

# **JEDEC PUBLICATION**

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## **PartModel Package Guidelines for Electronic-Device Packages – XML Requirements**

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## **PartModel Package Guidelines for Electronic-Device Substrates and Assemblies – XML Requirements**

(From JEDEC Board Ballots JCB-17-48, JCB-23-10, JCB-23-27, JCB-23-33, JCB-24-08, JCB-24-29, JCB-24-50, JCB-24-53, and JCB-25-59 formulated under the cognizance of the JC-11 Committee on Mechanical Standardization.)

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### **1 Scope**

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The JEP30 document establishes the requirements for exchanging part data between part manufacturers and their customers for electrical and electronic products. The JEP30 documents are part of a series to describe XML data exchange structure and hierarchy. The JEP30 document series will detail data exchange between companies for design at the next level, analysis, and interconnection. The parent JEP30 document specifically focuses on the parental structure, under which several sub-sections are listed, such as electrical, physical, thermal, supply chain, assembly process classification, design kit, generated ECAD models, product substrate and assemblies, and environment including material declaration. This document specifically focuses on the Package sub-section of the PartModel.

All releases of the [Package](#) sub-schema must be under the umbrella of the PartModel Schema to ensure that the PartModel schema is referencing the correct version of the [Package](#) sub-schema. In addition, this will enable the [Package](#) sub-schema to connect to the Manufacturer Part Number and the Manufacturer of the Part.

#### **1.1 Purpose**

This standard is intended to benefit part manufacturers and their customers by providing consistency and efficiency to the transfer of part data from part manufacturer to customers. This standard specifically covers data applicable to the package definition of the device.

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### **2 Applicable Documents**

---

The following documents form a part of this standard to the extent specified herein. The revision of the document in effect at the time of solicitation shall take precedence.

#### **2.1 JEDEC ([www.jedec.org](http://www.jedec.org))**

**JESD30L**, *Descriptive Designation System for Electronic-device Packages*

**JEP30**, *PartModel Guidelines for Electronic-Device Packages – XML Requirements*

**JEP95**, *JEDEC Registered and Standard Outlines for Solid State Products*

**JEP30-10**, *PartModel Schema*

**JEP30-P101**, *PartModel Package Schema*

**JEP30-D10**, *PartModel Schema Types Dictionary* (Required to support the PartModel Schema and each of its sectional sub-schemas.)

**SPP-010** Standard Procedures and Practices for Grid Array Terminal Position Numbering

## 2.2 IPC ([www.ipc.org](http://www.ipc.org))

**IPC-T-50**, *Terms and Definitions for Interconnecting and Packaging Electronic Circuits*

## 2.3 JEDEC/IPC ([www.jedec.org](http://www.jedec.org))

**J-Std-609**, *Marking, Symbols, and Labels of Leaded and Lead-Free Terminal Finished Materials Used in Electronic Assembly*

## 2.4 ASME ([www.asme.org](http://www.asme.org))

ASME Y14.5-2009 Dimensioning and Tolerancing

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## 3 Requirements

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The following terms and definitions are applicable to this XML Schema.

### 3.1 Terms and Definitions

All definitions and terms associated with the physical aspect of the part are in accordance with JESD30H or later versions. The physical details of the part are defined in the [PackageSection](#) of the XML Schema.

All common Terms and Definitions that are used by more than one sectional sub-schema, such as any of the Electrical, Package, Environmental, Assembly Process Classification, are defined in the “PartModel Schema Types Library”.

All other definitions and terms necessary to define the schema, are defined by this standard and included below.

**PartModel:** A PartModel is a data representation described in an XML file that conforms to the rules and structure of the PartModel XML Schema. Companies who use the PartModel XML Files and claim compliance to JEDEC, must ensure that their PartModel XML file conforms to the specific released version of the PartModel XML Schema released by JEDEC.

Section 4 will define the outline of the structure of the Package XML Schema. Specific components of the XML Schema and their hierarchy are specifically controlled by the JC-11 Standards Committee who retain the expertise for these structures.

The [PackageSection](#) of the schema forms part of the PartModel XML Schema and is not intended to act as a standalone schema. In addition, there is a “PartModel Schema Types Library” XML Schema, which is a common set of xml structures shared across the PartModel XML Schema and all its sub-section schemas.

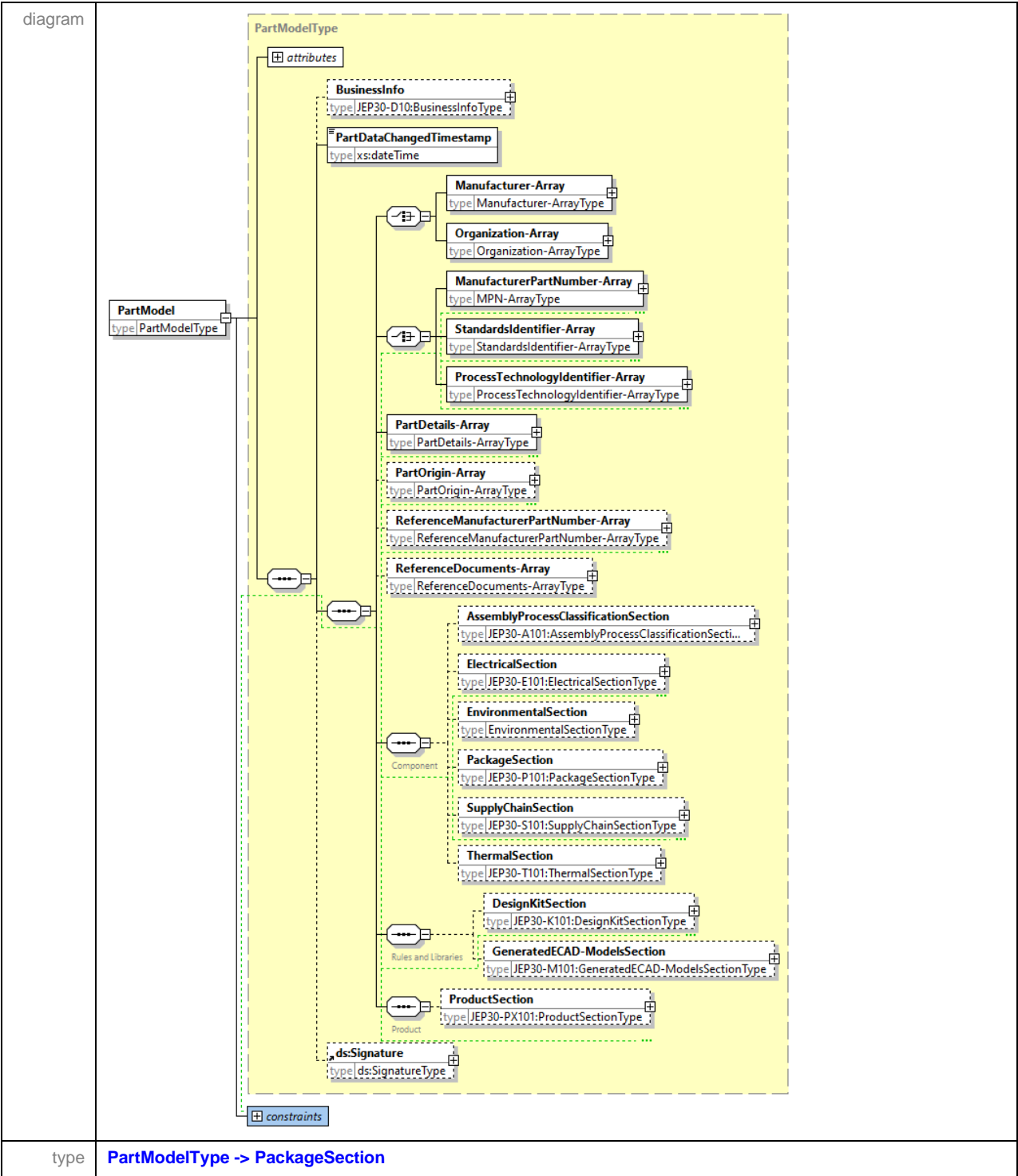
### 3.2 XML Schema Key Terms and Definitions

Reference JEP30 for details of the "XML Schema Key Terms and Definitions".

4 PartModel Schema Definition

The following section describes the XML Schema structure.

4.1 PartModel - Package Section



#### 4.1 PartModel - Package Section (cont'd)

The [PartModelType](#) belongs to the “PartModel XML Schema”. The [PackageSection](#) belongs to the “PartModel Package XML Schema”. The primary purpose of the PartModel Schema is to provide the structure for identifying unique parts (Manufacturer and MPN) or unique standards (Organization and Standards Identifier) and the structure to include the sub schemas which define the part details, as outlined in the JEP30 publication.

This document covers the [PackageSection](#), which is referenced from its parent’s structure, the [PartModel](#). The contents under the [PackageSection](#) are

- 1 Tied to the Manufacturer’s name and Manufacturer’s part number if the Package is applicable to a part or a chiplet, or
- 2 Tied to a Standards Body and a Standards Model Identifier, if the Package represents a standard mechanical outline of the Package as defined by a specific Standards Body.

The [ComplianceToPartModelSchemaVersion](#) indicates the version of the Schema to which the XML file is to be validated against. All new releases to this document or XML Schema is governed by the rules outlined in the JEP30-XX and must be released in sync with the PartModel.

*“Each time that a Sub-schema gets updated, then the PartModel version also gets updated in order to release that Sub-schema under the umbrella of the PartModel. This is because the PartModel must now reference the new version of sub-schema, since all subschemas have their own version number. The parent schema includes them by referring to a precise version, so a version bump in the subschema requires a version bump in the parent only at the time of release of the Parent.”*

The [PackageContentRevision](#) indicates the revision of the data for the Part that is submitted in the XML file. This enables the Component Manufacturer to provide a new XML file for a Part each time they wish to upgrade a new set of data for a part, in any of the sub-sections such as this [PackageSection](#).

The [PartModelPackageSectionStatus](#) attribute is a mandatory attribute that determines the status of the PartModel XML file. It has enumerated values of [Pre-Release](#), [Released](#), [Superseded](#), and [Withdrawn](#).

The [DocumentID](#) attribute provides a unique ID for the JEP30-P101 document that is being published.



4.2 Manufacturer Part Number-Array

path	PartModel/ManufacturerPartNumber-Array.
diagram	
type	MPN-ArrayType, ManufacturerPartNumbersType, PartNumberType, OrderablePartNumber-ArrayType, JEP30-D10:SignatureDigestLinkType, ds:SignatureType.

The [ManufacturerPartNumber-Array/ManufacturerPartNumbers](#) provides the definition of the part number or a specific Standard, so that it can be connected to the technical specification details in the [PackageSection](#) via the [PartDetails-Array](#) section.

### 4.3 Standards Identifier - Array

path	<a href="#">PartModel/StandardsIdentifier-Array.</a>
diagram	<p>The diagram illustrates the XML Schema (XSD) structure for the <b>StandardsIdentifier-Array</b>. It consists of two main components: <b>StandardsIdentifier-ArrayType</b> and <b>StandardsIdentifierType</b>.</p> <ul style="list-style-type: none"> <li><b>StandardsIdentifier-ArrayType</b> is an array type containing zero or more (<math>0..∞</math>) instances of <b>StandardsIdentifier</b>.</li> <li><b>StandardsIdentifierType</b> is a complex type with the following elements: <ul style="list-style-type: none"> <li><b>attributes</b>: A container for attributes, including: <ul style="list-style-type: none"> <li><b>ID</b>: A required attribute of type <code>xs:string</code>.</li> <li><b>Name</b>: A required attribute of type <code>xs:string</code>.</li> <li><b>StandardsNumber</b>: A required attribute of type <code>xs:string</code>.</li> <li><b>Version</b>: A required attribute of type <code>xs:string</code>.</li> <li><b>BaseIdentifier</b>: A required attribute of type <code>xs:string</code>.</li> <li><b>ModelVariationIdentifier</b>: A required attribute of type <code>xs:string</code>.</li> <li><b>Description</b>: A required attribute of type <code>xs:string</code>.</li> </ul> </li> <li><b>StandardsOrganizationIdentityID</b>: A required element of type <code>xs:string</code>.</li> <li><b>StandardsOrganizationIdentitySignatureDigest</b>: A required element of type <code>JEP30-D10:SignatureDigestLinkType</code>.</li> <li><b>ds:Signature</b>: A required element of type <code>ds:SignatureType</code>.</li> </ul> </li> </ul> <p>Both <b>StandardsIdentifier-ArrayType</b> and <b>StandardsIdentifierType</b> include <b>constraints</b> sections.</p>
type	<a href="#">StandardsIdentifier-ArrayType</a> , <a href="#">StandardsIdentifierType</a> , <a href="#">JEP30-D10:SignatureDigestLinkType</a> , <a href="#">ds:SignatureType</a> .

The [StandardsIdentifier-Array/StandardsIdentifier](#) provides the definition of a specific Standard, so that it can be connected to the technical specification details in the [PackageSection](#) via the [PartDetails-Array](#) section.

4.4 Linking the MPN to a specific Package Family Data set

The linking of the Parts to its technical data is done via the *PartDetails-Array* section as outline in the JEP30 - PartModel Guidelines for Electronic-Device Packages – XML Requirements. This consists of two sections called *PartsSelection-Array* and *Association-Array* which defines the relationship between identifying the specific set of parts and how they are associated with the package content. Reference the JEP30 parent document for more details on this association.

path	PartModel/PartDetails-Array/PartDetails/Association-Array/Association/Package-Array
diagram at the Association level	<p>The diagram illustrates the association level structure. A <b>Package-Array</b> (type <code>PackageAssociation-ArrayType</code>) is linked via a composition relationship (indicated by a solid line with a filled circle) to a <b>PackageAssociation-ArrayType</b>. This array type contains three sub-arrays: <b>Package</b> (type <code>PackageAssociationType</code>), <b>PhysicalModel</b> (type <code>PhysicalModelAssociationType</code>), and <b>Die</b> (type <code>DieAssociationType</code>). Each of these sub-arrays has a cardinality of <code>0..∞</code>.</p>
type	PackageAssociation-ArrayType, PackageAssociationType, PhysicalModelAssociationType, DieAssociationType.
diagram at the Package Section level	<p>The diagram illustrates the package section level structure. A <b>PackageSection</b> (type <code>PackageSectionType</code>) is linked via a composition relationship to a <b>PackageSectionType</b>. This type contains two main sub-sections: <b>Package-Array</b> (type <code>Package-ArrayType</code>) and <b>Die-Array</b> (type <code>Die-ArrayType</code>). The <b>Package-Array</b> sub-section contains a <b>Package</b> (type <code>PackageType</code>) with cardinality <code>1..∞</code> and a <b>PhysicalModel</b> (type <code>PhysicalModelType</code>) with cardinality <code>0..∞</code>. The <b>Die-Array</b> sub-section contains a <b>Die</b> (type <code>DieType</code>) with cardinality <code>1..∞</code>. Both sub-sections are linked to a <b>constraints</b> box. The <b>Package-Array</b> and <b>Die-Array</b> sub-sections are themselves linked via composition relationships to their respective array types.</p>
type	PackageSectionType, Package-ArrayType, PackageType, PhysicalModelType, Die-ArrayType, DieType.

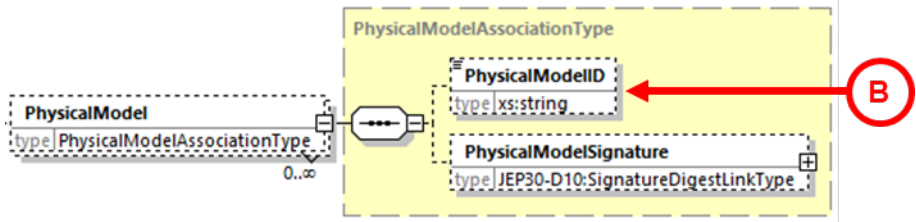
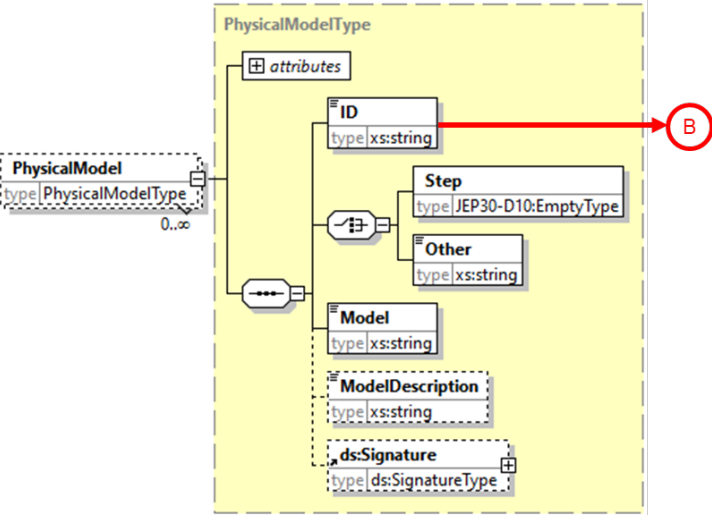
The *Package-Array* content is now sub-grouped into 2 major sections as shown in the diagram. This enables each section to be digitally signed independently of each other. The linkage between the 2 sections plus the *Die* is shown below.

#### 4.4.1 Linking the Manufacturing Part Number to Package Content

path	<a href="#">PartModel/PartDetails-Array/PartDetails/Association-Array/Association/Package-Array/Package</a>
diagram at the Package Association level	<p>The diagram shows a dashed box labeled 'PackageAssociationType'. Inside, there is a 'Package' element with a dashed border and a 'type' attribute set to 'PackageAssociationType'. To its right is a 'PackageSignature' element with a dashed border and a 'type' attribute set to 'JEP30-D10:SignatureDigestLinkType'. A red arrow points from a circled 'A' to the 'PackageID' element, which is a dashed box with 'type' set to 'xs:string'.</p>
type	<a href="#">PackageAssociationType</a> , <a href="#">JEP30-D10:SignatureDigestLinkType</a> .
path	<a href="#">PartModel/PackageSection/Package-Array/Package</a>
diagram at the Package level	<p>The diagram shows a dashed box labeled 'PackageType'. Inside, there is an 'ID' element with a dashed border and a 'type' attribute set to 'xs:string'. Below it are several other elements: 'DescriptiveDesignation' (type 'xs:string'), 'ManufacturerPackageCode' (type 'xs:string'), 'StandardsBodyPackageCode' (type 'xs:string'), and 'PackageStatus' (type 'PackageStatusType'). A red arrow points from a circled 'A' to the 'ID' element. To the left of the 'PackageType' box is a 'Package' element with a dashed border and a 'type' attribute set to 'PackageType'.</p>
type	<a href="#">PackageType</a> , <a href="#">ds:SignatureType</a> , ...

The [PackageID](#) references the [Package/ID](#) under the [PackageSection/Package-Array](#). This is enforced by the key named as [PackageKey](#) that is assigned to the [Package/ID](#) element, which is referenced by the [PackageID](#) which has a KeyRef that refers to the [JEP30-P101:PackageKey](#).

4.4.2      Linking the Manufacturing Part Number to Physical Model Content

path	PartModel/PartDetails-Array/PartDetails/Association-Array/Association/Package-Array/PhysicalModel
diagram at the Physical Model Association level	 <p>The diagram shows a dashed box labeled <b>PhysicalModelAssociationType</b>. Inside, there is a <b>PhysicalModel</b> element with a key icon and a type reference to <b>PhysicalModelAssociationType</b>. To its right is a container with two elements: <b>PhysicalModelID</b> (type <b>xs:string</b>) and <b>PhysicalModelSignature</b> (type <b>JEP30-D10:SignatureDigestLinkType</b>). A red arrow points from a circled 'B' to the <b>PhysicalModelID</b> element. A multiplicity of <b>0..∞</b> is shown near the <b>PhysicalModel</b> element.</p>
type	PhysicalModelAssociationType, JEP30-D10:SignatureDigestLinkType.
path	PartModel/PackageSection/Package-Array/PhysicalModel
diagram at the Physical Model level	 <p>The diagram shows a dashed box labeled <b>PhysicalModelType</b>. It contains an <b>attributes</b> container, an <b>ID</b> element (type <b>xs:string</b>) with a key icon, and a choice container. The choice has two branches: one with <b>Step</b> (type <b>JEP30-D10:EmptyType</b>) and <b>Other</b> (type <b>xs:string</b>); the other with <b>Model</b> (type <b>xs:string</b>). Below the choice are <b>ModelDescription</b> (type <b>xs:string</b>) and <b>ds:Signature</b> (type <b>ds:SignatureType</b>) with a key icon. A red arrow points from a circled 'B' to the <b>ID</b> element. A multiplicity of <b>0..∞</b> is shown near the <b>PhysicalModel</b> element.</p>
type	PhysicalModelType, ModelType, ds:SignatureType.

The *PhysicalModelID* references the *PhysicalModel/ID* under the *PackageSection/Package-Array*. This is enforced by the key named as *PhysicalModelKey* that is assigned to the *PhysicalModel/ID* element, which is referenced by the *PhysicalModelID* which has a KeyRef that refers to the *JEP30-P101:PhysicalModelKey*.

#### 4.4.3 Linking the Manufacturing Part Number to Die Content

path	<a href="#">PartModel/PartDetails-Array/PartDetails/Association-Array/Association/Package-Array/Die</a>
diagram at the Physical Model Association level	
type	<a href="#">DieAssociationType</a> , <a href="#">JEP30-D10:SignatureDigestLinkType</a> .
path	<a href="#">PartModel/PackageSection/Die-Array/Die</a>
diagram at the Physical Model level	
type	<a href="#">DieType</a> , <a href="#">FiducialMarkingType</a> , <a href="#">DieTerminalGroupsType</a> , <a href="#">ds:SignatureType</a> .

The [DieID](#) references the [Die/ID](#) under the [PackageSection/Die-Array](#). This is enforced by the key named as [DieKey](#) that is assigned to the [Die/ID](#) element, which is referenced by the [DieID](#) which has a KeyRef that refers to the [JEP30-P101:DieKey](#).

5 Package Section - Package

path	PartModel/PackageSection
diagram part 1 of 4	
type	PackageSectionType, Package-ArrayType, PackageType, PhysicalModelType, Die-ArrayType.
path	PartModel/PackageSection/Package-Array/Package

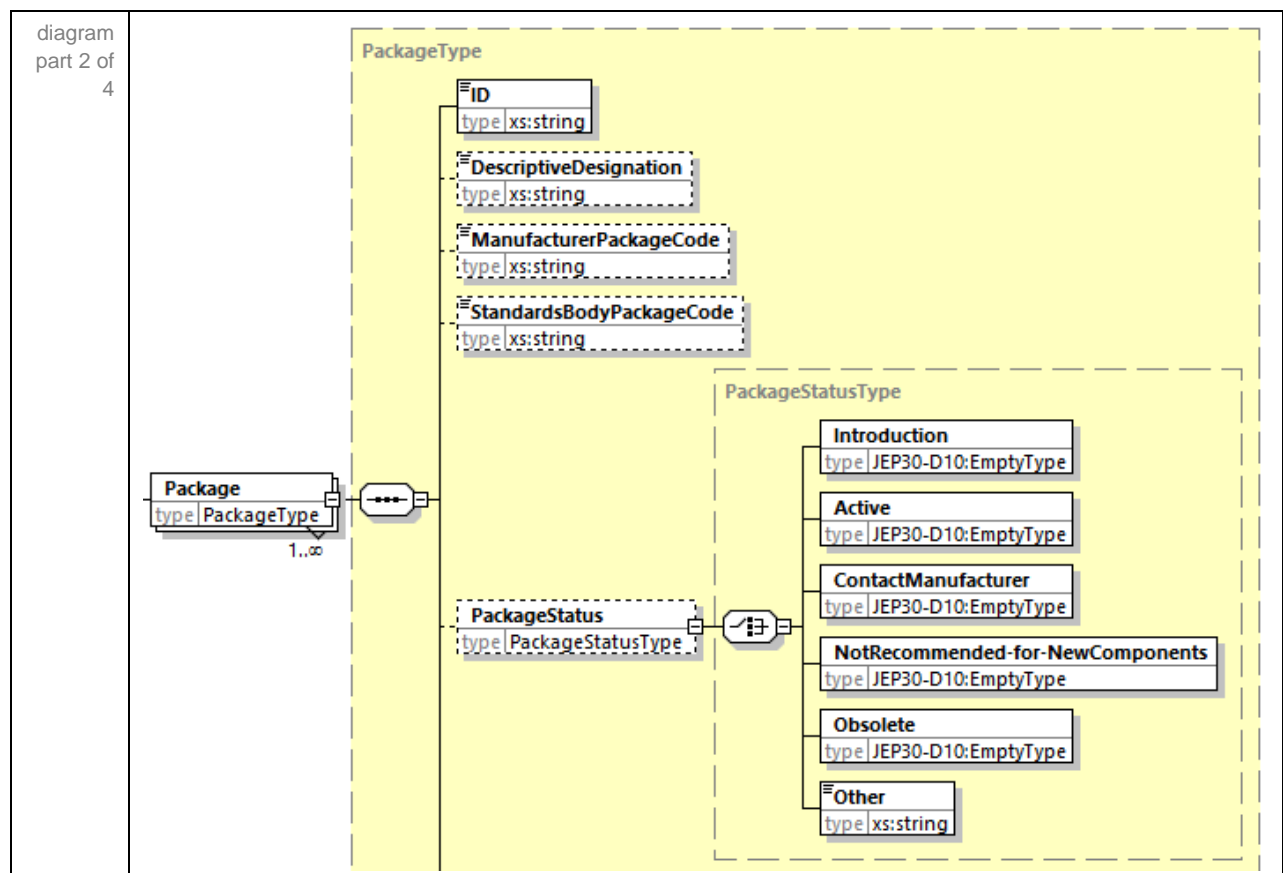
The [ComplianceToJEP30-P101SchemaVersion](#) attribute indicates the version of the Schema to which the JEP30-P101 XML file is to be validated against.

The [PartModelContentRevision](#) attribute indicates the revision of the data for the Part that is submitted in the XML file. This enables the Component Manufacturer to provide a new XML file for a Part each time they wish to upgrade a new set of data for a part, in any of the child sections.

The [PartModelStatus](#) attribute is a mandatory attribute that determines the status of the PartModel XML file. It has enumerated values of [Pre-Release](#), [Released](#), [Superseded](#), and [Withdrawn](#).

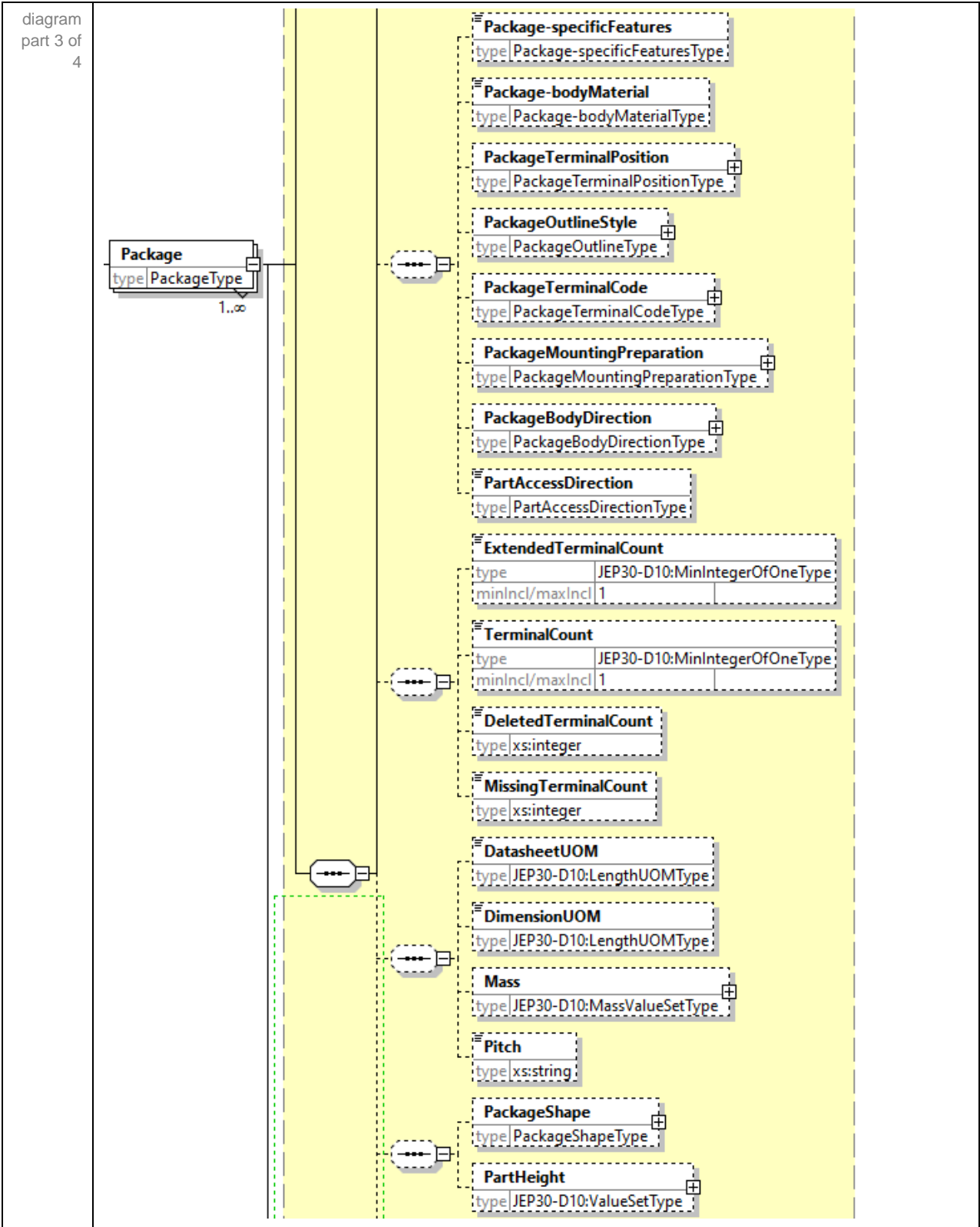
The [DocumentID](#) attribute provides a unique ID for the JEP30 document that is being published.

## 5 Package Section – Package (cont'd)



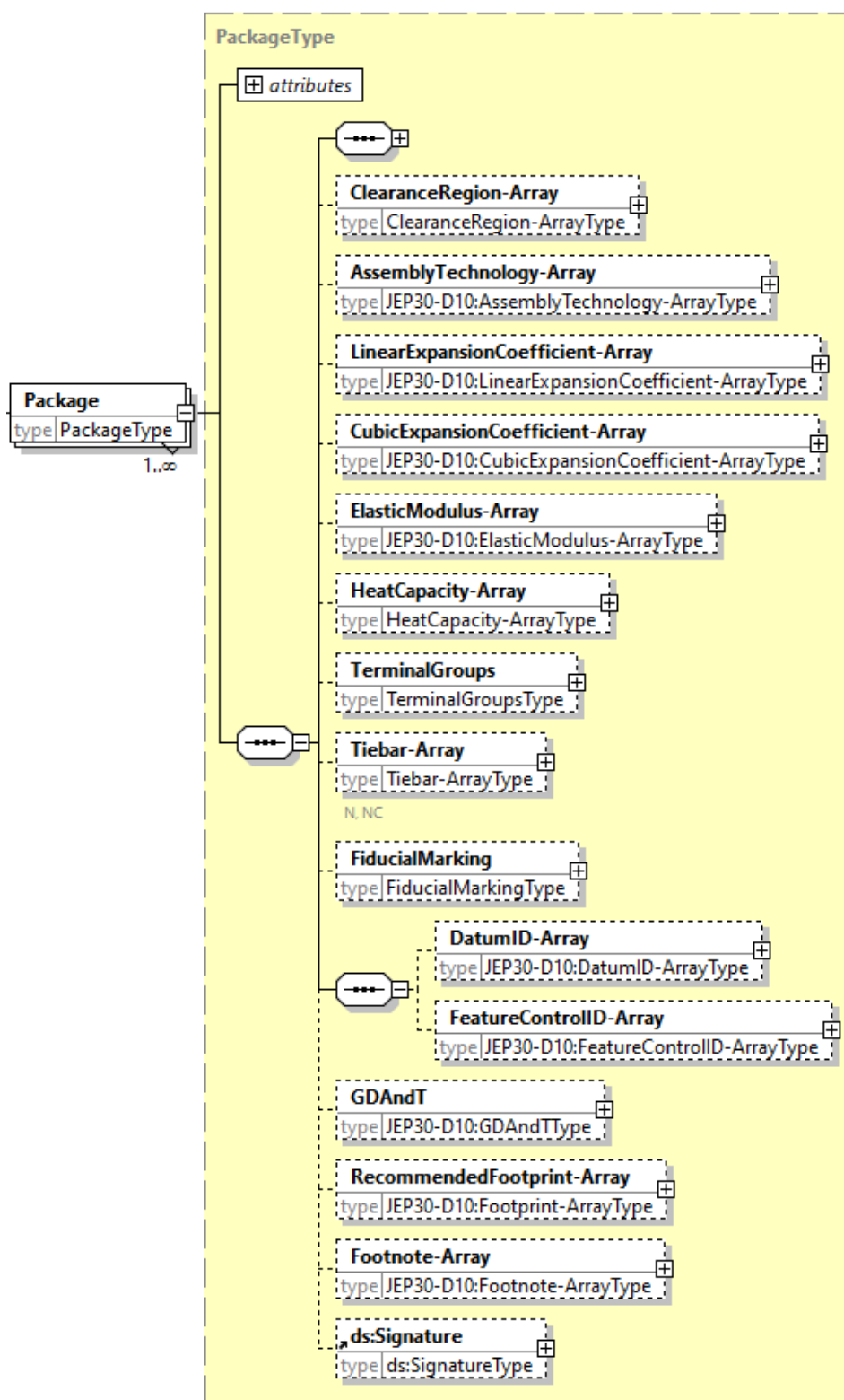


5 Package Section – Package (cont'd)



## 5 Package Section – Package (cont'd)

diagram  
part 4 of  
4



## 5 Package Section – Package (cont'd)

type	<a href="#">PackageType</a> , <a href="#">PackageStatusType</a> , <a href="#">Package-specificFeaturesType</a> , <a href="#">Package-bodyMaterialType</a> , <a href="#">PackageTerminalPositionType</a> , <a href="#">PackageOutlineType</a> , <a href="#">PackageTerminalCodeType</a> , <a href="#">PackageMountingPreparationType</a> , <a href="#">PackageBodyDirectionType</a> , <a href="#">PartAccessDirectionType</a> , <a href="#">JEP30-D10:MinIntegerOfOneType</a> , <a href="#">JEP30-D10:LengthUOMType</a> , <a href="#">JEP30-D10:MassValueSetType</a> , <a href="#">PackageShapeType</a> , <a href="#">JEP30-D10:ValueSetType</a> , <a href="#">ClearanceRegion-ArrayType</a> , <a href="#">JEP30-D10:AssemblyTechnologyType</a> , <a href="#">JEP30-D10:LinearExpansionCoefficient-ArrayType</a> , <a href="#">JEP30-D10:CubicExpansionCoefficient-ArrayType</a> , <a href="#">JEP30-D10:ElasticModulus-ArrayType</a> , <a href="#">HeatCapacity-ArrayType</a> , <a href="#">TerminalGroupsType</a> , <a href="#">FiducialMarkingType</a> , <a href="#">JEP30-D10:DatumID-ArrayType</a> , <a href="#">JEP30-D10:FeatureControlID-ArrayType</a> , <a href="#">JEP30-D10:GDAndTTType</a> , <a href="#">JEP30-D10:Footprint-ArrayType</a> , <a href="#">JEP30-D10:Footnote-ArrayType</a> : <a href="#">ds:SignatureType</a> .
------	--

The [DescriptiveDesignation](#) is described in JESD30, “Descriptive Designation System for Electronic-device Packages and Footprints”. The [ManufacturerPackageCode](#) is a non-standardized package Code that is assigned to the Package by the component manufacturer. The definitions of the [ExtendedTerminalCount](#), [TerminalCount](#), [DeletedTerminalCount](#), [MissingTerminalCount](#) and [Package/Pitch](#) are also described in the JESD30 document.

The [PackageStatus](#) is an optional attribute that determines the status of the Package.

The enumerated values of the [JEP30-D10:LengthUOMType](#) are [nm](#), [μm](#), [mm](#), [m](#), [μin](#), [mil](#) and [in](#).

The enumerate values of the above lists of [Package-specificFeatures](#), [Package-bodyMaterial](#), and [PartAccessDirection](#), are contained in JESD30, as indicated in Table 1.

**Table 1 - JESD30 Table and Section References for Package Elements**

Enumerated Value List	JESD30 Tables / Section
Package-specific Features	Codes for package-specific features table
Package-body Material Type	Prefixes for predominant package-body material table
Part Access Direction	Part access Direction section

5.1 Package Terminal Position

path	PartModel/PackageSection/Package-Array/Package/PackageTerminalPosition.
diagram	<p>The diagram illustrates the <b>PackageTerminalPosition</b> type as a union of several <b>PackageTerminalPositionType</b> subclasses. On the left, a dashed box labeled <b>PackageTerminalPosition</b> with the type <code>PackageTerminalPositionType</code> is connected via a union symbol (a circle with a cross) to a large yellow dashed box on the right labeled <b>PackageTerminalPositionType</b>. This yellow box contains a vertical list of subclasses, each with its own type: <b>Axial</b> (type <code>JEP30-D10:EmptyType</code>), <b>Bottom</b> (type <code>BottomUpperPositionConfigurationType</code>, marked with a '+' sign), <b>Dual</b> (type <code>DualPositionConfigurationType</code>, marked with a '+' sign), <b>End</b> (type <code>JEP30-D10:EmptyType</code>), <b>Diagonal</b> (type <code>DiagonalCornerConfigurationType</code>, marked with a '+' sign), <b>Internal</b> (type <code>JEP30-D10:EmptyType</code>), <b>MixedPosition</b> (type <code>JEP30-D10:EmptyType</code>), <b>Quad</b> (type <code>QuadPositionConfigurationType</code>, marked with a '+' sign), <b>Radial</b> (type <code>RadialPositionConfigurationType</code>, marked with a '+' sign), <b>Single</b> (type <code>SinglePositionConfigurationType</code>, marked with a '+' sign), <b>Triple</b> (type <code>TriplePositionConfigurationType</code>, marked with a '+' sign), <b>Upper</b> (type <code>BottomUpperPositionConfigurationType</code>, marked with a '+' sign), and <b>ZigZag</b> (type <code>JEP30-D10:EmptyType</code>).</p>
type	PackageTerminalPositionType, JEP30-D10:EmptyType, BottomUpperPositionConfigurationType, DualPositionConfigurationType, DiagonalCornerConfigurationType, QuadPositionConfigurationType, RadialPositionConfigurationType, SinglePositionConfigurationType, TriplePositionConfigurationType.

5.1 Package Terminal Position (cont'd)

The definition of the above *PackageTerminalPosition* data elements can be found in JESD30, under the “Terminal position Prefix” section which includes the “Prefixes for terminal position” table, plus three sections in Annex A, namely

- Terminal position with additional definition,
- Relationship concepts between the Terminal Contact Area and the Body outline, and
- Position Images.

NOTE As a result of the *TerminalGroup/TerminalPosition* (as defined in section 4.16 Terminal Position below), the rollup of the *TerminalPosition* values for all *TerminalGroup-Array/TerminalGroups* into the *PackageTerminalPosition*, may be different than the value at the *PackageTerminalPosition* level. This is described in detail in JESD30, “Terminal-position prefix”.

5.1.1 Bottom

path	PartModel/PackageSection/Package-Array/Package/PackageTerminalPosition/Bottom.
diagram	<pre>classDiagram     class Bottom {         type BottomUpperPositionConfigurationType     }     class BottomUpperPositionConfigurationType {         CircularArray         Diagonal         Matrix     }     class CircularArray {         type JEP30-D10:EmptyType     }     class Diagonal {         type BottomUpperDiagonalType     }     class Matrix {         type MatrixType     }     class BottomUpperDiagonalType {         Southwest-to-Northeast         Northwest-to-Southeast     }     class Southwest-to-Northeast {         type JEP30-D10:EmptyType     }     class Northwest-to-Southeast {         type JEP30-D10:EmptyType     }     class MatrixType {         FullMatrix         ColumnMatrix         PerimeterMatrix         PerimeterWithInnerArrayMatrix         PerimeterMatrixWithThermalPad         RandomMatrix     }     class FullMatrix {         type MatrixAlterationType     }     class ColumnMatrix {         type MatrixAlterationType     }     class PerimeterMatrix {         type MatrixAlterationType     }     class PerimeterWithInnerArrayMatrix {         type MatrixAlterationType     }     class PerimeterMatrixWithThermalPad {         type MatrixAlterationType     }     class RandomMatrix {         type JEP30-D10:EmptyType     }     class MatrixAlterationType {         CornerPatternMissing         Staggered     }     class CornerPatternMissing {         type JEP30-D10:EmptyType     }     class Staggered {         type JEP30-D10:EmptyType     }      Bottom --&gt; BottomUpperPositionConfigurationType     BottomUpperPositionConfigurationType --&gt; CircularArray     BottomUpperPositionConfigurationType --&gt; Diagonal     BottomUpperPositionConfigurationType --&gt; Matrix     BottomUpperPositionConfigurationType --&gt; BottomUpperDiagonalType     BottomUpperPositionConfigurationType --&gt; MatrixType     BottomUpperDiagonalType --&gt; Southwest-to-Northeast     BottomUpperDiagonalType --&gt; Northwest-to-Southeast     MatrixType --&gt; FullMatrix     MatrixType --&gt; ColumnMatrix     MatrixType --&gt; PerimeterMatrix     MatrixType --&gt; PerimeterWithInnerArrayMatrix     MatrixType --&gt; PerimeterMatrixWithThermalPad     MatrixType --&gt; RandomMatrix     MatrixAlterationType --&gt; FullMatrix     MatrixAlterationType --&gt; ColumnMatrix     MatrixAlterationType --&gt; PerimeterMatrix     MatrixAlterationType --&gt; PerimeterWithInnerArrayMatrix     MatrixAlterationType --&gt; PerimeterMatrixWithThermalPad     MatrixAlterationType --&gt; CornerPatternMissing     MatrixAlterationType --&gt; Staggered</pre>
type	BottomUpperPositionConfigurationType, JEP30-D10:EmptyType, BottomDiagonalType, MatrixType, MatrixAlterationType.

## 5.1.2 Dual

path	<b>PartModel/PackageSection/Package-Array/Package/PackageTerminalPosition/Dual.</b>
diagram	<pre> classDiagram     class Dual {         type DualPositionConfigurationType     }     class LefttoRight {         type DualSidePositionRelationshipType     }     class BacktoFront {         type DualSidePositionRelationshipType     }     class BottomtoUpper {         type BottomtoUpperDualPositionRelationshipType     }     class Corners {         type DualCornerConfirurationType     }     class Left {         type SideCornerPositionRelationshipType     }     class Back {         type SideCornerPositionRelationshipType     }     class Right {         type SideCornerPositionRelationshipType     }     class Front {         type SideCornerPositionRelationshipType     }     class LefttoRightTop {         type DifferentSidePositionRelationshipType     }     class LefttoRightBottom {         type DifferentSidePositionRelationshipType     }     class BacktoFrontLeft {         type DifferentSidePositionRelationshipType     }     class BacktoFrontRight {         type DifferentSidePositionRelationshipType     }      Dual --&gt; LefttoRight     Dual --&gt; BacktoFront     Dual --&gt; BottomtoUpper     Dual --&gt; Corners     Corners --&gt; Left     Corners --&gt; Back     Corners --&gt; Right     Corners --&gt; Front     Corners --&gt; LefttoRightTop     Corners --&gt; LefttoRightBottom     Corners --&gt; BacktoFrontLeft     Corners --&gt; BacktoFrontRight </pre>
type	<b>DualPositionConfigurationType, DualSidePositionRelationshipType, Bottom-to-UpperDualPositionRelationshipType, DualCornerConfirurationType, SideCornerPositionRelationshipType, DifferentSidePositionRelationshipType.</b>

### 5.1.2.1 Dual Left-to-Right and Back-to-Front

path	<ol style="list-style-type: none"> <li>1. PartModel/PackageSection/Package-Array/Package/PackageTerminalPosition/Dual/Left-to-Right</li> <li>2. PartModel/PackageSection/Package-Array/Package/PackageTerminalPosition/Dual/Back-to-Front</li> </ol>
diagram	<pre> classDiagram     class DualSidePositionRelationshipType {         +Staggered JEP30-D10:EmptyType         +Outside JEP30-D10:EmptyType         +Edge-Out JEP30-D10:EmptyType         +Overlap JEP30-D10:EmptyType         +Edge-In JEP30-D10:EmptyType         +Inside JEP30-D10:EmptyType         +Span SpanPositionRelationshipType     }     class LeftToRight {         +type DualSidePositionRelationshipType     }     DualSidePositionRelationshipType "1" -- "*" LeftToRight     DualSidePositionRelationshipType "1" -- "*" Staggered     DualSidePositionRelationshipType "1" -- "*" Outside     DualSidePositionRelationshipType "1" -- "*" EdgeOut     DualSidePositionRelationshipType "1" -- "*" Overlap     DualSidePositionRelationshipType "1" -- "*" EdgeIn     DualSidePositionRelationshipType "1" -- "*" Inside     DualSidePositionRelationshipType "1" -- "*" Span     </pre>
type	DualSidePositionRelationshipType, JEP30-D10:EmptyType, SpanPositionRelationshipType.

### 5.1.2.2 Dual Bottom-to-Upper

path	PartModel/PackageSection/Package-Array/Package/PackageTerminalPosition/Dual/Bottom-to-Upper
diagram	<pre> classDiagram     class BottomToUpperDualPositionRelationshipType {         +Outside JEP30-D10:EmptyType         +Edge-Out JEP30-D10:EmptyType         +Overlap JEP30-D10:EmptyType         +Edge-In JEP30-D10:EmptyType         +Span Bottom-to-UpperSpanPositionRelationshipType     }     class BottomToUpper {         +type Bottom-to-UpperDualPositionRelationshipType     }     class BottomToUpperSpanPositionRelationshipType {         +Outside JEP30-D10:EmptyType         +Edge-Out JEP30-D10:EmptyType         +Overlap JEP30-D10:EmptyType         +Edge-In JEP30-D10:EmptyType     }     BottomToUpperDualPositionRelationshipType "1" -- "*" BottomToUpper     BottomToUpperDualPositionRelationshipType "1" -- "*" Outside     BottomToUpperDualPositionRelationshipType "1" -- "*" EdgeOut     BottomToUpperDualPositionRelationshipType "1" -- "*" Overlap     BottomToUpperDualPositionRelationshipType "1" -- "*" EdgeIn     BottomToUpperDualPositionRelationshipType "1" -- "*" Span     BottomToUpperDualPositionRelationshipType "1" -- "*" BottomToUpperSpanPositionRelationshipType     </pre>
type	Bottom-to-UpperDualPositionRelationshipType, JEP30-D10:EmptyType, Bottom-to-UpperSpanPositionRelationshipType

### 5.1.2.3 Dual Corners

path	<b>PartModel/PackageSection/Package-Array/Package/PackageTerminalPosition/Dual/Corners</b>
diagram	<p>The diagram illustrates the structure of the Dual Corners package terminal position. It features a central <b>DualCornerConfigurationType</b> class (highlighted in yellow) which is associated with a <b>Corners</b> class (type <b>DualCornerConfigurationType</b>). The <b>DualCornerConfigurationType</b> class contains several subclasses, each representing a different corner or side relationship:</p> <ul style="list-style-type: none"> <li><b>Left</b> (type <b>SideCornerPositionRelationshipType</b>)</li> <li><b>Back</b> (type <b>SideCornerPositionRelationshipType</b>)</li> <li><b>Right</b> (type <b>SideCornerPositionRelationshipType</b>)</li> <li><b>Front</b> (type <b>SideCornerPositionRelationshipType</b>)</li> <li><b>Left-to-RightTop</b> (type <b>DifferentSidePositionRelationshipType</b>)</li> <li><b>Left-to-RightBottom</b> (type <b>DifferentSidePositionRelationshipType</b>)</li> <li><b>Back-to-FrontLeft</b> (type <b>DifferentSidePositionRelationshipType</b>)</li> <li><b>Back-to-FrontRight</b> (type <b>DifferentSidePositionRelationshipType</b>)</li> </ul> <p>Each of these subclasses is further associated with a <b>SideCornerPositionRelationshipType</b> or <b>DifferentSidePositionRelationshipType</b> class. The <b>SideCornerPositionRelationshipType</b> class includes the following subclasses:</p> <ul style="list-style-type: none"> <li><b>Outside</b> (type <b>JEP30-D10:EmptyType</b>)</li> <li><b>Edge-Out</b> (type <b>JEP30-D10:EmptyType</b>)</li> <li><b>Overlap</b> (type <b>JEP30-D10:EmptyType</b>)</li> <li><b>Edge-In</b> (type <b>JEP30-D10:EmptyType</b>)</li> </ul> <p>The <b>DifferentSidePositionRelationshipType</b> class includes the following subclasses:</p> <ul style="list-style-type: none"> <li><b>Outside</b> (type <b>JEP30-D10:EmptyType</b>)</li> <li><b>Edge-Out</b> (type <b>JEP30-D10:EmptyType</b>)</li> <li><b>Overlap</b> (type <b>JEP30-D10:EmptyType</b>)</li> </ul>
type	<b>DualCornerConfigurationType, SideCornerPositionRelationshipType, DifferentSidePositionRelationshipType, JEP30-D10:EmptyType.</b>



5.1.3 Diagonal

path	PartModel/PackageSection/Package-Array/Package/PackageTerminalPosition/Diagonal
diagram	<p>The diagram illustrates the structure of the <b>Diagonal</b> configuration. It is a class of type <b>DiagonalCornerConfigurationType</b>. This class is associated with a collection of relationship types, represented by a dashed box. Within this box, the following relationships are defined:</p> <ul style="list-style-type: none"><li><b>Southwest-to-Northeast</b> (type <b>InternalCornerPositionRelationshipType</b>)</li><li><b>Northwest-to-Southeast</b> (type <b>InternalCornerPositionRelationshipType</b>)</li><li><b>Back-left-to-Front-right</b> (type <b>DifferentSidePositionRelationshipType</b>)<ul style="list-style-type: none"><li>Associated with <b>Outside</b> (type <b>JEP30-D10:EmptyType</b>)</li><li>Associated with <b>Edge-Out</b> (type <b>JEP30-D10:EmptyType</b>)</li><li>Associated with <b>Overlap</b> (type <b>JEP30-D10:EmptyType</b>)</li></ul></li><li><b>Front-left-to-Back-right</b> (type <b>DifferentSidePositionRelationshipType</b>)</li><li><b>Left-bottom-to-Right-top</b> (type <b>DifferentSidePositionRelationshipType</b>)</li><li><b>Left-top-to-Right-bottom</b> (type <b>DifferentSidePositionRelationshipType</b>)</li></ul>
type	DiagonalCornerConfigurationType, InternalCornerPositionRelationshipType, JEP30-D10:EmptyType, DifferentSidePositionRelationshipType.

5.1.4 Quad

path	PartModel/PackageSection/Package-Array/Package/PackageTerminalPosition/Quad.	
diagram		
type	QuadPositionConfigurationType, JEP30-D10:EmptyType, SpanPositionRelationshipType, QuadCornerConfigurationType, DifferentSidePositionRelationshipType.	

5.1.5 Radial

path	PartModel/PackageSection/Package-Array/Package/PackageTerminalPosition/Radial
diagram	<p>The diagram illustrates the structure of the <b>RadialPositionConfigurationType</b> and its relationship to <b>RadialCornerPositionRelationshipType</b>. The <b>RadialPositionConfigurationType</b> is a container type that includes several subtypes: <b>Outside</b>, <b>Edge-Out</b>, <b>Overlap</b>, <b>Edge-In</b>, and <b>Inside</b>. Each of these subtypes is of type <b>JEP30-D10:EmptyType</b>. Additionally, it includes a <b>Corners</b> subtype of type <b>RadialCornerPositionRelationshipType</b>. The <b>RadialCornerPositionRelationshipType</b> is a container type that includes subtypes <b>Outside</b>, <b>Edge-Out</b>, <b>Overlap</b>, <b>Edge-In</b>, and <b>Inside</b>, all of which are of type <b>JEP30-D10:EmptyType</b>. The <b>Radial</b> type is of type <b>RadialPositionConfigurationType</b> and is connected to the <b>RadialPositionConfigurationType</b> container via a dashed line with a circle and a plus sign, indicating a composition relationship.</p>
type	RadialPositionConfigurationType, JEP30-D10:EmptyType, RadialCornerpositionRelationshipType.

## 5.1.6 Single

path	<b>PartModel/PackageSection/Package-Array/Package/PackageTerminalPosition/Single.</b>
diagram	<p>The diagram illustrates the structure of the <b>Single</b> package terminal position. It shows a <b>Single</b> entity (type <b>SinglePositionConfigurationType</b>) connected to a <b>SinglePositionConfigurationType</b> container. This container includes four <b>SingleSidePositionRelationshipType</b> entities (<b>Left</b>, <b>Back</b>, <b>Right</b>, <b>Front</b>) and one <b>SingleCornerConfigurationType</b> entity (<b>Corner</b>). The <b>SingleCornerConfigurationType</b> entity is further connected to a <b>SingleCornerConfigurationType</b> container, which lists twelve <b>DifferentSidePositionRelationshipType</b> entities: <b>Southwest</b>, <b>Southeast</b>, <b>Northeast</b>, <b>Northwest</b>, <b>Back-left</b>, <b>Back-right</b>, <b>Front-right</b>, <b>Front-left</b>, <b>Left-bottom</b>, <b>Right-bottom</b>, <b>Right-top</b>, and <b>Left-top</b>. The <b>InternalCornerPositionRelationshipType</b> entities (<b>Southwest</b>, <b>Southeast</b>, <b>Northeast</b>, <b>Northwest</b>) are connected to the <b>SingleCornerConfigurationType</b> container, while the <b>DifferentSidePositionRelationshipType</b> entities are connected to the <b>SingleCornerConfigurationType</b> entity.</p>
type	<b>SinglePositionConfigurationType, SingleSidePositionRelationshipType, SingleCornerConfigurationType, InternalCornerPositionRelationshipType, DifferentSidePositionRelationshipType.</b>

### 5.1.6.1 Single Side

path	<ol style="list-style-type: none"> <li>1. <a href="#">PartModel/PackageSection/Package-Array/Package/PackageTerminalPosition/Single/Left</a></li> <li>2. <a href="#">PartModel/PackageSection/Package-Array/Package/PackageTerminalPosition/Single/Back</a></li> <li>3. <a href="#">PartModel/PackageSection/Package-Array/Package/PackageTerminalPosition/Single/Right</a></li> <li>4. <a href="#">PartModel/PackageSection/Package-Array/Package/PackageTerminalPosition/Single/Front</a></li> </ol>
diagram	<p>The diagram illustrates the structure of the <b>SingleSidePositionRelationshipType</b>. It features a central dashed box labeled <b>SingleSidePositionRelationshipType</b> containing five sub-elements: <b>Outside</b>, <b>Edge-Out</b>, <b>Overlap</b>, <b>Edge-In</b>, and <b>Inside</b>. Each sub-element has a <b>type</b> attribute set to <b>JEP30-D10:EmptyType</b>. To the left of this dashed box is a box labeled <b>Left</b> with a <b>type</b> attribute set to <b>SingleSidePositionRelationshipType</b>. A dashed line with a double-headed arrow connects the <b>Left</b> box to the central dashed box.</p>
type	<b>SingleSidePositionRelationshipType</b> , JEP30-D10:EmptyType.

### 5.1.6.2 Corner - Internal

path	<ol style="list-style-type: none"> <li>1. <a href="#">PartModel/PackageSection/Package-Array/Package/PackageTerminalPosition/Single/Corner/Southwest</a></li> <li>2. <a href="#">PartModel/PackageSection/Package-Array/Package/PackageTerminalPosition/Single/Corner/Southeast</a></li> <li>3. <a href="#">PartModel/PackageSection/Package-Array/Package/PackageTerminalPosition/Single/Corner/Northeast</a></li> <li>4. <a href="#">PartModel/PackageSection/Package-Array/Package/PackageTerminalPosition/Single/Corner/Northwest</a></li> </ol>
diagram	<p>The diagram illustrates the structure of the <b>InternalCornerPositionRelationshipType</b>. It features a central dashed box labeled <b>InternalCornerPositionRelationshipType</b> containing three sub-elements: <b>Overlap</b>, <b>Edge-In</b>, and <b>Inside</b>. Each sub-element has a <b>type</b> attribute set to <b>JEP30-D10:EmptyType</b>. To the left of this dashed box is a box labeled <b>Southwest</b> with a <b>type</b> attribute set to <b>InternalCornerPositionRelationshipType</b>. A dashed line with a double-headed arrow connects the <b>Southwest</b> box to the central dashed box.</p>
type	<b>InternalCornerPositionRelationshipType</b> , JEP30-D10:EmptyType.

5.1.6.3 Corner - External

path	<div>1. PartModel/PackageSection/Package-Array/Package/PackageTerminalPosition/Single/Corner/Back-left</div> <div>2. PartModel/PackageSection/Package-Array/Package/PackageTerminalPosition/Single/Corner/Back-right</div> <div>3. PartModel/PackageSection/Package-Array/Package/PackageTerminalPosition/Single/Corner/Front-right</div> <div>4. PartModel/PackageSection/Package-Array/Package/PackageTerminalPosition/Single/Corner/Front-left</div> <div>5. PartModel/PackageSection/Package-Array/Package/PackageTerminalPosition/Single/Corner/Left-bottom</div> <div>6. PartModel/PackageSection/Package-Array/Package/PackageTerminalPosition/Single/Corner/Right-bottom</div> <div>7. PartModel/PackageSection/Package-Array/Package/PackageTerminalPosition/Single/Corner/Right-top</div> <div>8. PartModel/PackageSection/Package-Array/Package/PackageTerminalPosition/Single/Corner/Left-top</div>
diagram	<p>The diagram illustrates the 'Back-left' relationship type. It is a class box labeled 'Back-left' with a note 'type DifferentSidePositionRelationshipType'. This box is connected by a solid line to a dashed-line box. Inside this dashed box, the title is 'DifferentSidePositionRelationshipType'. It contains three stacked class boxes: 'Outside' (type JEP30-D10:EmptyType), 'Edge-Out' (type JEP30-D10:EmptyType), and 'Overlap' (type JEP30-D10:EmptyType). A dashed line with a small circle at its end connects the 'Back-left' box to the dashed container box.</p>
type	DifferentSidePositionRelationshipType, JEP30-D10:EmptyType.

5.1.7 Triple

path	PartModel/PackageSection/Package-Array/Package/PackageTerminalPosition/Triple
diagram	<p>The diagram illustrates the structure of the Triple class. The Triple class is of type TriplePositionConfigurationType. It is composed of two main sub-configuration types: TriplePositionConfigurationType and TripleCornerConfigurationType. The TriplePositionConfigurationType sub-configuration contains four attributes: NotLeft, NotBack, NotRight, and NotFront, all of type MultiSidePositionRelationshipType. The TripleCornerConfigurationType sub-configuration contains twelve attributes: Not-Southwest, Not-Southeast, Not-Northeast, Not-Northwest, Not-Back-left, Not-Back-right, Not-Front-right, Not-Front-left, Not-Left-bottom, Not-Right-bottom, Not-Right-top, and Not-Left-top, all of type DifferentSidePositionRelationshipType. The Triple class also has a composition relationship with TripleCornerConfigurationType.</p>
type	TriplePositionConfigurationType, MultiSidePositionRelationshipType, TripleCornerConfigurationType, InternalCornerPositionRelationshipType, DifferentSidePositionRelationshipType.

### 5.1.7.1 Triple – Multi Side position

path	<ol style="list-style-type: none"> <li>1. <a href="#">PartModel/PackageSection/Package-Array/Package/PackageTerminalPosition/Triple/NotLeft</a></li> <li>2. <a href="#">PartModel/PackageSection/Package-Array/Package/PackageTerminalPosition/Triple/NotBack</a></li> <li>3. <a href="#">PartModel/PackageSection/Package-Array/Package/PackageTerminalPosition/Triple/NotRight</a></li> <li>4. <a href="#">PartModel/PackageSection/Package-Array/Package/PackageTerminalPosition/Triple/NotFront</a></li> </ol>
diagram	
type	<a href="#">MultiSidePositionRelationshipType</a> , <a href="#">JEP30-D10:EmptyType</a> , <a href="#">SpanPositionRelationshipType</a> .

### 5.1.8 Upper

path	<a href="#">PartModel/PackageSection/Package-Array/Package/PackageTerminalPosition/Upper.</a>
diagram	
type	<a href="#">BottomUpperPositionConfigurationType</a> , <a href="#">JEP30-D10:EmptyType</a> , <a href="#">BottomUpperDiagonalType</a> , <a href="#">MatrixType</a> , <a href="#">MatrixAlterationType</a> .



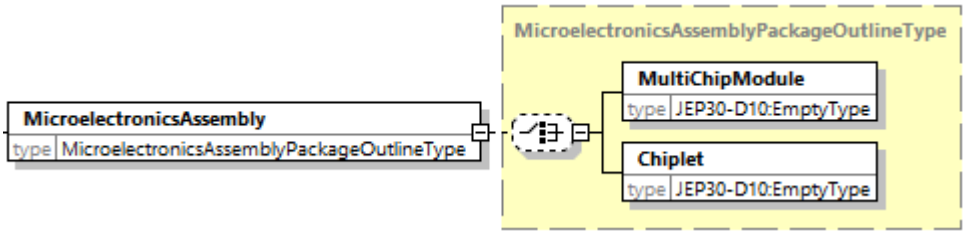
5.2 Package Outline Style

path	PartModel/PackageSection/Package-Array/Package/PackageOutlineStyle.
diagram	<p>The diagram illustrates the structure of the PackageOutlineStyle. It is a specialization of PackageOutlineType, indicated by a dashed box. The PackageOutlineStyle is composed of a list of package types, represented by a solid box with a composition relationship (a circle with a plus sign). The list includes the following types:</p> <ul style="list-style-type: none"><li>ArrayType (type JEP30-D10:EmptyType)</li><li>ClampedPackage (type JEP30-D10:EmptyType)</li><li>ChipScalePackage (type JEP30-D10:EmptyType)</li><li>CylinderOrCan (type JEP30-D10:EmptyType)</li><li>DiskButton (type JEP30-D10:EmptyType)</li><li>FlangeMount (type JEP30-D10:EmptyType)</li><li>Flatpack (type JEP30-D10:EmptyType)</li><li>GridArray (type JEP30-D10:EmptyType)</li><li>InlinePackage (type JEP30-D10:EmptyType)</li><li>Longform (type JEP30-D10:EmptyType)</li><li>MicroelectronicsAssembly (type MicroelectronicsAssemblyPackageOutlineType)</li><li>Pressfit (type JEP30-D10:EmptyType)</li><li>PostMount (type PostMountPackageOutlineType)</li><li>SmallOutline (type JEP30-D10:EmptyType)</li><li>UncasedChip (type JEP30-D10:EmptyType)</li><li>Connector (type JEP30-D10:EmptyType)</li><li>Discrete (type JEP30-D10:EmptyType)</li><li>Hardware (type JEP30-D10:EmptyType)</li><li>Switch (type JEP30-D10:EmptyType)</li></ul>
type	PackageOutlineType, JEP30-D10:EmptyType, MicroelectronicsAssemblyPackageOutlineType, PostMountPackageOutlineType

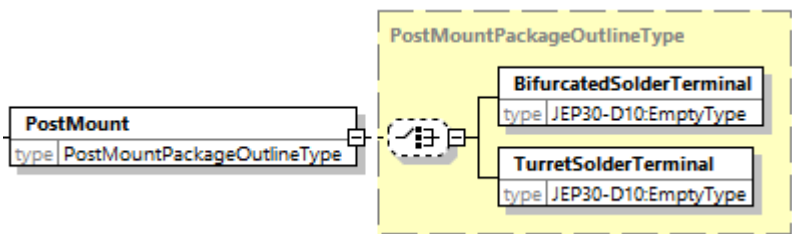
## 5.2 Package Outline Style (cont'd)

The definition of the above [PackageOutlineStyle](#) data elements can be found in the JESD30 publication, under the “Package-outline style codes” section which includes a table with the definitions of each of the above data elements. In addition, in JESD30, there is an “Illustrations of Package Outline Styles” in Annex A.

### 5.2.1 Microelectronics Assembly

path	<a href="#">PartModel/PackageSection/Package-Array/Package/PackageOutlineStyle/MicroelectronicsAssembly</a>
diagram	 <p>The diagram illustrates the structure of the <b>MicroelectronicsAssemblyPackageOutlineType</b>. It shows a box labeled <b>MicroelectronicsAssembly</b> with the type <b>MicroelectronicsAssemblyPackageOutlineType</b>. This box is connected via a dashed line with a circle containing a plus sign to a larger dashed box labeled <b>MicroelectronicsAssemblyPackageOutlineType</b>. Inside this larger dashed box, there are two sub-boxes: <b>MultiChipModule</b> (type <b>JEP30-D10:EmptyType</b>) and <b>Chiplet</b> (type <b>JEP30-D10:EmptyType</b>).</p>
type	<a href="#">MicroelectronicsAssemblyPackageOutlineType</a>

### 5.2.2 Post Mount

path	<a href="#">PartModel/PackageSection/Package-Array/Package/PackageOutlineStyle/PostMount.</a>
diagram	 <p>The diagram illustrates the structure of the <b>PostMountPackageOutlineType</b>. It shows a box labeled <b>PostMount</b> with the type <b>PostMountPackageOutlineType</b>. This box is connected via a dashed line with a circle containing a plus sign to a larger dashed box labeled <b>PostMountPackageOutlineType</b>. Inside this larger dashed box, there are two sub-boxes: <b>BifurcatedSolderTerminal</b> (type <b>JEP30-D10:EmptyType</b>) and <b>TurretSolderTerminal</b> (type <b>JEP30-D10:EmptyType</b>).</p>
type	<a href="#">PostMountPackageOutlineType</a>

5.3 Package Terminal Code

path	PartModel/PackageSection/Package-Array/Package/PackageTerminalCode	
diagram	<p>The diagram illustrates the structure of <b>PackageTerminalCodeType</b> and its associated subtypes. The subtypes are organized into two columns:</p> <ul style="list-style-type: none"><li><b>Left Column Subtypes:</b><ul style="list-style-type: none"><li><b>Ball</b> (type: BallType)</li><li><b>C-bend</b> (type: JEP30-D10:EmptyType)</li><li><b>Lug</b> (type: LugType)</li><li><b>Mixed-SMT</b> (type: JEP30-D10:EmptyType)</li><li><b>Flat</b> (type: FlatType)</li><li><b>Gull-wing</b> (type: Gull-wingType)</li><li><b>CompressedMountTechnology</b> (type: JEP30-D10:EmptyType)</li><li><b>PostTerminal</b> (type: PostTerminalType)</li><li><b>J-bend</b> (type: JEP30-D10:EmptyType)</li><li><b>Mixed-TH</b> (type: JEP30-D10:EmptyType)</li><li><b>L-bend</b> (type: L-bendType)</li></ul></li><li><b>Right Column Subtypes:</b><ul style="list-style-type: none"><li><b>Column</b> (type: ColumnType)</li><li><b>Surface-terminal</b> (type: Surface-terminalType)</li><li><b>Pressfit</b> (type: PressfitType)</li><li><b>Pin</b> (type: PinType)</li><li><b>Quick-connect</b> (type: JEP30-D10:EmptyType)</li><li><b>Mixed-Technology</b> (type: JEP30-D10:EmptyType)</li><li><b>Wraparound</b> (type: WraparoundType)</li><li><b>S-bend</b> (type: S-bendType)</li><li><b>Through-Hole</b> (type: Through-HoleType)</li><li><b>J-inverted</b> (type: JEP30-D10:EmptyType)</li><li><b>TerminalWire</b> (type: WireType)</li><li><b>Screw</b> (type: ScrewType)</li></ul></li></ul> <p>A <b>PackageTerminalCode</b> element is shown at the bottom left, connected to the <b>PackageTerminalCodeType</b> box.</p>	
type	PackageTerminalCodeType, BallType, LugType, FlatType, Gull-wingType, PostTerminalType, L-BendType, ColumnType, SurfaceTerminalType, PressfitType, PinType, WraparoundType, S-BendType, Through-HoleType, WireType, ScrewType.	

The definition of the above [PackageTerminalCode](#) data elements and their following sub-structures can be found in JESD30, under the “Terminal Shape Suffix” section which *includes* the “Suffixes for terminal shape” table, and two sections in Annex A, namely “Suffixes for terminal shape with additional definition”, and “Illustrations of terminal shape”.

NOTE As a result of the [TerminalGroup/Terminal](#) (as defined in 4.18), the rollup of the [Terminal](#) values for all [TerminalGroup-Array/TerminalGroups](#) into the [PackageTerminalCode](#), may be different than the value at the [PackageTerminalCode](#) level. This is described in detail in JESD30, “Terminal Shape Suffix”.

### 5.3.1 Ball

path	<a href="#">PartModel/PackageSection/Package-Array/Package/PackageTerminalCode/Ball</a>
diagram	
type	<a href="#">BallType</a> , <a href="#">JEP30-D10:EmptyType</a>

### 5.3.2 Lug

path	<a href="#">PartModel/PackageSection/Package-Array/Package/PackageTerminalCode/Lug</a>
diagram	
type	<a href="#">LugType</a> , <a href="#">JEP30-D10:EmptyType</a>

### 5.3.3 Flat

path	<a href="#">PartModel/PackageSection/Package-Array/Package/PackageTerminalCode/Flat</a>
diagram	
type	<a href="#">FlatType</a> , <a href="#">JEP30-D10:EmptyType</a>

### 5.3.4 Gull-wing

path	<a href="#">PartModel/PackageSection/Package-Array/Package/PackageTerminalCode/Gull-wing</a>
diagram	
type	<a href="#">Gull-wingType</a> , <a href="#">JEP30-D10:EmptyType</a>

### 5.3.5 Post Terminal

path	<a href="#">PartModel/PackageSection/Package-Array/Package/PackageTerminalCode/PostTerminal</a>
diagram	
type	<a href="#">PostTerminalType</a> , <a href="#">JEP30-D10:EmptyType</a>

### 5.3.6 L-bend

path	<a href="#">PartModel/PackageSection/Package-Array/Package/PackageTerminalCode/L-Bend</a>
diagram	
type	<a href="#">L-BendType</a> , <a href="#">JEP30-D10:EmptyType</a>

### 5.3.7 Column

path	<a href="#">PartModel/PackageSection/Package-Array/Package/PackageTerminalCode/ Column</a>
diagram	
type	<a href="#">ColumnType</a> , <a href="#">JEP30-D10:EmptyType</a>

5.3.8 Surface Terminal

path	PartModel/PackageSection/Package-Array/Package/PackageTerminalCode/SurfaceTerminal
diagram	<p>The diagram illustrates the structure of the <b>Surface-terminalType</b>. It is a class with a <b>type</b> attribute of <b>Surface-terminalType</b>. It is composed of several other types, indicated by dashed boxes and composition lines with hollow diamond heads:</p> <ul style="list-style-type: none"><li><b>Surface-terminalType</b> (outermost dashed box) contains:<ul style="list-style-type: none"><li><b>D-Shape</b> (type: JEP30-D10:EmptyType)</li><li><b>Pullback</b> (type: JEP30-D10:EmptyType)</li><li><b>CastellatedType</b> (dashed box) which contains:<ul style="list-style-type: none"><li><b>WettableFlank</b> (type: JEP30-D10:EmptyType)</li><li><b>D-Shape</b> (type: JEP30-D10:EmptyType)</li><li><b>Pullback</b> (type: JEP30-D10:EmptyType)</li></ul></li><li><b>HorizontalCastellationType</b> (dashed box) which contains:<ul style="list-style-type: none"><li><b>StepCut</b> (type: JEP30-D10:EmptyType)</li><li><b>Dimple</b> (type: JEP30-D10:EmptyType)</li></ul></li><li><b>Vertical</b> (type: JEP30-D10:EmptyType)</li><li><b>Hole</b> (type: JEP30-D10:EmptyType)</li><li><b>With-opening</b> (type: JEP30-D10:EmptyType)</li><li><b>RingType</b> (dashed box) which contains:<ul style="list-style-type: none"><li><b>Open-Ring</b> (type: RingType)</li><li><b>Castellated</b> (type: RingCastellatedType) which contains:<ul style="list-style-type: none"><li><b>WettableFlank</b> (type: JEP30-D10:EmptyType)</li></ul></li></ul></li></ul></li></ul>
type	SurfaceTerminalType, JEP30-D10:EmptyType, CastellatedType, HorizontalCastellationType, RingType, RingCastellatedType.

### 5.3.9 Pressfit

path	<a href="#">PartModel/PackageSection/Package-Array/Package/PackageTerminalCode/Pressfit</a>
diagram	<pre> classDiagram     class PressfitType {         type PressfitType     }     class Pressfit {         type PressfitType     }     class CompliantType {         type CompliantType     }     class Compliant {         type CompliantType     }     class NonCompliant {         type JEP30-D10:EmptyType     }     class EyeOfTheNeedlePin {         type JEP30-D10:EmptyType     }     class ConicalPin {         type JEP30-D10:EmptyType     }     class MultiSpringPin {         type JEP30-D10:EmptyType     }     class ActionPin {         type JEP30-D10:EmptyType     }      PressfitType -- &gt; Pressfit     PressfitType -- &gt; CompliantType     PressfitType -- &gt; NonCompliant     CompliantType -- &gt; Compliant     CompliantType -- &gt; EyeOfTheNeedlePin     CompliantType -- &gt; ConicalPin     CompliantType -- &gt; MultiSpringPin     CompliantType -- &gt; ActionPin     </pre> <p>The diagram illustrates the hierarchy of the <b>PressfitType</b>. It is a base type with three direct subclasses: <b>Pressfit</b>, <b>CompliantType</b>, and <b>Non-Compliant</b>. <b>Pressfit</b> has a type constraint of <code>PressfitType</code>. <b>CompliantType</b> has a type constraint of <code>CompliantType</code> and further branches into four subclasses: <b>Compliant</b>, <b>Eye-of-the-NeedlePin</b>, <b>ConicalPin</b>, <b>Multi-SpringPin</b>, and <b>ActionPin</b>. All these subclasses have a type constraint of <code>JEP30-D10:EmptyType</code>. <b>Non-Compliant</b> also has a type constraint of <code>JEP30-D10:EmptyType</code>. The <b>CompliantType</b> and its subclasses are enclosed in a dashed yellow box.</p>
type	<a href="#">PressfitType</a> , <a href="#">CompliantType</a> , <a href="#">JEP30-D10:EmptyType</a>

### 5.3.10 Pin

path	<a href="#">PartModel/PackageSection/Package-Array/Package/PackageTerminalCode/Pin</a>
diagram	<pre> classDiagram     class PinType {         type PinType     }     class Pin {         type PinType     }     class Kinked {         type JEP30-D10:EmptyType     }     class Shoulder {         type JEP30-D10:EmptyType     }     class PressInSolderable {         type JEP30-D10:EmptyType     }     class SurfaceMount {         type JEP30-D10:EmptyType     }     class SwageFasteningPin {         type JEP30-D10:EmptyType     }     class PressInNonSolderable {         type JEP30-D10:EmptyType     }      PinType -- &gt; Pin     PinType -- &gt; Kinked     PinType -- &gt; Shoulder     PinType -- &gt; PressInSolderable     PinType -- &gt; SurfaceMount     PinType -- &gt; SwageFasteningPin     PinType -- &gt; PressInNonSolderable     </pre> <p>The diagram illustrates the hierarchy of the <b>PinType</b>. It is a base type with seven direct subclasses: <b>Pin</b>, <b>Kinked</b>, <b>Shoulder</b>, <b>Press-In Solderable</b>, <b>Surface-mount</b>, <b>SwageFasteningPin</b>, and <b>Press-In Non-Solderable</b>. All these subclasses have a type constraint of <code>JEP30-D10:EmptyType</code>. The <b>Pin</b> class has a type constraint of <code>PinType</code>. The subclasses <b>Kinked</b> through <b>Press-In Non-Solderable</b> are enclosed in a dashed yellow box.</p>
type	<a href="#">PinType</a> , <a href="#">JEP30-D10:EmptyType</a>



5.3.11 Wraparound

path	PartModel/PackageSection/Package-Array/Package/PackageTerminalCode/Wraparound
diagram	
type	WraparoundType, JEP30-D10:EmptyType, WraparoundCastellatedType, RingType, RingCastellatedType.

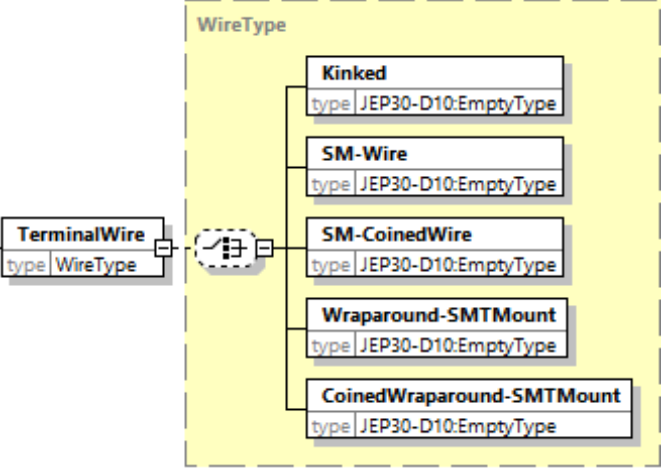
### 5.3.12 S-Bend

path	<a href="#">PartModel/PackageSection/Package-Array/Package/PackageTerminalCode/S-Bend</a>
diagram	
type	<a href="#">S-BendType</a> , <a href="#">JEP30-D10:EmptyType</a>

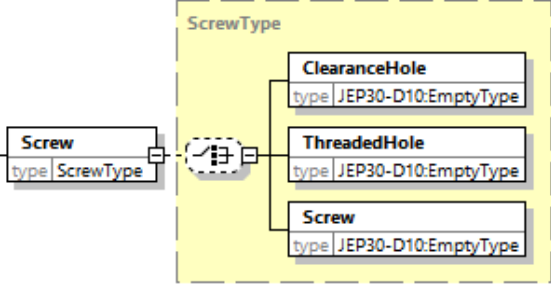
### 5.3.13 Through-Hole

path	<a href="#">PartModel/PackageSection/Package-Array/Package/PackageTerminalCode/Through-Hole</a>
diagram	
type	<a href="#">Through-HoleType</a> , <a href="#">JEP30-D10:EmptyType</a>

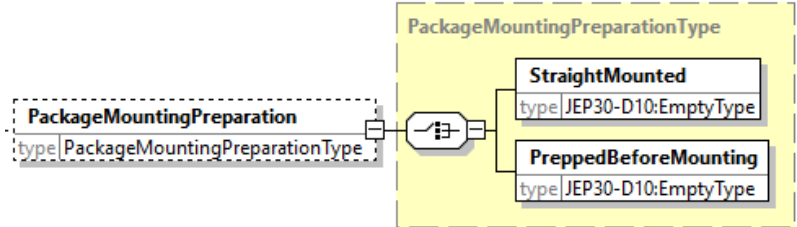
### 5.3.14 Terminal Wire

path	<a href="#">PartModel/PackageSection/Package-Array/Package/PackageTerminalCode/TerminalWire</a>
diagram	 <p>The diagram shows a <b>TerminalWire</b> box with a dashed border and a yellow background. It is connected to a central node (a circle with a cross) which is then connected to a vertical stack of five boxes: <b>Kinked</b>, <b>SM-Wire</b>, <b>SM-CoinedWire</b>, <b>Wraparound-SMTMount</b>, and <b>CoinedWraparound-SMTMount</b>. Each of these boxes has a 'type' field set to 'JEP30-D10:EmptyType'. The entire stack is enclosed in a dashed yellow box labeled <b>WireType</b>.</p>
type	<a href="#">TerminalWireType</a> , <a href="#">JEP30-D10:EmptyType</a>

### 5.3.15 Screw

path	<a href="#">PartModel/PackageSection/Package-Array/Package/PackageTerminalCode/Screw</a>
diagram	 <p>The diagram shows a <b>Screw</b> box with a dashed border and a yellow background. It is connected to a central node (a circle with a cross) which is then connected to a vertical stack of three boxes: <b>ClearanceHole</b>, <b>ThreadedHole</b>, and <b>Screw</b>. Each of these boxes has a 'type' field set to 'JEP30-D10:EmptyType'. The entire stack is enclosed in a dashed yellow box labeled <b>ScrewType</b>.</p>
type	<a href="#">ScrewType</a> , <a href="#">JEP30-D10:EmptyType</a>

## 5.4 Package Mounting Preparation

path	<a href="#">PartModel/PackageSection/Package-Array/Package/PackageMountingPreparation</a>
diagram	 <p>The diagram shows a <b>PackageMountingPreparation</b> box with a dashed border and a yellow background. It is connected to a central node (a circle with a cross) which is then connected to a vertical stack of two boxes: <b>StraightMounted</b> and <b>PreppedBeforeMounting</b>. Each of these boxes has a 'type' field set to 'JEP30-D10:EmptyType'. The entire stack is enclosed in a dashed yellow box labeled <b>PackageMountingPreparationType</b>.</p>
type	<a href="#">PackageMountingPreparationType</a> , <a href="#">JEP30-D10:EmptyType</a> .

## 5.4 Package Mounting Preparation (cont'd)

*PackageMountingPreparation* definition can be found in JESD30, under the “Mounting Preparation” section which includes some graphical images to describe the values.

## 5.5 Package Body Direction

path	<b>PartModel/PackageSection/Package-Array/Package/PackageBodyDirection</b>
diagram	<p>The diagram shows a dashed box labeled <b>PackageBodyDirection</b> with <code>type PackageBodyDirectionType</code>. This box is connected to a choice symbol (a circle with a vertical line and two horizontal lines). The choice symbol points to a yellow box labeled <b>PackageBodyDirectionType</b>. Inside this yellow box, there are two options: <b>Horizontal</b> (type <code>JEP30-D10:EmptyType</code>) and <b>Vertical</b> (type <code>JEP30-D10:EmptyType</code>).</p>
type	<b>PackageBodyDirectionType, JEP30-D10:EmptyType.</b>

*PackageBodyDirection* definition can be found in the JESD30, under the “Body Direction” section which includes some graphical images to describe the values.

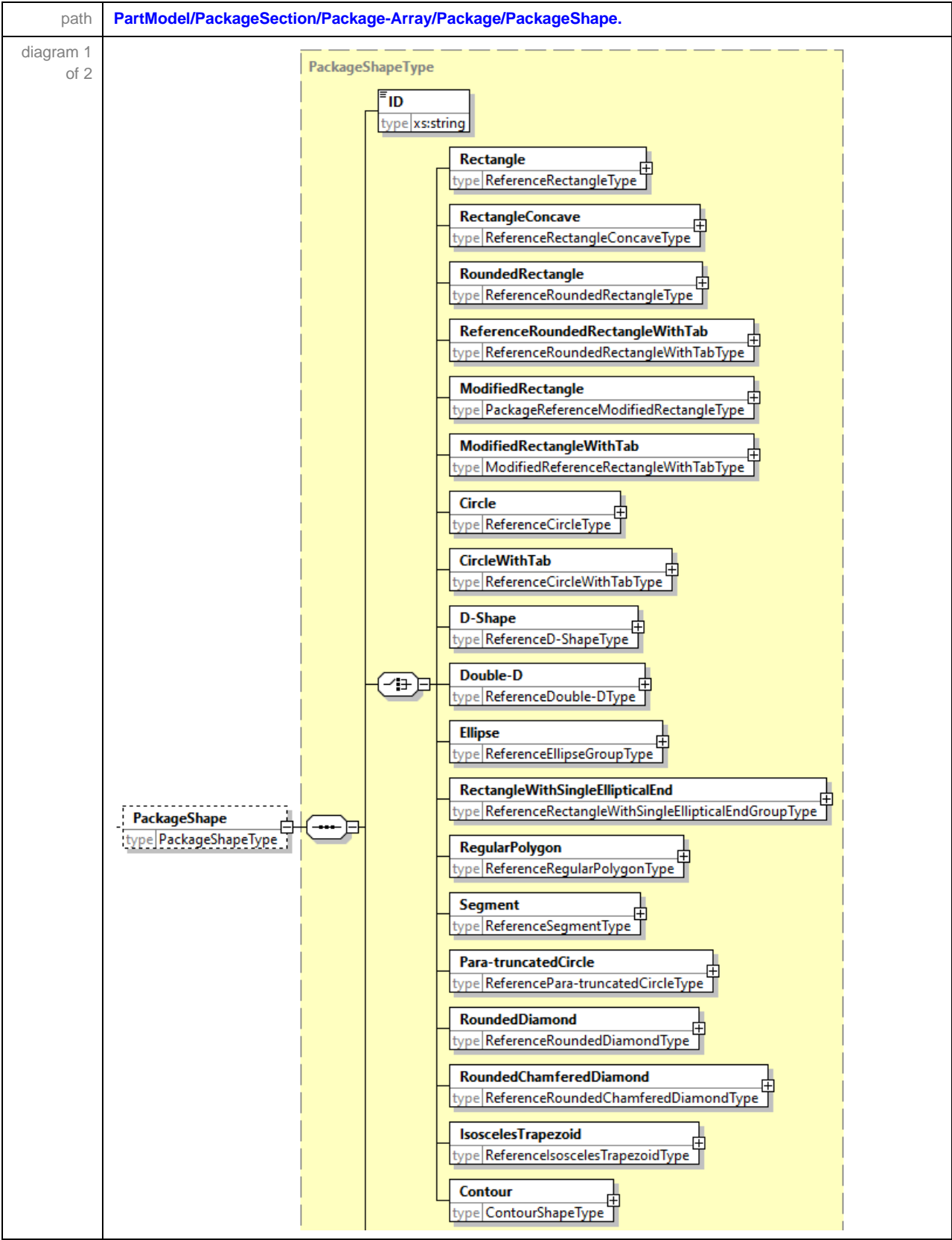
## 5.6 Mass

path	<b>PartModel/PackageSection/Package-Array/Package/Mass</b>
diagram	<p>The diagram shows a dashed box labeled <b>Mass</b> with <code>type JEP30-D10:MassValueSetType</code>. This box is connected to a choice symbol (a circle with a vertical line and two horizontal lines). The choice symbol points to a yellow box labeled <b>JEP30-D10:MassValueSetType</b>. Inside this yellow box, there are several elements: <b>ValueSetGroup</b> (type <code>ValueSetType</code>), <b>Units</b> (type <code>MassUOMType</code>), <b>FootnoteID</b> (type <code>xs:string</code>), and a choice symbol. The choice symbol points to a yellow box labeled <b>JEP30-D10:MassValueSetType</b>. Inside this box, there are several elements: <b>Nominal</b> (type <code>xs:decimal</code>), <b>Minimum</b> (type <code>xs:decimal</code>), <b>Maximum</b> (type <code>xs:decimal</code>), <b>ToleranceUOM</b> (type <code>ToleranceUOMType</code>), <b>TotalTolerance</b> (type <code>xs:decimal</code>), <b>NegativeTolerance</b> (type <code>xs:decimal</code>), and <b>PositiveTolerance</b> (type <code>xs:decimal</code>).</p>
type	<b>JEP30-D10:MassValueSetType, ValueSetType, StandardType, MinMaxLimitsType, ToleranceUOMType, MassUOMType.</b>
group	<b>ValueSetGroup</b>

The Mass *Units* of Measure are as follows; however, the standard preference is metric in grams.

- |                   |                  |
|-------------------|------------------|
| 1) Microgram (ug) | 4) Kilogram (kg) |
| 2) Miligram (mg)  | 5) Ounce (oz)    |
| 3) Gram (g)       | 6) Pound (lb)    |

5.7 Package Shape



## 5.7 Package Shape (cont'd)

<p>diagram 2 of 2</p>	<pre> classDiagram     class PackageShape {         type PackageShapeType     }     class ShapeCenter {         type JEP30-D10:PointXYType     }     class PackageVerticalDimension {         type PackageVerticalDimensionType     }     class MoldChamfer-Array {         type MoldChamfer-ArrayType     }     class ExcessMaterialProtrusion-Array {         type ExcessMaterialProtrusion-ArrayType     }     class Cutout-Array {         type PackageCutout-ArrayType     }     class PackageProtrusion-Array {         type PackageProtrusion-ArrayType     }     class DatumID-Array {         type JEP30-D10:DatumID-ArrayType     }     class FeatureControlID-Array {         type JEP30-D10:FeatureControlID-ArrayType     }     PackageShape --&gt; ShapeCenter     PackageShape --&gt; PackageVerticalDimension     PackageShape --&gt; MoldChamfer-Array     PackageShape --&gt; ExcessMaterialProtrusion-Array     PackageShape --&gt; Cutout-Array     PackageShape --&gt; PackageProtrusion-Array     PackageShape --&gt; DatumID-Array     PackageShape --&gt; FeatureControlID-Array </pre>	<p>type</p> <p><a href="#">PackageShapeType</a>, <a href="#">ReferenceRectangleType</a>, <a href="#">ReferenceRectangleConcaveType</a>,  <a href="#">ReferenceRoundedRectangleType</a>, <a href="#">ReferenceRoundedRectangleWithTabType</a>,  <a href="#">PackageReferenceModifiedRectangleType</a>, <a href="#">ModifiedReferenceRectangleWithTabType</a>,  <a href="#">ReferenceCircleType</a>, <a href="#">ReferenceCircleWithTabType</a>, <a href="#">ReferenceD-ShapeType</a>, <a href="#">ReferenceDouble-DType</a>,  <a href="#">ReferenceEllipseGroupType</a>, <a href="#">ReferenceRectangleWithSingleEllipticalEndGroupType</a>,  <a href="#">ReferenceRegularPolygonType</a>, <a href="#">ReferenceSegmentType</a>, <a href="#">ReferencePara-truncatedCircleType</a>,  <a href="#">ReferenceRoundedDiamondType</a>, <a href="#">ReferenceRoundedChamferedDiamondType</a>,  <a href="#">ReferenceIsoscelesTrapezoidType</a>, <a href="#">ContourShapeType</a>, <a href="#">JEP30-D10:PointXYType</a>,  <a href="#">PackageVerticalDimensionType</a>, <a href="#">MoldChamfer-ArrayType</a>,  <a href="#">ExcessMaterialProtrusion-ArrayType</a>, <a href="#">PackageCutout-ArrayType</a>, <a href="#">PackageProtrusion-ArrayType</a>.</p>
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Table 2 shows an array of dimensions that are captured below each shape listed under [PackageShape](#).

## 5.7 Package Shape (cont'd)

Table 2 - Package Shape versus Dimensions

Package Shape	Dimension 1	Dimension 2	Dimension 3	Diameter	Radius	Angle	Major Axis	Minor Axis	Semi-major Axis	No. of Sides	Inner/Outer	Tab Length	Tab Width	Tab Orientation	Impacted Corner
Rectangle	Y	Y				Y									
Rectangle Concave	Y	Y			Y	Y									
Rounded Rectangle	Y	Y			Y	Y									
Rounded Rectangle with Tab	Y	Y			Y	Y						Y	Y	Y	
Modified Rectangle	Y	Y				Y									Y
Modified Rectangle with Tab	Y	Y				Y						Y	Y	Y	Y
Circle				Y											
Circle with Tab				Y								Y	Y	Y	
D-Shape	Y	Y				Y									
Double-D	Y	Y				Y									
Ellipse							Y	Y							

## 5.7 Package Shape (cont'd)

**Table 2 - Package Shape versus Dimensions (cont'd)**

Package Shape	Dimension 1	Dimension 2	Dimension 3	Diameter	Radius	Angle	Major Axis	Minor Axis	Semi-major Axis	No. of Sides	Inner/Outer	Tab Length	Tab Width	Tab Orientation	Impacted Corner
Elliptical End Shape	Y	Y							Y						
Regular Polygon				Y		Y				Y	Y				
Segment	Y			Y		Y									
Para-truncated Circle	Y			Y		Y									
Rounded Diamond	Y			Y	Y	Y									
Rounded Chamfered Diamond	Y	Y		Y		Y									
Isosceles Trapezoid	Y	Y	Y			Y									

The Shape Center and the Package Vertical Dimensions are applicable to all shapes. The definition of each shape including Contour is outlined in Annex A (informative) Shape Dimensions.

In the event that the modified corners of a modified rectangle shape is not dimensioned within a datasheet, and all corners are modified with the same shape, with one corner having a different dimension on the corner that defines the part orientation, then it is preferred to specify only the corner that defines the part orientation with the unspecified dimension.



5.7.1 Contour

path	PartModel/PackageSection/Package-Array/Package/PackageShape/Contour
diagram	
type	ContourShapeType, ContourToleranceType, JEP30-D10:ToleranceUOMType, Outline-ArrayType, OutlineSegmentType, JEP30-D10:ArcSegmentRotationType, JEP30-D10:FeatureControlID-ArrayType.

The addition of the *Outline-Array* enables the GD&T to be assigned to any segment of the contour outline. The enumerated values for the *ArcSegmentRotation* are Clockwise and Anti-clockwise.

5.7.2 Shape Center

path	PartModel/PackageSection/Package-Array/Package/PackageShape/ShapeCenter
diagram	
type	JEP30-D10:PointXYType

### 5.7.3 Package Vertical Dimension

path	<a href="#">PartModel/PackageSection/Package-Array/Package/PackageShape/PackageVerticalDimension</a>
diagram	<p>The diagram shows a dashed box labeled <b>PackageVerticalDimension</b> with the type <code>PackageVerticalDimensionType</code>. This box is connected via a multiplicity symbol (a circle with three dots) to a solid box labeled <b>PackageBodyHeight</b> with the type <code>JEP30-D10:ValueSetType</code>. The <b>PackageBodyHeight</b> box is enclosed within a larger yellow dashed box labeled <b>PackageVerticalDimensionType</b>.</p>
type	<a href="#">PackageVerticalDimensionType</a> , <a href="#">JEP30-D10:ValueSetType</a> ,

### 5.7.4 Mold Chamfer - Array

path	<a href="#">PartModel/PackageSection/Package-Array/Package/PackageShape/MoldChamfer-Array</a>
diagram	<p>The diagram illustrates the structure of the <b>MoldChamfer-Array</b>. It starts with a dashed box labeled <b>MoldChamfer-Array</b> (type <code>MoldChamfer-ArrayType</code>) connected via a multiplicity symbol to a large yellow dashed box labeled <b>MoldChamfer-ArrayType</b>. Inside this yellow box, there are two main components: <b>MoldChamferType</b> and <b>MoldOrientationChamferType</b>.   <b>MoldChamferType</b> (dashed box) contains: <b>Position</b> (type <code>MoldChamferPositionType</code>), <b>Angle</b> (type <code>JEP30-D10:UnspecifiedValueSetType</code>), <b>Depth-of-Chamfer</b> (type <code>Depth-of-ChamferType</code>), and <b>FootnoteID</b> (type <code>xs:string</code>, multiplicity 0..∞).   <b>MoldOrientationChamferType</b> (dashed box) contains: <b>Left</b> (type <code>JEP30-D10:EmptyType</code>), <b>Back</b> (type <code>JEP30-D10:EmptyType</code>), <b>Right</b> (type <code>JEP30-D10:EmptyType</code>), <b>Front</b> (type <code>JEP30-D10:EmptyType</code>), <b>Upper</b> (type <code>JEP30-D10:EmptyType</code>), <b>Lower</b> (type <code>JEP30-D10:EmptyType</code>), <b>Angle</b> (type <code>JEP30-D10:UnspecifiedValueSetType</code>), <b>Depth-of-Chamfer</b> (type <code>Depth-of-ChamferType</code>), and <b>FootnoteID</b> (type <code>xs:string</code>, multiplicity 0..∞).   The <b>MoldChamfer-Array</b> is connected to both <b>MoldChamferType</b> and <b>MoldOrientationChamferType</b> via multiplicity symbols.</p>
type	<a href="#">MoldChamfer-ArrayType</a> , <a href="#">MoldChamferType</a> , <a href="#">MoldChamferPositionType</a> , <a href="#">JEP30-D10:UnspecifiedValueSetType</a> , <a href="#">MoldOrientationChamferType</a> , <a href="#">JEP30-D10:EmptyType</a> , <a href="#">Depth-of-ChamferType</a> .

5.7.4.1      Position

path	PartModel/PackageSection/Package-Array/Package/PackageShape/MoldChamfer-Array
diagram	<div><div><div><div><div><div>Position</div><div>type   MoldChamferPositionType</div></div></div><div><div><div><div><div><div>BothVerticalChamfers</div><div>type   JEP30-D10:EmptyType</div></div><div><div><div>UpperChamfer</div><div>type   JEP30-D10:EmptyType</div></div><div><div>LowerChamfer</div><div>type   JEP30-D10:EmptyType</div></div><div><div>BackChamfer</div><div>type   JEP30-D10:EmptyType</div></div><div><div>FrontChamfer</div><div>type   JEP30-D10:EmptyType</div></div><div><div>LeftChamfer</div><div>type   JEP30-D10:EmptyType</div></div><div><div>RightChamfer</div><div>type   JEP30-D10:EmptyType</div></div></div></div><div><div><div>QuadSides</div><div>type   JEP30-D10:EmptyType</div></div><div><div><div>Dual-Back-to-Front</div><div>type   JEP30-D10:EmptyType</div></div><div><div>Dual-Left-to-Right</div><div>type   JEP30-D10:EmptyType</div></div><div><div>Dual-Underside-to-Topside</div><div>type   JEP30-D10:EmptyType</div></div><div><div>Left</div><div>type   JEP30-D10:EmptyType</div></div><div><div>Back</div><div>type   JEP30-D10:EmptyType</div></div><div><div>Right</div><div>type   JEP30-D10:EmptyType</div></div><div><div>Front</div><div>type   JEP30-D10:EmptyType</div></div><div><div>Underside</div><div>type   JEP30-D10:EmptyType</div></div><div><div>Topside</div><div>type   JEP30-D10:EmptyType</div></div></div></div></div></div></div></div><div>MoldChamferPositionType</div></div></div>
type	MoldChamferPositionType, JEP30-D10:EmptyType

## 5.7.4.2 Depth – of - Chamfer

path	PartModel/PackageSection/Package-Array/Package/PackageShape/MoldChamfer-Array/MoldChamfer/Depth-of-Chamfer
diagram	<pre> classDiagram     class DepthOfChamfer {         type Depth-of-ChamferType     }     class FromBodyEdgeToChamfer {         type JEP30-D10:UnspecifiedValueSetType     }     class DepthOfChamferXDirection {         type Depth-of-Chamfer-X-DirectionType     }     class LeftSideOfBody {         type JEP30-D10:EmptyType     }     class RightSideOfBody {         type JEP30-D10:EmptyType     }     class DepthOfChamferYDirection {         type Depth-of-Chamfer-Y-DirectionType     }     class BackSideOfBody {         type JEP30-D10:EmptyType     }     class FrontSideOfBody {         type JEP30-D10:EmptyType     }     class DepthOfChamferZDirection {         type Depth-of-Chamfer-Z-DirectionType     }     class UndersideSideOfBody {         type JEP30-D10:EmptyType     }     class TopsideSideOfBody {         type JEP30-D10:EmptyType     }     class ReferenceDatumID {         type xs:string     }     class LeftSideOfPackage {         type JEP30-D10:EmptyType     }     class RightSideOfPackage {         type JEP30-D10:EmptyType     }     class BackSideOfPackage {         type JEP30-D10:EmptyType     }     class FrontSideOfPackage {         type JEP30-D10:EmptyType     }     class TopsideOfPackage {         type JEP30-D10:EmptyType     }     class UndersideOfPackage {         type JEP30-D10:EmptyType     }     class PlusDimensionID {         type xs:string     }     class MinusDimensionID {         type xs:string     }      DepthOfChamfer --&gt; FromBodyEdgeToChamfer     DepthOfChamfer --&gt; DepthOfChamferXDirection     DepthOfChamferXDirection --&gt; LeftSideOfBody     DepthOfChamferXDirection --&gt; RightSideOfBody     DepthOfChamferXDirection --&gt; FromBodyEdgeToChamfer     DepthOfChamferXDirection --&gt; PlusDimensionID     DepthOfChamferXDirection --&gt; MinusDimensionID     DepthOfChamfer --&gt; DepthOfChamferYDirection     DepthOfChamferYDirection --&gt; BackSideOfBody     DepthOfChamferYDirection --&gt; FrontSideOfBody     DepthOfChamferYDirection --&gt; FromBodyEdgeToChamfer     DepthOfChamferYDirection --&gt; PlusDimensionID     DepthOfChamferYDirection --&gt; MinusDimensionID     DepthOfChamfer --&gt; DepthOfChamferZDirection     DepthOfChamferZDirection --&gt; UndersideSideOfBody     DepthOfChamferZDirection --&gt; TopsideSideOfBody     DepthOfChamferZDirection --&gt; FromBodyEdgeToChamfer     DepthOfChamferZDirection --&gt; PlusDimensionID     DepthOfChamferZDirection --&gt; MinusDimensionID     ReferenceDatumID --&gt; LeftSideOfPackage     ReferenceDatumID --&gt; RightSideOfPackage     ReferenceDatumID --&gt; BackSideOfPackage     ReferenceDatumID --&gt; FrontSideOfPackage     ReferenceDatumID --&gt; TopsideOfPackage     ReferenceDatumID --&gt; UndersideOfPackage     ReferenceDatumID --&gt; PlusDimensionID     ReferenceDatumID --&gt; MinusDimensionID </pre>
type	Depth-of-ChamferType, JEP30-D10:UnspecifiedValueSetType, Depth-of-Chamfer-X-DirectionType, JEP30-D10:EmptyType, Depth-of-Chamfer-Y-DirectionType, Depth-of-Chamfer-Z-DirectionType

5.7.5 Excess Material Protrusion - Array

path	PartModel/PackageSection/Package-Array/Package/PackageShape/ExcessMaterialProtrusion-Array
diagram 1 of 2	<p>Diagram 1 of 2 shows the structure of the ExcessMaterialProtrusion-Array. It consists of a dashed box labeled 'ExcessMaterialProtrusion-Array' with 'type ExcessMaterialProtrusion-ArrayType'. This box is connected to a solid box labeled 'ExcessMaterialProtrusion' with 'type ExcessMaterialProtrusionType'. The 'ExcessMaterialProtrusion' box has a multiplicity of '0..∞'.</p>
diagram 2 of 2	<p>Diagram 2 of 2 shows the structure of the ExcessMaterialProtrusionType. It consists of a dashed box labeled 'ExcessMaterialProtrusionType' with 'type ExcessMaterialProtrusionType'. This box is connected to a solid box labeled 'ExcessMaterialProtrusion' with 'type ExcessMaterialProtrusionType'. The 'ExcessMaterialProtrusion' box has a multiplicity of '0..∞'. The 'ExcessMaterialProtrusionType' box contains several sub-elements: 'MoldFlash' (type JEP30-D10:EmptyType), 'GateBurs' (type JEP30-D10:EmptyType), 'Protrusions' (type JEP30-D10:EmptyType), 'InterterminalFlash' (type JEP30-D10:EmptyType), 'QuadSides' (type JEP30-D10:EmptyType), 'Dual-Left-to-Right' (type JEP30-D10:EmptyType), 'Dual-Back-to-Front' (type JEP30-D10:EmptyType), 'Dual-Underside-to-Topside' (type JEP30-D10:EmptyType), 'Left' (type JEP30-D10:EmptyType), 'Back' (type JEP30-D10:EmptyType), 'Right' (type JEP30-D10:EmptyType), 'Front' (type JEP30-D10:EmptyType), 'Underside' (type JEP30-D10:EmptyType), 'Topside' (type JEP30-D10:EmptyType), 'Protrusion' (type JEP30-D10:UnspecifiedValueSetType), and 'FootnoteID' (type xs:string). The 'Protrusion' box has a multiplicity of '0..∞'.</p>
type	ExcessMaterialProtrusion-ArrayType, ExcessMaterialProtrusionType, JEP30-D10:EmptyType, JEP30-D10:UnspecifiedValueSetType.

5.7.6 Cutout - Array

path	PartModel/PackageSection/Package-Array/Package/PackageShape/Cutout-Array
diagram	
type	PackageCutout-ArrayType, PackageCutoutType, CutoutPatternType, CutoutPatternGroupType, CutoutShape-ArrayType, CutoutSelectionToBodyRelationship-ArrayType, CutoutSelectionToCutoutSelectionType.

### 5.7.6.1 Cutout Pattern

path	<a href="#">PartModel/PackageSection/Package-Array/Package/PackageShape/Cutout-Array/Cutout/CutoutPattern</a>
diagram	
type	<a href="#">CutoutPatternType</a> , <a href="#">CutoutStandardArrayType</a> , <a href="#">CutoutCircularArrayType</a> , <a href="#">JEP30-D10:DeletedStatusType</a> , <a href="#">CutoutRandomArrayType</a> , <a href="#">JEP30-D10:PointXYType</a> , <a href="#">CutoutLocationOnPackageType</a> .

#### 5.7.6.1.1 Standard Array

path	<a href="#">PartModel/PackageSection/Package-Array/Package/PackageShape/Cutout-Array/Cutout/CutoutPattern/StandardArray</a>
diagram	
type	<a href="#">CutoutStandardArrayType</a> , <a href="#">JEP30-D10:PitchValueSetType</a> , <a href="#">JEP30-D10:PointXYType</a>

5.7.6.1.2 Circular Array

path	PartModel/PackageSection/Package-Array/Package/PackageShape/Cutout-Array/Cutout/CutoutPattern/CircularArray	
diagram		
type	CutoutCircularArrayType, JEP30-D10:PointXYType, RotationType	



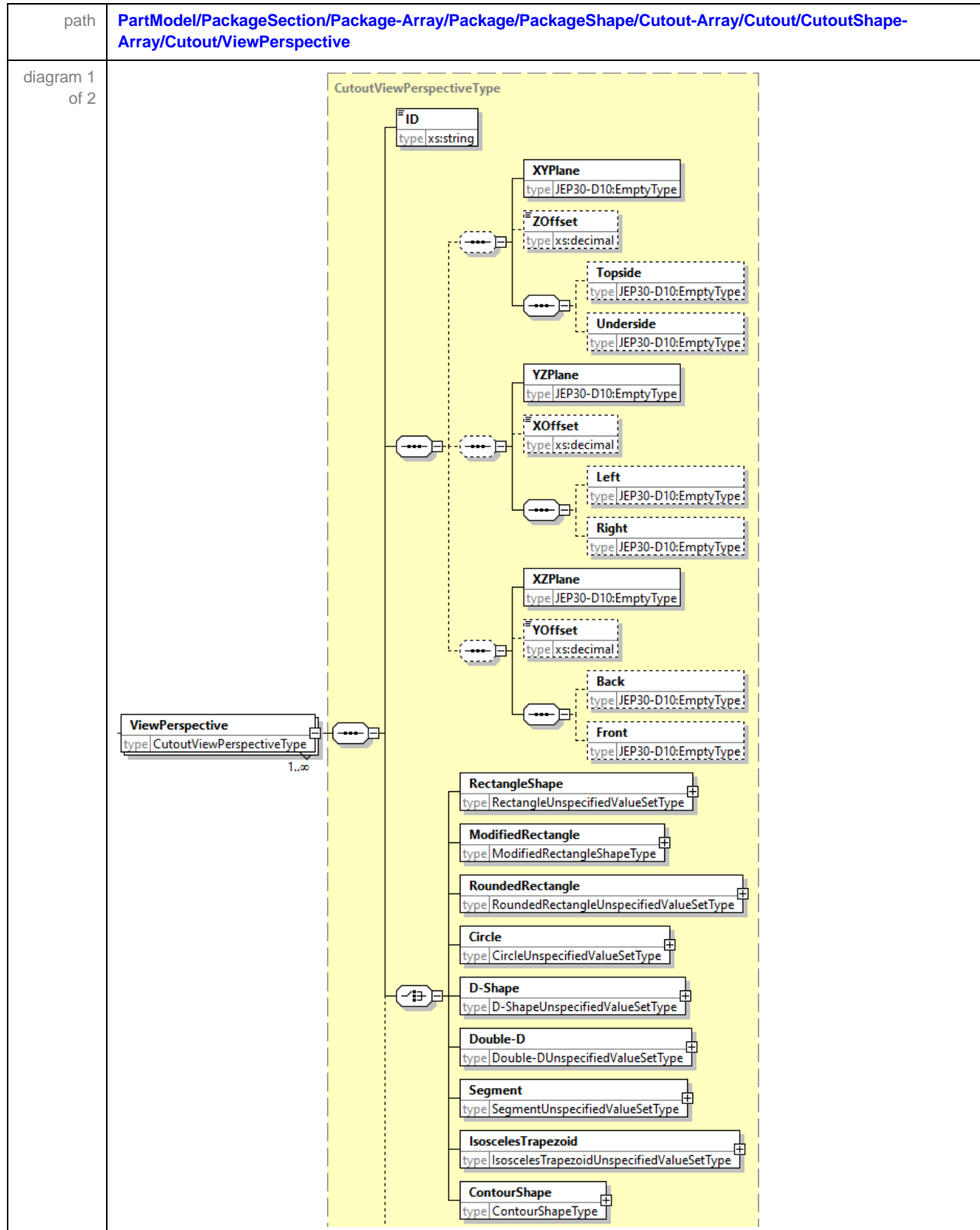
### 5.7.6.2 Pattern Group

path	<b>PartModel/PackageSection/Package-Array/Package/PackageShape/Cutout-Array/Cutout/CutoutPattern</b>
diagram 1 of 2	
diagram 2 of 2	
type	<b>CutoutPatternGroupType, CutoutPatternGroupRelationshipType, CutoutPatternGroupRelationshipTransformationsType.</b>

### 5.7.6.3 Cutout Shape - Array

path	<b>PartModel/PackageSection/Package-Array/Package/PackageShape/Cutout-Array/Cutout/CutoutShape-Array</b>
diagram	
type	<b>CutoutShape-ArrayType, CutoutShapeType, CutoutViewPerspectiveType, ViewPerspective-to-ViewPerspectiveAlignment-ArrayType, CutoutAssembledShapeType.</b>

### 5.7.6.3.1 View Perspective



5.7.6.3.1 View Perspective (Cont'd)

diagram 2 of 2	
type	CutoutViewPerspectiveType, JEP30-D10:EmptyType, RectangleUnspecifiedValueSetType, , ModifiedRectangleShapeType, RoundedRectangleUnspecifiedValueSetType, CircleUnspecifiedValueSetType, D-ShapeUnspecifiedValueSetType, Double-DUnspecifiedValueSetType, SegmentUnspecifiedValueSetType, IsoscelesTrapezoidUnspecifiedValueSetType, ContourShapeType, JEP30-D10:UnspecifiedValueSetType.

### 5.7.6.3.2 View Perspective – to – View Perspective Alignment - Array

path	<a href="#">PartModel/PackageSection/Package-Array/Package/PackageShape/Cutout-Array/Cutout/CutoutShape-Array/Cutout/ViewPerspective-to-ViewPerspectiveAlignment-Array</a>
diagram 1 of 2	<p>UML diagram showing the relationship between <b>ViewPerspective-to-ViewPerspectiveAlignment-Array</b> and <b>ViewPerspective-to-ViewPerspectiveAlignment-ArrayType</b>. The array is connected to the type via a dashed line with a multiplicity of 1..∞. A constraints box is also shown.</p>
diagram 1 of 2	<p>UML diagram showing the structure of <b>ViewPerspective-to-ViewPerspectiveAlignmentType</b>. It includes an <b>ID</b> attribute of type <code>xs:string</code>, and two attributes: <b>FromViewPerspectiveShape</b> and <b>ToViewPerspectiveShape</b>, both of type <code>ViewPerspectiveShapeIDReferenceType</code>.</p>
type	<a href="#">ViewPerspective-to-ViewPerspectiveAlignment-ArrayType</a> , <a href="#">ViewPerspective-to-ViewPerspectiveAlignmentType</a> , <a href="#">ViewPerspectiveShapeIDReferenceType</a> .

5.7.6.3.2.1 View Perspective Shape ID Reference type

path	<div>PartModel/PackageSection/Package-Array/Package/PackageShape/Cutout-Array/Cutout/CutoutShape-Array/CutoutShape/ViewPerspective-to-ViewPerspectiveAlignment-Array/ViewPerspective-to-ViewPerspectiveAlignment/FromViewPerspectiveShapeID</div> <div>PartModel/PackageSection/Package-Array/Package/PackageShape/Cutout-Array/Cutout/CutoutShape-Array/CutoutShape/ViewPerspective-to-ViewPerspectiveAlignment-Array/ViewPerspective-to-ViewPerspectiveAlignment/ToViewPerspectiveShape</div>
diagram	<pre>graph LR     subgraph ViewPerspectiveShapeIDReferenceType         FromViewPerspectiveShape[FromViewPerspectiveShape type ViewPerspectiveShapeIDReferenceType]         ViewPerspectiveID[ViewPerspectiveID type xs:string]         ViewPerspectiveAlignmentID[ViewPerspective-to-ViewPerspectiveAlignmentID type xs:string]         Underside[Underside type JEP30-D10:EmptyType]         Topside[Topside type JEP30-D10:EmptyType]         ZOffset[ZOffset type xs:decimal]         Back[Back type JEP30-D10:EmptyType]         Front[Front type JEP30-D10:EmptyType]         YOffset[YOffset type xs:decimal]         Left[Left type JEP30-D10:EmptyType]         Right[Right type JEP30-D10:EmptyType]         XOffset[XOffset type xs:decimal]          FromViewPerspectiveShape --&gt; ViewPerspectiveID         ViewPerspectiveID --&gt; ViewPerspectiveAlignmentID         ViewPerspectiveAlignmentID --&gt; Choice1(( ))         Choice1 --&gt; Underside         Choice1 --&gt; Topside         Choice1 --&gt; ZOffset         Choice1 --&gt; Back         Choice1 --&gt; Front         Choice1 --&gt; YOffset         Choice1 --&gt; Left         Choice1 --&gt; Right         Choice1 --&gt; XOffset     end</pre>
type	ViewPerspectiveShapeIDReferenceType, JEP30-D10:EmptyType.

5.7.6.3.3 Assembled Shape

path	PartModel/PackageSection/Package-Array/Package/PackageShape/Cutout-Array/Cutout/CutoutShape-Array/CutoutShape/AssembledShape
diagram	<p>The diagram illustrates the structure of the <b>AssembledShape</b> class and its relationship to the <b>CutoutAssembledShapeType</b> type. The <b>AssembledShape</b> class is shown on the left with the type <b>CutoutAssembledShapeType</b>. It is connected to a dashed box labeled <b>CutoutAssembledShapeType</b> on the right. Inside this dashed box, the structure is defined as follows:</p> <ul style="list-style-type: none"><li><b>ViewPerspectiveID</b> (type <b>xs:string</b>)</li><li><b>ViewPerspective-to-ViewPerspectiveAlignmentID</b> (type <b>xs:string</b>)</li><li><b>ImpactedCutout</b> (type <b>ImpactedAssembledShapeType</b>)</li><li><b>Impact-to-CutoutGroup</b> (type <b>Impact-to-AssembledShapeGroupType</b>)</li><li><b>Depth</b> (type <b>CutoutDepthType</b>)</li></ul> <p>The <b>AssembledShape</b> class is connected to the <b>CutoutAssembledShapeType</b> type via a relationship line with a multiplicity of 1 at the <b>AssembledShape</b> end and a multiplicity of 1 at the <b>CutoutAssembledShapeType</b> end.</p>
type	CutoutAssembledShapeType, ImpactedAssembledShapeType, Impact-to-AssembledShapeGroupType, CutoutDepthType.

5.7.6.3.3.1      Impacted Cutout

path	PartModel/PackageSection/Package-Array/Package/PackageShape/Cutout-Array/Cutout/CutoutShape-Array/CutoutShape/AssembledShape/ImpactedCutout
diagram	<p>The diagram illustrates the XSD structure for the <b>ImpactedCutout</b> element. It is defined as a complex type derived from <b>ImpactedAssembledShapeType</b>. The structure is as follows:</p> <ul style="list-style-type: none"><li><b>ImpactedCutout</b> (type: <b>ImpactedAssembledShapeType</b>)<ul style="list-style-type: none"><li><b>Center</b> (type: <b>AssembledShapeCenterType</b>)<ul style="list-style-type: none"><li><b>AssembledShapeCenterType</b> (type: <b>AssembledShapeCenterType</b>)<ul style="list-style-type: none"><li><b>x</b> (type: <b>xs:decimal</b>)</li><li><b>y</b> (type: <b>xs:decimal</b>)</li><li><b>PitchRadius</b> (type: <b>xs:decimal</b>)</li><li><b>Center</b> (type: <b>JEP30-D10:PointXYType</b>)</li><li><b>Angle</b> (type: <b>xs:integer</b>)</li></ul></li></ul></li><li><b>RowIndex</b> (type: <b>JEP30-D10:MinIntegerOfOneType</b>)</li><li><b>ColumnIndex</b> (type: <b>JEP30-D10:MinIntegerOfOneType</b>)</li><li><b>PolarIndex</b> (type: <b>JEP30-D10:MinIntegerOfOneType</b>)</li></ul></li></ul>
type	ImpactedAssembledShapeType, AssembledShapeCenterType, JEP30-D10:PointXYType, JEP30-D10:EmptyType, JEP30-D10:MinIntegerOfOneType.

### 5.7.6.3.3.2 Impact – to – Cutout Group

path	<b>PartModel/PackageSection/Package-Array/Package/PackageShape/Cutout-Array/Cutout/CutoutShape-Array/CutoutShape/AssembledShape/Impact-to-CutoutGroup</b>
diagram	
type	<b>Impact-to-AssembledShapeGroupType, Apply-to-all-AssembledShapesType, JEP30-D10:CornerImpact-to-StandardArrayType, JEP30-D10:EmptyType, AssembledShapeSymmetryType, AssembledShapeSymmetryRotationType, AssembledShapeReflectionType.</b>

#### 5.7.6.3.3.2.1 Standard Array

path	<b>PartModel/PackageSection/Package-Array/Package/PackageShape/Cutout-Array/Cutout/CutoutShape-Array/CutoutShape/AssembledShape/Impact-to-CutoutGroup/Apply-to-all-AssembledShapes/StandardArray</b>
diagram	
type	<b>JEP30-D10:CornerImpact-to-StandardArrayType, EmptyType.</b>



### 5.7.6.3.3.2.2 Rotation

path	<a href="#">PartModel/PackageSection/Package-Array/Package/PackageShape/Cutout-Array/Cutout/CutoutShape-Array/CutoutShape/AssembledShape/Impact-to-CutoutGroup/Symmetry/Rotation</a>
diagram	
type	<a href="#">AssembledShapeSymmetryRotationType</a> , <a href="#">SymmetryRotationAxisType</a> , <a href="#">JEP30-D10:EmptyType</a> , <a href="#">AssembledShapeSymmetryRotationCenterType</a> .

### 5.7.6.3.3.2.3 Reflection

path	<a href="#">PartModel/PackageSection/Package-Array/Package/PackageShape/Cutout-Array/Cutout/CutoutShape-Array/CutoutShape/AssembledShape/Impact-to-CutoutGroup/Symmetry/Reflection</a>
diagram	
type	<a href="#">AssembledShapeReflectionType</a> , <a href="#">ReflectionAxisType</a> , <a href="#">JEP30-D10:EmptyType</a> , <a href="#">AssembledShapeReflectionInversionCenterType</a> .

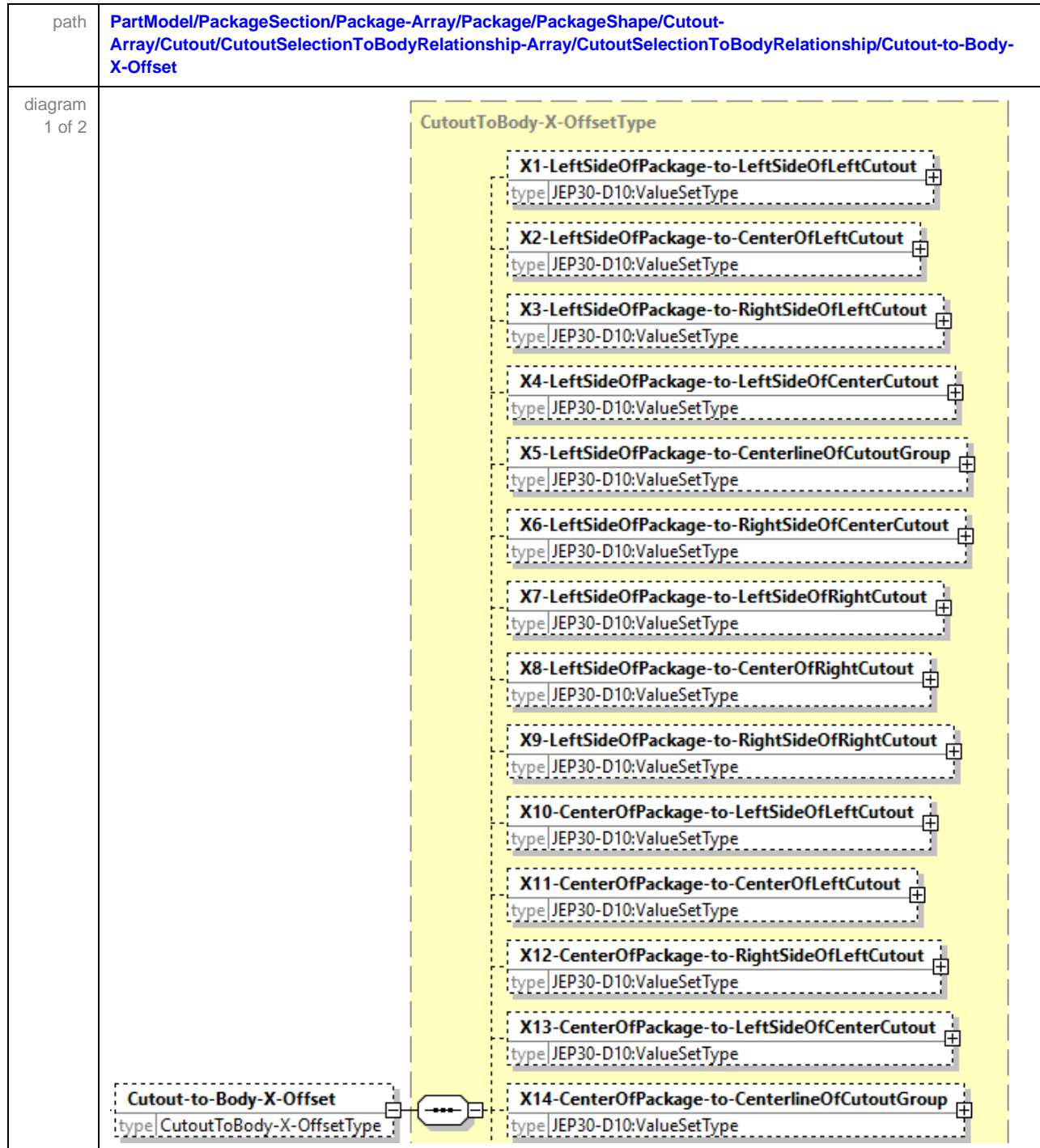
### 5.7.6.3.3.3 Depth

path	<a href="#">PartModel/PackageSection/Package-Array/Package/PackageShape/Cutout-Array/Cutout/CutoutShape-Array/CutoutShape/AssembledShape/Depth</a>
diagram	
type	<a href="#">CutoutDepthType</a> , <a href="#">JEP30-D10:UnspecifiedValueType</a> , <a href="#">JEP30-D10:EmptyType</a>

### 5.7.6.4 Cutout Selection To Body Relationship - Array

path	<a href="#">PartModel/PackageSection/Package-Array/Package/PackageShape/Cutout-Array/Cutout/CutoutSelectionToBodyRelationship-Array</a>
diagram	
type	<a href="#">CutoutSelectionToBodyRelationship-ArrayType</a> , <a href="#">CutoutSelectionToBodyRelationshipType</a> , <a href="#">CutoutToBody-X-OffsetType</a> , <a href="#">CutoutToBody-Y-OffsetType</a> , <a href="#">CutoutToBody-Z-OffsetType</a> .

#### 5.7.6.4.1 Cutout - to- Body - X - Offset



#### 5.7.6.4.1 Cutout - to- Body - X - Offset (Cont'd)

<p>diagram 2 of 2</p>	 <p><b>Cutout-to-Body-X-Offset</b> type CutoutToBody-X-OffsetType</p> <p><b>X14-CenterOfPackage-to-CenterlineOfCutoutGroup</b> type JEP30-D10:ValueSetType</p> <p><b>X15-CenterOfPackage-to-RightSideOfCenterCutout</b> type JEP30-D10:ValueSetType</p> <p><b>X16-CenterOfPackage-to-LeftSideOfRightCutout</b> type JEP30-D10:ValueSetType</p> <p><b>X17-CenterOfPackage-to-CenterOfRightCutout</b> type JEP30-D10:ValueSetType</p> <p><b>X18-CenterOfPackage-to-RightSideOfRightCutout</b> type JEP30-D10:ValueSetType</p> <p><b>X19-RightSideOfPackage-to-LeftSideOfLeftCutout</b> type JEP30-D10:ValueSetType</p> <p><b>X20-RightSideOfPackage-to-CenterOfLeftCutout</b> type JEP30-D10:ValueSetType</p> <p><b>X21-RightSideOfPackage-to-RightSideOfLeftCutout</b> type JEP30-D10:ValueSetType</p> <p><b>X22-RightSideOfPackage-to-LeftSideOfCenterCutout</b> type JEP30-D10:ValueSetType</p> <p><b>X23-RightSideOfPackage-to-CenterlineOfCutoutGroup</b> type JEP30-D10:ValueSetType</p> <p><b>X24-RightSideOfPackage-to-RightSideOfCenterCutout</b> type JEP30-D10:ValueSetType</p> <p><b>X25-RightSideOfPackage-to-LeftSideOfRightCutout</b> type JEP30-D10:ValueSetType</p> <p><b>X26-RightSideOfPackage-to-CenterOfRightCutout</b> type JEP30-D10:ValueSetType</p> <p><b>X27-RightSideOfPackage-to-RightSideOfRightCutout</b> type JEP30-D10:ValueSetType</p>
<p>type</p>	<p><b>CutoutToBody-X-OffsetType, JEP30-D10:ValueSetType.</b></p>

Table 3 – Cutout Location on Package X - Offset lists out all the various dimensions that can be selected from any major point of the package body to any major point of the Cutout in X direction.

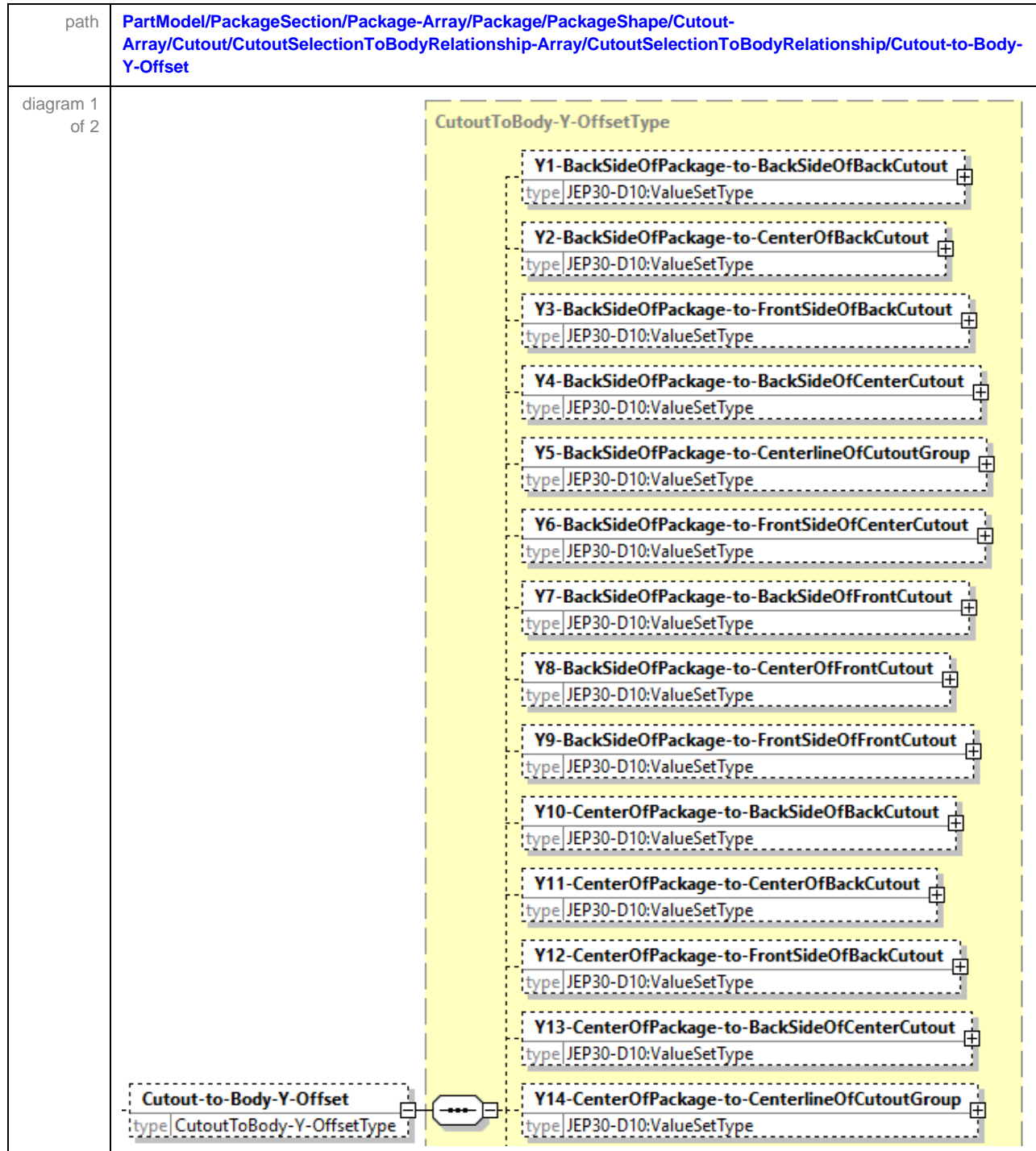
Center of Center Cutout is the same as Centerline of Cutout Group, however the use of the “...Centerline of Cutout Group” is more encompassing since it also includes the centerline of a row or column of an even number of Cutouts, i.e., midway between cutout 2 and cutout 3 of 4 cutout in a row or column.

#### 5.7.6.4.1 Cutout - to- Body - X - Offset (Cont'd)

**Table 3 – Cutout to Body Relationship - X - Offset**

Symbol	Description
X1	X1-LeftSideOfPackage-to-LeftSideOfLeftCutout
X2	X2-LeftSideOfPackage-to-CenterOfLeftCutout
X3	X3-LeftSideOfPackage-to-RightSideOfLeftCutout
X4	X4-LeftSideOfPackage-to-LeftSideOfCenterCutout
X5	X5-LeftSideOfPackage-to-CenterlineOfCutoutGroup
X6	X6-LeftSideOfPackage-to-RightSideOfCenterCutout
X7	X7-LeftSideOfPackage-to-LeftSideOfRightCutout
X8	X8-LeftSideOfPackage-to-CenterOfRightCutout
X9	X9-LeftSideOfPackage-to-RightSideOfRightCutout
X10	X10-CenterOfPackage-to-LeftSideOfLeftCutout
X11	X11-CenterOfPackage-to-CenterOfLeftCutout
X12	X12-CenterOfPackage-to-RightSideOfLeftCutout
X13	X13-CenterOfPackage-to-LeftSideOfCenterCutout
X14	X14-CenterOfPackage-to-CenterlineOfCutoutGroup
X15	X15-CenterOfPackage-to-RightSideOfCenterCutout
X16	X16-CenterOfPackage-to-LeftSideOfRightCutout
X17	X17-CenterOfPackage-to-CenterOfRightCutout
X18	X18-CenterOfPackage-to-RightSideOfRightCutout
X19	X19-RightSideOfPackage-to-LeftSideOfLeftCutout
X20	X20-RightSideOfPackage-to-CenterOfLeftCutout
X21	X21-RightSideOfPackage-to-RightSideOfLeftCutout
X22	X22-RightSideOfPackage-to-LeftSideOfCenterCutout
X23	X23-RightSideOfPackage-to-CenterlineOfCutoutGroup
X24	X24-RightSideOfPackage-to-RightSideOfCenterCutout
X25	X25-RightSideOfPackage-to-LeftSideOfRightCutout
X26	X26-RightSideOfPackage-to-CenterOfRightCutout
X27	X27-RightSideOfPackage-to-RightSideOfRightCutout

#### 5.7.6.4.2 Cutout - to- Body - Y - Offset



#### 5.7.6.4.2 Cutout - to- Body - Y - Offset (Cont'd)

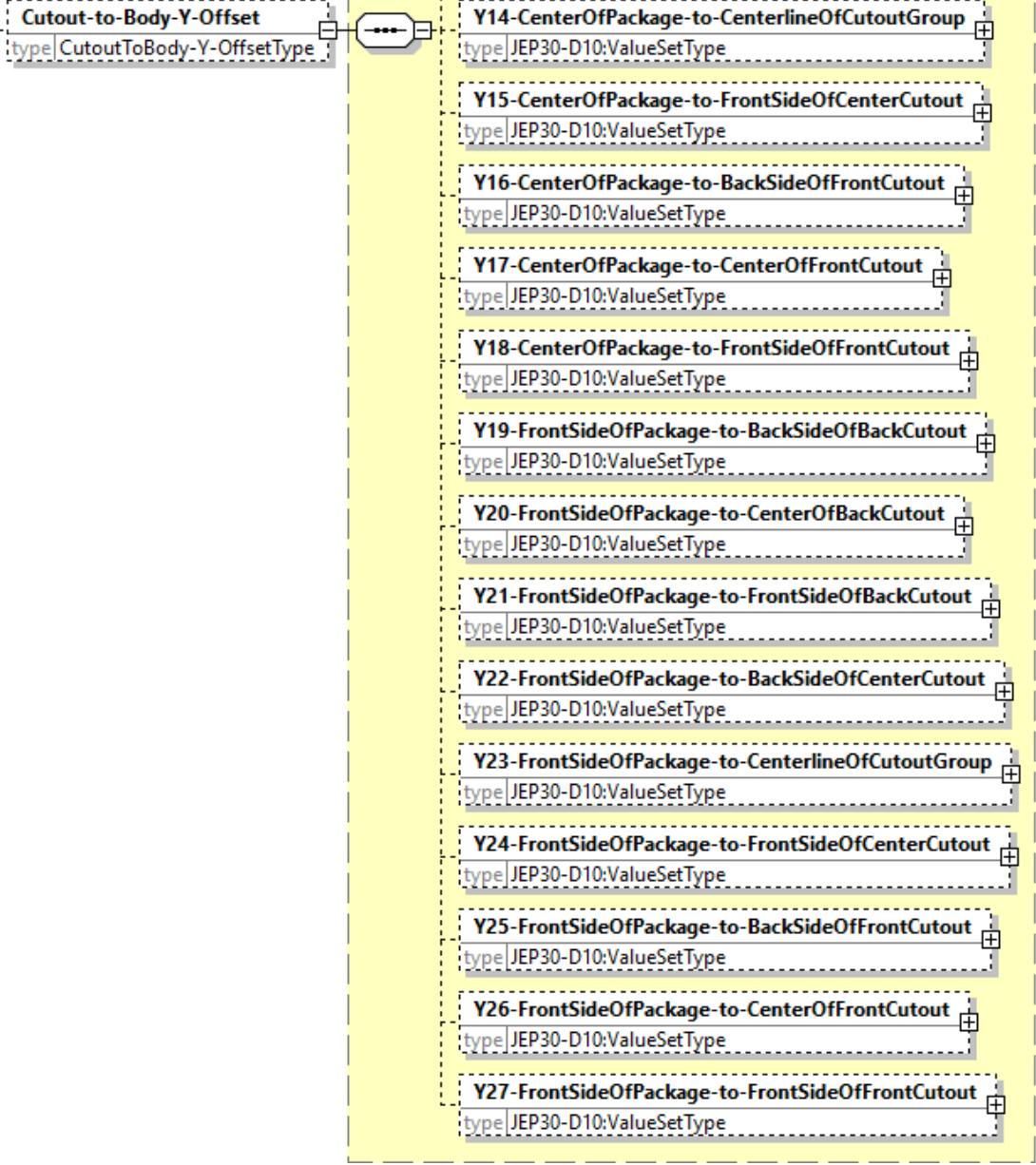
<p>diagram 2 of 2</p>	
<p>type</p>	<p>CutoutToBody-Y-OffsetType, JEP30-D10:ValueSetType.</p>

Table 4 – Cutout Location on Package Y - Offset lists out all the various dimensions that can be selected from any major point of the package body to any major point of the Cutout in Y direction.

#### 5.7.6.4.2 Cutout - to- Body - Y - Offset (Cont'd)

**Table 4 – Cutout to Body Relationship - Y - Offset**

Symbol	Description
Y1	Y1-BackSideOfPackage-to-BackSideOfBackCutout
Y2	Y2-BackSideOfPackage-to-CenterOfBackCutout
Y3	Y3-BackSideOfPackage-to-FrontSideOfBackCutout
Y4	Y4-BackSideOfPackage-to-BackSideOfCenterCutout
Y5	Y5-BackSideOfPackage-to-CenterlineOfCutoutGroup
Y6	Y6-BackSideOfPackage-to-FrontSideOfCenterCutout
Y7	Y7-BackSideOfPackage-to-BackSideOfFrontCutout
Y8	Y8-BackSideOfPackage-to-CenterOfFrontCutout
Y9	Y9-BackSideOfPackage-to-FrontSideOfFrontCutout
Y10	Y10-CenterOfPackage-to-BackSideOfBackCutout
Y11	Y11-CenterOfPackage-to-CenterOfBackCutout
Y12	Y12-CenterOfPackage-to-FrontSideOfBackCutout
Y13	Y13-CenterOfPackage-to-BackSideOfCenterCutout
Y14	Y14-CenterOfPackage-to-CenterlineOfCutoutGroup
Y15	Y15-CenterOfPackage-to-FrontSideOfCenterCutout
Y16	Y16-CenterOfPackage-to-BackSideOfFrontCutout
Y17	Y17-CenterOfPackage-to-CenterOfFrontCutout
Y18	Y18-CenterOfPackage-to-FrontSideOfFrontCutout
Y19	Y19-FrontSideOfPackage-to-BackSideOfBackCutout
Y20	Y20-FrontSideOfPackage-to-CenterOfBackCutout
Y21	Y21-FrontSideOfPackage-to-FrontSideOfBackCutout
Y22	Y22-FrontSideOfPackage-to-BackSideOfCenterCutout
Y23	Y23-FrontSideOfPackage-to-CenterlineOfCutoutGroup
Y24	Y24-FrontSideOfPackage-to-FrontSideOfCenterCutout
Y25	Y25-FrontSideOfPackage-to-BackSideOfFrontCutout
Y26	Y26-FrontSideOfPackage-to-CenterOfFrontCutout
Y27	Y27-FrontSideOfPackage-to-FrontSideOfFrontCutout



#### 5.7.6.4.3 Cutout - to- Body - Z - Offset

path	PartModel/PackageSection/Package-Array/Package/PackageShape/Cutout-Array/Cutout/CutoutSelectionToBodyRelationship-Array/CutoutSelectionToBodyRelationship/Cutout-to-Body-Z-Offset
diagram 1 of 2	<pre> classDiagram     class CutoutToBody_Z_OffsetType {         Z1-UndersideOfPackage-to-UndersideOfBottomCutout         Z2-UndersideOfPackage-to-CenterOfBottomCutout         Z3-UndersideOfPackage-to-TopsideOfBottomCutout         Z4-UndersideOfPackage-to-UndersideOfCenterCutout         Z5-UndersideOfPackage-to-CenterlineOfCutoutGroup         Z6-UndersideOfPackage-to-TopsideOfCenterCutout         Z7-UndersideOfPackage-to-UndersideOfTopCutout         Z8-UndersideOfPackage-to-CenterOfTopCutout         Z9-UndersideOfPackage-to-TopsideOfTopCutout         Z10-CenterOfPackage-to-UndersideOfBottomCutout         Z11-CenterOfPackage-to-CenterOfBottomCutout         Z12-CenterOfPackage-to-TopsideOfBottomCutout         Z13-CenterOfPackage-to-UndersideOfCenterCutout         Z14-CenterOfPackage-to-CenterlineOfCutoutGroup     }     class Cutout_to_Body_Z_Offset {         type CutoutToBody-Z-OffsetType     }     Cutout_to_Body_Z_Offset --&gt; CutoutToBody_Z_OffsetType     </pre> <p>The diagram illustrates the structure of the <b>CutoutToBody-Z-OffsetType</b> class, which is a specialization of the <b>Cutout-to-Body-Z-Offset</b> class. The <b>CutoutToBody-Z-OffsetType</b> class is defined by a dashed yellow box and contains 14 attributes, each representing a specific Z-offset relationship. These attributes are:</p> <ul style="list-style-type: none"> <li><b>Z1-UndersideOfPackage-to-UndersideOfBottomCutout</b></li> <li><b>Z2-UndersideOfPackage-to-CenterOfBottomCutout</b></li> <li><b>Z3-UndersideOfPackage-to-TopsideOfBottomCutout</b></li> <li><b>Z4-UndersideOfPackage-to-UndersideOfCenterCutout</b></li> <li><b>Z5-UndersideOfPackage-to-CenterlineOfCutoutGroup</b></li> <li><b>Z6-UndersideOfPackage-to-TopsideOfCenterCutout</b></li> <li><b>Z7-UndersideOfPackage-to-UndersideOfTopCutout</b></li> <li><b>Z8-UndersideOfPackage-to-CenterOfTopCutout</b></li> <li><b>Z9-UndersideOfPackage-to-TopsideOfTopCutout</b></li> <li><b>Z10-CenterOfPackage-to-UndersideOfBottomCutout</b></li> <li><b>Z11-CenterOfPackage-to-CenterOfBottomCutout</b></li> <li><b>Z12-CenterOfPackage-to-TopsideOfBottomCutout</b></li> <li><b>Z13-CenterOfPackage-to-UndersideOfCenterCutout</b></li> <li><b>Z14-CenterOfPackage-to-CenterlineOfCutoutGroup</b></li> </ul> <p>Each attribute is represented by a dashed box containing the attribute name and its type, <b>JEP30-D10:ValueSetType</b>. The <b>Cutout-to-Body-Z-Offset</b> class is shown as a solid box at the bottom left, with a dashed box containing the attribute <b>type</b> and the value <b>CutoutToBody-Z-OffsetType</b>. A solid line with an open circle at the end connects the <b>type</b> attribute to the <b>CutoutToBody-Z-OffsetType</b> class, indicating a generalization relationship.</p>

### 5.7.6.4.3 Cutout - to- Body - Z - Offset (Cont'd)

<p>diagram 2 of 2</p>	 <p><b>Cutout-to-Body-Z-Offset</b> type CutoutToBody-Z-OffsetType</p> <p><b>Z14-CenterOfPackage-to-CenterlineOfCutoutGroup</b> type JEP30-D10:ValueSetType</p> <p><b>Z15-CenterOfPackage-to-TopsideOfCenterCutout</b> type JEP30-D10:ValueSetType</p> <p><b>Z16-CenterOfPackage-to-UndersideOfTopCutout</b> type JEP30-D10:ValueSetType</p> <p><b>Z17-CenterOfPackage-to-CenterOfTopCutout</b> type JEP30-D10:ValueSetType</p> <p><b>Z18-CenterOfPackage-to-TopsideOfTopCutout</b> type JEP30-D10:ValueSetType</p> <p><b>Z19-TopsideOfPackage-to-UndersideOfBottomCutout</b> type JEP30-D10:ValueSetType</p> <p><b>Z20-TopsideOfPackage-to-CenterOfBottomCutout</b> type JEP30-D10:ValueSetType</p> <p><b>Z21-TopsideOfPackage-to-TopsideOfBottomCutout</b> type JEP30-D10:ValueSetType</p> <p><b>Z22-TopsideOfPackage-to-UndersideOfCenterCutout</b> type JEP30-D10:ValueSetType</p> <p><b>Z23-TopsideOfPackage-to-CenterlineOfCutoutGroup</b> type JEP30-D10:ValueSetType</p> <p><b>Z24-TopsideOfPackage-to-TopsideOfCenterCutout</b> type JEP30-D10:ValueSetType</p> <p><b>Z25-TopsideOfPackage-to-UndersideOfTopCutout</b> type JEP30-D10:ValueSetType</p> <p><b>Z26-TopsideOfPackage-to-CenterOfTopCutout</b> type JEP30-D10:ValueSetType</p> <p><b>Z27-TopsideOfPackage-to-TopsideOfTopCutout</b> type JEP30-D10:ValueSetType</p>
<p>type</p>	<p><b>CutoutToBody-Y-OffsetType, JEP30-D10:ValueSetType.</b></p>

Table 5 – Cutout Location on Package X - Offset lists out all the various dimensions that can be selected from any major point of the package body to any major point of the Cutout in Z direction.

#### 5.7.6.4.3 Cutout - to- Body - Z - Offset (Cont'd)

**Table 5 – Cutout to Body Relationship - X - Offset**

Symbol	Description
Z1	Z1-UndersideOfPackage-to-UndersideOfBottomCutout
Z2	Z2-UndersideOfPackage-to-CenterOfBottomCutout
Z3	Z3-UndersideOfPackage-to-TopsideOfBottomCutout
Z4	Z4-UndersideOfPackage-to-UndersideOfCenterCutout
Z5	Z5-UndersideOfPackage-to-CenterlineOfCutoutGroup
Z6	Z6-UndersideOfPackage-to-TopsideOfCenterCutout
Z7	Z7-UndersideOfPackage-to-UndersideOfTopCutout
Z8	Z8-UndersideOfPackage-to-CenterOfTopCutout
Z9	Z9-UndersideOfPackage-to-TopsideOfTopCutout
Z10	Z10-CenterOfPackage-to-UndersideOfBottomCutout
Z11	Z11-CenterOfPackage-to-CenterOfBottomCutout
Z12	Z12-CenterOfPackage-to-TopsideOfBottomCutout
Z13	Z13-CenterOfPackage-to-UndersideOfCenterCutout
Z14	Z14-CenterOfPackage-to-CenterlineOfCutoutGroup
Z15	Z15-CenterOfPackage-to-TopsideOfCenterCutout
Z16	Z16-CenterOfPackage-to-UndersideOfTopCutout
Z17	Z17-CenterOfPackage-to-CenterOfTopCutout
Z18	Z18-CenterOfPackage-to-TopsideOfTopCutout
Z19	Z19-TopsideOfPackage-to-UndersideOfBottomCutout
Z20	Z20-TopsideOfPackage-to-CenterOfBottomCutout
Z21	Z21-TopsideOfPackage-to-TopsideOfBottomCutout
Z22	Z22-TopsideOfPackage-to-UndersideOfCenterCutout
Z23	Z23-TopsideOfPackage-to-CenterlineOfCutoutGroup
Z24	Z24-TopsideOfPackage-to-TopsideOfCenterCutout
Z25	Z25-TopsideOfPackage-to-UndersideOfTopCutout
Z26	Z26-TopsideOfPackage-to-CenterOfTopCutout
Z27	Z27-TopsideOfPackage-to-TopsideOfTopCutout

### 5.7.6.5 Cutout Selection To Cutout Selection - Array

path	<a href="#">PartModel/PackageSection/Package-Array/Package/PackageShape/Cutout-Array/Cutout/CutoutSelectionToCutoutSelection-Array</a>
diagram	<p>The diagram illustrates the structure of the <b>CutoutSelectionToCutoutSelection-Array</b>. It consists of a sequence of <b>CutoutSelectionToCutoutSelection</b> objects, each containing a <b>FirstCutout</b> and a <b>SecondCutout</b>. The <b>FirstCutout</b> and <b>SecondCutout</b> are of type <b>JEP30-D10:EmptyType</b>. The <b>FirstCutout</b> has three attributes: <b>FromCutoutID</b> (type <b>xs:string</b>), <b>FromCutoutPatternID</b> (type <b>xs:string</b>), and <b>FromCutoutPatternGroupID</b> (type <b>xs:string</b>). The <b>SecondCutout</b> has three attributes: <b>ToCutoutID</b> (type <b>xs:string</b>), <b>ToCutoutPatternID</b> (type <b>xs:string</b>), and <b>ToCutoutPatternGroupID</b> (type <b>xs:string</b>). Below the sequence, there are three optional attributes: <b>FirstCutout-to-SecondCutout-X-Offset</b> (type <b>FirstCutout-to-SecondCutout-X-OffsetType</b>), <b>FirstCutout-to-SecondCutout-Y-Offset</b> (type <b>FirstCutout-to-SecondCutout-Y-OffsetType</b>), and <b>FirstCutout-to-SecondCutout-Z-Offset</b> (type <b>FirstCutout-to-SecondCutout-Z-OffsetType</b>). A <b>FootnoteID</b> (type <b>xs:string</b>) is also present at the bottom (0..∞).</p>
type	<a href="#">CutoutSelectionToCutoutSelection-ArrayType</a> , <a href="#">JEP30-D10:EmptyType</a> , <a href="#">CutoutSelectionToCutoutSelectionType</a> , <a href="#">FirstCutout-to-SecondCutout-X-OffsetType</a> , <a href="#">FirstCutout-to-SecondCutout-Y-OffsetType</a> , <a href="#">FirstCutout-to-SecondCutout-Z-OffsetType</a> .

### 5.7.6.5.1 First Cutout- to - Second Cutout - X - Offset



#### 5.7.6.4.1 First Cutout- to - Second Cutout - X - Offset (Cont'd)

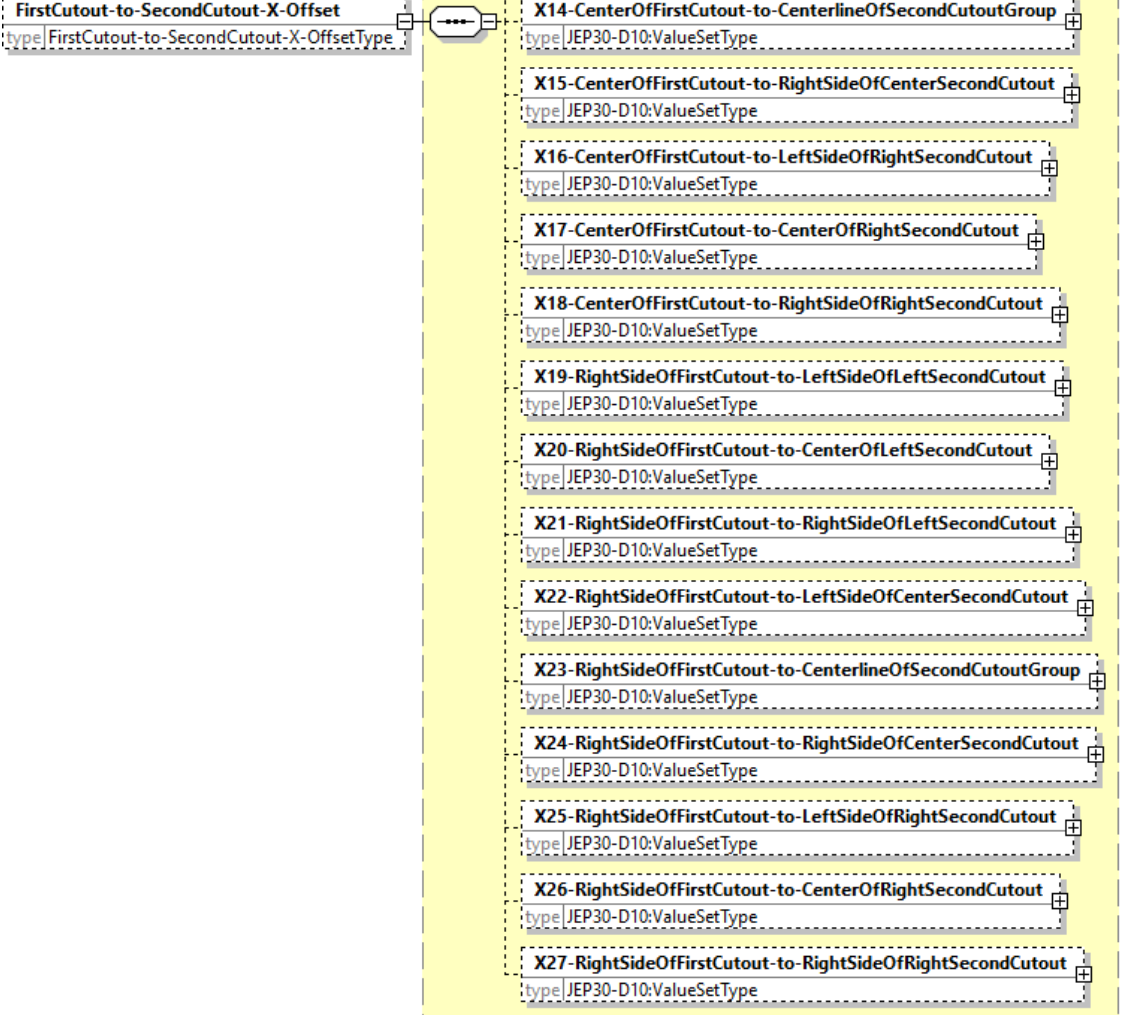
<p>diagram 2 of 2</p>	
<p>type</p>	<p><b>FirstCutout-to-SecondCutout-X-OffsetType, JEP30-D10:ValueSetType.</b></p>

Table 6 – First Cutout- to - Second Cutout Relationship - X - Offset lists out all the various dimensions that can be selected from any major point of the first cutout to any major point of the second cutout in X direction.

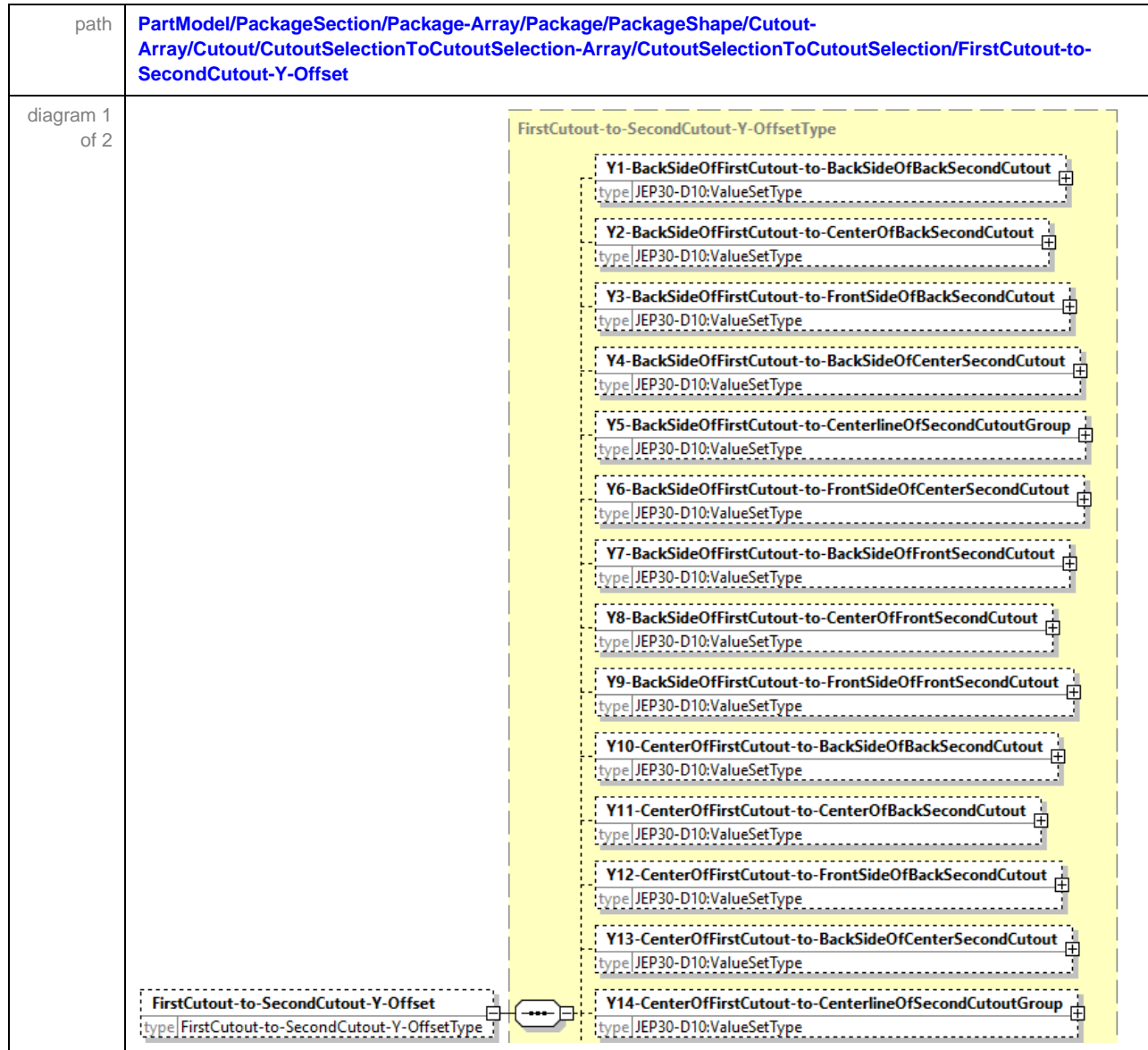
Center of Center Cutout is the same as Centerline of Cutout Group, however the use of the “...Centerline of Cutout Group” is more encompassing since it also includes the centerline of a row or column of an even number of Cutout, i.e., midway between Cutout 2 and Cutout 3 of 4 Cutout in a row or column.

#### 5.7.6.4.1 First Cutout- to - Second Cutout - X - Offset (Cont'd)

**Table 6 – First Cutout- to - Second Cutout Relationship - X - Offset**

Symbol	Description
X1	X1-LeftSideOfFirstCutout-to-LeftSideOfLeftCutout
X2	X2-LeftSideOfFirstCutout-to-CenterOfLeftCutout
X3	X3-LeftSideOfFirstCutout-to-RightSideOfLeftCutout
X4	X4-LeftSideOfFirstCutout-to-LeftSideOfCenterCutout
X5	X5-LeftSideOfFirstCutout-to-CenterlineOfCutoutGroup
X6	X6-LeftSideOfFirstCutout-to-RightSideOfCenterCutout
X7	X7-LeftSideOfFirstCutout-to-LeftSideOfRightCutout
X8	X8-LeftSideOfFirstCutout-to-CenterOfRightCutout
X9	X9-LeftSideOfFirstCutout-to-RightSideOfRightCutout
X10	X10-CenterOfFirstCutout-to-LeftSideOfLeftCutout
X11	X11-CenterOfFirstCutout-to-CenterOfLeftCutout
X12	X12-CenterOfFirstCutout-to-RightSideOfLeftCutout
X13	X13-CenterOfFirstCutout-to-LeftSideOfCenterCutout
X14	X14-CenterOfFirstCutout-to-CenterlineOfCutoutGroup
X15	X15-CenterOfFirstCutout-to-RightSideOfCenterCutout
X16	X16-CenterOfFirstCutout-to-LeftSideOfRightCutout
X17	X17-CenterOfFirstCutout-to-CenterOfRightCutout
X18	X18-CenterOfFirstCutout-to-RightSideOfRightCutout
X19	X19-RightSideOfFirstCutout-to-LeftSideOfLeftCutout
X20	X20-RightSideOfFirstCutout-to-CenterOfLeftCutout
X21	X21-RightSideOfFirstCutout-to-RightSideOfLeftCutout
X22	X22-RightSideOfFirstCutout-to-LeftSideOfCenterCutout
X23	X23-RightSideOfFirstCutout-to-CenterlineOfCutoutGroup
X24	X24-RightSideOfFirstCutout-to-RightSideOfCenterCutout
X25	X25-RightSideOfFirstCutout-to-LeftSideOfRightCutout
X26	X26-RightSideOfFirstCutout-to-CenterOfRightCutout
X27	X27-RightSideOfFirstCutout-to-RightSideOfRightCutout

### 5.7.6.5.2 First Cutout- to - Second Cutout - Y - Offset





#### 5.7.6.4.2 First Cutout- to - Second Cutout - Y - Offset (Cont'd)

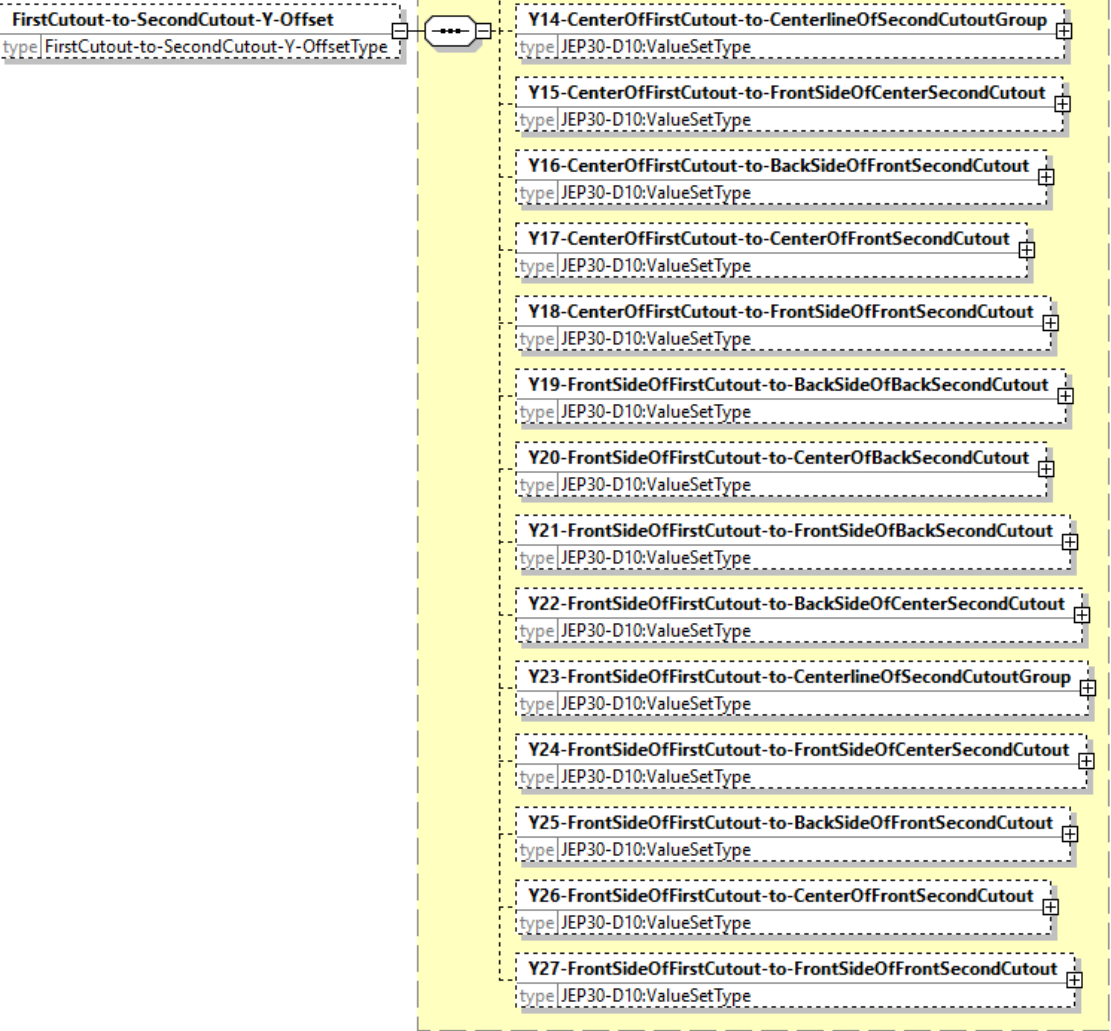
<p>diagram 2 of 2</p>	 <p>The diagram illustrates the relationship between the 'FirstCutout-to-SecondCutout-Y-Offset' and a series of Y dimensions for the 'CenterlineOfSecondCutoutGroup'. The 'FirstCutout-to-SecondCutout-Y-Offset' is shown as a dashed box on the left, connected by a line to a central connector. This connector is linked to a vertical stack of 14 dashed boxes on the right, each representing a specific Y dimension. Each box contains the dimension name and its type, 'JEP30-D10:ValueSetType'. The dimensions are: Y14-CenterOfFirstCutout-to-CenterlineOfSecondCutoutGroup, Y15-CenterOfFirstCutout-to-FrontSideOfCenterSecondCutout, Y16-CenterOfFirstCutout-to-BackSideOfFrontSecondCutout, Y17-CenterOfFirstCutout-to-CenterOfFrontSecondCutout, Y18-CenterOfFirstCutout-to-FrontSideOfFrontSecondCutout, Y19-FrontSideOfFirstCutout-to-BackSideOfBackSecondCutout, Y20-FrontSideOfFirstCutout-to-CenterOfBackSecondCutout, Y21-FrontSideOfFirstCutout-to-FrontSideOfBackSecondCutout, Y22-FrontSideOfFirstCutout-to-BackSideOfCenterSecondCutout, Y23-FrontSideOfFirstCutout-to-CenterlineOfSecondCutoutGroup, Y24-FrontSideOfFirstCutout-to-FrontSideOfCenterSecondCutout, Y25-FrontSideOfFirstCutout-to-BackSideOfFrontSecondCutout, Y26-FrontSideOfFirstCutout-to-CenterOfFrontSecondCutout, and Y27-FrontSideOfFirstCutout-to-FrontSideOfFrontSecondCutout.</p>
<p>type</p>	<p>CutoutToBody-Y-OffsetType, JEP30-D10:ValueSetType.</p>

Table 7 – First Cutout- to - Second Cutout Relationship - Y - Offset lists out all the various dimensions that can be selected from any major point of the first cutout to any major point of the second cutout in Y direction.

#### 5.7.6.4.2 First Cutout- to - Second Cutout - Y - Offset (Cont'd)

**Table 7 – First Cutout- to - Second Cutout Relationship - Y - Offset**

Symbol	Description
Y1	Y1-BackSideOfFirstCutout-to-BackSideOfBackCutout
Y2	Y2-BackSideOfFirstCutout-to-CenterOfBackCutout
Y3	Y3-BackSideOfFirstCutout-to-FrontSideOfBackCutout
Y4	Y4-BackSideOfFirstCutout-to-BackSideOfCenterCutout
Y5	Y5-BackSideOfFirstCutout-to-CenterlineOfCutoutGroup
Y6	Y6-BackSideOfFirstCutout-to-FrontSideOfCenterCutout
Y7	Y7-BackSideOfFirstCutout-to-BackSideOfFrontCutout
Y8	Y8-BackSideOfFirstCutout-to-CenterOfFrontCutout
Y9	Y9-BackSideOfFirstCutout-to-FrontSideOfFrontCutout
Y10	Y10-CenterOfFirstCutout-to-BackSideOfBackCutout
Y11	Y11-CenterOfFirstCutout-to-CenterOfBackCutout
Y12	Y12-CenterOfFirstCutout-to-FrontSideOfBackCutout
Y13	Y13-CenterOfFirstCutout-to-BackSideOfCenterCutout
Y14	Y14-CenterOfFirstCutout-to-CenterlineOfCutoutGroup
Y15	Y15-CenterOfFirstCutout-to-FrontSideOfCenterCutout
Y16	Y16-CenterOfFirstCutout-to-BackSideOfFrontCutout
Y17	Y17-CenterOfFirstCutout-to-CenterOfFrontCutout
Y18	Y18-CenterOfFirstCutout-to-FrontSideOfFrontCutout
Y19	Y19-FrontSideOfFirstCutout-to-BackSideOfBackCutout
Y20	Y20-FrontSideOfFirstCutout-to-CenterOfBackCutout
Y21	Y21-FrontSideOfFirstCutout-to-FrontSideOfBackCutout
Y22	Y22-FrontSideOfFirstCutout-to-BackSideOfCenterCutout
Y23	Y23-FrontSideOfFirstCutout-to-CenterlineOfCutoutGroup
Y24	Y24-FrontSideOfFirstCutout-to-FrontSideOfCenterCutout
Y25	Y25-FrontSideOfFirstCutout-to-BackSideOfFrontCutout
Y26	Y26-FrontSideOfFirstCutout-to-CenterOfFrontCutout
Y27	Y27-FrontSideOfFirstCutout-to-FrontSideOfFrontCutout

5.7.6.5.3 First Cutout- to - Second Cutout - Z - Offset

path	PartModel/PackageSection/Package-Array/Package/PackageShape/Cutout-Array/Cutout/CutoutSelectionToCutoutSelection-Array/CutoutSelectionToCutoutSelection/FirstCutout-to-SecondCutout-Z-Offset	
diagram 1 of 2	<div><div>FirstCutout-to-SecondCutout-Z-OffsetType</div><div><div>Z1-UndersideOfFirstCutout-to-UndersideOfBottomSecondCutout</div><div>type JEP30-D10:ValueSetType</div></div><div><div>Z2-UndersideOfFirstCutout-to-CenterOfBottomSecondCutout</div><div>type JEP30-D10:ValueSetType</div></div><div><div>Z3-UndersideOfFirstCutout-to-TopsideOfBottomSecondCutout</div><div>type JEP30-D10:ValueSetType</div></div><div><div>Z4-UndersideOfFirstCutout-to-UndersideOfCenterSecondCutout</div><div>type JEP30-D10:ValueSetType</div></div><div><div>Z5-UndersideOfFirstCutout-to-CenterlineOfSecondCutoutGroup</div><div>type JEP30-D10:ValueSetType</div></div><div><div>Z6-UndersideOfFirstCutout-to-TopsideOfCenterSecondCutout</div><div>type JEP30-D10:ValueSetType</div></div><div><div>Z7-UndersideOfFirstCutout-to-UndersideOfTopSecondCutout</div><div>type JEP30-D10:ValueSetType</div></div><div><div>Z8-UndersideOfFirstCutout-to-CenterOfTopSecondCutout</div><div>type JEP30-D10:ValueSetType</div></div><div><div>Z9-UndersideFirstCutout-to-TopsideOfTopSecondCutout</div><div>type JEP30-D10:ValueSetType</div></div><div><div>Z10-CenterOfFirstCutout-to-UndersideOfBottomSecondCutout</div><div>type JEP30-D10:ValueSetType</div></div><div><div>Z11-CenterOfFirstCutout-to-CenterOfBottomSecondCutout</div><div>type JEP30-D10:ValueSetType</div></div><div><div>Z12-CenterOfFirstCutout-to-TopsideOfBottomSecondCutout</div><div>type JEP30-D10:ValueSetType</div></div><div><div>Z13-CenterOfFirstCutout-to-UndersideOfCenterSecondCutout</div><div>type JEP30-D10:ValueSetType</div></div><div><div>Z14-CenterOfFirstCutout-to-CenterlineOfSecondCutoutGroup</div><div>type JEP30-D10:ValueSetType</div></div></div> <div><div>FirstCutout-to-SecondCutout-Z-Offset</div><div>type FirstCutout-to-SecondCutout-Z-OffsetType</div></div> <div><div></div><div></div></div>	

### 5.7.6.4.3 First Cutout- to - Second Cutout - Z - Offset (Cont'd)

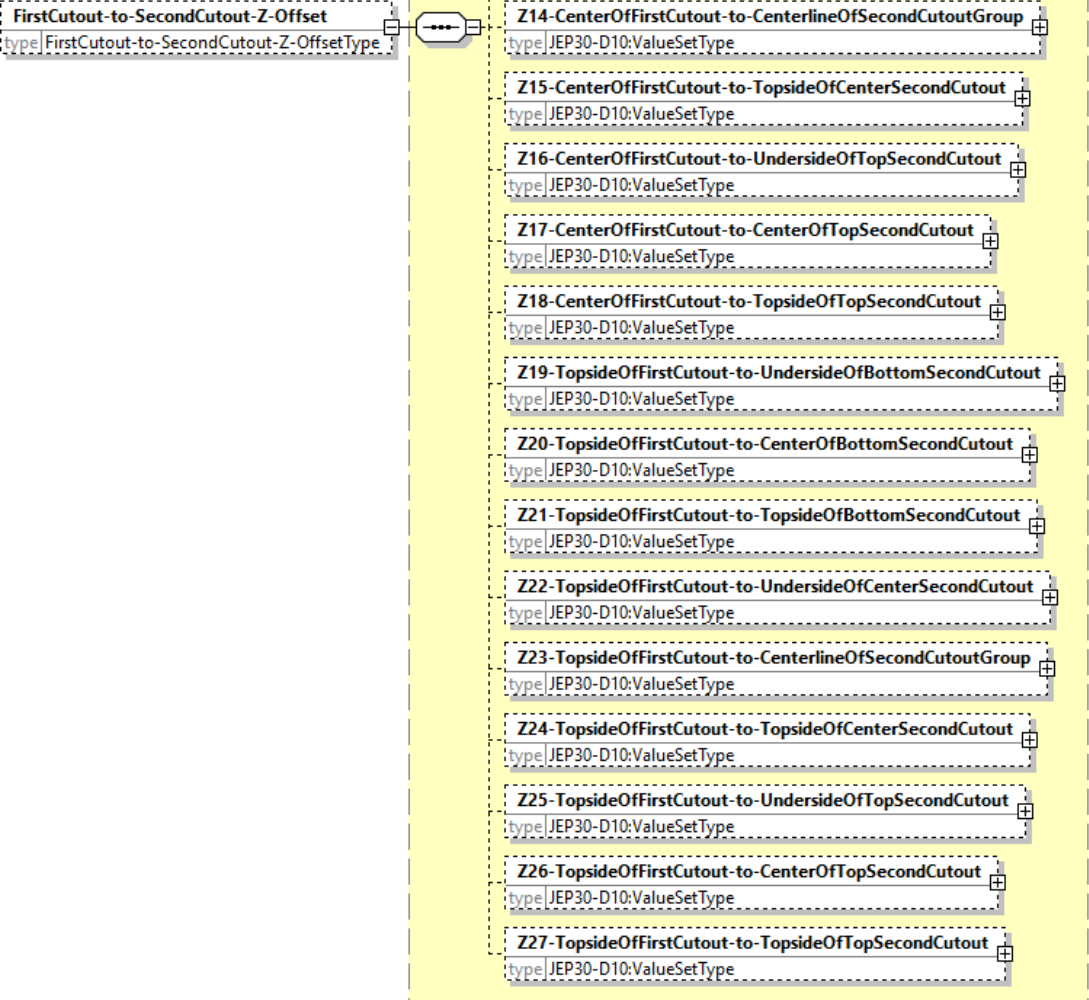
<p>diagram 2 of 2</p>	
<p>type</p>	<p>CutoutToBody-Y-OffsetType, JEP30-D10:ValueSetType.</p>

Table 8 – First Cutout- to - Second Cutout Relationship - X - Offset lists out all the various dimensions that can be selected from any major point of the first cutout to any major point of the second cutout in Z direction.

#### 5.7.6.4.3 First Cutout- to - Second Cutout - Z - Offset (Cont'd)

**Table 8 – First Cutout- to - Second Cutout Relationship - X - Offset**

Symbol	Description
Z1	Z1-UndersideOfFirstCutout-to-UndersideOfBottomCutout
Z2	Z2-UndersideOfFirstCutout-to-CenterOfBottomCutout
Z3	Z3-UndersideOfFirstCutout-to-TopsideOfBottomCutout
Z4	Z4-UndersideOfFirstCutout-to-UndersideOfCenterCutout
Z5	Z5-UndersideOfFirstCutout-to-CenterlineOfCutoutGroup
Z6	Z6-UndersideOfFirstCutout-to-TopsideOfCenterCutout
Z7	Z7-UndersideOfFirstCutout-to-UndersideOfTopCutout
Z8	Z8-UndersideOfFirstCutout-to-CenterOfTopCutout
Z9	Z9-UndersideOfFirstCutout-to-TopsideOfTopCutout
Z10	Z10-CenterOfFirstCutout-to-UndersideOfBottomCutout
Z11	Z11-CenterOfFirstCutout-to-CenterOfBottomCutout
Z12	Z12-CenterOfFirstCutout-to-TopsideOfBottomCutout
Z13	Z13-CenterOfFirstCutout-to-UndersideOfCenterCutout
Z14	Z14-CenterOfFirstCutout-to-CenterlineOfCutoutGroup
Z15	Z15-CenterOfFirstCutout-to-TopsideOfCenterCutout
Z16	Z16-CenterOfFirstCutout-to-UndersideOfTopCutout
Z17	Z17-CenterOfFirstCutout-to-CenterOfTopCutout
Z18	Z18-CenterOfFirstCutout-to-TopsideOfTopCutout
Z19	Z19-TopsideOfFirstCutout-to-UndersideOfBottomCutout
Z20	Z20-TopsideOfFirstCutout-to-CenterOfBottomCutout
Z21	Z21-TopsideOfFirstCutout-to-TopsideOfBottomCutout
Z22	Z22-TopsideOfFirstCutout-to-UndersideOfCenterCutout
Z23	Z23-TopsideOfFirstCutout-to-CenterlineOfCutoutGroup
Z24	Z24-TopsideOfFirstCutout-to-TopsideOfCenterCutout
Z25	Z25-TopsideOfFirstCutout-to-UndersideOfTopCutout
Z26	Z26-TopsideOfFirstCutout-to-CenterOfTopCutout
Z27	Z27-TopsideOfFirstCutout-to-TopsideOfTopCutout

### 5.7.7 Protrusion - Array

path	<b>PartModel/PackageSection/Package-Array/Package/PackageShape/PackageProtrusion-Array</b>
diagram	<pre> classDiagram     class PackageProtrusionArray {         type PackageProtrusionArrayType     }     class PackageProtrusionType {         ID xs:string         ProtrusionPattern ProtrusionPatternType 1..∞         PatternGroup ProtrusionPatternGroupType 0..∞         ProtrusionShapeArray ProtrusionShape-ArrayType         ProtrusionSelectionToBodyRelationshipArray ProtrusionSelectionToBodyRelationship-ArrayType         FootnoteID xs:string 0..∞     }     class Protrusion {         type PackageProtrusionType     }     class ProtrusionPattern {         type ProtrusionPatternType     }     class PatternGroup {         type ProtrusionPatternGroupType     }     class ProtrusionShapeArray {         type ProtrusionShape-ArrayType     }     class ProtrusionSelectionToBodyRelationshipArray {         type ProtrusionSelectionToBodyRelationship-ArrayType     }     class FootnoteID {         type xs:string     }     class ProtrusionSelectionToProtrusionSelection {         type ProtrusionSelectionToProtrusionSelectionType     }      PackageProtrusionArray "0..∞" -- "0..∞" Protrusion     Protrusion "0..∞" -- "1..∞" ProtrusionPattern     Protrusion "0..∞" -- "0..∞" PatternGroup     Protrusion "0..∞" -- "0..∞" ProtrusionShapeArray     Protrusion "0..∞" -- "0..∞" ProtrusionSelectionToBodyRelationshipArray     Protrusion "0..∞" -- "0..∞" FootnoteID     Protrusion "0..∞" -- "0..∞" ProtrusionSelectionToProtrusionSelection     </pre>
type	<b>PackageProtrusion-ArrayType, PackageProtrusionType, ProtrusionPatternType, ProtrusionPatternGroupType, ProtrusionShape-ArrayType, ProtrusionSelectionToBodyRelationship-ArrayType, ProtrusionSelectionToProtrusionSelection-ArrayType.</b>

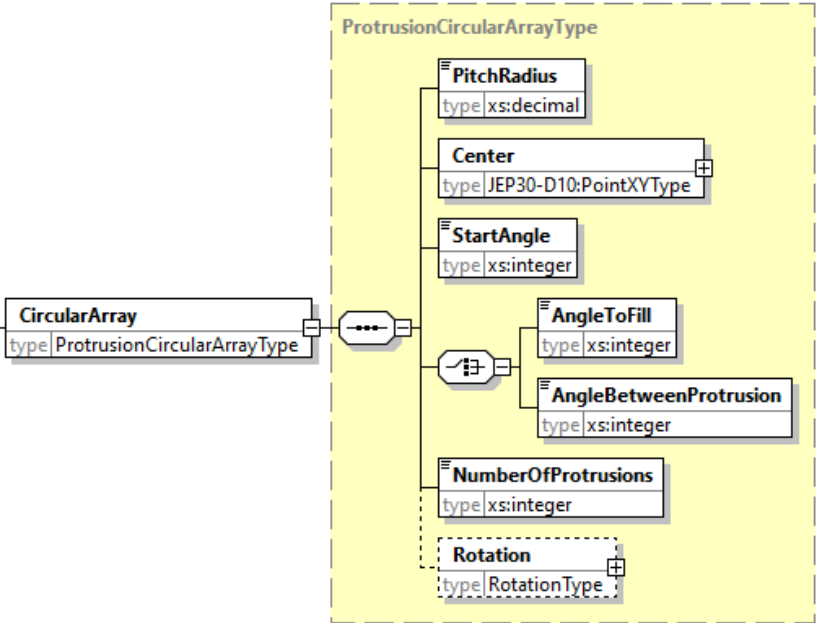
### 5.7.7.1 Protrusion Pattern

path	<a href="#">PartModel/PackageSection/Package-Array/Package/PackageShape/PackageProtrusion-Array/Protrusion/ProtrusionPattern</a>
diagram	
type	<a href="#">ProtrusionPatternType</a> , <a href="#">ProtrusionStandardArrayType</a> , <a href="#">ProtrusionCircularArrayType</a> , <a href="#">JEP30-D10:DeletedStatusType</a> , <a href="#">ProtrusionRandomArrayType</a> , <a href="#">JEP30-D10:PointXYType</a> .

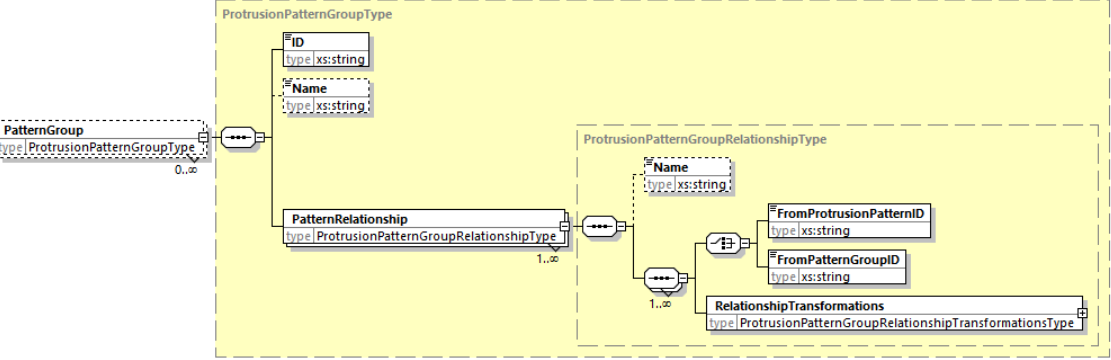
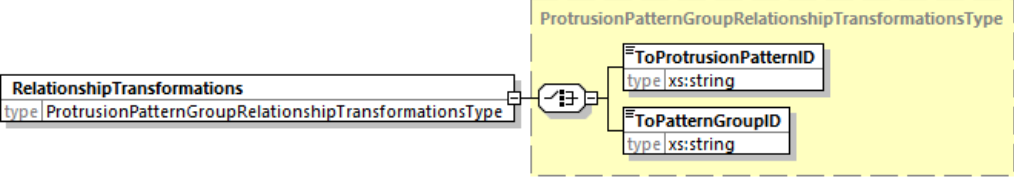
#### 5.7.7.1.1 Standard Array

path	<a href="#">PartModel/PackageSection/Package-Array/Package/PackageShape/PackageProtrusion-Array/Protrusion/ProtrusionPattern/StandardArray</a>
diagram	
type	<a href="#">ProtrusionStandardArrayType</a> , <a href="#">JEP30-D10:PitchValueSetType</a> , <a href="#">JEP30-D10:PointXYType</a>

### 5.7.7.1.2 Circular Array

path	<a href="#">PartModel/PackageSection/Package-Array/Package/PackageShape/PackageProtrusion-Array/Protrusion/ProtrusionPattern/CircularArray</a>
diagram	 <p>The diagram shows a <b>CircularArray</b> element (type <code>ProtrusionCircularArrayType</code>) connected to a dashed box representing the <code>ProtrusionCircularArrayType</code>. Inside this box, the following elements are defined:</p> <ul style="list-style-type: none"> <li><b>PitchRadius</b> (type <code>xs:decimal</code>)</li> <li><b>Center</b> (type <code>JEP30-D10:PointXYType</code>)</li> <li><b>StartAngle</b> (type <code>xs:integer</code>)</li> <li><b>AngleToFill</b> (type <code>xs:integer</code>)</li> <li><b>AngleBetweenProtrusion</b> (type <code>xs:integer</code>)</li> <li><b>NumberOfProtrusions</b> (type <code>xs:integer</code>)</li> <li><b>Rotation</b> (type <code>RotationType</code>)</li> </ul>
type	<a href="#">ProtrusionCircularArrayType</a> , <a href="#">JEP30-D10:PointXYType</a> , <a href="#">RotationType</a>

### 5.7.7.2 Pattern Group

path	<a href="#">PartModel/PackageSection/Package-Array/Package/PackageShape/PackageProtrusion-Array/Protrusion/PatternGroup</a>
diagram 1 of 2	 <p>The diagram shows a <b>PatternGroup</b> element (type <code>ProtrusionPatternGroupType</code>) connected to a dashed box representing the <code>ProtrusionPatternGroupType</code>. Inside this box, the following elements are defined:</p> <ul style="list-style-type: none"> <li><b>ID</b> (type <code>xs:string</code>)</li> <li><b>Name</b> (type <code>xs:string</code>)</li> <li><b>PatternRelationship</b> (type <code>ProtrusionPatternGroupRelationshipType</code>)</li> </ul> <p>The <b>PatternRelationship</b> element is further connected to a dashed box representing the <code>ProtrusionPatternGroupRelationshipType</code>. Inside this box, the following elements are defined:</p> <ul style="list-style-type: none"> <li><b>Name</b> (type <code>xs:string</code>)</li> <li><b>FromProtrusionPatternID</b> (type <code>xs:string</code>)</li> <li><b>FromPatternGroupID</b> (type <code>xs:string</code>)</li> <li><b>RelationshipTransformations</b> (type <code>ProtrusionPatternGroupRelationshipTransformationsType</code>)</li> </ul>
diagram 2 of 2	 <p>The diagram shows a <b>RelationshipTransformations</b> element (type <code>ProtrusionPatternGroupRelationshipTransformationsType</code>) connected to a dashed box representing the <code>ProtrusionPatternGroupRelationshipTransformationsType</code>. Inside this box, the following elements are defined:</p> <ul style="list-style-type: none"> <li><b>ToProtrusionPatternID</b> (type <code>xs:string</code>)</li> <li><b>ToPatternGroupID</b> (type <code>xs:string</code>)</li> </ul>
type	<a href="#">ProtrusionPatternGroupType</a> , <a href="#">ProtrusionPatternGroupRelationshipType</a> , <a href="#">ProtrusionPatternGroupRelationshipTransformationsType</a>



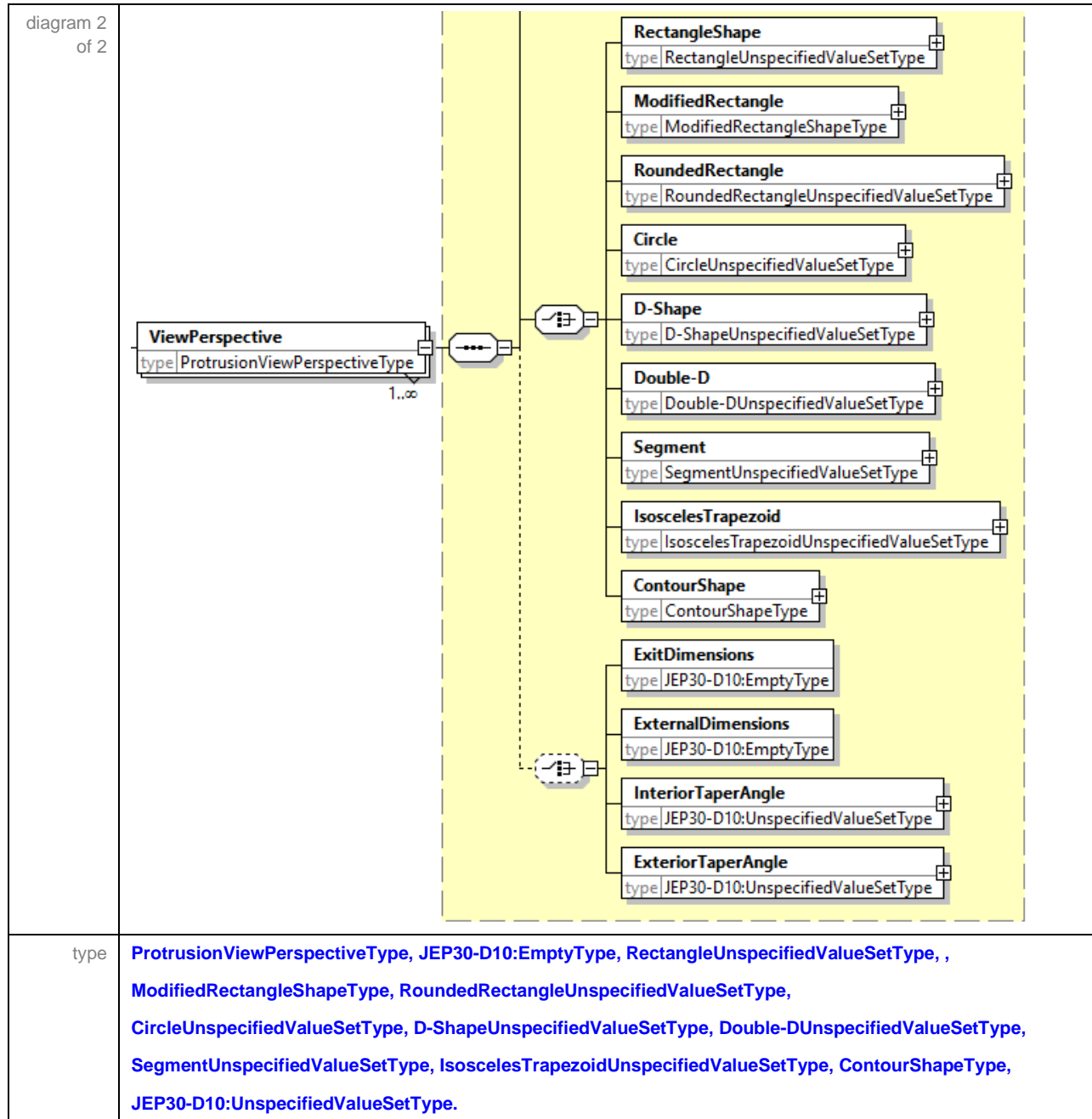
5.7.7.3      Protrusion Shape - Array

path	PartModel/PackageSection/Package-Array/Package/PackageShape/PackageProtrusion-Array/Protrusion/ProtrusionShape-Array
diagram	<p>ProtrusionShape-ArrayType</p> <p>ProtrusionShapeType</p> <p>ID</p> <p>type xs:string</p> <p>ProtrusionPatternID</p> <p>type xs:string</p> <p>ProtrusionPatternGroupID</p> <p>type xs:string</p> <p>ViewPerspective</p> <p>type ProtrusionViewPerspectiveType</p> <p>1..∞</p> <p>ViewPerspective-to-ViewPerspectiveAlignment-Array</p> <p>type ViewPerspective-to-ViewPerspectiveAlignment-ArrayType</p> <p>AssembledShape</p> <p>type ProtrusionAssembledShapeType</p> <p>constraints</p>
type	ProtrusionShape-ArrayType, ProtrusionShapeType, ProtrusionViewPerspectiveType, ViewPerspective-to-ViewPerspectiveAlignment-ArrayType, ProtrusionAssembledShapeType.

5.7.7.3.1      View Perspective

path	PartModel/PackageSection/Package-Array/Package/PackageShape/PackageProtrusion-Array/Protrusion/ProtrusionShape-Array/ProtrusionShape/ViewPerspective
diagram 1 of 2	<p>ProtrusionViewPerspectiveType</p> <p>ID</p> <p>type xs:string</p> <p>XYPlane</p> <p>type JEP30-D10:EmptyType</p> <p>ZOffset</p> <p>type xs:decimal</p> <p>Topside</p> <p>type JEP30-D10:EmptyType</p> <p>Underside</p> <p>type JEP30-D10:EmptyType</p> <p>YZPlane</p> <p>type JEP30-D10:EmptyType</p> <p>XOffset</p> <p>type xs:decimal</p> <p>Left</p> <p>type JEP30-D10:EmptyType</p> <p>Right</p> <p>type JEP30-D10:EmptyType</p> <p>XZPlane</p> <p>type JEP30-D10:EmptyType</p> <p>YOffset</p> <p>type xs:decimal</p> <p>Back</p> <p>type JEP30-D10:EmptyType</p> <p>Front</p> <p>type JEP30-D10:EmptyType</p> <p>ViewPerspective</p> <p>type ProtrusionViewPerspectiveType</p> <p>1..∞</p>

### 5.7.6.3.1 View Perspective (Cont'd)



### 5.7.7.3.2 Assembled Shape

path	<a href="#">PartModel/PackageSection/Package-Array/Package/PackageShape/PackageProtrusion-Array/Protrusion/ProtrusionShape-Array/ProtrusionShape/AssembledShape</a>
diagram	
type	<a href="#">ProtrusionAssembledShapeType</a> , <a href="#">ImpactedAssembledShapeType</a> , <a href="#">Impact-to-AssembledShapeGroupType</a> , <a href="#">JEP30-D10:ValueSetType</a> .

### 5.7.7.4 Protrusion Selection To Body Relationship - Array

path	<a href="#">PartModel/PackageSection/Package-Array/Package/PackageShape/PackageProtrusion-Array/Protrusion/ProtrusionSelectionToBodyRelationship-Array</a>
diagram	
type	<a href="#">ProtrusionSelectionToBodyRelationship-ArrayType</a> , <a href="#">ProtrusionSelectionToBodyRelationshipType</a> , <a href="#">ProtrusionToBody-X-OffsetType</a> , <a href="#">ProtrusionToBody-Y-OffsetType</a> , <a href="#">ProtrusionToBody-Z-OffsetType</a> .

#### 5.7.7.4.1 Protrusion - to - Body - X - Offset



#### 5.7.6.4.1 Protrusion - to- Body - X - Offset (Cont'd)

diagram 2 of 2	<div> <div> <b>Protrusion-to-Body-X-Offset</b>            type   ProtrusionToBody-X-OffsetType         </div> <div> <p>The diagram illustrates a package body with a protrusion. A dashed line represents the centerline of the protrusion group. Various offset dimensions are shown, labeled X14 through X27. Each dimension is represented by a box with a plus sign on the right, indicating a positive offset. The dimensions are grouped into a yellow shaded area.</p> <ul style="list-style-type: none"> <li>X14-CenterOfPackage-to-CenterlineOfProtrusionGroup</li> <li>X15-CenterOfPackage-to-RightSideOfCenterProtrusion</li> <li>X16-CenterOfPackage-to-LeftSideOfRightProtrusion</li> <li>X17-CenterOfPackage-to-CenterOfRightProtrusion</li> <li>X18-CenterOfPackage-to-RightSideOfRightProtrusion</li> <li>X19-RightSideOfPackage-to-LeftSideOfLeftProtrusion</li> <li>X20-RightSideOfPackage-to-CenterOfLeftProtrusion</li> <li>X21-RightSideOfPackage-to-RightSideOfLeftProtrusion</li> <li>X22-RightSideOfPackage-to-LeftSideOfCenterProtrusion</li> <li>X23-RightSideOfPackage-to-CenterlineOfProtrusionGroup</li> <li>X24-RightSideOfPackage-to-RightSideOfCenterProtrusion</li> <li>X25-RightSideOfPackage-to-LeftSideOfRightProtrusion</li> <li>X26-RightSideOfPackage-to-CenterOfRightProtrusion</li> <li>X27-RightSideOfPackage-to-RightSideOfRightProtrusion</li> </ul> </div> </div>
type	<b>ProtrusionToBody-X-OffsetType, JEP30-D10:ValueSetType.</b>

Table 9 – Protrusion to Body Relationship - X - Offset lists out all the various dimensions that can be selected from any major point of the package body to any major point of the Protrusion in X direction.

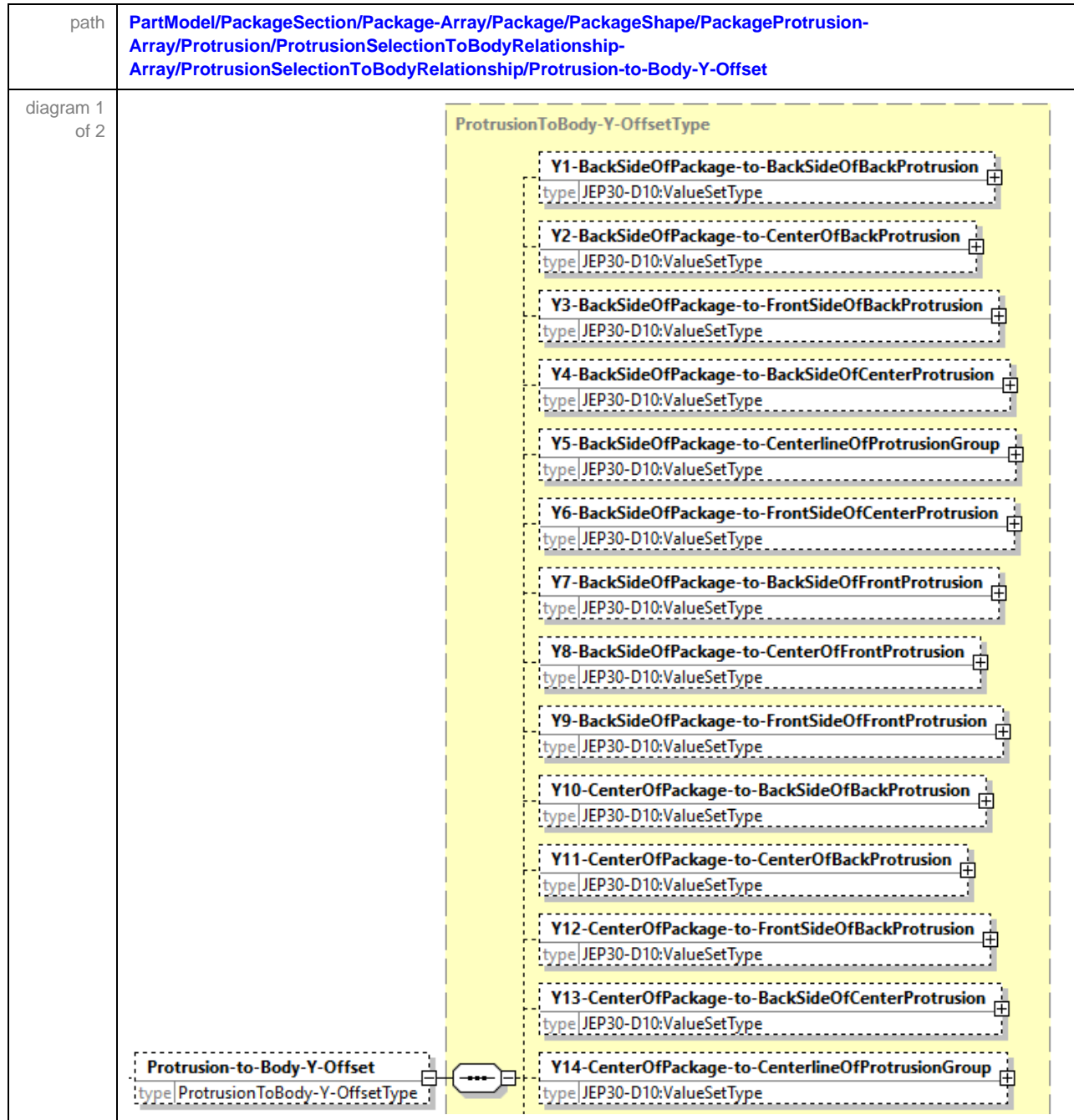
Center of Center Protrusion is the same as Centerline of Protrusion Group, however the use of the “...Centerline of Protrusion Group” is more encompassing since it also includes the centerline of a row or column of an even number of Protrusions, i.e., midway between protrusion 2 and protrusion 3 of 4 protrusions in a row or column.

#### 5.7.6.4.1 Protrusion - to - Body - X - Offset (Cont'd)

**Table 9 – Protrusion to Body Relationship - X - Offset**

Symbol	Description
X1	X1-LeftSideOfPackage-to-LeftSideOfLeftProtrusion
X2	X2-LeftSideOfPackage-to-CenterOfLeftProtrusion
X3	X3-LeftSideOfPackage-to-RightSideOfLeftProtrusion
X4	X4-LeftSideOfPackage-to-LeftSideOfCenterProtrusion
X5	X5-LeftSideOfPackage-to-CenterlineOfProtrusionGroup
X6	X6-LeftSideOfPackage-to-RightSideOfCenterProtrusion
X7	X7-LeftSideOfPackage-to-LeftSideOfRightProtrusion
X8	X8-LeftSideOfPackage-to-CenterOfRightProtrusion
X9	X9-LeftSideOfPackage-to-RightSideOfRightProtrusion
X10	X10-CenterOfPackage-to-LeftSideOfLeftProtrusion
X11	X11-CenterOfPackage-to-CenterOfLeftProtrusion
X12	X12-CenterOfPackage-to-RightSideOfLeftProtrusion
X13	X13-CenterOfPackage-to-LeftSideOfCenterProtrusion
X14	X14-CenterOfPackage-to-CenterlineOfProtrusionGroup
X15	X15-CenterOfPackage-to-RightSideOfCenterProtrusion
X16	X16-CenterOfPackage-to-LeftSideOfRightProtrusion
X17	X17-CenterOfPackage-to-CenterOfRightProtrusion
X18	X18-CenterOfPackage-to-RightSideOfRightProtrusion
X19	X19-RightSideOfPackage-to-LeftSideOfLeftProtrusion
X20	X20-RightSideOfPackage-to-CenterOfLeftProtrusion
X21	X21-RightSideOfPackage-to-RightSideOfLeftProtrusion
X22	X22-RightSideOfPackage-to-LeftSideOfCenterProtrusion
X23	X23-RightSideOfPackage-to-CenterlineOfProtrusionGroup
X24	X24-RightSideOfPackage-to-RightSideOfCenterProtrusion
X25	X25-RightSideOfPackage-to-LeftSideOfRightProtrusion
X26	X26-RightSideOfPackage-to-CenterOfRightProtrusion
X27	X27-RightSideOfPackage-to-RightSideOfRightProtrusion

### 5.7.7.4.2 Protrusion - to- Body - Y - Offset



#### 5.7.6.4.2 Protrusion - to- Body - Y - Offset (Cont'd)

<p>diagram 2 of 2</p>	
<p>type</p>	<p><b>ProtrusionToBody-Y-OffsetType, JEP30-D10:ValueSetType.</b></p>

Table 10 – Protrusion to Body Relationship - Y - Offset lists out all the various dimensions that can be selected from any major point of the package body to any major point of the Protrusion in Y direction.

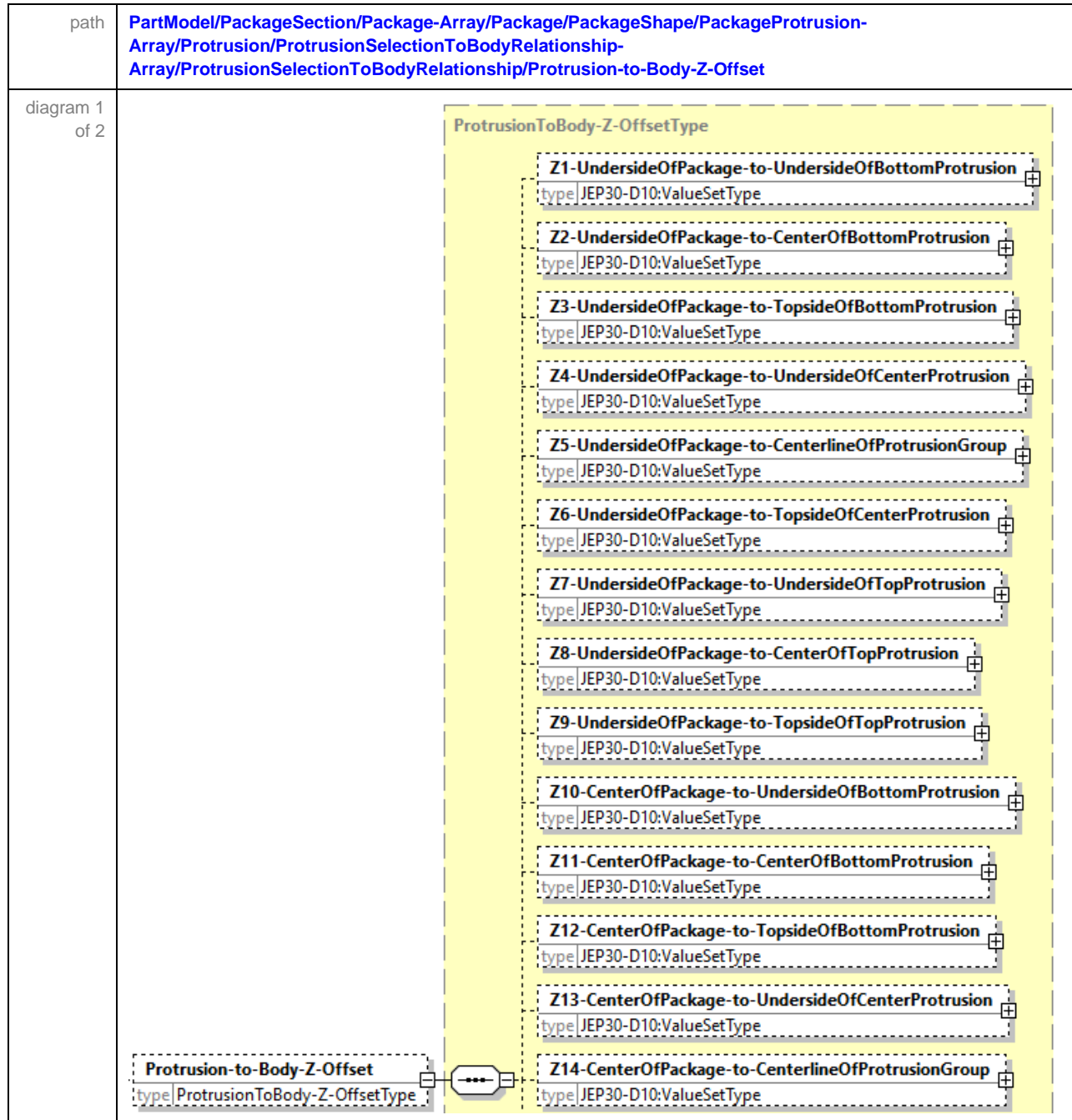


#### 5.7.6.4.2 Protrusion - to- Body - Y - Offset (Cont'd)

**Table 10 – Protrusion to Body Relationship - Y - Offset**

Symbol	Description
Y1	Y1-BackSideOfPackage-to-BackSideOfBackProtrusion
Y2	Y2-BackSideOfPackage-to-CenterOfBackProtrusion
Y3	Y3-BackSideOfPackage-to-FrontSideOfBackProtrusion
Y4	Y4-BackSideOfPackage-to-BackSideOfCenterProtrusion
Y5	Y5-BackSideOfPackage-to-CenterlineOfProtrusionGroup
Y6	Y6-BackSideOfPackage-to-FrontSideOfCenterProtrusion
Y7	Y7-BackSideOfPackage-to-BackSideOfFrontProtrusion
Y8	Y8-BackSideOfPackage-to-CenterOfFrontProtrusion
Y9	Y9-BackSideOfPackage-to-FrontSideOfFrontProtrusion
Y10	Y10-CenterOfPackage-to-BackSideOfBackProtrusion
Y11	Y11-CenterOfPackage-to-CenterOfBackProtrusion
Y12	Y12-CenterOfPackage-to-FrontSideOfBackProtrusion
Y13	Y13-CenterOfPackage-to-BackSideOfCenterProtrusion
Y14	Y14-CenterOfPackage-to-CenterlineOfProtrusionGroup
Y15	Y15-CenterOfPackage-to-FrontSideOfCenterProtrusion
Y16	Y16-CenterOfPackage-to-BackSideOfFrontProtrusion
Y17	Y17-CenterOfPackage-to-CenterOfFrontProtrusion
Y18	Y18-CenterOfPackage-to-FrontSideOfFrontProtrusion
Y19	Y19-FrontSideOfPackage-to-BackSideOfBackProtrusion
Y20	Y20-FrontSideOfPackage-to-CenterOfBackProtrusion
Y21	Y21-FrontSideOfPackage-to-FrontSideOfBackProtrusion
Y22	Y22-FrontSideOfPackage-to-BackSideOfCenterProtrusion
Y23	Y23-FrontSideOfPackage-to-CenterlineOfProtrusionGroup
Y24	Y24-FrontSideOfPackage-to-FrontSideOfCenterProtrusion
Y25	Y25-FrontSideOfPackage-to-BackSideOfFrontProtrusion
Y26	Y26-FrontSideOfPackage-to-CenterOfFrontProtrusion
Y27	Y27-FrontSideOfPackage-to-FrontSideOfFrontProtrusion

### 5.7.7.4.3 Protrusion - to- Body - Z - Offset



### 5.7.6.4.3 Protrusion - to- Body - Z - Offset (Cont'd)

<p>diagram 2 of 2</p>	
<p>type</p>	<p><b>ProtrusionToBody-Y-OffsetType, JEP30-D10:ValueSetType.</b></p>

Table 11 – Protrusion to Body Relationship - X - Offset lists out all the various dimensions that can be selected from any major point of the package body to any major point of the Protrusion in Z direction.

#### 5.7.6.4.3 Protrusion - to- Body - Z - Offset (Cont'd)

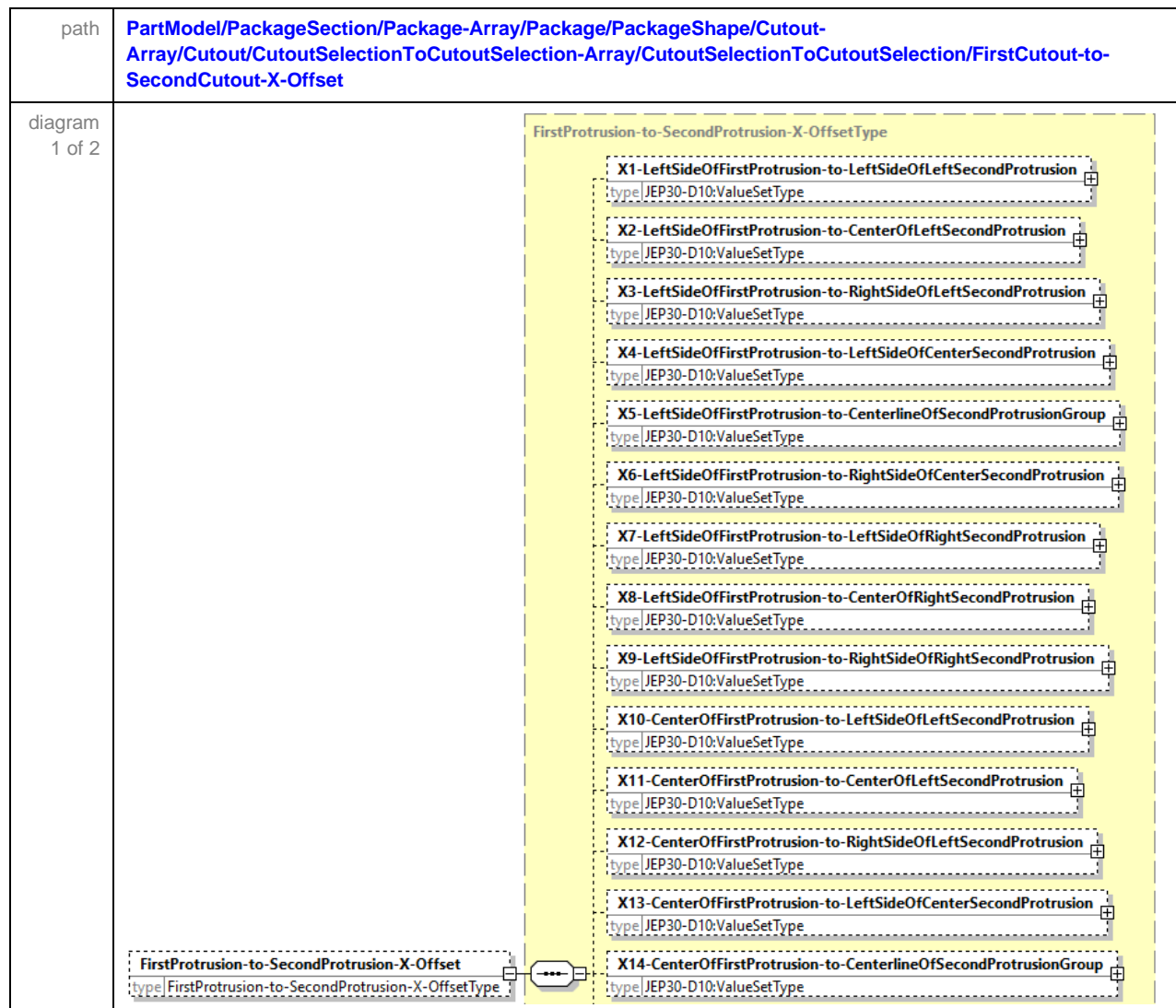
**Table 11 – Protrusion to Body Relationship - X - Offset**

Symbol	Description
Z1	Z1-UndersideOfPackage-to-UndersideOfBottomProtrusion
Z2	Z2-UndersideOfPackage-to-CenterOfBottomProtrusion
Z3	Z3-UndersideOfPackage-to-TopsideOfBottomProtrusion
Z4	Z4-UndersideOfPackage-to-UndersideOfCenterProtrusion
Z5	Z5-UndersideOfPackage-to-CenterlineOfProtrusionGroup
Z6	Z6-UndersideOfPackage-to-TopsideOfCenterProtrusion
Z7	Z7-UndersideOfPackage-to-UndersideOfTopProtrusion
Z8	Z8-UndersideOfPackage-to-CenterOfTopProtrusion
Z9	Z9-UndersideOfPackage-to-TopsideOfTopProtrusion
Z10	Z10-CenterOfPackage-to-UndersideOfBottomProtrusion
Z11	Z11-CenterOfPackage-to-CenterOfBottomProtrusion
Z12	Z12-CenterOfPackage-to-TopsideOfBottomProtrusion
Z13	Z13-CenterOfPackage-to-UndersideOfCenterProtrusion
Z14	Z14-CenterOfPackage-to-CenterlineOfProtrusionGroup
Z15	Z15-CenterOfPackage-to-TopsideOfCenterProtrusion
Z16	Z16-CenterOfPackage-to-UndersideOfTopProtrusion
Z17	Z17-CenterOfPackage-to-CenterOfTopProtrusion
Z18	Z18-CenterOfPackage-to-TopsideOfTopProtrusion
Z19	Z19-TopsideOfPackage-to-UndersideOfBottomProtrusion
Z20	Z20-TopsideOfPackage-to-CenterOfBottomProtrusion
Z21	Z21-TopsideOfPackage-to-TopsideOfBottomProtrusion
Z22	Z22-TopsideOfPackage-to-UndersideOfCenterProtrusion
Z23	Z23-TopsideOfPackage-to-CenterlineOfProtrusionGroup
Z24	Z24-TopsideOfPackage-to-TopsideOfCenterProtrusion
Z25	Z25-TopsideOfPackage-to-UndersideOfTopProtrusion
Z26	Z26-TopsideOfPackage-to-CenterOfTopProtrusion
Z27	Z27-TopsideOfPackage-to-TopsideOfTopProtrusion

### 5.7.7.5 Protrusion Selection To Protrusion Selection - Array

path	<a href="#">PartModel/PackageSection/Package-Array/Package/PackageShape/PackageProtrusion-Array/Protrusion/ProtrusionSelectionToProtrusionSelection-Array</a>
diagram 1 of 2	
diagram 2 of 2	
type	<a href="#">ProtrusionSelectionToProtrusionSelection-ArrayType</a> , <a href="#">ProtrusionSelectionToProtrusionSelectionType</a> , <a href="#">FirstProtrusion-to-SecondProtrusion-X-OffsetType</a> , <a href="#">FirstProtrusion-to-SecondProtrusion-Y-OffsetType</a> , <a href="#">FirstProtrusion-to-SecondProtrusion-Z-OffsetType</a> .

### 5.7.7.5.1 First Protrusion - to - Second Protrusion - X - Offset



#### 5.7.6.4.1 First Protrusion - to - Second Protrusion - X - Offset (Cont'd)

<p>diagram 2 of 2</p>	 <p><b>FirstProtrusion-to-SecondProtrusion-X-Offset</b> type FirstProtrusion-to-SecondProtrusion-X-OffsetType</p> <p><b>X14-CenterOfFirstProtrusion-to-CenterlineOfSecondProtrusionGroup</b> type JEP30-D10:ValueSetType</p> <p><b>X15-CenterOfFirstProtrusion-to-RightSideOfCenterSecondProtrusion</b> type JEP30-D10:ValueSetType</p> <p><b>X16-CenterOfFirstProtrusion-to-LeftSideOfRightSecondProtrusion</b> type JEP30-D10:ValueSetType</p> <p><b>X17-CenterOfFirstProtrusion-to-CenterOfRightSecondProtrusion</b> type JEP30-D10:ValueSetType</p> <p><b>X18-CenterOfFirstProtrusion-to-RightSideOfRightSecondProtrusion</b> type JEP30-D10:ValueSetType</p> <p><b>X19-RightSideOfFirstProtrusion-to-LeftSideOfLeftSecondProtrusion</b> type JEP30-D10:ValueSetType</p> <p><b>X20-RightSideOfFirstProtrusion-to-CenterOfLeftSecondProtrusion</b> type JEP30-D10:ValueSetType</p> <p><b>X21-RightSideOfFirstProtrusion-to-RightSideOfLeftSecondProtrusion</b> type JEP30-D10:ValueSetType</p> <p><b>X22-RightSideOfFirstProtrusion-to-LeftSideOfCenterSecondProtrusion</b> type JEP30-D10:ValueSetType</p> <p><b>X23-RightSideOfFirstProtrusion-to-CenterlineOfSecondProtrusionGroup</b> type JEP30-D10:ValueSetType</p> <p><b>X24-RightSideOfFirstProtrusion-to-RightSideOfCenterSecondProtrusion</b> type JEP30-D10:ValueSetType</p> <p><b>X25-RightSideOfFirstProtrusion-to-LeftSideOfRightSecondProtrusion</b> type JEP30-D10:ValueSetType</p> <p><b>X26-RightSideOfFirstProtrusion-to-CenterOfRightSecondProtrusion</b> type JEP30-D10:ValueSetType</p> <p><b>X27-RightSideOfFirstProtrusion-to-RightSideOfRightSecondProtrusion</b> type JEP30-D10:ValueSetType</p>
<p>type</p>	<p><b>FirstCutout-to-SecondCutout-X-OffsetType, JEP30-D10:ValueSetType.</b></p>

Table 12 – First Protrusion - to - Second Protrusion Relationship - X - Offset lists out all the various dimensions that can be selected from any major point of the first protrusion to any major point of the second protrusion in X direction.

Center of Center Protrusion is the same as Centerline of Protrusion Group, however the use of the “...Centerline of Protrusion Group” is more encompassing since it also includes the centerline of a row or column of an even number of Protrusion, i.e., midway between Protrusion 2 and Protrusion 3 of 4 Protrusion in a row or column.

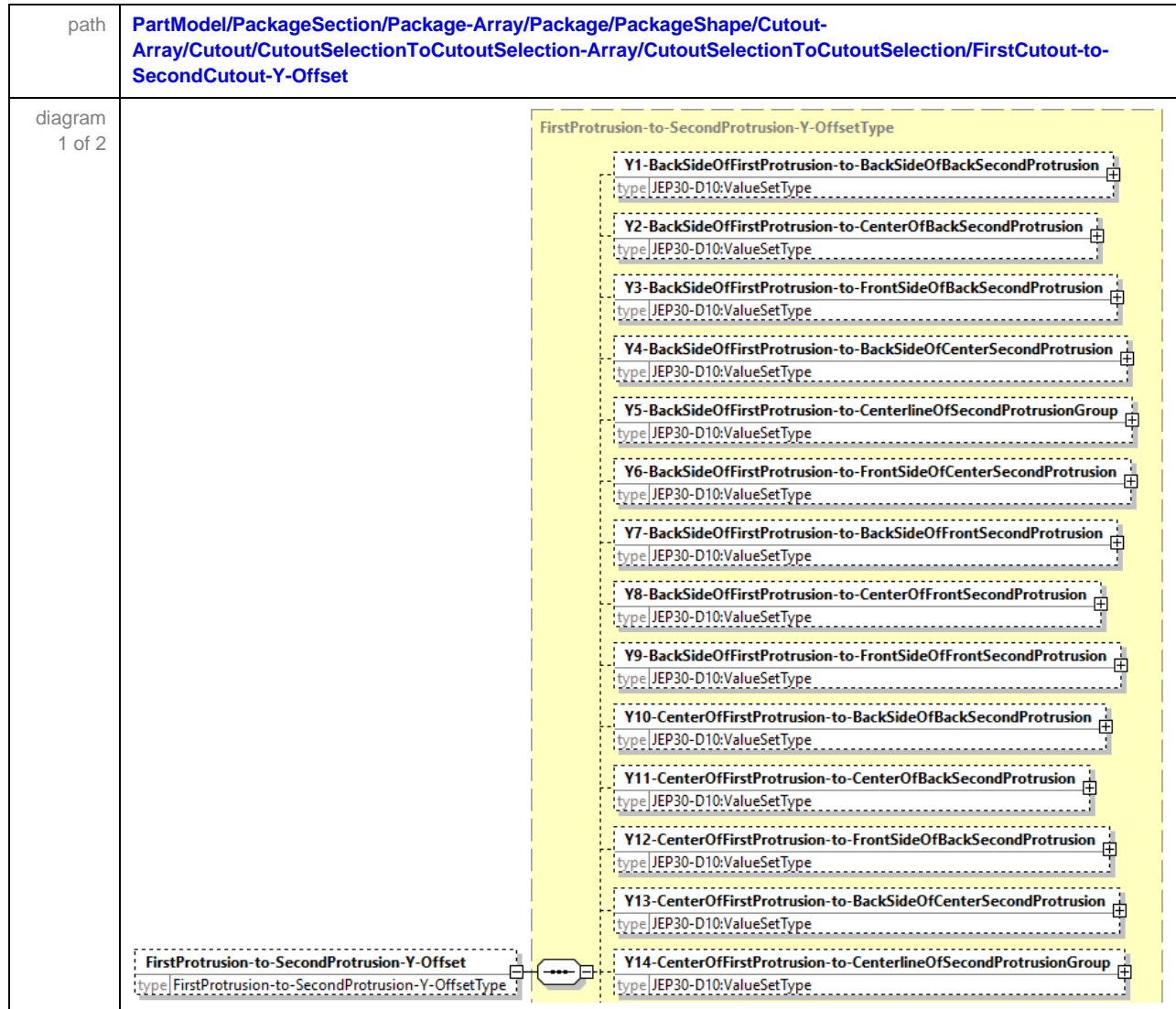
#### 5.7.6.4.1 First Protrusion - to - Second Protrusion - X - Offset (Cont'd)

**Table 12 – First Protrusion - to - Second Protrusion Relationship - X - Offset**

Symbol	Description
X1	X1-LeftSideOfFirstProtrusion-to-LeftSideOfLeftProtrusion
X2	X2-LeftSideOfFirstProtrusion-to-CenterOfLeftProtrusion
X3	X3-LeftSideOfFirstProtrusion-to-RightSideOfLeftProtrusion
X4	X4-LeftSideOfFirstProtrusion-to-LeftSideOfCenterProtrusion
X5	X5-LeftSideOfFirstProtrusion-to-CenterlineOfProtrusionGroup
X6	X6-LeftSideOfFirstProtrusion-to-RightSideOfCenterProtrusion
X7	X7-LeftSideOfFirstProtrusion-to-LeftSideOfRightProtrusion
X8	X8-LeftSideOfFirstProtrusion-to-CenterOfRightProtrusion
X9	X9-LeftSideOfFirstProtrusion-to-RightSideOfRightProtrusion
X10	X10-CenterOfFirstProtrusion-to-LeftSideOfLeftProtrusion
X11	X11-CenterOfFirstProtrusion-to-CenterOfLeftProtrusion
X12	X12-CenterOfFirstProtrusion-to-RightSideOfLeftProtrusion
X13	X13-CenterOfFirstProtrusion-to-LeftSideOfCenterProtrusion
X14	X14-CenterOfFirstProtrusion-to-CenterlineOfProtrusionGroup
X15	X15-CenterOfFirstProtrusion-to-RightSideOfCenterProtrusion
X16	X16-CenterOfFirstProtrusion-to-LeftSideOfRightProtrusion
X17	X17-CenterOfFirstProtrusion-to-CenterOfRightProtrusion
X18	X18-CenterOfFirstProtrusion-to-RightSideOfRightProtrusion
X19	X19-RightSideOfFirstProtrusion-to-LeftSideOfLeftProtrusion
X20	X20-RightSideOfFirstProtrusion-to-CenterOfLeftProtrusion
X21	X21-RightSideOfFirstProtrusion-to-RightSideOfLeftProtrusion
X22	X22-RightSideOfFirstProtrusion-to-LeftSideOfCenterProtrusion
X23	X23-RightSideOfFirstProtrusion-to-CenterlineOfProtrusionGroup
X24	X24-RightSideOfFirstProtrusion-to-RightSideOfCenterProtrusion
X25	X25-RightSideOfFirstProtrusion-to-LeftSideOfRightProtrusion
X26	X26-RightSideOfFirstProtrusion-to-CenterOfRightProtrusion
X27	X27-RightSideOfFirstProtrusion-to-RightSideOfRightProtrusion



### 5.7.7.5.2 First Protrusion - to - Second Protrusion - Y - Offset



#### 5.7.6.4.2 First Protrusion - to - Second Protrusion - Y - Offset (Cont'd)

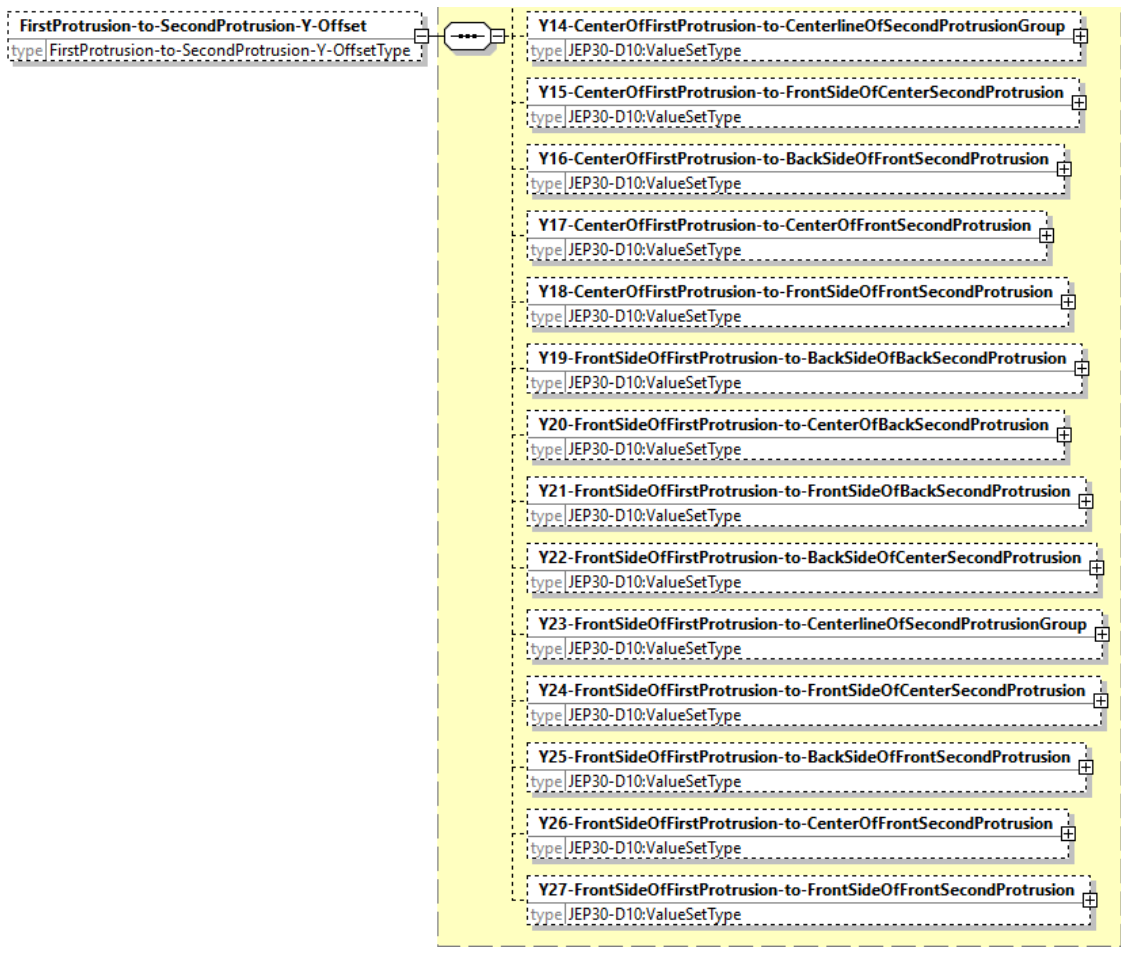
<p>diagram 2 of 2</p>	 <p><b>FirstProtrusion-to-SecondProtrusion-Y-Offset</b> type FirstProtrusion-to-SecondProtrusion-Y-OffsetType</p> <p><b>Y14-CenterOfFirstProtrusion-to-CenterlineOfSecondProtrusionGroup</b> type JEP30-D10:ValueSetType</p> <p><b>Y15-CenterOfFirstProtrusion-to-FrontSideOfCenterSecondProtrusion</b> type JEP30-D10:ValueSetType</p> <p><b>Y16-CenterOfFirstProtrusion-to-BackSideOfFrontSecondProtrusion</b> type JEP30-D10:ValueSetType</p> <p><b>Y17-CenterOfFirstProtrusion-to-CenterOfFrontSecondProtrusion</b> type JEP30-D10:ValueSetType</p> <p><b>Y18-CenterOfFirstProtrusion-to-FrontSideOfFrontSecondProtrusion</b> type JEP30-D10:ValueSetType</p> <p><b>Y19-FrontSideOfFirstProtrusion-to-BackSideOfBackSecondProtrusion</b> type JEP30-D10:ValueSetType</p> <p><b>Y20-FrontSideOfFirstProtrusion-to-CenterOfBackSecondProtrusion</b> type JEP30-D10:ValueSetType</p> <p><b>Y21-FrontSideOfFirstProtrusion-to-FrontSideOfBackSecondProtrusion</b> type JEP30-D10:ValueSetType</p> <p><b>Y22-FrontSideOfFirstProtrusion-to-BackSideOfCenterSecondProtrusion</b> type JEP30-D10:ValueSetType</p> <p><b>Y23-FrontSideOfFirstProtrusion-to-CenterlineOfSecondProtrusionGroup</b> type JEP30-D10:ValueSetType</p> <p><b>Y24-FrontSideOfFirstProtrusion-to-FrontSideOfCenterSecondProtrusion</b> type JEP30-D10:ValueSetType</p> <p><b>Y25-FrontSideOfFirstProtrusion-to-BackSideOfFrontSecondProtrusion</b> type JEP30-D10:ValueSetType</p> <p><b>Y26-FrontSideOfFirstProtrusion-to-CenterOfFrontSecondProtrusion</b> type JEP30-D10:ValueSetType</p> <p><b>Y27-FrontSideOfFirstProtrusion-to-FrontSideOfFrontSecondProtrusion</b> type JEP30-D10:ValueSetType</p>
<p>type</p>	<p><b>CutoutToBody-Y-OffsetType, JEP30-D10:ValueSetType.</b></p>

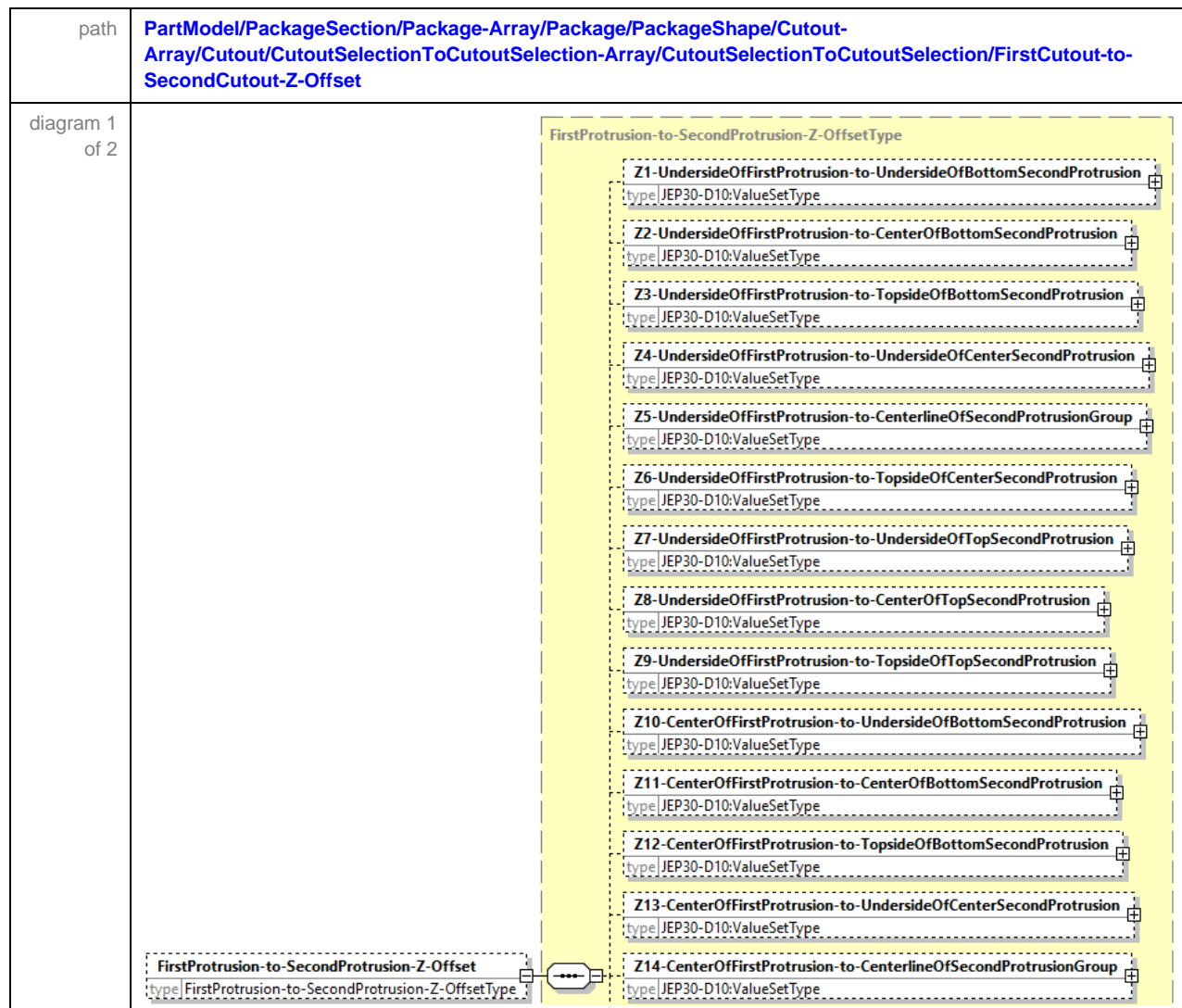
Table 13 – First Protrusion - to - Second Protrusion Relationship - Y - Offset lists out all the various dimensions that can be selected from any major point of the first protrusion to any major point of the second protrusion in Y direction.

#### 5.7.6.4.2 First Protrusion - to - Second Protrusion - Y - Offset (Cont'd)

**Table 13 – First Protrusion - to - Second Protrusion Relationship - Y - Offset**

Symbol	Description
Y1	Y1-BackSideOfFirstProtrusion-to-BackSideOfBackProtrusion
Y2	Y2-BackSideOfFirstProtrusion-to-CenterOfBackProtrusion
Y3	Y3-BackSideOfFirstProtrusion-to-FrontSideOfBackProtrusion
Y4	Y4-BackSideOfFirstProtrusion-to-BackSideOfCenterProtrusion
Y5	Y5-BackSideOfFirstProtrusion-to-CenterlineOfProtrusionGroup
Y6	Y6-BackSideOfFirstProtrusion-to-FrontSideOfCenterProtrusion
Y7	Y7-BackSideOfFirstProtrusion-to-BackSideOfFrontProtrusion
Y8	Y8-BackSideOfFirstProtrusion-to-CenterOfFrontProtrusion
Y9	Y9-BackSideOfFirstProtrusion-to-FrontSideOfFrontProtrusion
Y10	Y10-CenterOfFirstProtrusion-to-BackSideOfBackProtrusion
Y11	Y11-CenterOfFirstProtrusion-to-CenterOfBackProtrusion
Y12	Y12-CenterOfFirstProtrusion-to-FrontSideOfBackProtrusion
Y13	Y13-CenterOfFirstProtrusion-to-BackSideOfCenterProtrusion
Y14	Y14-CenterOfFirstProtrusion-to-CenterlineOfProtrusionGroup
Y15	Y15-CenterOfFirstProtrusion-to-FrontSideOfCenterProtrusion
Y16	Y16-CenterOfFirstProtrusion-to-BackSideOfFrontProtrusion
Y17	Y17-CenterOfFirstProtrusion-to-CenterOfFrontProtrusion
Y18	Y18-CenterOfFirstProtrusion-to-FrontSideOfFrontProtrusion
Y19	Y19-FrontSideOfFirstProtrusion-to-BackSideOfBackProtrusion
Y20	Y20-FrontSideOfFirstProtrusion-to-CenterOfBackProtrusion
Y21	Y21-FrontSideOfFirstProtrusion-to-FrontSideOfBackProtrusion
Y22	Y22-FrontSideOfFirstProtrusion-to-BackSideOfCenterProtrusion
Y23	Y23-FrontSideOfFirstProtrusion-to-CenterlineOfProtrusionGroup
Y24	Y24-FrontSideOfFirstProtrusion-to-FrontSideOfCenterProtrusion
Y25	Y25-FrontSideOfFirstProtrusion-to-BackSideOfFrontProtrusion
Y26	Y26-FrontSideOfFirstProtrusion-to-CenterOfFrontProtrusion
Y27	Y27-FrontSideOfFirstProtrusion-to-FrontSideOfFrontProtrusion

### 5.7.7.5.3 First Protrusion - to - Second Protrusion - Z - Offset



### 5.7.6.4.3 First Protrusion - to - Second Protrusion - Z - Offset (Cont'd)

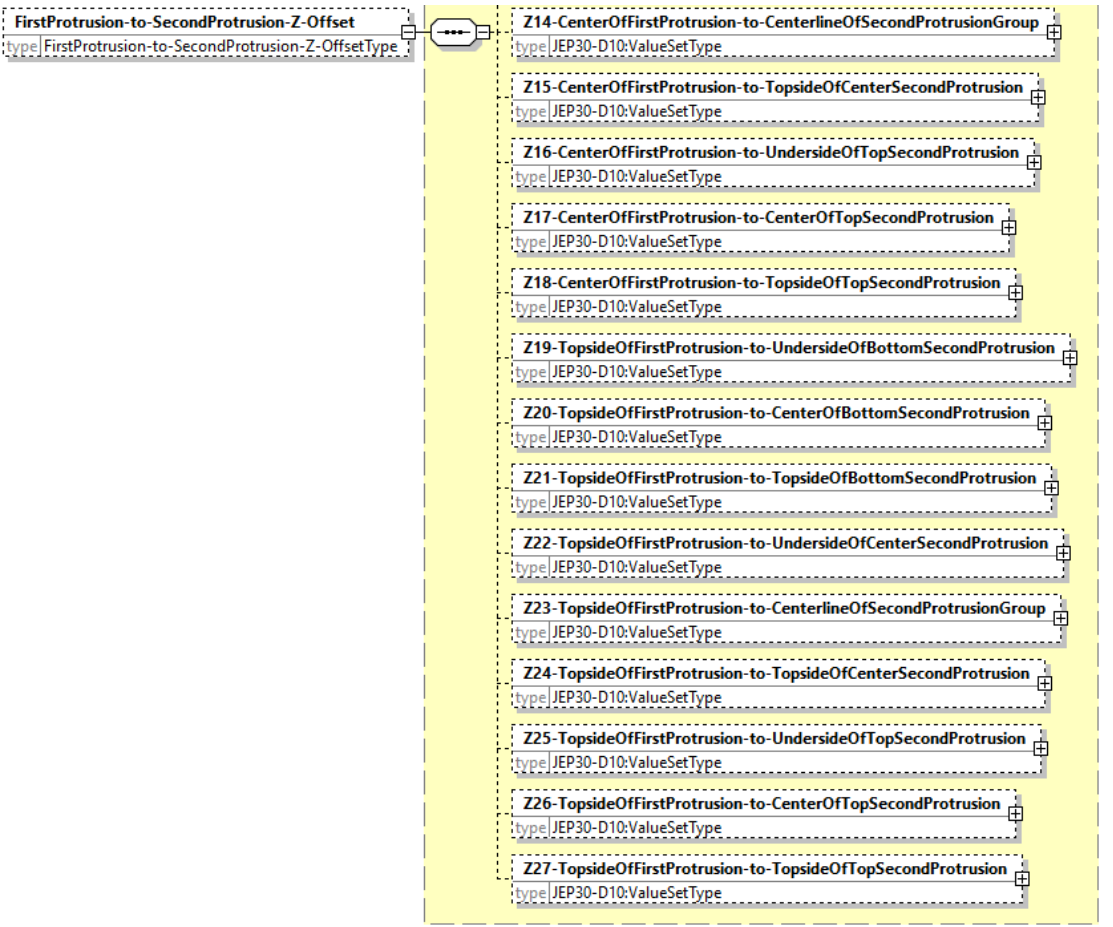
<p>diagram 2 of 2</p>	
<p>type</p>	<p>CutoutToBody-Y-OffsetType, JEP30-D10:ValueSetType.</p>

Table 14 – First Protrusion - to - Second Protrusion Relationship - X - Offset lists out all the various dimensions that can be selected from any major point of the first protrusion to any major point of the second protrusion in Z direction.

#### 5.7.6.4.3 First Protrusion - to - Second Protrusion - Z - Offset (Cont'd)

**Table 14 – First Protrusion - to - Second Protrusion Relationship - Z - Offset**

Symbol	Description
Z1	Z1-UndersideOfFirstProtrusion-to-UndersideOfBottomProtrusion
Z2	Z2-UndersideOfFirstProtrusion-to-CenterOfBottomProtrusion
Z3	Z3-UndersideOfFirstProtrusion-to-TopsideOfBottomProtrusion
Z4	Z4-UndersideOfFirstProtrusion-to-UndersideOfCenterProtrusion
Z5	Z5-UndersideOfFirstProtrusion-to-CenterlineOfProtrusionGroup
Z6	Z6-UndersideOfFirstProtrusion-to-TopsideOfCenterProtrusion
Z7	Z7-UndersideOfFirstProtrusion-to-UndersideOfTopProtrusion
Z8	Z8-UndersideOfFirstProtrusion-to-CenterOfTopProtrusion
Z9	Z9-UndersideOfFirstProtrusion-to-TopsideOfTopProtrusion
Z10	Z10-CenterOfFirstProtrusion-to-UndersideOfBottomProtrusion
Z11	Z11-CenterOfFirstProtrusion-to-CenterOfBottomProtrusion
Z12	Z12-CenterOfFirstProtrusion-to-TopsideOfBottomProtrusion
Z13	Z13-CenterOfFirstProtrusion-to-UndersideOfCenterProtrusion
Z14	Z14-CenterOfFirstProtrusion-to-CenterlineOfProtrusionGroup
Z15	Z15-CenterOfFirstProtrusion-to-TopsideOfCenterProtrusion
Z16	Z16-CenterOfFirstProtrusion-to-UndersideOfTopProtrusion
Z17	Z17-CenterOfFirstProtrusion-to-CenterOfTopProtrusion
Z18	Z18-CenterOfFirstProtrusion-to-TopsideOfTopProtrusion
Z19	Z19-TopsideOfFirstProtrusion-to-UndersideOfBottomProtrusion
Z20	Z20-TopsideOfFirstProtrusion-to-CenterOfBottomProtrusion
Z21	Z21-TopsideOfFirstProtrusion-to-TopsideOfBottomProtrusion
Z22	Z22-TopsideOfFirstProtrusion-to-UndersideOfCenterProtrusion
Z23	Z23-TopsideOfFirstProtrusion-to-CenterlineOfProtrusionGroup
Z24	Z24-TopsideOfFirstProtrusion-to-TopsideOfCenterProtrusion
Z25	Z25-TopsideOfFirstProtrusion-to-UndersideOfTopProtrusion
Z26	Z26-TopsideOfFirstProtrusion-to-CenterOfTopProtrusion
Z27	Z27-TopsideOfFirstProtrusion-to-TopsideOfTopProtrusion

5.8 Part Height

path	PartModel/PackageSection/Package-Array/Package/PartHeight
diagram	
type	JEP30-D10:ValueSetType, StandardType, ToleranceUOMType, m.math.type.
group	ValueSetGroup.

*PartHeight* represents the total height of the part from the seating plane – therefore the sum of the *PackageBodyHeight* plus the *Standoff* (as defined in section 4.13 below) is normally equal to the part height. The exception is when you also have terminals exiting from the “Topside” (as defined by *PartAccessDirection*) of the part, whereby *PartHeight* is then defined as the distance from the seating plane to the top of the terminal that exits from the topside of the part.

The Value Set Type is widely used throughout the Schema. It provides for all the following combinations in a structured way:

- 1) Nominal,
- 2) Positive and Negative Tolerances, or Total tolerance based on the same UOM or based on a percentage of the nominal value, and
- 3) Minimum and or Maximum.

For many applications, both the minimum and maximum Part Height details are required.

## 5.9 Clearance Region - Array

path	PartModel/PackageSection/Package-Array/Package/ClearanceRegion-Array.
diagram	<pre> classDiagram     class ClearanceRegionArrayType {         StandOff JEP30-D10:UnspecifiedDimensionalValueSetType         ClearanceRegion ClearanceRegionType     }     class ClearanceRegionType {         Rectangle RectangleType         Circle CircleType         Contour ContourShapeType         ShapeCenter JEP30-D10:PointXYType         Clearance JEP30-D10:UnspecifiedValueSetType     }     ClearanceRegionArrayType "1" -- "0..1" ClearanceRegionType     ClearanceRegionType "1" -- "0..1" RectangleType     ClearanceRegionType "1" -- "0..1" CircleType     ClearanceRegionType "1" -- "0..1" ContourShapeType     ClearanceRegionType "1" -- "0..1" ShapeCenter     ClearanceRegionType "1" -- "0..1" Clearance     </pre>
type	ClearanceRegionArrayType, JEP30-D10:UnspecifiedValueSetType, StandardType, MinMaxLimitsType, ClearanceRegionType, RectangleType, CircleType, ContourShapeType, JEP30-D10:PointType.

*ClearanceRegion-Array* represents the space available underneath the part after mounting to the printed board. This space if large enough can allow other parts to be placed in the product design underneath this part. The space also determines the rules applied to the solder fillet for any terminal whose land pattern may encroach inside the package body outline. If there is insufficient space around the terminals in this area, changes to the land pattern may be necessary.

If there is a simple clearance as for example typically found under an SOIC, then the clearance value can be captured under the element *Standoff*. However, many parts have different *ClearanceRegions* under the part. These *ClearanceRegions* can have different shapes, the most common being *Rectangle* or *Circle* shapes, but additional shapes can be captured via the *Contour* element.

NOTE The element *Unspecified* under the *ClearanceRegion-Array/Standoff*. The purpose of this flag is to enable the user to specify that a Clearance does exist even though its value is not specified, and that the clearance is adequate to provide for a Heel, Toe, Side or Periphery fillet of solder around the Terminal Contact Area without the solder touching the package body, where this could lead to manufacturing defects such as solder balls.

The *Unspecified* element under *ClearanceRegion-Array/ClearanceRegion/Clearance* is used when there are some *ClearanceRegions* shapes that do not have a *Clearance* specified, but the *ClearanceRegion* shape is defined.

This document recommends that the clearance value is properly specified, and that the *Unspecified* field is not used.

The definition of each shape is outlined in Annex A (informative) Shape Dimensions.



5.10 Assembly Technology - Array

path	PartModel/PackageSection/Package-Array/Package/AssemblyTechnology-Array.
diagram 1 of 2	<p>JEP30-D10:AssemblyTechnology-ArrayType</p> <p>AssemblyTechnology-Array type JEP30-D10:AssemblyTechnology-ArrayType</p> <p>AssemblyTechnology type AssemblyTechnologyType</p> <p>1..∞</p> <p>constraints</p>
diagram 2 of 2	<p>AssemblyTechnologyType</p> <p>AssemblyTechnology type AssemblyTechnologyType 1..∞</p> <p>ID type xs:string</p> <p>SMT-MaskReflow type EmptyType</p> <p>Paste-in-Hole type EmptyType</p> <p>WaveSoldering type EmptyType</p> <p>SelectiveMini-WaveSoldering type EmptyType</p> <p>LaserSoldering type EmptyType</p> <p>ManualSoldering type EmptyType</p> <p>Pressfit type EmptyType</p> <p>WireBonding type WireBondingType</p> <p>WireBondingType</p> <p>Chip-on-Board type EmptyType</p> <p>Chip-on-Glass type EmptyType</p> <p>Other type xs:string</p> <p>Copper-to-CopperHybridBonding type EmptyType</p> <p>ThermoCompressionBonding type EmptyType</p> <p>Other type xs:string</p> <p>DocumentID type xs:string</p>
type	JEP30-D10:AssemblyTechnology-ArrayType, AssemblyTechnologyType, EmptyType, WireBondingType.

## 5.11 Linear Expansion Coefficient - Array

path	PartModel/PackageSection/Package-Array/Package/LinearExpansionCoefficient-Array		
diagram			
type	JEP30-D10:LinearExpansionCoefficient-ArrayType, LinearExpansionCoefficientType, TemperatureConditionType, LinearExpansionCoefficientValuesType, RuleVsDirectional-xy-and-z-RuleType, LinearExpansionCoefficientGraphType.		
group	ParameterIdentityGroup,		

5.11.1 Temperature Condition

path	PartModel/PackageSection/Package-Array/Package/LinearExpansionCoefficient-Array/LinearExpansionCoefficient/TemperatureCondition
diagram	<p>The diagram illustrates the XSD structure for TemperatureConditionType and ValueSetType. TemperatureConditionType is a complex type containing several elements: Name (xs:string), StandardsAuthorityBodyID (xs:string), Property-ID (xs:string), LaTeX-Symbol (xs:string), MathML-Symbol (math:type), SymbolDescription (xs:string), Definition (xs:string), and FootnoteID (xs:string, 0..∞). ValueSetType is a complex type containing: Nominal (xs:decimal), NegativeTolerance (xs:decimal), PositiveTolerance (xs:decimal), TotalTolerance (xs:decimal), ToleranceUOM (ToleranceUOMType), Minimum (xs:decimal), Maximum (xs:decimal), and FootnoteID (xs:string, 0..∞). A TemperatureCondition element is shown with a TemperatureConditionType type and a ValueSetType type.</p>
type	TemperatureConditionType, ValueSetType, Temperature-in-Celsius-or-KelvinUOMType.
group	ParameterIdentityGroup, ValueSetGroup.

The enumerated value for *TemperatureUOM* is °C and K but it is set to °C as default.

5.11.2 Values

path	PartModel/PackageSection/Package-Array/Package/LinearExpansionCoefficient-Array/LinearExpansionCoefficient/Values
diagram	<p>The diagram illustrates the structure of the <code>LinearExpansionCoefficientValuesType</code>. It shows a <code>Values</code> class (type <code>LinearExpansionCoefficientValuesType</code>) connected to a <code>ValueVsDirectional-xy-and-z-ValueGroup</code> class (type <code>ValueVsDirectional-xy-and-z-ValueGroup</code>). This group is further divided into three sub-groups: <code>Value</code> (type <code>ValueSetType</code>), <code>xy-Value</code> (type <code>ValueSetType</code>), and <code>z-Value</code> (type <code>ValueSetType</code>). Each of these sub-groups is associated with a <code>TestMethod</code> (type <code>xs:string</code>). Additionally, there is a <code>LinearExpansionCoefficientUOM</code> class (type <code>LinearExpansionCoefficientUOMType</code>) with a default value of <math>^{\circ}\text{C}^{-1}</math>.</p>
type	LinearExpansionCoefficientValuesType, ValueSetType, LinearExpansionCoefficientUOMType.
group	ValueVsDirectional-xy-and-z-ValueGroup.

The enumerated value for *LinearExpansionCoefficientUOM* is  $^{\circ}\text{C}^{-1}$  and  $\text{K}^{-1}$  but it is set to  $^{\circ}\text{C}^{-1}$  as default.

### 5.11.3 Rule Vs Directional – xy – and – z - Rule

[illegible]

#### 5.11.4 Linear Expansion Coefficient - Graph

path	PartModel/PackageSection/Package-Array/Package/LinearExpansionCoefficient-Array/LinearExpansionCoefficientGraph
diagram	
type	LinearExpansionCoefficientGraphType, TemperatureParametricGraphChartX-AxisType, Temperature-in-Celsius-or-KelvinUOMType, GraphChartX-AxisFormattingType, LinearExpansionCoefficientParametricGraphChartY-AxisType, LinearExpansionCoefficientUOMType, GraphChartY-AxisFormattingType, LinearExpansionCoefficientParameterGraphData-ArrayType, GraphFormulaType, GraphFormattingType.
group	AxisParameterIdentityGroup,

A *ParameterGraph* has 2 axis that are defined by the *TestConditionType* (The X-axis definition), and the *ParameterType* (The Y-axis definition). Each axis is labelled by the *AxisTitle*. When possible, the *Symbol* which represents the *AxisTitle* should be added to the PartModel file and should represent a standards-based symbol as defined in the appropriate Terms and Definitions standards. If appropriate, a more detailed *Description* can be used to describe the definition of the *AxisTitle*. Each axis will also have a pre-defined set of *Units* but can be optionally excluded for those axis' which are unitless.

Note that the *ParameterDefinition* is unbounded whereas the *TestConditionDefinition* is bounded to a single instance. This is to cater for those graphs in which there are 2 or more y-axis, each with their own definition.

The graph can either be captured under the *Data-Array* or represented via a *GraphFormula* (A string representing the equation of the *ParameterDefinition* relationship to the *TestConditionDefinition*).

5.11.4.1     **Formatting**

The Formatting is an optional set of data that enables the user to re-create the graph for visualization purposes. Formatting applies to the following

path	PartModel/PackageSection/Package-Array/Package/LinearExpansionCoefficient-Array/LinearExpansionCoefficientGraph/TestConditionDefinition/Formatting
diagram	
type	JEP30-D10:GraphChartXAxisFormattingType, GraphAxisRangeType, EmptyType, GraphAxisScaleType, GraphAxisScaleLinearType, GraphAxisScaleLogarithmicType, GraphChartXAxisPositionType.

### 5.11.1.1 Formatting (cont'd)

path	<a href="#">PartModel/PackageSection/Package-Array/Package/LinearExpansionCoefficient-Array/LinearExpansionCoefficientGraph/ParameterDefinition/Formatting</a>
diagram	
type	<a href="#">JEP30-D10:GraphChartYAxisFormattingType</a> , <a href="#">GraphAxisRangeType</a> , <a href="#">EmptyType</a> , <a href="#">GraphAxisScaleType</a> , <a href="#">GraphAxisScaleLinearType</a> , <a href="#">GraphAxisScaleLogarithmicType</a> , <a href="#">GraphChartYAxisPositionType</a> .

The axis range which is usually defined from minimum to maximum can be inverted to show a graph going from maximum to minimum. The scale can be defined in either a linear step amount, a natural logarithm, or a logarithm of the specified base. The [Base](#) log is set to a default of [Base 10](#) but can be defined to any base number.

The *Position* enumerated list for the [GraphChartXAxisPositionType](#) is

- Top
- Bottom

And for the [GraphChartYAxisPositionType](#), the enumerated values are

- Left
- Right



5.11.1.1      **Formatting (cont'd)**

path	PartModel/PackageSection/Package-Array/Package/LinearExpansionCoefficient-Array/LinearExpansionCoefficientGraph/Formatting
diagram	
type	JEP30-D10:GraphChartYAxisFormattingType, GraphAxisRangeType, EmptyType, GraphAxisScaleType, GraphAxisScaleLinearType, GraphAxisScaleLogarithmicType, GraphChartYAxisPositionType.

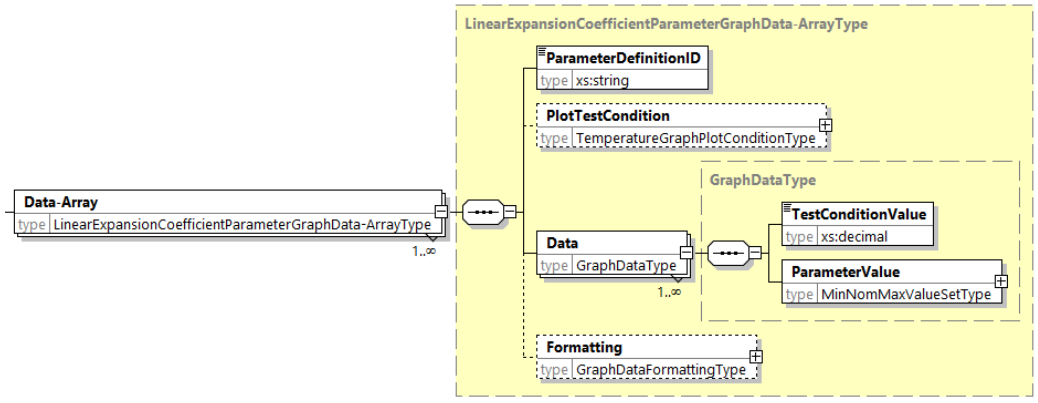
The body of the graph can be formatted under the *GraphFormattingType*. The *DisplayType* enumerated list is

- Line
- Bar

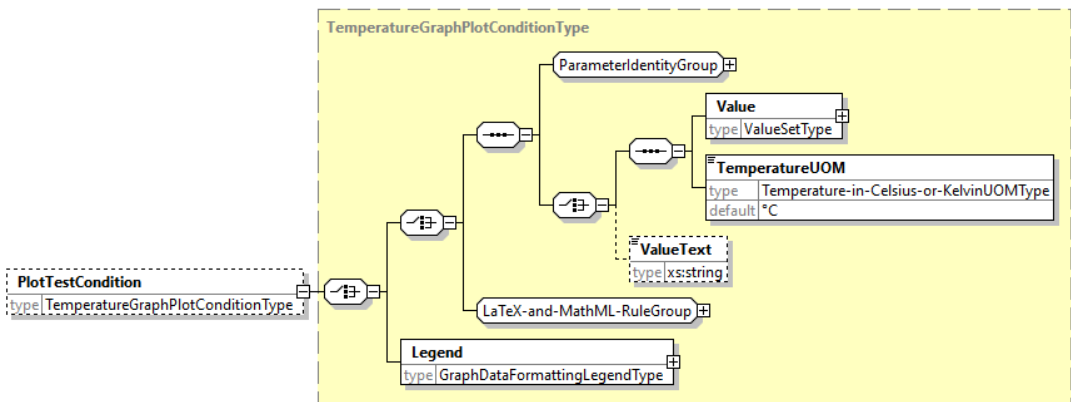
The graph Legend can also be positioned around the graph in any of the following locations:

- Location
  - Inside Graph,
  - Outside Graph,
- Vertical Position
  - Top,
  - Center,
  - Bottom,
- Horizontal Position
  - Left,
  - Center,
  - Right.

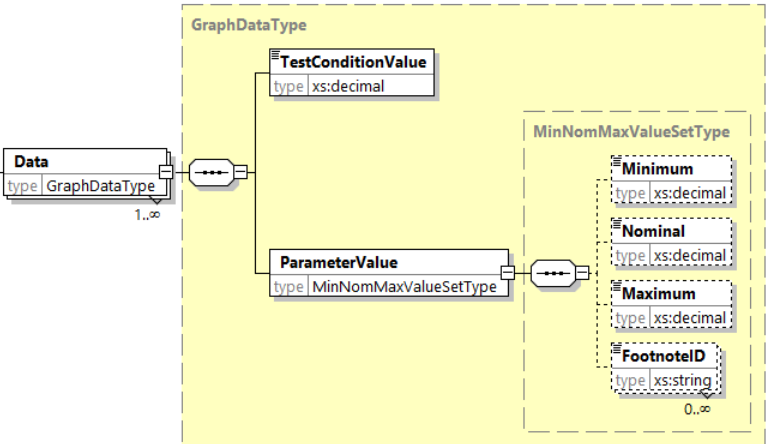
### 5.11.5 Data - Array

path	<b>PartModel/PackageSection/Package-Array/Package/LinearExpansionCoefficient-Array/LinearExpansionCoefficientGraph/Data-Array</b>
diagram	 <p>The diagram illustrates the structure of the <b>LinearExpansionCoefficientParameterGraphData-ArrayType</b>. It is a container type that includes the following elements:</p> <ul style="list-style-type: none"> <li><b>ParameterDefinitionID</b> (type: xs:string)</li> <li><b>PlotTestCondition</b> (type: TemperatureGraphPlotConditionType)</li> <li><b>Data</b> (type: GraphDataType, 1..∞)</li> <li><b>TestConditionValue</b> (type: xs:decimal)</li> <li><b>ParameterValue</b> (type: MinNomMaxValueSetType)</li> <li><b>Formatting</b> (type: GraphDataFormattingType)</li> </ul> <p>The <b>Data</b> element is further detailed as <b>GraphDataType</b>, which contains:</p> <ul style="list-style-type: none"> <li><b>TestConditionValue</b> (type: xs:decimal)</li> <li><b>ParameterValue</b> (type: MinNomMaxValueSetType)</li> </ul>
type	<b>LinearExpansionCoefficientParameterGraphData-ArrayType</b> , <b>TemperatureGraphPlotConditionType</b> , <b>GraphDataType</b> , <b>MinNomMaxValueSetType</b> , <b>GraphDataFormattingType</b> , <b>GraphDataFormattingPointType</b> , <b>GraphDataFormattingColorType</b> , <b>GraphDataFormattingPointStyleType</b> , <b>GraphDataFormattingLineType</b> , <b>GraphDataFormattingLineStyleType</b>

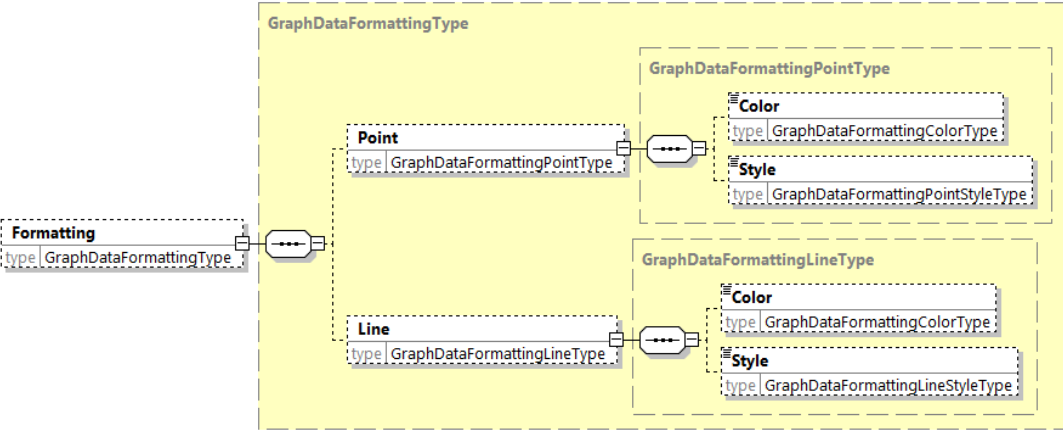
#### 5.11.5.1 Plot Test Condition

path	<b>PartModel/PackageSection/Package-Array/Package/LinearExpansionCoefficient-Array/LinearExpansionCoefficientGraph/Data-Array/PlotTestCondition</b>
diagram	 <p>The diagram illustrates the structure of the <b>TemperatureGraphPlotConditionType</b>. It is a container type that includes the following elements:</p> <ul style="list-style-type: none"> <li><b>ParameterIdentityGroup</b></li> <li><b>Value</b> (type: ValueSetType)</li> <li><b>TemperatureUOM</b> (type: Temperature-in-Celsius-or-KelvinUOMType, default: °C)</li> <li><b>ValueText</b> (type: xs:string)</li> <li><b>Legend</b> (type: GraphDataFormattingLegendType)</li> </ul> <p>The <b>Value</b> element is further detailed as <b>ValueSetType</b>, which contains:</p> <ul style="list-style-type: none"> <li><b>TemperatureUOM</b> (type: Temperature-in-Celsius-or-KelvinUOMType, default: °C)</li> </ul>
type	<b>TemperatureGraphPlotConditionType</b> , <b>ValueSetType</b> , <b>Temperature-in-Celsius-or-KelvinUOMType</b> , <b>GraphDataFormattingLegendType</b> .
group	<b>ParameterIdentityGroup</b> , <b>LaTeX-and-MathML-RuleGroup</b> .

5.11.5.2 Data

path	PartModel/PackageSection/Package-Array/Package/LinearExpansionCoefficient-Array/LinearExpansionCoefficientGraph/Data-Array/Data
diagram	 <p>The diagram illustrates the structure of the <b>GraphDataType</b>. It is a container type that holds an array of <b>Data</b> elements (type <b>GraphDataType</b>, cardinality 1..∞). Each <b>Data</b> element is further structured into two main components: <b>TestConditionValue</b> (type <b>xs:decimal</b>) and <b>ParameterValue</b> (type <b>MinNomMaxValueSetType</b>). The <b>MinNomMaxValueSetType</b> is a complex type containing four sub-elements: <b>Minimum</b> (type <b>xs:decimal</b>), <b>Nominal</b> (type <b>xs:decimal</b>), <b>Maximum</b> (type <b>xs:decimal</b>), and <b>FootnotelD</b> (type <b>xs:string</b>, cardinality 0..∞).</p>
type	GraphDataType, MinNomMaxValueSetType.

5.11.5.3 Formatting

path	PartModel/PackageSection/Package-Array/Package/LinearExpansionCoefficient-Array/LinearExpansionCoefficientGraph/Data-Array/Formatting
diagram	 <p>The diagram illustrates the structure of the <b>GraphDataFormattingType</b>. It is a container type that holds an array of <b>Formatting</b> elements (type <b>GraphDataFormattingType</b>). Each <b>Formatting</b> element is further structured into two main components: <b>Point</b> (type <b>GraphDataFormattingPointType</b>) and <b>Line</b> (type <b>GraphDataFormattingLineType</b>). The <b>GraphDataFormattingPointType</b> contains <b>Color</b> (type <b>GraphDataFormattingColorType</b>) and <b>Style</b> (type <b>GraphDataFormattingPointStyleType</b>). The <b>GraphDataFormattingLineType</b> contains <b>Color</b> (type <b>GraphDataFormattingColorType</b>) and <b>Style</b> (type <b>GraphDataFormattingLineStyleType</b>).</p>
type	GraphDataFormattingType, GraphDataFormattingPointType, GraphDataFormattingLineType, GraphDataFormattingColorType, GraphDataFormattingPointStyleType, GraphDataFormattingLineStyleType.

The *Color* enumerated list for the *GraphDataFormattingColorType* is

Red,

Green,

Blue,

Orange,

Brown,

Pink,

Purple,

Yellow,

Black.

5.11.5.3      **Formatting (cont'd)**

The *Style* enumerated list for the *GraphDataFormattingPointStyleType* is  
*Circle*,                      *Square*,                      *Triangle*,                      *None*.

The *Color* enumerated list for the *GraphDataFormattingLineStyleType* is  
*Solid*,                      *Dash*,                      *Dot*,                      *Dash-Dot*,  
*Dash-dash-dot*,                      *None*.

5.11.6      **Graph Formula**

path	PartModel/PackageSection/Package-Array/Package/LinearExpansionCoefficient-Array/LinearExpansionCoefficientGraph/GraphFormula
diagram	
type	GraphFormulaType, MinNomMaxRuleContextType, m:math.type
group	LaTeX-and-MathML-RuleGroup.

### 5.12 Cubic Expansion Coefficient - Array

path	PartModel/PackageSection/Package-Array/Package/CubicExpansionCoefficient-Array
diagram	
type	JEP30-D10:CubicExpansionCoefficient-ArrayType, CubicExpansionCoefficientType, TemperatureConditionType, CubicExpansionCoefficientValuesType, RuleVsDirectional-xy-and-z-RuleType, CubicExpansionCoefficientGraphType.
group	ParameterIdentityGroup,

5.12.1 Values

path	PartModel/PackageSection/Package-Array/Package/CubicExpansionCoefficient-Array/CubicExpansionCoefficient/Values
diagram	<p>The diagram illustrates the structure of the <code>CubicExpansionCoefficientValuesType</code>. It features a <code>Values</code> element (type <code>CubicExpansionCoefficientValuesType</code>) which contains a <code>ValueVsDirectional-xy-and-z-ValueGroup</code>. This group contains three elements: <code>Value</code>, <code>xy-Value</code>, and <code>z-Value</code>, each of type <code>ValueSetType</code>. Each <code>ValueSetType</code> contains a <code>TestMethod</code> element (type <code>xs:string</code>). Additionally, there is a <code>CubicExpansionCoefficientUOM</code> element (type <code>CubicExpansionCoefficientUOMType</code>) with a default value of <math>^{\circ}\text{C}^{-1}</math>.</p>
type	CubicExpansionCoefficientValuesType, ValueSetType, CubicExpansionCoefficientUOMType.
group	ValueVsDirectional-xy-and-z-ValueGroup.

The enumerated value for `CubicExpansionCoefficientUOM` is  $^{\circ}\text{C}^{-1}$  and  $\text{K}^{-1}$  but it is set to  $^{\circ}\text{C}^{-1}$  as default.

### 5.12.2 Cubic Expansion Coefficient - Graph

path	PartModel/PackageSection/Package-Array/Package/CubicExpansionCoefficient-Array/CubicExpansionCoefficientGraph
diagram	
type	CubicExpansionCoefficientGraphType, TemperatureParametricGraphChartX-AxisType, CubicExpansionCoefficientParametricGraphChartY-AxisType, CubicExpansionCoefficientUOMType, GraphChartY-AxisFormattingType, CubicExpansionCoefficientParameterGraphData-ArrayType, GraphFormulaType, GraphFormattingType.
group	AxisParameterIdentityGroup,

### 5.12.3 Data - Array

path	PartModel/PackageSection/Package-Array/Package/CubicExpansionCoefficient-Array/CubicExpansionCoefficientGraph/Data-Array
diagram	
type	CubicExpansionCoefficientParameterGraphData-ArrayType, TemperatureGraphPlotConditionType, GraphDataType, GraphDataFormattingType.

5.13 Elastic Modulus - Array

path	PartModel/PackageSection/Package-Array/Package/ElasticModulus-Array.
diagram	
type	JEP30-D10:ElasticModulus-ArrayType, ElasticModulusType, TemperatureConditionType, ElasticModulusValuesType, ElasticModulus-UOMType, RuleVsDirectional-xy-and-z-RuleType, ElasticModulus-GraphType.
group	ParameterIdentityGroup, ValueVsDirectional-xy-and-z-ValueGroup.

The enumerated values for *ElasticModulus-UOM* are

- *Pa*, and *GPa*.



5.13.1 Elastic Modulus- Graph

path	PartModel/PackageSection/Package-Array/Package/ElasticModulus-Array/ElasticModulus-Graph
diagram	<p>The diagram illustrates the XSD structure for ElasticModulusGraphType. It is a complex type containing several elements: GraphTitle (xs:string), TestConditionDefinition (TemperatureParametricGraphChartX-AxisType), ParameterDefinition (ElasticModulusParameterGraphChartY-AxisType, 1..∞), Data-Array (ElasticModulusParameterGraphData-ArrayType, 1..∞), GraphFormula (GraphFormulaType, 1..∞), and Formatting (GraphFormattingType). There are also nested elements: ElasticModulusParameterGraphChartY-AxisType contains ID (xs:string), AxisParameterIdentityGroup, ElasticModulusUOM (ElasticModulusUOMType), and Formatting (GraphChartY-AxisFormattingType). ElasticModulusParameterGraphData-ArrayType contains ParameterDefinitionID (xs:string), PlotTestCondition (TemperatureGraphPlotConditionType, 0..∞), Data (GraphDataType, 1..∞), and Formatting (GraphDataFormattingType). A dashed box labeled 'constraints' is at the bottom.</p>
type	ElasticModulus-GraphType, TemperatureParametricGraphChartX-AxisType, ElasticModulusParameterGraphChartY-AxisType, ElasticModulus-UOMType, GraphChartY-AxisFormattingType, ElasticModulusParameter-GraphData-ArrayType, TemperatureGraphPlotConditionType, GraphDataType, GraphDataFormattingType, GraphFormulaType, GraphFormattingType.
group	AxisParameterIdentityGroup,

5.14 Heat Capacity - Array

path	PartModel/PackageSection/Package-Array/Package/YoungsModulus-Array.		
diagram			
type	HeatCapacity-ArrayType, HeatCapacityType, HeatCapacityUOMType, JEP30-D10:RuleType		
group	JEP30-D10:ParameterIdentityGroup		

The enumerated values for *HeatCapacityUOM* are

*mJ/K*, *J/K*, *mJ/°C*, *J/°C*.

5.15 Terminal Groups

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups
diagram	<p>The diagram illustrates the structure of TerminalGroups. A class named <b>TerminalGroups</b> (of type <b>TerminalGroupsType</b>) is connected to a large dashed box labeled <b>TerminalGroupsType</b>. Inside this box, there are five sub-classes: <b>TerminalGroup-Array</b> (type <b>TerminalGroup-ArrayType</b>), <b>Region-Array</b> (type <b>Region-ArrayType</b>), <b>TerminalGroupToTerminalGroupRelationships-Array</b> (type <b>TerminalGroupToTerminalGroupRelationships-ArrayType</b>), <b>TerminalDetail-Array</b> (type <b>TerminalDetail-ArrayType</b>), and <b>Via-Array</b> (type <b>Via-ArrayType</b>). A <b>constraints</b> box is also shown at the bottom of the dashed box.</p>
type	TerminalsGroupsType, TerminalGroup-ArrayType, Region-ArrayType, TerminalGroupToTerminalGroupRelationships-ArrayType, TerminalDetail-ArrayType, ViaRegion-ArrayType.

Since a package may have several terminal groups under the *TerminalGroup-Array*, and since there may be dimensional relationships between some or all these groups, an *ID* is assigned to each *TerminalGroup* that can then be referenced in the *TerminalGroupToTerminalGroup Relationships-Array* branch.

### 5.15.1 Terminal Group - Array

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array
diagram	
type	<p>TerminalsGroup-ArrayType, TerminalGroupType, TerminalPositionType, TerminalType, TerminalMaterialType, JEP30-D10:LinearExpansionCoefficient-ArrayType, JEP30-D10:CubicExpansionCoefficient-ArrayType, TerminalBasicFunctionType, TerminalPatternType, TerminalPatternGroupType, TerminalShapeType, TerminalSpanType, TerminalSpacingType, TerminalGroupToBodyRelationship.</p>

*Coplanarity* is defined in JESD88, JEDEC Dictionary of Terms for Solid-State Technology.

*FlexibleTerminal* is a new type of material applied to mostly ceramic chip component terminals for the purpose of reducing the mechanical stress between the component terminal and the printed board. This element is optional and can be set by the component manufacturer when they have incorporated this technology to the part construction.

5.15.1.1 Terminal Position

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalPosition.
diagram	<pre>classDiagram     class TerminalPosition {         type TerminalPositionType     }     class TerminalPositionType {         Axial         Bottom         Dual         End         Diagonal         Internal         Quad         Radial         Single         Triple         Upper         ZigZag     }     TerminalPosition "1" --&gt; "1" TerminalPositionType</pre>
type	TerminalPositionType, BottomUpperPositionConfigurationType, DualPositionConfigurationType, DiagonalCornerConfigurationType, QuadConfigurationType, RadialPositionConfigurationType, SinglePositionConfigurationType, TriplePositionConfigurationType.

The definition of the above *TerminalPosition* data elements and their following sub-structures can be found in JESD30, under the “Terminal position Prefix” section which *includes* the “Prefixes for terminal position” table, plus three sections in Annex A, namely:

- Terminal position with additional definition,
- Relationship concepts between the Terminal Contact Area and the Body outline, and
- Position Images.

The only difference between this *TerminalPosition* type and the *PackageTerminalPosition* type is that the *MixedPosition* option is not available to a single *TerminalGroup*. Refer to sub-sections of 5.1 Package Terminal Position for details of each of the sub-sections under *TerminalPosition*.

### 5.15.1.2 Terminal

path	<a href="#">PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/Terminal</a>
diagram	
type	<a href="#">TerminalType</a> , <a href="#">BallType</a> , <a href="#">JEP30-D10:EmptyType</a> , <a href="#">LugType</a> , <a href="#">FlatType</a> , <a href="#">Gull-wingType</a> , <a href="#">PostTerminalType</a> , <a href="#">L-BendType</a> , <a href="#">ColumnType</a> , <a href="#">SurfaceTerminalType</a> , <a href="#">PressfitType</a> , <a href="#">PinType</a> , <a href="#">WraparoundType</a> , <a href="#">S-BendType</a> , <a href="#">Through-HoleType</a> , <a href="#">WireType</a> , <a href="#">ScrewType</a> .

The definition of the [TerminalCode](#) data elements and their following sub-structures can be found in the JESD30, under the “Terminal Shape Suffix” section which *includes* the “Suffixes for terminal shape” table, plus two sections in Annex A, namely

- Suffixes for terminal shape with additional definition, and
- Illustrations of terminal shape.

NOTE The structure for the [TerminalGroup/Terminal](#) that is under [Package/TerminalGroups/TerminalGroup-Array](#) is exactly the same as for [Package/PackageTerminalCode](#) as outlined in section 4.7 Package Terminal Code above, with the exception that the following three elements that are contained in the [Package/PackageTerminalCode](#) structure are not contained in the [TerminalGroup/Terminal](#) structure. This is because each single [TerminalGroup](#) can only represent a single [Terminal](#) Type.

5.13.1.2 Terminal (cont'd)

- Mixed-SMT,
- Mixed-TH, or
- Mixed-Technology.

Refer to 4.7 Package Terminal Code for details of each of the sub-sections under *Terminal*.

5.15.1.3 Terminal Material

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalMaterial.
diagram	
type	TerminalMaterialType, J-Std-609AlloyCompositionType, J-Std-609e-codeType, BaseMaterialType, Plating-ArrayType, PlatingType, PlatingThicknessUOMType.

The *J-Std-609AlloyComposition* and *J-Std-609e-code* enumerated values are defined in “Annex A (informative) Example Alloys and Associated Material Codes” in the J-Std-609, “Marking, Symbols, and Labels of Leaded and Lead-Free Terminal Finished Materials Used in Electronic Assembly” standard.

The is *PlatingThicknessUOM* specified in *uM*.

5.15.1.4 Terminal Function

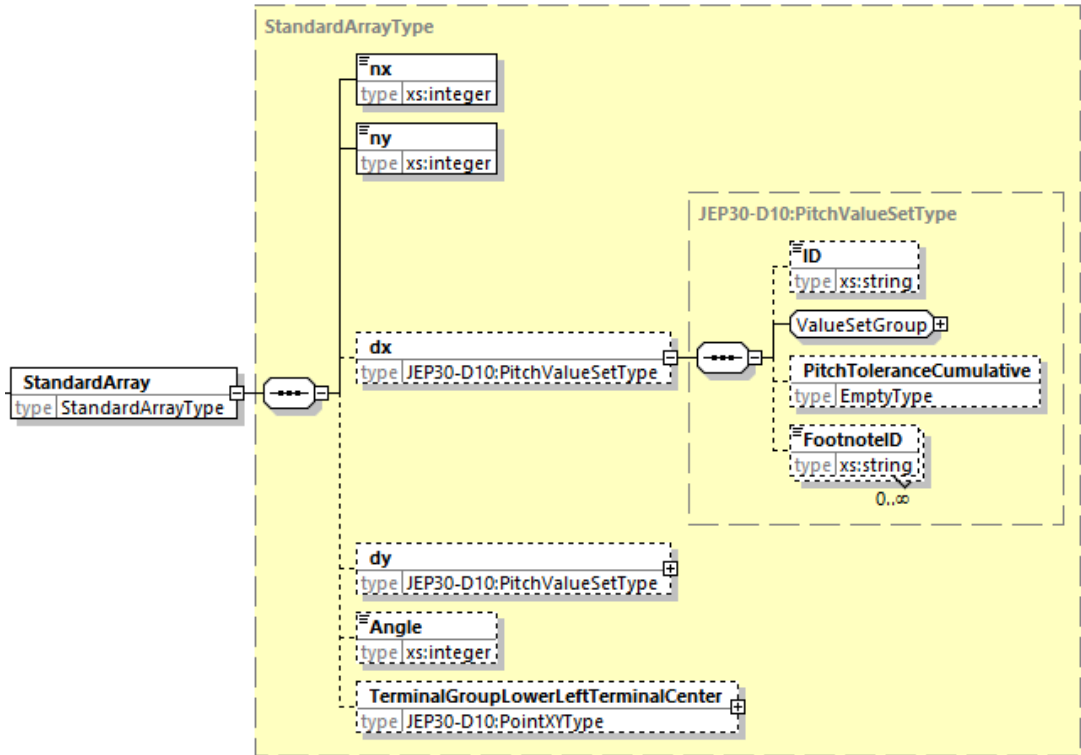
path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalFunction.
diagram	
type	TerminalBasicFunctionType, JEP30-D10:EmptyType.

5.15.1.5 Terminal Pattern

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalPattern.
diagram	
type	TerminalPatternType, StandardArrayType, CircularArrayType, TerminalRandomArrayType.



5.15.1.5.1 Standard Array

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalLocation
diagram	 <p>The diagram illustrates the structure of the <b>StandardArray</b> type. It is a class with a <b>type</b> attribute of <b>StandardArrayType</b>. The main body of the class is enclosed in a dashed box labeled <b>StandardArrayType</b>. Inside this box, there are several attributes and a complex nested structure:</p> <ul style="list-style-type: none"><li><b>nx</b>: type <b>xs:integer</b></li><li><b>ny</b>: type <b>xs:integer</b></li><li><b>dx</b>: type <b>JEP30-D10:PitchValueSetType</b>. This attribute is connected via a dashed line to a <b>JEP30-D10:PitchValueSetType</b> box. Inside this box, there is a <b>ValueSetGroup</b> (indicated by a plus sign in a box) containing:<ul style="list-style-type: none"><li><b>ID</b>: type <b>xs:string</b></li><li><b>PitchToleranceCumulative</b>: type <b>EmptyType</b></li><li><b>FootnoteID</b>: type <b>xs:string</b> with a cardinality of <b>0..∞</b></li></ul></li><li><b>dy</b>: type <b>JEP30-D10:PitchValueSetType</b> (indicated by a plus sign in a box)</li><li><b>Angle</b>: type <b>xs:integer</b></li><li><b>TerminalGroupLowerLeftTerminalCenter</b>: type <b>JEP30-D10:PointXYType</b> (indicated by a plus sign in a box)</li></ul>
type	StandardArrayType, JEP30-D10:PitchValueSetType, StandardType, MinMaxLimitsType, JEP30-D10:PointType.


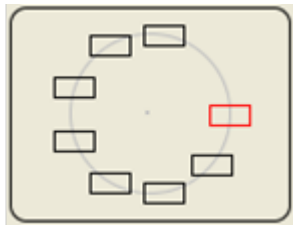
5.15.1.5.2 Circular Array

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalLocation/CircularArray.
diagram	<p>The diagram illustrates the structure of the <b>CircularArray</b> class and its associated types. The <b>CircularArray</b> class (type <b>CircularArrayType</b>) is shown on the left, connected to a dashed box representing the <b>CircularArrayType</b> structure. This structure contains several attributes and a nested <b>RotationType</b> structure.</p> <ul style="list-style-type: none"><li><b>PitchRadius</b>: type <b>xs:decimal</b></li><li><b>Center</b>: type <b>JEP30-D10:PointXYType</b></li><li><b>StartAngle</b>: type <b>xs:integer</b></li><li><b>AngleToFill</b>: type <b>xs:integer</b></li><li><b>AngleBetweenTerminals</b>: type <b>xs:integer</b></li><li><b>NumberOfTerminals</b>: type <b>xs:integer</b></li><li><b>Rotation</b>: type <b>RotationType</b></li></ul> <p>The <b>RotationType</b> structure (dashed box) contains two attributes:</p> <ul style="list-style-type: none"><li><b>RotateWithCircle</b>: type <b>JEP30-D10:EmptyType</b></li><li><b>RotationAngle</b>: type <b>xs:integer</b></li></ul>
type	CircularArrayType, JEP30-D10:PointXYType, RotationType, JEP30-D10:EmptyType.

### 5.13.1.5.2 Circular Array (cont'd)

Under the [CircularArray](#), Table 15 provides the definition of each elements.

**Table 15 - Terminal Circular Array Elements Definition**

Element	Explanation
Pitch Radius	The radius of the circle of terminals.
Center	The center of the circle of terminals.
Start Angle	The angle at which to place the first terminal in the array. By default, the terminal is at the right-most point on the circle (i.e. the number 3 position on a clock face). This angle specifies a rotation clockwise around the circle from this point.
Angle to Fill	The angle through which the terminals are distributed, starting from the first terminal and continuing clockwise, until the last terminal is reached.
Angle between Terminals	Instead of specifying <b>Angle to fill</b> , you can specify the angle between the centers of each terminal.
Number of Terminals	The number of terminals to be arrayed around the circle. The first terminal is displayed in red. This number includes any missing or deleted terminals in the array.
Rotate with Circle	 <p>If the terminals are rotated so that they are oriented perpendicular to the circle. This does not apply to circular or contour terminal shapes.</p>
Rotation Angle	 <p>If the terminals are not oriented perpendicular to the circle, then the terminals could be rotated around the center of the terminal itself. In this image, each terminal has a “0” degree rotation with respect to the “3 O’clock position”. This does not apply to circular or contour terminal shapes.</p>

### 5.15.1.5.3 Random Array

path	<a href="#">PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalLocation/RandomArray</a>
diagram	
type	<a href="#">TerminalRandomArrayType</a> , <a href="#">JEP30-D10:PointXYType</a> .

### 5.15.1.6 Pattern Group

path	<a href="#">PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/PackageGroup</a>
diagram	
type	<a href="#">TerminalPatternGroupType</a> , <a href="#">TerminalPatternRelationshipType</a> .

5.15.1.6.1 Pattern Relationship

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/PatternGroup/PatternRelationship.
diagram	<p>The diagram illustrates the structure of the <b>PatternRelationship</b> element, which is of type <b>TerminalPatternRelationshipType</b>. It is a sequence of elements, indicated by the <b>1..∞</b> cardinality. The elements are:</p> <ul style="list-style-type: none"><li><b>Name</b> (type <b>xs:string</b>)</li><li><b>FromTerminalPatternID</b> (type <b>xs:string</b>)</li><li><b>FromPatternGroupID</b> (type <b>xs:string</b>)</li><li><b>PrefixCode</b> (type <b>xs:string</b>)</li><li><b>SuffixCode</b> (type <b>xs:string</b>)</li><li><b>RelationshipTransformations</b> (type <b>RelationshipTransformationsType</b>)</li><li><b>TerminalPatternID</b> (type <b>xs:string</b>)</li><li><b>PatternGroupID</b> (type <b>xs:string</b>)</li><li><b>Duplicate</b> (type <b>JEP30-D10:TransformDuplicateType</b>)</li></ul> <p>The <b>PrefixCode</b> and <b>SuffixCode</b> elements are grouped together with a choice cardinality of <b>0..2</b>, indicating that at most two of these elements can appear in the sequence.</p>
type	TerminalPatternRelationshipType, RelationshipTransformationsType, JEP30-D10:TransformDuplicateType.

5.15.1.6.1.1 Relationship Transformations

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/PackageGroup/PatternRelationship/RelationshipTransformations.
diagram	
type	RelationshipTransformationsType, TransformMirrorType, TransformRotateType, JEP30-D10:EmptyType, JEP30-D10:PointXYType.

5.15.1.6.1.2 Duplicate

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/PatternGroup/PatternRelationship/Duplicate.
diagram	
type	TransformDuplicateType, RowTerminalNumberOrderingType, ColumnTerminalNumberOrderingType, NumericalSequenceType, AlphabeticalSequenceType.

### 5.15.1.7 Terminal Shape

path	<a href="#">PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape</a>
diagram part 1 of 8	
type	<a href="#">TerminalShapeType</a> , <a href="#">JEP30-D10:EmptyType</a> , <a href="#">Pad-on-PackageType</a> , <a href="#">SoldermaskOpening-on-PackageType</a> , <a href="#">BallTerminalShapeType</a> , <a href="#">ColumnTerminalShapeType</a> , <a href="#">Surface-terminalShapeType</a> .
path	<a href="#">PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/Pad-on-Package</a>
diagram part 1.1 of 8	
type	<a href="#">Pad-on-PackageType</a> , <a href="#">ReferenceRectangleGroupType</a> , <a href="#">ReferenceRoundedRectangleGroupType</a> , <a href="#">ReferenceModifiedRectangleGroupType</a> , <a href="#">ReferenceCircleGroupType</a> , <a href="#">ReferenceDouble-DGroupType</a> , <a href="#">ReferenceRegularPolygonGroupType</a> , <a href="#">ReferenceTerminalContourGroupType</a> , <a href="#">JEP30-D10:UnspecifiedDimensionalValueSetType</a>



### 5.14.1.7 Terminal Shape (cont'd)

path	<a href="#">PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/SoldermaskOpening-on-Package</a>
diagram part 1.2 of 8	
type	<a href="#">SoldermaskOpening-on-PackageType</a> , <a href="#">ReferenceRectangleGroupType</a> , <a href="#">ReferenceRoundedRectangleGroupType</a> , <a href="#">ReferenceModifiedRectangleGroupType</a> , <a href="#">ReferenceCircleGroupType</a> , <a href="#">ReferenceDouble-DGroupType</a> , <a href="#">ReferenceRegularPolygonGroupType</a> , <a href="#">ReferenceTerminalContourGroupType</a> , <a href="#">JEP30-D10:UnspecifiedDimensionalValueSetType</a>
path	<a href="#">PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/Ball</a>
diagram part 1.3 of 8	
type	<a href="#">BallTerminalShapeType</a> , <a href="#">ReferenceRoundedRectangleGroupType</a> , <a href="#">ReferenceCircleGroupType</a> , <a href="#">ReferenceRegularPolygonGroupType</a> , <a href="#">JEP30-D10:UnspecifiedDimensionalValueSetType</a> , <a href="#">JEP30-D10:UnspecifiedValueSetType</a>

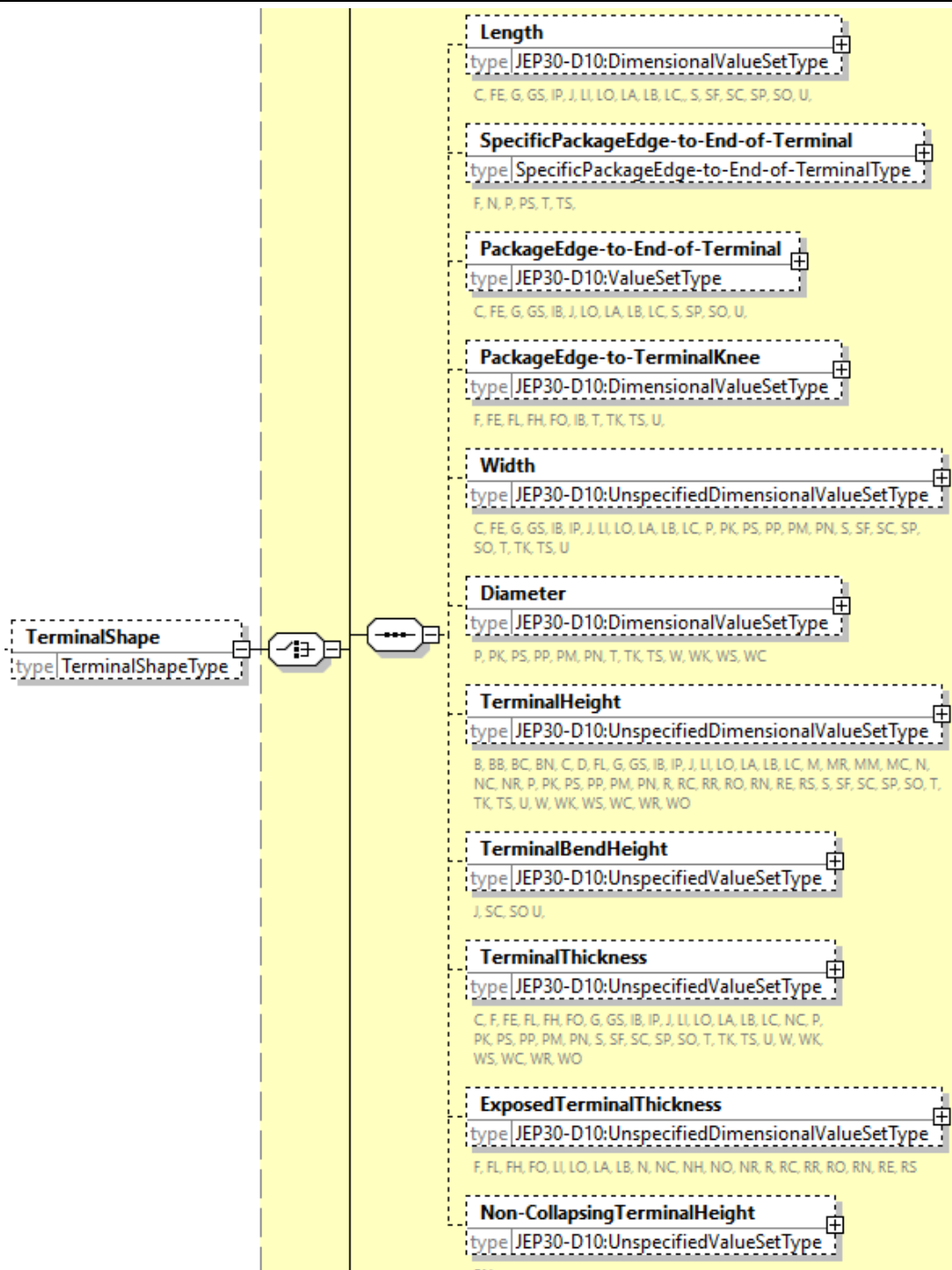
5.14.1.7 Terminal Shape (cont'd)

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/Column
diagram part 1.4 of 8	<p>The diagram illustrates the structure of the <b>ColumnTerminalShapeType</b>. It is a composite type that includes several nested and associated types:</p> <ul style="list-style-type: none"><li><b>Circle</b> (type: ReferenceCircleGroupType)</li><li><b>RegularPolygon</b> (type: ReferenceRegularPolygonType)</li><li><b>UpperSide-of-Column</b> (type: UpperSide-of-ColumnShapeType, dimensions: M, MR, MM, MC)<ul style="list-style-type: none"><li><b>Circle</b> (type: ReferenceCircleGroupType)</li><li><b>RegularPolygon</b> (type: ReferenceRegularPolygonGroupType)</li></ul></li><li><b>LowerSide-of-Column</b> (type: LowerSide-of-ColumnShapeType, dimensions: M, MR, MM, MC)<ul style="list-style-type: none"><li><b>Circle</b> (type: ReferenceCircleGroupType)</li><li><b>RegularPolygon</b> (type: ReferenceRegularPolygonType)</li></ul></li><li><b>TerminalHeight</b> (type: JEP30-D10:UnspecifiedDimensionalValueSetGroupType, dimensions: M, MR, MM, MC; N, NC; NR, D, PK, PS, PP, PN, R, RC, RR, RD, RN, RE, RS, S, SF, SC, SP, SQ, T, TK, TS, U, W, WK, WS, WC, WR, WO)</li><li><b>Core</b> (type: ColumnCoreType, dimensions: M, MR, MM, MC)<ul style="list-style-type: none"><li><b>CopperThickness</b> (type: JEP30-D10:UnspecifiedValueSetGroupType, dimension: MC)</li><li><b>RibbonThickness</b> (type: JEP30-D10:UnspecifiedValueSetGroupType, dimension: MR)</li><li><b>RibbonHeight</b> (type: JEP30-D10:UnspecifiedValueSetGroupType, dimension: MR)</li><li><b>RibbonPitch</b> (type: JEP30-D10:UnspecifiedValueSetGroupType, dimension: MR)</li><li><b>Number-of-Turns</b> (type: xs:decimal, dimensions: MM, MR)</li><li><b>Direction-of-Helix</b> (type: Direction-of-HelixType, dimensions: MM, MR)</li></ul></li></ul> <p>The <b>Column</b> type (type: ColumnTerminalShapeType, dimensions: M, MR, MM, MC) is shown as a container for these shapes.</p>
type	ColumnTerminalShapeType, ReferenceCircleGroupType, ReferenceRegularPolygonType, UpperSide-of-ColumnShapeType, ReferenceCircleGroupType, ReferenceRegularPolygonGroupType, LowerSide-of-ColumnShapeType, JEP30-D10:UnspecifiedDimensionalValueSetType, ColumnCoreType, JEP30-D10:DimensionalValueSetType, JEP30-D10:ValueSetType, JEP30-D10:UnspecifiedDimensionalValueSetType, JEP30-D10:UnspecifiedValueSetType.

5.14.1.7 Terminal Shape (cont'd)

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/Surface-terminal
diagram part 1.5 of 8	<p>The diagram illustrates the composition of the <b>Surface-terminalShapeType</b>. A <b>Surface-terminal</b> entity, which is of type <b>Surface-terminalShapeType</b> and has a cardinality of <b>N</b>, is connected to a dashed box representing the <b>Surface-terminalShapeType</b>. Inside this dashed box, there are eleven entities, each with a '+' icon in its top right corner, indicating a composition relationship. These entities are: <b>Rectangle</b> (type <b>ReferenceRectangleGroupType</b>), <b>RoundedRectangle</b> (type <b>ReferenceRoundedRectangleGroupType</b>), <b>ModifiedRectangle</b> (type <b>ReferenceModifiedRectangleGroupType</b>), <b>Circle</b> (type <b>ReferenceCircleGroupType</b>), <b>D-Shape</b> (type <b>ReferenceD-ShapeGroupType</b>), <b>Double-D</b> (type <b>ReferenceDouble-DGroupType</b>), <b>Ellipse</b> (type <b>ReferenceEllipseGroupType</b>), <b>RectangleWithSingleEllipticalEnd</b> (type <b>ReferenceRectangleWithSingleEllipticalEndGroupType</b>), <b>RegularPolygon</b> (type <b>ReferenceRegularPolygonGroupType</b>), <b>Para-truncatedCircle</b> (type <b>ReferencePara-truncatedCircleGroupType</b>), and <b>ExposedTerminalThickness</b> (type <b>JEP30-D10:UnspecifiedValueSetType</b>). The <b>ExposedTerminalThickness</b> entity is shown in a dashed box at the bottom of the main dashed box.</p>
type	Surface-terminalShapeType, ReferenceRectangleGroupType, ReferenceCircleGroupType, ReferenceRoundedRectangleGroupType, ReferenceModifiedRectangleGroupType, ReferenceCircleGroupType, ReferenceD-ShapeType, ReferenceDouble-DGroupType, ReferenceEllipseGroupType, ReferenceRectangleWithSingleEllipticalEndGroupType, ReferenceRegularPolygonGroupType, ReferencePara-truncatedCircleGroupType, JEP30-D10:UnspecifiedValueSetType.

### 5.14.1.7 Terminal Shape (cont'd)

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/Column		
diagram part 2 of 8	 <p><b>Length</b> type JEP30-D10:DimensionalValueSetType C, FE, G, GS, IP, J, LI, LO, LA, LB, LC, S, SF, SC, SP, SO, U,</p> <p><b>SpecificPackageEdge-to-End-of-Terminal</b> type SpecificPackageEdge-to-End-of-TerminalType F, N, P, PS, T, TS,</p> <p><b>PackageEdge-to-End-of-Terminal</b> type JEP30-D10:ValueSetType C, FE, G, GS, IB, J, LI, LO, LA, LB, LC, S, SP, SO, U,</p> <p><b>PackageEdge-to-TerminalKnee</b> type JEP30-D10:DimensionalValueSetType F, FE, FL, FH, FO, IB, T, TK, TS, U,</p> <p><b>Width</b> type JEP30-D10:UnspecifiedDimensionalValueSetType C, FE, G, GS, IB, IP, J, LI, LO, LA, LB, LC, P, PK, PS, PP, PM, PN, S, SF, SC, SP, SO, T, TK, TS, U</p> <p><b>Diameter</b> type JEP30-D10:DimensionalValueSetType P, PK, PS, PP, PM, PN, T, TK, TS, W, WK, WS, WC</p> <p><b>TerminalHeight</b> type JEP30-D10:UnspecifiedDimensionalValueSetType B, BB, BC, BN, C, D, FL, G, GS, IB, IP, J, LI, LO, LA, LB, LC, M, MR, MM, MC, N, NC, NR, P, PK, PS, PP, PM, PN, R, RC, RR, RO, RN, RE, RS, S, SF, SC, SP, SO, T, TK, TS, U, W, WK, WS, WC, WR, WO</p> <p><b>TerminalBendHeight</b> type JEP30-D10:UnspecifiedValueSetType J, SC, SO U,</p> <p><b>TerminalThickness</b> type JEP30-D10:UnspecifiedValueSetType C, F, FE, FL, FH, FO, G, GS, IB, IP, J, LI, LO, LA, LB, LC, NC, P, PK, PS, PP, PM, PN, S, SF, SC, SP, SO, T, TK, TS, U, W, WK, WS, WC, WR, WO</p> <p><b>ExposedTerminalThickness</b> type JEP30-D10:UnspecifiedDimensionalValueSetType F, FL, FH, FO, LI, LO, LA, LB, N, NC, NH, NO, NR, R, RC, RR, RO, RN, RE, RS</p> <p><b>Non-CollapsingTerminalHeight</b> type JEP30-D10:UnspecifiedValueSetType BN,</p>		
type	TerminalShapeType, JEP30-D10:DimensionalValueSetType, SpecificPackageEdge-to-End-of-TerminalType, JEP30-D10:ValueSetType, JEP30-D10:UnspecifiedDimensionalValueSetType, JEP30-D10:UnspecifiedValueSetType.		

5.14.1.7 Terminal Shape (cont'd)

diagram part 3 of 8	<p>The diagram illustrates the structure of the <b>TerminalShape</b> type. It is composed of several sub-elements, each with a specific type and a set of allowed values:</p> <ul style="list-style-type: none"><li><b>TerminalShape</b> (type: <b>TerminalShapeType</b>)<ul style="list-style-type: none"><li><b>TerminalInsertionHeight</b> (type: <b>JEP30-D10:UnspecifiedValueSetType</b>) D, P, PK, PS, PP, PN, T, TK, TS, W, WK, WS, WC.</li><li><b>Radius</b> (type: <b>JEP30-D10:DimensionalValueSetType</b>) FL.</li><li><b>RadiusTop</b> (type: <b>JEP30-D10:UnspecifiedValueSetType</b>) C, G, GS, IB, J, LC, S, SF, SC, SP, SO, T, TK, TS, U.</li><li><b>RadiusBottom</b> (type: <b>JEP30-D10:UnspecifiedValueSetType</b>) C, G, GS, J, LI, LO, LA, LB, S, SF, SC, SP, SO, U.</li><li><b>RadiusInsideBottom</b> (type: <b>JEP30-D10:UnspecifiedValueSetType</b>) LC.</li><li><b>RadiusOutsideBottom</b> (type: <b>JEP30-D10:UnspecifiedValueSetType</b>) LC.</li><li><b>WettableFlank</b> (type: <b>JEP30-D10:EmptyType</b>) NC, NR, R.</li><li><b>Pullback</b> (type: <b>JEP30-D10:EmptyType</b>) N, NC.</li><li><b>RiseAngle</b> (type: <b>JEP30-D10:UnspecifiedValueSetGroupType</b>) C, G, GS, J, IB, T, TK, TS, U.</li><li><b>SeatingAngle</b> (type: <b>JEP30-D10:UnspecifiedValueSetGroupType</b>) C, G, GS, LI, LO, LA, LB, LC.</li><li><b>PlatingThickness</b> (type: <b>JEP30-D10:UnspecifiedValueSetType</b>) C, F, FE, FL, FH, FO, G, GS, IB, IP, J, LI, LO, LA, LB, LC, P, PK, PS, PP, PM, S, SF, SC, SP, SO, T, TK, TS, U, W, WK, WS, WC, WR, WO.</li></ul></li></ul>
type	<b>TerminalShapeType</b> , <b>JEP30-D10:UnspecifiedValueSetType</b> , <b>JEP30-D10:DimensionalValueSetType</b> , <b>JEP30-D10:EmptyType</b> ,

5.14.1.7 Terminal Shape (cont'd)

diagram part 4 of 8	<p><b>BaseMetal</b> type BaseMetalType C, G, GS, IB, IP, J, LL, LO, LA, LB, LC, S, SF, SC, SP, SO, U</p> <p><b>CopperThickness</b> type JEP30-D10:UnspecifiedValueSetType MC</p> <p><b>RibbonThickness</b> type JEP30-D10:UnspecifiedValueSetType MR</p> <p><b>RibbonHeight</b> type JEP30-D10:UnspecifiedValueSetType MR</p> <p><b>RibbonPitch</b> type JEP30-D10:UnspecifiedValueSetType MR</p> <p><b>Number-of-Turns</b> type xs:decimal MM</p> <p><b>Direction-of-Helix</b> type Direction-of-HelixType MM</p> <p><b>WireDiameter</b> type JEP30-D10:UnspecifiedValueSetType MM</p> <p><b>SpringConstant</b> type SpringConstantType MM</p> <p><b>SpringLengthFreeLoad</b> type JEP30-D10:DimensionalValueSetType MM</p> <p><b>SwageFasteningPin</b> type SwageFasteningPinType DF</p>	
type	TerminalShapeType, JEP30-D10:UnspecifiedValueSetType, Direction-of-HelixType, JEP30-D10:EmptyType, SpringConstantType, JEP30-D10:DimensionalValueSetType	

5.14.1.7 Terminal Shape (cont'd)

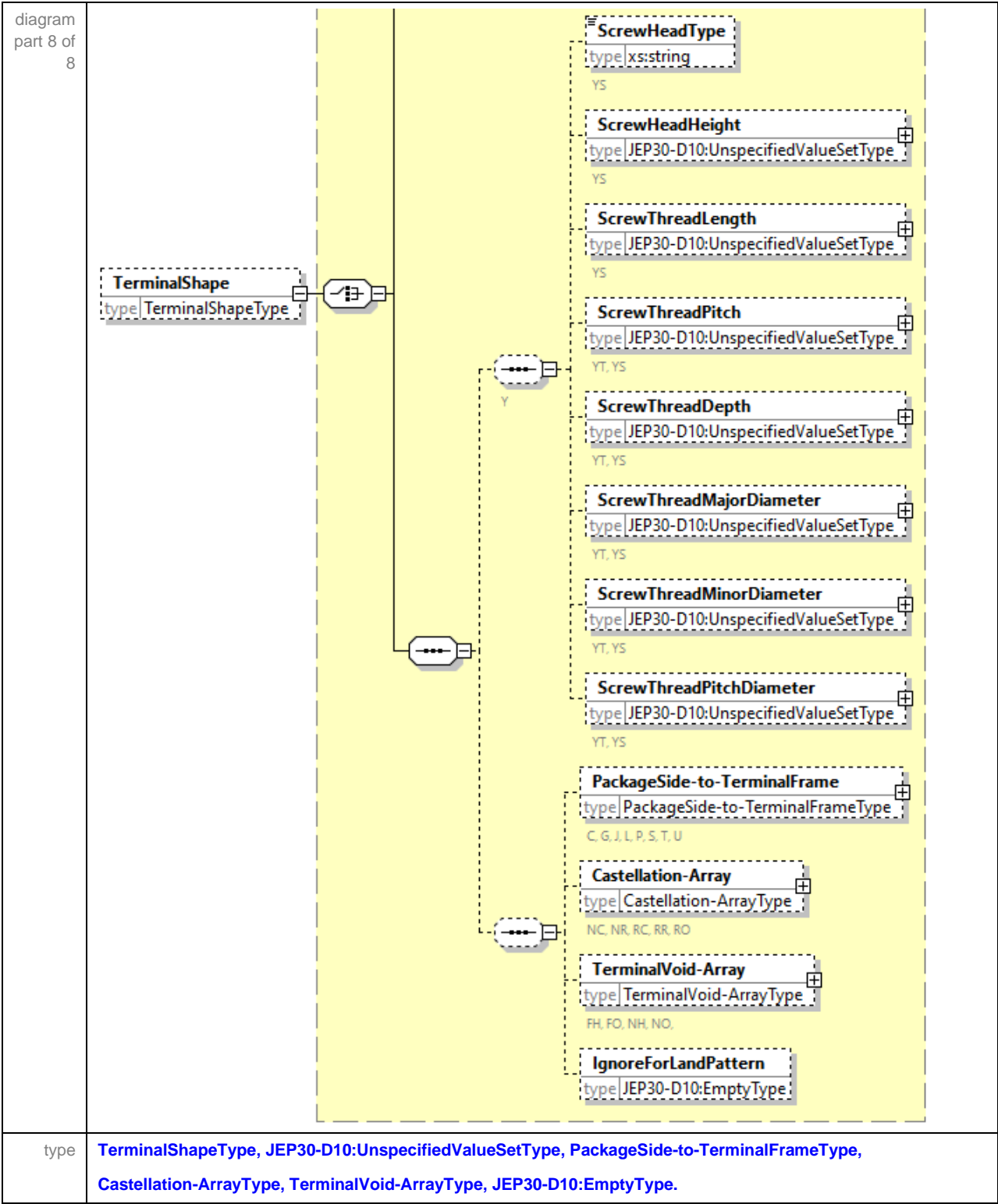
diagram part 5 of 8	<p><b>TerminalShape</b> type TerminalShapeType</p> <p><b>TerminalPostWidth</b> type JEP30-D10:UnspecifiedValueSetType IP, PM,</p> <p><b>TerminalPostThickness</b> type JEP30-D10:UnspecifiedValueSetType IP, PM,</p> <p><b>TerminalFootThickness</b> type JEP30-D10:UnspecifiedValueSetType IP,</p> <p><b>Un-preppedTerminalLength</b> type JEP30-D10:UnspecifiedValueSetType T, TK, TS, W, WK, WS, WC, WR, WO</p> <p><b>WireEndShape</b> type WireEndShapeType W, WK, WS, WC, WR, WO</p> <p><b>WireGuage</b> type WireGuageType W, WK, WS, WC, WR, WO</p> <p><b>ModifiedCorner</b> type ModifiedCornerType G, GS,</p> <p><b>ToeUp</b> type JEP30-D10:EmptyType G, GS,</p> <p><b>ToeDown</b> type JEP30-D10:EmptyType G, GS,</p> <p><b>Shoulder</b> type ConfigurableShoulderType GS, J, U, PS, PP, PN, TS, U</p> <p><b>Neck</b> type NeckType GS,</p> <p><b>Dambar</b> type DambarType GS,</p> <p><b>Kinked</b> type KinkedType PK, TK, WK</p> <p><b>TerminalEndShape</b> type TerminalEndShapeType O, OT, OE, OC, OM, OA, ON, P, PK, PS, PP, PM, PN, T, TK, TS, W, WK, WS, WC</p>
type	TerminalShapeType, SwageFasteningPinType, JEP30-D10:UnspecifiedValueSetType, WireEndShapeType, WireGuageType, ModifiedCornerType, JEP30-D10:EmptyType, ConfigurableShoulderType, NeckType, DambarType, KinkedType

### 5.14.1.7 Terminal Shape (cont'd)

<p>diagram part 6 of 8</p>	<p><b>Rectangle</b> type ReferenceRectangleType B, BB, BC, BN, F, FE, FL, FH, FO, M, MC, MM, MR, N, NC, NH, NO, NR, PM, R, RC, RR, RO, RN, RE, RS, W, WK, WS, WC, WR, WO, YC</p> <p><b>RoundedRectangle</b> type ReferenceRoundedRectangleType B, BB, BC, BN, F, FE, FL, FH, FO, M, MC, MM, MR, N, NH, NO, YC</p> <p><b>ModifiedRectangle</b> type ReferenceModifiedRectangleType B, BB, BC, BN, F, FE, FL, FH, FO, M, MC, MM, MR, N, NC, NH, NO, NR, R, RC, RR, RO, RN, RE, RS, YC</p> <p><b>Circle</b> type ReferenceCircleType B, BB, BC, BN, M, MC, MM, MR, N, NH, NO, PM, YC, YT</p> <p><b>D-Shape</b> type ReferenceD-ShapeType F, N, NC, R, RC</p> <p><b>Double-D</b> type ReferenceDouble-DType B, BB, BC, BN, F, M, MC, MM, MR, N, NH, NO, YC</p> <p><b>Ellipse</b> type ReferenceEllipseGroupType N, NC</p> <p><b>RectangleWithSingleEllipticalEnd</b> type ReferenceRectangleWithSingleEllipticalEndGroupType F, N, NC, R, RC</p> <p><b>MickeyMouseEars</b> type ReferenceTerminalContourType NH</p> <p><b>RegularPolygon</b> type ReferenceRegularPolygonType N, NH, NO</p> <p><b>Segment</b> type ReferenceSegmentType N</p> <p><b>Para-truncatedCircle</b> type ReferencePara-truncatedCircleType N, NH, NO</p> <p><b>ConvexS</b> type ConvexS-ShapeType RS</p> <p><b>IsoscelesTrapezoid</b> type ReferenceIsoscelesTrapezoidType</p> <p><b>Contour</b> type ReferenceTerminalContourType B, BB, BC, BN, F, FL, FH, FO, G, GS, M, MR, MM, MC, N, NC, NH, NO, NR, P, PK, PS, PP, PN, PM, T, TK, TS, R, RC, RR, RO, RN, RE, RS, T, TK, TS, W, WK, WS, WC, WR, WO</p>
<p>type</p>	<p><b>TerminalShapeType, ReferenceRectangleType, ReferenceRoundedRectangleType, ReferenceModifiedRectangleType, ReferenceCircleType, ReferenceD-ShapeType, ReferenceDouble-DType, ReferenceEllipseGroupType, ReferenceRectangleWithSingleEllipticalEndGroupType, ReferenceTerminalContourType, ReferenceRegularPolygonType, ReferenceSegmentType, ReferencePara-truncatedCircleType, ConvexS-ShapeType, IsoscelesTrapezoidType.</b></p>



5.14.1.7 Terminal Shape (cont'd)



### 5.15.1.7.1 Ball Types

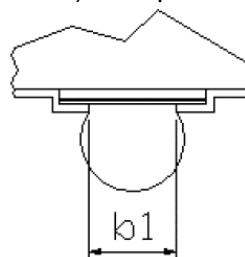
Table 16 shows an array of dimensions that are applicable to this terminal:

**Table 16 - Ball Dimensions**

Schema Labels	Ball Types	Applicable Shapes to capture			Schema Types
		Terminal Shape	Soldermask Opening	Pad Shape	
Rectangle	All		NSMD	SMD	ReferenceRectangleType
Rounded Rectangle	Bump	SMD, NSMD	SMD, NSMD	SMD, NSMD	ReferenceRoundedRectangleType
	Collapsing, Non-Collapsing		NSMD	SMD	
Modified Rectangle	All		NSMD	SMD	ReferenceModifiedRectangleType
Circle	All	SMD, NSMD	SMD, NSMD	SMD, NSMD	ReferenceCircleType
Double-D	All		NSMD	SMD	ReferenceDouble-DType
Regular Polygon	All	SMD, NSMD	SMD, NSMD	SMD, NSMD	ReferenceRegularPolygonType
Contour	Bump		NSMD	SMD	ReferenceTerminalContourType
Terminal Height	All	SMD, NSMD	n/a	n/a	JEP30-D10: UnspecifiedDimensionalValueSetType
Non-Collapsing Terminal Height	All	SMD, NSMD	n/a	n/a	JEP30-D10:UnspecifiedValueSetType

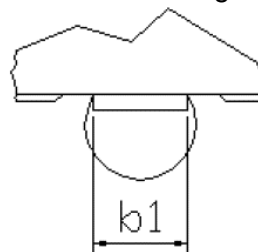
The definition of each shape is outlined in Annex A (informative) Shape Definitions & Dimensions.

The Terminal shapes is mandatory for all combinations of Ball types. The solderable surface of the terminal to the package may be defined by an opening in the soldermask resist layer as defined in Figure 1 – Solder Mask Defined Pad. For this type of SMD Pad, the Soldermask Opening shape is mandatory while the Pad shape is optional.



**Figure 1 - Solder Mask Defined Pad**

Alternatively, the solderable surface of the terminal to the package may be defined by the size of the metalized pad as defined in Figure 2 –Non Solder Mask Defined Pad. For this type of NSMD Pad, the Soldermask Opening shape is optional while the Pad shape is mandatory.



**Figure 2 - Non Solder Mask Defined Pad**

The preferred method of capturing ball dimensions is via the [BallTerminalShapeType](#) as shown in diagram 1.3 of 9. Information as specified in diagrams 1, 1.1, 1.2 and 1.3 are applicable for Ball terminals.

### 5.15.1.7.2 C-bend

Table 17 shows an array of dimensions that are applicable to this terminal.

**Table 17 - C-bend Dimensions**

Schema Labels	Symbol	Schema Types	Data Requirements
Length	L	JEP30-D10:DimensionalValueSetType	Mandatory – but can be derived by other dimensions provided
PackageEdge-to-end-of-Terminal	L1	JEP30-D10:ValueSetType	Mandatory – but can be derived by other dimensions provided
Width	b	JEP30-D10:UnspecifiedDimensionalValueSetType	Mandatory
TerminalHeight	A3	JEP30-D10:UnspecifiedDimensionalValueSetType	Optional
TerminalThickness	c	JEP30-D10:UnspecifiedValueSetType	Mandatory
RadiusTop	R1	JEP30-D10:UnspecifiedValueSetType	Optional
RadiusBottom	R2	JEP30-D10:UnspecifiedValueSetType	Optional
SeatingAngle	$\Phi 1$	JEP30-D10:UnspecifiedValueSetType	Optional
RiseAngle	$\Phi 2$	JEP30-D10:UnspecifiedValueSetType	Optional
PlatingThickness	p	JEP30-D10:UnspecifiedValueSetType	Mandatory
BaseMetal	b1, c1	BaseMetalType	Mandatory

The definition of each shape is outlined in Annex A (informative) Shape Definitions & Dimensions

### 5.15.1.7.3 Lug

Table 18 shows an array of dimensions that are applicable to this terminal.

**Table 18 - Lug Dimensions**

Schema Labels	Symbol	Schema Types	Data Requirements
TerminalHeight	A3	JEP30-D10:UnspecifiedDimensionalValueSetType	Mandatory
TerminalInsertionHeight		JEP30-D10:UnspecifiedValueSetType	Mandatory
Shoulder		ConfigurableShoulderType	Optional

In addition to this table of dimensions, any one of the 2D shapes as defined in diagram 6 of 8 in this section. The definition of each shape is outlined in Annex A (informative) Shape Definitions & Dimensions.

#### 5.15.1.7.4 Flat

Table 19 shows an array of dimensions that are applicable to this terminal.

**Table 19 - Flat Terminal Type Dimensions**

Schema Labels	Flat	Elevated	Flat – L-bend	Hole	With- opening	Schema Types
One of the following 2D shapes is applicable to this Terminal type						
Rectangle	Y	Y	Y	Y	Y	ReferenceRectangleType
RoundedRectangle	Y			Y	Y	ReferenceRoundedRectangleType
ModifiedRectangle	Y	Y	Y	Y	Y	ReferenceModifiedRectangleType
D-Shape	Y					ReferenceD-ShapeType
Double-D	Y			Y	Y	ReferenceDouble-DType
The dimensions below are mandatory if applicable						
Terminal Height			Y			JEP30-D10: UnspecifiedDimensionalValueSetType
TerminalThickness	Y	Y	Y	Y	Y	JEP30-D10:UnspecifiedValueSetType
ExposedTerminalThickness	Opt		Opt	Opt	Opt	JEP30- D10:UnspecifiedDimensionalValueSetType
PackageEdge-to-End-of- Terminal	Y	Y	Y	Y	Y	JEP30-D10:ValueSetType
SpecificPackageEdge-to- End-of-Terminal	Opt			Opt	Opt	SpecificPackageEdge-to-End-of- TerminalType
PlatingThickness	Y	Y	Y	Y	Y	JEP30-D10:UnspecifiedValueSetType
TerminalVoid-Array				Y	Y	TerminalVoid-ArrayType
BaseMetal	Y					BaseMetaltype

The definition of each shape is outlined in Annex A (informative) Shape Definitions & Dimensions.

5.15.1.7.4.1 Specific Package Edge-to-End-of-Terminal

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/SpecificPackageEdge-to-End-of-Terminal
diagram	
type	SpecificPackageEdge-to-End-of-TerminalType, JEP30-D10:EmptyType.
group	JEP30-D10:ValueSetGroup

### 5.15.1.7.5 Gull-wing

Table 20 shows an array of dimensions that are applicable to this terminal.

**Table 20 - Gull-wing Dimensions**

Schema Labels	Symbol	Schema Types	Data Requirements
Length	L	JEP30-D10:DimensionalValueSetType	Mandatory – but can be derived by other dimensions provided
PackageEdge-to-end-of-Terminal	L1	JEP30-D10:ValueSetType	Mandatory – but can be derived by other dimensions provided
Width	b	JEP30-D10:UnspecifiedDimensionalValueSetType	Mandatory
ModifiedCorner		ImpactedCornerType	Optional
Contour		ReferenceTerminalContourType	Optional
TerminalHeight	A3	JEP30-D10:UnspecifiedDimensionalValueSetType	Optional
TerminalThickness	c	JEP30-D10:UnspecifiedValueSetType	Mandatory
RadiusTop	R1	JEP30-D10:UnspecifiedValueSetType	Optional
RadiusBottom	R2	JEP30-D10:UnspecifiedValueSetType	Optional
SeatingAngle	Φ1	JEP30-D10:UnspecifiedValueSetType	Optional
RiseAngle	Φ2	JEP30-D10:UnspecifiedValueSetType	Optional
PlatingThickness	p	JEP30-D10:UnspecifiedValueSetType	Mandatory
BaseMetal	b1, c1	BaseMetalType	Mandatory
One of the following two elements is applicable to this Terminal type			
ToeUp		JEP30-D10:EmptyType	If omitted, and seating angle is specified, then the default is <b>ToeDown</b> .
ToeDown		JEP30-D10:EmptyType	
One of the following elements is applicable if there is a Shoulder or Neck on this Gull-wing			
Shoulder		ConfigurableShoulderType	Optional
Neck		NeckType	Optional
If the Gull-wing has a Dambar, then the following element is Optional			
Dambar		DambarType	Optional

Shoulder and Kinked are described in sections 4.15.1.5.15 Shoulder and 4.15.1.5.16 Kinked below, since they are applicable to other terminals.

### 5.15.1.7.5.1 Modified Corner

path	<a href="#">PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/ModifiedCorner</a>
diagram	
type	<a href="#">ModifiedCornerType</a> , <a href="#">ImpactedTerminalType</a> , <a href="#">TerminalCenterType</a> , <a href="#">Impact-to-TerminalGroupType</a> , <a href="#">Apply-to-all-TerminalsType</a> , <a href="#">SymmetryType</a> , <a href="#">ImpactedCornerType</a> , <a href="#">CornerType</a> .

### 5.15.1.7.5.1.1 Impacted Terminal

path	<a href="#">PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/ModifiedCorner/ImpactedTerminal</a>
diagram	
type	<a href="#">ImpactedTerminalType</a> , <a href="#">TerminalCenterType</a> , <a href="#">JEP30-D10:PointXYType</a> , <a href="#">JEP30-D10:MinIntegerOfOneType</a> .

### 5.15.1.7.5.1.2 Impact – to – Terminal Group

path	<a href="#">PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/ModifiedCorner/Impact-to-TerminalGroup</a>
diagram	
type	<a href="#">Impact-to-TerminalGroupType</a> , <a href="#">Apply-to-all-TerminalsType</a> , <a href="#">SymmetryType</a> , <a href="#">SymmetryRotationType</a> , <a href="#">ReflectionType</a> ,

### 5.15.1.7.5.1.2.1 Apply – to – all - Terminals

path	<a href="#">PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/ModifiedCorner/ShapeImpactedCorner</a>
diagram	
type	<a href="#">Apply-to-all-TerminalsType</a> , <a href="#">CornerImpact-to-StandardArrayType</a> , <a href="#">JEP30-D10:EmptyType</a> .



### 5.15.1.7.5.1.2.2 Rotation

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/ModifiedCorner/Impact-to-TerminalGroup/Symmetry/Rotation
diagram	
type	SymmetryRotationType, SymmetryRotationAxisType, SymmetryRotationCenterType, JEP30-D10:EmptyType.

### 5.15.1.7.5.1.2.3 Reflection

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/ModifiedCorner/Impact-to-TerminalGroup/Symmetry/Reflection
diagram	
type	ReflectionType, ReflectionAxisType, JEP30-D10:EmptyType, ReflectionInversionCenterType.

5.15.1.7.5.1.3      Shape Impacted Corner

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/ModifiedCorner/ShapeImpactedCorner
diagram	
type	ImpactedCornerType, CornerType, ChamferedCornerType, RectangularInCornerType, ConvexCornerType, ConcaveCornerType, CornerArcType.

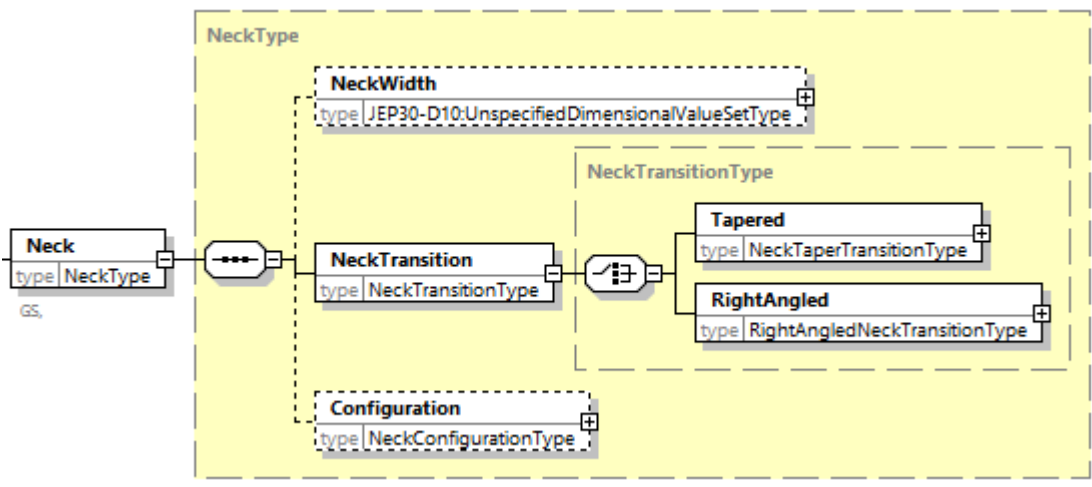
#### 5.15.1.7.5.1.4 Corner Type

path	<p>PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/ModifiedCorner/ShapeImpactedCorner/NE</p> <p>PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/ModifiedCorner/ShapeImpactedCorner/SE</p> <p>PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/ModifiedCorner/ShapeImpactedCorner/SW</p> <p>PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/ModifiedCorner/ShapeImpactedCorner/NW</p>
diagram	<pre> classDiagram     class CornerType {         type CornerType     }     class ChamferedCorner {         type ChamferedCornerType         DX JEP30-D10:UnspecifiedValueSetType         DY JEP30-D10:UnspecifiedValueSetType     }     class RectangularInCorner {         type RectangularInCornerType         DX JEP30-D10:UnspecifiedValueSetType         DY JEP30-D10:UnspecifiedValueSetType     }     class ConvexCorner {         type ConvexCornerType         Radius JEP30-D10:UnspecifiedValueSetType         ConvexCornerCenter JEP30-D10:PointXYType     }     class ConcaveCorner {         type ConcaveCornerType         Radius JEP30-D10:UnspecifiedValueSetType         ConcaveCornerCenter JEP30-D10:PointXYType     }     class CornerArc {         type CornerArcType         Radius1 JEP30-D10:UnspecifiedValueSetType         Radius2 JEP30-D10:UnspecifiedValueSetType         Neck JEP30-D10:UnspecifiedValueSetType         CornerArcCenter JEP30-D10:PointXYType     }     CornerType &lt; -- ChamferedCorner     CornerType &lt; -- RectangularInCorner     CornerType &lt; -- ConvexCorner     CornerType &lt; -- ConcaveCorner     CornerType &lt; -- CornerArc </pre>
type	<p>ImpactedCornerType, CornerType, ChamferedCornerType, RectangularInCornerType, ConvexCornerType, ConcaveCornerType, CornerArcType.</p>

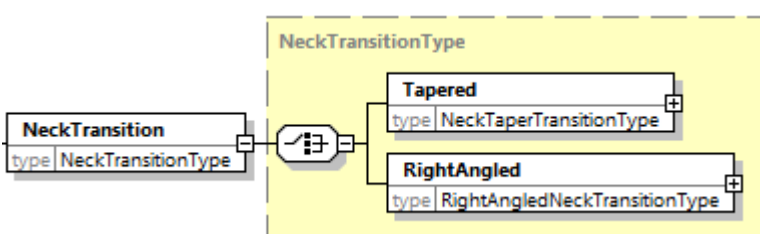
5.15.1.7.5.2 Reference Terminal Contour Type

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/Contour
diagram	<div><div><div><div><div>Contour</div><div>type ReferenceTerminalContourType</div><div>B, BB, BC, BN, F, FL, FH, FO, G, GS, M, MR, MM, MC, N, NC, NH, NO, NR, P, PK, PS, PP, PN, T, TK, TS, R, RC, RR, RO, RN, RE, RS, T, TK, TS, W, WK, WS, WC, WR, WO</div></div></div><div><div>ReferenceTerminalContourType</div><div><div><div>ID</div><div>type xs:string</div></div><div><div>X-Tolerance</div><div>type ContourToleranceType</div></div><div><div>Y-Tolerance</div><div>type ContourToleranceType</div></div><div><div>OutlineReference</div><div>type OutlineReferenceType</div></div><div><div>ImpactedTerminal</div><div>type ImpactedTerminalType</div></div><div><div>Impact-to-TerminalGroup</div><div>type Impact-to-TerminalGroupType</div></div><div><div>FootnoteID</div><div>type xs:string</div></div></div><div>0..∞</div></div><div><div>OutlineReferenceType</div><div><div><div>TerminalCenter</div><div>type JEP30-D10:EmptyType</div></div><div><div>PackageBodyCenter</div><div>type JEP30-D10:EmptyType</div></div><div><div>Outline-Array</div><div>type Outline-ArrayType</div></div></div></div></div></div> <div>type</div> <div>ReferenceTerminalContourType, ContourToleranceType, OutlineReferenceType, JEP30-D10:EmptyType, Outline-ArrayType, ImpactedTerminalType, Impact-to-TerminalGroupType.</div>

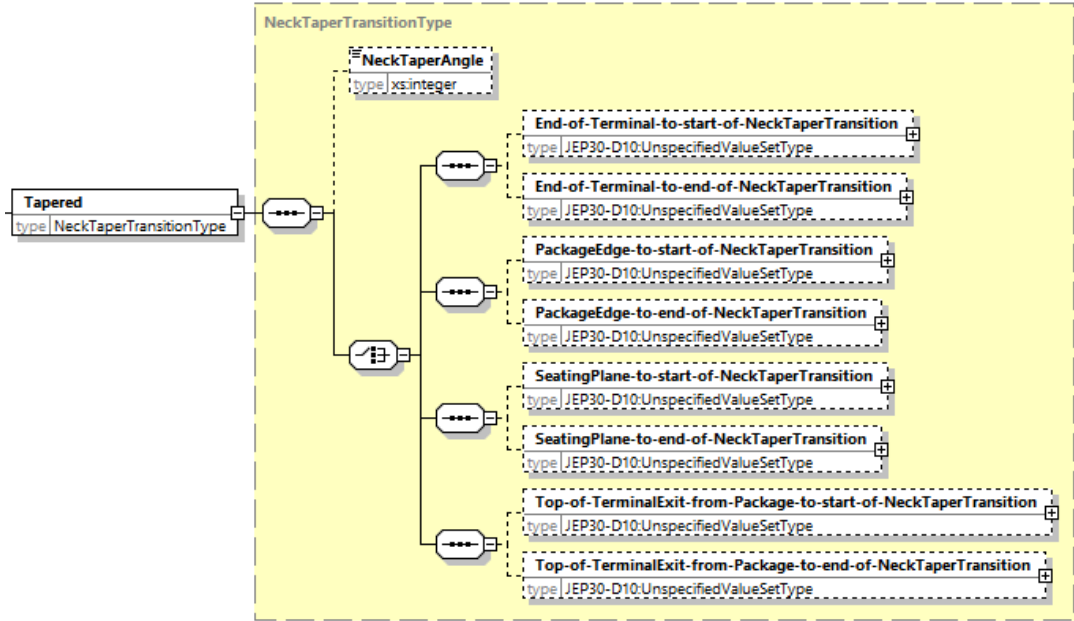
5.15.1.7.5.3 Neck

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/Neck
diagram	 <p>The diagram illustrates the structure of the Neck class. It is a class with a type NeckType and a generalization relationship (GS) to a base class. The Neck class has a composition relationship with NeckTransition. NeckTransition has a composition relationship with NeckTransitionType. NeckTransitionType has two composition relationships: one with Tapered (type NeckTaperTransitionType) and one with RightAngled (type RightAngledNeckTransitionType). Additionally, NeckTransitionType has a composition relationship with Configuration (type NeckConfigurationType). NeckTransitionType also has a composition relationship with NeckWidth (type JEP30-D10:UnspecifiedDimensionalValueSetType).</p>
type	NeckType, JEP30-D10:UnspecifiedDimensionalValueSetType, NeckTransitionType, NeckTaperTransitionType, RightAngledNeckTransitionType, ShoulderConfigurationType

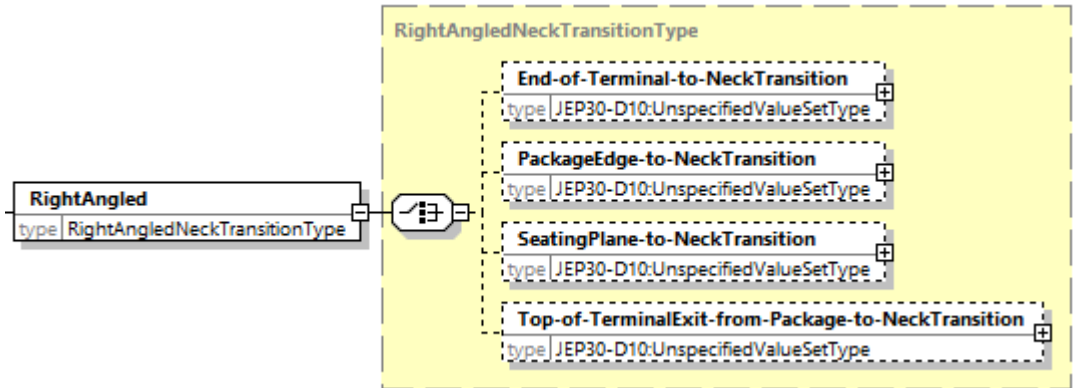
5.15.1.7.5.3.1 Neck Transition

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/Neck/NeckTransition
diagram	 <p>The diagram illustrates the structure of the NeckTransition class. It is a class with a type NeckTransitionType and a composition relationship with NeckTransitionType. NeckTransitionType has two composition relationships: one with Tapered (type NeckTaperTransitionType) and one with RightAngled (type RightAngledNeckTransitionType).</p>
type	ShoulderTransitionType, ShoulderTaperTransitionType, RightAngledShoulderTransitionType.

5.15.1.7.5.3.1.1      Tapered

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/Neck/NeckTransition/Tapered
diagram	 <p>The diagram illustrates the structure of the NeckTaperTransitionType. It features a central box labeled 'Tapered' with the type 'NeckTaperTransitionType'. This box is connected to a larger dashed box labeled 'NeckTaperTransitionType'. Inside this dashed box, there is a 'NeckTaperAngle' box with type 'xs:integer'. Below the angle box, there are eight transition boxes, each with a '+' icon in the top right corner. These transitions are: 'End-of-Terminal-to-start-of-NeckTaperTransition' (type JEP30-D10:UnspecifiedValueSetType), 'End-of-Terminal-to-end-of-NeckTaperTransition' (type JEP30-D10:UnspecifiedValueSetType), 'PackageEdge-to-start-of-NeckTaperTransition' (type JEP30-D10:UnspecifiedValueSetType), 'PackageEdge-to-end-of-NeckTaperTransition' (type JEP30-D10:UnspecifiedValueSetType), 'SeatingPlane-to-start-of-NeckTaperTransition' (type JEP30-D10:UnspecifiedValueSetType), 'SeatingPlane-to-end-of-NeckTaperTransition' (type JEP30-D10:UnspecifiedValueSetType), 'Top-of-TerminalExit-from-Package-to-start-of-NeckTaperTransition' (type JEP30-D10:UnspecifiedValueSetType), and 'Top-of-TerminalExit-from-Package-to-end-of-NeckTaperTransition' (type JEP30-D10:UnspecifiedValueSetType).</p>
type	NeckTaperTransitionType, JEP30-D10:UnspecifiedValueSetType

5.15.1.7.5.3.1.2      Right Angled

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/Neck/NeckTransition/RightAngled
diagram	 <p>The diagram illustrates the structure of the RightAngledNeckTransitionType. It features a central box labeled 'RightAngled' with the type 'RightAngledNeckTransitionType'. This box is connected to a larger dashed box labeled 'RightAngledNeckTransitionType'. Inside this dashed box, there are four transition boxes, each with a '+' icon in the top right corner. These transitions are: 'End-of-Terminal-to-NeckTransition' (type JEP30-D10:UnspecifiedValueSetType), 'PackageEdge-to-NeckTransition' (type JEP30-D10:UnspecifiedValueSetType), 'SeatingPlane-to-NeckTransition' (type JEP30-D10:UnspecifiedValueSetType), and 'Top-of-TerminalExit-from-Package-to-NeckTransition' (type JEP30-D10:UnspecifiedValueSetType).</p>
type	RightAngledNeckTransitionType, JEP30-D10:UnspecifiedValueSetType

5.15.1.7.5.3.2 Configuration

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/Neck/Configuration
diagram	<p>The diagram illustrates the structure of the NeckConfigurationType. It is a class that can be configured in three ways: Inward, Centered, or Outward, all of which are represented by the JEP30-D10:EmptyType. Additionally, it includes a NeckOffset configuration, which is represented by the NeckOffsetType class. This class further defines two offset types: InnerOffset and OuterOffset, both of which are represented by the JEP30-D10:UnspecifiedValueSetType.</p>
type	NeckConfigurationType, JEP30-D10:EmptyType, NeckOffsetType, JEP30-D10:UnspecifiedValueSetType

### 5.15.1.7.6 Post (Stud) Terminal

Table 21 shows an array of dimensions that are applicable to this terminal.

**Table 21 - Post (Stud) Terminal Dimensions**

Schema Labels	Butt	Flatten Post Connection	Schema Types	Data Requirements
Length		Y	JEP30-D10:DimensionalValueSetType	Mandatory
PackageEdge-to-end-of-Terminal	Y		JEP30-D10:ValueSetType	Mandatory
PackageEdge-to-TerminalKnee	Y		JEP30-D10:DimensionalValueSetType	Optional
Width	Y	Y	JEP30-D10:UnspecifiedDimensionalValueSetType	Mandatory
TerminalHeight	Y	Y	JEP30-D10:UnspecifiedDimensionalValueSetType	Mandatory
TerminalThickness	Y	Opt	JEP30-D10:UnspecifiedValueSetType	Mandatory
RadiusTop	Y		JEP30-D10:UnspecifiedValueSetType	Optional
RiseAngle	Y		JEP30-D10:UnspecifiedValueSetType	Optional
TerminalPostWidth		Y	JEP30-D10:UnspecifiedValueSetType	Optional
TerminalPostThickness		Y	JEP30-D10:UnspecifiedValueSetType	Optional
TerminalFootThickness		Y	JEP30-D10:UnspecifiedValueSetType	Optional
PlatingThickness	Y	Y	JEP30-D10:UnspecifiedValueSetType	Mandatory

The definition of each shape is outlined in Annex A (informative) Shape Definitions & Dimensions.



### 5.15.1.7.7 J-bend

Table 22 shows an array of dimensions that are applicable to this terminal.

**Table 22 - J-bend Dimensions**

Schema Labels	Symbol	Schema Types	Data Requirements
Length	L	JEP30-D10:DimensionalValueSetType	Mandatory – but can be derived by other dimensions provided
PackageEdge-to-end-of-Terminal	L1	JEP30-D10:ValueSetType	Mandatory – but can be derived by other dimensions provided
Width	b	JEP30-D10:UnspecifiedDimensionalValueSetType	Mandatory
TerminalHeight	A3	JEP30-D10:UnspecifiedDimensionalValueSetType	Optional
TerminalBendHeight		JEP30-D10:UnspecifiedValueSetType	Optional
TerminalThickness	c	JEP30-D10:UnspecifiedValueSetType	Mandatory
RadiusTop	R1	JEP30-D10:UnspecifiedValueSetType	Optional
RadiusBottom	R2	JEP30-D10:UnspecifiedValueSetType	Optional
RiseAngle	Φ2	JEP30-D10:UnspecifiedValueSetType	Optional
PlatingThickness	p	JEP30-D10:UnspecifiedValueSetType	Mandatory
BaseMetal	b1, c1	BaseMetalType	Mandatory
If the Terminal has a Shoulder, then the following elements is applicable.			
Shoulder		ConfigurableShoulderType	Optional

The definition of each shape is outlined in Annex A (informative) Shape Definitions & Dimensions.

### 5.15.1.7.8 L-bend

Table 23 shows an array of dimensions that are applicable to this terminal.

**Table 23 - L-bend Dimensions**

Schema Labels	Inward	Outward	Side Inward	Side Outward	LC-bend	Schema Types
Length	Y	Y	Y	Y	Y	JEP30-D10:DimensionalValueSetType
PackageEdge-to-End-of-Terminal		Y	Opt	Y	Y	JEP30-D10:ValueSetType
Width	Y	Y	Y	Y	Y	JEP30-D10:UnspecifiedDimensionalValueSetType
Terminal Height	Y	Y	Y	Y	Y	JEP30-D10:UnspecifiedDimensionalValueSetType
TerminalThickness	Y	Y	Opt	Opt	Y	JEP30-D10:UnspecifiedValueSetType
ExposedTerminalThickness	Y	Y	Y	Y		JEP30-D10:UnspecifiedValueSetType
RadiusBottom	Y	Y	Y	Y		JEP30-D10:UnspecifiedValueSetType
RadiusInsideBottom					Y	JEP30-D10:UnspecifiedValueSetType
RadiusOutsideBottom					Y	JEP30-D10:UnspecifiedValueSetType
SeatingAngle	Y	Y	Y	Y	Y	JEP30-D10:UnspecifiedValueSetType
PlatingThickness	Y	Y	Y	Y	Y	JEP30-D10:UnspecifiedValueSetType
BaseMetal	Y	Y	Y	Y		BaseMetalType

The definition of each shape is outlined in Annex A (informative) Shape Definitions & Dimensions.

### 5.15.1.7.9 Column Types

Table 24 shows an array of dimensions that are applicable to this terminal:

**Table 24 - Column Type Dimensions**

Schema Labels	Column Types	Applicable Shapes to capture			Schema Types
		Terminal Shape	Soldermask Opening	Pad Shape	
Rectangle	All		NSMD	SMD	ReferenceRectangleType
Rounded Rectangle	All		NSMD	SMD, NSMD	ReferenceRoundedRectangleType
Modified Rectangle	All		NSMD	SMD	ReferenceModifiedRectangleType
Circle	All	SMD, NSMD	SMD, NSMD	SMD, NSMD	ReferenceCircleType
Double-D	All		NSMD	SMD	ReferenceDouble-DType
Contour	All		NSMD	SMD	ReferenceTerminalContourType
Terminal Height	All	SMD, NSMD	n/a	n/a	JEP30-D10: UnspecifiedDimensionalValueSetType
UpperSide-of-Column	Column	Y			UpperSide-of-ColumnShapeType
LowerSide-of-Column	Column	Y			LowerSide-of-ColumnShapeType

All Column variations have only a circular terminal shape, even if mounted on the package via a SMD or a NSMD pad. The definition of each shape is outlined in Annex A (informative) Shape Definitions & Dimensions.

When *Column* has an no extended terminal code, then the Terminal shape dimensions should be classified for either the *LowerSide-of-Column* and/or the *UpperSide-of-Column*. If both ends of the terminal are different (i.e., Column is tapered), then two entries are required to capture both shape dimensions. The *LowerSide-of-Column* terminal shape is mandatory, whereas the *UpperSide-of-Column* terminal shape dimensions are optional. If the column is not tapered, then both of these flags are set for the same dimension captured.

When the *Column* has an extended terminal code to denote *Ribbon Wrap*, then the element *RibbonThickness*, *RibbonHeight*, *RibbonPitch* are applicable. These elements have an *UnspecifiedValueSetType* and are optional. The *Number-of-Turns* in the helix can also be captured in addition to the *Direction-of-Helix* as in *LeftSpiral* or *RightSpiral*.

When the *Column* has an extended terminal code to denote *Microspring*, then the element *SpringConstant*, *WireDiameter* and *SpringLengthFreeLoad* are applicable. The *WireDiameter* element has an *UnspecifiedValueSetType* and is optional. The *SpringLengthFreeLoad* element has an *DimensionalValueSetType* and is mandatory. When the *Column* has an extended terminal code to denote *Copper Coated Solder Column*, then the element *CopperThickness* is applicable. This has an *UnspecifiedValueSetType* and is optional. An additional entry is required to capture the *Core* shape dimensions.

The preferred method of capturing Column dimensions is via the *ColumnTerminalShapeType* as shown in diagram 1.4 of 9, coupled with diagrams 1, 1.1, and 1.2 similar to Ball terminals.

### 5.15.1.7.10 Surface-terminal

Table 25 shows an array of dimensions that are applicable to this terminal.

**Table 25 - Surface-terminal Dimensions**

Schema Labels	Surface-terminal	Castellated	Hole	With-opening	Open-Ring	Schema Types
One of the following 2D shapes is applicable to this Terminal type						
Rectangle	Y	Y	Y	Y	Y	ReferenceRectangleType
RoundedRectangle	Y		Y	Y		ReferenceRoundedRectangleType
ModifiedRectangle	Y	Y	Y	Y	Y	ReferenceModifiedRectangleType
Circle	Y		Y	Y		ReferenceCircleType
D-Shape	Y	Y				ReferenceD-ShapeType
Double-D	Y		Y	Y		ReferenceDouble-DType
Ellipse	Y		Y	Y		ReferenceEllipseType
Rectangle with Single Elliptical End	Y	Y				ReferenceRectangleWithSingleEllipticalEndType
MickeyMouseEars			Y			ReferenceTerminalContourType
RegularPolygon	Y		Y	Y		RegularPolygonType
Segment	Y					SegmentType
Para-truncatedCircle	Y		Y	Y		
Contour	Y	Y	Y	Y	Y	ReferenceTerminalContourType
The elements below are mandatory if applicable						
ExposedTerminalThickness	Y	Y	Y	Y	Y	JEP30-D10:UnspecifiedValueSetType
Terminal Height	Y	Y			Y	JEP30-D10:UnspecifiedDimensionalValueSetType
SpecificPackageEdge-to-End-of-Terminal	Y		Y	Y		SpecificPackageEdge-to-End-of-TerminalType
TerminalVoid-Array			Y	Y		TerminalVoid-ArrayType
The elements below are optional if applicable						
CircularCastellation		Y			Y	CircularCastellationType
TriangularCastellation		Y			Y	TriangularCastellationType
ChamferedRectangleCastellation		Y			Y	ChamferedRectangleCastellationType
RoundedRectangleCastellation		Y			Y	RoundedRectangleCastellationType

The definition of each shape is outlined in Annex A (informative) Shape Definitions & Dimensions.

### 5.15.1.7.11 Pin

Table 26 shows an array of dimensions that are applicable to this terminal.

**Table 26 - Pin Dimensions**

Schema Labels	Pin	Kinked	Shoulder	Press-in Solderable	Surface-mount	Swage Fastening Pin	Press-in Non-Solderable	Schema Types
TerminalInsertionHeight	Y	Y	Y	Y			Y	JEP30-D10:UnspecifiedValueSetType
Diameter	Y	Y	Y	Y	Y		Y	JEP30-D10: DimensionalValueSetType
Width	Y	Y	Y	Y	Y		Y	JEP30-D10:UnspecifiedDimensionalValueSetType
TerminalThickness	Y	Y	Y	Y	Y		Y	JEP30-D10:UnspecifiedValueSetType
TerminalHeight	Y	Y	Y	Y	Y		Y	JEP30-D10:UnspecifiedDimensionalValueSetType
SpecificPackageEdge-to-End-of-Terminal	Y		Y					SpecificPackageEdge-to-End-of-TerminalType
PlatingThickness	Y	Y	Y	Y	Y			JEP30-D10:UnspecifiedValueSetType
Contour	Y	Y	Y	Y	Y		Y	ReferenceTerminalContourType
Kinked		Y						KinkedType
Shoulder			Y	Y			Y	ConfigurableShoulderType
SwageFasteningPin						Y		SwageFasteningPinType
TerminalEndShape	Y	Y	Y	Y	Y		Y	TerminalEndShapeType
TerminalPostWidth					Y			JEP30-D10:UnspecifiedValueSetType
TerminalPostThickness					Y			JEP30-D10:UnspecifiedValueSetType
BaseMetal	Y	Y	Y		Y			BaseMetalType

The definition of each shape is outlined in Annex A (informative) Shape Definitions & Dimensions.

5.15.1.7.11.1 Swage Fastening Pin

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/SwageFasteningPin
diagram	
type	SwageFasteningPinType, JEP30-D10:DimensionalValueSetType, SwageFasteningPinTailStyleType,

5.15.1.7.11.1.1 Tail Style

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/SwageFasteningPin/TailStyle
diagram	
type	SwageFasteningPinTailStyleType, SwageFasteningPinSlottedTailStyleType, SwageFasteningPinTurretTailStyleType

#### 5.15.1.7.11.1.1 Slotted

path	<a href="#">PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/SwageFasteningPin/TailStyle/Slotted</a>
diagram	
type	<a href="#">SwageFasteningPinSlottedTailStyleType</a> , <a href="#">JEP30-D10:DimensionalValueSetType</a> .

#### 5.15.1.7.11.1.2 Turret

path	<a href="#">PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/SwageFasteningPin/TailStyle/Turret</a>
diagram	
type	<a href="#">SwageFasteningPinTurretTailStyleType</a> , <a href="#">JEP30-D10:DimensionalValueSetType</a> .

### 5.15.1.7.12 Wraparound

Table 27 shows an array of dimensions that are applicable to this terminal.

**Table 27 - Wraparound Dimensions**

Schema Labels	Wraparound	Castellated	Ring	Open-Ring	Nibble	Convex-E	Convex-S	Schema Types
One of the following 2D shapes is applicable to this Terminal type								
Rectangle	Y	Y	Y	Y	Y	Y	Y	ReferenceRectangleType
ModifiedRectangle	Y	Y	Y	Y	Y		Y	ReferenceModifiedRectangleType
Contour	Y	Y	Y	Y	Y		Y	ReferenceTerminalContourType
The elements below are mandatory if applicable								
ExposedTerminalThickness	Y	Y	Y	Y	Y	Y	Y	JEP30-D10:UnspecifiedValueSetType
Terminal Height	Y	Y	Y	Y	Y	Y	Y	JEP30-D10:UnspecifiedDimensionalValueSetType
The elements below are optional if applicable								
CircularCastellation		Y	Y	Y				CircularCastellationType
TriangularCastellation		Y	Y	Y				TriangularCastellationType
ChamferedRectangleCastellation		Y	Y	Y				ChamferedRectangleCastellationType
RoundedRectangleCastellation		Y	Y	Y				RoundedRectangleCastellationType

The definition of each shape is outlined in Annex A (informative) Shape Definitions & Dimensions.



### 5.15.1.7.13 S-bend Terminal

Table 28 shows an array of dimensions that are applicable to this terminal.

**Table 28 - S-bend Dimensions**

Schema Labels	S-bend	Inward Flat	Inward Curved	Outward Flat	Outward Curved	Schema Types
Length	Y	Y	Y	Y	Y	JEP30-D10:DimensionalValueSetType
PackageEdge-to-End-of-Terminal	Y			Y	Y	JEP30-D10:ValueSetType
Width	Y	Y	Y	Y	Y	JEP30-D10:UnspecifiedDimensionalValueSetType
Terminal Height	Opt	Opt	Opt	Opt	Opt	JEP30-D10:UnspecifiedDimensionalValueSetType
TerminalBendHeight			Opt		Opt	JEP30-D10:UnspecifiedValueSetType
TerminalThickness	Y	Y	Y	Y	Y	JEP30-D10:UnspecifiedValueSetType
RadiusTop	Y	Y	Y	Y	Y	JEP30-D10:UnspecifiedValueSetType
RadiusBottom	Y	Y	Y	Y	Y	JEP30-D10:UnspecifiedValueSetType
PlatingThickness	Y	Y	Y	Y	Y	JEP30-D10:UnspecifiedValueSetType
BaseMetal	Y	Y	Y	Y	Y	BaseMetalType

The definition of each shape is outlined in Annex A (informative) Shape Definitions & Dimensions.

#### 5.15.1.7.14 Through - Hole

Table 29 - Through - Hole Dimensions shows an array of dimensions that are applicable to this terminal.

**Table 29 - Through - Hole Dimensions**

Schema Labels	Through - Hole	Kinked	Shoulder	Schema Types
PackageEdge-to-TerminalKnee	Y	Y	Y	JEP30-D10: DimensionalValueSetType
Diameter	Y	Y	Y	JEP30-D10: DimensionalValueSetType
Width	Y	Y	Y	JEP30-D10: UnspecifiedDimensionalValueSetType
TerminalThickness	Y	Y	Y	JEP30-D10: UnspecifiedValueSetType
TerminalHeight	Y	Y	Y	JEP30-D10: UnspecifiedDimensionalValueSetType
TerminalInsertionHeight	Y	Y	Y	JEP30-D10: UnspecifiedValueSetType
SpecificPackageEdge-to-End-of-Terminal	Y		Y	SpecificPackageEdge-to-End-of-TerminalType
Un-preppedTerminalLength	Y	Y	Y	JEP30-D10: UnspecifiedValueSetType
RadiusTop	Y	Y	Y	JEP30-D10: UnspecifiedValueSetType
RiseAngle	Y	Y	Y	JEP30-D10: UnspecifiedValueSetType
PlatingThickness	Y	Y	Y	JEP30-D10: UnspecifiedValueSetType
TerminalEndShape	Y	Y	Y	TerminalEndShapeType
Contour	Y	Y	Y	ReferenceTerminalContourType
Kinked		Y		KinkedType
Shoulder			Y	ConfigurableShoulderType
BaseMetal	Y	Y	Y	BaseMetalType

The definition of each shape is outlined in Annex A (informative) Shape Definitions & Dimensions

### 5.15.1.7.15 J-inverted

Table 30 shows an array of dimensions that are applicable to this terminal.

**Table 30 - J-inverted Dimensions**

Schema Labels	Symbol	Schema Types	Data Requirements
Length	L	JEP30-D10:DimensionalValueSetType	Mandatory – but can be derived by other dimensions provided
PackageEdge-to-end-of-Terminal	L1	JEP30-D10:ValueSetType	Mandatory – but can be derived by other dimensions provided
PackageEdge-to-TerminalKnee		JEP30-D10:DimensionalValueSetType	Optional
Width	b	JEP30-D10:UnspecifiedDimensionalValueSetType	Mandatory
TerminalHeight	A3	JEP30-D10:UnspecifiedDimensionalValueSetType	Optional
TerminalBendHeight		JEP30-D10:UnspecifiedValueSetType	Optional
TerminalThickness	c	JEP30-D10:UnspecifiedValueSetType	Mandatory
RadiusTop	R1	JEP30-D10:UnspecifiedValueSetType	Optional
RadiusBottom	R2	JEP30-D10:UnspecifiedValueSetType	Optional
RiseAngle	Φ2	JEP30-D10:UnspecifiedValueSetType	Optional
PlatingThickness	p	JEP30-D10:UnspecifiedValueSetType	Mandatory
BaseMetal	b1, c1	BaseMetalType	Mandatory
If the Terminal has a Shoulder, then the following elements is applicable.			
Shoulder		ConfigurableShoulderType	Optional

The definition of each shape is outlined in Annex A (informative) Shape Definitions & Dimensions.

### 5.15.1.7.16 Terminal Wire

Table 31 shows an array of dimensions that are applicable to this terminal.

**Table 31 - Terminal Wire Dimensions**

Schema Labels	Terminal Wire	Kinked (Bent)	SM-Wire	SM-Coined Wire	Wraparound SMT Mount	Coined Wraparound SMT Mount	Schema Types
<a href="#">TerminalInsertionHeight</a>	Y	Y	Y	Y			<a href="#">JEP30-D10:UnspecifiedValueSetType</a>
<a href="#">Diameter</a>	Y	Y	Y	Y			<a href="#">JEP30-D10: DimensionalValueSetType</a>
<a href="#">WireGuage</a>	Y	Y	Y	Y	Y	Y	<a href="#">WireGuageType</a>
<a href="#">TerminalHeight</a>	Y	Y	Y	Y	Y	Y	<a href="#">JEP30-D10:UnspecifiedDimensionalValueSetType</a>
<a href="#">TerminalThickness</a>	Y	Y	Y	Y	Y	Y	<a href="#">JEP30-D10:UnspecifiedValueSetType</a>
<a href="#">PlatingThickness</a>	Y	Y	Y	Y			<a href="#">JEP30-D10:UnspecifiedValueSetType</a>
<a href="#">Kinked</a>		Y					<a href="#">KinkedType</a>
<a href="#">Un-preppedTerminalLength</a>	Y						<a href="#">JEP30-D10:UnspecifiedValueSetType</a>
<a href="#">Contour</a>	Y	Y	Y	Y	Y	Y	<a href="#">ReferenceTerminalContourType</a>
<a href="#">Rectangle</a>	Y	Y	Y	Y	Y	Y	<a href="#">ReferenceRectangleType</a>
<a href="#">WireEndShape</a>	Y	Y	Y	Y			<a href="#">WireEndShapeType</a>
<a href="#">TerminalEndShape</a>	Y	Y	Y	Y			<a href="#">TerminalEndShapeType</a>

[WireGuage](#) is a numerical integer value between 10 and 40. The definition of each shape is outlined in Annex A (informative) Shape Definitions & Dimensions.

### 5.15.1.7.17 Screw

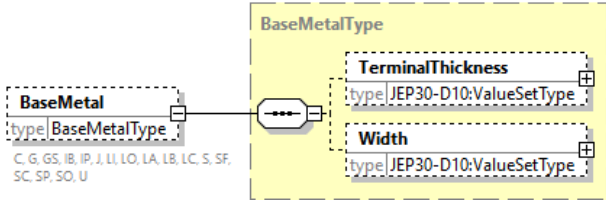
Table 32 shows an array of dimensions that are applicable to this terminal.

**Table 32 - Screw Dimensions**

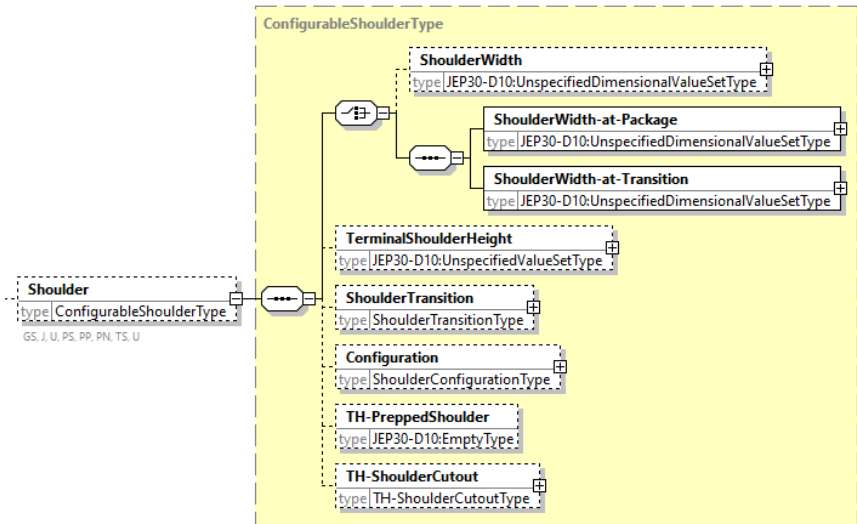
Schema Labels	Clearance Hole	Threaded Hole	Screw	Schema Types
Rectangle	Y			ReferenceRectangleType
RoundedRectangle	Y			ReferenceRoundedRectangleType
ModifiedRectangle	Y			ReferenceModifiedRectangleType
Circle	Y	Y		ReferenceCircleType
Double-D	Y			ReferenceDouble-DType
ScrewHeadType			Y	Xs: string
ScrewHeadHeight			Y	JEP30-D10:UnspecifiedValueSetType
ScrewThreadLength			Y	JEP30-D10:UnspecifiedValueSetType
ScrewThreadPitch		Y	Y	JEP30-D10:UnspecifiedValueSetType
ScrewThreadDepth		Y	Y	JEP30-D10:UnspecifiedValueSetType
ScrewThreadMajorDiameter		Y	Y	JEP30-D10:UnspecifiedValueSetType
ScrewThreadMinorDiameter		Y	Y	JEP30-D10:UnspecifiedValueSetType
ScrewThreadPitchDiameter		Y	Y	JEP30-D10:UnspecifiedValueSetType

The definition of each shape is outlined in Annex A (informative) Shape Definitions & Dimensions.

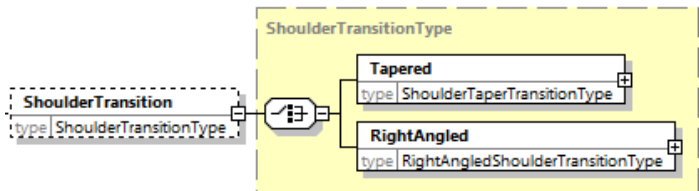
### 5.15.1.7.18 Base Metal

path	<a href="#">PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/Basemetal</a>
diagram	 <p>The diagram shows a <b>BaseMetal</b> entity (type <b>BaseMetalType</b>) with a list of values: C, G, GS, IB, IP, J, LL, LO, LA, LB, LC, S, SF, SC, SP, SO, U. It is connected to a <b>BaseMetalType</b> container, which contains two sub-entities: <b>TerminalThickness</b> (type <b>JEP30-D10:ValueSetType</b>) and <b>Width</b> (type <b>JEP30-D10:ValueSetType</b>).</p>
type	<b>BaseMetalType.</b>

### 5.15.1.7.19 Shoulder

path	<a href="#">PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/Shoulder</a>
diagram	 <p>The diagram shows a <b>Shoulder</b> entity (type <b>ConfigurableShoulderType</b>) with a list of values: GS, J, U, PS, PP, PN, TS, U. It is connected to a <b>ConfigurableShoulderType</b> container, which contains several sub-entities: <b>ShoulderWidth</b> (type <b>JEP30-D10:UnspecifiedDimensionalValueSetType</b>), <b>ShoulderWidth-at-Package</b> (type <b>JEP30-D10:UnspecifiedDimensionalValueSetType</b>), <b>ShoulderWidth-at-Transition</b> (type <b>JEP30-D10:UnspecifiedDimensionalValueSetType</b>), <b>TerminalShoulderHeight</b> (type <b>JEP30-D10:UnspecifiedValueSetType</b>), <b>ShoulderTransition</b> (type <b>ShoulderTransitionType</b>), <b>Configuration</b> (type <b>ShoulderConfigurationType</b>), <b>TH-PreppedShoulder</b> (type <b>JEP30-D10:EmptyType</b>), and <b>TH-ShoulderCutout</b> (type <b>TH-ShoulderCutoutType</b>).</p>
type	<b>ConfigurableShoulderType, JEP30-D10:UnspecifiedDimensionalValueSetType, ShoulderTransitionType, ShoulderConfigurationType, JEP30-D10:EmptyType.</b>

### 5.15.1.7.19.1 Shoulder Transition

path	<a href="#">PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/Shoulder/ShoulderTransition</a>
diagram	 <p>The diagram shows a <b>ShoulderTransition</b> entity (type <b>ShoulderTransitionType</b>) connected to a <b>ShoulderTransitionType</b> container, which contains two sub-entities: <b>Tapered</b> (type <b>ShoulderTaperTransitionType</b>) and <b>RightAngled</b> (type <b>RightAngledShoulderTransitionType</b>).</p>
type	<b>ShoulderTransitionType, ShoulderTaperTransitionType, RightAngledShoulderTransitionType.</b>

### 5.15.1.7.19.1.1 Tapered

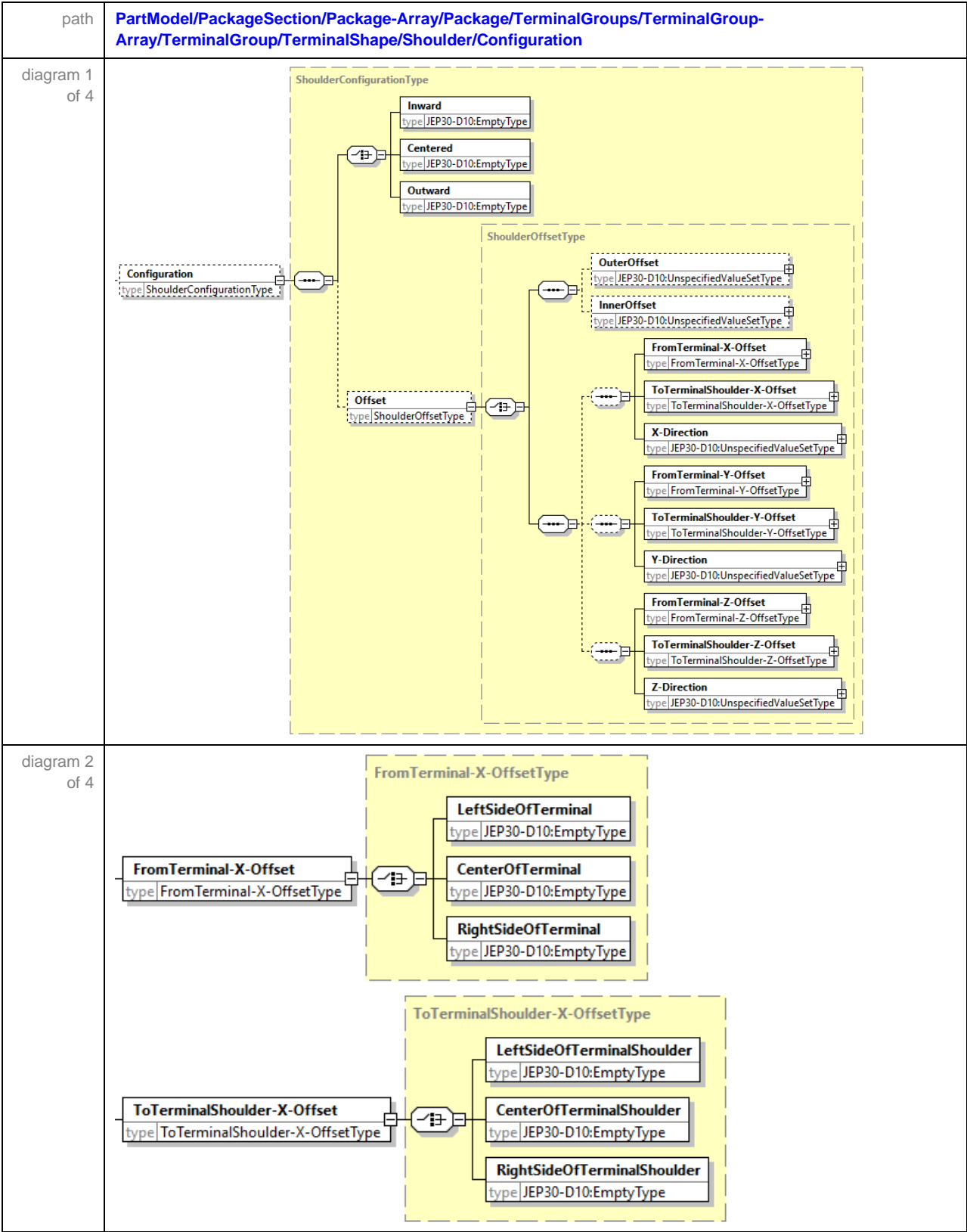
path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/Shoulder/ShoulderTransition/Tapered
diagram 1 of 2	
diagram 2 of 2	
type	ShoulderTaperTransitionType, JEP30-D10:UnspecifiedValueSetType, SpecificPackageEdge-to-TerminalShoulderType, PrincipalFacesType, JEP30-D10:EmptyType.

5.15.1.7.19.1.2      Right Angled

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/Shoulder/ShoulderTransition/RightAngled
diagram	<p>The diagram illustrates the structure of the <b>RightAngledShoulderTransitionType</b>. It consists of a <b>RightAngled</b> class (type <b>RightAngledShoulderTransitionType</b>) and a composite structure (type <b>RightAngledShoulderTransitionType</b>). The composite structure contains five sub-elements, each with a type attribute pointing to <b>JEP30-D10:UnspecifiedValueSetType</b>:</p> <ul style="list-style-type: none"><li><b>RoundedShoulderEdge</b> (type <b>JEP30-D10:UnspecifiedValueSetType</b>)</li><li><b>SpecificPackageEdge-to-TerminalShoulder</b> (type <b>SpecificPackageEdge-to-TerminalShoulderType</b>)</li><li><b>End-of-Terminal-to-ShoulderTransition</b> (type <b>JEP30-D10:UnspecifiedValueSetType</b>)</li><li><b>PackageEdge-to-ShoulderTransition</b> (type <b>JEP30-D10:UnspecifiedValueSetType</b>)</li><li><b>SeatingPlane-to-ShoulderTransition</b> (type <b>JEP30-D10:UnspecifiedValueSetType</b>)</li><li><b>Top-of-TerminalExit-from-Package-to-ShoulderTransition</b> (type <b>JEP30-D10:UnspecifiedValueSetType</b>)</li></ul>
type	RightAngledShoulderTransitionType, JEP30-D10:UnspecifiedValueSetType, SpecificPackageEdge-to-TerminalShoulderType.



5.15.1.7.19.2 Configuration



### 5.15.1.7.19.2 Configuration (cont'd)

<p>diagram 3 of 4</p>	
<p>diagram 4 of 4</p>	
<p>type</p>	<p>ShoulderConfigurationType, JEP30-D10:EmptyType, ShoulderOffsetType, JEP30-D10:UnspecifiedValueType, FromTerminal-X-OffsetType, ToTerminalShoulder-X-OffsetType, FromTerminal-Y-OffsetType, ToTerminalShoulder-Y-OffsetType, FromTerminal-Z-OffsetType, ToTerminalShoulder-Z-OffsetType.</p>

5.15.1.7.19.3 TH - Shoulder Cutout

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/Shoulder/TH-ShoulderCutout
diagram	
type	TH-ShoulderCutoutType, CutoutConfigurationType, JEP30-D10:EmptyType, JEP30-D10:UnspecifiedValueSetType.

### 5.15.1.7.20 Neck

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/Neck
diagram	<pre> classDiagram     class NeckType {         NeckWidth : JEP30-D10:UnspecifiedDimensionalValueSetType         NeckTransition : NeckTransitionType         Configuration : NeckConfigurationType     }     class NeckTransitionType {     }     class Tapered {         type NeckTaperTransitionType     }     class RightAngled {         type RightAngledNeckTransitionType     }     NeckType "1" -- "*" NeckTransitionType     NeckTransitionType "1" -- "*" Tapered     NeckTransitionType "1" -- "*" RightAngled     </pre>
type	NeckType, JEP30-D10:UnspecifiedDimensionalValueSetType, NeckTransitionType, NeckTaperTransitionType, RightAngledNeckTransitionType, NeckConfigurationType.

#### 5.15.1.7.20.1 Tapered

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/Neck/NeckTransition/Tapered
diagram	<pre> classDiagram     class NeckTaperTransitionType {         NeckTaperAngle : xs:integer     }     class EndOfTerminalToStartOfNeckTaperTransition {         type JEP30-D10:UnspecifiedValueSetType     }     class EndOfTerminalToEndOfNeckTaperTransition {         type JEP30-D10:UnspecifiedValueSetType     }     class PackageEdgeToStartOfNeckTaperTransition {         type JEP30-D10:UnspecifiedValueSetType     }     class PackageEdgeToEndOfNeckTaperTransition {         type JEP30-D10:UnspecifiedValueSetType     }     class SeatingPlaneToStartOfNeckTaperTransition {         type JEP30-D10:UnspecifiedValueSetType     }     class SeatingPlaneToEndOfNeckTaperTransition {         type JEP30-D10:UnspecifiedValueSetType     }     class TopOfTerminalExitFromPackageToStartOfNeckTaperTransition {         type JEP30-D10:UnspecifiedValueSetType     }     class TopOfTerminalExitFromPackageToEndOfNeckTaperTransition {         type JEP30-D10:UnspecifiedValueSetType     }     NeckTaperTransitionType "1" -- "*" EndOfTerminalToStartOfNeckTaperTransition     NeckTaperTransitionType "1" -- "*" EndOfTerminalToEndOfNeckTaperTransition     NeckTaperTransitionType "1" -- "*" PackageEdgeToStartOfNeckTaperTransition     NeckTaperTransitionType "1" -- "*" PackageEdgeToEndOfNeckTaperTransition     NeckTaperTransitionType "1" -- "*" SeatingPlaneToStartOfNeckTaperTransition     NeckTaperTransitionType "1" -- "*" SeatingPlaneToEndOfNeckTaperTransition     NeckTaperTransitionType "1" -- "*" TopOfTerminalExitFromPackageToStartOfNeckTaperTransition     NeckTaperTransitionType "1" -- "*" TopOfTerminalExitFromPackageToEndOfNeckTaperTransition     </pre>
type	NeckTaperTransitionType, JEP30-D10:UnspecifiedValueSetType.

### 5.15.1.7.20.2 RightAngled

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/Neck/NeckTransition/RightAngled
diagram	
type	RightAngledNeckTransitionType, JEP30-D10:UnspecifiedValueSetType.

### 5.15.1.7.20.3 Configuration

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/Neck/Configuration
diagram	
type	NeckConfigurationType, JEP30-D10:EmptyType, NeckOffsetType, JEP30-D10:UnspecifiedValueSetType.

5.15.1.7.21 Dambar

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/Dambar
diagram	<p>The diagram illustrates the hierarchical structure of the Dambar type. It starts with a <b>Dambar</b> type (G, GS, J, S) which is composed of several sub-types: <b>DambarType</b>, <b>DambarProtrusionType</b>, and <b>DambarIntrusionType</b>. <b>DambarType</b> is further divided into <b>Protrusion</b> (type: DambarProtrusionType) and <b>Intrusion</b> (type: DambarIntrusionType). <b>DambarProtrusionType</b> includes <b>DambarProtrusion</b> (type: JEP30-D10:UnspecifiedDimensionalValueSetType) and <b>DambarWidth</b> (type: JEP30-D10:UnspecifiedValueSetType). <b>DambarIntrusionType</b> includes <b>Intrusion</b> (type: JEP30-D10:UnspecifiedValueSetType) and <b>DambarWidth</b> (type: JEP30-D10:UnspecifiedValueSetType). Additionally, <b>DambarType</b> includes several other attributes: <b>End-of-Terminal-to-Dambar</b> (type: JEP30-D10:UnspecifiedUncontrolledValueSetType), <b>PackageEdge-to-Dambar</b> (type: JEP30-D10:UnspecifiedUncontrolledValueSetType), <b>SeatingPlane-to-Dambar</b> (type: JEP30-D10:UnspecifiedUncontrolledValueSetType), <b>Top-of-TerminalExit-from-Package-to-Dambar</b> (type: JEP30-D10:UnspecifiedUncontrolledValueSetType), and <b>DambarLength</b> (type: JEP30-D10:UnspecifiedUncontrolledValueSetType).</p>
type	DambarType, DambarProtrusionType, DambarIntrusionType, JEP30-D10:UnspecifiedDimensionalValueSetType, JEP30-D10:UnspecifiedValueSetType, JEP30-D10:UnspecifiedUncontrolledValueSetType

The definition of each shape is outlined in Annex A (informative) Shape Definitions & Dimensions

5.15.1.7.22 Kinked

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/Kinked
diagram	<p>The diagram illustrates the hierarchical structure of the Kinked type. It starts with a <b>Kinked</b> type (PK, TK) which is composed of <b>KinkedType</b>. <b>KinkedType</b> is further divided into <b>PackageEdge-to-Start-of-Kink</b> (type: JEP30-D10:DimensionalValueSetType) and <b>PackageEdge-to-End-of-Kink</b> (type: JEP30-D10:DimensionalValueSetType).</p>
type	KinkedType, JEP30-D10:DimensionalValueSetType,

The definition of each shape is outlined in Annex A (informative) Shape Definitions & Dimensions

5.15.1.7.23 Terminal End Shape

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/TerminalEndShape
diagram	<p>The diagram illustrates the structure of the <b>TerminalEndShapeType</b> and its associated classes and attributes. It is organized as follows:</p> <ul style="list-style-type: none"><li><b>TerminalEndShapeType</b> (Base Type):<ul style="list-style-type: none"><li>Attributes: <b>Conical</b> (type: JEP30-D10:EmptyType), <b>Dome</b> (type: JEP30-D10:EmptyType), <b>Straight</b> (type: JEP30-D10:EmptyType).</li><li>Subclasses: <b>RectangularInTerminalEndShape</b> and <b>TaperedTerminalEndShape</b>.</li><li>Subclass <b>RectangularInTerminalEndShape</b> (type: RectangularInTerminalEndShapeType):<ul style="list-style-type: none"><li>Attributes: <b>TaperAngle</b> (type: xs:integer), <b>TipWidth</b> (type: JEP30-D10:UnspecifiedValueSetType), <b>TipLength</b> (type: JEP30-D10:UnspecifiedValueSetType).</li></ul></li><li>Subclass <b>TaperedTerminalEndShape</b> (type: TaperedTerminalEndShapeType):<ul style="list-style-type: none"><li>Attributes: <b>TaperAngle</b> (type: xs:integer), <b>TipWidth</b> (type: JEP30-D10:UnspecifiedValueSetType), <b>TipLength</b> (type: JEP30-D10:UnspecifiedValueSetType).</li></ul></li><li>Subclass <b>IsoscelesTrapezoid</b> (type: JEP30-D10:EmptyType).</li></ul></li><li><b>TerminalEndShape</b> (Type):<ul style="list-style-type: none"><li>Attributes: <b>TerminalEndShapeType</b> (type: TerminalEndShapeType).</li><li>Associations: <b>TerminalEndShapeType</b> (type: TerminalEndShapeType) and <b>TerminalEndShapeType</b> (type: TerminalEndShapeType).</li></ul></li></ul>
type	TerminalEndShapeType, RectangularInTerminalEndShapeType, TaperedTerminalEndShapeType, JEP30-D10:UnspecifiedValueSetType, JEP30-D10:EmptyType.

#### 5.15.1.7.24 Terminal Shape versus Dimensions

Table 33 shows an array of dimensions that are captured below each shape listed above:

**Table 33 - Terminal Shape versus Dimensions**

Terminal Shape	Dimension 1	Dimension 2	Dimension 3	Diameter	Radius	Angle	Major Axis	Minor Axis	Semi-major Axis	No. of Sides	Inner/Outer	Shoulder	Impacted Corner
Rectangle	Y	Y				Y							
Rectangle with Shoulder	Y	Y				Y						Y	
Rounded Rectangle	Y	Y			Y	Y							
Modified Rectangle	Y	Y				Y							Y
Modified Rectangle with Shoulder	Y	Y				Y						Y	Y
Circle				Y									
Circle with Shoulder				Y								Y	
D-Shape	Y	Y				Y							
Double-D	Y	Y				Y							
Ellipse							Y	Y					
Elliptical End Shape	Y	Y							Y				
Regular Polygon				Y		Y				Y	Y		



### 5.15.1.7.21 Terminal Shape versus Dimensions (cont'd)

**Table 33 – Terminal Shape versus Dimensions (cont'd)**

Terminal Shape	Dimension 1	Dimension 2	Dimension 3	Diameter	Radius	Angle	Major Axis	Minor Axis	Semi-major Axis	No. of Sides	Inner/Outer	Shoulder	Impacted Corner
Segment	Y			Y		Y							
Para-truncated Circle	Y			Y		Y							
Concave	Y	Y			Y								
Concave D-Shape	Y	Y			Y								
Isosceles Trapezoid	Y	Y	Y			Y							
Contour						Y							

The definition of each shape is outlined in Annex A (informative) Shape Dimensions.

### 5.15.1.7.25 Package Side – to – Terminal Frame

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/PackageSide-to-TerminalFrame
diagram	<p>The diagram illustrates the XSD structure for the <b>PackageSide-to-TerminalFrameType</b>. It is a complex type containing several elements and attributes:</p> <ul style="list-style-type: none"> <li><b>ID</b>: A required attribute of type <code>xs:string</code>.</li> <li><b>PackageSide</b>: An element of type <code>PrincipalFacesType</code>, which is a complex type with six attributes: <b>Topside</b>, <b>Underside</b>, <b>Left</b>, <b>Right</b>, <b>Back</b>, and <b>Front</b>, all of type <code>JEP30-D10:EmptyType</code>.</li> <li><b>TerminalFrameSide</b>: An element of type <code>PrincipalFacesType</code>, identical in structure to <b>PackageSide</b>.</li> <li><b>JEP30-D10:ValueSetGroup</b>: An element containing:       <ul style="list-style-type: none"> <li><b>Nominal</b>: A required attribute of type <code>xs:decimal</code>.</li> <li><b>TotalTolerance</b>: A required attribute of type <code>xs:decimal</code>, which is further broken down into <b>NegativeTolerance</b> and <b>PositiveTolerance</b> (both of type <code>xs:decimal</code>).</li> <li><b>ToleranceUOM</b>: A required attribute of type <code>ToleranceUOMType</code>.</li> <li><b>Minimum</b> and <b>Maximum</b>: Optional attributes of type <code>xs:decimal</code>.</li> </ul> </li> <li><b>PackageSide-to-TerminalFrame</b>: An external element of type <code>PackageSide-to-TerminalFrameType</code> with a <code>C.G.I.L.P.S.T.U.</code> attribute.</li> <li><b>FootnoteID</b>: A required attribute of type <code>xs:string</code> with a value range of <code>0..∞</code>.</li> </ul>
type	PackageSide-to-TerminalFrameType, PrincipalFacesType, JEP30-D10:EmptyType,
group	JEP30-D10:ValueSetGroup

### 5.15.1.7.26 Castellation - Array

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/Castellation-Array
diagram	
type	Castellation-ArrayType, CastellationType, CastellationLocationType, CastellationStandardArrayType, CastellationCircularArrayType, DeletedStatusType, CastellationRandomArrayType, VerticalCastellationLocationOnTerminalType, CastellationShapeType, CircularCastellationType, ChamferedRectangleCastellationType, RectangleCastellationType, RoundedRectangleCastellationType, TriangularCastellationType, HorizontalStepCutType, HorizontalCastellationDimpleType.
group	VerticalCastellation, HorizontalCastellation

All *CastellationShapes* are defined in Annex A.1

### 5.15.1.7.26.1 Standard - Array

path	<a href="#">PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/Castellation-Array/Castellation/CastellationLocation/StandardArray</a>
diagram	
type	<a href="#">CastellationStandardArrayType</a> , <a href="#">JEP30-D10:PitchValueSetType</a> , <a href="#">JEP30-D10:PointXYType</a> .

### 5.15.1.7.26.2 Circular - Array

path	<a href="#">PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/Castellation-Array/Castellation/CastellationLocation/CircularArray</a>
diagram	
type	<a href="#">CastellationCircularArrayType</a> , <a href="#">JEP30-D10:PitchValueSetType</a> , <a href="#">JEP30-D10:PointXYType</a> .

5.15.1.7.26.3     Status

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/Castellation-Array/Castellation/CastellationLocation/Status
diagram	
type	DeletedStatusType, JEP30-D10:PointXYType, JEP30-D10:MinIntegerOfOneType, JEP30-D10:EmptyType.

5.15.1.7.26.4     Random - Array

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/Castellation-Array/Castellation/CastellationLocation/RandomArray
diagram	
type	CastellationRandomArrayType, JEP30-D10:PointXYType.

5.15.1.7.26.5 Vertical Castellation Location on Terminal

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/Castellation-Array/Castellation/CastellationLocation/VerticalCastellationLocationOnTerminal
diagram	<p>The diagram illustrates the structure of the <code>VerticalCastellationLocationOnTerminalType</code>. It features a central class <code>VerticalCastellationLocationOnTerminal</code> with a self-referencing association and a composition relationship with a container class <code>VerticalCastellationLocationOnTerminalType</code>. This container class includes several subclasses, each with a <code>type</code> attribute:</p> <ul style="list-style-type: none"><li><code>Center</code>: <code>type</code> JEP30-D10:EmptyType</li><li><code>Left</code>: <code>type</code> JEP30-D10:EmptyType</li><li><code>Right</code>: <code>type</code> JEP30-D10:EmptyType</li><li><code>X-Offset</code>: <code>type</code> CastellatioToTerminal-X-OffsetType</li><li><code>Front</code>: <code>type</code> JEP30-D10:EmptyType</li><li><code>Back</code>: <code>type</code> JEP30-D10:EmptyType</li><li><code>Y-Offset</code>: <code>type</code> CastellatioToTerminal-Y-OffsetType</li><li><code>Topside</code>: <code>type</code> JEP30-D10:EmptyType</li><li><code>Underside</code>: <code>type</code> JEP30-D10:EmptyType</li><li><code>Z-Offset</code>: <code>type</code> CastellatioToTerminal-Z-OffsetType</li><li><code>Corner</code>: <code>type</code> VerticalCastellationCornerLocationsOnTerminalType</li></ul>
type	VerticalCastellationLocationOnTerminalType, JEP30-D10:EmptyType, CastellatioToTerminal-X-OffsetType, CastellatioToTerminal-X-OffsetType, VerticalCastellationCornerLocationsOnTerminalType.

5.15.1.7.26.5.1      Castellation to Terminal X - Offset

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/Castellation-Array/Castellation/CastellationLocation/VerticalCastellationLocationOnTerminal/X-Offset	
diagram part 1 of 2	<div><div>CastellationToTerminal-X-OffsetType</div><div><div>X1-LeftSideOfTerminal-to-LeftSideOfLeftCastellation</div><div>type JEP30-D10:ValueSetType</div></div><div><div>X2-LeftSideOfTerminal-to-CenterOfLeftCastellation</div><div>type JEP30-D10:ValueSetType</div></div><div><div>X3-LeftSideOfTerminal-to-RightSideOfLeftCastellation</div><div>type JEP30-D10:ValueSetType</div></div><div><div>X4-LeftSideOfTerminal-to-LeftSideOfCenterCastellation</div><div>type JEP30-D10:ValueSetType</div></div><div><div>X5-LeftSideOfTerminal-to-CenterlineOfCastellationGroup</div><div>type JEP30-D10:ValueSetType</div></div><div><div>X6-LeftSideOfTerminal-to-RightSideOfCenterCastellation</div><div>type JEP30-D10:ValueSetType</div></div><div><div>X7-LeftSideOfTerminal-to-LeftSideOfRightCastellation</div><div>type JEP30-D10:ValueSetType</div></div><div><div>X8-LeftSideOfTerminal-to-CenterOfRightCastellation</div><div>type JEP30-D10:ValueSetType</div></div><div><div>X9-LeftSideOfTerminal-to-RightSideOfRightCastellation</div><div>type JEP30-D10:ValueSetType</div></div><div><div>X10-CenterOfTerminal-to-LeftSideOfLeftCastellation</div><div>type JEP30-D10:ValueSetType</div></div><div><div>X11-CenterOfTerminal-to-CenterOfLeftCastellation</div><div>type JEP30-D10:ValueSetType</div></div><div><div>X12-CenterOfTerminal-to-RightSideOfLeftCastellation</div><div>type JEP30-D10:ValueSetType</div></div><div><div>X13-CenterOfTerminal-to-LeftSideOfCenterCastellation</div><div>type JEP30-D10:ValueSetType</div></div><div><div>X14-CenterOfTerminal-to-CenterlineOfCastellationGroup</div><div>type JEP30-D10:ValueSetType</div></div></div> <div><div>X-Offset</div><div>type CastellationToTerminal-X-OffsetType</div></div> <div><div></div><div></div></div>	

#### 5.14.1.7.22.5.1 Castellation to Terminal X - Offset (cont'd)

<p>diagram part 2 of 2</p>	 <p><b>X-Offset</b> type: <code>CastellationToTerminal-X-OffsetType</code></p> <p><b>X14-CenterOfTerminal-to-CenterlineOfCastellationGroup</b> type: <code>JEP30-D10:ValueSetType</code></p> <p><b>X15-CenterOfTerminal-to-RightSideOfCenterCastellation</b> type: <code>JEP30-D10:ValueSetType</code></p> <p><b>X16-CenterOfTerminal-to-LeftSideOfRightCastellation</b> type: <code>JEP30-D10:ValueSetType</code></p> <p><b>X17-CenterOfTerminal-to-CenterOfRightCastellation</b> type: <code>JEP30-D10:ValueSetType</code></p> <p><b>X18-CenterOfTerminal-to-RightSideOfRightCastellation</b> type: <code>JEP30-D10:ValueSetType</code></p> <p><b>X19-RightSideOfTerminal-to-LeftSideOfLeftCastellation</b> type: <code>JEP30-D10:ValueSetType</code></p> <p><b>X20-RightSideOfTerminal-to-CenterOfLeftCastellation</b> type: <code>JEP30-D10:ValueSetType</code></p> <p><b>X21-RightSideOfTerminal-to-RightSideOfLeftCastellation</b> type: <code>JEP30-D10:ValueSetType</code></p> <p><b>X22-RightSideOfTerminal-to-LeftSideOfCenterCastellation</b> type: <code>JEP30-D10:ValueSetType</code></p> <p><b>X23-RightSideOfTerminal-to-CenterlineOfCastellationGroup</b> type: <code>JEP30-D10:ValueSetType</code></p> <p><b>X24-RightSideOfTerminal-to-RightSideOfCenterCastellation</b> type: <code>JEP30-D10:ValueSetType</code></p> <p><b>X25-RightSideOfTerminal-to-LeftSideOfRightCastellation</b> type: <code>JEP30-D10:ValueSetType</code></p> <p><b>X26-RightSideOfTerminal-to-CenterOfRightCastellation</b> type: <code>JEP30-D10:ValueSetType</code></p> <p><b>X27-RightSideOfTerminal-to-RightSideOfRightCastellation</b> type: <code>JEP30-D10:ValueSetType</code></p>
<p>type</p>	<p><code>CastellationToTerminal-X-OffsetType, JEP30-D10:ValueSetType</code></p>

Table 34 - Castellation to Terminal X - Offset lists out all the various dimensions that can be selected from any major point of the terminal to any major point of the Castellation in X direction.

Center of Center Castellation is the same as Centerline of Castellation Group, however the use of the "...Centerline of Castellation Group" is more encompassing since it also includes the centerline of a row or column of an even number of Castellation, i.e., midway between castellation 2 and castellation 3 of 4 castellation in a row or column.



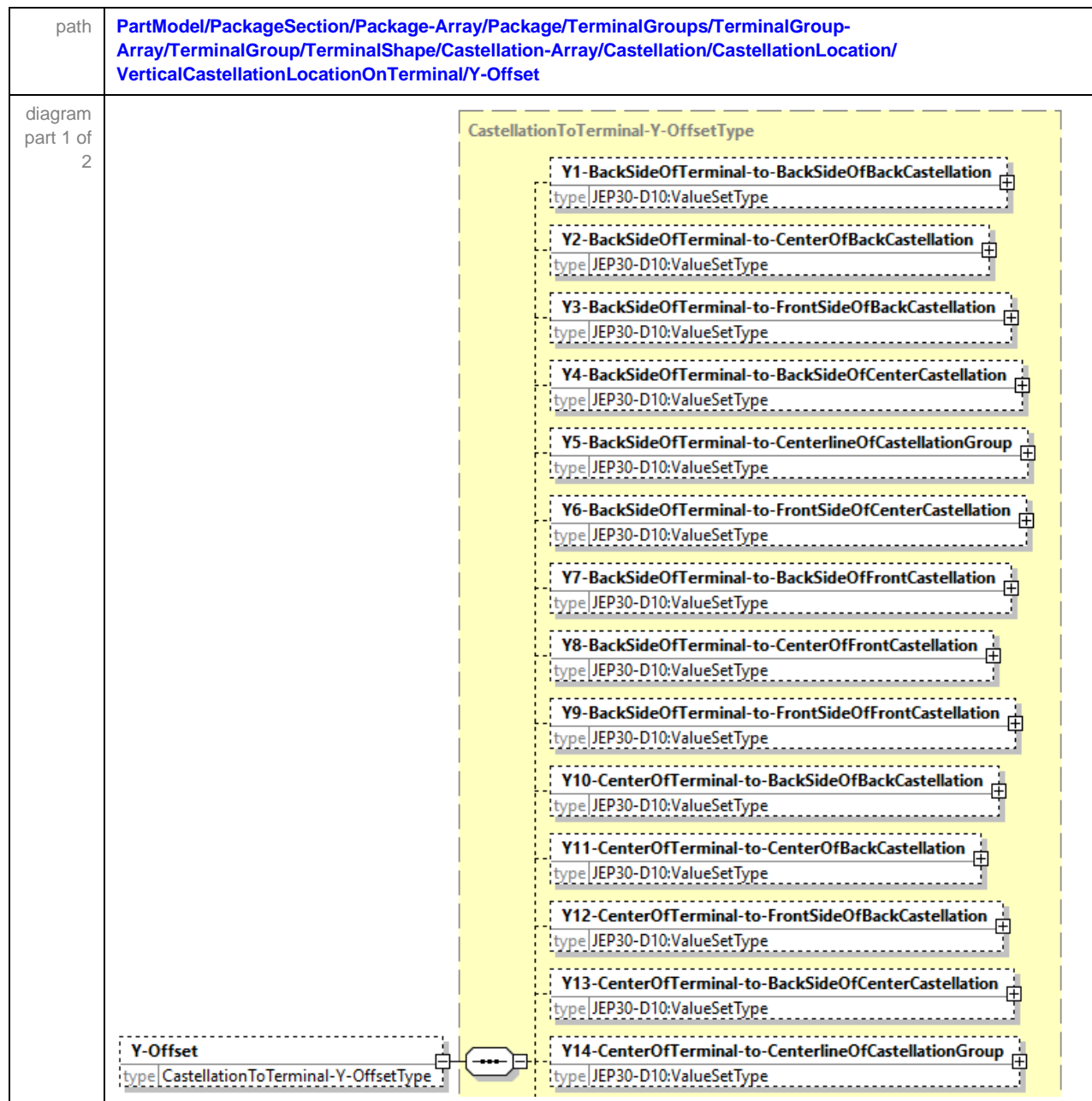
5.14.1.7.22.5.1

**Castellation to Terminal X - Offset (cont'd)**

**Table 34 - Castellation to Terminal X - Offset**

<b>Symbol</b>	<b>Description</b>
X1	Left side of Terminal to Left Side of Left Castellation
X2	Left side of Terminal to Center of Left Castellation
X3	Left side of Terminal to Right side of Left Castellation
X4	Left side of Terminal to Left Side of Center Castellation
X5	Left side of Terminal to Centerline of Castellation Group
X6	Left side of Terminal to Right side of Center Castellation
X7	Left side of Terminal to Left side of Right Castellation
X8	Left side of Terminal to Center of Right Castellation
X9	Left side of Terminal to Right side of Right Castellation
X10	Center of Terminal to Left side of Left Castellation
X11	Center of Terminal to Center of Left Castellation
X12	Center of Terminal to Right side of Left Castellation
X13	Center of Terminal to Left side of Center Castellation
X14	Center of Terminal to Centerline of Castellation Group
X15	Center of Terminal to Right side of Center Castellation
X16	Center of Terminal to Left side of Right Castellation
X17	Center of Terminal to Center of Right Castellation
X18	Center of Terminal to Right side of Right Castellation
X19	Right side of Terminal to Left side of Left Castellation
X20	Right side of Terminal to Center of Left Castellation
X21	Right side of Terminal to Right side of Left Castellation
X22	Right side of Terminal to Left side of Center Castellation
X23	Right side of Terminal to Centerline of Castellation Group
X24	Right side of Terminal to Right side of Center Castellation
X25	Right side of Terminal to Left side of Right Castellation
X26	Right side of Terminal to Center of Right Castellation
X27	Right side of Terminal to Right side of Right Castellation

## 5.15.1.7.26.5.2 Castellation to Terminal Y - Offset



### 5.14.1.7.22.5.2 Castellations to Terminal Y - Offset (cont'd)

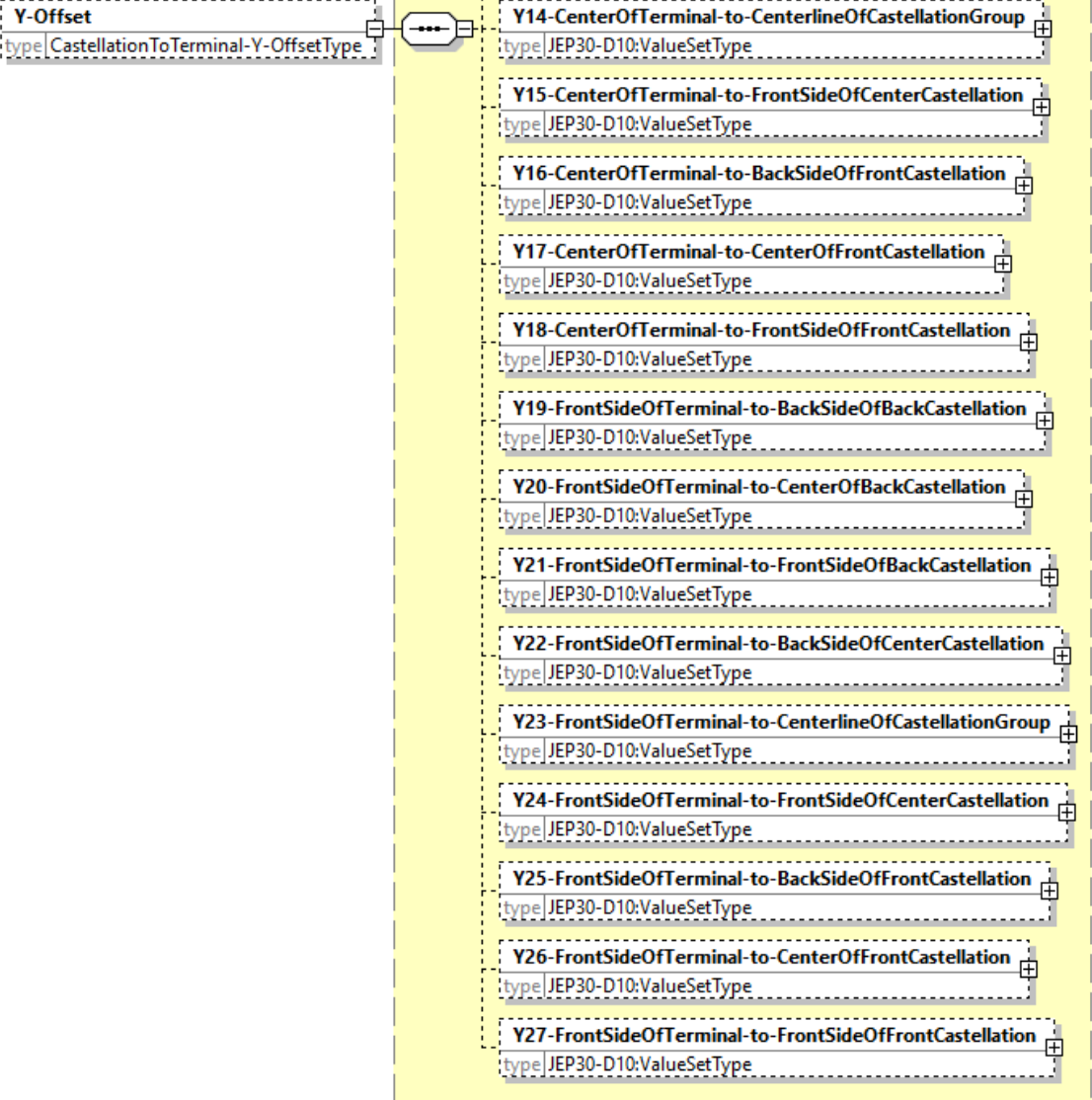
<p>diagram part 2 of 2</p>	
<p>type</p>	<p>CastellationToTerminal-Y-OffsetType, JEP30-D10:ValueSetType</p>

Table 35 - Castellations to Terminal Y - Offset lists out all the various dimensions that can be selected from any major point of the terminal to any major point of the Castellations in Y direction.

#### 5.14.1.7.22.5.2 Castellations to Terminal Y - Offset (cont'd)

**Table 35 - Castellations to Terminal Y - Offset**

Symbol	Description
Y1	Back side of Terminal to Back side of Back Castellations
Y2	Back side of Terminal to Center of Back Castellations
Y3	Back side of Terminal to Front side of Back Castellations
Y4	Back side of Terminal to Back side of Center Castellations
Y5	Back side of Terminal to Centerline of Castellations Group
Y6	Back side of Terminal to Front side of Center Castellations
Y7	Back side of Terminal to Back side of Front Castellations
Y8	Back side of Terminal to Center of Front Castellations
Y9	Back side of Terminal to Front side of Front Castellations
Y10	Center of Terminal to Back side of Back Castellations
Y11	Center of Terminal to Center of Back Castellations
Y12	Center of Terminal to Front side of Back Castellations
Y13	Center of Terminal to Back side of Center Castellations
Y14	Center of Terminal to Centerline of Castellations Group
Y15	Center of Terminal to Front side of Center Castellations
Y16	Center of Terminal to Back side of Front Castellations
Y17	Center of Terminal to Center of Front Castellations
Y18	Center of Terminal to Front side of Front Castellations
Y19	Front side of Terminal to Back side of Back Castellations
Y20	Front side of Terminal to Center of Back Castellations
Y21	Front side of Terminal to Front side of Back Castellations
Y22	Front side of Terminal to Back side of Center Castellations
Y23	Front side of Terminal to Centerline of Castellations Group
Y24	Front side of Terminal to Front side of Center Castellations
Y25	Front side of Terminal to Back side of Front Castellations
Y26	Front side of Terminal to Center of Front Castellations
Y27	Front side of Terminal to Front side of Front Castellations

### 5.15.1.7.26.5.3 Castellation to Terminal Z - Offset

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/Castellation-Array/Castellation/CastellationLocation/VerticalCastellationLocationOnTerminal/Z-Offset
diagram part 1 of 2	<pre> classDiagram     class ZOffset {         +CastellationToTerminal-Z-OffsetType     }     class CastellationToTerminal_ZOffsetType {         +type JEP30-D10:ValueSetType     }     ZOffset --&gt; CastellationToTerminal_ZOffsetType   </pre>

### 5.14.1.7.22.5.3 Castellations to Terminal Z - Offset (cont'd)

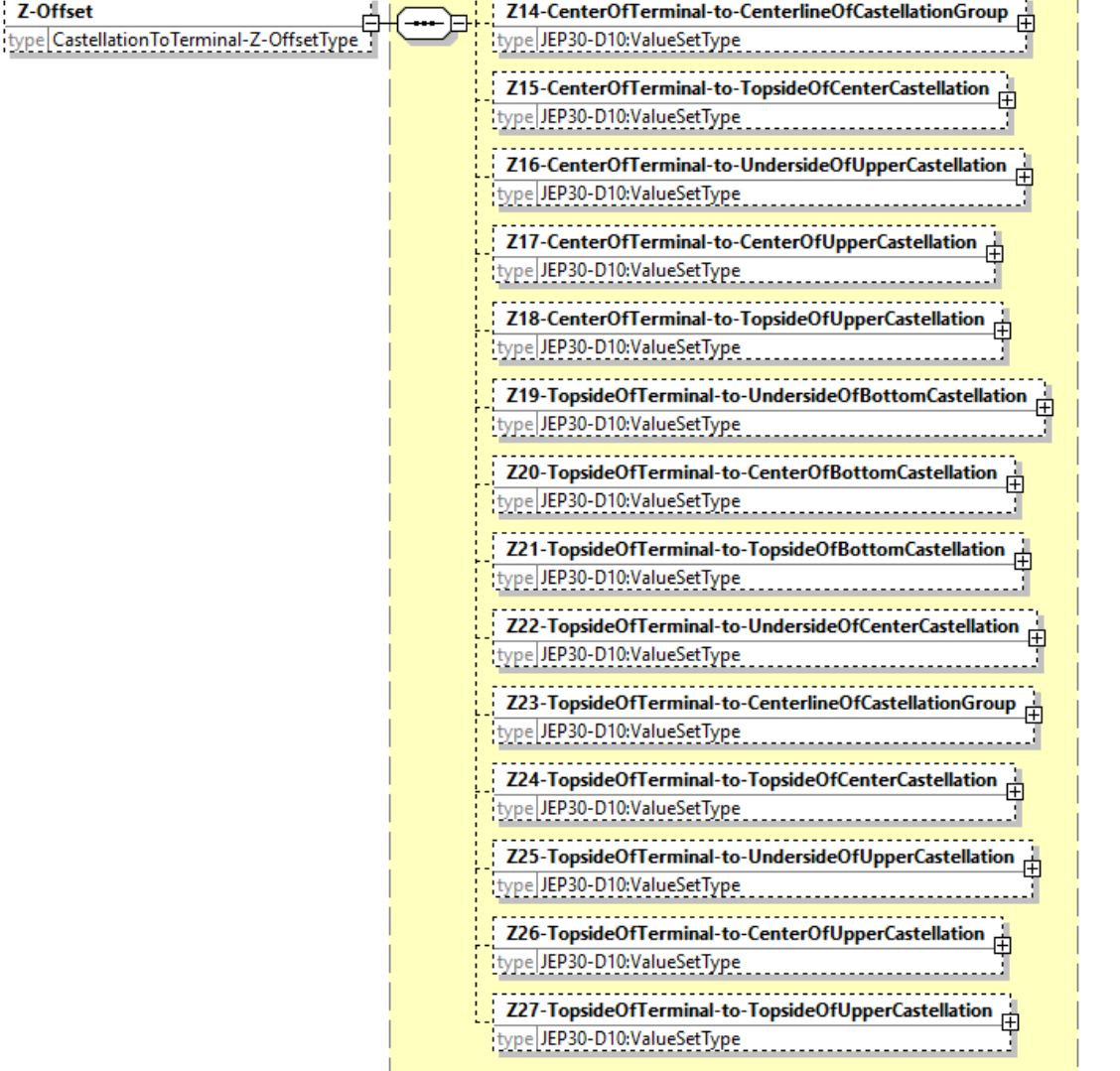
<p>diagram part 2 of 2</p>	 <p>The diagram illustrates the 'Z-Offset' parameter, which is defined as 'CastellationToTerminal-Z-OffsetType'. It shows a series of dimensions (Z14 through Z27) that represent offsets from Terminal Z to various points on the Castellation. Each dimension is represented by a box with a '+' sign, indicating a positive offset. The dimensions are listed as follows:</p> <ul style="list-style-type: none"> <li><b>Z14-CenterOfTerminal-to-CenterlineOfCastellationGroup</b> (type: JEP30-D10:ValueSetType)</li> <li><b>Z15-CenterOfTerminal-to-TopsideOfCenterCastellation</b> (type: JEP30-D10:ValueSetType)</li> <li><b>Z16-CenterOfTerminal-to-UndersideOfUpperCastellation</b> (type: JEP30-D10:ValueSetType)</li> <li><b>Z17-CenterOfTerminal-to-CenterOfUpperCastellation</b> (type: JEP30-D10:ValueSetType)</li> <li><b>Z18-CenterOfTerminal-to-TopsideOfUpperCastellation</b> (type: JEP30-D10:ValueSetType)</li> <li><b>Z19-TopsideOfTerminal-to-UndersideOfBottomCastellation</b> (type: JEP30-D10:ValueSetType)</li> <li><b>Z20-TopsideOfTerminal-to-CenterOfBottomCastellation</b> (type: JEP30-D10:ValueSetType)</li> <li><b>Z21-TopsideOfTerminal-to-TopsideOfBottomCastellation</b> (type: JEP30-D10:ValueSetType)</li> <li><b>Z22-TopsideOfTerminal-to-UndersideOfCenterCastellation</b> (type: JEP30-D10:ValueSetType)</li> <li><b>Z23-TopsideOfTerminal-to-CenterlineOfCastellationGroup</b> (type: JEP30-D10:ValueSetType)</li> <li><b>Z24-TopsideOfTerminal-to-TopsideOfCenterCastellation</b> (type: JEP30-D10:ValueSetType)</li> <li><b>Z25-TopsideOfTerminal-to-UndersideOfUpperCastellation</b> (type: JEP30-D10:ValueSetType)</li> <li><b>Z26-TopsideOfTerminal-to-CenterOfUpperCastellation</b> (type: JEP30-D10:ValueSetType)</li> <li><b>Z27-TopsideOfTerminal-to-TopsideOfUpperCastellation</b> (type: JEP30-D10:ValueSetType)</li> </ul>
<p>type</p>	<p><b>CastellationToTerminal-Z-OffsetType, JEP30-D10:ValueSetType</b></p>

Table 36 - Castellations to Terminal Z - Offset lists out all the various dimensions that can be selected from any major point of the terminal to any major point of the Castellation in Y direction.

5.14.1.7.22.5.3

Castellation to Terminal Z - Offset (cont'd)

Table 36 - Castellation to Terminal Z - Offset

Symbol	Description
Z1	Underside of Terminal to Underside of Bottom Castellation
Z2	Underside of Terminal to Center of Bottom Castellation
Z3	Underside of Terminal to Topside of Bottom Castellation
Z4	Underside of Terminal to Underside of Center Castellation
Z5	Underside of Terminal to Centerline of Castellation Group
Z6	Underside of Terminal to Topside of Center Castellation
Z7	Underside of Terminal to Underside of Upper Castellation
Z8	Underside of Terminal to Center of Upper Castellation
Z9	Underside of Terminal to Topside of Upper Castellation
Z10	Center of Terminal to Underside of Bottom Castellation
Z11	Center of Terminal to Center of Bottom Castellation
Z12	Center of Terminal to Topside of Bottom Castellation
Z13	Center of Terminal to Underside of Center Castellation
Z14	Center of Terminal to Centerline of Castellation Group
Z15	Center of Terminal to Topside of Center Castellation
Z16	Center of Terminal to Underside of Upper Castellation
Z17	Center of Terminal to Center of Upper Castellation
Z18	Center of Terminal to Topside of Upper Castellation
Z19	Topside of Terminal to Underside of Bottom Castellation
Z20	Topside of Terminal to Center of Bottom Castellation
Z21	Topside of Terminal to Topside of Bottom Castellation
Z22	Topside of Terminal to Underside of Center Castellation
Z23	Topside of Terminal to Centerline of Castellation Group
Z24	Topside of Terminal to Topside of Center Castellation
Z25	Topside of Terminal to Underside of Upper Castellation
Z26	Topside of Terminal to Center of Upper Castellation
Z27	Topside of Terminal to Topside of Upper Castellation

#### 5.15.1.7.26.5.4 Corner

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/Castellation-Array/Castellation/CastellationLocation/VerticalCastellationLocationOnTerminal/Corner
diagram	<pre> classDiagram     class Corner {         type VerticalCastellationCornerLocationsOnTerminalType     }     class VerticalCastellationCornerLocationsOnTerminalType {         NW {             type JEP30-D10:EmptyType         }         SW {             type JEP30-D10:EmptyType         }         SE {             type JEP30-D10:EmptyType         }         NE {             type JEP30-D10:EmptyType         }     }     Corner "1" -- "*" VerticalCastellationCornerLocationsOnTerminalType     </pre>
type	VerticalCastellationCornerLocationsOnTerminalType, JEP30-D10:EmptyType

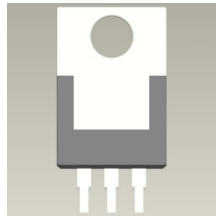
#### 5.15.1.7.27 Terminal Void - Array

path	PartModel/PackageSection/Package-Array/Package-Array/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/TerminalVoid-Array.
diagram	<pre> classDiagram     class TerminalVoidArray {         type TerminalVoidArrayType     }     class TerminalVoid {         type TerminalVoidType     }     class TerminalVoidLocation {         type VoidLocationType     }     class TerminalVoidShape {         type TerminalVoidShapeType     }     class StandardArray {         type VoidStandardArrayType     }     class CircularArray {         type VoidCircularArrayType     }     class RandomArray {         type VoidRandomArrayType     }     class VoidStatus {         type DeletedStatusType     }     class RoundedRectangle {         type RoundedRectangleType     }     class Circle {         type CircleType     }     class DoubleD {         type DoubleDType     }     class Contour {         type ContourShapeType     }     class CavityDepth {         type xs:decimal     }      TerminalVoidArray "1" -- "1..∞" TerminalVoid     TerminalVoid "1" -- "1" TerminalVoidLocation     TerminalVoid "1" -- "1" TerminalVoidShape     TerminalVoidLocation "1" -- "1" StandardArray     TerminalVoidLocation "1" -- "1" CircularArray     TerminalVoidLocation "1" -- "1" RandomArray     TerminalVoidLocation "1" -- "1" VoidStatus     TerminalVoidShape "1" -- "1" RoundedRectangle     TerminalVoidShape "1" -- "1" Circle     TerminalVoidShape "1" -- "1" DoubleD     TerminalVoidShape "1" -- "1" Contour     TerminalVoidShape "1" -- "1" CavityDepth     </pre>
type	TerminalVoid-ArrayType, TerminalVoidType, VoidlocationType, VoidStandardArrauType, VoidCircularArrayType, VoidStatusType, VoidRandomArrayType, TerminalVoidShapeType, RoundedRectangleType, CircleType, Double-DType, ContourShapeType.

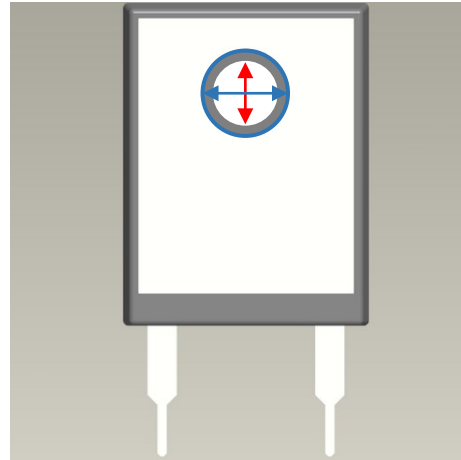


### 5.13.1.7.23 Terminal Void – Array (cont'd)

Some terminals such as Flat terminals and Surface terminals may have voids within the Terminal Contact Area, as shown in JESD30, “Illustrations of terminal shape” table. The example in Figure 4 is a Flat terminal with Hole, whereas the example in Figure 3 is a Surface terminal With-opening, plus a 2<sup>nd</sup> terminal called a Screw - Clearance Hole.



**Figure 4 - Flat Terminal with Hole**



**Figure 3 - Surface terminal With-Opening, plus Screw-Clearance Hole**

When capturing the details of the Surface terminal With-opening, the dimensions associated with the larger diameter (as denoted by the horizontal arrow) is used to define the diameter of the circular opening within the Surface terminal. When the 2<sup>nd</sup> terminal group is defined to capture the definition of the Screw - Clearance Hole, the smaller diameter (as denoted by the vertical arrow) is used to define the diameter of the hole. The dimension then as calculated by the (larger diameter minus the smaller diameter) / 2 = the clearance between the edge of the hole and the metallization of the Surface terminal.

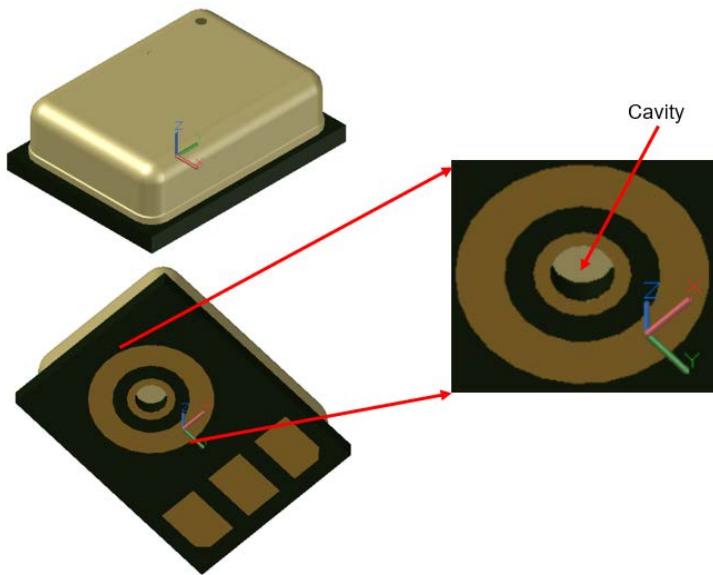


Figure 5 shows a package where a cavity exists within the inner terminal void. This is not a hole that goes through the part like a flange mount device as can be seen from the lack of a hole exiting from the top of the package. In this case, the depth of the cavity can be captured via the element called *CavityDepth*.

**Figure 5 – Surface terminal With-Opening and Cavity**

Since there may be more than one void within the Terminal shape shown in Figure 6, and since these voids may be different in shape (e.g., A Circle and a Double-D shape holes), the following sections outlines the array location of the voids and the different shapes that can be defined.

5.13.1.7.23    Terminal Void – Array (cont’d)



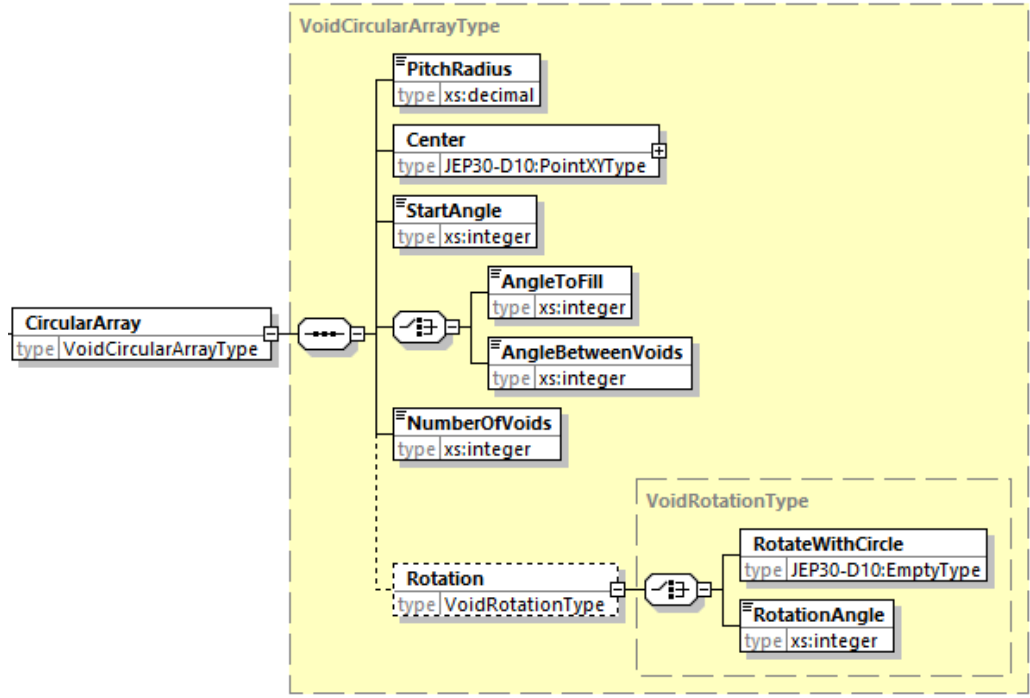
Figure 6 - Flat terminal with different shape Voids

The definition of each shape is outlined in Annex A (informative) Shape Dimensions.

5.15.1.7.27.1    Standard Array


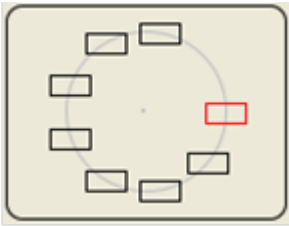
path	<a href="#">PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/TerminalVoid-Array/TerminalVoid/TerminalVoidLocation/StandardArray.</a>
diagram	<p>The diagram shows a class <b>StandardArray</b> with a type constraint <code>VoidStandardArrayType</code>. It is connected to a dashed box representing the <code>VoidStandardArrayType</code> interface. This interface defines several attributes: <b>ny</b> (type <code>xs:integer</code>), <b>nx</b> (type <code>xs:integer</code>), <b>dx</b> (type <code>JEP30-D10:PitchValueSetType</code>), <b>dy</b> (type <code>JEP30-D10:PitchValueSetType</code>), <b>Angle</b> (type <code>xs:integer</code>), and <b>VoidGroupLowerLeftVoidCenter</b> (type <code>JEP30-D10:PointXYType</code>).</p>
type	<a href="#">VoidStandardArrayType</a> , <a href="#">JEP30-D10:PitchValueSetType</a> , <a href="#">JEP30-D10:PointType</a> .

5.15.1.7.27.2 Circular Array

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/TerminalVoid-Array/TerminalVoid/TerminalVoidLocation/CircularArray.
diagram	 <p>The diagram illustrates the structure of the <b>CircularArray</b> type. It is a class with a type constraint <code>type VoidCircularArrayType</code>. The class is associated with a <b>VoidCircularArrayType</b> container, which is highlighted in yellow. This container holds several attributes: <b>PitchRadius</b> (type <code>xs:decimal</code>), <b>Center</b> (type <code>JEP30-D10:PointXYType</code>), <b>StartAngle</b> (type <code>xs:integer</code>), <b>AngleToFill</b> (type <code>xs:integer</code>), <b>AngleBetweenVoids</b> (type <code>xs:integer</code>), and <b>NumberOfVoids</b> (type <code>xs:integer</code>). Additionally, there is a <b>Rotation</b> attribute (type <code>VoidRotationType</code>) which is associated with a <b>VoidRotationType</b> container. This container holds two attributes: <b>RotateWithCircle</b> (type <code>JEP30-D10:EmptyType</code>) and <b>RotationAngle</b> (type <code>xs:integer</code>).</p>
type	VoidCircularArrayType, JEP30-D10:PointType, VoidRotationType.

### 5.13.1.6.22.2 Circular Array (cont'd)

**Table 37 - Void Circular Array Elements Definition**

Element	Explanation
Pitch Radius	The radius of the circle of voids.
Center	The center of the circle of voids.
Start Angle	The angle at which to place the first void in the array. By default, the void is at the right-most point on the circle (i.e. the number 3 position on a clock face). This angle specifies a rotation clockwise around the circle from this point.
Angle to Fill	The angle through which the voids are distributed, starting from the first void and continuing clockwise, until the last void is reached.
Angle between voids	Instead of specifying Angle to fill, you can specify the angle between the centers of each void.
Number of voids	The number of voids to be arrayed around the circle. The first void is displayed in red. This number includes any deleted voids in the array.
Rotate with Circle	 <p>If the voids are rotated so that they are oriented perpendicular to the circle. This does not apply to circular or contour void shapes.</p>
Rotation Angle	 <p>If the voids are not oriented perpendicular to the circle, then the voids could be rotated around the center of the voids itself. In this image, each void has a “0” degree rotation with respect to the “3 O’clock position”. This does not apply to circular or contour void shapes.</p>

5.15.1.7.27.3 Void Status

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/TerminalVoid-Array/TerminalVoid/TerminalVoidLocation/VoidStatus.
diagram	<p>The diagram illustrates the structure of the <b>VoidStatusType</b>. It is a tree-like structure starting from a <b>VoidStatus</b> entity (type <code>VoidStatusType</code>). This entity branches into two main paths: <b>VoidCenter</b> (type <code>JEP30-D10:PointXYType</code>) and <b>Deleted</b> (type <code>JEP30-D10:EmptyType</code>). The <b>VoidCenter</b> path further branches into three categories of terminal indices: <b>RowTerminalIndex</b>, <b>ColumnTerminalIndex</b>, and <b>PolarTerminalIndex</b>. Each of these categories has a <b>From</b> and <b>To</b> sub-index. The <b>RowTerminalIndex</b> and <b>ColumnTerminalIndex</b> sub-indices are of type <code>JEP30-D10:MinIntegerOfOneType</code> and have a minimum inclusion of 1. The <b>PolarTerminalIndex</b> sub-indices are also of type <code>JEP30-D10:MinIntegerOfOneType</code> and have a minimum inclusion of 1. The <b>Deleted</b> path is a simple terminal node.</p>
type	VoidStatusType, JEP30-D10:PointType, JEP30-D10:MinIntegerOfOneType.

For *TerminalVoidLocation* defined via *StandardArray* or *CircularArray*, some voids in the array may be deleted. This is covered in the *VoidStatus* branch.

5.15.1.7.27.4 Random Array

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/TerminalVoid-Array/TerminalVoid/TerminalVoidLocation/RandomArray.
diagram	<pre>classDiagram     class RandomArray {         type VoidRandomArrayType     }     class VoidLocation {         type JEP30-D10:PointXYType     }     class JEP30_D10_PointXYType {         x type xs:decimal         y type xs:decimal     }     RandomArray "1" -- "1..∞" VoidLocation     VoidLocation "1" -- "1" JEP30_D10_PointXYType</pre>
type	VoidRandomArrayType, JEP30-D10:PointXYType.

*TerminalVoidLocation* can also be defined via *RandomArray* when there is just 1 void, or when there is no logical structure to the location of the voids.

### 5.15.1.8 Terminal Span

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalSpan.		
diagram 1 of 4	<div><div><div>TerminalSpan</div><div>type TerminalSpanType</div><div>0..∞</div></div><div><div>TerminalSpanType</div><div><div><div><div><div>FromTerminalPatternID</div><div>type xs:string</div></div><div><div>FromPatternGroupID</div><div>type xs:string</div></div></div><div><div><div>ToTerminalPatternID</div><div>type xs:string</div></div><div><div>ToPatternGroupID</div><div>type xs:string</div></div></div></div><div><div><div>X-Direction</div><div>type JEP30-D10:DimensionalValueSetType</div></div><div><div>X-Span</div><div>type LeftTerminal-to-RightTerminal-X-SpanType</div></div></div><div><div><div>Y-Direction</div><div>type JEP30-D10:DimensionalValueSetType</div></div><div><div>Y-Span</div><div>type BackTerminal-to-FrontTerminal-Y-SpanType</div></div></div><div><div><div>Z-Direction</div><div>type JEP30-D10:DimensionalValueSetType</div></div><div><div>Z-Span</div><div>type BottomTerminal-to-UpperTerminal-Z-SpanType</div></div></div></div></div></div>		
diagram 2 of 4	<div><div><div>X-Span</div><div>type LeftTerminal-to-RightTerminal-X-SpanType</div></div><div><div>LeftTerminal-to-RightTerminal-X-SpanType</div><div><div><div>X1-LeftSideOfLeftTerminalContactArea-to-RightSideOfRightTerminalContactArea</div><div>type JEP30-D10:DimensionalValueSetType</div></div><div><div>X2-CenterOfLeftTerminalContactArea-to-CenterOfRightTerminalContactArea</div><div>type JEP30-D10:DimensionalValueSetType</div></div></div></div></div>		
diagram 3 of 4	<div><div><div>Y-Span</div><div>type BackTerminal-to-FrontTerminal-Y-SpanType</div></div><div><div>BackTerminal-to-FrontTerminal-Y-SpanType</div><div><div><div>Y1-BackSideOfBackTerminalContactArea-to-FrontSideOfFrontTerminalContactArea</div><div>type JEP30-D10:DimensionalValueSetType</div></div><div><div>Y2-CenterOfBackTerminalContactArea-to-CenterOfFrontTerminalContactArea</div><div>type JEP30-D10:DimensionalValueSetType</div></div></div></div></div>		
diagram 4 of 4	<div><div><div>Z-Span</div><div>type BottomTerminal-to-UpperTerminal-Z-SpanType</div></div><div><div>BottomTerminal-to-UpperTerminal-Z-SpanType</div><div><div><div>Z1-UndersideOfBottomTerminalContactArea-to-TopSideOfUpperTerminalContactA...</div><div>type JEP30-D10:DimensionalValueSetType</div></div><div><div>Z2-CenterOfBottomTerminalContactArea-to-CenterOfUpperTerminalContactArea</div><div>type JEP30-D10:DimensionalValueSetType</div></div></div></div></div>		
type	TerminalSpanType, JEP30-D10:DimensionalValueSetType, LeftTerminal-to-RightTerminal-X-SpanType, BackTerminal-to-FrontTerminal-Y-SpanType, BottomTerminal-to-UpperTerminal-Z-SpanType.		

5.15.1.9 Terminal Spacing

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalSpacing.
diagram	<p>The diagram illustrates the structure of the <b>TerminalSpacingType</b>. It is a sequence of elements: <b>FromTerminalPatternID</b> (type xs:string), <b>FromPatternGroupID</b> (type xs:string), <b>ToTerminalPatternID</b> (type xs:string), and <b>ToPatternGroupID</b> (type xs:string). These are followed by three optional elements: <b>X-Direction</b>, <b>Y-Direction</b>, and <b>Z-Direction</b>, each of type <b>JEP30-D10:DimensionalValueSetType</b>. The <b>X-Direction</b>, <b>Y-Direction</b>, and <b>Z-Direction</b> elements are grouped together in a dashed box. The entire structure is enclosed in a yellow dashed box labeled <b>TerminalSpacingType</b>.</p>
type	TerminalSpacingType, JEP30-D10:DimensionalValueSetType.

*TerminalSpan* and *TerminalSpacing* values are critical in the calculation of the most efficient land patterns for several *Terminal* types. The requirements for the provision of the above data elements can be found in JESD30, under the “Terminal Span and Terminal Spacing” section which includes a table titled “Terminal Shapes requiring Terminal Span and Terminal Spacing dimensions”.

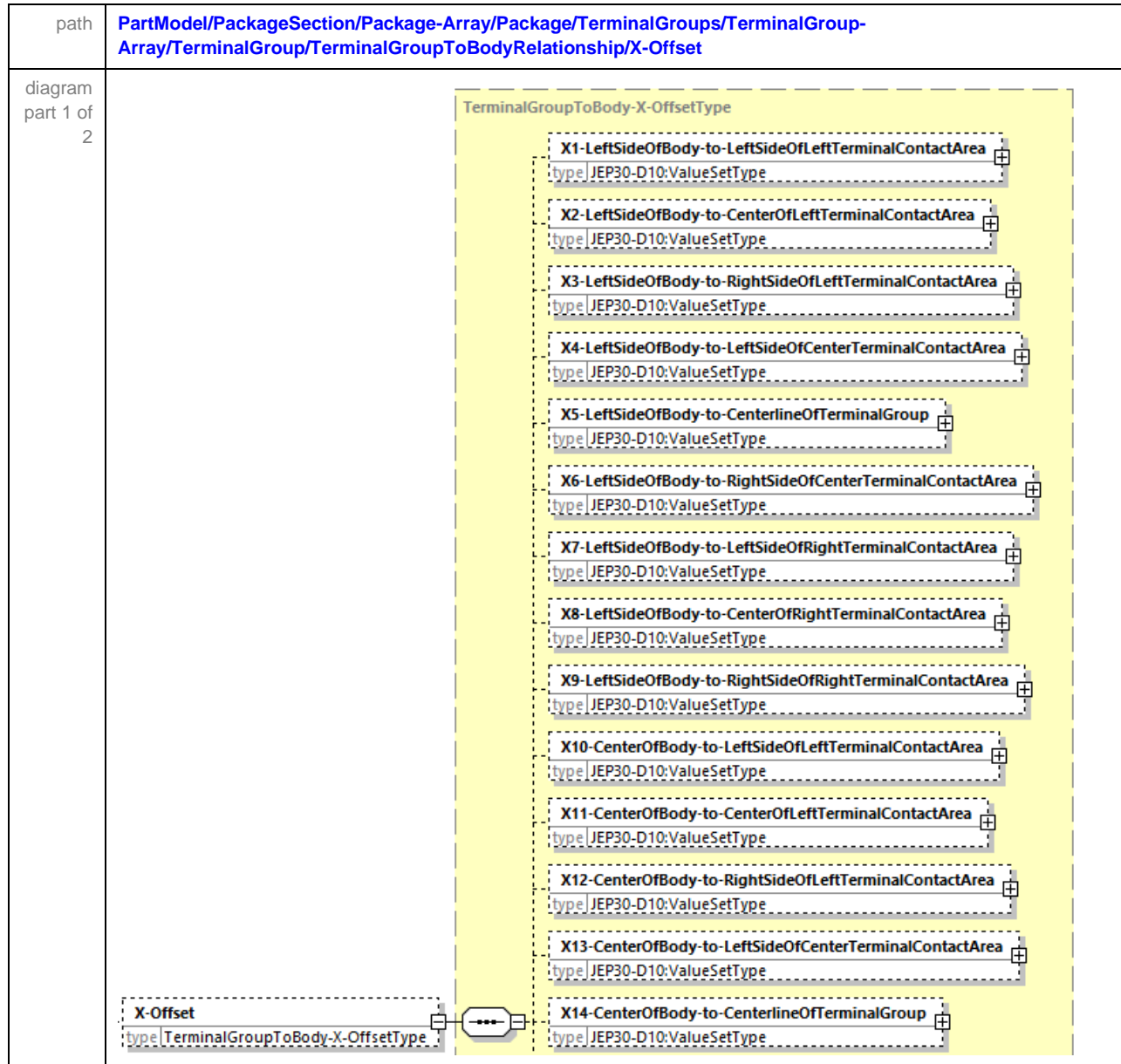


5.15.1.10 Terminal Group to Body Relationship

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalGroupToBodyRelationship
diagram	<p>The diagram illustrates the structure of the <b>TerminalGroupToBodyRelationshipType</b>. It is a class with the following attributes:</p> <ul style="list-style-type: none"><li><b>TerminalPatternID</b>: type xs:string</li><li><b>TerminalPatternGroupID</b>: type xs:string</li><li><b>X-Offset</b>: type TerminalGroupToBody-X-OffsetType</li><li><b>Y-Offset</b>: type TerminalGroupToBody-Y-OffsetType</li><li><b>Z-Offset</b>: type TerminalGroupToBody-Z-OffsetType</li></ul> <p>The diagram also shows a dashed box labeled <b>TerminalGroupToBodyRelationship</b> with the type <b>TerminalGroupToBodyRelationshipType</b>.</p>
type	TerminalGroupToBodyRelationshipType, TerminalGroupToBody-X-OffsetType, TerminalGroupToBody-Y-OffsetType, TerminalGroupToBody-Z-OffsetType.

For non-symmetrical Terminals around the package center, dimensions may be referenced from the Terminal Contact Area to the Package body area. This data can be captured in the *TerminalGroupToBodyRelationship* section.

### 5.15.1.10.1 Terminal Group to Body X-Offset



### 5.13.1.9.1 Terminal Group to Body X-Offset (cont'd)

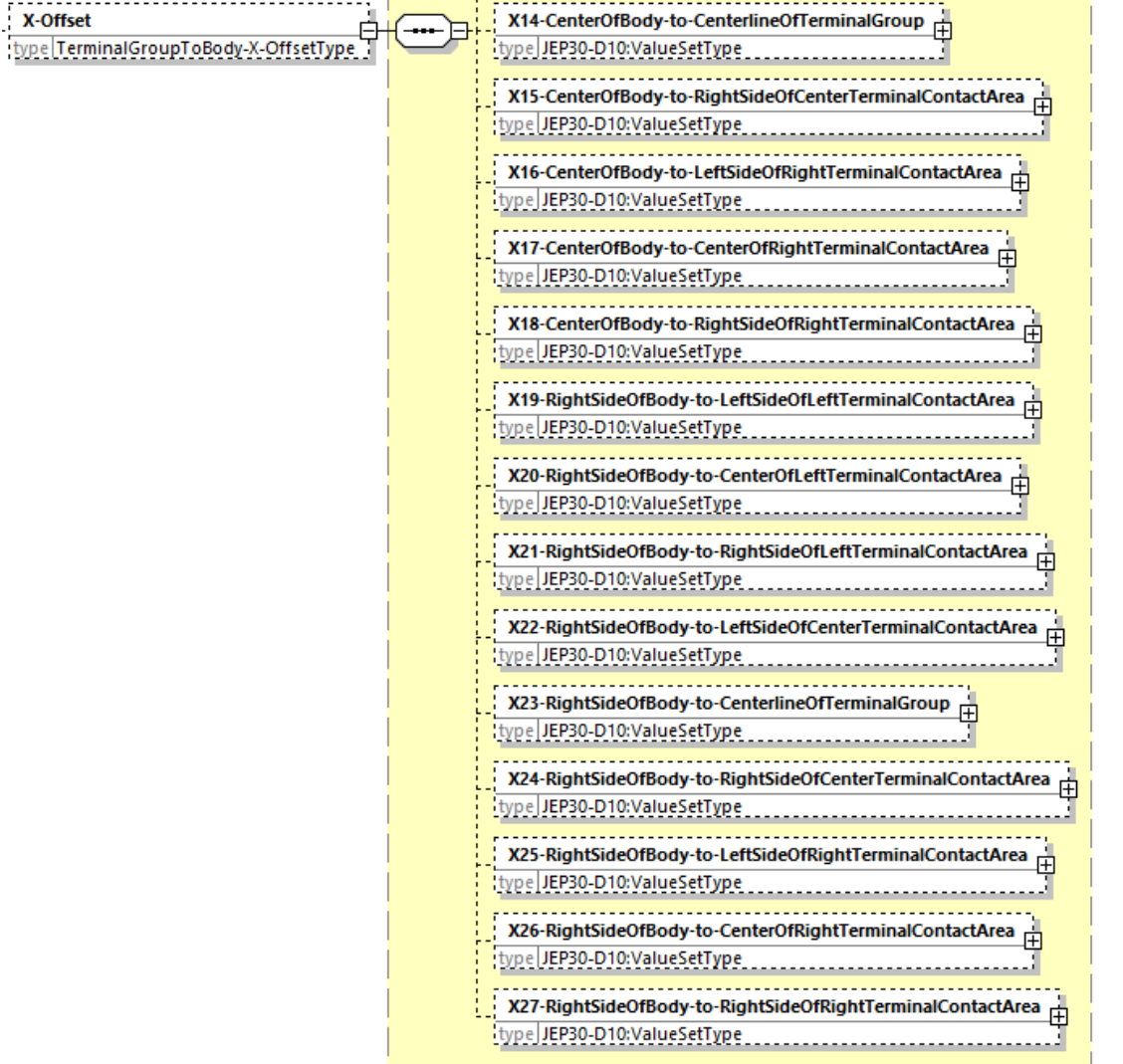
<p>diagram part 2 of 2</p>	 <p><b>X-Offset</b> type TerminalGroupToBody-X-OffsetType</p> <p>X14-CenterOfBody-to-CenterlineOfTerminalGroup type JEP30-D10:ValueSetType</p> <p>X15-CenterOfBody-to-RightSideOfCenterTerminalContactArea type JEP30-D10:ValueSetType</p> <p>X16-CenterOfBody-to-LeftSideOfRightTerminalContactArea type JEP30-D10:ValueSetType</p> <p>X17-CenterOfBody-to-CenterOfRightTerminalContactArea type JEP30-D10:ValueSetType</p> <p>X18-CenterOfBody-to-RightSideOfRightTerminalContactArea type JEP30-D10:ValueSetType</p> <p>X19-RightSideOfBody-to-LeftSideOfLeftTerminalContactArea type JEP30-D10:ValueSetType</p> <p>X20-RightSideOfBody-to-CenterOfLeftTerminalContactArea type JEP30-D10:ValueSetType</p> <p>X21-RightSideOfBody-to-RightSideOfLeftTerminalContactArea type JEP30-D10:ValueSetType</p> <p>X22-RightSideOfBody-to-LeftSideOfCenterTerminalContactArea type JEP30-D10:ValueSetType</p> <p>X23-RightSideOfBody-to-CenterlineOfTerminalGroup type JEP30-D10:ValueSetType</p> <p>X24-RightSideOfBody-to-RightSideOfCenterTerminalContactArea type JEP30-D10:ValueSetType</p> <p>X25-RightSideOfBody-to-LeftSideOfRightTerminalContactArea type JEP30-D10:ValueSetType</p> <p>X26-RightSideOfBody-to-CenterOfRightTerminalContactArea type JEP30-D10:ValueSetType</p> <p>X27-RightSideOfBody-to-RightSideOfRightTerminalContactArea type JEP30-D10:ValueSetType</p>
<p>type</p>	<p>TerminalGroupToBody-X-OffsetType, JEP30-D10:ValueSetType.</p>

Table 38 - Terminal Group to Package Body X-Offset lists out all the various dimensions that can be selected from any major point of the package body to any point of the terminal contact area in X direction.

Center of Center Terminal Contact Area is the same as Centerline of Terminal Group, however the use of the "...Centerline of Terminal Group" is more encompassing since it also includes the centerline of a row or column of an even number of terminals, i.e., midway between terminal 2 and terminal 3 of 4 terminals in a row or column.

### 5.13.1.9.1 Terminal Group to Body X-Offset (cont'd)

**Table 38 - Terminal Group to Package Body X-Offset**

Symbol	Description
X1	Left side of body to Left Side of Left Terminal Contact Area
X2	Left side of body to Center of Left Terminal Contact Area
X3	Left side of body to Right side of Left Terminal Contact Area
X4	Left side of body to Left Side of Center Terminal Contact Area
X5	Left side of body to Centerline of Terminal Group
X6	Left side of body to Right side of Center Terminal Contact Area
X7	Left side of body to Left side of Right Terminal Contact Area
X8	Left side of body to Center of Right Terminal Contact Area
X9	Left side of body to Right side of Right Terminal Contact Area
X10	Center of body to Left side of Left Terminal Contact Area
X11	Center of body to Center of Left Terminal Contact Area
X12	Center of body to Right side of Left Terminal Contact Area
X13	Center of body to Left side of Center Terminal Contact Area
X14	Center of body to Centerline of Terminal Group
X15	Center of body to Right side of Center Terminal Contact Area
X16	Center of body to Left side of Right Terminal Contact Area
X17	Center of body to Center of Right Terminal Contact Area
X18	Center of body to Right side of Right Terminal Contact Area
X19	Right side of body to Left side of Left Terminal Contact Area
X20	Right side of body to Center of Left Terminal Contact Area
X21	Right side of body to Right side of Left Terminal Contact Area
X22	Right side of body to Left side of Center Terminal Contact Area
X23	Right side of body to Centerline of Terminal Group
X24	Right side of body to Right side of Center Terminal Contact Area
X25	Right side of body to Left side of Right Terminal Contact Area
X26	Right side of body to Center of Right Terminal Contact Area
X27	Right side of body to Right side of Right Terminal Contact Area

#### 5.15.1.10.2 Terminal Group to Body Y-Offset

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalGroupToBodyRelationship/Y-Offset
diagram part 1 of 2	<pre> classDiagram     class Y1["Y1-BackSideOfBody-to-BackSideOfBackTerminalContactArea"]     class Y2["Y2-BackSideOfBody-to-CenterOfBackTerminalContactArea"]     class Y3["Y3-BackSideOfBody-to-FrontSideOfBackTerminalContactArea"]     class Y4["Y4-BackSideOfBody-to-BackSideOfCenterTerminalContactArea"]     class Y5["Y5-BackSideOfBody-to-CenterlineOfTerminalGroup"]     class Y6["Y6-BackSideOfBody-to-FrontSideOfCenterTerminalContactArea"]     class Y7["Y7-BackSideOfBody-to-BackSideOfFrontTerminalContactArea"]     class Y8["Y8-BackSideOfBody-to-CenterOfFrontTerminalContactArea"]     class Y9["Y9-BackSideOfBody-to-FrontSideOfFrontTerminalContactArea"]     class Y10["Y10-CenterOfBody-to-BackSideOfBackTerminalContactArea"]     class Y11["Y11-CenterOfBody-to-CenterOfBackTerminalContactArea"]     class Y12["Y12-CenterOfBody-to-FrontSideOfBackTerminalContactArea"]     class Y13["Y13-CenterOfBody-to-BackSideOfCenterTerminalContactArea"]     class Y14["Y14-CenterOfBody-to-CenterlineOfTerminalGroup"]     class YOffset["Y-Offset"]     class TGTBYOT["TerminalGroupToBody-Y-OffsetType"]      Y1 -- &gt; YOffset     Y2 -- &gt; YOffset     Y3 -- &gt; YOffset     Y4 -- &gt; YOffset     Y5 -- &gt; YOffset     Y6 -- &gt; YOffset     Y7 -- &gt; YOffset     Y8 -- &gt; YOffset     Y9 -- &gt; YOffset     Y10 -- &gt; YOffset     Y11 -- &gt; YOffset     Y12 -- &gt; YOffset     Y13 -- &gt; YOffset     Y14 -- &gt; YOffset     YOffset -- &gt; TGTBYOT   </pre>

### 5.13.1.9.2 Terminal Group to Body Y-Offset (cont'd)

<p>diagram part 2 of 2</p>	
<p>type</p>	<p><b>TerminalGroupToBody-Y-OffsetType, JEP30-D10:ValueSetType.</b></p>

Table 39 - Terminal Group to Package Body Y-Offset lists out all the various dimensions that can be selected from any major point of the package body to any point of the terminal contact area in Y direction.

### 5.13.1.9.2 Terminal Group to Body Y-Offset (cont'd)

**Table 39 - Terminal Group to Package Body Y-Offset**

Symbol	Description
Y1	Back side of body to Back side of Back Terminal Contact Area
Y2	Back side of body to Center of Back Terminal Contact Area
Y3	Back side of body to Front side of Back Terminal Contact Area
Y4	Back side of body to Back side of Center Terminal Contact Area
Y5	Back side of body to Centerline of Terminal Group
Y6	Back side of body to Front side of Center Terminal Contact Area
Y7	Back side of body to Back side of Front Terminal Contact Area
Y8	Back side of body to Center of Front Terminal Contact Area
Y9	Back side of body to Front side of Front Terminal Contact Area
Y10	Center of body to Back side of Back Terminal Contact Area
Y11	Center of body to Center of Back Terminal Contact Area
Y12	Center of body to Front side of Back Terminal Contact Area
Y13	Center of body to Back side of Center Terminal Contact Area
Y14	Center of body to Centerline of Terminal Group
Y15	Center of body to Front side of Center Terminal Contact Area
Y16	Center of body to Back side of Front Terminal Contact Area
Y17	Center of body to Center of Front Terminal Contact Area
Y18	Center of body to Front side of Front Terminal Contact Area
Y19	Front side of body to Back side of Back Terminal Contact Area
Y20	Front side of body to Center of Back Terminal Contact Area
Y21	Front side of body to Front side of Back Terminal Contact Area
Y22	Front side of body to Back side of Center Terminal Contact Area
Y23	Front side of body to Centerline of Terminal Group
Y24	Front side of body to Front side of Center Terminal Contact Area
Y25	Front side of body to Back side of Front Terminal Contact Area
Y26	Front side of body to Center of Front Terminal Contact Area
Y27	Front side of body to Front side of Front Terminal Contact Area

### 5.15.1.10.3 Terminal Group to Body Z-Offset





### 5.13.1.9.3 Terminal Group to Body Z-Offset (cont'd)

<p>diagram part 2 of 2</p>	
<p>type</p>	<p><b>TerminalGroupToBody-Z-OffsetType, JEP30-D10:ValueSetType.</b></p>

Table 40 - Terminal Group to Package Body Z-Offset lists out all the various dimensions that can be selected from any major point of the package body to any point of the terminal contact area in Z direction.

### 5.13.1.9.3 Terminal Group to Body Z-Offset (cont'd)

**Table 40 - Terminal Group to Package Body Z-Offset**

Symbol	Description
Z1	Under side of Body to Lower side of Lower Terminal Contact Area
Z2	Under side of Body to Center of Lower Terminal Contact Area
Z3	Under side of Body to Upper side of Lower Terminal Contact Area
Z4	Under side of Body to Lower side of Center Terminal Contact Area
Z5	Under side of Body to Centerline of Terminal Group
Z6	Under side of Body to Upper side of Center Terminal Contact Area
Z7	Under side of Body to Lower side of Upper Terminal Contact Area
Z8	Under side of Body to Center of Upper Terminal Contact Area
Z9	Under side of Body to Upper side of Upper Terminal Contact Area
Z10	Center of Body to Lower side of Lower Terminal Contact Area
Z11	Center of Body to Center of Lower Terminal Contact Area
Z12	Center of Body to Upper side of Lower Terminal Contact Area
Z13	Center of Body to Lower side of Center Terminal Contact Area
Z14	Center of Body to Centerline of Terminal Group
Z15	Center of Body to Upper side of Center Terminal Contact Area
Z16	Center of Body to Lower side of Upper Terminal Contact Area
Z17	Center of Body to Center of Upper Terminal Contact Area
Z18	Center of Body to Upper side of Upper Terminal Contact Area
Z19	Upper side of Body to Lower side of Lower Terminal Contact Area
Z20	Upper side of Body to Center of Lower Terminal Contact Area
Z21	Upper side of Body to Upper side of Lower Terminal Contact Area
Z22	Upper side of Body to Lower side of Center Terminal Contact Area
Z23	Upper side of Body to Centerline of Terminal Group
Z24	Upper side of Body to Upper side of Center Terminal Contact Area
Z25	Upper side of Body to Lower side of Upper Terminal Contact Area
Z26	Upper side of Body to Center of Upper Terminal Contact Area
Z27	Upper side of Body to Upper side of Upper Terminal Contact Area

## 5.15.2 Terminal Regions - Array

path	<a href="#">PartModel/PackageSection/Package-Array/Package/TerminalGroups/Region-Array</a> <a href="#">PartModel/PackageSection/Die-Array/Die/TerminalGroups/Regions-Array</a>
diagram	
type	<a href="#">Region-ArrayType</a> , <a href="#">RegionType</a> , <a href="#">RegionAreaSelectionType</a> , <a href="#">RegionTerminalSelectionType</a> .

### 5.15.2.1 Area Selection

path	<a href="#">PartModel/PackageSection/Package-Array/Package/TerminalGroups/Region-Array/Region/AreaSelection</a> <a href="#">PartModel/PackageSection/Die-Array/Die/TerminalGroups/Regions-Array/Region/AreaSelection</a>
diagram	
type	<a href="#">RegionAreaSelectionType</a> , <a href="#">ReferenceRectangleGroupType</a> , <a href="#">ReferenceRegularPolygonGroupType</a> , <a href="#">JEP30-D10:PointXYType</a> , <a href="#">ContourShapeGroupType</a> .

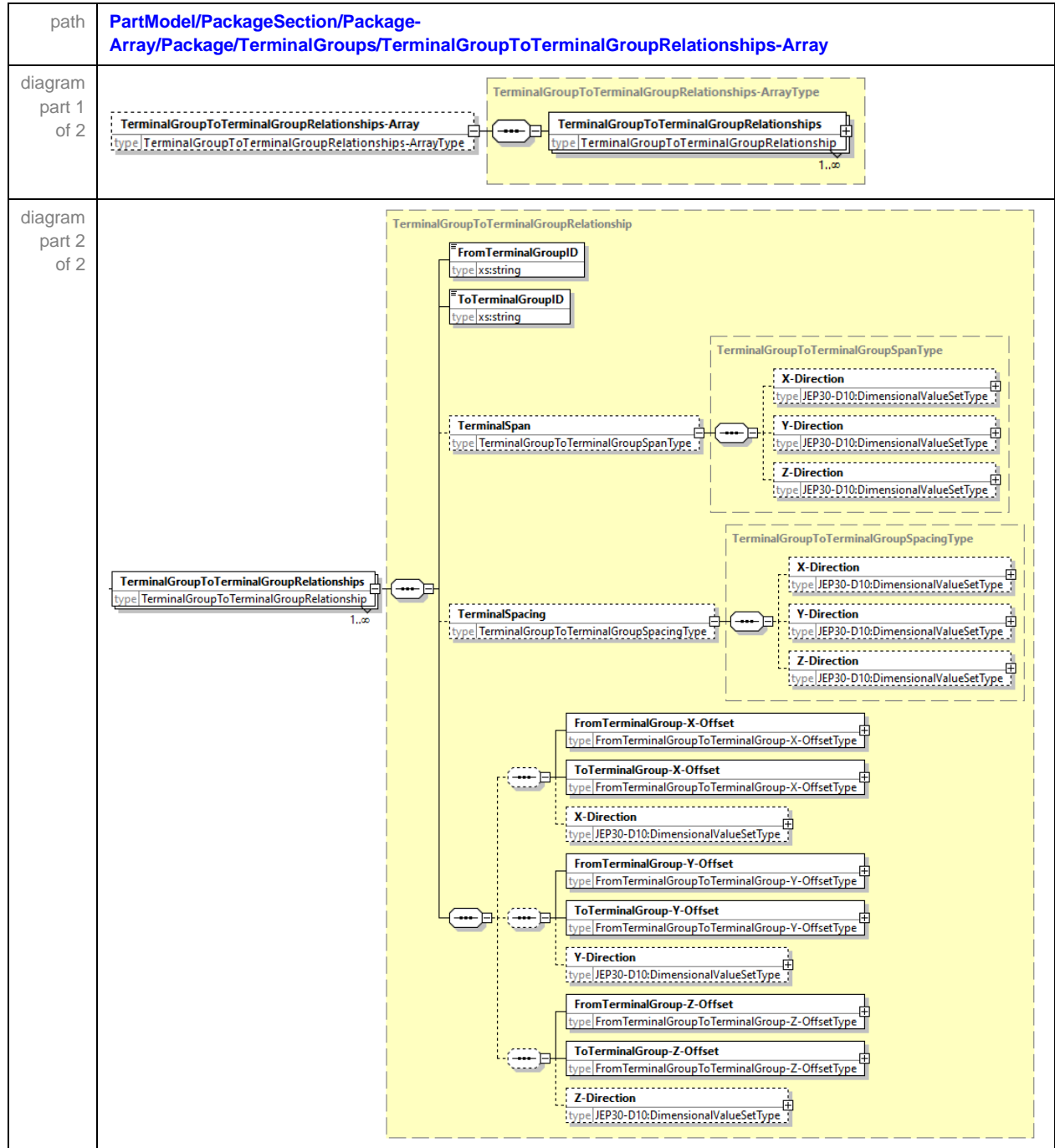
5.15.2.2 Terminal Selection

path	<a href="#">PartModel/PackageSection/Package-Array/Package/TerminalGroups/Region-Array/Region/TerminalSelection</a> <a href="#">PartModel/PackageSection/Die-Array/Die/TerminalGroups/Regions-Array/Region/TerminalSelection</a>
diagram	<p>The diagram illustrates an XSD structure. On the left, a <b>TerminalSelection</b> element is shown with a base type of <code>RegionTerminalSelectionType</code> and a cardinality of <code>1..∞</code>. It has a connector that points to a larger container element on the right. This container is labeled <b>RegionTerminalSelectionType</b> and is enclosed in a dashed yellow border. Inside this container, there is an <b>ID</b> attribute with a base type of <code>xs:string</code>. Below the ID, there are two child elements: <b>Select</b> and <b>Deselect</b>. Both <b>Select</b> and <b>Deselect</b> have a base type of <code>JEP30-D10:TerminalSelectionType</code>. The <b>Deselect</b> element is shown with a dashed border and a cardinality of <code>0..∞</code>.</p>
type	<a href="#">RegionTerminalSelectionType</a> , <a href="#">RegionalTerminalSelectionType</a> .

5.15.2.2.1      **Select**

path	<div><div>PartModel/PackageSection/Package-Array/Package/TerminalGroups/Region-Array/Region/TerminalSelection/Select</div><div>PartModel/PackageSection/Package-Array/Package/TerminalGroups/Region-Array/Region/TerminalSelection/Deselect</div><div>PartModel/PackageSection/Die-Array/Die/TerminalGroups/Regions-Array/Region/TerminalSelection/Select,</div><div>PartModel/PackageSection/Die-Array/Die/TerminalGroups/Regions-Array/Region/TerminalSelection/Deselect</div></div>
diagram	<div><div><div><div><div>TerminalPatternID</div><div>type xs:string</div></div><div><div>PatternGroupID</div><div>type xs:string</div></div><div><div>TerminalGroupID</div><div>type xs:string</div></div><div><div>RegionID</div><div>type xs:string</div></div></div><div><div>0..∞</div><div><div><div>RowTerminalIndex</div><div>type MinIntegerOfOneType</div><div>minIncl/maxIncl 1</div></div><div><div>FromRowTerminalIndex</div><div>type MinIntegerOfOneType</div><div>minIncl/maxIncl 1</div></div><div><div>ToRowTerminalIndex</div><div>type MinIntegerOfOneType</div><div>minIncl/maxIncl 1</div></div></div><div><div>0..∞</div><div><div><div>ColumnTerminalIndex</div><div>type MinIntegerOfOneType</div><div>minIncl/maxIncl 1</div></div><div><div>FromColumnTerminalIndex</div><div>type MinIntegerOfOneType</div><div>minIncl/maxIncl 1</div></div><div><div>ToColumnTerminalIndex</div><div>type MinIntegerOfOneType</div><div>minIncl/maxIncl 1</div></div></div><div><div>1..∞</div><div><div><div>PolarTerminalIndex</div><div>type MinIntegerOfOneType</div><div>minIncl/maxIncl 1</div></div><div><div>FromPolarTerminalIndex</div><div>type MinIntegerOfOneType</div><div>minIncl/maxIncl 1</div></div><div><div>ToPolarTerminalIndex</div><div>type MinIntegerOfOneType</div><div>minIncl/maxIncl 1</div></div></div><div><div>1..∞</div><div><div><div>TerminalNumber</div><div>type xs:string</div></div><div><div>FromTerminalNumber</div><div>type xs:string</div></div><div><div>ToTerminalNumber</div><div>type xs:string</div></div></div></div></div></div><div><div>Select</div><div>type JEP30-D10:TerminalSelectionType</div></div></div></div></div>
type	<b>RegionalTerminalSelectionType.</b>

### 5.15.3 Terminal Group to Terminal Group Relationship Array



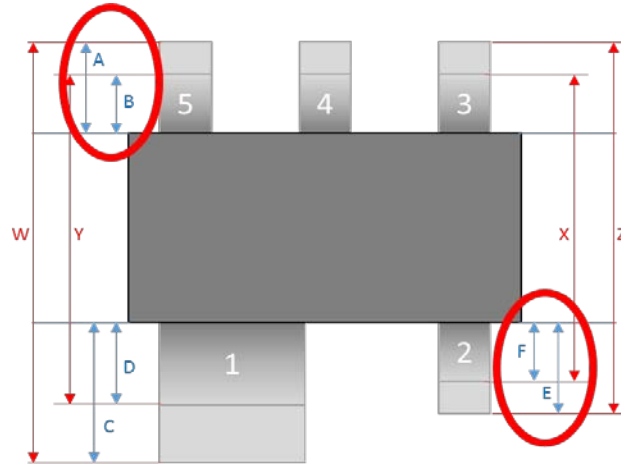
### 5.14.3 Terminal Group to Terminal Group Relationship Array (cont'd)

type	<p><b>TerminalGroupToTerminalGroupRelationships-ArrayType</b>, <b>TerminalGroupToTerminalGroupRelationship</b>, <b>TerminalGroupToTerminalGroupSpanXYZType</b>, <b>TerminalGroupToTerminalGroupSpacingXYZType</b>, <b>FromTerminalGroupToTerminalGroup-X-OffsetType</b>, <b>FromTerminalGroupToTerminalGroup-Z-OffsetType</b>, <b>TerminalPositionInGroup-X-OffsetType</b>, <b>LocationInTerminalShape-X-OffsetType</b>, <b>TerminalPositionInGroup-Y-OffsetType</b>, <b>LocationInTerminalShape-Y-OffsetType</b>, <b>TerminalPositionInGroup-Z-OffsetType</b>, <b>LocationInTerminalShape-Z-OffsetType</b>, <b>JEP30-D10:EmptyType</b>.</p>

### 5.14.3 Terminal Group to Terminal Group Relationship Array (cont'd)

This section is very similar to Terminal Span and Spacing but in this case, it is capturing the Terminal Span and Spacing between Terminal Contact Area that are not symmetrical around the Package-body shape, or between terminal groups whose terminal types are different.

**Figure 7 - Terminal Group to Terminal Group Span and Spacing**



Assuming that the only dimensions provided for the Part in Figure 7, were the dimensions (w, x, y, and z), but not dimensions (a, b, c, d, e or f), then the only way to establish the location of Terminal 1 contact area is to define terminals 2, 3, 4 and 5 first, and then leveraging off the terminal location for terminal 5, using dimension w and y, the dimension w therefore becomes the Terminal Span between terminal 1 and terminal 5. Dimension y becomes the Terminal Spacing between terminal 1 and terminal 5. Terminal 1 must be located in different terminal groups to terminals 2-5.

Terminal Span and Spacing values are more critical than Terminal length in the calculation of the most efficient land patterns for several Terminal Shapes. The requirements for the provision of the above data elements can be found in JESD30, under the “Terminal Span and Terminal Spacing” section which includes a table titled “Terminal Shapes requiring Terminal Span and Terminal Spacing dimensions”.

### 5.15.4 Terminal Detail Array

path	<a href="#">PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalDetail-Array</a>
diagram	<pre> classDiagram     class TerminalDetailArray {         type TerminalDetail-ArrayType     }     class TerminalDetail {         type TerminalDetailType     }     class FirstTerminalLocation {         type FirstTerminalLocationType     }     class TerminalNumberPattern {         type TerminalNumberPatternType     }     class TerminalDetailExceptions {         type TerminalDetailExceptionsType     }     TerminalDetailArray -- &gt; TerminalDetail     TerminalDetailArray -- &gt; FirstTerminalLocation     TerminalDetailArray -- &gt; TerminalNumberPattern     TerminalDetailArray -- &gt; TerminalDetailExceptions     </pre>
type	<a href="#">TerminalDetail-ArrayType</a> , <a href="#">TerminalDetailType</a> , <a href="#">FirstTerminalLocationType</a> , <a href="#">TerminalNumberPatternType</a> , <a href="#">TerminalDetailExceptionsType</a> .



5.15.4.1 Terminal Detail

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalDetail-Array/TerminalDetail
diagram	
type	TerminalDetailType, TerminalCenterType, JEP30-D10:MinIntegerOfOneType, TerminalStatusType, JEP30-D10:EmptyType.

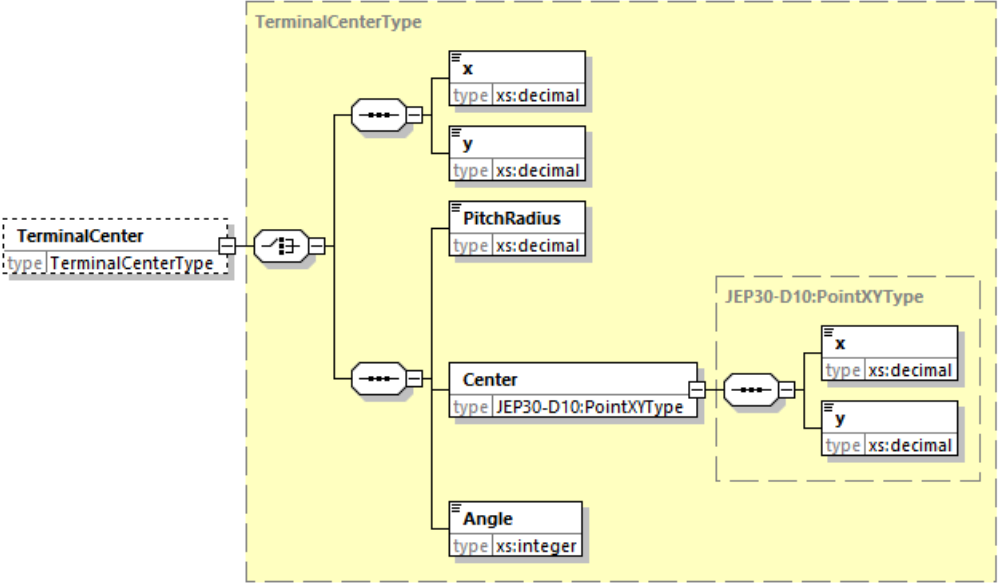
This section identifies the relationship between the electrical [TerminalNumber](#) and the physical terminal location on the package. The physical terminal location can be defined by either the identification of the [TerminalGroup](#), [RowTerminalIndex](#) and the [ColumnTerminalIndex](#) within that specific [TerminalGroup](#), or by a set of x,y coordinates. If the [TerminalPattern](#) is a [CircularArray](#), then the physical terminal location can be defined by either the identification of the [TerminalGroup](#), [PolarTerminalIndex](#) within that specific [TerminalGroup](#), or by polar coordinates.

The row and column terminal index are simply a grid index of the terminal locations, within a specific [TerminalGroup](#) and starts off with the number 1 in the lower left position. The [RowTerminalIndex](#) increments from left-to-right, whereas the [ColumnTerminalIndex](#) increments from back-to-front. The [TerminalGroupID](#), [RowTerminalIndex](#) and the [ColumnTerminalIndex](#) combination provide a unique ID for every terminal on the package, irrespective of the status that is assigned to the specific terminal.

The [IgnoreForLandPattern](#) is when a specific terminal does not contribute to the generation of a

land pattern.

5.15.4.1.1 Terminal Center

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalDetail-Array/TerminalDetail/TerminalCenter
diagram	 <p>The diagram illustrates the structure of the <code>TerminalCenterType</code>. It is a class with a dashed border and a yellow background. The class has four attributes: <code>x</code> (type <code>xs:decimal</code>), <code>y</code> (type <code>xs:decimal</code>), <code>PitchRadius</code> (type <code>xs:decimal</code>), and <code>Center</code> (type <code>JEP30-D10:PointXYType</code>). The <code>Center</code> attribute is further detailed by a dashed box labeled <code>JEP30-D10:PointXYType</code>, which contains two attributes: <code>x</code> (type <code>xs:decimal</code>) and <code>y</code> (type <code>xs:decimal</code>). The <code>Center</code> attribute is also associated with an <code>Angle</code> attribute (type <code>xs:integer</code>).</p>
type	TerminalCenterType, JEP30-D10:PointType

For [StandardArray](#) and for [RandomArray](#), xy coordinates can be used to capture the center of the terminals, whereas for [CircularArray](#), polar coordinates are a more convenient representation to capture the terminal centers.

### 5.13.3.1.1 Terminal Center (cont'd)

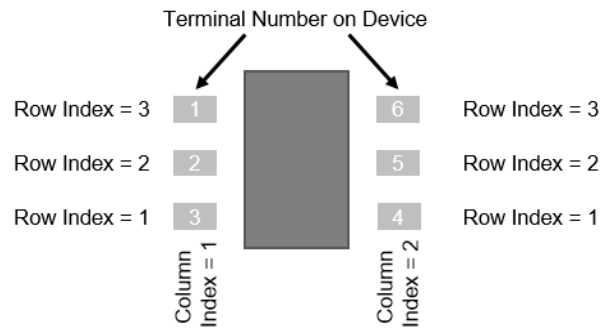


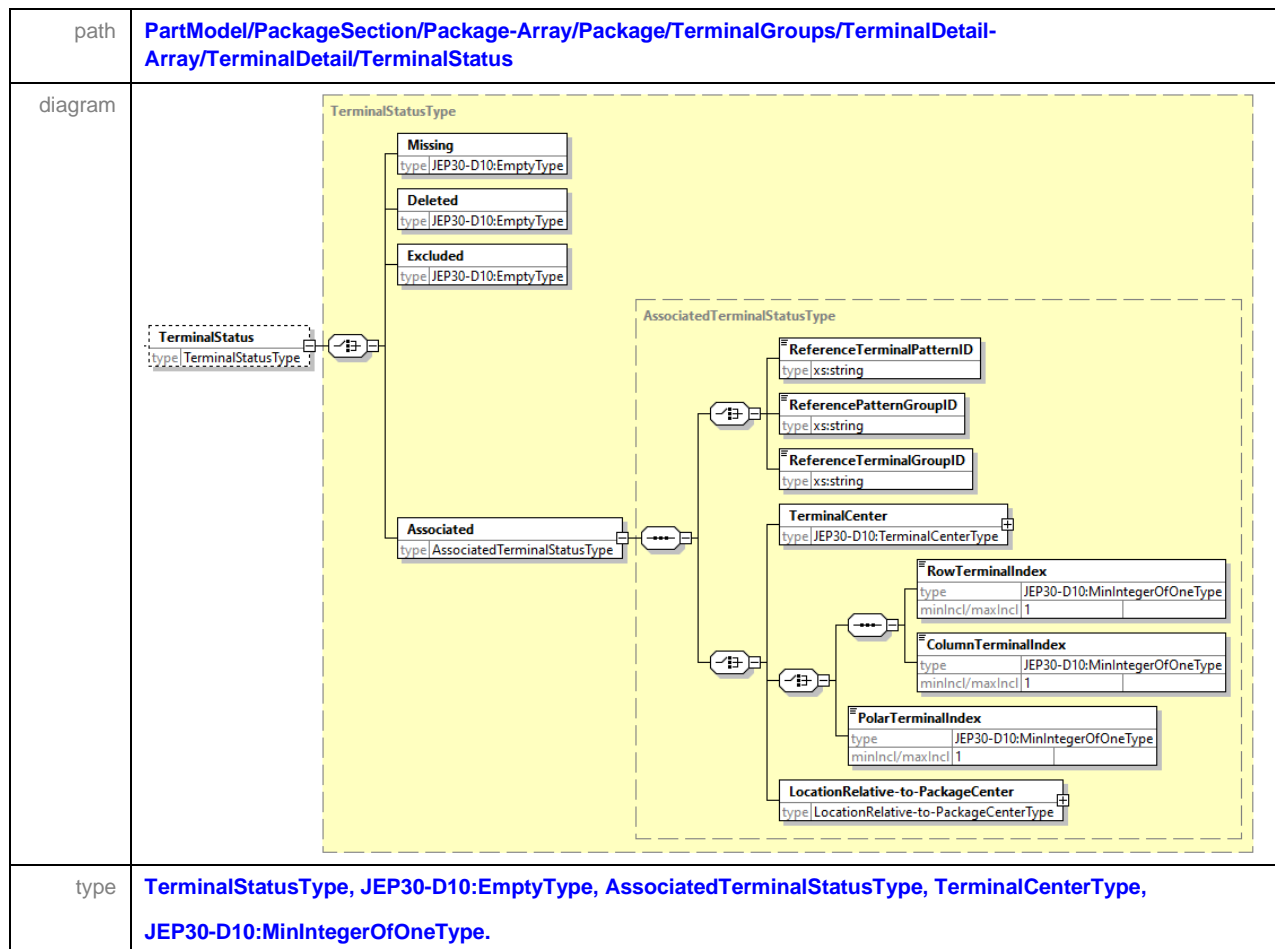
Figure 8 - SOIC

```

<TerminalDetail-Array>
  <TerminalDetail>
    <TerminalNumber>1</TerminalNumber>
    <TerminalGroupID>1</TerminalGroupID>
    <RowTerminalIndex>3</RowTerminalIndex>
    <ColumnTerminalIndex>1</ColumnTerminalIndex>
  </TerminalDetail>
  <TerminalDetail>
    <TerminalNumber>2</TerminalNumber>
    <TerminalGroupID>1</TerminalGroupID>
    <RowTerminalIndex>2</RowTerminalIndex>
    <ColumnTerminalIndex>1</ColumnTerminalIndex>
  </TerminalDetail>
  <TerminalDetail>
    <TerminalNumber>3</TerminalNumber>
    <TerminalGroupID>1</TerminalGroupID>
    <RowTerminalIndex>1</RowTerminalIndex>
    <ColumnTerminalIndex>1</ColumnTerminalIndex>
  </TerminalDetail>
  <TerminalDetail>
    <TerminalNumber>4</TerminalNumber>
    <TerminalGroupID>1</TerminalGroupID>
    <RowTerminalIndex>1</RowTerminalIndex>
    <ColumnTerminalIndex>2</ColumnTerminalIndex>
  </TerminalDetail>
  <TerminalDetail>
    <TerminalNumber>5</TerminalNumber>
    <TerminalGroupID>1</TerminalGroupID>
    <RowTerminalIndex>2</RowTerminalIndex>
    <ColumnTerminalIndex>2</ColumnTerminalIndex>
  </TerminalDetail>
  <TerminalDetail>
    <TerminalNumber>6</TerminalNumber>
    <TerminalGroupID>1</TerminalGroupID>
    <RowTerminalIndex>3</RowTerminalIndex>
    <ColumnTerminalIndex>2</ColumnTerminalIndex>
  </TerminalDetail>
</TerminalDetail-Array>

```

### 5.15.4.1.2 Terminal Status



This section identifies the terminal status of each terminal. The status of [Missing](#), [Deleted](#) and [Excluded](#) are defined in section called “Terminal-count suffixes” of JESD30.

The [TerminalDetail](#) and associated [TerminalStatus](#) will now look like this in the xml file.

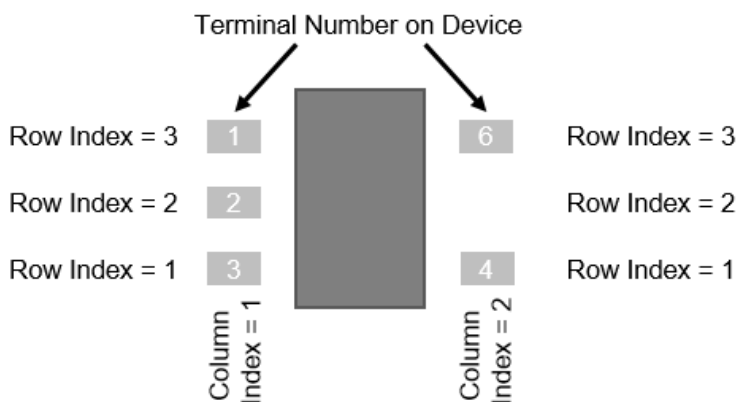


Figure 9 - SOIC with Terminal 5 Missing

### 5.13.3.1.2 Terminal Status (cont'd)

```
<TerminalDetail>
  <TerminalNumber>5</TerminalNumber>
  <TerminalGroupID>1</TerminalGroupID>
  <RowTerminalIndex>2</RowTerminalIndex>
  <ColumnTerminalIndex>2</ColumnTerminalIndex>
  <TerminalStatus>
    <Missing/>
  </TerminalStatus>
</TerminalDetail>
```

Note how *TerminalNumber* 5 is included in the xml file, and that the terminal at location of *RowTerminalIndex* = 3, and *ColumnTerminalIndex* = 2, that the *TerminalNumber* is 6.

When the Terminal is deleted, its index within the *TerminalGroup*, must still be defined. However, notice how the *TerminalNumber* element is not populated for this deleted position of *RowTerminalIndex* = 2, and *ColumnTerminalIndex* = 2. *TerminalNumber* 5 is now included in the xml file at location of *RowTerminalIndex* = 3, and *ColumnTerminalIndex* = 2.

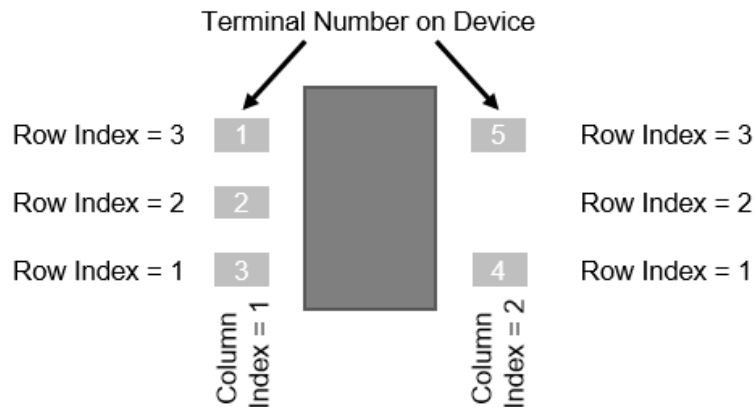


Figure 10 - SOIC with Terminal 5 Deleted

### 5.13.3.1.2 Terminal Status (cont'd)

```
<TerminalDetail-Array>
  <TerminalDetail>
    <TerminalNumber>1</TerminalNumber>
    <TerminalGroupID>1</TerminalGroupID>
    <RowTerminalIndex>3</RowTerminalIndex>
    <ColumnTerminalIndex>1</ColumnTerminalIndex>
  </TerminalDetail>
  <TerminalDetail>
    <TerminalNumber>2</TerminalNumber>
    <TerminalGroupID>1</TerminalGroupID>
    <RowTerminalIndex>2</RowTerminalIndex>
    <ColumnTerminalIndex>1</ColumnTerminalIndex>
  </TerminalDetail>
  <TerminalDetail>
    <TerminalNumber>3</TerminalNumber>
    <TerminalGroupID>1</TerminalGroupID>
    <RowTerminalIndex>1</RowTerminalIndex>
    <ColumnTerminalIndex>1</ColumnTerminalIndex>
  </TerminalDetail>
  <TerminalDetail>
    <TerminalNumber>4</TerminalNumber>
    <TerminalGroupID>1</TerminalGroupID>
    <RowTerminalIndex>1</RowTerminalIndex>
    <ColumnTerminalIndex>2</ColumnTerminalIndex>
  </TerminalDetail>
  <TerminalDetail>
    <TerminalGroupID>1</TerminalGroupID>
    <RowTerminalIndex>2</RowTerminalIndex>
    <ColumnTerminalIndex>2</ColumnTerminalIndex>
    <TerminalStatus>
      <Deleted/>
    </TerminalStatus>
  </TerminalDetail>
  <TerminalDetail>
    <TerminalNumber>5</TerminalNumber>
    <TerminalGroupID>1</TerminalGroupID>
    <RowTerminalIndex>3</RowTerminalIndex>
    <ColumnTerminalIndex>2</ColumnTerminalIndex>
  </TerminalDetail>
</TerminalDetail-Array>
```

### 5.13.3.1.2 Terminal Status (cont'd)

*TerminalStatus* of *Associated* occurs when you have parts with physically connected terminals and where there is a special requirement to be implemented in the land pattern for the proper performance of the device. The device may be constructed in accordance with either option A or option B as shown in Figure 11.

This device has two *TerminalGroups*. Lets assume that *TerminalGroup* 1 represents a 2 rows of 4 columns, and that *TerminalGroup* 2 represent the actual shape of terminal 1 on the device.

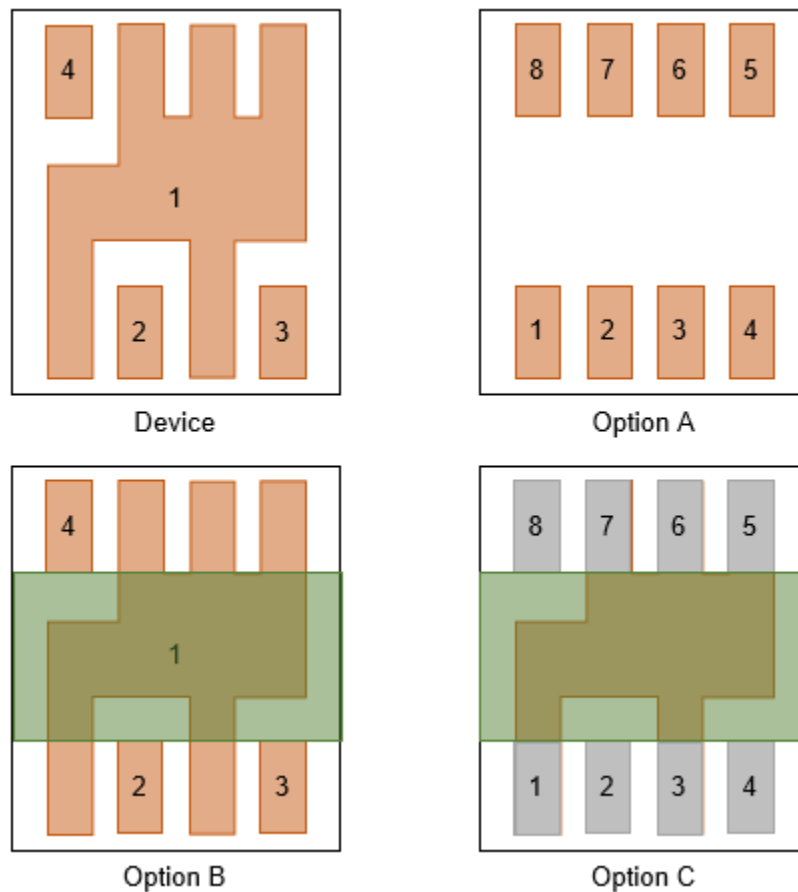


Figure 11 – Part with Special Terminal Pattern

### 5.13.3.1.2 Terminal Status (cont'd)

If option A land pattern is desired for the device, then the xml configuration should be as follows:

```
<TerminalDetail-Array>
  <TerminalDetail>
    <TerminalNumber>1</TerminalNumber>
    <TerminalGroupID>1</TerminalGroupID>
    <RowTerminalIndex>1</RowTerminalIndex>
    <ColumnTerminalIndex>1</ColumnTerminalIndex>
    <TerminalStatus>
      <Associated>
        <ReferenceTerminalGroupID>2</ReferenceTerminalGroupID>
      </Associated>
    </TerminalStatus>
  </TerminalDetail>
  <TerminalDetail>
    <TerminalNumber>2</TerminalNumber>
    <TerminalGroupID>1</TerminalGroupID>
    <RowTerminalIndex>1</RowTerminalIndex>
    <ColumnTerminalIndex>2</ColumnTerminalIndex>
  </TerminalDetail>
  <TerminalDetail>
    <TerminalNumber>3</TerminalNumber>
    <TerminalGroupID>1</TerminalGroupID>
    <RowTerminalIndex>1</RowTerminalIndex>
    <ColumnTerminalIndex>3</ColumnTerminalIndex>
    <TerminalStatus>
      <Associated>
        <ReferenceTerminalGroupID>2</ReferenceTerminalGroupID>
      </Associated>
    </TerminalStatus>
  </TerminalDetail>
  <TerminalDetail>
    <TerminalNumber>4</TerminalNumber>
    <TerminalGroupID>1</TerminalGroupID>
    <RowTerminalIndex>1</RowTerminalIndex>
    <ColumnTerminalIndex>4</ColumnTerminalIndex>
  </TerminalDetail>
  <TerminalDetail>
    <TerminalNumber>5</TerminalNumber>
    <TerminalGroupID>1</TerminalGroupID>
    <RowTerminalIndex>2</RowTerminalIndex>
    <ColumnTerminalIndex>4</ColumnTerminalIndex>
    <TerminalStatus>
      <Associated>
        <ReferenceTerminalGroupID>2</ReferenceTerminalGroupID>
      </Associated>
    </TerminalStatus>
  </TerminalDetail>
  <TerminalDetail>
    <TerminalNumber>6</TerminalNumber>
    <TerminalGroupID>1</TerminalGroupID>
    <RowTerminalIndex>2</RowTerminalIndex>
    <ColumnTerminalIndex>3</ColumnTerminalIndex>
    <TerminalStatus>
      <Associated>
        <ReferenceTerminalGroupID>2</ReferenceTerminalGroupID>
      </Associated>
    </TerminalStatus>
  </TerminalDetail>
</TerminalDetail-Array>
```



### 5.13.3.1.2 Terminal Status (cont'd)

```

<TerminalDetail>
  <TerminalNumber>7</TerminalNumber>
  <TerminalGroupID>1</TerminalGroupID>
  <RowTerminalIndex>2</RowTerminalIndex>
  <ColumnTerminalIndex>2</ColumnTerminalIndex>
  <TerminalStatus>
    <Associated>
      <ReferenceTerminalGroupID>2</ReferenceTerminalGroupID>
    </Associated>
  </TerminalStatus>
</TerminalDetail>
<TerminalDetail>
  <TerminalNumber>8</TerminalNumber>
  <TerminalGroupID>1</TerminalGroupID>
  <RowTerminalIndex>2</RowTerminalIndex>
  <ColumnTerminalIndex>1</ColumnTerminalIndex>
</TerminalDetail>
<TerminalDetail>
  <TerminalGroupID>2</TerminalGroupID>
  <RowTerminalIndex>1</RowTerminalIndex>
  <ColumnTerminalIndex>1</ColumnTerminalIndex>
  <IgnoreForLandPattern/>
</TerminalDetail>
</TerminalDetail-Array>

```

In this scenario, the following are enforced:-

1. Terminal group 2 is set to *IgnoreForLandPattern*,
2. Positions as shown by the number sequence in option A of 1, 3, 5, 6 and 7 are associated with terminal Group 2.
3. Since there is only 1 terminal in TerminalGroup 2, then there is no requirement to reference the *RowTerminalIndex* and the *ColumnTerminalIndex*. If the *RowTerminalIndex* and the *ColumnTerminalIndex* are omitted, then 1 is assumed.

### 5.13.3.1.2 Terminal Status (cont'd)

If option B land pattern is desired for the device, then the xml configuration should be as follows.

```
<TerminalDetail-Array>
  <TerminalDetail>
    <TerminalNumber>1</TerminalNumber>
    <TerminalGroupID>1</TerminalGroupID>
    <RowTerminalIndex>1</RowTerminalIndex>
    <ColumnTerminalIndex>1</ColumnTerminalIndex>
    <TerminalStatus>
      <Associated>
        <ReferenceTerminalGroupID>2</ReferenceTerminalGroupID>
      </Associated>
    </TerminalStatus>
    <IgnoreForLandPattern/>
  </TerminalDetail>
  <TerminalDetail>
    <TerminalNumber>2</TerminalNumber>
    <TerminalGroupID>1</TerminalGroupID>
    <RowTerminalIndex>1</RowTerminalIndex>
    <ColumnTerminalIndex>2</ColumnTerminalIndex>
  </TerminalDetail>
  <TerminalDetail>
    <TerminalNumber>1</TerminalNumber>
    <TerminalGroupID>1</TerminalGroupID>
    <RowTerminalIndex>1</RowTerminalIndex>
    <ColumnTerminalIndex>3</ColumnTerminalIndex>
    <TerminalStatus>
      <Associated>
        <ReferenceTerminalGroupID>2</ReferenceTerminalGroupID>
      </Associated>
    </TerminalStatus>
    <IgnoreForLandPattern/>
  </TerminalDetail>
  <TerminalDetail>
    <TerminalNumber>3</TerminalNumber>
    <TerminalGroupID>1</TerminalGroupID>
    <RowTerminalIndex>1</RowTerminalIndex>
    <ColumnTerminalIndex>4</ColumnTerminalIndex>
  </TerminalDetail>
  <TerminalDetail>
    <TerminalNumber>1</TerminalNumber>
    <TerminalGroupID>1</TerminalGroupID>
    <RowTerminalIndex>2</RowTerminalIndex>
    <ColumnTerminalIndex>4</ColumnTerminalIndex>
    <TerminalStatus>
      <Associated>
        <ReferenceTerminalGroupID>2</ReferenceTerminalGroupID>
      </Associated>
    </TerminalStatus>
    <IgnoreForLandPattern/>
  </TerminalDetail>
  <TerminalDetail>
    <TerminalNumber>1</TerminalNumber>
    <TerminalGroupID>1</TerminalGroupID>
    <RowTerminalIndex>2</RowTerminalIndex>
    <ColumnTerminalIndex>3</ColumnTerminalIndex>
    <TerminalStatus>
      <Associated>
        <ReferenceTerminalGroupID>2</ReferenceTerminalGroupID>
      </Associated>
    </TerminalStatus>
  </TerminalDetail>

```

### 5.13.3.1.2 Terminal Status (cont'd)

```

        </TerminalStatus>
        <IgnoreForLandPattern/>
    </TerminalDetail>
    <TerminalDetail>
        <TerminalNumber>1</TerminalNumber>
        <TerminalGroupID>1</TerminalGroupID>
        <RowTerminalIndex>2</RowTerminalIndex>
        <ColumnTerminalIndex>2</ColumnTerminalIndex>
        <TerminalStatus>
            <Associated>
                <ReferenceTerminalGroupID>2</ReferenceTerminalGroupID>
            </Associated>
        </TerminalStatus>
        <IgnoreForLandPattern/>
    </TerminalDetail>
    <TerminalDetail>
        <TerminalNumber>4</TerminalNumber>
        <TerminalGroupID>1</TerminalGroupID>
        <RowTerminalIndex>2</RowTerminalIndex>
        <ColumnTerminalIndex>1</ColumnTerminalIndex>
    </TerminalDetail>
    <TerminalDetail>
        <TerminalNumber>1</TerminalNumber>
        <TerminalGroupID>2</TerminalGroupID>
        <RowTerminalIndex>1</RowTerminalIndex>
        <ColumnTerminalIndex>1</ColumnTerminalIndex>
    </TerminalDetail>
</TerminalDetail-Array>

```

In this scenario, the following are enforced:-

1. Terminal group 2 is not set to *IgnoreForLandPattern* and therefore drives the shape of the land pattern on the printed board.
2. Positions as shown by the number sequence in option A of 1, 3, 5, 6 and 7 are associated with terminal Group 2, and each of these are set to *IgnoreForLandPattern*.

### 5.13.3.1.2 Terminal Status (cont'd)

If option C land pattern is desired for the device, then the xml configuration should be as follows.

```
<TerminalDetail-Array>
  <TerminalDetail>
    <TerminalNumber>1</TerminalNumber>
    <TerminalGroupID>1</TerminalGroupID>
    <RowTerminalIndex>1</RowTerminalIndex>
    <ColumnTerminalIndex>1</ColumnTerminalIndex>
    <TerminalStatus>
      <Associated>
        <ReferenceTerminalGroupID>2</ReferenceTerminalGroupID>
      </Associated>
    </TerminalStatus>
    <IgnoreForLandPattern/>
  </TerminalDetail>
  <TerminalDetail>
    <TerminalNumber>2</TerminalNumber>
    <TerminalGroupID>1</TerminalGroupID>
    <RowTerminalIndex>1</RowTerminalIndex>
    <ColumnTerminalIndex>2</ColumnTerminalIndex>
  </TerminalDetail>
  <TerminalDetail>
    <TerminalNumber>3</TerminalNumber>
    <TerminalGroupID>1</TerminalGroupID>
    <RowTerminalIndex>1</RowTerminalIndex>
    <ColumnTerminalIndex>3</ColumnTerminalIndex>
    <TerminalStatus>
      <Associated>
        <ReferenceTerminalGroupID>2</ReferenceTerminalGroupID>
      </Associated>
    </TerminalStatus>
    <IgnoreForLandPattern/>
  </TerminalDetail>
  <TerminalDetail>
    <TerminalNumber>4</TerminalNumber>
    <TerminalGroupID>1</TerminalGroupID>
    <RowTerminalIndex>1</RowTerminalIndex>
    <ColumnTerminalIndex>4</ColumnTerminalIndex>
  </TerminalDetail>
  <TerminalDetail>
    <TerminalNumber>5</TerminalNumber>
    <TerminalGroupID>1</TerminalGroupID>
    <RowTerminalIndex>2</RowTerminalIndex>
    <ColumnTerminalIndex>4</ColumnTerminalIndex>
    <TerminalStatus>
      <Associated>
        <ReferenceTerminalGroupID>2</ReferenceTerminalGroupID>
      </Associated>
    </TerminalStatus>
    <IgnoreForLandPattern/>
  </TerminalDetail>
  <TerminalDetail>
    <TerminalNumber>6</TerminalNumber>
    <TerminalGroupID>1</TerminalGroupID>
    <RowTerminalIndex>2</RowTerminalIndex>
    <ColumnTerminalIndex>3</ColumnTerminalIndex>
    <TerminalStatus>
      <Associated>
        <ReferenceTerminalGroupID>2</ReferenceTerminalGroupID>
      </Associated>
    </TerminalStatus>
  </TerminalDetail>
</TerminalDetail-Array>
```

### 5.13.3.1.2 Terminal Status (cont'd)

```

        </TerminalStatus>
        <IgnoreForLandPattern/>
    </TerminalDetail>
    <TerminalDetail>
        <TerminalNumber>7</TerminalNumber>
        <TerminalGroupID>1</TerminalGroupID>
        <RowTerminalIndex>2</RowTerminalIndex>
        <ColumnTerminalIndex>2</ColumnTerminalIndex>
        <TerminalStatus>
            <Associated>
                <ReferenceTerminalGroupID>2</ReferenceTerminalGroupID>
            </Associated>
        </TerminalStatus>
        <IgnoreForLandPattern/>
    </TerminalDetail>
    <TerminalDetail>
        <TerminalNumber>8</TerminalNumber>
        <TerminalGroupID>1</TerminalGroupID>
        <RowTerminalIndex>2</RowTerminalIndex>
        <ColumnTerminalIndex>1</ColumnTerminalIndex>
    </TerminalDetail>
    <TerminalDetail>
        <TerminalNumber>1</TerminalNumber>
        <TerminalGroupID>2</TerminalGroupID>
        <RowTerminalIndex>1</RowTerminalIndex>
        <ColumnTerminalIndex>1</ColumnTerminalIndex>
    </TerminalDetail>
</TerminalDetail-Array>

```

In this scenario, the following are enforced:-

1. Terminal group 2 is not set to *IgnoreForLandPattern* and therefore drives the shape of the land pattern on the printed board.
2. Positions as shown by the number sequence in option A of 1, 3, 5, 6 and 7 are associated with terminal Group 2, and each of these are set to *IgnoreForLandPattern*.

#### 5.15.4.2 First Terminal Location

path	<b>PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalDetail-Array/FirstTerminalLocation</b>
diagram	
type	<b>FirstTerminalLocationType, TerminalCenterType, JEP30-D10:MinIntegerOfOneType, LocationRelative-to-PackageCenterType, LocationRelative-to-PackageCenterCodeType, LocationRelative-to-PackageCenterDescriptionType.</b>

The enumerated values for the *LocationRelative-to-PackageCenter* (Code and Description) are defined in Table 41.

**5.13.3.2.1 First Terminal Location (cont'd)**

**Table 41 - Location Relative to Package Center**

<b>Code</b>	<b>Description</b>
SW	Southwest
SE	Southeast
NE	Northeast
NW	Northwest
BL	Back-Left
BC	Back-Center
BR	Back-Right
FL	Front-Left
FC	Front-Center
FR	Front-Right
LB	Left-Bottom
LC	Left-Center
LT	Left-Top
RB	Right-Bottom
RC	Right-Center
RT	Right-Top
L	Left
B	Back
R	Right
F	Front

Reference the “Single Position” single terminal illustrations in JESD30, Annex A for graphical representations of some of the above descriptions.

5.15.4.3 Terminal Number Pattern

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalDetail-Array/TerminalNumberPattern
diagram	
type	TerminalNumberPatternType, JEP30-D10:SequentialTerminalNomenclatureOrderingType, JEP30-D10:GridTerminalNomenclatureOrderingType.

If the terminal numbering on a Part has logical structure to its pattern, then this can be captured in this [TerminalNumberPattern](#) section. The section covers the capturing of the [FirstTerminalLocation](#) which is the start of the pattern numbering via the [Sequential](#) or [Grid](#) branches. Any terminals that are either deleted, missing or associated within the pattern are then covered via the [TerminalDetailExceptions](#).



5.15.4.3.1 Sequential

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalDetail-Array/TerminalNumberPattern/Sequential
diagram	
type	JEP30-D10:SequentialTerminalNomenclatureOrderingType, TerminalNomenclatureOrderingCodeType, TerminalNomenclatureOrderingDescriptionType, NumericalSequenceType, AlphabeticalSequenceType.

The enumerated values for the *Sequential* (*Code* and *Description*) are defined in Table 42.

#### 5.13.3.2.1 Sequential (cont'd)

**Table 42 - Terminal Nomenclature Ordering Pattern**

Code	Description
CW	Clockwise
CCW	Counter-Clockwise
L2R	Left-to-Right
B2F	Back-to-Front
R2L	Right-to-Left
F2B	Front-to-Back
S-H	Snake Horizontal
S-V	Snake Vertical
ZZ-H	Zig-Zag Horizontal
ZZ-V	Zig-Zag Vertical

Typically, the default sequence is a running number starting with the digit 1 and incrementing by 1. If this is the case, then the *NumericalSequence* or the *AlphabeticalSequence* do not have to be populated. However, in some cases, the Numerical or alphabetical sequence can override the default, in which case the sequence of terminal numbers is applied in the same order as the sequence pattern defined by the Code or Description as outlined in Table 42.






### 5.13.3.2.1 Sequential (cont'd)

**Table 43 - Terminal Number Patterns**

Pattern	Terminal Numbering Pattern	Sequential Code	Start Position	Towards Point 2	Towards Point 3	Towards Point 4	Towards Point 5	Last Point
1		CW	User Defined	Start + 1 CW	Start + 2 CW	Start + 3 CW	Start + 4 CW	Start - 1 CW
2		CCW	User Defined	Start + 1 CCW	Start + 2 CCW	Start + 3 CCW	Start + 4 CCW	Start - 1 CCW
3		ZZ-V	BL	TL	BL+1	TL+1	BL+2	TR
4		ZZ-V	BR	TR	BR-1	TR-1	BR-2	TL
5		ZZ-V	TR	BR	TR-1	BR-1	TR-2	BL
6		ZZ-V	TL	BL	TL+1	BL+1	TL+2	BR
7		ZZ-H	TL	TR	T-1L	T-1R	T-2L	BR
8		ZZ-H	BL	BR	B+1L	B+1R	B+2L	TR
9		ZZ-H	BR	BL	B+1R	B+1L	B+2R	TL
10		ZZ-H	TR	TL	T-1R	T-1L	T-2R	BL
11		S-V	TL	BL	BL+1	TL+1	TL+2	IF(Col # = odd, BR, TR)
12		S-V	BL	TL	TL+1	BL+1	BL+2	IF(Col # = odd, TR, BR)
13		S-V	TR	BR	BR-1	TR-1	TR-2	IF(Col # = odd, BL, TL)
14		S-V	BR	TR	TR-1	BR-1	BR-2	IF(Col # = odd, TL, BL)
15		S-H	TL	TR	T-1R	T-1L	T-2L	IF(Col # = odd, BR, BL)
16		S-H	BL	BR	B+1R	B+1L	B+2L	IF(Col # = odd, TR, TL)
17		S-H	TR	TL	R-1L	T-1R	T-2R	IF(Col # = odd, BL, BR)
18		S-H	BR	BL	B+1L	B+1R	B+2R	IF(Col # = odd, TL, TR)

### 5.13.3.2.1 Sequential (cont'd)

**Table 43 - Grid Terminal Number Patterns (cont'd).**

Pattern	Terminal Numbering Pattern	Sequential Code	Start Position	Towards Point 2	Towards Point 3	Towards Point 4	Towards Point 5	Last Point
19		L2R	L	L+1	L+2	L+3	L+4	R
20		R2L	R	R-1	R-2	R-3	R-4	L
21		B2F	B	B+1	B+2	B+3	B+4	T
22		F2B	T	T-1	T-2	T-3	T-4	B
23		Assign	User Defined	N/A	N/A	N/A	N/A	N/A

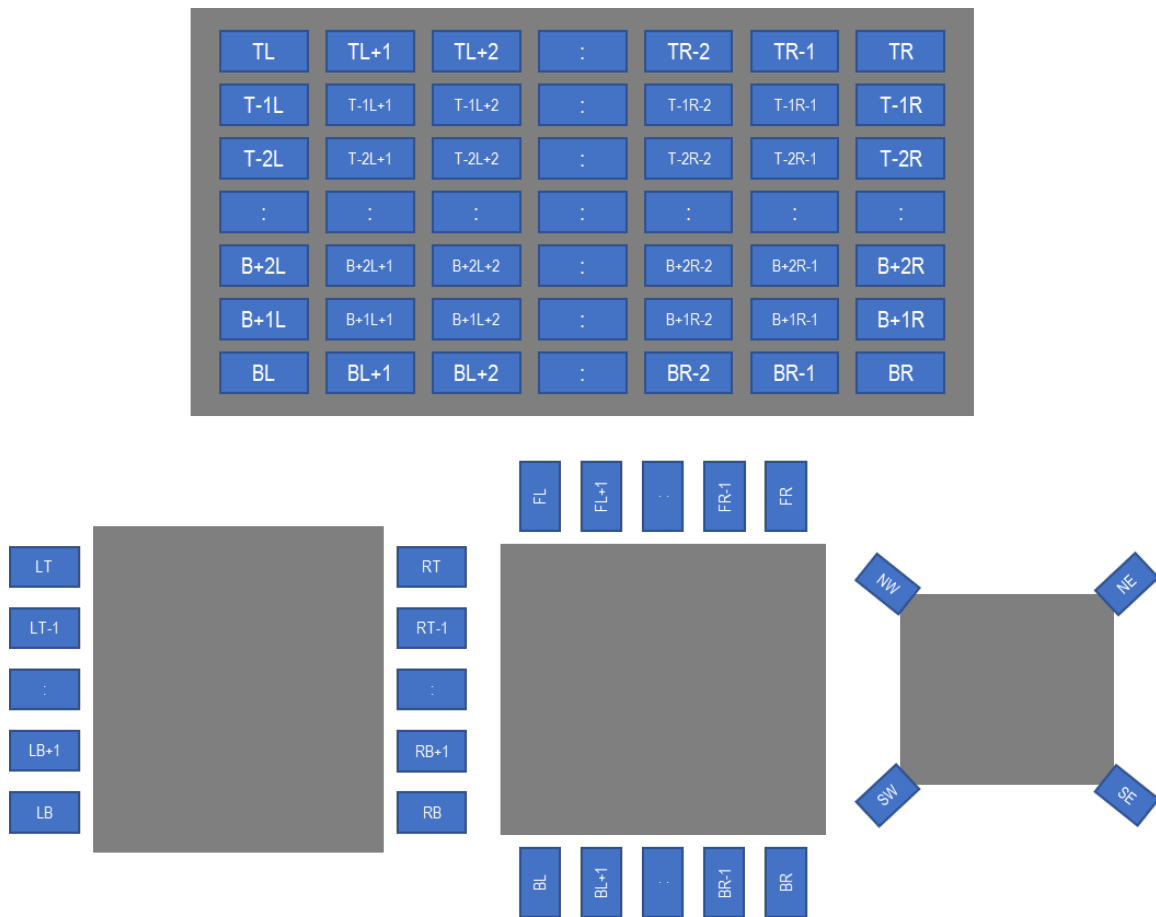
By combining the start position of the terminal number via the [LocationRelative-to-PackageCenter](#) with the [Sequential](#) pattern, we can achieve the patterns outlined in Table 30 - Terminal Number Patterns for terminal numbering.

For positions of BL, TL, BR, TR, the following is also valid for terminals positioned outside of the package body, namely.

1. The position of BL (Bottom Left) corresponds to
  - (a) For terminals with a position of Left, Right or Left-to-Right of the package body, then Left-bottom (LB),
  - (b) For terminals with a position of Back, Front or Back-to-Front of the package body, then Back-left (BL),
  - (c) For terminals with a position of Diagonal of the package body, then Southwest (SW),
2. The position of TL (Top Left) corresponds to
  - (a) For terminals with a position of Left, Right or Left-to-Right of the package body, then Left-top (LT),
  - (b) For terminals with a position of Back, Front or Back-to-Front of the package body, then Front-left (FL),
  - (c) For terminals with a position of Diagonal of the package body, then Northwest (NW),
3. The position of BR (Bottom Right) corresponds to
  - (a) For terminals with a position of Left, Right or Left-to-Right of the package body, then Right-bottom (RB),
  - (b) For terminals with a position of Back, Front or Back-to-Front of the package body, then Back-right (BR),

#### 5.15.4.3.1 Sequential (cont'd)

- (c) For terminals with a position of Diagonal of the package body, then Southeast (SE),
4. The position of TR (Top Right) corresponds to
- (a) For terminals with a position of Left, Right or Left-to-Right of the package body, then Right-top (RT),
  - (b) For terminals with a position of Back, Front or Back-to-Front of the package body, then Front-right (FR),
  - (c) For terminals with a position of Diagonal of the package body, then Northeast (NE).



**Figure 12 – Terminal Numbering Pattern Samples**

### 5.15.4.3.2 Grid

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalDetail-Array/TerminalNumberPattern/Grid
diagram	
type	GridTerminalNomenclatureOrderingType, RowTerminalNumberOrderingType, NumericalSequenceType, AlphabeticalSequenceType, JEP30-D10:EmptyType, ColumnTerminalNumberOrderingType.

This section identifies the terminal numbering of each terminal in a grid array by providing both a *Row* and *Column* identification of the terminal location on the *Grid*. Each Row and Column can have either a *NumericalSequence* or an *AlphabeticalSequence*. The *NumericalSequence* is a running number beginning with the digit 1 and incrementing by 1, however that sequence can be over-ridden by the provision of a sequence of numbers defined in the *Numerical* element.

Similarly, the *AlphabeticalSequence* is a running number sequence of the letters of the English alphabet, however in the majority of cases, the characters I, O, Q, S, X, and Z are sometimes not used because it is hard to distinguish these either legibly or from their numerical equivalency from the legend. As such the Character element under the *AlphabeticalSequence* is an unbounded element that contains the used set of characters in an ordered sequence.

The *Prefix* is an optional integer that can be placed before the character to define the terminal numbering of a multi grid package, as shown in Figure 13 – A Multi grid Package.

5.13.3.2.3     Grid (cont'd)

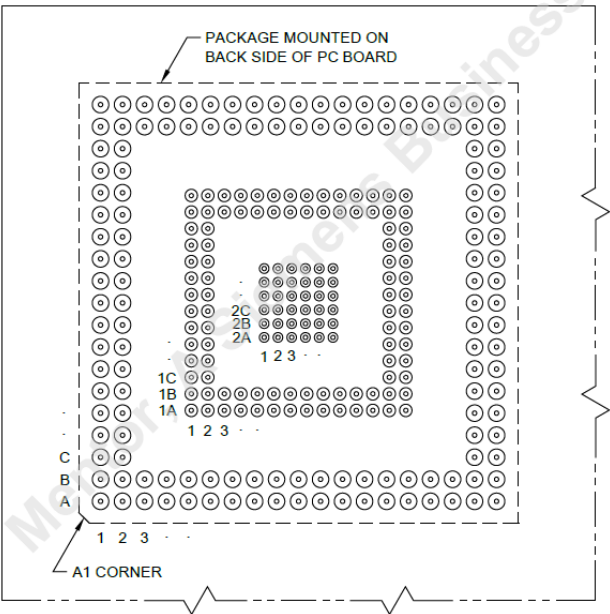


Figure 13 – A Multi grid Package

In Figure 14, the columns have a *NumericalSequence* from *Front-to-Back*. The rows have an *AlphabeticalSequence* going from *Left-to-Right*, with a specific set of alphabetical set of *Characters*. The xml structure below represents the detail terminal numbering in this example.

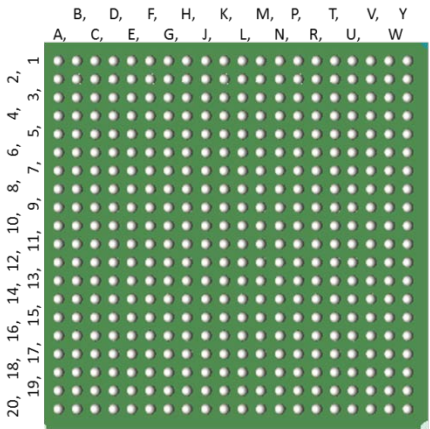


Figure 14 – Grid Array with Terminal Numbering

```
<TerminalDetail-Array>
  <TerminalNumberPattern>
    <FirstTerminalLocation>
      <TerminalGroupID> Terminal Group ID 1 </TerminalGroupID>
      <LocationRelative-to-PackageCenter>
        <Code>SW</Code>
      </LocationRelative-to-PackageCenter>
    </FirstTerminalLocation>
  </TerminalNumberPattern>
  <Grid>
    <Row>
      <AlphabeticalSequence>
        <Character>A</Character>
        <Character>B</Character>
        <Character>C</Character>
        <Character>D</Character>
        <Character>E</Character>
        <Character>F</Character>
        <Character>G</Character>
        <Character>H</Character>
        <Character>J</Character>
        <Character>K</Character>
        <Character>L</Character>
      </AlphabeticalSequence>
    </Row>
  </Grid>
</TerminalDetail-Array>
```

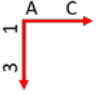
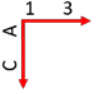

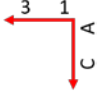



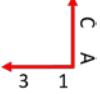
### 5.13.3.2.3 Grid (cont'd)

```

<Character>M</Character>
<Character>N</Character>
<Character>P</Character>
<Character>R</Character>
<Character>T</Character>
<Character>U</Character>
<Character>V</Character>
<Character>W</Character>
<Character>Y</Character>
</AlphabeticalSequence>
<Left-to-Right/>
</Row>
<Column>
<NumericalSequence></NumericalSequence>
<Front-to-Back/>
</Column>
</Grid>
</TerminalNumberPattern>
</TerminalDetail-Array>

```

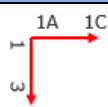
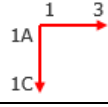
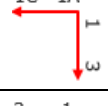

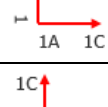
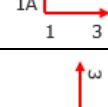
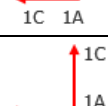
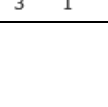
**Table 44 – Grid Terminal Numbering Pattern**

Grid	Terminal Grid Pattern	First Terminal Location	Numerical Sequence	Alphabetical Sequence
1		NW	Front-to-Back	Left-to-Right
2		NW	Left-to-Right	Front-to-Back
3		NE	Front-to-Back	Right-to-Left
4		NE	Right-to-Left	Front-to-Back
5		SW	Back-to-Front	Left-to-Right
6		SW	Left-to-Right	Back-to-Front
7		SE	Back-to-Front	Right-to-Left
8		SE	Right-to-Left	Back-to-Front



### 5.13.3.2.3 Grid (cont'd)

**Table 44 - Grid Terminal Number Patterns (cont'd).**

Grid	Terminal Grid Pattern	First Terminal Location	Numerical Sequence	Alphabetical Sequence
9		NW	Front-to-Back	Left-to-Right
10		NW	Left-to-Right	Front-to-Back
11		NE	Front-to-Back	Right-to-Left
12		NE	Right-to-Left	Front-to-Back
13		SW	Back-to-Front	Left-to-Right
14		SW	Left-to-Right	Back-to-Front
15		SE	Back-to-Front	Right-to-Left
15		SE	Right-to-Left	Back-to-Front

5.15.4.4 Terminal Detail Exceptions

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalDetail-Array/TerminalDetailExceptions
diagram	<p>The diagram illustrates the structure of the <b>TerminalDetailExceptionsType</b>. It is a complex type containing several elements:</p> <ul style="list-style-type: none"><li><b>TerminalPatternID</b>: type <code>xs:string</code></li><li><b>PatternGroupID</b>: type <code>xs:string</code> (optional)</li><li><b>TerminalGroupID</b>: type <code>xs:string</code> (optional)</li><li><b>TerminalCenter-Array</b>: type <code>JEP30-D10:TerminalCenter-ArrayType</code> (optional)</li><li><b>TerminalIndex</b>: type <code>JEP30-D10:TerminalIndexType</code> (optional)</li><li><b>TerminalNumber</b>: type <code>JEP30-D10:TerminalNumberType</code> (optional)</li><li><b>TerminalStatus</b>: type <code>TerminalStatusType</code> (optional)</li><li><b>IgnoreForLandPattern</b>: type <code>JEP30-D10:EmptyType</code> (optional)</li></ul> <p>The <b>TerminalStatusType</b> (referenced by <b>TerminalStatus</b>) contains the following elements:</p> <ul style="list-style-type: none"><li><b>Missing</b>: type <code>JEP30-D10:EmptyType</code> (optional)</li><li><b>Deleted</b>: type <code>JEP30-D10:EmptyType</code> (optional)</li><li><b>Excluded</b>: type <code>JEP30-D10:EmptyType</code> (optional)</li><li><b>Associated</b>: type <code>AssociatedTerminalStatusType</code> (optional)</li><li><b>FootnoteID</b>: type <code>xs:string</code> (optional, 0..∞)</li></ul> <p>The diagram also shows a reference to <b>TerminalDetailExceptionsType</b> from a separate element, and a reference to <b>TerminalStatusType</b> from the <b>TerminalStatus</b> element.</p>
type	TerminalDetailExceptionsType, TerminalCenterType, TerminalIndexType, TerminalNumberType, TerminalStatusType, JEP30-D10:EmptyType, AssociatedTerminalStatusType.

5.15.4.4.1.1 Terminal Center - Array

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalDetail-Array/TerminalNumberPattern/TerminalDetailExceptions/TerminalCenter-Array
diagram	<p>The diagram illustrates the structure of the <b>TerminalCenter-Array</b> type. It is composed of an array of <b>TerminalCenter</b> types. Each <b>TerminalCenter</b> type contains an array of <b>TerminalCenterType</b> types. Each <b>TerminalCenterType</b> type contains the following fields:</p> <ul style="list-style-type: none"><li><b>x</b>: type xs:decimal</li><li><b>y</b>: type xs:decimal</li><li><b>PitchRadius</b>: type xs:decimal</li><li><b>Center</b>: type JEP30-D10:PointXYType</li><li><b>Angle</b>: type xs:integer</li></ul>
type	TerminalCenter-ArrayType, TerminalCenterType, JEP30-D10:PointXYType.

5.15.4.4.1.2 Terminal Index

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalDetail-Array/TerminalNumberPattern/TerminalDetailExceptions/TerminalIndex
diagram	<p>The diagram illustrates the structure of the <b>TerminalIndexType</b>. It is a disjoint union of three main categories: <b>RowTerminalIndex</b>, <b>ColumnTerminalIndex</b>, and <b>PolarTerminalIndex</b>. Each of these categories is further divided into <b>From</b> and <b>To</b> sub-indices. All indices are of type <b>JEP30-D10:MinIntegerOfOneType</b> with <b>minIncl/maxIncl</b> of 1.</p> <ul style="list-style-type: none"><li><b>TerminalIndex</b> (type: TerminalIndexType) is a disjoint union of:<ul style="list-style-type: none"><li><b>RowTerminalIndex</b> (type: JEP30-D10:MinIntegerOfOneType, minIncl/maxIncl: 1)<ul style="list-style-type: none"><li><b>FromRowTerminalIndex</b> (type: JEP30-D10:MinIntegerOfOneType, minIncl/maxIncl: 1)</li><li><b>ToRowTerminalIndex</b> (type: JEP30-D10:MinIntegerOfOneType, minIncl/maxIncl: 1)</li></ul></li><li><b>ColumnTerminalIndex</b> (type: JEP30-D10:MinIntegerOfOneType, minIncl/maxIncl: 1)<ul style="list-style-type: none"><li><b>FromColumnTerminalIndex</b> (type: JEP30-D10:MinIntegerOfOneType, minIncl/maxIncl: 1)</li><li><b>ToColumnTerminalIndex</b> (type: JEP30-D10:MinIntegerOfOneType, minIncl/maxIncl: 1)</li></ul></li><li><b>PolarTerminalIndex</b> (type: JEP30-D10:MinIntegerOfOneType, minIncl/maxIncl: 1)<ul style="list-style-type: none"><li><b>FromPolarTerminalIndex</b> (type: JEP30-D10:MinIntegerOfOneType, minIncl/maxIncl: 1)</li><li><b>ToPolarTerminalIndex</b> (type: JEP30-D10:MinIntegerOfOneType, minIncl/maxIncl: 1)</li></ul></li></ul></li></ul>
type	TerminalIndexType, JEP30-D10:MinIntegerOfOneType.

5.15.4.4.1.3 Terminal Number

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalDetail-Array/TerminalNumberPattern/TerminalDetailExceptions/TerminalNumberType
diagram	<pre>graph LR     TN[TerminalNumber type TerminalNumberType] -- 1..∞ --&gt; C1(( ))     C1 -- 1..∞ --&gt; N[Number type xs:string]     C1 -- 1..∞ --&gt; C2(( ))     C1 -- 1..∞ --&gt; CN[Column type xs:string]     C1 -- 1..∞ --&gt; FN[FromNumber type xs:string]     C2 -- 1..∞ --&gt; R[Row type xs:string]     C2 -- 1..∞ --&gt; CR[FromRow type xs:string]     C2 -- 1..∞ --&gt; TR[ToRow type xs:string]     C3 -- 1..∞ --&gt; C[Column type xs:string]     C3 -- 1..∞ --&gt; FC[FromColumn type xs:string]     C3 -- 1..∞ --&gt; TC[ToColumn type xs:string]     C4 -- 1..∞ --&gt; FN[FromNumber type xs:string]     C4 -- 1..∞ --&gt; TN[ToNumber type xs:string]</pre>
type	TerminalNumberType

If a pattern of terminals are missing from the device, then these missing patterns can be captured under the *TerminalDetailExceptions* section as shown below for the Peripheral Grid Array shown in Figure 15.

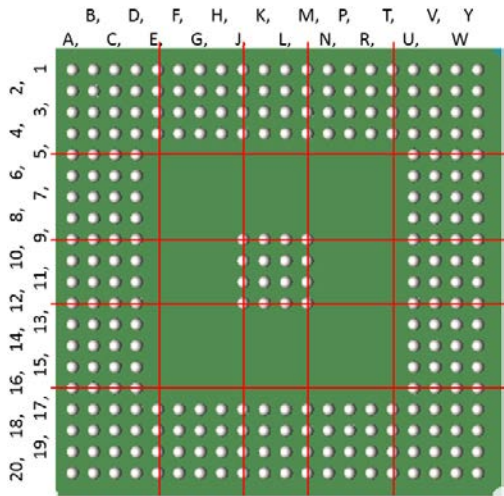


Figure 15 – Periphery Grid Array with Inner Array Matrix

#### 5.13.3.2.4.2 Terminal Number (cont'd)

```
<TerminalDetailExceptions>
  <TerminalNumber>
    <FromRow>5</FromRow>
    <ToRow>16</ToRow>
    <FromColumn>E</FromColumn>
    <ToColumn>H</ToColumn>
  </TerminalNumber>
  <TerminalStatus>
    <Missing></Missing>
  </TerminalStatus>
</TerminalDetailExceptions>
<TerminalDetailExceptions>
  <TerminalNumber>
    <FromRow>5</FromRow>
    <ToRow>16</ToRow>
    <FromColumn>N</FromColumn>
    <ToColumn>T</ToColumn>
  </TerminalNumber>
  <TerminalStatus>
    <Missing></Missing>
  </TerminalStatus>
</TerminalDetailExceptions>
<TerminalDetailExceptions>
  <TerminalNumber>
    <FromRow>5</FromRow>
    <ToRow>8</ToRow>
    <FromColumn>J</FromColumn>
    <ToColumn>M</ToColumn>
  </TerminalNumber>
  <TerminalStatus>
    <Missing></Missing>
  </TerminalStatus>
</TerminalDetailExceptions>
<TerminalDetailExceptions>
  <TerminalNumber>
    <FromRow>13</FromRow>
    <ToRow>16</ToRow>
    <FromColumn>J</FromColumn>
    <ToColumn>M</ToColumn>
  </TerminalNumber>
  <TerminalStatus>
    <Missing></Missing>
  </TerminalStatus>
</TerminalDetailExceptions>
```

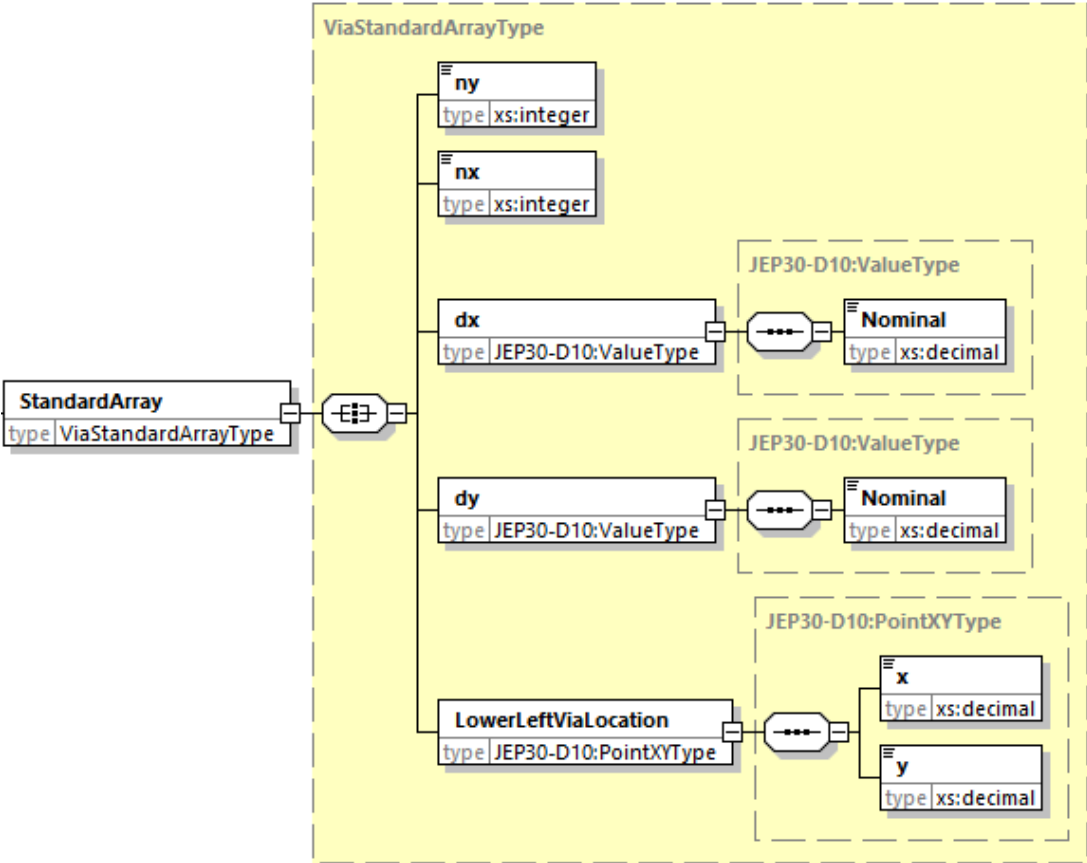
5.15.5 Via Array

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/Via-Array
diagram	<p>The diagram illustrates the structure of the <b>Via-Array</b> section. It shows a <b>Via-Array</b> type (type <b>Via-ArrayType</b>) which is composed of a <b>ViaLocation</b> type (type <b>ViaLocationType</b>) and a <b>ViaDetail</b> type (type <b>ViaDetailType</b>). The <b>ViaLocation</b> type is further composed of an <b>ID</b> attribute (type <b>xs:string</b>) and a <b>TerminalGroupID</b> attribute (type <b>xs:string</b>). The <b>ViaDetail</b> type is composed of three subtypes: <b>StandardArray</b> (type <b>ViaStandardArrayType</b>), <b>CircularArray</b> (type <b>ViaCircularArrayType</b>), and <b>RandomArray</b> (type <b>ViaRandomArrayType</b>). The <b>Via-Array</b> type is also associated with a <b>constraints</b> element. The <b>ViaLocation</b> type is associated with the <b>ViaDetail</b> type via a <b>1..∞</b> relationship. The <b>ViaDetail</b> type is associated with the <b>constraints</b> element via a <b>0..∞</b> relationship.</p>
type	<b>Via-ArrayType</b> , <b>ViaLocationType</b> , <b>ViaStandardArrayType</b> , <b>ViaCircularArrayType</b> , <b>ViaRandomArrayType</b> , <b>ViaDetailType</b> .

Grounding Vias are sometimes required to support the operational functionality of the Part in a product design. This **Via-Array** section enables this detail to be captured. The location and pattern of these Vias can be captured via any combination of a **StandardArray**, **CircularArray** or **RandomArray** as shown in the diagram..

The dimensions and technology of the vias are not defined since this is determined by the Product on to which the Part is assembled.

5.15.5.1 Standard Array

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/Via-Array/ViaLocation/StandardArray
diagram	 <p>The diagram illustrates the structure of the <b>StandardArray</b> type. It is a sequence type (indicated by a box with three horizontal lines) containing an array of <b>ViaStandardArrayType</b> objects. The <b>ViaStandardArrayType</b> is a complex type (indicated by a dashed box) containing the following elements:</p> <ul style="list-style-type: none"><li><b>ny</b>: type <code>xs:integer</code></li><li><b>nx</b>: type <code>xs:integer</code></li><li><b>dx</b>: type <code>JEP30-D10:ValueType</code>, which is a sequence type containing a <b>Nominal</b> element of type <code>xs:decimal</code>.</li><li><b>dy</b>: type <code>JEP30-D10:ValueType</code>, which is a sequence type containing a <b>Nominal</b> element of type <code>xs:decimal</code>.</li><li><b>LowerLeftViaLocation</b>: type <code>JEP30-D10:PointXYType</code>, which is a sequence type containing two elements: <b>x</b> (type <code>xs:decimal</code>) and <b>y</b> (type <code>xs:decimal</code>).</li></ul>
type	ViaStandardArrayType, JEP30-D10:ValueType, JEP30-D10:PointXYType.



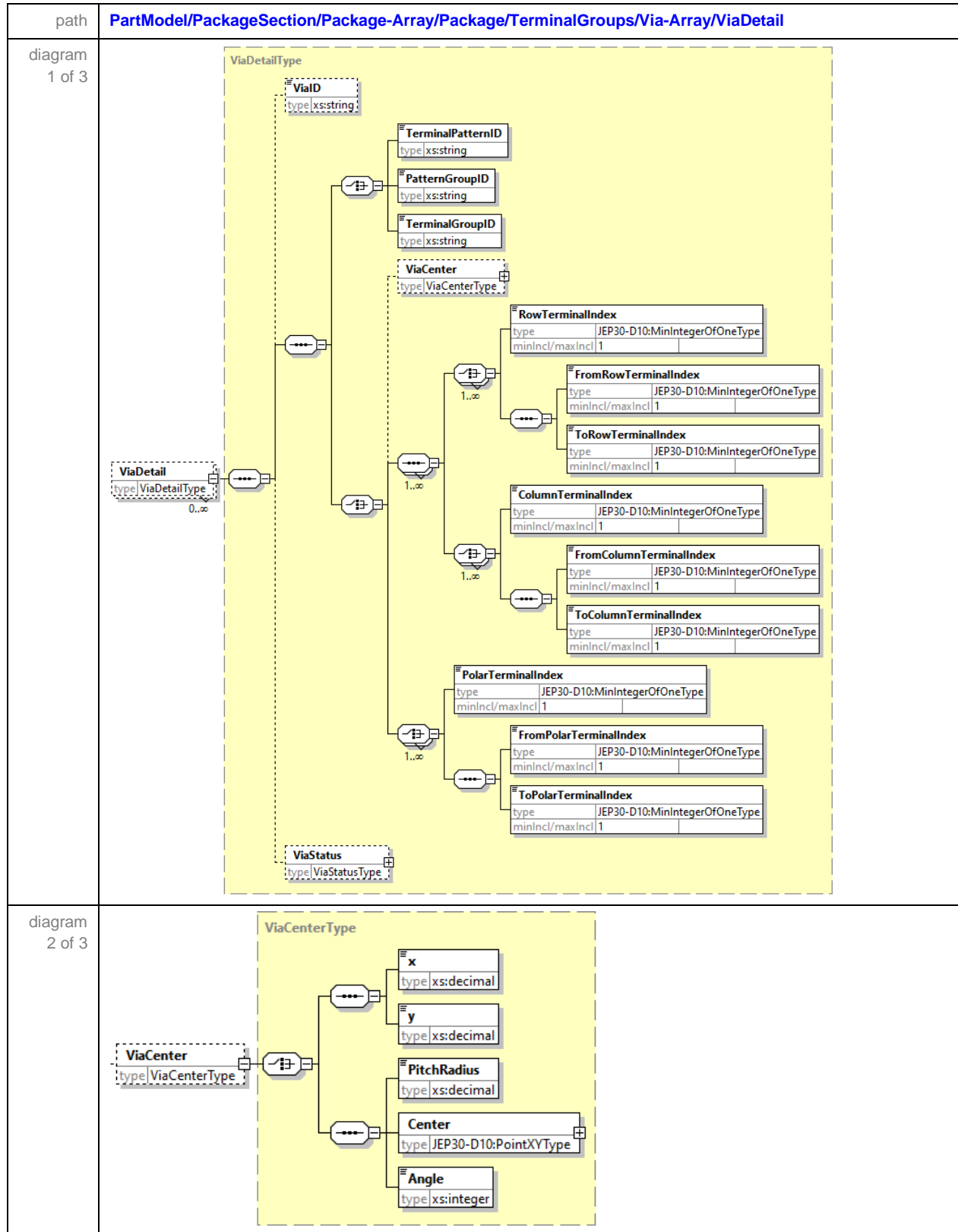
5.15.5.2 Circular Array

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/Via-Array/ViaLocation/CircularArray
diagram	<p>UML class diagram for CircularArray. The diagram shows a class <b>CircularArray</b> with type <code>ViaCircularArrayType</code>. It is connected to a dashed box labeled <b>ViaCircularArrayType</b>. Inside this box, there are several elements: <b>PitchRadius</b> (type <code>xs:decimal</code>), <b>Center</b> (type <code>JEP30-D10:PointXYType</code>), <b>StartAngle</b> (type <code>xs:integer</code>), <b>AngleToFill</b> (type <code>xs:integer</code>), <b>AngleBetweenVias</b> (type <code>xs:integer</code>), and <b>NumberOfVias</b> (type <code>xs:integer</code>). The <b>Center</b> element is connected to a dashed box labeled <b>JEP30-D10:PointXYType</b>, which contains <b>x</b> (type <code>xs:decimal</code>) and <b>y</b> (type <code>xs:decimal</code>).</p>
type	ViaCircularArrayType, JEP30-D10:PointXYType.

5.15.5.3 Random Array

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/Via-Array/ViaLocation/RandomArray
diagram	<p>UML class diagram for RandomArray. The diagram shows a class <b>RandomArray</b> with type <code>ViaRandomArrayType</code>. It is connected to a dashed box labeled <b>ViaRandomArrayType</b>. Inside this box, there is a class <b>ViaLocation</b> with type <code>JEP30-D10:PointXYType</code>. <b>ViaLocation</b> is connected to a dashed box labeled <b>JEP30-D10:PointXYType</b>, which contains <b>x</b> (type <code>xs:decimal</code>) and <b>y</b> (type <code>xs:decimal</code>). The connection between <b>ViaLocation</b> and the <b>JEP30-D10:PointXYType</b> box is labeled <code>1..∞</code>.</p>
type	ViaRandomArrayType, JEP30-D10:PointXYType.

#### 5.15.5.4 Via Detail



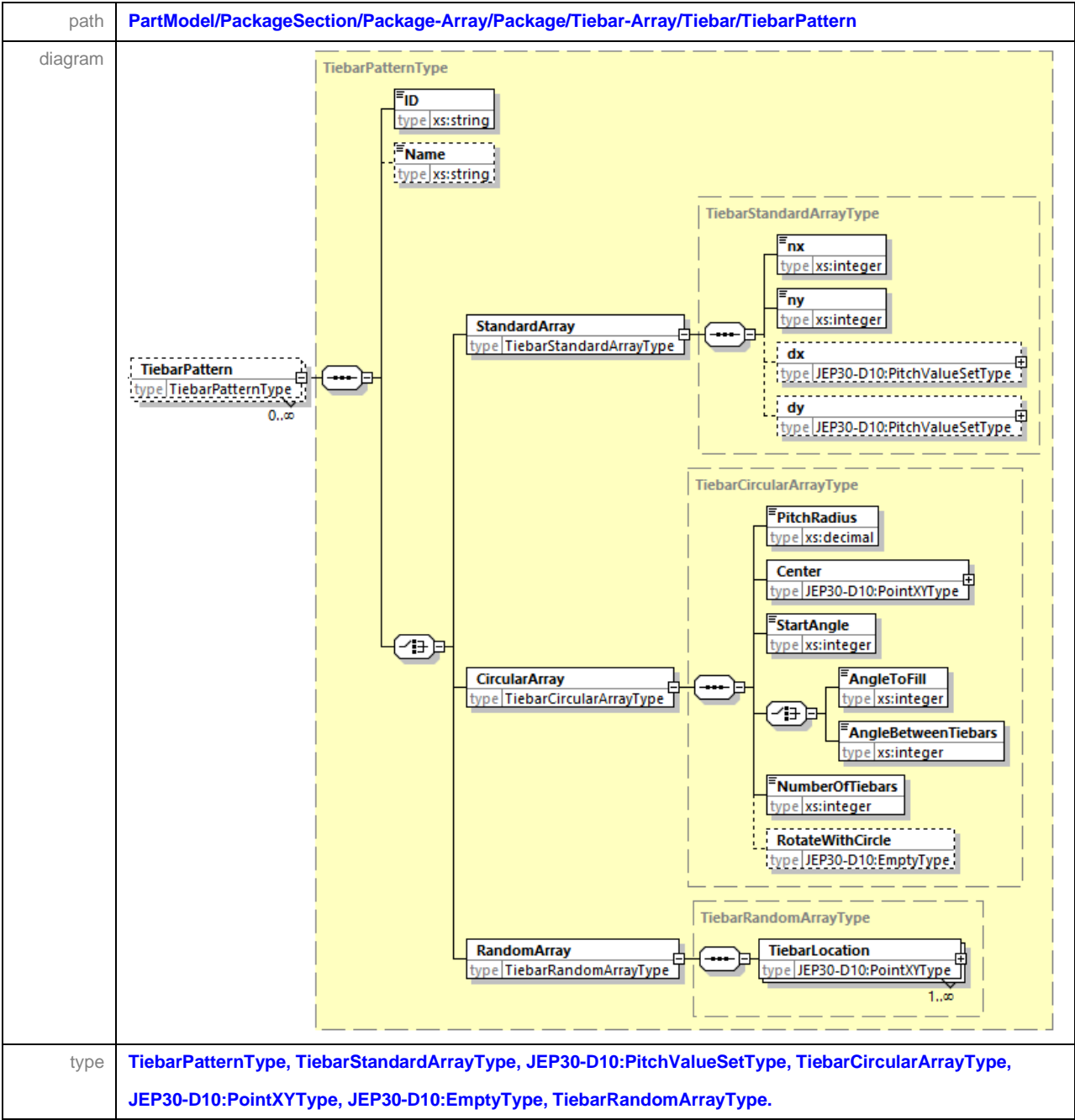
#### 5.15.5.4 Via Detail (cont'd)

<p>diagram 3 of 3</p>	
<p>type</p>	<p>ViaDetailType, ViaCenterType, JEP30-D10:PointXYType, JEP30-D10:MinIntegerOfOneType, ViaStatusType, JEP30-D10:EmptyType.</p>

#### 5.16 Tiebar - Array

<p>path</p>	<p>PartModel/PackageSection/Package-Array/Package/Tiebar-Array</p>
<p>diagram</p>	
<p>type</p>	<p>Tiebar-ArrayType, TiebarType, TiebarPatternType, TiebarPatternGroupType, TiebarShape-ArrayType, TiebarSelectionToBodyRelationship-ArrayType.</p>

5.16.1 Tiebar Pattern



5.16.2 Pattern Group

path	PartModel/PackageSection/Package-Array/Package/Tiebar-Array/Tiebar/PatternGroup
diagram	
type	TiebarPatternGroupType, TiebarPatternGroupRelationshipType, TiebarPatternGroupRelationshipTransformationsType.

5.16.2.1 Relationship Transformations

path	PartModel/PackageSection/Package-Array/Package/Tiebar-Array/Tiebar/PatternGroup/PatternRelationship/RelationshipTransformations
diagram	
type	TiebarPatternGroupRelationshipTransformationsType.

5.16.3 Tiebar Shape - Array

path	PartModel/PackageSection/Package-Array/Package/Tiebar-Array/Tiebar/TiebarShape-Array	
diagram		
type	TiebarShape-ArrayType, TiebarShapeType, JEP30-D10:EmptyType, ViewPerspectiveType, ViewPerspective-to-ViewPerspectiveAlignment-ArrayType, AssembledShapeType.	

5.16.3.1 View Perspective

path	PartModel/PackageSection/Package-Array/Package/Tiebar-Array/Tiebar/TiebarShape-Array/TiebarShape/ViewPerspective
diagram	<p>The diagram illustrates the structure of the <b>TiebarViewPerspectiveType</b> complex type. It is composed of the following elements in sequence:</p> <ul style="list-style-type: none"><li><b>ID</b> (type: xs:string)</li><li>A choice between <b>XYPlane</b> (type: JEP30-D10:EmptyType) and <b>YZPlane</b> (type: JEP30-D10:EmptyType).</li><li>A choice between <b>XOffset</b> (type: xs:decimal) and <b>YOffset</b> (type: xs:decimal).</li><li>A choice between <b>Left</b> (type: JEP30-D10:EmptyType) and <b>Right</b> (type: JEP30-D10:EmptyType).</li><li>A choice between <b>Back</b> (type: JEP30-D10:EmptyType) and <b>Front</b> (type: JEP30-D10:EmptyType).</li><li>A choice between <b>RectangleShape</b> (type: ReferenceRectangleType), <b>ModifiedRectangleShape</b> (type: ModifiedRectangleShapeExteriorCornerType), and <b>ContourShape</b> (type: ContourShapeType).</li></ul> <p>The elements are grouped into a dashed box labeled <b>TiebarViewPerspectiveType</b>. The <b>ViewPerspective</b> element (type: TiebarViewPerspectiveType) is shown with a cardinality of 1..∞.</p>
type	ViewPerspectiveType, JEP30-D10:EmptyType, RectangleShapeType, ModifiedRectangleShapeExterior, ContourShapeType.

### 5.16.3.1.1 Rectangle Shape

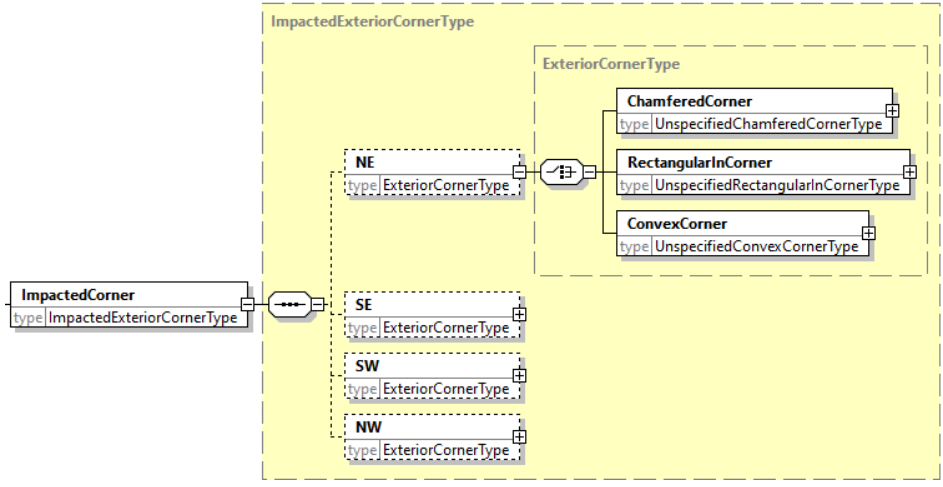
path	<a href="#">PartModel/PackageSection/Package-Array/Package/Tiebar-Array/Tiebar/TiebarShape-Array/TiebarShape/ViewPerspective/RectangleShape</a>
diagram	
type	<a href="#">RectangleShapeType</a> , <a href="#">JEP30-D10:DimensionalValueSetType</a> .

### 5.16.3.1.2 Modified Rectangle Shape

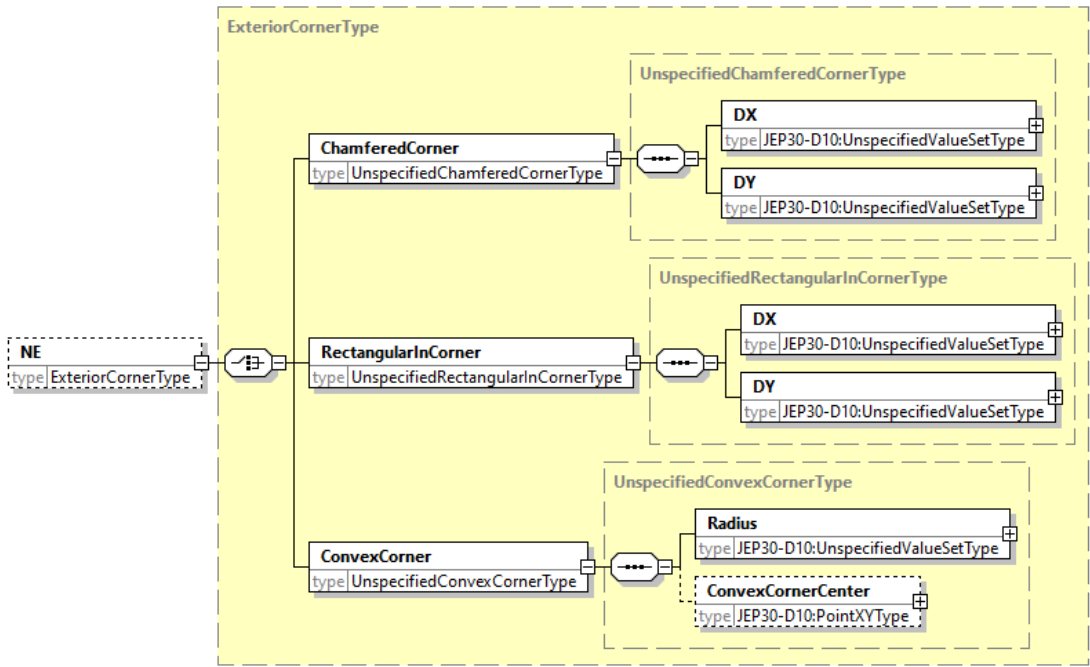
path	<a href="#">PartModel/PackageSection/Package-Array/Package/Tiebar-Array/Tiebar/TiebarShape-Array/TiebarShape/ViewPerspective/ModifiedRectangleShape</a>
diagram	
type	<a href="#">ModifiedRectangleShapeExteriorCornerType</a> , <a href="#">JEP30-D10:DimensionalValueSetType</a> , <a href="#">ImpactedExteriorCornerType</a> .



### 5.16.3.1.2.1 Impacted Corner

path	<a href="#">PartModel/PackageSection/Package-Array/Package/Tiebar-Array/Tiebar/TiebarShape-Array/TiebarShape/ViewPerspective/ModifiedRectangleShape/ImpactedCorner</a>
diagram	 <p>The diagram illustrates the structure of an <b>ImpactedCorner</b>. It is a container for an <b>ImpactedExteriorCornerType</b>. This type is further divided into four directional categories: <b>NE</b>, <b>SE</b>, <b>SW</b>, and <b>NW</b>, each of type <b>ExteriorCornerType</b>. The <b>NE</b> category is expanded to show its internal structure: it contains <b>ChamferedCorner</b> (type <b>UnspecifiedChamferedCornerType</b>), <b>RectangularInCorner</b> (type <b>UnspecifiedRectangularInCornerType</b>), and <b>ConvexCorner</b> (type <b>UnspecifiedConvexCornerType</b>).</p>
type	<a href="#">ImpactedExteriorCornerType</a> , <a href="#">ExteriorCornerType</a> , <a href="#">UnspecifiedChamferedCornerType</a> , <a href="#">UnspecifiedRectangularInCornerType</a> , <a href="#">UnspecifiedConvexCornerType</a> .

### 5.16.3.1.2.2 Exterior Corner Type

path	<a href="#">PartModel/PackageSection/Package-Array/Package/Tiebar-Array/Tiebar/TiebarShape-Array/TiebarShape/ViewPerspective/ModifiedRectangleShape/ImpactedCorner/...</a>
diagram	 <p>The diagram illustrates the structure of an <b>ExteriorCornerType</b>. It is a container for an <b>ExteriorCornerType</b>. This type is further divided into three directional categories: <b>NE</b>, <b>SE</b>, and <b>NW</b>, each of type <b>ExteriorCornerType</b>. The <b>NE</b> category is expanded to show its internal structure: it contains <b>ChamferedCorner</b> (type <b>UnspecifiedChamferedCornerType</b>), <b>RectangularInCorner</b> (type <b>UnspecifiedRectangularInCornerType</b>), and <b>ConvexCorner</b> (type <b>UnspecifiedConvexCornerType</b>). The <b>ChamferedCorner</b> is further divided into <b>DX</b> and <b>DY</b> (both type <b>JEP30-D10:UnspecifiedValueSetType</b>). The <b>RectangularInCorner</b> is further divided into <b>DX</b> and <b>DY</b> (both type <b>JEP30-D10:UnspecifiedValueSetType</b>). The <b>ConvexCorner</b> is further divided into <b>Radius</b> (type <b>JEP30-D10:UnspecifiedValueSetType</b>) and <b>ConvexCornerCenter</b> (type <b>JEP30-D10:PointXYType</b>).</p>
type	<a href="#">ExteriorCornerType</a> , <a href="#">UnspecifiedChamferedCornerType</a> , <a href="#">JEP30-D10:UnspecifiedValueSetType</a> , <a href="#">UnspecifiedRectangularInCornerType</a> , <a href="#">UnspecifiedConvexCornerType</a> , <a href="#">JEP30-D10:PointXYType</a> .

### 5.16.3.2 View Perspective – to – View Perspective Alignment - Array

path	<a href="#">PartModel/PackageSection/Package-Array/Package/Tiebar-Array/Tiebar/TiebarShape-Array/TiebarShape/ViewPerspective-to-ViewPerspectiveAlignment-Array</a>
diagram	<p>The diagram shows a class <b>ViewPerspective-to-ViewPerspectiveAlignment-Array</b> with a multiplicity of 1 and a containment relationship (indicated by a solid line with an open circle at the array end and a solid line with a filled circle at the element end) to a class <b>ViewPerspective-to-ViewPerspectiveAlignment</b> with a multiplicity of 1..∞. The array class has a type constraint <code>type ViewPerspective-to-ViewPerspectiveAlignment-ArrayType</code>. The element class has a type constraint <code>type ViewPerspective-to-ViewPerspectiveAlignmentType</code>. A dashed box labeled <b>ViewPerspective-to-ViewPerspectiveAlignment-ArrayType</b> encloses the element class.</p>
type	<a href="#">ViewPerspective-to-ViewPerspectiveAlignment-ArrayType</a> , <a href="#">ViewPerspective-to-ViewPerspectiveAlignmentType</a> .

#### 5.16.3.2.1 View Perspective – to – View Perspective Alignment

path	<a href="#">PartModel/PackageSection/Package-Array/Package/Tiebar-Array/Tiebar/TiebarShape-Array/TiebarShape/ViewPerspective-to-ViewPerspectiveAlignment-Array/ViewPerspective-to-ViewPerspectiveAlignment</a>
diagram	<p>The diagram shows a class <b>ViewPerspective-to-ViewPerspectiveAlignment</b> with a multiplicity of 1..∞. It has three attributes: <b>ID</b> (type <code>xs:string</code>), <b>FromViewPerspectiveShapeID</b> (type <code>FromViewPerspectiveShapeIDType</code>), and <b>ToViewPerspectiveShape</b> (type <code>ToViewPerspectiveShapeType</code>). A dashed box labeled <b>ViewPerspective-to-ViewPerspectiveAlignmentType</b> encloses the entire class.</p>
type	<a href="#">ViewPerspective-to-ViewPerspectiveAlignmentType</a> , <a href="#">ViewPerspectiveShapeIDReferenceType</a> .

5.16.3.2.1.1 From View Perspective Shape ID

path	PartModel/PackageSection/Package-Array/Package/Tiebar-Array/Tiebar/TiebarShape-Array/TiebarShape/ViewPerspective-to-ViewPerspectiveAlignment-Array/ViewPerspective-to-ViewPerspectiveAlignment/FromViewPerspectiveShapeID
diagram	<p>The diagram illustrates the structure of the <code>FromViewPerspectiveShapeID</code> element. It is a sequence of elements: <code>FromViewPerspectiveShapeID</code> (type <code>ViewPerspectiveShapeIDReferenceType</code>), followed by a choice of <code>ViewPerspectiveID</code> (type <code>xs:string</code>) and <code>ViewPerspective-to-ViewPerspectiveAlignmentID</code> (type <code>xs:string</code>). This is followed by a choice of <code>Underside</code> (type <code>JEP30-D10:EmptyType</code>), <code>Topside</code> (type <code>JEP30-D10:EmptyType</code>), <code>ZOffset</code> (type <code>xs:decimal</code>), <code>Back</code> (type <code>JEP30-D10:EmptyType</code>), <code>Front</code> (type <code>JEP30-D10:EmptyType</code>), <code>YOffset</code> (type <code>xs:decimal</code>), <code>Left</code> (type <code>JEP30-D10:EmptyType</code>), <code>Right</code> (type <code>JEP30-D10:EmptyType</code>), and <code>XOffset</code> (type <code>xs:decimal</code>). The entire choice is enclosed in a dashed box labeled <code>ViewPerspectiveShapeIDReferenceType</code>.</p>
type	FromViewPerspectiveShapeIDType, JEP30-D10:EmptyType.

### 5.16.3.3 Assembled Shape

path	<a href="#">PartModel/PackageSection/Package-Array/Package/Tiebar-Array/Tiebar/TiebarShape-Array/TiebarShape/AssembledShape</a>
diagram	<p>The diagram illustrates the structure of the <b>AssembledShapeType</b>. It is a complex type containing several elements:</p> <ul style="list-style-type: none"> <li><b>ViewPerspective-to-ViewPerspectiveAlignmentID</b>: A string element.</li> <li><b>ImpactedTiebar</b>: A complex type containing: <ul style="list-style-type: none"> <li><b>TiebarCenter</b>: A <b>TiebarCenterType</b>.</li> <li><b>RowTiebarIndex</b>: A <b>JEP30-D10:MinIntegerOfOneType</b> with minIncl/maxIncl of 1.</li> <li><b>ColumnTiebarIndex</b>: A <b>JEP30-D10:MinIntegerOfOneType</b> with minIncl/maxIncl of 1.</li> <li><b>PolarTiebarIndex</b>: A <b>JEP30-D10:MinIntegerOfOneType</b> with minIncl/maxIncl of 1.</li> </ul> </li> <li><b>Impact-to-TiebarGroup</b>: A complex type containing: <ul style="list-style-type: none"> <li><b>Apply-to-all-Tiebars</b>: An <b>Apply-to-all-TiebarsType</b>.</li> <li><b>Symmetry</b>: A <b>TiebarSymmetryType</b>.</li> </ul> </li> </ul> <p>The <b>AssembledShape</b> type is defined as <b>AssembledShapeType</b>.</p>
type	<b>TiebarPatternGroupRelationshipTransformationsType</b> .

#### 5.16.3.3.1 Tiebar Center

path	<a href="#">PartModel/PackageSection/Package-Array/Package/Tiebar-Array/Tiebar/TiebarShape-Array/TiebarShape/AssembledShape/ImpactedTiebar/TiebarCenter</a>
diagram	<p>The diagram illustrates the structure of the <b>TiebarCenterType</b>. It is a complex type containing several elements:</p> <ul style="list-style-type: none"> <li><b>x</b>: A decimal element.</li> <li><b>y</b>: A decimal element.</li> <li><b>PitchRadius</b>: A decimal element.</li> <li><b>Center</b>: A <b>JEP30-D10:PointXYType</b>.</li> <li><b>Angle</b>: An integer element.</li> </ul> <p>The <b>TiebarCenter</b> type is defined as <b>TiebarCenterType</b>.</p>
type	<b>TiebarCenterType</b> , <b>JEP30-D10:PointXYType</b> .

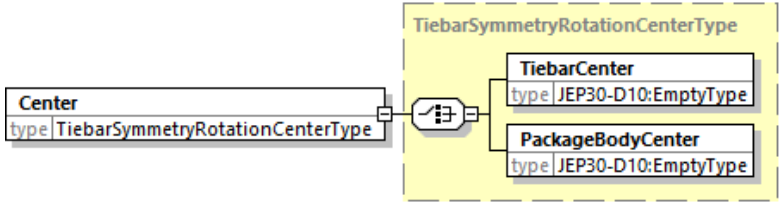
### 5.16.3.3.2 Apply – to – all - Tiebars

path	PartModel/PackageSection/Package-Array/Package/Tiebar-Array/Tiebar/TiebarShape-Array/TiebarShape/AssembledShape/Impact-to-TiebarGroup/Apply-to-all-Tiebars
diagram	
type	Apply-to-all-TiebarsType, JEP30-D10:CornerImpact-to-StandardArrayType, JEP30-D10:EmptyType

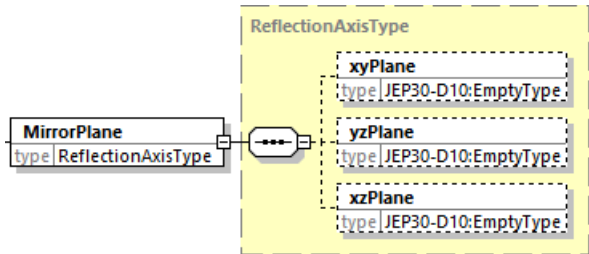
### 5.16.3.3.3 Symmetry

path	PartModel/PackageSection/Package-Array/Package/Tiebar-Array/Tiebar/TiebarShape-Array/TiebarShape/AssembledShape/Impact-to-TiebarGroup/Symmetry
diagram	
type	TiebarSymmetryType, TiebarSymmetryRotationType, SymmetryRotationAxisType, TiebarSymmetryRotationCenterType, TiebarReflectionType, ReflectionAxisType, TiebarReflectionInversionCenterType.

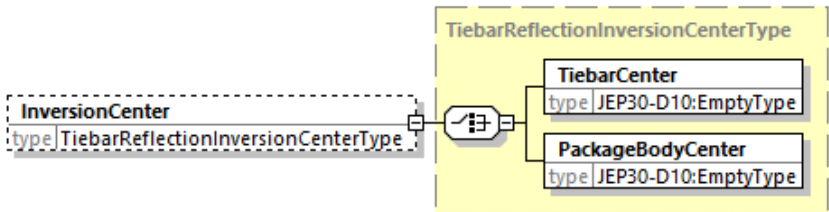
### 5.16.3.3.3.1 Center

path	<a href="#">PartModel/PackageSection/Package-Array/Package/Tiebar-Array/Tiebar/TiebarShape-Array/TiebarShape/AssembledShape/Impact-to-TiebarGroup/Symmetry/Rotation/Center</a>
diagram	 <p>The diagram shows a box labeled 'Center' with the text 'type TiebarSymmetryRotationCenterType'. This box is connected to a larger yellow box labeled 'TiebarSymmetryRotationCenterType'. Inside the yellow box, there are two sub-boxes: 'TiebarCenter' with 'type JEP30-D10:EmptyType' and 'PackageBodyCenter' with 'type JEP30-D10:EmptyType'.</p>
type	<a href="#">TiebarSymmetryRotationCenterType</a> , <a href="#">JEP30-D10:EmptyType</a> .

### 5.16.3.3.3.2 Mirror Plane

path	<a href="#">PartModel/PackageSection/Package-Array/Package/Tiebar-Array/Tiebar/TiebarShape-Array/TiebarShape/AssembledShape/Impact-to-TiebarGroup/Symmetry/Reflection/MirrorPlane</a>
diagram	 <p>The diagram shows a box labeled 'MirrorPlane' with the text 'type ReflectionAxisType'. This box is connected to a larger yellow box labeled 'ReflectionAxisType'. Inside the yellow box, there are three sub-boxes: 'xyPlane' with 'type JEP30-D10:EmptyType', 'yzPlane' with 'type JEP30-D10:EmptyType', and 'xzPlane' with 'type JEP30-D10:EmptyType'.</p>
type	<a href="#">ReflectionAxisType</a> , <a href="#">JEP30-D10:EmptyType</a> .

### 5.16.3.3.3.3 Inversion Center

path	<a href="#">PartModel/PackageSection/Package-Array/Package/Tiebar-Array/Tiebar/TiebarShape-Array/TiebarShape/AssembledShape/Impact-to-TiebarGroup/Symmetry/Reflection/InversionCenter</a>
diagram	 <p>The diagram shows a box labeled 'InversionCenter' with the text 'type TiebarReflectionInversionCenterType'. This box is connected to a larger yellow box labeled 'TiebarReflectionInversionCenterType'. Inside the yellow box, there are two sub-boxes: 'TiebarCenter' with 'type JEP30-D10:EmptyType' and 'PackageBodyCenter' with 'type JEP30-D10:EmptyType'.</p>
type	<a href="#">TiebarReflectionInversionCenterType</a> , <a href="#">JEP30-D10:EmptyType</a> .

5.16.4 Tiebar Selection To Body Relationship - Array

path	PartModel/PackageSection/Package-Array/Package/Tiebar-Array/Tiebar/TiebarSelectionToBodyRelationship-Array
diagram	
type	TiebarSelectionToBodyRelationship-ArrayType, TiebarSelectionToBodyRelationshipType, Tiebar-to-Body-X-OffsetType, Tiebar-to-Body-Y-OffsetType, Tiebar-to-Body-Z-OffsetType.

For non-symmetrical Tiebars around the package center, dimensions may be referenced from the Tiebar shape to the Package body area. This data can be captured in the *TiebarSelectionToBodyRelationship* section.

#### 5.16.4.1 Tiebar Pattern or Tiebar Pattern Group to Body X-Offset





#### 5.15.4.1 Tiebar Pattern or Tiebar Pattern Group to Body X-Offset (cont'd)

<p>diagram part 2 of 2</p>	<p><b>Tiebar-to-Body-X-Offset</b> type Tiebar-to-Body-X-OffsetType</p> <p><b>X14-CenterOfBody-to-CenterlineOfTiebarGroup</b> type JEP30-D10:ValueSetType</p> <p><b>X15-CenterOfBody-to-RightSideOfCenterTiebarShape</b> type JEP30-D10:ValueSetType</p> <p><b>X16-CenterOfBody-to-LeftSideOfRightTiebarShape</b> type JEP30-D10:ValueSetType</p> <p><b>X17-CenterOfBody-to-CenterOfRightTiebarShape</b> type JEP30-D10:ValueSetType</p> <p><b>X18-CenterOfBody-to-RightSideOfRightTiebarShape</b> type JEP30-D10:ValueSetType</p> <p><b>X19-RightSideOfBody-to-LeftSideOfLeftTiebarShape</b> type JEP30-D10:ValueSetType</p> <p><b>X20-RightSideOfBody-to-CenterOfLeftTiebarShape</b> type JEP30-D10:ValueSetType</p> <p><b>X21-RightSideOfBody-to-RightSideOfLeftTiebarShape</b> type JEP30-D10:ValueSetType</p> <p><b>X22-RightSideOfBody-to-LeftSideOfCenterTiebarShape</b> type JEP30-D10:ValueSetType</p> <p><b>X23-RightSideOfBody-to-CenterlineOfTiebarGroup</b> type JEP30-D10:ValueSetType</p> <p><b>X24-RightSideOfBody-to-RightSideOfCenterTiebarShape</b> type JEP30-D10:ValueSetType</p> <p><b>X25-RightSideOfBody-to-LeftSideOfRightTiebarShape</b> type JEP30-D10:ValueSetType</p> <p><b>X26-RightSideOfBody-to-CenterOfRightTiebarShape</b> type JEP30-D10:ValueSetType</p> <p><b>X27-RightSideOfBody-to-RightSideOfRightTiebarShape</b> type JEP30-D10:ValueSetType</p>
<p>type</p>	<p><b>Tiebar-to-Body-X-OffsetType, JEP30-D10:ValueSetType.</b></p>

Table 45 - Tiebar to Package Body X-Offset lists out all the various dimensions that can be selected from any major point of the package body to any point of the tiebar shape in X direction.

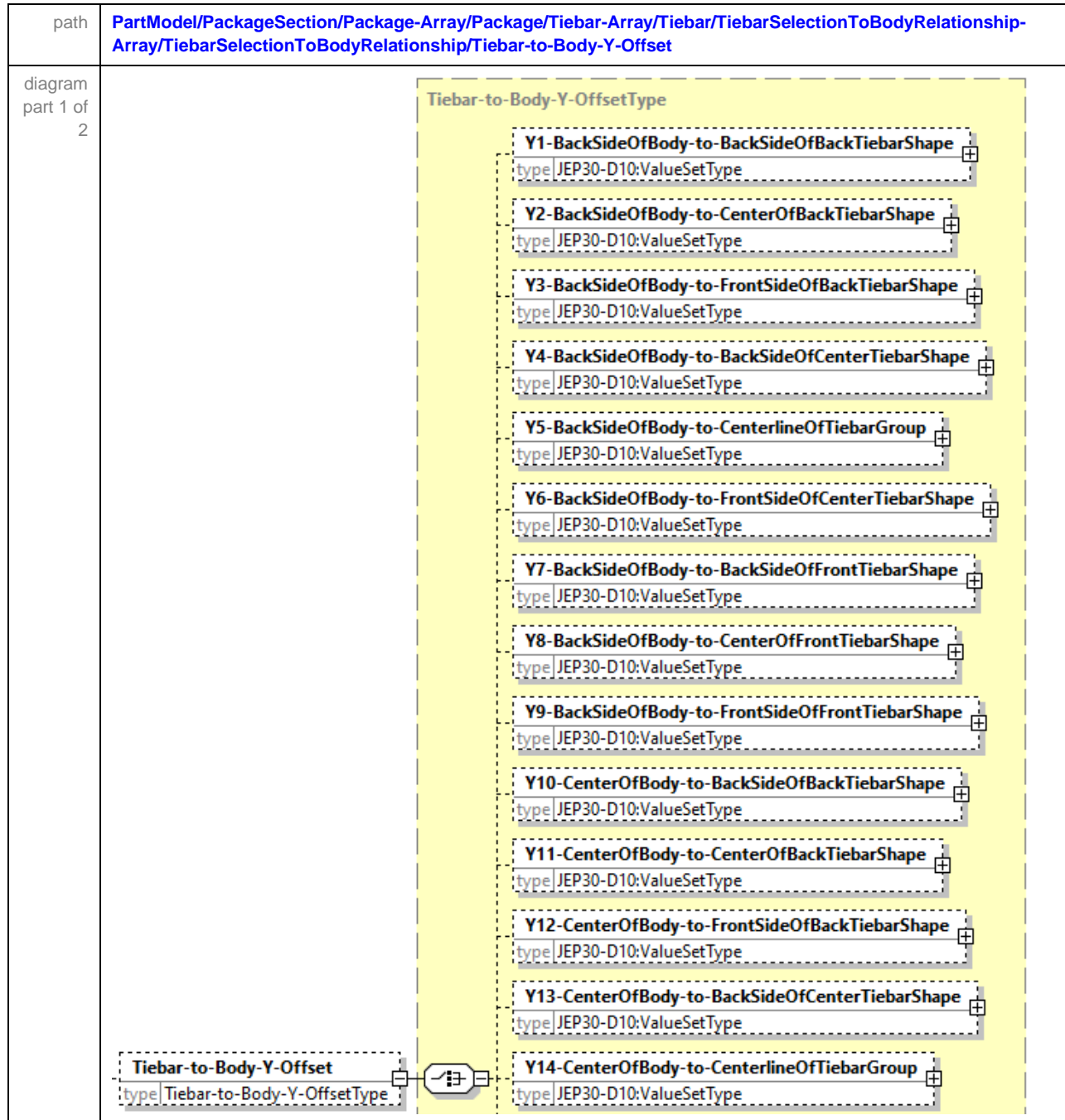
Center of Center Tiebar Group is the same as Centerline of Tiebar Group, however the use of the "...Centerline of Tiebar Group" is more encompassing since it also includes the centerline of a row or column of an even number of tiebars, i.e., midway between tiebar 2 and tiebar 3 of 4 tiebars in a row or column.

#### 5.15.4.1 Tiebar Pattern or Tiebar Pattern Group to Body X-Offset (cont'd)

**Table 45 - Tiebar to Package Body X-Offset**

Symbol	Description
X1	Left side of body to Left Side of Left Tiebar Shape
X2	Left side of body to Center of Left Tiebar Shape
X3	Left side of body to Right side of Left Tiebar Shape
X4	Left side of body to Left Side of Center Tiebar Shape
X5	Left side of body to Centerline of Tiebar Group
X6	Left side of body to Right side of Center Tiebar Shape
X7	Left side of body to Left side of Right Tiebar Shape
X8	Left side of body to Center of Right Tiebar Shape
X9	Left side of body to Right side of Right Tiebar Shape
X10	Center of body to Left side of Left Tiebar Shape
X11	Center of body to Center of Left Tiebar Shape
X12	Center of body to Right side of Left Tiebar Shape
X13	Center of body to Left side of Center Tiebar Shape
X14	Center of body to Centerline of Tiebar Group
X15	Center of body to Right side of Center Tiebar Shape
X16	Center of body to Left side of Right Tiebar Shape
X17	Center of body to Center of Right Tiebar Shape
X18	Center of body to Right side of Right Tiebar Shape
X19	Right side of body to Left side of Left Tiebar Shape
X20	Right side of body to Center of Left Tiebar Shape
X21	Right side of body to Right side of Left Tiebar Shape
X22	Right side of body to Left side of Center Tiebar Shape
X23	Right side of body to Centerline of Tiebar Group
X24	Right side of body to Right side of Center Tiebar Shape
X25	Right side of body to Left side of Right Tiebar Shape
X26	Right side of body to Center of Right Tiebar Shape
X27	Right side of body to Right side of Right Tiebar Shape

#### 5.16.4.2 Tiebar Pattern or Tiebar Pattern Group to Body Y-Offset



#### 5.15.4.2 Tiebar Pattern or Tiebar Pattern Group to Body Y-Offset (cont'd)

<p>diagram part 2 of 2</p>	
<p>type</p>	<p><b>Tiebar-to-Body-Y-OffsetType, JEP30-D10:ValueSetType.</b></p>

Table 46 - Tiebar to Package Body Y-Offset lists out all the various dimensions that can be selected from any major point of the package body to any point of the tiebar shape in Y direction.

#### 5.15.4.2 Tiebar Pattern or Tiebar Pattern Group to Body Y-Offset (cont'd)

**Table 46 - Tiebar to Package Body Y-Offset**

Symbol	Description
Y1	Back side of body to Back side of Back Tiebar Shape
Y2	Back side of body to Center of Back Tiebar Shape
Y3	Back side of body to Front side of Back Tiebar Shape
Y4	Back side of body to Back side of Center Tiebar Shape
Y5	Back side of body to Centerline of Tiebar Group
Y6	Back side of body to Front side of Center Tiebar Shape
Y7	Back side of body to Back side of Front Tiebar Shape
Y8	Back side of body to Center of Front Tiebar Shape
Y9	Back side of body to Front side of Front Tiebar Shape
Y10	Center of body to Back side of Back Tiebar Shape
Y11	Center of body to Center of Back Tiebar Shape
Y12	Center of body to Front side of Back Tiebar Shape
Y13	Center of body to Back side of Center Tiebar Shape
Y14	Center of body to Centerline of Tiebar Group
Y15	Center of body to Front side of Center Tiebar Shape
Y16	Center of body to Back side of Front Tiebar Shape
Y17	Center of body to Center of Front Tiebar Shape
Y18	Center of body to Front side of Front Tiebar Shape
Y19	Front side of body to Back side of Back Tiebar Shape
Y20	Front side of body to Center of Back Tiebar Shape
Y21	Front side of body to Front side of Back Tiebar Shape
Y22	Front side of body to Back side of Center Tiebar Shape
Y23	Front side of body to Centerline of Tiebar Group
Y24	Front side of body to Front side of Center Tiebar Shape
Y25	Front side of body to Back side of Front Tiebar Shape
Y26	Front side of body to Center of Front Tiebar Shape
Y27	Front side of body to Front side of Front Tiebar Shape

### 5.16.4.3 Tiebar Pattern or Tiebar Pattern Group to Body Z-Offset

path	<a href="#">PartModel/PackageSection/Package-Array/Package/Tiebar-Array/Tiebar/TiebarSelectionToBodyRelationship-Array/TiebarSelectionToBodyRelationship/Tiebar-to-Body-Z-Offset</a>
diagram	
type	<a href="#">Tiebar-to-Body-Z-OffsetType</a> , <a href="#">JEP30-D10.ValueSetType</a> .

Table 47 lists out all the various dimensions that can be selected from any major point of the package body to any point of the terminal contact area in Z direction.

**Table 47 - Terminal Group to Package Body Z-Offset**

Symbol	Description
Z1	Seating Plane to Lower side of Tiebar Shape
Z2	Seating Plane to Center of Tiebar Shape
Z3	Seating Plane to Upper side of Tiebar Shape
Z4	Under side of Body to Lower side of Tiebar Shape
Z5	Under side of Body to Center of Tiebar Shape
Z6	Under side of Body to Upper side of Tiebar Shape
Z7	Upper side of Body to Lower side of Tiebar Shape
Z8	Upper side of Body to Center of Tiebar Shape
Z9	Upper side of Body to Upper side of Tiebar Shape

## 5.17 Fiducial Marking

path	<a href="#">PartModel/PackageSection/Package-Array/Package/FiducialMarking</a>
diagram	
type	<a href="#">FiducialMarkingType</a> , <a href="#">FiducialShape-ArrayType</a> , <a href="#">FiducialShapeType</a> , <a href="#">JEP30-D10:ShapeOrderType</a> , <a href="#">JEP30-D10:GraphicalFormat-ArrayType</a>

A fiducial marker or fiducial is an object placed in the field of view of an imaging system that appears in the image produced, for use as a point of reference or a measure. It may be either something placed into or on the imaging subject, or a mark or set of marks in the reticle of an optical instrument.

### 5.17.1 Fiducial Shape

path	<a href="#">PartModel/PackageSection/Package-Array/Package/FiducialMarking/FiducialShape-Array/FiducialShape</a>
diagram	
type	<a href="#">FiducialShapeType</a> , <a href="#">FiducialVertex-ArrayType</a> , <a href="#">PrimitiveFiducialShapeType</a> , <a href="#">JEP30-D10:GraphicalFormat-ArrayType</a>

5.14.1      **Fiducial Shape (cont'd)**

The Shape can be created from a choice of Vertices, or primitive shapes.

*GraphicalFormatID* serves as a reference ID for the *GraphicalFormat*, that is defined under the *GraphicalFormat-Array/GraphicalFormats* where a set of graphical formats can be defined that can be standardized across multiple *Shape* entries. The addition of the *GraphicalFormat* under *Shape* enables unique modification of a references Graphical Format for applying to this specific shape instance.

The *ShapeOrderSequence* can be used to define the order of shapes for a complex fiducial that may consist of various shapes. It works in tandem with the *ShapeOrder* that is defined under *FiducialMarking/FiducialShape-Array*.

5.17.1.1      **Vertex - Array**

path	PartModel/PackageSection/Package-Array/Package/FiducialMarking/FiducialShape-Array/FiducialShape/Vertex-Array
diagram	<p>The diagram illustrates the structure of the Vertex-Array. A 'Vertex' box (type: FiducialVertexType) with a multiplicity of 1..∞ is connected to a dashed box labeled 'FiducialVertexType'. Inside this box, 'x' (type: xs:decimal) and 'y' (type: xs:decimal) are shown. A dashed box labeled 'JEP30-D10:FeatureControlID-ArrayType' contains a 'FeatureControlID-Array' (type: JEP30-D10:FeatureControlID-ArrayType) connected to a 'FeatureControlID' (type: xs:string) with a multiplicity of 1..∞.</p>
type	FiducialVertex-ArrayType, FiducialVertexType, JEP30-D10:FeatureControlID-ArrayType, FiducialEdgeVertexControlType



5.17.1.1.1 Edge

path	PartModel/PackageSection/Package-Array/Package/FiducialMarking/FiducialShape-Array/FiducialShape/Vertex-Array/Edge
diagram	<p>The diagram illustrates the structure of the <b>FiducialEdgeVertexControlType</b> and <b>FiducialLineVertexControlType</b> elements. The <b>FiducialEdgeVertexControlType</b> element is shown as a container for the <b>Edge</b> and <b>Line</b> elements. The <b>Edge</b> element is of type <b>FiducialEdgeVertexControlType</b> and has a note: "Default should be assumed to be line strip if this section is omitted". The <b>Line</b> element is of type <b>FiducialLineVertexControlType</b>. The <b>FiducialLineVertexControlType</b> element is shown as a container for the <b>Strip</b> and <b>Loop</b> elements. The <b>Strip</b> element is of type <b>JEP30-D10:EmptyType</b> and has a note: "Series of connected line segments". The <b>Loop</b> element is of type <b>JEP30-D10:EmptyType</b> and has a note: "Same as strip, with a segment added between last and first vertices". A <b>Triangle</b> element is also shown, of type <b>JEP30-D10:EmptyType</b>.</p>
type	FiducialEdgeVertexControlType, FiducialLineVertexControlType, JEP30-D10:EmptyType

The default is assumed to be *Line/Strip* if the *Edge* element is omitted. The *Edge* structure governs how each of the vertices in the unbounded *Vertex* element is to be processed.

*Line/Lines* represent pairs of vertices interpreted as individual line segments. Vertices 1 and 2 make one line segment whereas vertices 3 and 4 makes the 2<sup>nd</sup> line segment. Vertices 2 and 3 are not connected with a line segment.

*Line/Strip* represent a series of connected line segments. Vertices 1 and 2 make one line segment whereas vertices 2 and 3 makes the 2<sup>nd</sup> line segment, and vertices 3 and 4 makes the 3<sup>rd</sup> line segment.

*Lines/Loop* is the same as strip, with a segment added between last and first vertices. From the previous example, vertices 4 and 1 makes the final line segment, creation a closed loop.

*Triangle* represent each triple set of vertices to be interpreted as an individual triangle. Vertices 1, 2, and 3 make one triangle whereas vertices 4, 5, and 6 makes the 2<sup>nd</sup> triangle.

### 5.17.1.2 Primitive Fiducial Shape

path	<a href="#">PartModel/PackageSection/Package-Array/Package/FiducialMarking/FiducialShape-Array/FiducialShape/PrimitiveFiducialShape</a>
diagram	
type	<a href="#">PrimitiveFiducialShapeType</a> , <a href="#">ReferenceRectangleType</a> , <a href="#">ReferenceCrosshairType</a> , <a href="#">JEP30-D10:DimensionalValueSetType</a> , <a href="#">ReferenceRegularPolygonType</a> , <a href="#">ReferenceCircleType</a> , <a href="#">JEP30-D10:PointXYType</a>

### 5.17.2 Graphical Format - Array

path	<a href="#">PartModel/PackageSection/Package-Array/Package/FiducialMarking/GraphicalFormat-Array</a>
diagram	
type	<a href="#">JEP30-D10:GraphicalFormat-ArrayType</a> , <a href="#">GraphicalFormatsType</a> , <a href="#">GraphicalFormatType</a> .

5.17.2.1 Graphical Format

path	PartModel/PackageSection/Package-Array/Package/FiducialMarking/FiducialShape-Array/FiducialShape/GraphicalFormat
diagram	
type	GraphicalFormatType, StrokeWidthType, StrokeOpacityType, StrokeLineCapType, StrokeDash-ArrayType, ColorType, FillOpacityType

5.17.2.1.1 Color Type

path	<div>PartModel/PackageSection/Package-Array/Package/FiducialMarking/FiducialShape-Array/FiducialShape/GraphicalFormat/StrokeColor</div> <div>PartModel/PackageSection/Package-Array/Package/FiducialMarking/FiducialShape-Array/FiducialShape/GraphicalFormat/FillColor</div>
diagram	
type	DefaultColorType, DefaultColorNameType, DefaultColorHexType, DefaultColor-RType, DefaultColor-GType, DefaultColor-BType

[ColorNameType](#) as defined in the [StrokeColor/Name](#) element list the names of the Scalable Vector Graphics (SVG) Colors as defined by the Scalable Vector Graphics (SVG) Specification.

[ColorHexType](#) as defined in the [StrokeColor/Hex](#) element uses a regular expression pattern to recognize the six-digit hexadecimal representation of the Scalable Vector Graphics (SVG) Colors.

[Color-RType](#), [Color-GType](#), [Color-BType](#) allows the construction of all the colors from the combination of the red, green, and blue colors in the RGB Color Space. The red, green, and blue use 8 bits each, which have integer values from 0 to 255.

5.18 Geometric Dimensioning and Tolerancing

path	PartModel/PackageSection/Package-Array/Package/GDAndT, PartModel/PackageSection/Package-Array/Package/GDandTDatum-to-ElementMap
diagram	<p>The diagram illustrates the structure of geometric dimensioning and tolerancing (GD&amp;T) data. It features two main classes: <b>JEP30-D10:GDAndTType</b> and <b>GDandTDatum-to-ElementMap-ArrayType</b>. <b>JEP30-D10:GDAndTType</b> is a base class for <b>Datum-Array</b>, <b>FeatureControl-Array</b>, and <b>FeatureControlPlacement-Array</b>. It also includes a <b>constraints</b> property. <b>GDandTDatum-to-ElementMap-ArrayType</b> is a base class for <b>GDandTDatum-to-ElementMap</b>. There is an association between <b>JEP30-D10:GDAndTType</b> and <b>GDandTDatum-to-ElementMap-ArrayType</b>. The diagram also shows a <b>GDAndT</b> class with a type <b>JEP30-D10:GDAndTType</b> and a <b>GDandTDatum-to-ElementMap-Array</b> class with a type <b>GDandTDatum-to-ElementMap-ArrayType</b>. The <b>GDandTDatum-to-ElementMap</b> class has a multiplicity of <b>0..∞</b>.</p>
type	JEP30-D10:GDAndTType, Datum-ArrayType, FeatureControl-ArrayType, FeatureControlPlacement-ArrayType

When applying GD&T, the first consideration is to establish a datum reference frame based on the function of the part in the assembly with its mating parts. After the datum reference plane is established, the form of the primary datum features is controlled, followed by the orientation and / or location of the secondary and tertiary datum features. After the datum features are related relative to each other, the remaining features are controlled for orientation and location relative to the datum reference framework.

As a result of increased decentralization of design and manufacturing, it is even more important that the design more precisely states the functional requirements. To accomplish this, it is becoming increasingly more important that the use of geometric and dimensioning replace the former limit dimensioning for form, orientation, location, and profile of part features. This section follows the ASME Y14.5-2009 Dimensioning and Tolerancing which establishes uniform practices for stating and interpreting dimensioning, Tolerancing and related requirements for use on engineering drawings and in related documents.

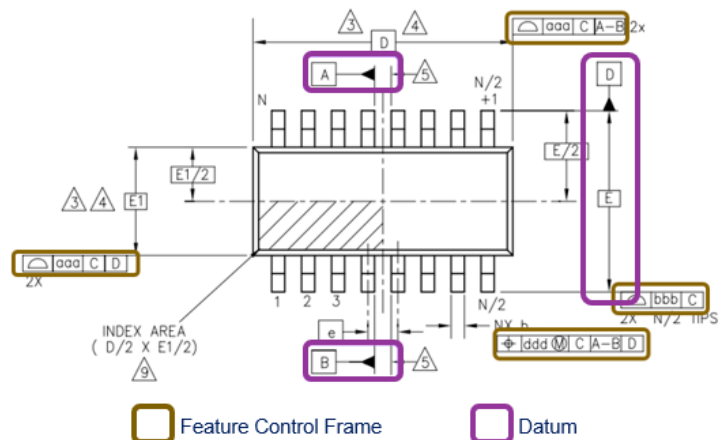
Refer to this ASME Y14.5-2009 Dimensioning and Tolerancing standard for a detailed explanation of the terminology used in association with this section.

### 5.18.1 Datum Array

path	PartModel/PackageSection/Package-Array/Package/GDAndT/Datum-Array
diagram	
type	Datum-ArrayType, DatumType, EmptyType.

A datum feature is selected based on its functional relationship to the tolerance feature and the requirements of the design.

**Figure 16 – Example showing Datum and Feature Control Frames**



### 5.15.1 Datum Array (cont'd)

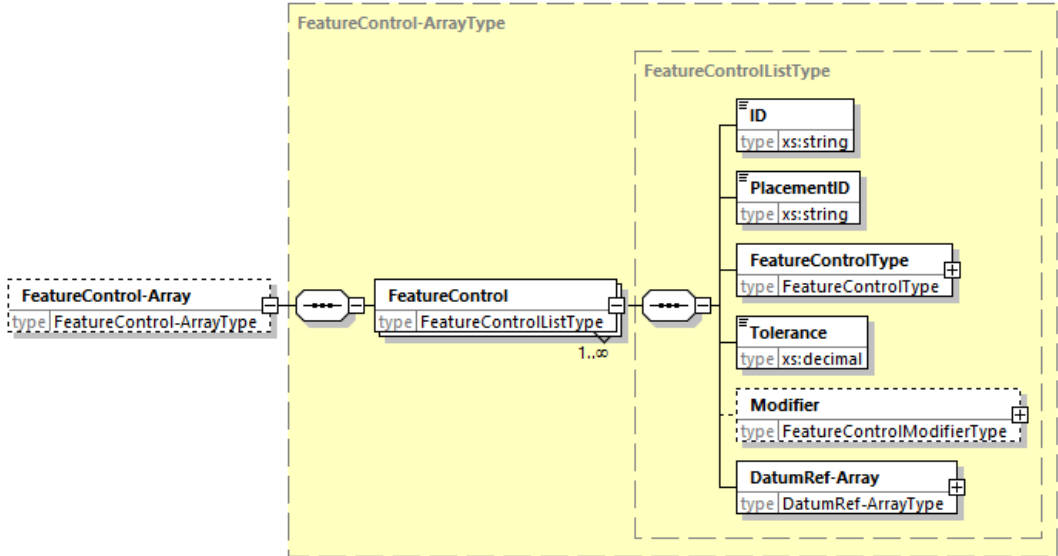
The diagram below from the ASME Y14.5-2009 Dimensioning and Tolerancing standard for a detailed explanation of the terminology used in association with this section.

FEATURE TYPE	ON THE DRAWING	DATUM FEATURE	DATUM AND DATUM FEATURE SIMULATOR	DATUM AND CONSTRAINING DEGREES OF FREEDOM
PLANAR (a)				
WIDTH (b)				
SPHERICAL (c)				
CYLINDRICAL (d)				
CONICAL (e)				
LINEAR EXTRUDED SHAPE (f)				
COMPLEX (g)				

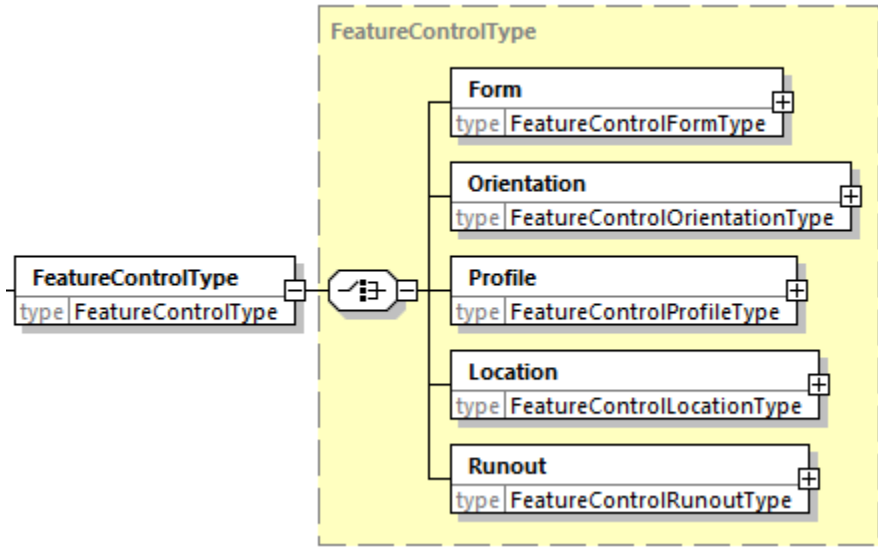
Source: ASME Y14-5 2009

Figure 17 – Constrained Degrees of Freedom for Primary Datum Features

## 5.18.2 Feature Control Array

path	<a href="#">PartModel/PackageSection/Package-Array/Package/GDAndT/FeatureControl-Array</a>
diagram	 <p>The diagram illustrates the structure of the <b>FeatureControl-ArrayType</b>. It is a dashed box containing a <b>FeatureControl-Array</b> element (type <b>FeatureControl-ArrayType</b>) connected to a <b>FeatureControl</b> element (type <b>FeatureControlListType</b>) via a 1..∞ multiplicity. The <b>FeatureControl</b> element is further connected to a <b>FeatureControlListType</b> element (type <b>FeatureControlListType</b>) via a 1..∞ multiplicity. The <b>FeatureControlListType</b> element is a dashed box containing the following elements: <b>ID</b> (type <b>xs:string</b>), <b>PlacementID</b> (type <b>xs:string</b>), <b>FeatureControlType</b> (type <b>FeatureControlType</b>), <b>Tolerance</b> (type <b>xs:decimal</b>), <b>Modifier</b> (type <b>FeatureControlModifierType</b>), and <b>DatumRef-Array</b> (type <b>DatumRef-ArrayType</b>).</p>
type	<a href="#">FeatureControl-ArrayType</a> , <a href="#">FeatureControlListType</a> , <a href="#">FeatureControlType</a> , <a href="#">FeatureControlModifierType</a> , <a href="#">DatumRef-ArrayType</a> .

### 5.18.2.1 Feature Control Type

path	<a href="#">PartModel/PackageSection/Package-Array/Package/GDAndT/FeatureControl-Array/FeatureControl/FeatureControlType</a>
diagram	 <p>The diagram illustrates the structure of the <b>FeatureControlType</b>. It is a dashed box containing the following elements: <b>Form</b> (type <b>FeatureControlFormType</b>), <b>Orientation</b> (type <b>FeatureControlOrientationType</b>), <b>Profile</b> (type <b>FeatureControlProfileType</b>), <b>Location</b> (type <b>FeatureControlLocationType</b>), and <b>Runout</b> (type <b>FeatureControlRunoutType</b>). Each element is connected to the <b>FeatureControlType</b> element via a 1..∞ multiplicity.</p>
type	<a href="#">FeatureControlTypeType</a> , <a href="#">FeatureControlFormType</a> , <a href="#">FeatureControlOrientationType</a> , <a href="#">FeatureControlProfileType</a> , <a href="#">FeatureControlLocationType</a> , <a href="#">FeatureControlRunoutType</a> .



### 5.18.2.1.1 Form

path	PartModel/PackageSection/Package-Array/Package/GDAndT/FeatureControl-Array/FeatureControl/FeatureControlType/Form
diagram	
type	FeatureControlFormType, EmptyType.

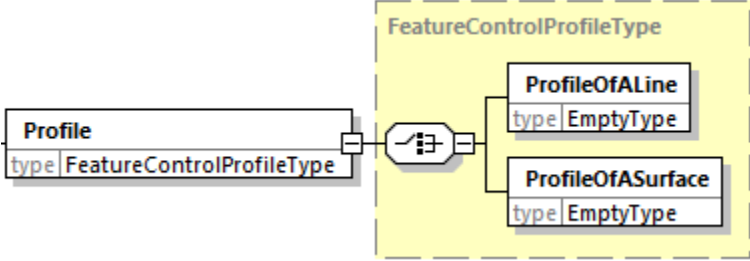
Form tolerances control straightness, flatness, circularity, and cylindricity. See section on “Tolerance of Form” in the ASME Y14-5 2009 for more details.

### 5.18.2.1.2 Orientation

path	PartModel/PackageSection/Package-Array/Package/GDAndT/FeatureControl-Array/FeatureControl/FeatureControlType/Orientation
diagram	
type	FeatureControlOrientationType, EmptyType.

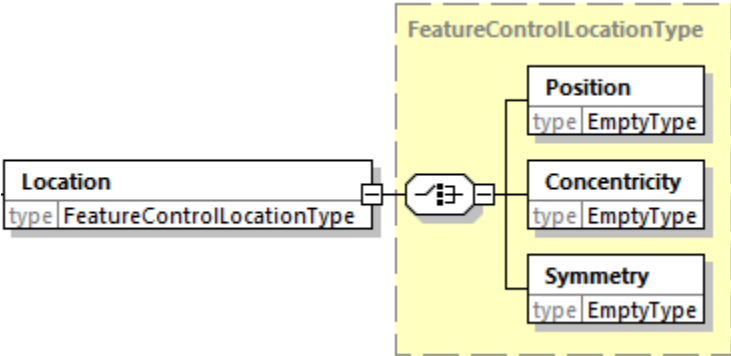
An orientation tolerance controls parallel, perpendicular, and all other angular relationships. See section on “Tolerance of Orientation” in the ASME Y14-5 2009 for more details.

### 5.18.2.1.3 Profile

path	<a href="#">PartModel/PackageSection/Package-Array/Package/GDAndT/FeatureControl-Array/FeatureControl/FeatureControlType/Profile</a>
diagram	 <p>The diagram shows a box labeled 'Profile' with 'type FeatureControlProfileType' below it. This box is connected to a dashed yellow box labeled 'FeatureControlProfileType'. Inside this dashed box, there is a central icon (a circle with a cross) connected to two sub-boxes: 'ProfileOfALine' and 'ProfileOfASurface'. Both sub-boxes have 'type EmptyType' below them.</p>
type	<a href="#">FeatureControlProfileType</a> , <a href="#">EmptyType</a> .

A profile is an outline of a surface, a shape made up of one or more features, or a two-dimensional element of one or more features. Profile tolerances are used to define a tolerance zone to control form or combinations of size, form, orientation, and location of a feature(s) relative to a true profile. See section on “Tolerance of Profile” in the ASME Y14-5 2009 for more details.

### 5.18.2.1.4 Location

path	<a href="#">PartModel/PackageSection/Package-Array/Package/GDAndT/FeatureControl-Array/FeatureControl/FeatureControlType/Location</a>
diagram	 <p>The diagram shows a box labeled 'Location' with 'type FeatureControlLocationType' below it. This box is connected to a dashed yellow box labeled 'FeatureControlLocationType'. Inside this dashed box, there is a central icon (a circle with a cross) connected to three sub-boxes: 'Position', 'Concentricity', and 'Symmetry'. Each sub-box has 'type EmptyType' below it.</p>
type	<a href="#">FeatureControlLocationType</a> , <a href="#">EmptyType</a> .

Included in the principles of tolerances of location. are position, concentricity, and symmetry used to control the following relationships:

1. Center distance between features of size such as holes, slots, bosses, and tabs.
2. Location of features of size (such as in the previous bullet) as a group, from datum features, such as plane and cylindrical surfaces.
3. Coaxiality of features of size, and
4. Concentricity or symmetry of features of size—center distances of correspondingly located feature elements equally disposed about a datum axis or plane

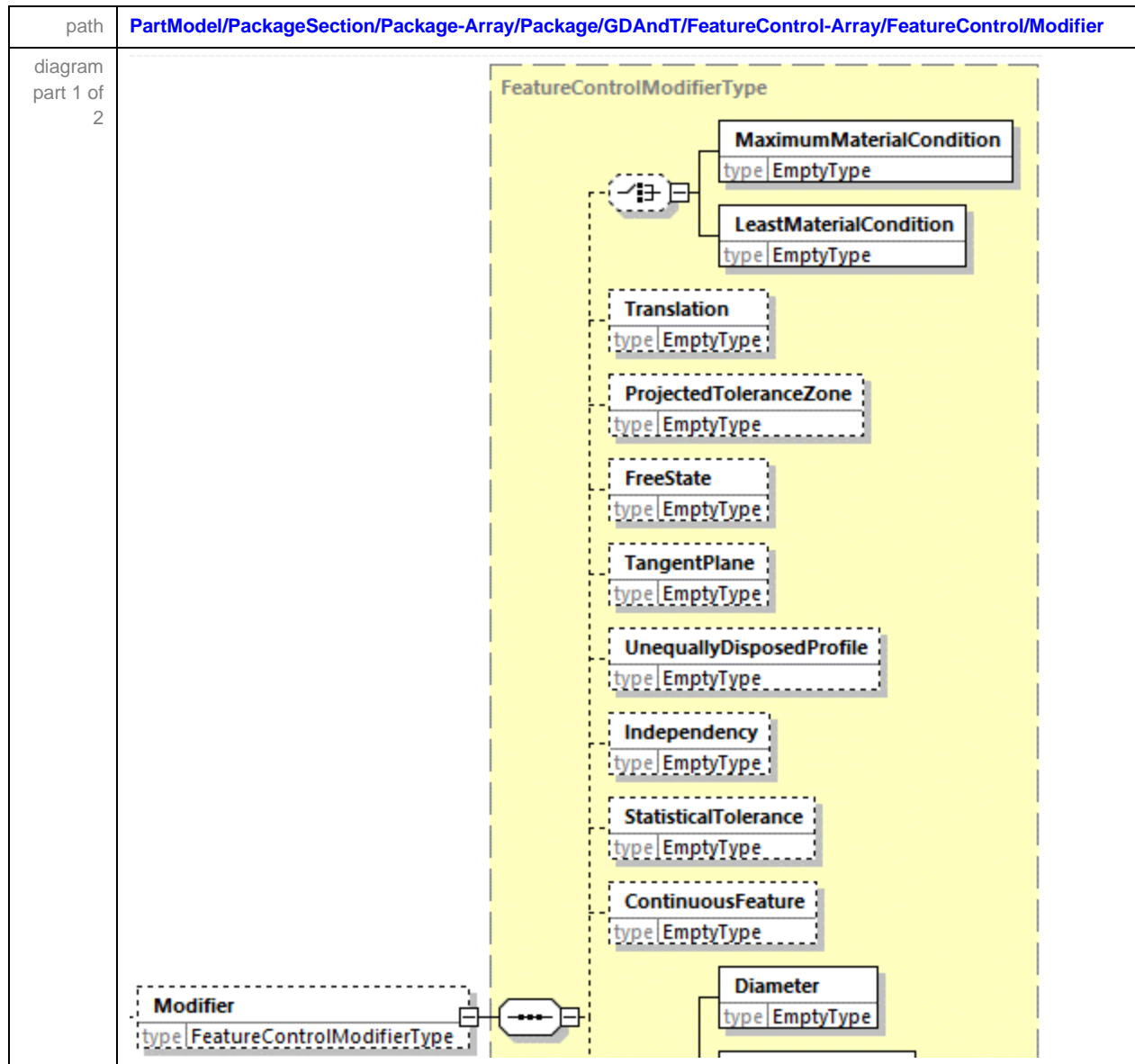
See section on “Tolerance of Location” in the ASME Y14-5 2009 for more details.

5.18.2.1.5     Runout

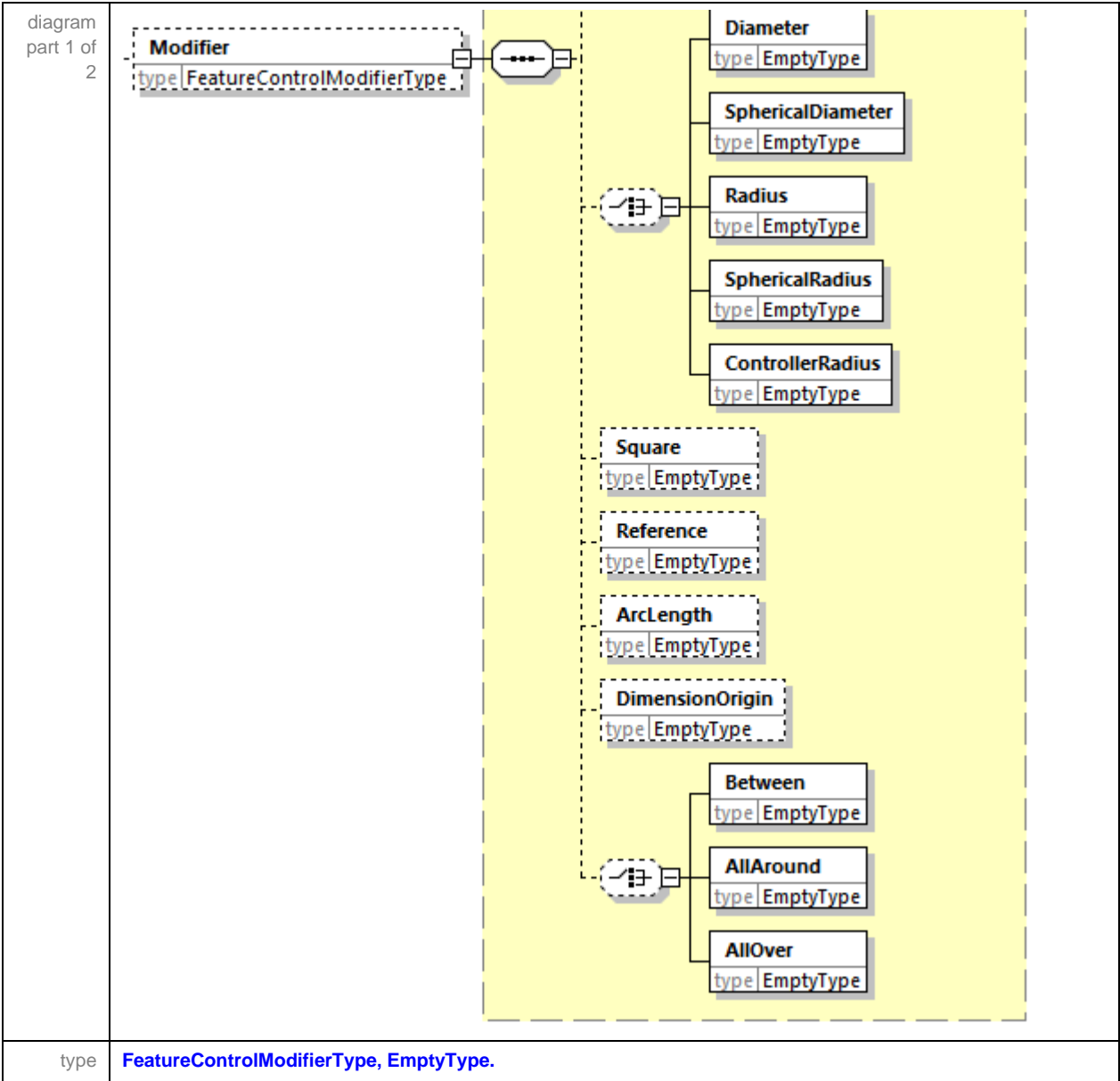
path	PartModel/PackageSection/Package-Array/Package/GDAndT/FeatureControl-Array/FeatureControl/FeatureControlType/Runout
diagram	<pre>classDiagram     class Runout {         type FeatureControlRunoutType     }     class FeatureControlRunoutType {         Runout         TotalRunout     }     Runout --&gt; FeatureControlRunoutType     FeatureControlRunoutType -- &gt; Runout     FeatureControlRunoutType -- &gt; TotalRunout     class RunoutSub {         type EmptyType     }     class TotalRunoutSub {         type EmptyType     }</pre>
type	FeatureControlRunoutType, EmptyType.

Runout is a tolerance used to control the functional relationship of one or more features to a datum axis established from a datum feature specified at RMB. The types of features controlled by runout tolerances include those surfaces constructed around a datum axis and those constructed at right angles to a datum axis. See section on “Tolerance of Runout” in the ASME Y14-5 2009 for more details.

### 5.18.3 Modifier

























5.15.3 Modifier (cont'd)



Modifiers establishes additional symbols for specifying geometric characteristics and other dimensional requirements on engineering drawings. The application of Modifiers such as Most Material Condition or Least Material Condition may be applied to geometric tolerance values on features of size. See section on “Applicability of Modifiers on Geometric Tolerance Values and Datum Feature References” in the ASME Y14-5 2009 for more details.

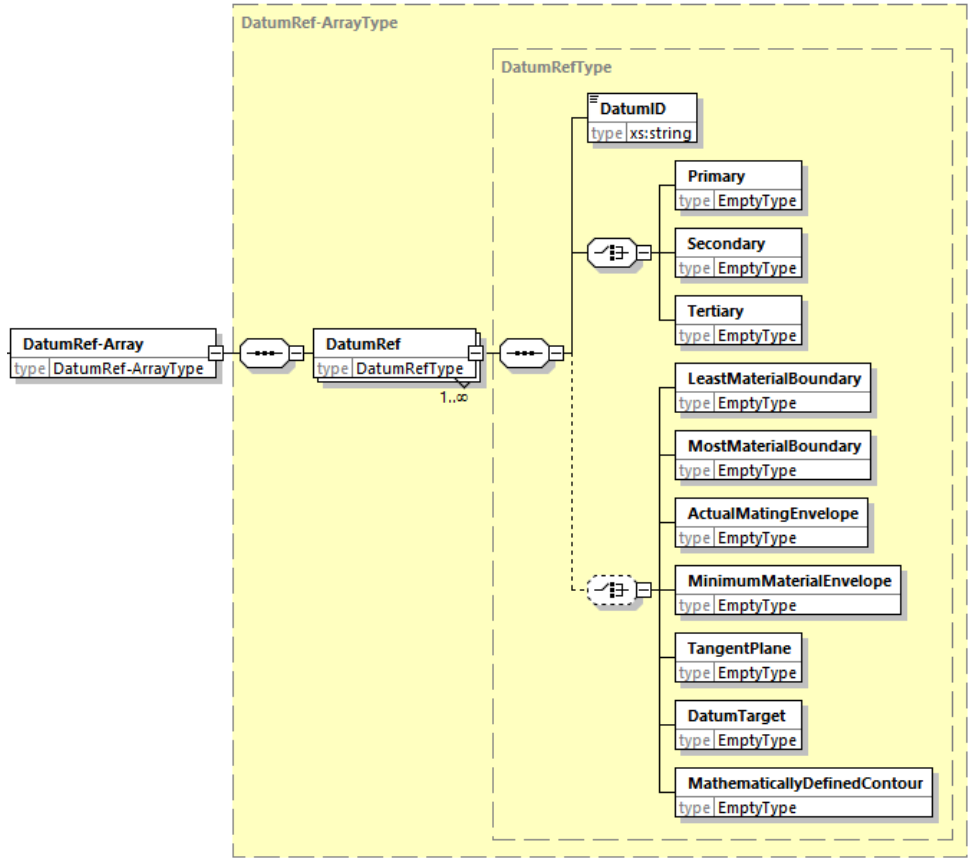
### 5.15.3 Modifier (cont'd)

TERM	SYMBOL	SEE:
AT MAXIMUM MATERIAL CONDITION (When applied to a tolerance value) AT MAXIMUM MATERIAL BOUNDARY (When applied to a datum reference)		3.3.5
AT LEAST MATERIAL CONDITION (When applied to a tolerance value) AT LEAST MATERIAL BOUNDARY (When applied to a datum reference)		3.3.5
TRANSLATION		3.3.26
PROJECTED TOLERANCE ZONE		3.3.6
FREE STATE		3.3.20
TANGENT PLANE		3.3.21
UNEQUALLY DISPOSED PROFILE		3.3.22
INDEPENDENCY		3.3.24
STATISTICAL TOLERANCE		3.3.10
CONTINUOUS FEATURE		3.3.23
DIAMETER		3.3.7
SPHERICAL DIAMETER		3.3.7
RADIUS		3.3.7
SPHERICAL RADIUS		3.3.7
CONTROLLED RADIUS		3.3.7
SQUARE		3.3.16
REFERENCE		3.3.8
ARC LENGTH		3.3.9
DIMENSION ORIGIN		3.3.17
BETWEEN		3.3.11
ALL AROUND		3.3.19
ALL OVER		3.3.25

Source: ASME Y14-5 2009

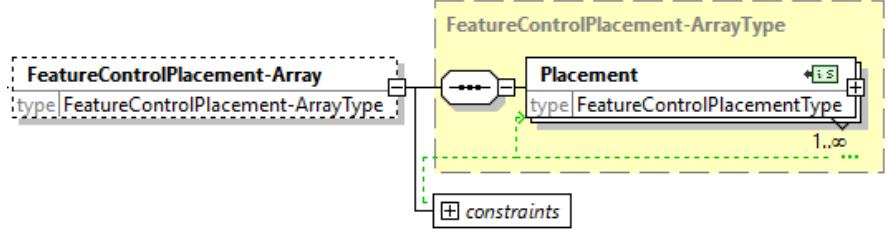
**Figure 18 – Modifying Symbols**

5.18.4 Datum Reference Array

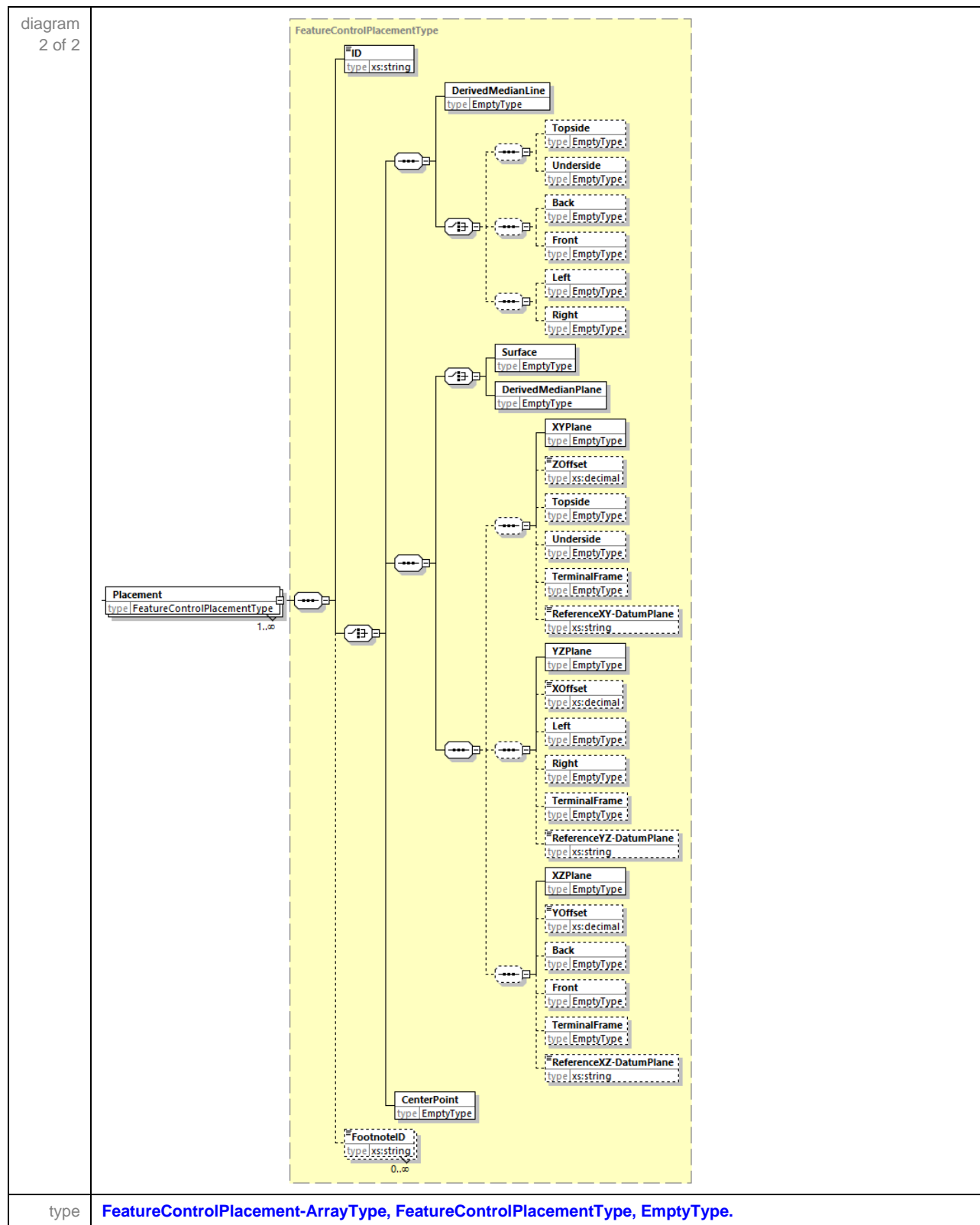
path	PartModel/PackageSection/Package-Array/Package/GDAndT/FeatureControl-Array/FeatureControl/DatumRef-Array
diagram	 <p>The diagram illustrates the structure of a Datum Reference Array. It shows a sequence of elements: <b>DatumRef-Array</b> (type: DatumRef-ArrayType), followed by an array of <b>DatumRef</b> (type: DatumRefType) with a cardinality of 1..∞. The <b>DatumRefType</b> is detailed in a dashed box and includes the following elements: <b>DatumID</b> (type: xs:string), <b>Primary</b> (type: EmptyType), <b>Secondary</b> (type: EmptyType), <b>Tertiary</b> (type: EmptyType), <b>LeastMaterialBoundary</b> (type: EmptyType), <b>MostMaterialBoundary</b> (type: EmptyType), <b>ActualMatingEnvelope</b> (type: EmptyType), <b>MinimumMaterialEnvelope</b> (type: EmptyType), <b>TangentPlane</b> (type: EmptyType), <b>DatumTarget</b> (type: EmptyType), and <b>MathematicallyDefinedContour</b> (type: EmptyType). The <b>DatumRef</b> element is connected to the <b>DatumRefType</b> box via a dashed line.</p>
type	DatumRef-ArrayType, DatumRefType.

A datum reference frame is three mutually perpendicular intersecting datum planes. See section on “Datum Reference Frames” in the ASME Y14-5 2009 for more details.

5.18.5 Feature Control Placement Array

path	PartModel/PackageSection/Package-Array/Package/GDAndT/FeatureControlPlacement-Array
diagram 1 of 2	 <p>The diagram illustrates the structure of a Feature Control Placement Array. It shows a sequence of elements: <b>FeatureControlPlacement-Array</b> (type: FeatureControlPlacement-ArrayType), followed by an array of <b>Placement</b> (type: FeatureControlPlacementType) with a cardinality of 1..∞. The <b>Placement</b> element is connected to the <b>FeatureControlPlacementType</b> box via a dashed line. Below the <b>Placement</b> box, there is a <b>constraints</b> box with a plus sign icon.</p>

### 5.15.5 Feature Control Placement Array (cont'd)





### 5.15.5 Feature Control Placement Array (cont'd)

A feature control frame is related to a considered feature by one of the following methods

1. Locating the frame below or attached to a leader-directed note or dimension pertaining to the feature.
2. Attaching a leader from the frame pointing to the feature.
3. Attaching a side, corner, or an end of the frame to an extension line from the feature, provided it is a plane surface,
4. Attaching a side, corner, or an end of the frame to an extension of the dimension line pertaining to a feature of size, and
5. Placing in a note, chart, or the general tolerance block.

See section on “Datum Reference Frames” in the ASME Y14-5 2009 for more details.

### 5.18.6 GD&T XML Example

Figure 19 represents an SOIC device with a Feature Control Frame highlighted that is represented in the xml example below.

```
<GDAndT>
  <FeatureControl-Array>
    <FeatureControl>
      <ID>Feature Control ID 1</ID>
      <PlacementID>Place ID X</PlacementID>
      <FeatureControlType>
        <Location>
          <Position/>
        </Location>
      </FeatureControlType>
      <Tolerance>0.25</Tolerance>
      <Modifier>
        <MaximumMaterialBoundary/>
      </Modifier>
      <DatumRef-Array>
        <DatumRef>
          <DatumID>C</DatumID>
          <Primary/>
        </DatumRef>
        <DatumRef>
          <DatumID>A</DatumID>
          <Secondary/>
        </DatumRef>
        <DatumRef>
          <DatumID>B</DatumID>
          <Secondary/>
        </DatumRef>
        <DatumRef>
          <DatumID>D</DatumID>
          <Tertiary/>
        </DatumRef>
      </DatumRef-Array>
    </FeatureControl>
  </FeatureControl-Array>
```

...

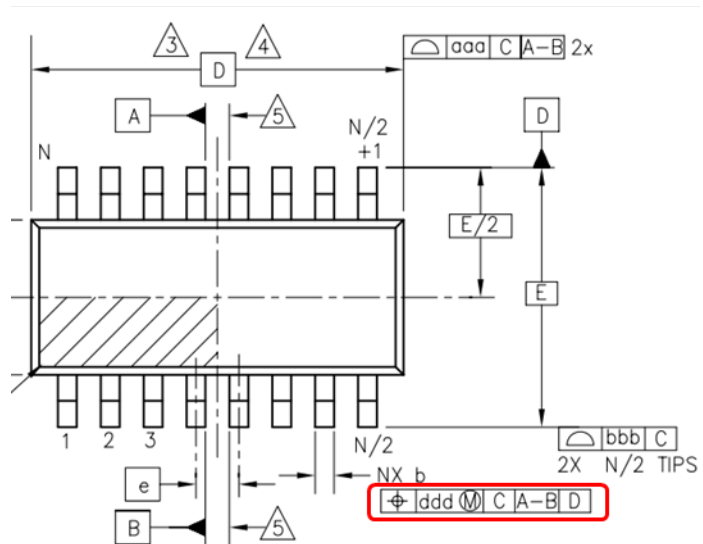


Figure 19 – Sample for Representation in an XML Structure

### 5.15.6 GD&T XML Example (cont'd)

```
<FeatureControlPlacement-Array>
  <Placement>
    <ID> Place ID X</ID>
    <DerivedMedianPlane/>
    <XZPlane/>
    <Left/>
    <Right/>
  </Placement>
</FeatureControlPlacement-Array>
</ GDAndT>

...
<FeatureControl-ID>
  <FeatureControlID>456</FeatureControlID>
  <FeatureControlPlacementID>BBB</FeatureControlPlacementID>
</FeatureControl-ID>
```

5.19 Recommended Footprint - Array

path	PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array
diagram	
type	JEP30-D10:Footprint-ArrayType, RecommendedFootprintType, JEP30-D10:EmptyType, InterconnectTechnology-ArrayType, RecommendedPadOrHole-ArrayType, ThermalRelief-ArrayType, AssemblyOutlineLayerType, ConductiveArea-ArrayType, PlacementOutlineType, Keep-inLayer-ArrayType, KeepoutRegion-ArrayType, SoldermaskLayer-ArrayType, PasteMaskLayer-ArrayType.

The *FootprintName* and *FootprintExtendedName* is described in JESD30, “Descriptive Designation System for Electronic-device Packages and Footprints”.

5.19.1 Interconnect Technology - Array

path	PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/InterconnectTechnology-Array
diagram	
type	InterconnectTechnology-ArrayType, InterconnectTechnologyType, JEP30-D10:EmptyType

5.19.2 Recommended Pad Or Hole Shape - Array

path	PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/RecommendedPadOrHoleShape-Array
diagram	
type	RecommendedPadOrHole-ArrayType, RecommendedPadOrHoleType, PadGroupToPadGroupRelationshipType

5.19.2.1 Recommended Pad or Hole Shape

path	PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/RecommendedPadOrHoleShape-Array/RecommendedPadOrHoleShape
diagram	<p>RecommendedPadOrHoleType</p> <ul style="list-style-type: none"><li>ID (type xs:string)</li><li>InterconnectTechnologyID (type xs:string)</li><li>SurfaceMount (type RecommendedSurfaceMountPadShapeType)</li><li>ThroughHole (type RecommendedThroughHoleType)</li><li>Location (type RecommendedPadOrHoleLocationType)</li><li>PatternGroup (type RecommendedPadOrHolePatternGroupType)</li><li>LandPatternSpan (type RecommendedLandPatternSpanType)</li><li>LandPatternSpacing (type RecommendedLandPatternSpacingType)</li></ul> <p>RecommendedPadOrHoleShape (type RecommendedPadOrHoleType) 0..∞</p>
type	RecommendedPadOrHoleShapeType, RecommendedSurfaceMountPadShapeType, RecommendedThroughHoleType, RecommendedPadOrHoleLocationType, RecommendedPadOrHolePatternGroupType, RecommendedLandPatternSpanType, RecommendedLandPatternSpacingType.

Although not recommended for most terminal types, the component manufacturer may provide their recommended land pattern or hole mounting requirement for the part. This is typically not good business practice as the component manufacturer can not necessarily control or know in advance all the possible use cases of the part, resulting in a one size fits all user environment. This seldom leads to a high yield impacting footprint. The exception to this rule is for the following terminal types since final hole sizes is critical to be properly matched to the dimensions of the pin or pressfit terminal. Recommended Pad or Hole Shape sizes are applicable to the following terminal types:

- Pressfit – All variations
- Column – Microspring solid core and air-core
- Pin – Press-in Solderable Terminal
- Pin – Swage Fastening Pin
- Pin – Press-in Non-Solderable

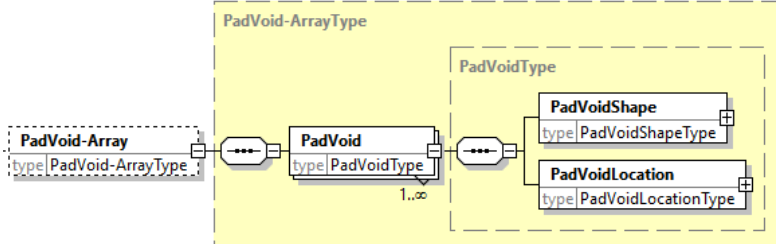
Although not recommended for most terminal types, the component manufacturer may provide

### 5.19.2.1.1 Surface Mount

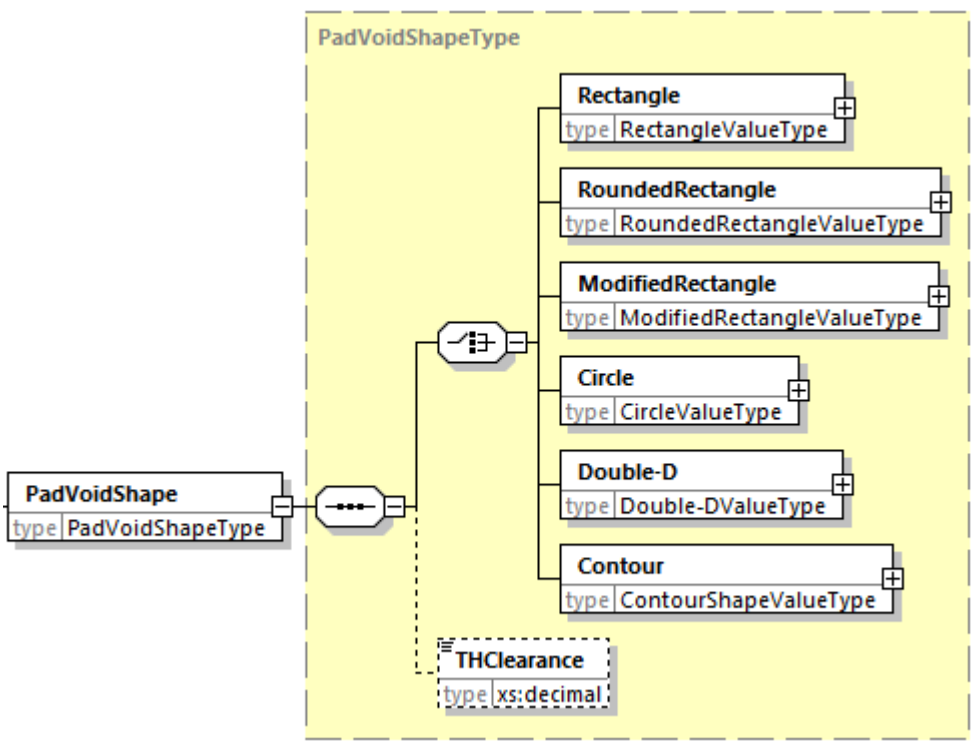
path	<a href="#">PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/RecommendedPadOrHoleShape-Array/RecommendedPadOrHoleShape/SurfaceMount</a>
diagram	<p>The diagram illustrates the structure of the <b>RecommendedSurfaceMountPadShapeType</b>. It shows a central <b>SurfaceMount</b> element with the type <b>RecommendedSurfaceMountPadShapeType</b>. This element is connected to a dashed box representing the <b>RecommendedSurfaceMountPadShapeType</b>. Inside this dashed box, there are several shape types, each with its own type definition:</p> <ul style="list-style-type: none"> <li><b>Rectangle</b> (type <b>RectangleValueType</b>)</li> <li><b>RoundedRectangle</b> (type <b>RoundedRectangleValueType</b>)</li> <li><b>HalfRoundedRectangle</b> (type <b>HalfRoundedRectangleValueType</b>)</li> <li><b>ModifiedRectangle</b> (type <b>ModifiedRectangleValueType</b>)</li> <li><b>Circle</b> (type <b>CircleValueType</b>)</li> <li><b>D-Shape</b> (type <b>D-ShapeValueType</b>)</li> <li><b>RoundedRectangleD-Shape</b> (type <b>D-ShapeRoundedRectangleValueType</b>)</li> <li><b>Double-D</b> (type <b>Double-DValueType</b>)</li> <li><b>Contour</b> (type <b>ContourShapeValueType</b>)</li> <li><b>PadVoid-Array</b> (type <b>PadVoid-ArrayType</b>)</li> <li><b>ThermalReliefID</b> (type <b>xs:string</b>)</li> </ul>
type	<a href="#">RecommendedSurfaceMountPadShapeType</a> , <a href="#">RectangleValueType</a> , <a href="#">RoundedRectangleValueType</a> , <a href="#">HalfRoundedRectangleValueType</a> , <a href="#">ModifiedRectangleValueType</a> , <a href="#">CircleValueType</a> , <a href="#">D-ShapeValueType</a> , <a href="#">D-ShapeRoundedRectangleValueType</a> , <a href="#">Double-DValueType</a> , <a href="#">ContourShapeValueType</a> , <a href="#">PadVoid-ArrayType</a> .

The definition of each shape is outlined in Annex A (informative) Shape Definitions & Dimensions. Recommended land pattern only require the nominal defined and not any of the tolerances nor the min and max values.

### 5.19.2.1.1.1 Pad Void - Array

path	<a href="#">PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/RecommendedPadOrHoleShape-Array/RecommendedPadOrHoleShape/SurfaceMount/PadVoid-Array</a>
diagram	 <p>The diagram illustrates the structure of the <b>PadVoid-ArrayType</b>. It is a dashed box containing a <b>PadVoid-Array</b> entity (type <b>PadVoid-ArrayType</b>) connected to a <b>PadVoid</b> entity (type <b>PadVoidType</b>) with a multiplicity of 1..∞. The <b>PadVoid</b> entity is further connected to a <b>PadVoidType</b> entity, which contains two sub-entities: <b>PadVoidShape</b> (type <b>PadVoidShapeType</b>) and <b>PadVoidLocation</b> (type <b>PadVoidLocationType</b>).</p>
type	<a href="#">PadVoid-ArrayType</a> , <a href="#">PadVoidType</a> , <a href="#">PadVoidShapeType</a> , <a href="#">PadVoidLocationType</a> .

### 5.19.2.1.1.1.1 Pad Void Shape

path	<a href="#">PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/RecommendedPadOrHoleShape-Array/RecommendedPadOrHoleShape/SurfaceMount/PadVoid-Array/PadVoid/PadVoidLocation/VoidStatus</a>
diagram	 <p>The diagram illustrates the structure of the <b>PadVoidShapeType</b>. It is a dashed box containing a <b>PadVoidShape</b> entity (type <b>PadVoidShapeType</b>) connected to a <b>PadVoidShapeType</b> entity. The <b>PadVoidShapeType</b> entity contains several sub-entities: <b>Rectangle</b> (type <b>RectangleValueType</b>), <b>RoundedRectangle</b> (type <b>RoundedRectangleValueType</b>), <b>ModifiedRectangle</b> (type <b>ModifiedRectangleValueType</b>), <b>Circle</b> (type <b>CircleValueType</b>), <b>Double-D</b> (type <b>Double-DValueType</b>), and <b>Contour</b> (type <b>ContourShapeValueType</b>). Additionally, there is a <b>THClearance</b> entity (type <b>xs:decimal</b>) connected to the <b>PadVoidShapeType</b> entity.</p>
type	<a href="#">PadVoidShapeType</a> , <a href="#">RectangleValueType</a> , <a href="#">RoundedRectangleValueType</a> , <a href="#">ModifiedRectangleValueType</a> , <a href="#">CircleValueType</a> , <a href="#">Double-DValueType</a> , <a href="#">ContourShapeValueType</a> .

The definition of each shape is outlined in Annex A (informative) Shape Definitions & Dimensions.

### 5.19.2.1.1.2 Pad Void Location

path	PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/RecommendedPadOrHoleShape-Array/RecommendedPadOrHoleShape/SurfaceMount/PadVoid-Array/PadVoid/PadVoidLocation
diagram	
type	PadVoidLocationType, VoidStandardArrayType, VoidCircularArrayType, DeletedStatusType, VoidRandomArrayType, JEP30-D10:EmptyType, JEP30-D10:PointXYType, JEP30-D10:MinIntegerOfOneType.

For *PadVoidLocation* defined via *StandardArray* or *CircularArray*, some voids in the array may be deleted. This is covered in the *VoidStatus* branch. Alternatively, *PadVoidLocation* can also be defined via *RandomArray* when there is just 1 Pad-or-Hole, or when there is no logical structure to the location of the Pads-or-Holes.



5.19.2.1.1.1.2.1      Standard Array

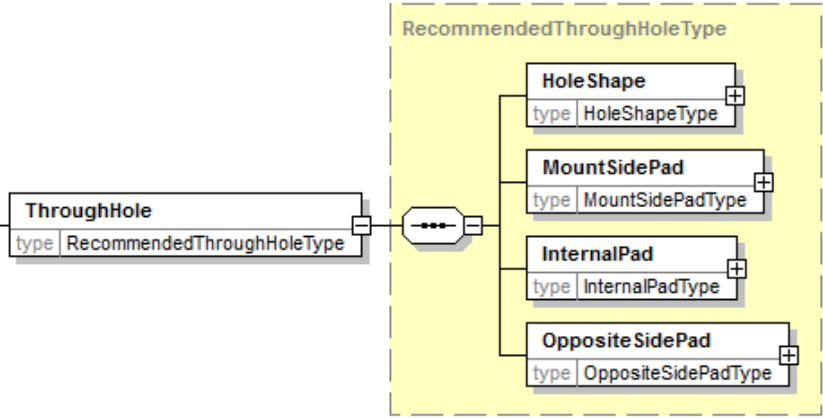
path	PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/RecommendedPadOrHoleShape-Array/RecommendedPadOrHoleShape/SurfaceMount/PadVoid-Array/PadVoid/PadVoidLocation/StandardArray
diagram	<p>The diagram shows a class <b>StandardArray</b> with a type <code>VoidStandardArrayType</code>. It is connected to a larger class <b>VoidStandardArrayType</b> (highlighted in yellow) which contains several attributes: <code>ny</code> (type <code>xs:integer</code>), <code>nx</code> (type <code>xs:integer</code>), <code>dx</code> (type <code>JEP30-D10:PitchValueSetType</code>), <code>dy</code> (type <code>JEP30-D10:PitchValueSetType</code>), <code>Angle</code> (type <code>xs:integer</code>), and <code>VoidGroupLowerLeftVoidCenter</code> (type <code>JEP30-D10:PointXYType</code>). The <code>StandardArray</code> class has a composition relationship with <code>VoidStandardArrayType</code> indicated by a filled diamond on the <code>StandardArray</code> side and a hollow diamond on the <code>VoidStandardArrayType</code> side.</p>
type	VoidStandardArrayType, JEP30-D10:PitchValueSetType, JEP30-D10:PointXYType.

5.19.2.1.1.1.2.2      Circular Array

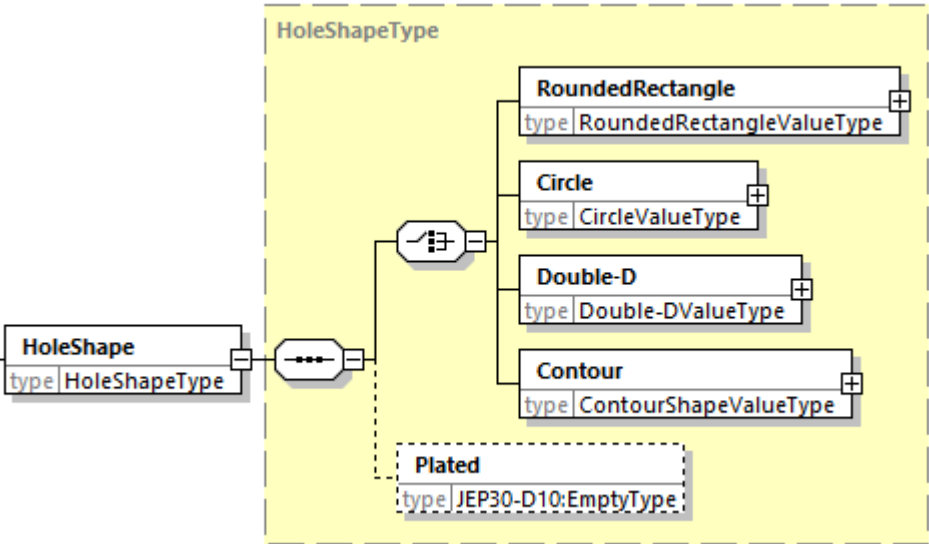
path	PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/RecommendedPadOrHoleShape-Array/RecommendedPadOrHoleShape/SurfaceMount/PadVoid-Array/PadVoid/PadVoidLocation/CircularArray
diagram	
type	JEP30-D10:PointXYType, VoidRotationType.

See Table 37 - Void Circular Array Elements Definition for the definition of the *CircularArray* data elements.

### 5.19.2.1.2 Through Hole

path	<a href="#">PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/RecommendedPadOrHoleShape-Array/RecommendedPadOrHoleShape/ThroughHole</a>
diagram	 <p>The diagram shows a 'ThroughHole' block with a 'type' field set to 'RecommendedThroughHoleType'. This block is connected to a dashed box labeled 'RecommendedThroughHoleType'. Inside this dashed box, there are four sub-blocks: 'HoleShape' (type: HoleShapeType), 'MountSidePad' (type: MountSidePadType), 'InternalPad' (type: InternalPadType), and 'Opposite Side Pad' (type: OppositeSidePadType). Each sub-block has a '+' icon in its top right corner, indicating it is an optional or variable component.</p>
type	<a href="#">RecommendedThroughHoleType</a> , <a href="#">HoleShapeType</a> , <a href="#">MountSidePadType</a> , <a href="#">InternalPadType</a> , <a href="#">OppositeSidePadType</a> .

### 5.19.2.1.2.1 Hole Shape

path	<a href="#">PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/RecommendedPadOrHoleShape-Array/RecommendedPadOrHoleShape/ThroughHole/HoleShape</a>
diagram	 <p>The diagram shows a 'HoleShape' block with a 'type' field set to 'HoleShapeType'. This block is connected to a dashed box labeled 'HoleShapeType'. Inside this dashed box, there are four sub-blocks: 'RoundedRectangle' (type: RoundedRectangleValueType), 'Circle' (type: CircleValueType), 'Double-D' (type: Double-DValueType), and 'Contour' (type: ContourShapeValueType). Each sub-block has a '+' icon in its top right corner. Additionally, there is a 'Plated' block (type: JEP30-D10:EmptyType) shown in a dashed box below the main structure, connected to the 'HoleShape' block via a dashed line.</p>
type	<a href="#">HoleShapeType</a> , <a href="#">RoundedRectangleValueType</a> , <a href="#">CircleValueType</a> , <a href="#">Double-DValueType</a> , <a href="#">ContourShapeValueType</a> , <a href="#">JEP30-D10:EmptyType</a> .

The definition of each shape is outlined in Annex A (informative) Shape Definitions & Dimensions.

5.19.2.1.2.2 Mount Side Pad

path	PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/RecommendedPadOrHoleShape-Array/RecommendedPadOrHoleShape/ThroughHole/MountSidePad
diagram	
type	MountSidePadType, RectangleValueType, RoundedRectangleValueType, CircleValueType, D-ShapeValueType, Double-DValueType, ContourShapeValueType.

The definition of each shape is outlined in Annex A (informative) Shape Definitions & Dimensions.

5.19.2.1.2.3 Internal Pad

path	PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/RecommendedPadOrHoleShape-Array/RecommendedPadOrHoleShape/ThroughHole/InternalPad
diagram	<p>The diagram illustrates the XSD structure for the InternalPad element. The InternalPad element (type InternalPadType) contains a choice element (type choiceType) which is either an InternalPadType element or a sequence of five elements: Rectangle (type RectangleValueType), RoundedRectangle (type RoundedRectangleValueType), Circle (type CircleValueType), Double-D (type Double-DValueType), and Contour (type ContourShapeValueType). A dashed box labeled Clearance (type xs:decimal) is also shown.</p>
type	InternalPadType, RectangleValueType, RoundedRectangleValueType, CircleValueType, D-ShapeValueType, Double-DValueType, ContourShapeValueType.

The definition of each shape is outlined in Annex A (informative) Shape Definitions & Dimensions.

5.19.2.1.2.4      Opposite Side Pad

path	PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/RecommendedPadOrHoleShape-Array/RecommendedPadOrHoleShape/ThroughHole/OppositeSidePad
diagram	<p>The diagram illustrates the structure of the <b>OppositeSidePadType</b>. It is a choice type (indicated by a dashed box) that contains five elements: <b>Rectangle</b>, <b>RoundedRectangle</b>, <b>Circle</b>, <b>Double-D</b>, and <b>Contour</b>. Each element has a corresponding value type: <b>RectangleValueType</b>, <b>RoundedRectangleValueType</b>, <b>CircleValueType</b>, <b>Double-DValueType</b>, and <b>ContourShapeValueType</b>. A dashed box labeled <b>Clearance</b> is also shown, with a value type of <b>xs:decimal</b>. The <b>OppositeSidePad</b> type is shown as a choice type containing the <b>OppositeSidePadType</b>.</p>
type	OppositeSideType, RectangleHoleType, RoundedRectangleHoleType, CircleHoleType, D-ShapeHoleType, Double-DHoleType, ContourShapeHoleType.

The definition of each shape is outlined in Annex A (informative) Shape Definitions & Dimensions.

### 5.19.2.1.3 Location

path	<a href="#">PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/RecommendedPadOrHoleShape-Array/RecommendedPadOrHoleShape/Location</a>
diagram	
type	<a href="#">RecommendedPadOrHoleLocationType</a> , <a href="#">PadStandardArrayType</a> , <a href="#">PadCircularArrayType</a> , <a href="#">DeletedStatusType</a> , <a href="#">Pad-or-HoleRandomArrayType</a> .

#### 5.19.2.1.3.1 Standard Array

path	<a href="#">PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/RecommendedPadOrHoleShape-Array/RecommendedPadOrHoleShape/Location/StandardArray</a>
diagram	
type	<a href="#">PadStandardArrayType</a> , <a href="#">JEP30-D10:PointType</a> .


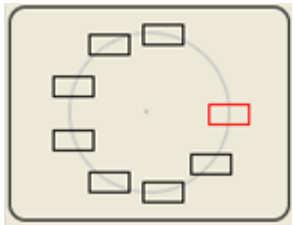
5.19.2.1.3.2 Circular Array

path	PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/RecommendedPadOrHoleShape-Array/RecommendedPadOrHoleShape/Location/CircularArray
diagram	<p>The diagram illustrates the structure of the CircularArray and its associated PadCircularArrayType. The CircularArray class is shown on the left, with a type attribute of PadCircularArrayType. It is connected to the PadCircularArrayType class via a composition relationship, indicated by a solid line with a filled diamond at the CircularArray end. The PadCircularArrayType class is highlighted with a yellow background and contains several attributes: PitchRadius (type xs:decimal), Center (type JEP30-D10:PointXYType), StartAngle (type xs:integer), AngleToFill (type xs:integer), AngleBetweenPads (type xs:integer), NumberOfPads (type xs:integer), and Rotation (type PadRotationType, shown in a dashed box). The Rotation attribute is also connected to the PadCircularArrayType class via a composition relationship, indicated by a solid line with a filled diamond at the PadCircularArrayType end.</p>
type	PadCircularArrayType, PadRotationType, JEP30-D10:PointXYType.



### 5.16.2.1.3.2 Circular Array (cont'd)

**Table 48 - Pad Circular Array Elements Definition**

Element	Explanation
Pitch Radius	The radius of the circle of the Pads-or-Holes.
Center	The center of the circle of the Pads-or-Holes.
Start Angle	The angle at which to place the first Pad-or-Hole in the array. By default, the Pad-or-Hole is at the right-most point on the circle (i.e. the number 3 position on a clock face). This angle specifies a rotation clockwise around the circle from this point.
Angle to Fill	The angle through which the Pads-or-Holes are distributed, starting from the first Pad-or-Hole and continuing clockwise, until the last Pad-or-Hole is reached.
Angle between Pads	Instead of specifying Angle to fill, you can specify the angle between the centers of each Pad-or-Hole.
Number of Pads	The number of the Pads-or-Holes to be arrayed around the circle. The first Pad-or-Hole is displayed in red. This number includes any deleted the Pads-or-Holes in the array.
Rotate with Circle	 <p>If the Pads-or-Holes are rotated so that they are oriented perpendicular to the circle. This does not apply to circular or contour the Pad-or-Hole shapes.</p>
Rotation Angle	 <p>If the Pads-or-Holes are not oriented perpendicular to the circle, then the Pads-or-Holes could be rotated around the center of the Pad-or-Hole itself. In this image, each the Pad-or-Hole has a “0” degree rotation with respect to the “3 O’clock position”. This does not apply to circular or contour Pad-or-Hole shapes.</p>

### 5.19.2.1.3.3 Pad-or-Hole Status

path	<a href="#">PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/RecommendedPadOrHoleShape-Array/RecommendedPadOrHoleShape/Location/Pad-or-HoleStatus</a>
diagram	
type	<a href="#">DeletedStatusType</a> , <a href="#">JEP30-D10:PointXYType</a> , <a href="#">JEP30-D10:MinIntegerOfOneType</a> , <a href="#">JEP30-D10:EmptyType</a> .

For [Pad-or-HoleLocation](#) defined via [StandardArray](#) or [CircularArray](#), some Pads-or-Holes in the array may be deleted. This is covered in the [Pad-or-HoleStatus](#) branch.

5.19.2.1.3.4 Random Array

path	PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/RecommendedPadOrHoleShape-Array/RecommendedPadOrHoleShape/Location/RandomArray
diagram	<p>The diagram illustrates the structure of the <b>RandomArray</b> type. It is composed of a sequence of <b>Pad-or-HoleLocation</b> elements. The <b>RandomArray</b> element is of type <b>Pad-or-HoleRandomArrayType</b>. The <b>Pad-or-HoleLocation</b> element is of type <b>JEP30-D10:PointXYType</b> and has a cardinality of <b>1..∞</b>. The <b>JEP30-D10:PointXYType</b> is further detailed with a sequence of <b>x</b> and <b>y</b> elements, both of type <b>xs:decimal</b>, with a cardinality of <b>1..∞</b>.</p>
type	Pad-or-HoleRandomArrayType, JEP30-D10:PointType.

*Pad-or-HoleLocation* can also be defined via *RandomArray* when there is just 1 Pad-or-Hole, or when there is no logical structure to the location of the Pads-or-Holes.

5.19.2.1.4 Pattern Groups

path	PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/RecommendedPadOrHoleShape-Array/RecommendedPadOrHoleShape/PatternGroup
diagram	<p>The diagram illustrates the structure of the <b>PatternGroup</b> type. It is composed of a sequence of <b>RecommendedPadOrHolePatternGroupType</b> elements. The <b>PatternGroup</b> element is of type <b>RecommendedPadOrHolePatternGroupType</b> and has a cardinality of <b>0..∞</b>. The <b>RecommendedPadOrHolePatternGroupType</b> is further detailed with a sequence of <b>ID</b> (type <b>xs:string</b>), <b>Name</b> (type <b>xs:string</b>), <b>PrefixCode</b> (type <b>xs:string</b>), <b>SuffixCode</b> (type <b>xs:string</b>), and <b>PatternRelationship</b> (type <b>RecommendedPadOrHolePatternRelationshipType</b>) with a cardinality of <b>1..∞</b>.</p>
type	RecommendedPadOrHolePatternGroupType, RecommendedPadOrHolePatternRelationshipType.

### 5.19.2.1.4.1 Pattern Relationship

path	<a href="#">PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/RecommendedPadOrHoleShape-Array/RecommendedPadOrHoleShape/PatternGroup/PatternRelationship</a>
diagram	
type	<a href="#">RecommendedPadOrHolePatternRelationshipType</a> , <a href="#">RecommendedPadOrHoleRelationshipTransformationsType</a> , <a href="#">TransformDuplicateType</a>

### 5.19.2.1.4.1.1 Relationship Transformations

path	<a href="#">PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/RecommendedPadOrHoleShape-Array/RecommendedPadOrHoleShape/PatternGroup/PatternRelationship/RelationshipTransformations</a>
diagram	
type	<a href="#">RecommendedPadOrHoleRelationshipTransformationsType</a> , <a href="#">TransformMirrorType</a> , <a href="#">TransformRotateType</a> , <a href="#">JEP30-D10:PointXYType</a> ,

### 5.19.2.1.5 Land Pattern Span

path	PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/RecommendedPadOrHoleShape-Array/RecommendedPadOrHoleShape/LandPatternSpan
diagram	<pre> classDiagram     class LandPatternSpan {         type RecommendedLandPatternSpanType     }     class RecommendedLandPatternSpanType {         X-Direction JEP30-D10:ValueType         Y-Direction JEP30-D10:ValueType     }     class JEP30_D10_ValueType {         JEP30-D10:ValueType     }     class Nominal {         type xs:decimal     }     LandPatternSpan --&gt; RecommendedLandPatternSpanType     RecommendedLandPatternSpanType --&gt; JEP30_D10_ValueType     JEP30_D10_ValueType --&gt; Nominal </pre>
type	RecommendedLandPatternSpanType, JEP30-D10:ValueType.

### 5.19.2.1.6 Land Pattern Spacing

path	PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/RecommendedPadOrHoleShape-Array/RecommendedPadOrHoleShape/LandPatternSpacing
diagram	<pre> classDiagram     class LandPatternSpacing {         type RecommendedLandPatternSpacingType     }     class RecommendedLandPatternSpacingType {         X-Direction JEP30-D10:ValueType         Y-Direction JEP30-D10:ValueType     }     class JEP30_D10_ValueType {         JEP30-D10:ValueType     }     class Nominal {         type xs:decimal     }     LandPatternSpacing --&gt; RecommendedLandPatternSpacingType     RecommendedLandPatternSpacingType --&gt; JEP30_D10_ValueType     JEP30_D10_ValueType --&gt; Nominal </pre>
type	RecommendedLandPatternSpacingType, JEP30-D10:ValueType.

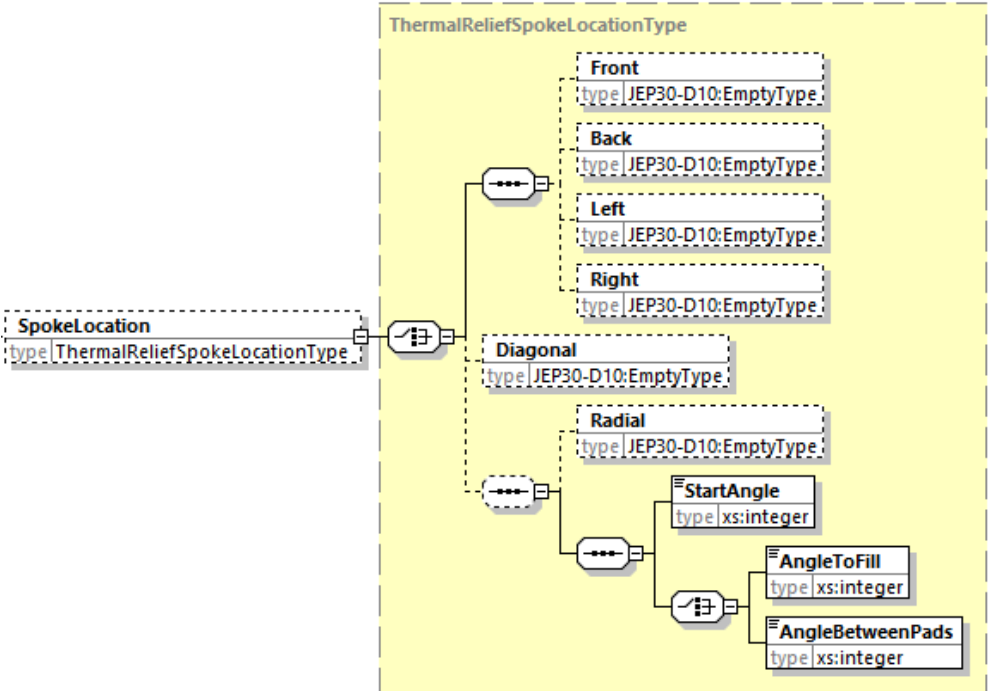
### 5.19.2.2 Pad Group To Pad Group Relationship

path	<a href="#">PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/RecommendedPadOrHoleShape-Array/ PadGroupToPadGroupRelationship</a>
diagram	
type	<a href="#">PadGroupToPadGroupRelationshipType</a> , <a href="#">LandPatternSpanType</a> , <a href="#">LandPatternSpacingType</a> .

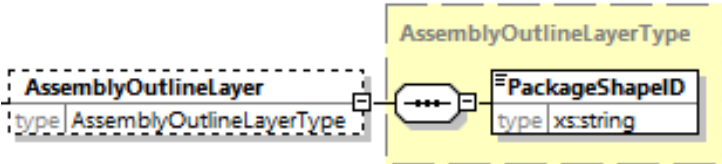
### 5.19.3 Thermal Relief - Array

path	<a href="#">PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/ThermalRelief-Array</a>
diagram	
type	<a href="#">ThermalRelief-ArrayType</a> , <a href="#">ThermalReliefType</a> , <a href="#">ThermalReliefSpokeLocationType</a>

5.19.3.1 Spoke Location

path	PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/ThermalRelief-Array/ThermalRelief/SpokeLocation
diagram	 <p>The diagram illustrates the structure of the <code>ThermalReliefSpokeLocationType</code>. It shows a sequence of elements: <code>SpokeLocation</code> (type <code>ThermalReliefSpokeLocationType</code>), followed by a choice of <code>Front</code>, <code>Back</code>, <code>Left</code>, and <code>Right</code> (all type <code>JEP30-D10:EmptyType</code>). This is followed by a choice of <code>Diagonal</code> and <code>Radial</code> (both type <code>JEP30-D10:EmptyType</code>). The <code>Radial</code> element is further expanded to show <code>StartAngle</code> (type <code>xs:integer</code>), <code>AngleToFill</code> (type <code>xs:integer</code>), and <code>AngleBetweenPads</code> (type <code>xs:integer</code>).</p>
type	ThermalReliefSpokeLocationType, JEP30-D10:EmptyType.

5.19.4 Assembly Outline Layer

path	PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/AssemblyOutlineLayer
diagram	 <p>The diagram illustrates the structure of the <code>AssemblyOutlineLayerType</code>. It shows a sequence of elements: <code>AssemblyOutlineLayer</code> (type <code>AssemblyOutlineLayerType</code>), followed by a choice of <code>PackageShapeID</code> (type <code>xs:string</code>).</p>
type	AssemblyOutlineLayerType.

5.19.5 Conductive Area - Array

path	PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/ConductiveArea-Array
diagram	
type	ConductiveArea-ArrayType, ConductiveAreaType, RectangleValueType, ModifiedRectangleValueType, CircleValueType, JEP30-D10:PointXYType, ContourShapeValueType, ConductiveAreaVoid-ArrayType.

5.19.5.1 Conductive Area Void - Array

path	PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/ConductiveArea-Array/ConductiveAreaVoid-Array
diagram	
type	ConductiveAreaVoid-ArrayType, ConductiveAreaVoidType, ConductiveAreaVoidShapeType, ConductiveAreaVoidLocationType.



5.19.5.1.1      Conductive Area Void Shape

path	PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/ConductiveArea-Array/ConductiveAreaVoid-Array/ConductiveAreaVoid/ConductiveAreaVoidShape
diagram	
type	ConductiveAreaVoidShapeType, RectangleValueType, RoundedRectangleValueType, ModifiedRectangleValueType, CircleValueType, Double-DValueType, ContourShapeValueType.

5.19.5.1.2      Conductive Area Void Location

path	PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/ConductiveArea-Array/ConductiveAreaVoid-Array/ConductiveAreaVoid/ConductiveAreaVoidLocation
diagram	
type	ConductiveAreaVoidLocationType, VoidStandardArrayType, VoidCircularArrayType, DeletedStatusType, VoidRandomArrayType.

5.19.6 Placement Outline

path	PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/PlacementOutline
diagram	<p>The diagram illustrates the structure of the PlacementOutlineType and its associated classes. A dashed box labeled 'PlacementOutlineType' contains the following elements:</p> <ul style="list-style-type: none"><li><b>Rectangle</b>: type RectangleValueType</li><li><b>ModifiedRectangle</b>: type ModifiedRectangleValueType</li><li><b>Circle</b>: type CircleValueType</li><li><b>ShapeCenter</b>: type JEP30-D10:PointXYType</li><li><b>Contour</b>: type ContourShapeValueType</li></ul> <p>Relationships are shown with solid lines and open circles:</p> <ul style="list-style-type: none"><li><b>PlacementOutline</b> (type PlacementOutlineType) is associated with <b>Rectangle</b>, <b>ModifiedRectangle</b>, <b>Circle</b>, <b>ShapeCenter</b>, and <b>Contour</b>.</li><li><b>Rectangle</b> is associated with <b>ModifiedRectangle</b>.</li><li><b>ModifiedRectangle</b> is associated with <b>Circle</b>.</li><li><b>Circle</b> is associated with <b>ShapeCenter</b>.</li><li><b>ShapeCenter</b> is associated with <b>Contour</b>.</li></ul>
type	PlacementOutlineType, RectangleValueType, ModifiedRectangleValueType, CircleValueType, JEP30-D10:PointXYType, ContourShapeValueType

5.19.7 Keep-in Layer - Array

path	PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/Keep-inLayer-Array
diagram	
type	Keep-inLayer-ArrayType, Keep-inLayerType, RectangleValueType, ModifiedRectangleValueType, CircleValueType, JEP30-D10:PointXYType, ContourShapeValueType, Keep-inRestrictiveLayerType, Keep-inLayerRestrictionType.

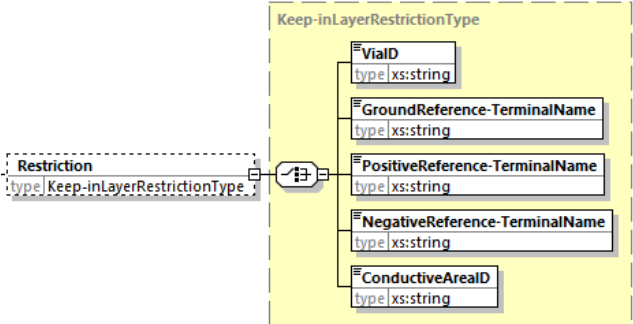
5.19.7.1 Restrictive Layer

path	PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/Keep-inLayer-Array/Keep-inLayer/RestrictiveLayer
diagram	
type	Keep-inRestrictiveLayerType, JEP30-D10:EmptyType, Keep-inRestrictiveInnerLayerType, RestrictiveInnerLayerFromOuterLayerType

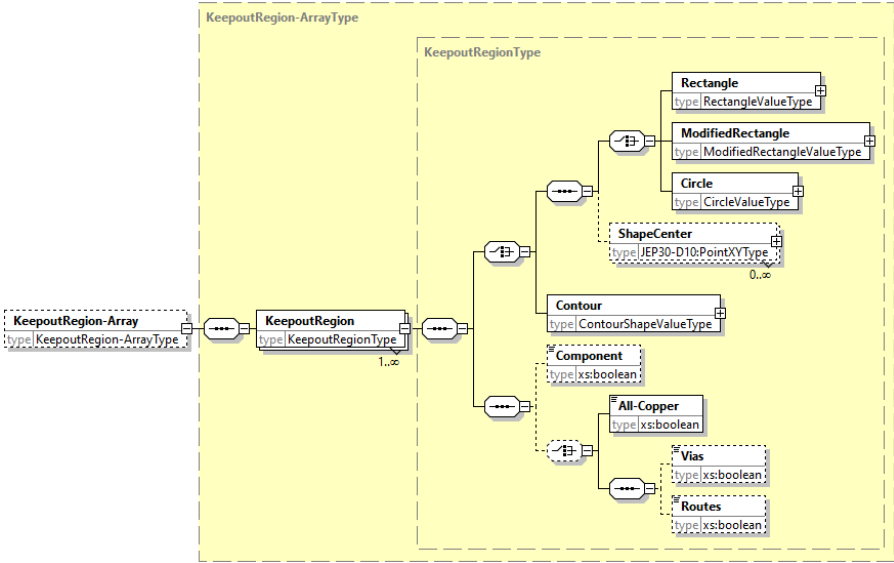
5.19.7.2 From Outer Layer

path	PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/Keep-inLayer-Array/Keep-inLayer/RestrictiveLayer/Keep-inRestrictiveInnerLayer/FromOuterLayer
diagram	
type	RestrictiveInnerLayerFromOuterLayerType, JEP30-D10:EmptyType

5.19.7.3 Restriction

path	PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/Keep-inLayer-Array/Keep-inLayer/Restriction
diagram	 <p>The diagram shows the structure of the <b>Keep-inLayerRestrictionType</b>. It is a dashed box containing several fields: <b>VialID</b> (type xs:string), <b>GroundReference-TerminalName</b> (type xs:string), <b>PositiveReference-TerminalName</b> (type xs:string), <b>NegativeReference-TerminalName</b> (type xs:string), and <b>ConductiveAreaID</b> (type xs:string). A <b>Restriction</b> (type Keep-inLayerRestrictionType) is shown as a dashed box with a 1:1 cardinality relationship to the <b>Keep-inLayerRestrictionType</b> structure.</p>
type	Keep-inLayerRestrictionType.

5.19.8 Keepout Region - Array

path	PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/KeepoutRegion-Array
diagram	 <p>The diagram shows the structure of the <b>KeepoutRegion-Array</b>. It is a dashed box containing a <b>KeepoutRegion-Array</b> (type KeepoutRegion-ArrayType) with a 1:1 cardinality relationship to the <b>KeepoutRegion-Array</b> structure. The <b>KeepoutRegion-Array</b> structure is a dashed box containing a <b>KeepoutRegion</b> (type KeepoutRegionType) with a 1:1 cardinality relationship to the <b>KeepoutRegion</b> structure. The <b>KeepoutRegion</b> structure is a dashed box containing a <b>Contour</b> (type ContourShapeValueType) with a 1:1 cardinality relationship to the <b>Contour</b> structure. The <b>Contour</b> structure is a dashed box containing a <b>Component</b> (type xs:boolean) with a 1:1 cardinality relationship to the <b>Component</b> structure. The <b>Component</b> structure is a dashed box containing a <b>All-Copper</b> (type xs:boolean) with a 1:1 cardinality relationship to the <b>All-Copper</b> structure. The <b>All-Copper</b> structure is a dashed box containing a <b>Vias</b> (type xs:boolean) with a 1:1 cardinality relationship to the <b>Vias</b> structure. The <b>Vias</b> structure is a dashed box containing a <b>Routes</b> (type xs:boolean) with a 1:1 cardinality relationship to the <b>Routes</b> structure. The <b>Contour</b> structure also contains a <b>ShapeCenter</b> (type JEP30-D10:PointXYType) with a 0..1 cardinality relationship to the <b>ShapeCenter</b> structure. The <b>Contour</b> structure also contains a <b>Rectangle</b> (type RectangleValueType) with a 1:1 cardinality relationship to the <b>Rectangle</b> structure. The <b>Contour</b> structure also contains a <b>ModifiedRectangle</b> (type ModifiedRectangleValueType) with a 1:1 cardinality relationship to the <b>ModifiedRectangle</b> structure. The <b>Contour</b> structure also contains a <b>Circle</b> (type CircleValueType) with a 1:1 cardinality relationship to the <b>Circle</b> structure.</p>
type	KeepoutRegionArray, KeepoutRegionType, ContourShapeType, JEP30-D10:PointType.

Keepout are sometimes required around Parts to ensure the proper functionality of the Part. The definition of the contour shape is outlined in Annex A (informative) Shape Dimensions. The various type of Keepouts are:

- Component
- All-Copper
- Vias
- Routes

### 5.19.9 Soldermask Layer - Array

path	PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/SoldermaskLayer-Array
diagram	
type	SoldermaskLayer-ArrayType, SoldermaskLayerType, SoldermaskGangRelief-ArrayType, SM-ShapeType, SoldermaskLayerToSoldermaskLayerRelationshipType.

#### 5.19.9.1 Soldermask Gang Relief- Array

path	PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/SoldermaskLayer-Array/SoldermaskLayer/SoldermaskGangRelief-Array
diagram	
type	SoldermaskGangRelief-ArrayType, SoldermaskGangReliefType, TerminalCenter-ArrayType, TerminalIndexType, TerminalNumberType

5.19.9.2      Soldermask Shape

path	PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/SoldermaskLayer-Array/SoldermaskLayer/SoldermaskShape
diagram	
type	SM-ShapeType, RectangleValueType, RoundedRectangleValueType, HalfRoundedRectangleValueType, ModifiedRectangleValueType, CircleValueType, D-ShapeValueType, D-ShapeRoundedRectangleValueType, Double-DValueType, ContourShapeValueType, SM-ShapeLocationType, SM-ShapePatternGroupType, SM-ShapePatternSpanType, SM-ShapePatternSpacingType.

5.19.9.2.1 SM - Shape Location

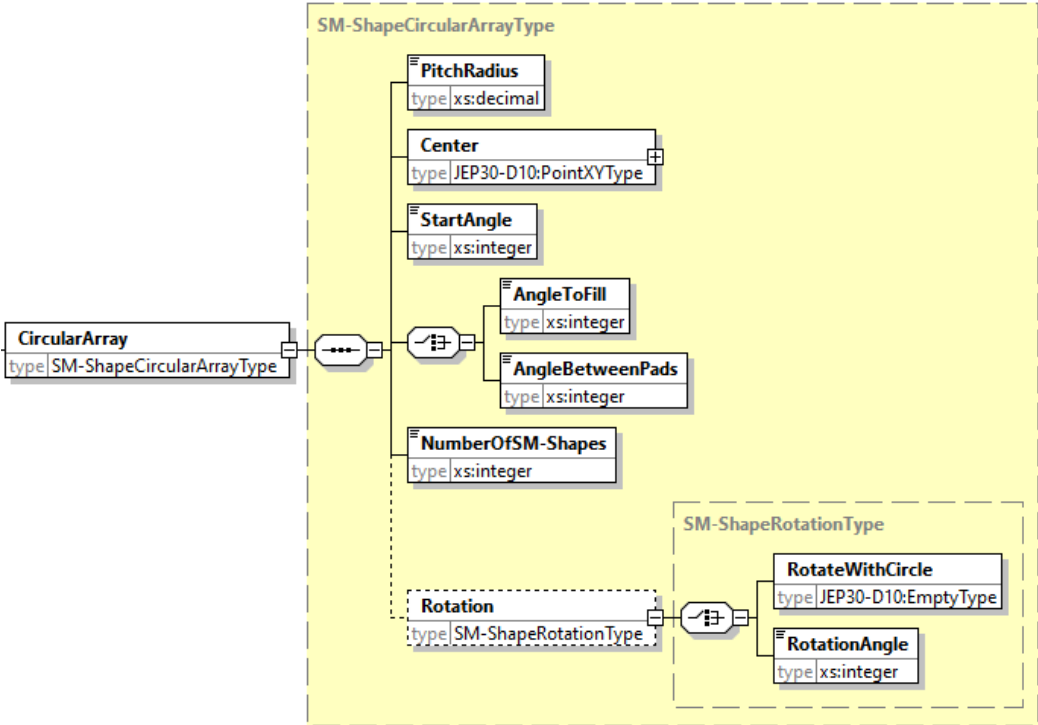
path	PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/SoldermaskLayer-Array/SoldermaskLayer/SoldermaskShape/SM-ShapeLocation
diagram	
type	SM-ShapeLocationType, SM-ShapeStandardArrayType, SM-ShapeCircularArrayType, SM-ShapeStatusType, SM-ShapeRandomArrayType.

5.19.9.2.1.1 Standard Array

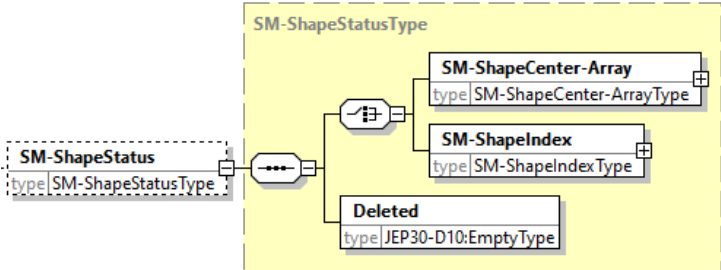
path	PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/SoldermaskLayer-Array/SoldermaskLayer/SoldermaskShape/SM-ShapeLocation
diagram	
type	SM-ShapeStandardArrayType, JEP30-D10:PointXYType.



### 5.19.9.2.1.2 Circular Array

path	<a href="#">PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/SoldermaskLayer-Array/SoldermaskLayer/SoldermaskShape/SM-ShapeLocation/CircularArray</a>
diagram	 <p>The diagram illustrates the structure of the <b>CircularArray</b> type, which is defined as <b>SM-ShapeCircularArrayType</b>. It is composed of several fields:</p> <ul style="list-style-type: none"> <li><b>PitchRadius</b>: type <b>xs:decimal</b></li> <li><b>Center</b>: type <b>JEP30-D10:PointXYType</b></li> <li><b>StartAngle</b>: type <b>xs:integer</b></li> <li><b>AngleToFill</b>: type <b>xs:integer</b></li> <li><b>AngleBetweenPads</b>: type <b>xs:integer</b></li> <li><b>NumberOfSM-Shapes</b>: type <b>xs:integer</b></li> <li><b>Rotation</b>: type <b>SM-ShapeRotationType</b>, which is further detailed as:             <ul style="list-style-type: none"> <li><b>RotateWithCircle</b>: type <b>JEP30-D10:EmptyType</b></li> <li><b>RotationAngle</b>: type <b>xs:integer</b></li> </ul> </li> </ul> <p>The <b>CircularArray</b> type is shown as a container for these fields, with a dashed box indicating the <b>SM-ShapeCircularArrayType</b> boundary.</p>
type	<b>SM-ShapeCircularArrayType</b> , <b>JEP30-D10:PointXYType</b> , <b>SM-ShapeRotationType</b> , <b>JEP30-D10:EmptyType</b> .

### 5.19.9.2.1.3 SM - Shape Status

path	<a href="#">PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/SoldermaskLayer-Array/SoldermaskLayer/SoldermaskShape/SM-ShapeLocation/ShapeStatus</a>
diagram	 <p>The diagram illustrates the structure of the <b>SM-ShapeStatus</b> type, which is defined as <b>SM-ShapeStatusType</b>. It is composed of several fields:</p> <ul style="list-style-type: none"> <li><b>SM-ShapeCenter-Array</b>: type <b>SM-ShapeCenter-ArrayType</b></li> <li><b>SM-ShapeIndex</b>: type <b>SM-ShapeIndexType</b></li> <li><b>Deleted</b>: type <b>JEP30-D10:EmptyType</b></li> </ul> <p>The <b>SM-ShapeStatus</b> type is shown as a container for these fields, with a dashed box indicating the <b>SM-ShapeStatusType</b> boundary.</p>
type	<b>SM-ShapeStatusType</b> , <b>SM-ShapeCenter-ArrayType</b> , <b>SM-ShapeIndexType</b> , <b>JEP30-D10:EmptyType</b> .

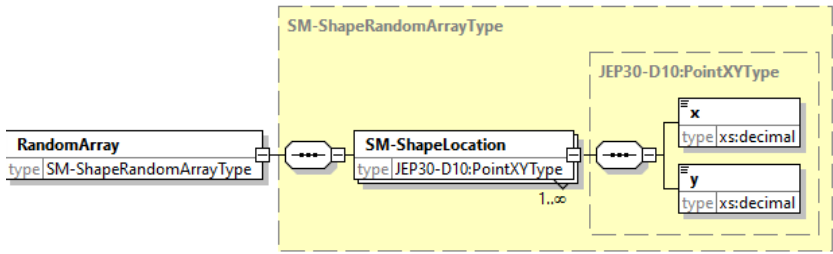
5.19.9.2.1.3.1 SM – Shape Center - Array

path	PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/SoldermaskLayer-Array/SoldermaskLayer/SoldermaskShape/SM-ShapeLocation/ShapeStatus/SM-ShapeCenter-Array
diagram	
type	SM-ShapeCenter-ArrayType, SM-ShapeCenterType, JEP30-D10:PointXYType.

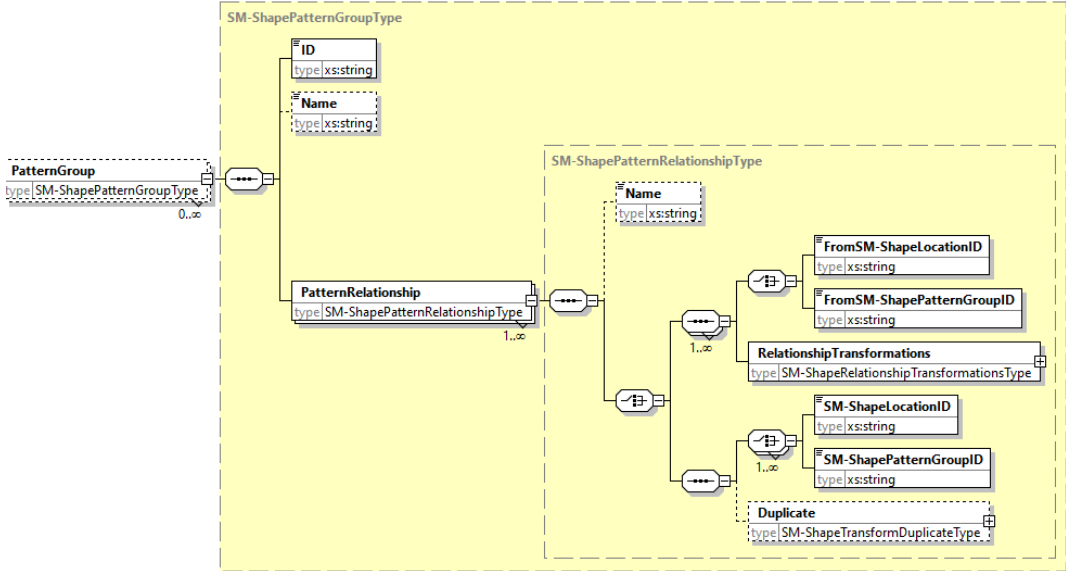
5.19.9.2.1.3.2 SM - Shape Index

path	PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/SoldermaskLayer-Array/SoldermaskLayer/SoldermaskShape/SM-ShapeLocation/ShapeStatus/ShapeIndex
diagram	<p>The diagram illustrates the structure of the SM-ShapeIndexType. It features a central class <b>SM-ShapeIndex</b> with a type <b>SM-ShapeIndexType</b>. This class is linked to a dashed box labeled <b>SM-ShapeIndexType</b>, which contains several sub-classes and their relationships:</p> <ul style="list-style-type: none"><li><b>Center</b>: type <b>JEP30-D10:PointXYType</b>, multiplicity <b>1..∞</b>.</li><li><b>RowTerminalIndex</b>: type <b>JEP30-D10:MinIntegerOfOneType</b>, multiplicity <b>1..∞</b>.</li><li><b>FromRowTerminalIndex</b>: type <b>JEP30-D10:MinIntegerOfOneType</b>, multiplicity <b>1..∞</b>.</li><li><b>ToRowTerminalIndex</b>: type <b>JEP30-D10:MinIntegerOfOneType</b>, multiplicity <b>1..∞</b>.</li><li><b>ColumnTerminalIndex</b>: type <b>JEP30-D10:MinIntegerOfOneType</b>, multiplicity <b>1..∞</b>.</li><li><b>FromColumnTerminalIndex</b>: type <b>JEP30-D10:MinIntegerOfOneType</b>, multiplicity <b>1..∞</b>.</li><li><b>ToColumnTerminalIndex</b>: type <b>JEP30-D10:MinIntegerOfOneType</b>, multiplicity <b>1..∞</b>.</li><li><b>PolarTerminalIndex</b>: type <b>JEP30-D10:MinIntegerOfOneType</b>, multiplicity <b>1..∞</b>.</li><li><b>FromPolarTerminalIndex</b>: type <b>JEP30-D10:MinIntegerOfOneType</b>, multiplicity <b>1..∞</b>.</li><li><b>ToPolarTerminalIndex</b>: type <b>JEP30-D10:MinIntegerOfOneType</b>, multiplicity <b>1..∞</b>.</li></ul> <p>Relationships are indicated by symbols: a solid line with a circle and a cross (exclusive), a solid line with a circle and a dot (inclusive), and a dashed line with a circle and a cross (disjoint).</p>
type	SM-ShapeIndexType, JEP30-D10:PointXYType, JEP30-D10:MinIntegerOfOneType, JEP30-D10:EmptyType.

#### 5.19.9.2.1.4 Random Array

path	<a href="#">PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/SoldermaskLayer-Array/SoldermaskLayer/SoldermaskShape/SM-ShapeLocation/RandomArray</a>
diagram	 <p>The diagram shows the structure of the <b>RandomArray</b> type. It is a sequence of <b>SM-ShapeLocation</b> types. The <b>SM-ShapeLocation</b> type is defined within the <b>SM-ShapeRandomArrayType</b> container and is of type <b>JEP30-D10:PointXYType</b>. The <b>JEP30-D10:PointXYType</b> contains two decimal values: <b>x</b> and <b>y</b>. The <b>RandomArray</b> type is of type <b>SM-ShapeRandomArrayType</b>. The <b>SM-ShapeLocation</b> type is of type <b>JEP30-D10:PointXYType</b>. The <b>JEP30-D10:PointXYType</b> contains two decimal values: <b>x</b> and <b>y</b>.</p>
type	<b>SM-ShapeRandomArrayType</b> , <b>JEP30-D10:PointXYType</b> .

#### 5.19.9.2.2 Pattern Group

path	<a href="#">PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/SoldermaskLayer-Array/SoldermaskLayer/SoldermaskShape/PatternGroup</a>
diagram	 <p>The diagram shows the structure of the <b>PatternGroup</b> type. It is a sequence of <b>PatternRelationship</b> types. The <b>PatternRelationship</b> type is defined within the <b>SM-ShapePatternGroupType</b> container and is of type <b>SM-ShapePatternRelationshipType</b>. The <b>SM-ShapePatternRelationshipType</b> contains a <b>Name</b> (xs:string) and a <b>RelationshipTransformations</b> (type <b>SM-ShapeRelationshipTransformationsType</b>). The <b>RelationshipTransformations</b> type contains a <b>FromSM-ShapeLocationID</b> (type <b>xs:string</b>) and a <b>FromSM-ShapePatternGroupID</b> (type <b>xs:string</b>). The <b>RelationshipTransformations</b> type also contains a <b>SM-ShapeLocationID</b> (type <b>xs:string</b>) and a <b>SM-ShapePatternGroupID</b> (type <b>xs:string</b>). The <b>RelationshipTransformations</b> type also contains a <b>Duplicate</b> (type <b>SM-ShapeTransformDuplicateType</b>). The <b>PatternGroup</b> type is of type <b>SM-ShapePatternGroupType</b>. The <b>PatternRelationship</b> type is of type <b>SM-ShapePatternRelationshipType</b>. The <b>SM-ShapePatternRelationshipType</b> contains a <b>Name</b> (type <b>xs:string</b>) and a <b>RelationshipTransformations</b> (type <b>SM-ShapeRelationshipTransformationsType</b>). The <b>RelationshipTransformations</b> type contains a <b>FromSM-ShapeLocationID</b> (type <b>xs:string</b>) and a <b>FromSM-ShapePatternGroupID</b> (type <b>xs:string</b>). The <b>RelationshipTransformations</b> type also contains a <b>SM-ShapeLocationID</b> (type <b>xs:string</b>) and a <b>SM-ShapePatternGroupID</b> (type <b>xs:string</b>). The <b>RelationshipTransformations</b> type also contains a <b>Duplicate</b> (type <b>SM-ShapeTransformDuplicateType</b>).</p>
type	<b>SM-ShapePatternGroupType</b> , <b>SM-ShapePatternRelationshipType</b> , <b>SM-ShapeRelationshipTransformationsType</b> , <b>SM-ShapeTransformDuplicateType</b> .

5.19.9.2.2.1 RelationshipTransformations

path	PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/SoldermaskLayer-Array/SoldermaskLayer/SoldermaskShape/PatternGroup/RelationshipTransformations
diagram	
type	SM-ShapeRelationshipTransformationsType

5.19.9.2.2.2 RelationshipTransformations

path	PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/SoldermaskLayer-Array/SoldermaskLayer/SoldermaskShape/PatternGroup/Duplicate
diagram	
type	SM-ShapeTransformDuplicateType.

### 5.19.9.2.3 SM – Shape Pattern Span

path	<a href="#">PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/SoldermaskLayer-Array/SoldermaskLayer/SoldermaskShape/SM-ShapePatternSpan</a>
diagram	<pre> classDiagram     class SMShapePatternSpan {         type SMShapePatternSpanType     }     class SMShapePatternSpanType {         X-Direction JEP30-D10:ValueType         Y-Direction JEP30-D10:ValueType     }     SMShapePatternSpan --&gt; SMShapePatternSpanType         </pre>
type	<a href="#">SM-ShapePatternSpanType</a> , <a href="#">JEP30-D10:ValueType</a> .

### 5.19.9.2.4 SM – Shape Pattern Spacing

path	<a href="#">PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/SoldermaskLayer-Array/SoldermaskLayer/SoldermaskShape/SM-ShapePatternSpacing</a>
diagram	<pre> classDiagram     class SMShapePatternSpacing {         type SMShapePatternSpacingType     }     class SMShapePatternSpacingType {         X-Direction JEP30-D10:ValueType         Y-Direction JEP30-D10:ValueType     }     SMShapePatternSpacing --&gt; SMShapePatternSpacingType         </pre>
type	<a href="#">SM-ShapePatternSpacingType</a> , <a href="#">JEP30-D10:ValueType</a> .

5.19.10    Pastemask Layer- Array

path	PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/PastemaskLayer-Array
diagram	<p>The diagram illustrates the structure of the <b>PastemaskLayer-Array</b> type. It is composed of several nested and associated types:</p> <ul style="list-style-type: none"><li><b>PastemaskLayer-Array</b> (type: <i>PastemaskLayer-ArrayType</i>) is the root type, represented by a dashed box. It contains an array of <b>PastemaskLayer</b> objects (multiplicity 1..∞).</li><li><b>PastemaskLayer</b> (type: <i>PastemaskLayerType</i>) is a type contained within the array. It is represented by a solid box and contains:<ul style="list-style-type: none"><li>An array of <b>RecommendedStencilThickness</b> objects (multiplicity 1..∞).</li><li>An array of <b>PastemaskLayerToPastemaskLayerRelationship</b> objects (multiplicity 0..∞).</li><li>A <b>PastemaskLayerType</b> (type: <i>PastemaskLayerType</i>) which is a nested type containing:<ul style="list-style-type: none"><li>An array of <b>RecommendedStencilThicknessType</b> objects (multiplicity 1..∞).</li><li>An array of <b>ApertureShape</b> objects (multiplicity 1..∞).</li><li>An <b>ID</b> attribute (type: <i>xs:string</i>).</li></ul></li></ul></li><li><b>RecommendedStencilThickness</b> (type: <i>RecommendedStencilThicknessType</i>) is a type contained within <b>PastemaskLayer</b>. It is represented by a dashed box and contains:<ul style="list-style-type: none"><li>A <b>Thickness</b> attribute (type: <i>JEP30-D10:MinNomMaxValueSetType</i>).</li><li>A <b>StencilThicknessUOM</b> attribute (type: <i>StencilThicknessUOMType</i>).</li></ul></li><li><b>RecommendedStencilThicknessType</b> (type: <i>RecommendedStencilThicknessType</i>) is a type contained within <b>RecommendedStencilThickness</b>. It is represented by a solid box and contains:<ul style="list-style-type: none"><li>A <b>Thickness</b> attribute (type: <i>JEP30-D10:MinNomMaxValueSetType</i>).</li><li>A <b>StencilThicknessUOM</b> attribute (type: <i>StencilThicknessUOMType</i>).</li></ul></li><li><b>ApertureShape</b> (type: <i>ApertureShapeType</i>) is a type contained within <b>PastemaskLayerType</b>. It is represented by a solid box.</li><li><b>PastemaskLayerToPastemaskLayerRelationship</b> (type: <i>PastemaskLayerToPastemaskLayerRelationshipType</i>) is a type contained within <b>PastemaskLayer</b>. It is represented by a dashed box.</li></ul>
type	PasteMaskLayer-ArrayType, RecommendedStencilThicknessType, JEP30-D10:MinNomMaxValueSetType, StencilThicknessUOMType, PasteMaskLayerType, ApertureShapeType, PastemaskLayerToPastemaskLayerRelationshipType.

### 5.19.10.1 Aperture Shape

path	PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/PastemaskLayer-Array/PastemaskLayer/ApertureShape
diagram	
type	<p>ApertureShapeType, RectangleValueType, RoundedRectangleValueType, ModifiedApertureRectangleType, CircleValueType, SegmentedRingType, ContourShapeValueType, ApertureThicknessType, JEP30-D10:MinNomMaxValueType, StencilThicknessUOMType, ApertureLocationType, AperturePatternGroupType, AperturePatternSpanType, AperturePatternSpacingType, JEP30-D10:ValueType.</p>

All shapes are defined in Annex A.1



### 5.19.10.1.1 Aperture Location

path	<a href="#">PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/PastemaskLayer-Array/PastemaskLayer/ApertureShape/ApertureLocation</a>
diagram	
type	<a href="#">ApertureLocationType</a> , <a href="#">ApertureStandardArrayType</a> , <a href="#">ApertureCircularArrayType</a> , <a href="#">ApertureStatusType</a> , <a href="#">ApertureRandomArrayType</a> .

### 5.19.10.1.1.1 Standard Array

path	<a href="#">PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/PastemaskLayer-Array/PastemaskLayer/ApertureShape/ApertureLocation/StandardArray</a>
diagram	
type	<a href="#">ApertureStandardArrayType</a> , <a href="#">JEP30-D10:PointXYType</a> .

5.19.10.1.1.2 Circular Array

path	PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/PastemaskLayer-Array/PastemaskLayer/ApertureShape/ApertureLocation/CircularArray
diagram	
type	ApertureCircularArrayType, JEP30-D10:PointXYType, ApertureRotationType.

### 5.19.10.1.1.3 Status

path	PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/PastemaskLayer-Array/PastemaskLayer/ApertureShape/ApertureLocation/Status
diagram	
type	ApertureStatusType, JEP30-D10:MinIntegerOfOneType, JEP30-D10:PointXYType, JEP30-D10:EmptyType.

### 5.19.10.1.1.4 RandomArray

path	PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/PastemaskLayer-Array/PastemaskLayer/ApertureShape/ApertureLocation/RandomArray
diagram	
type	ApertureRandomArrayType, JEP30-D10:PointXYType.

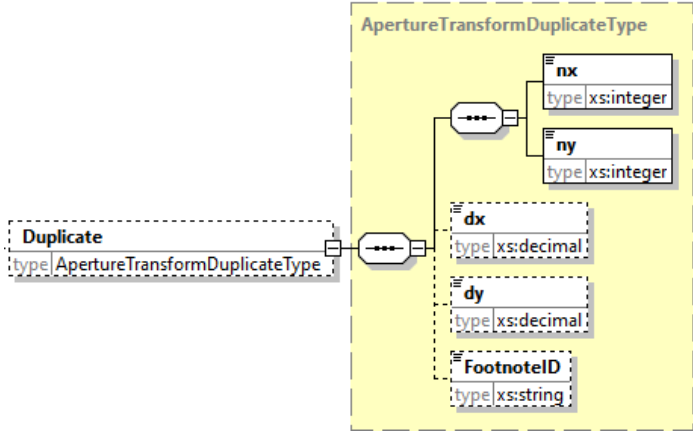
### 5.19.10.1.2 Pattern Groups

path	<a href="#">PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/PastemaskLayer-Array/PastemaskLayer/ApertureShape/PatternGroup</a>
diagram	
type	<a href="#">AperturePatternGroupType</a> , <a href="#">AperturePatternRelationshipType</a> , <a href="#">AperturePatternRelationshipTransformationsType</a> , <a href="#">ApertureTransformDuplicateType</a> .

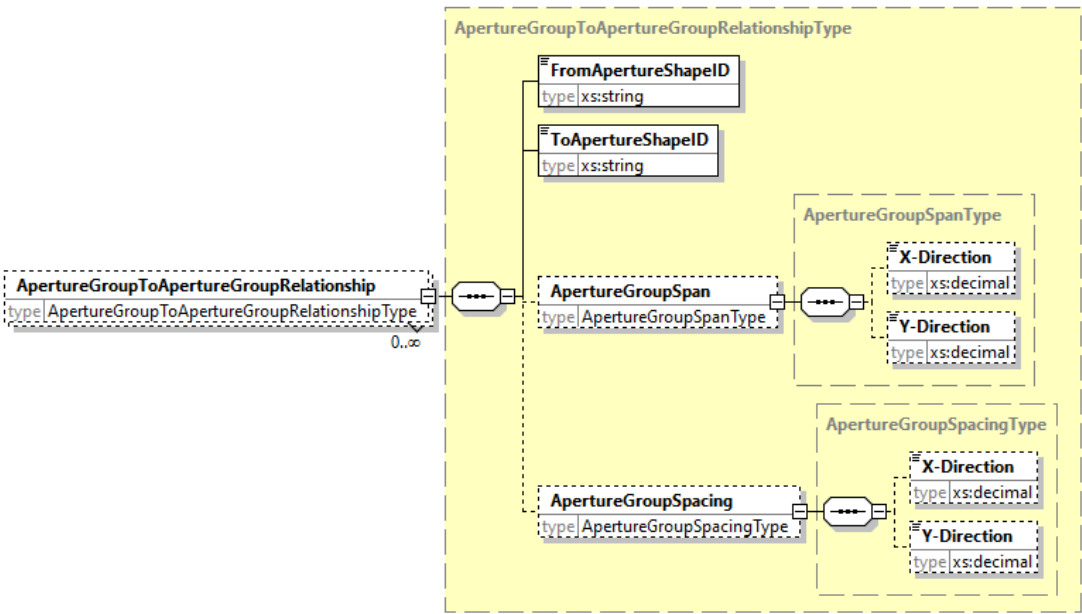
### 5.19.10.1.2.1 Relationship Transformations

path	<a href="#">PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/PastemaskLayer-Array/PastemaskLayer/ApertureShape/PatternGroup/PatternRelationship/RelationshipTransformations</a>
diagram	
type	<a href="#">AperturePatternRelationshipTransformationsType</a> , <a href="#">TransformMirrorType</a> , <a href="#">TransformRotateType</a> , <a href="#">JEP30-D10:PointXYType</a>

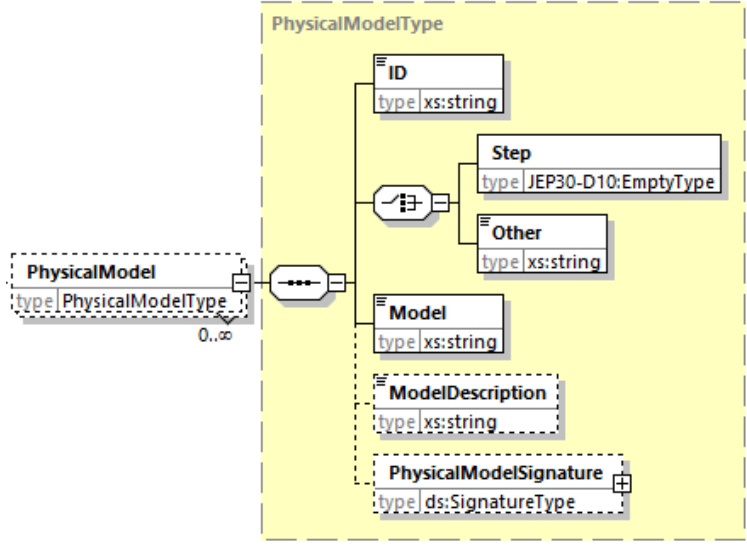
5.19.10.1.2.2 Duplicate

path	PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/PastemaskLayer-Array/PastemaskLayer/ApertureShape/PatternGroup/PatternRelationship/Duplicate
diagram	 <p>The diagram illustrates the structure of the <b>Duplicate</b> type. It is a dashed box containing a solid box labeled <b>Duplicate</b> with the type <code>ApertureTransformDuplicateType</code>. This box is connected to a larger dashed box labeled <b>ApertureTransformDuplicateType</b>. Inside this larger box, there are two main components: a <b>nx</b> field (type <code>xs:integer</code>) and a <b>ny</b> field (type <code>xs:integer</code>), both connected to a central point. Below these, there are two dashed boxes: <b>dx</b> (type <code>xs:decimal</code>) and <b>dy</b> (type <code>xs:decimal</code>), both connected to the same central point. At the bottom, there is a <b>FootnoteID</b> field (type <code>xs:string</code>) connected to the central point.</p>
type	ApertureTransformDuplicateType.

5.19.10.2 Pastemask Layer To Pastemask Layer Relationship

path	PartModel/PackageSection/Package-Array/Package/RecommendedFootprint-Array/RecommendedFootprint/PastemaskLayer-Array/PastemaskLayer/ApertureGroupToApertureGroupRelationship
diagram	 <p>The diagram illustrates the structure of the <b>ApertureGroupToApertureGroupRelationship</b> type. It is a dashed box containing a solid box labeled <b>ApertureGroupToApertureGroupRelationship</b> with the type <code>ApertureGroupToApertureGroupRelationshipType</code>. This box is connected to a larger dashed box labeled <b>ApertureGroupToApertureGroupRelationshipType</b>. Inside this larger box, there are two main components: a <b>FromApertureShapeID</b> field (type <code>xs:string</code>) and a <b>ToApertureShapeID</b> field (type <code>xs:string</code>), both connected to a central point. Below these, there are two dashed boxes: <b>ApertureGroupSpan</b> (type <code>ApertureGroupSpanType</code>) and <b>ApertureGroupSpacing</b> (type <code>ApertureGroupSpacingType</code>), both connected to the same central point. The <b>ApertureGroupSpan</b> box is further connected to a dashed box labeled <b>ApertureGroupSpanType</b>, which contains two fields: <b>X-Direction</b> (type <code>xs:decimal</code>) and <b>Y-Direction</b> (type <code>xs:decimal</code>). The <b>ApertureGroupSpacing</b> box is further connected to a dashed box labeled <b>ApertureGroupSpacingType</b>, which contains two fields: <b>X-Direction</b> (type <code>xs:decimal</code>) and <b>Y-Direction</b> (type <code>xs:decimal</code>).</p>
type	ApertureGroupToApertureGroupRelationshipType, ApertureGroupSpanType, ApertureGroupSpacingType.

## 5.20 Physical Model

path	<a href="#">PartModel/PackageSection/Package-Array/Package/PhysicalModel</a>
diagram	 <p>The diagram illustrates the structure of the <b>PhysicalModelType</b>. It is a complex type containing several elements:</p> <ul style="list-style-type: none"> <li><b>PhysicalModel</b>: A dashed box representing a reference to the <b>PhysicalModelType</b> itself, with a cardinality of 0..∞.</li> <li><b>ID</b>: A simple type of <b>xs:string</b>.</li> <li><b>Step</b>: A simple type of <b>JEP30-D10:EmptyType</b>.</li> <li><b>Other</b>: A simple type of <b>xs:string</b>.</li> <li><b>Model</b>: A simple type of <b>xs:string</b>.</li> <li><b>ModelDescription</b>: A dashed box representing a simple type of <b>xs:string</b>.</li> <li><b>PhysicalModelSignature</b>: A dashed box representing a simple type of <b>ds:SignatureType</b>.</li> </ul> <p>The elements are connected by a central vertical line, with a horizontal line branching off to the left for the <b>PhysicalModel</b> reference. The <b>PhysicalModelSignature</b> element has a small square icon with a plus sign, indicating it is optional.</p>
type	<a href="#">PhysicalModelType</a> , <a href="#">ModelType</a> , <a href="#">JEP30-D10:EmptyType</a> , <a href="#">ds:SignatureType</a> .

One or more references to external physical model files can be defined by the [PhysicalModel](#) section. The [Model](#) element can refer to either a file name of a file that is provided together with the corresponding JEP30 xml archive or a URL definition. An [Other](#) file format is accommodated to account for non-standard formats where it is advised that the optional [ModelDescription](#) element is used to describe the format and its intended usage.

6 Package Section - Die-Array

path	PartModel/PackageSection
diagram part 1 of 3	<p>This diagram illustrates the structure of the <b>JEP30-P101:PackageSectionType</b>. It shows a <b>PackageSection</b> element (type JEP30-P101:PackageSectionType) connected to a container. This container holds two elements: <b>Package-Array</b> (type Package-ArrayType) and <b>Die-Array</b> (type Die-ArrayType). The <b>Die-Array</b> element is further connected to a <b>Die-ArrayType</b> container, which contains a <b>Die</b> element (type DieType) with a cardinality of 1..∞ and a <b>constraints</b> element.</p>
type	PackageSectionType, Package-ArrayType, Die-ArrayType, DieType.
path	PartModel/PackageSection/Die-Array/Die
diagram part 2 of 3	<p>This diagram illustrates the structure of the <b>DieType</b>. It shows a <b>Die</b> element (type DieType) with a cardinality of 1..∞ connected to a container. This container holds several elements: <b>ID</b> (type xs:string), <b>ActiveZone</b> (type ActiveZoneType), <b>ScribeReferenceRectangle</b> (type ScribeReferenceRectangleType), <b>PhysicalDieSize</b> (type PhysicalDieSizeType), <b>PhysicalDieSpacing</b> (type PhysicalDieSpacingType), <b>SteppingDistance</b> (type SteppingDistanceType), <b>ExtendedTerminalCount</b> (type JEP30-D10:MinIntegerOfOneType, minIncl/maxIncl 1), <b>TerminalCount</b> (type JEP30-D10:MinIntegerOfOneType, minIncl/maxIncl 1), <b>DeletedTerminalCount</b> (type xs:integer), and <b>MissingTerminalCount</b> (type xs:integer).</p>

## 6 Package Section - Die-Array (cont'd)

<p>diagram part 3 of 3</p>	
<p>type</p>	<p><a href="#">DieType</a>, <a href="#">ActiveZoneType</a>, <a href="#">ScribeReferenceRectangleType</a>, <a href="#">PhysicalDieSizeType</a>, <a href="#">PhysicalDieSpacingType</a>, <a href="#">SteppingDistanceType</a>, <a href="#">JEP30-D10:MinIntegerOfOneType</a>, <a href="#">JEP30-D10:DimensionUOMType</a>, <a href="#">JEP30-D10:MassValueSetType</a>, <a href="#">JEP30-D10:ValueSetType</a>, <a href="#">FiducialMarkingType</a>, <a href="#">DieTerminalGroupsType</a>, <a href="#">JEP30-D10:DatumID-ArrayType</a>, <a href="#">JEP30-D10:FeatureControlID-ArrayType</a>, <a href="#">JEP30-D10:GDAndTType</a>, <a href="#">DieFootnote-ArrayType</a>, <a href="#">ds:SignatureType</a>.</p>

The definitions of the [ExtendedTerminalCount](#), [TerminalCount](#), [DeletedTerminalCount](#) and [MissingTerminalCount](#) are described in the JESD30 document. The Die/Pitch follows the same rules as Package/Pitch as defined in the JESD30 document.

The enumerate values of the [JEP30-D10:DimensionUOMType](#) are [nm](#), [um](#), [mm](#), [m](#), [in](#) and [mil](#), while [nm](#), [um](#), [mm](#), are the units of measure used in the die's.

The component Manufacturer can provide details the [ProcessTechnology](#) that was used for the die fabrication, such as 5nm, or company specific internal code name.



## 6.1 Die Zones

path	<b>PartModel/PackageSection/Die-Array/Die/ActiveZone</b>	
diagram part 1 of 4		
type	<b>ActiveZoneType, ReferenceRectangleGroupType, ReferenceRegularPolygonGroupType, D10:PointXYType, ContourShapeGroupType.</b>	
path	<b>PartModel/PackageSection/Die-Array/Die/ScribeReferenceRectangle</b>	
diagram part 2 of 4		
type	<b>ScribeReferenceRectangleType, ReferenceRectangleGroupType, ReferenceRegularPolygonGroupType, JEP30-D10:PointXYType, ContourShapeGroupType, FromActiveZoneEdgesType.</b>	

## 6.1 Die Zones (cont'd)

path	PartModel/PackageSection/Die-Array/Die/PhysicalDieSize	
diagram part 3 of 4		
type	PhysicalDieSizeType, ReferenceRectangleGroupType, ReferenceRegularPolygonGroupType, JEP30-D10:PointXYType, ContourShapeGroupType, FromScribeReferenceRectangleEdgesType, JEP30-D10:DatumID-ArrayType, JEP30-D10:FeatureControlID-ArrayType.	
path	PartModel/PackageSection/Die-Array/Die/PhysicalDieSizeSpacing	
diagram part 4 of 4		
type	PhysicalDieSizeSpacingType, JEP30-D10:DimensionalValueSetType.	

The centers of the [ActiveZone](#), [ScribeReferenceRectangle](#), [PhysicalDieSize](#) do not have to be at the same point. Each can have different offsets with respect to the [ActiveZone](#) center. The center of the active die is the primary datum.

The distance between the edge of the [ActiveZone](#) to the edge of the [ScribeReferenceRectangle](#) is defined as the [SealRing](#) for that side. The [SealRing](#) is sometimes referred to as the “Etch Ring” or “Guard Ring”. The [SealRing](#) can be a different dimensions on each of the 4 sides, although in most cases, the right side equals the left side and the top side equals the bottom side, but the top/bottom side values does not typically equal to the right/left side values.

6.1 Die Zones (cont'd)

The distance between the edge of the *ScribeReferenceRectangle* to the edge of the *PhysicalDieSize* is defined as the *RemnantScribe* for that side. The *RemnantScribe* can also be a different dimensions on each of the 4 sides, similar to that of the *SealRing*.

The *PhysicalDieSizeSpacing* is the physical distance between each *PhysicalDieSize* on the wafer. This *PhysicalDieSizeSpacing* can be a different dimension in the X and Y directions.

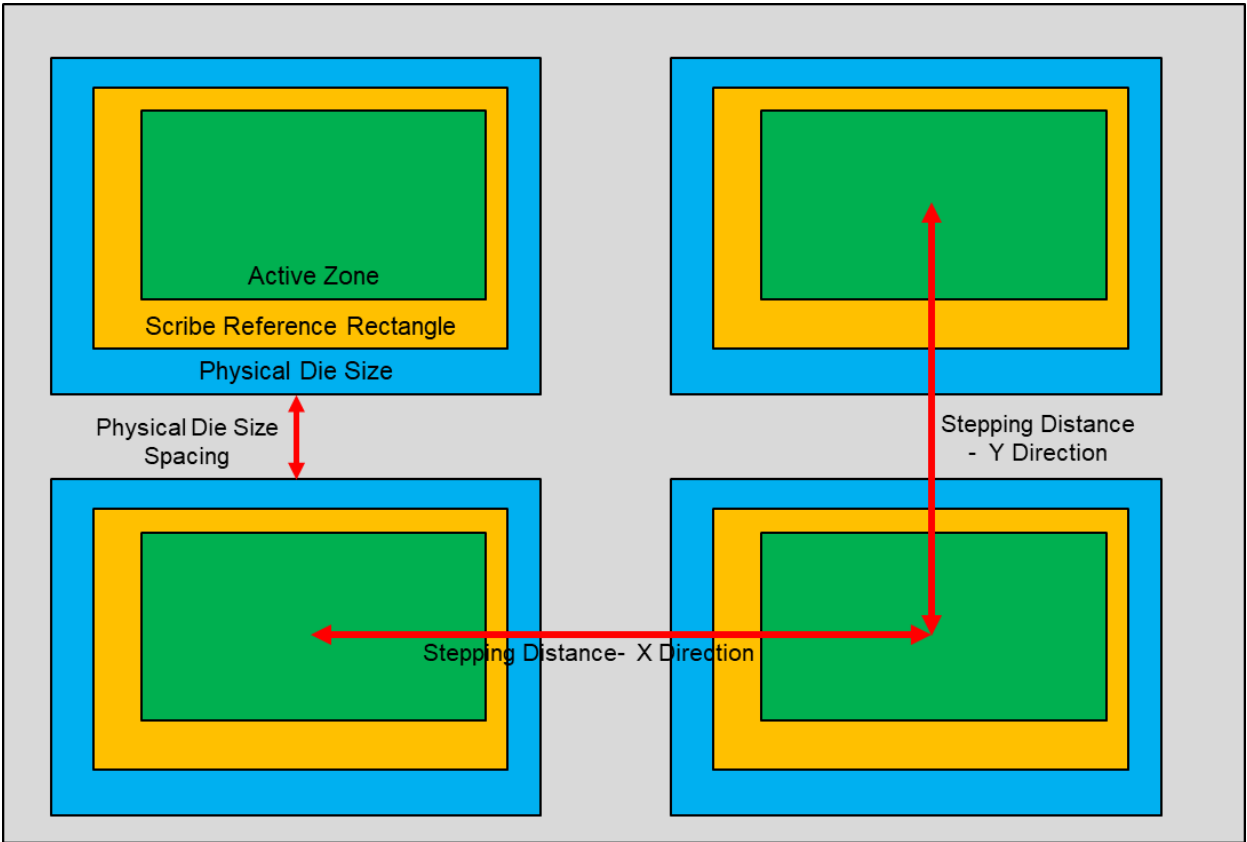


Figure 20 - Zone shapes for Physical Dies on a Wafer

6.2 Stepping Distance

path	PartModel/PackageSection/Die-Array/Die/SteppingDistance
diagram	
type	SteppingDistanceType.

As shown in Figure 20 above, the *SteppingDistance* can be a different value in the X and Y direction. This is sometimes referred to as the “Wafer Pitch”.

### 6.3 Mass

path	<b>PartModel/PackageSection/Die-Array/Die/Mass</b>
diagram	
type	<b>JEP30-D10:MassValueSetType, MassUOMType</b>
group	<b>ValueSetGroup</b>

The *ValueSetGroup* is widely used throughout the Schema. It provides for all the following combinations in a structured way and enables the xml file to have all of the following elements directly underneath its parent element to which it is assigned to. :

- 1) Nominal,
- 2) Positive and Negative Tolerances, or Total tolerance based on the same UOM or based on a percentage of the nominal value, and
- 3) Minimum and or Maximum.

### 6.4 Part Height

path	<b>PartModel/PackageSection/Die-Array/Die/Mass</b>
diagram	
type	<b>JEP30-D10:ValueSetType.</b>
group	<b>ValueSetGroup</b>

*PartHeight* for a *Die* represents the total height of the die part from its seating plane.

6.5 Terminal Groups

path	PartModel/PackageSection/Die-Array/Die/TerminalGroups
diagram	<pre>classDiagram     class TerminalGroups {         type DieTerminalGroupsType     }     class DieTerminalGroupsType {         TerminalGroup-Array type DieTerminalGroup-ArrayType         Region-Array type Region-ArrayType         TerminalMaterial-Array type DieTerminalMaterial-ArrayType         LinearExpansionCoefficient-Array type JEP30-D10:LinearExpansionCoefficient-ArrayType         CubicExpansionCoefficient-Array type JEP30-D10:CubicExpansionCoefficient-ArrayType         TerminalShape-Array type DieTerminalShape-ArrayType         TerminalSpecification-Array type DieTerminalSpecification-ArrayType         TerminalDetail-Array type DieTerminalDetail-ArrayType         constraints     }     TerminalGroups --&gt; DieTerminalGroupsType</pre>
type	DieTerminalGroupsType, DieTerminalGroup-ArrayType, TerminalRegions-ArrayType, DieTerminalMaterial-ArrayType, JEP30-D10:LinearExpansionCoefficient-ArrayType, JEP30-D10:CubicExpansionCoefficient-ArrayType, DieTerminalShape-ArrayType, DieTerminalSpecification-ArrayType, DieTerminalDetail-ArrayType.

Let’s assume that we have a complex array of 12 instantiations of a UCle function organized in two columns and 6 rows as shown in Figure 21 below. Let’s define these 12 instantiations as Bank 1.

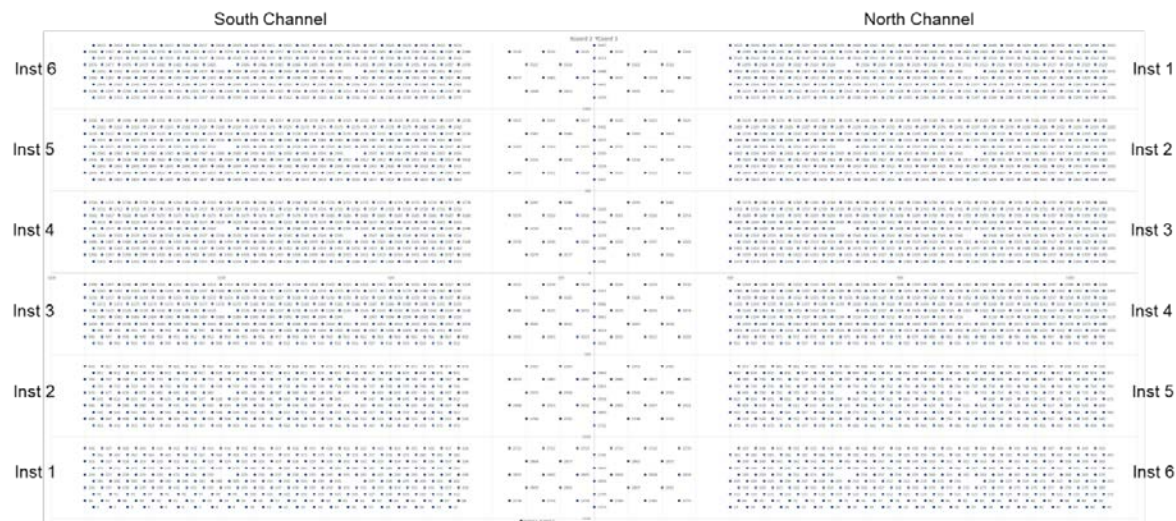


Figure 21 - Complex Array of 12 instantiations of a UCle Function

## 6.5 Terminal Groups (cont'd)

In the South channel, Inst 1 is duplicated 6 times in the Y direction. Then the entirety of the South channel is mirrored in both the x axis and y axis and offset to the right to create a duplicate North Channel.

There are many ways in which terminal numbering can be applied to this set of instantiations from maintaining a common numbering pattern for each instantiation or defining One contiguous sequential numbering pattern that covers all the terminals in Bank 1.

Let's also assume that each respective terminal location within each instantiation (the respective location is taken prior to any instantiations being mirrored), has the same StandardTerminalName, then, the assignment of properties, functions, terminal groupings to data/addresses busses, differential pairs, or any other logical groupings, only needs to be defined for one instantiation, and inherited by all other 11 instantiations.

The following sections will explore this example in more detail, to demonstrate the efficient compression of data, so that the resultant xml file remains as compact as possible.

### 6.5.1 Terminal Group - Array

path	<a href="#">PartModel/PackageSection/Die-Array/Die/TerminalGroups/TerminalGroup-Array</a>
diagram	<pre> classDiagram     class DieTerminalGroup-ArrayType {         TerminalGroup-Array         Relationship-to-ActiveZone         TerminalGroupToTerminalGroupRelationships         Coplanarity     }     class TerminalGroup-Array {         type DieTerminalGroup-ArrayType     }     class TerminalGroup {         type DieTerminalGroupType     }     class Relationship-to-ActiveZone {         type Relationship-to-ActiveZoneType     }     class TerminalGroupToTerminalGroupRelationships {         type DieTerminalGroupToTerminalGroupRelationshipsType     }     class Coplanarity {         type JEP30-D10:DimensionalValueType     }     DieTerminalGroup-ArrayType "1" -- "1..∞" TerminalGroup-Array     DieTerminalGroup-ArrayType "1" -- "0..∞" Relationship-to-ActiveZone     DieTerminalGroup-ArrayType "1" -- "0..∞" TerminalGroupToTerminalGroupRelationships     DieTerminalGroup-ArrayType "1" -- "0..∞" Coplanarity     </pre>
type	<a href="#">DieTerminalGroup-ArrayType</a> , <a href="#">Relationship-to-ActiveZoneType</a> , <a href="#">DieTerminalGroupToTerminalGroupRelationshipsType</a>

6.5.1.1 Terminal Group

path	PartModel/PackageSection/Die-Array/Die/TerminalGroups/TerminalGroup-Array/TerminalGroup
diagram	
type	DieTerminalGroupType, DieTerminalPositionType, BottomUpperPositionConfigurationType, DieTerminalPattern-ArrayType, DieTerminalPatternType, TerminalPatternGroupType.

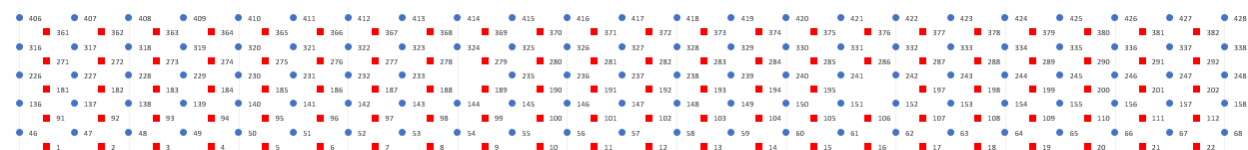
6.5.1.1.1 Terminal Pattern

path	PartModel/PackageSection/Die-Array/Die/TerminalGroups/TerminalGroup-Array/TerminalGroup/ TerminalPattern-Array/TerminalPattern
diagram	<p>The diagram illustrates the structure of the TerminalPattern class and its associated types. The TerminalPattern class is associated with the DieTerminalPatternType. It has a 1..∞ multiplicity. The DieTerminalPatternType is a base class for the StandardArray, CircularArray, and RandomArray classes. The StandardArray class is associated with the DieStandardArrayType. The DieStandardArrayType is a base class for the nx, ny, dx, dy, Angle, and TerminalPatternLowerLeftTerminalCenter classes. The nx, ny, dx, dy, and Angle classes are associated with the JEP30-D10:PointXYType. The TerminalPatternLowerLeftTerminalCenter class is associated with the JEP30-D10:PointXYType.</p> <pre>classDiagram     class TerminalPattern {         type DieTerminalPatternType     }     class DieTerminalPatternType {         ID xs:string         Name xs:string     }     class StandardArray {         type DieStandardArrayType     }     class CircularArray {         type CircularArrayType     }     class RandomArray {         type TerminalRandomArrayType     }     class DieStandardArrayType {         nx xs:integer         ny xs:integer         dx xs:decimal         dy xs:decimal         Angle xs:integer         TerminalPatternLowerLeftTerminalCenter JEP30-D10:PointXYType     }     class JEP30_D10_PointXYType {     }     TerminalPattern "1..∞" --&gt; "1" DieTerminalPatternType     DieTerminalPatternType -- &gt; StandardArray     DieTerminalPatternType -- &gt; CircularArray     DieTerminalPatternType -- &gt; RandomArray     StandardArray -- &gt; DieStandardArrayType     DieStandardArrayType -- &gt; nx     DieStandardArrayType -- &gt; ny     DieStandardArrayType -- &gt; dx     DieStandardArrayType -- &gt; dy     DieStandardArrayType -- &gt; Angle     DieStandardArrayType -- &gt; TerminalPatternLowerLeftTerminalCenter     nx -- &gt; JEP30_D10_PointXYType     ny -- &gt; JEP30_D10_PointXYType     dx -- &gt; JEP30_D10_PointXYType     dy -- &gt; JEP30_D10_PointXYType     Angle -- &gt; JEP30_D10_PointXYType     TerminalPatternLowerLeftTerminalCenter -- &gt; JEP30_D10_PointXYType</pre>
type	DieTerminalPatternType, DieStandardArrayType, JEP30-D10:PointXYType, CircularArrayType, TerminalRandomArrayType.



### 6.5.1.1.1 Terminal Pattern (cont'd)

A more detailed examination of a single UCle instantiation shows several distinct layout patterns of terminals, as shown by the various colored patterns in Figure 22 and Figure 23 below.



**Figure 22 - Single UCle Instantiation in South Channel Inst 1**



**Figure 23 - Power Nodes for South Channel Inst 1 & 2**

Each pattern can be represented by the standard array as shown in Table 49 below and in the subsequent xml structure.

**Table 49 - Pattern Details for the UCle Instantiation**

Terminal Pattern ID	nx	ny	dx	dy	Missing	
					Col Index	Row Index
1 (Blue circles)	22	5	50	80	16	3
2 (Red squares)	23	5	50	80	9	3
3 (Gold diamonds)	3	3	100	160	None	None
4 (Black triangles)	2	2	100	160	None	None
5 (Purple asterisks)	1	5	0	80	None	None
6 (Orange circles)	3	2	100	160	None	None
7 (Blue squares)	2	3	100	160	None	None

Note that some of the terminals are missing from the pattern ID's 1 and 2 which will be addressed in 6.5.7 Terminal Detail - Array below.

The VSS terminals as shown by Terminal pattern ID 5 (Purple asterisks) are shared between the South and North channels.

The VCCIO terminals as identified by Terminal patterns 3 (Gold diamonds) and 4 (Black triangles) for Instantiation 1 and Terminal patterns 6 (Orange circles) and 7 (Blue squares) for Instantiation 2 for the base of the repetitive pattern when applied to the rest of Bank 1.

### 6.5.1.1.1 Terminal Pattern (cont'd)

There may be additional VSS and VCCIO terminals intermingled throughout Terminal patterns 1 and 2, but there are treated as part of those patterns. Below is the xml representation of these Terminal Patterns.

```
<TerminalPattern-Array>
  <TerminalPattern>
    <ID>Terminal Pattern ID 1</ID>
    <Name>South Inst 1 Base</Name>
    <StandardArray>
      <nx>22</nx>
      <ny>5</ny>
      <dx>50.00</dx>
      <dy>80.00</dy>
      <TerminalPatternLowerLeftTerminalCenter>
        <x>-1475.00</x>
        <y>-1430.00</y>
      </TerminalPatternLowerLeftTerminalCenter>
    </StandardArray>
  </TerminalPattern>
  <TerminalPattern>
    <ID>Terminal Pattern ID 2</ID>
    <Name>South Inst 1 Staggered</Name>
    <StandardArray>
      <nx>23</nx>
      <ny>5</ny>
      <dx>50.00</dx>
      <dy>80.00</dy>
      <TerminalPatternLowerLeftTerminalCenter>
        <x>-1500.00</x>
        <y>-1390.00</y>
      </TerminalPatternLowerLeftTerminalCenter>
    </StandardArray>
  </TerminalPattern>
  <TerminalPattern>
    <ID>Terminal Pattern ID 3</ID>
    <Name>South Inst 1 VCCIO Base</Name>
    <StandardArray>
      <nx>3</nx>
      <ny>3</ny>
      <dx>100.00</dx>
      <dy>160.00</dy>
      <TerminalPatternLowerLeftTerminalCenter>
        <x>-250.00</x>
        <y>-1390.00</y>
      </TerminalPatternLowerLeftTerminalCenter>
    </StandardArray>
  </TerminalPattern>
  <TerminalPattern>
    <ID>Terminal Pattern ID 4</ID>
    <Name>South Inst 1 VCCIO Staggered</Name>
    <StandardArray>
      <nx>2</nx>
      <ny>2</ny>
      <dx>100.00</dx>
      <dy>160.00</dy>
      <TerminalPatternLowerLeftTerminalCenter>
        <x>-200.00</x>
        <y>-1310.00</y>
      </TerminalPatternLowerLeftTerminalCenter>
    </StandardArray>
  </TerminalPattern>
</TerminalPattern-Array>
```

### 6.5.1.1.1 Terminal Pattern (cont'd)

```

</TerminalPattern>
<TerminalPattern>
  <ID>Terminal Pattern ID 5</ID>
  <Name>VSS Center Inst 1</Name>
  <StandardArray>
    <nx>1</nx>
    <ny>5</ny>
    <dx>0</dx>
    <dy>80.00</dy>
    <TerminalPatternLowerLeftTerminalCenter>
      <x>0</x>
      <y>-1430.00</y>
    </TerminalPatternLowerLeftTerminalCenter>
  </StandardArray>
</TerminalPattern>
<TerminalPattern>
  <ID>Terminal Pattern ID 6</ID>
  <Name>South Inst 2 VCCIO Base</Name>
  <StandardArray>
    <nx>2</nx>
    <ny>3</ny>
    <dx>100.00</dx>
    <dy>160.00</dy>
    <TerminalPatternLowerLeftTerminalCenter>
      <x>-250.00</x>
      <y>-810.00</y>
    </TerminalPatternLowerLeftTerminalCenter>
  </StandardArray>
</TerminalPattern>
<TerminalPattern>
  <ID>Terminal Pattern ID 7</ID>
  <Name>South Inst 2 VCCIO Staggered</Name>
  <StandardArray>
    <nx>2</nx>
    <ny>3</ny>
    <dx>100.00</dx>
    <dy>160.00</dy>
    <TerminalPatternLowerLeftTerminalCenter>
      <x>-200.00</x>
      <y>-890.00</y>
    </TerminalPatternLowerLeftTerminalCenter>
  </StandardArray>
</TerminalPattern>
<TerminalPattern-Array>

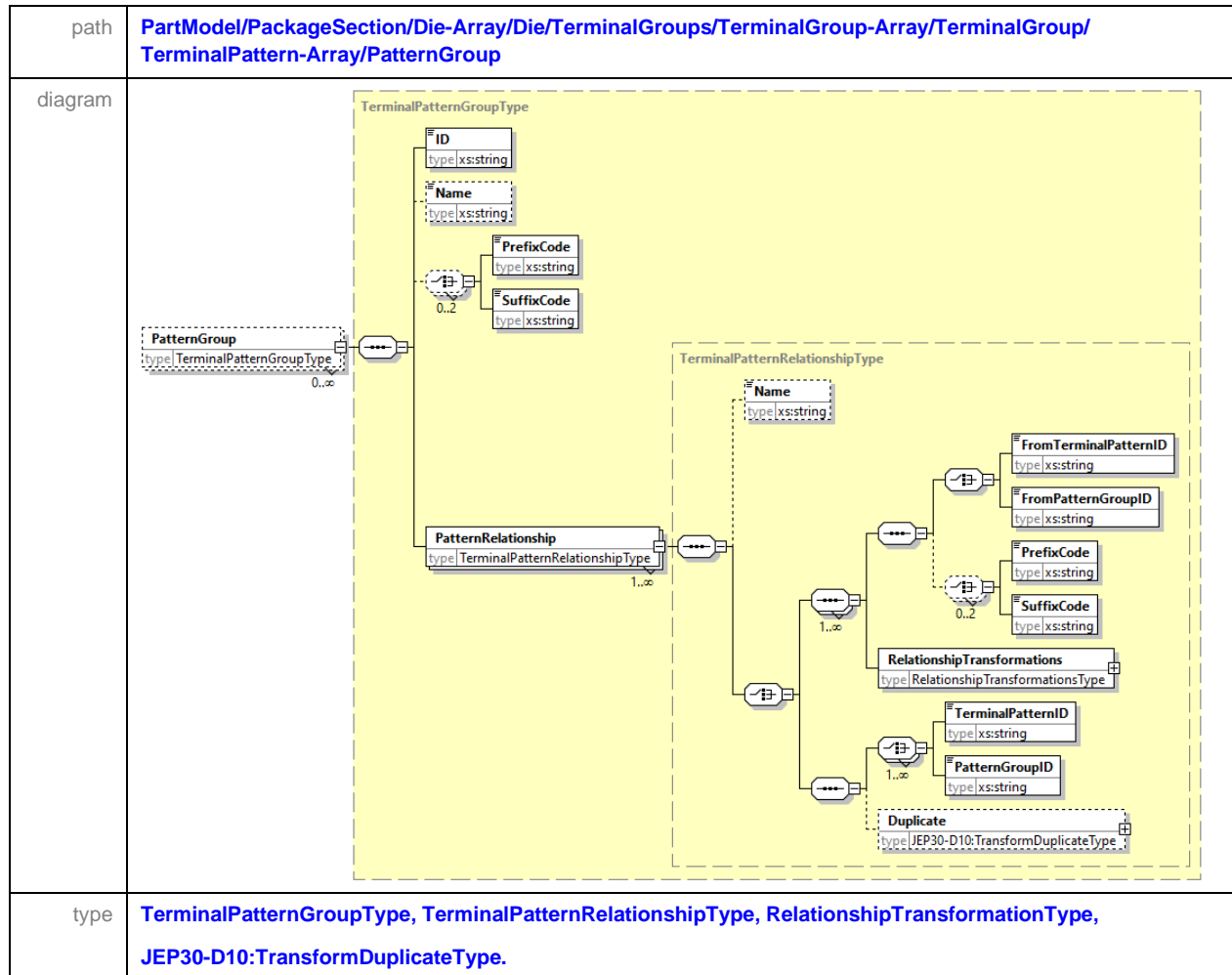
```

NOTE: The *TerminalPatternLowerLeftTerminalCenter* has been specified in each of these seven Terminal Patterns above, yet this is un-necessary, as the offset from one terminal pattern to the next terminal pattern could have been specified under section 6.5.1.2 Relationship – to – Active Zone below. The above *TerminalPatternLowerLeftTerminalCenter* coordinates are calculated based off the assumption that the entirety of Bank 1 is centered with the centered of the *ActiveZone*. In reality, Bank 1 may not be the final full configuration of all the die circuitry within the *ActiveZone*, and it may be just simply easier to adjust the final configuration with respect to the Active Zone instead of calculating all of the intermediate coordinates for every *TerminalPatternLowerLeftTerminalCenter*.

### 6.5.1.1.1 Terminal Pattern (cont'd)

Alternatively, *TerminalPatterns* can be grouped under a *PatternGroup* and their relationship between each other been determined via the *Offset* values. The *PatternGroup* could then be placed with respect to the *ActiveZone* under section 6.5.1.2 below.

### 6.5.1.1.2 Pattern Group



Before creating any *PatternGroup*, it is best to understand the most efficient form of defining the grouping to represent the duplication for the North and South channels as define in Figure 21 - Complex Array of 12 instantiations of a UCle Function above.

- Terminal Pattern ID 1 and 2 across all 12 instantiations of the UCle in the Bank 1 example have a contiguous sequential terminal numbering.
- Terminal Pattern ID 5 is a shared set of VSS terminals between the South and North channels and is not duplicated when a copy of the South channel is duplicated to form the North channel. For this reason, Terminal Pattern ID 5 does not form part of the *PatternGroup* that will be used later to create the North channel. However, Terminal Pattern ID 5 continues the terminal numbering from the Back to the Front for Bank 1 for that singular column of terminals.

6.5.1.1.2 Pattern Group (cont'd)

- The remaining terminals as defined within Terminal Pattern ID 3, 4, 6 and 7 across all instantiations in Bank 1 follow the S-H (Snake – Horizontal) pattern and continue the terminal numbering sequence from the shared VSS terminals.

path	PartModel/PackageSection/Die-Array/Die/TerminalGroups/TerminalGroup-Array/TerminalGroup/ TerminalPattern-Array/PatternGroup/PatternRelationship/RelationshipTransformations
diagram	<p>The diagram illustrates the XSD structure for RelationshipTransformationsType. The root element is RelationshipTransformations (type RelationshipTransformationsType). It has two children: Mirror (type JEP30-D10:TransformMirrorType) and Rotate (type JEP30-D10:TransformRotateType). The Mirror element has three children: ToTerminalPatternID (type xs:string), ToPatternGroupID (type xs:string), and a choice of PrefixCode (type xs:string) and SuffixCode (type xs:string) with a cardinality of 0..2. The Rotate element has three children: Origin (type EmptyType), SelectionCenter (type EmptyType), and Coordinate (type JEP30-D10:PointXYType). The Rotate element also has a child Angle (type xs:decimal). The Offset element (type JEP30-D10:PointXYType) has two children: x (type xs:decimal) and y (type xs:decimal). The diagram also shows the internal structure of JEP30-D10:TransformMirrorType, JEP30-D10:TransformRotateType, and JEP30-D10:PointXYType.</p>
type	RelationshipTransformationsType, TransformMirrorType, TransformRotateType, JEP30-D10:EmptyType, JEP30-D10:PointXYType.

6.5.1.1.2 Pattern Group (cont'd)

path	PartModel/PackageSection/Die-Array/Die/TerminalGroups/TerminalGroup-Array/TerminalGroup/ TerminalPattern-Array/PatternGroup/PatternRelationship/Duplicate
diagram	<p>The diagram illustrates the structure of the <code>TransformDuplicateType</code> and its associated types. It is organized into a hierarchy of boxes connected by lines and relationship symbols.</p> <ul style="list-style-type: none"><li><b>TransformDuplicateType</b> (type <code>xs:integer</code>) is the root type. It has a relationship with <code>Duplicate</code> (type <code>TransformDuplicateType</code>).</li><li><b>Duplicate</b> (type <code>TransformDuplicateType</code>) is a type that is used if <code>nx</code> and <code>ny</code> are both greater than 1.</li><li><b>nx</b> (type <code>xs:integer</code>) and <b>ny</b> (type <code>xs:integer</code>) are types that are used if either <code>nx</code> or <code>ny</code> is 1.</li><li><b>PrefixCode</b> (type <code>xs:string</code>) is a type that is used if either <code>nx</code> or <code>ny</code> is 1. It has a relationship with <code>PrefixNumericalSequence</code> (type <code>NumericalSequenceType</code>) and <code>PrefixAlphabeticalSequence</code> (type <code>AlphabeticalSequenceType</code>).</li><li><b>SuffixCode</b> (type <code>xs:string</code>) is a type that is used if either <code>nx</code> or <code>ny</code> is 1. It has a relationship with <code>SuffixNumericalSequence</code> (type <code>NumericalSequenceType</code>) and <code>SuffixAlphabeticalSequence</code> (type <code>AlphabeticalSequenceType</code>).</li><li><b>PrefixSeparator</b> (type <code>xs:string</code>) and <b>SuffixSeparator</b> (type <code>xs:string</code>) are types that are used if either <code>nx</code> or <code>ny</code> is 1.</li><li><b>X-PrefixCode</b> (type <code>xs:string</code>) is a type that is used if <code>nx</code> is 1. It has a relationship with <code>X-PrefixRowCode</code> (type <code>RowTerminalNumberOrderingType</code>).</li><li><b>X-SuffixCode</b> (type <code>xs:string</code>) is a type that is used if <code>nx</code> is 1. It has a relationship with <code>X-SuffixRowCode</code> (type <code>RowTerminalNumberOrderingType</code>).</li><li><b>Y-PrefixCode</b> (type <code>xs:string</code>) is a type that is used if <code>ny</code> is 1. It has a relationship with <code>Y-PrefixColumnCode</code> (type <code>ColumnTerminalNumberOrderingType</code>).</li><li><b>Y-SuffixCode</b> (type <code>xs:string</code>) is a type that is used if <code>ny</code> is 1. It has a relationship with <code>Y-SuffixColumnCode</code> (type <code>ColumnTerminalNumberOrderingType</code>).</li><li><b>dx</b> (type <code>xs:decimal</code>) and <b>dy</b> (type <code>xs:decimal</code>) are types that are used if either <code>nx</code> or <code>ny</code> is 1.</li></ul>
type	TransformDuplicateType, RowTerminalNumberOrderingType, ColumnTerminalNumberOrderingType, NumericalSequenceType, AlphabeticalSequenceType.

Option 1 – Leveraging Pattern Groups for the purpose of applying Terminal numbering.

- Group *TerminalPattern* ID 1 and 2 into a single *PatternGroup* ID 1 called “South\_Inst1\_TrmlPtrn1-2”.
- Create an array of *PatternGroup* ID 1 “South\_Inst1\_TrmlPtrn1-2” six times in the Y direction via a new *PatternGroup* ID 2 called “South\_Inst1-6\_PtrnGrp1”.
- Duplicate *PatternGroup* ID 2 “South\_Inst1-6\_TrmlPtrn1-2” one time in the X direction into a new *PatternGroup* ID 3 called “South-North\_Inst1-6\_PtrnGrp2”, ensuring that you mirror in both the horizontal and vertical axis for the North channel.
  - This enables the assignment of a unique sequence of terminal numbering to be applied specifically to the terminals defined within *PatternGroup* ID 3.
- Group *TerminalPattern* ID 3 and 4 into a single *PatternGroup* ID 4 called “South\_Inst1\_TrmlPtrn3-4”.
- Create an array of *PatternGroup* ID 4 “South\_Inst1, 3, 5\_PtrnGrp4” three times in the Y direction into a new *PatternGroup* ID 5 “South\_Inst1, 3, 5\_PtrnGrp4”.
- Group *TerminalPattern* ID 6 and 7 into a single *PatternGroup* ID 6 called “South\_Inst2\_TrmlPtrn6-7”.
- Create an array of *PatternGroup* ID 6 “South\_Inst2, 4, 6\_PtrnGrp6” three times in the Y direction into a new *PatternGroup* ID 7 “South\_Inst2, 4, 6\_PtrnGrp6”.
- Group *PatternGroup* ID 5 and 7 into a single *PatternGroup* ID 8 called “South\_Inst1-6\_PtrnGrp5, 7”
- Duplicate *PatternGroup* ID 8 “South\_Inst1-6\_PtrnGrp5, 7” one time in the X direction into a new *PatternGroup* ID 9 called “South-North\_Inst1-6\_PtrnGrp8”, with a straight offset and without rotation or mirroring.
  - This enables the assignment of a unique sequence of terminal numbering to be applied specifically to the terminals defined within *PatternGroup* ID 9.
- Create an array of *TerminalPattern* ID 5 “VSS Center Inst 1” six times in the Y direction via a new *PatternGroup* ID 10 called “VSS Center Inst 1-6”.
  - This enables the assignment of a unique sequence of terminal numbering to be applied specifically to the terminals defined within *PatternGroup* ID 10.
- Group *PatternGroup* ID 3, 9 and 10 into a single *PatternGroup* ID 11 called “Bank 1”.

### 6.5.1.1.2 Pattern Group (cont'd)

**Table 50 - Pattern Group Construction**

Pattern Group ID	Name	Pattern Relationship	nx	ny	Pitch (dx) / Offset (x)	Pitch (dy) / Offset (y)
1	South_Inst1_TrmlPtrn1-2	Terminal Pattern ID 1 Terminal Pattern ID 2				
2	South_Inst1-6_PtrnGrp1	Duplicate Pattern Group ID 1	1	6	0	500.00
3	South-North_Inst1-6_PtrnGrp2	Offset & Mirror (H & V) Pattern Group ID 2			1900.00	0
4	South_Inst1_TrmlPtrn3-4	Terminal Pattern ID 3 Terminal Pattern ID 4				
5	South_Inst1, 3, 5_PtrnGrp2	Duplicate Pattern Group ID 4	1	3	0	1000.00
6	South_Inst2_TrmlPtrn6-7	Terminal Pattern ID 6 Terminal Pattern ID 7				
7	South_Inst2, 4, 6_PtrnGrp6	Duplicate Pattern Group ID 6	1	3	0	1000.00
8	South_Inst1-6_PtrnGrp5, 7	Pattern Group ID 5 Pattern Group ID 7				
9	South-North_Inst1-6_PtrnGrp8	Offset & Mirror (H & V) Pattern Group ID 2			300.00	0
10	VSS Center Inst 1-6	Terminal Pattern ID 5	1	6	0	500.00
11	Bank 1	Pattern Group ID 3 Pattern Group ID 9 Pattern Group ID 10				

```

<PatternGroup>
  <ID>Pattern Group ID 1</ID>
  <Name>South_Inst1_TrmlPtrn1-2</Name>
  <PatternRelationship>
    <TerminalPatternID>Terminal Pattern ID 1</TerminalPatternID>
    <TerminalPatternID>Terminal Pattern ID 2</TerminalPatternID>
  </PatternRelationship>
</PatternGroup>
<PatternGroup>
  <ID>Pattern Group ID 2</ID>
  <Name>South_Inst1-6_PtrnGrp1</Name>
  <PatternRelationship>
    <PatternGroupID>Pattern Group ID 1</PatternGroupID>
    <Duplicate>
      <nx>1</nx>
      <ny>6</ny>
      <Y-PrefixCode>Inst 1</Y-PrefixCode>
      <Y-PrefixCode>Inst 2</Y-PrefixCode>
      <Y-PrefixCode>Inst 3</Y-PrefixCode>
      <Y-PrefixCode>Inst 4</Y-PrefixCode>
      <Y-PrefixCode>Inst 5</Y-PrefixCode>
      <Y-PrefixCode>Inst 6</Y-PrefixCode>
      <dy>500.00</dy>
    </Duplicate>
  </PatternRelationship>
</PatternGroup>

```



### 6.5.1.1.2 Pattern Group (cont'd)

```

<PatternGroup>
  <ID>Pattern Group ID 3</ID>
  <Name>South-North_Inst1-6_PtrnGrp2</Name>
  <PatternRelationship>
    <FromPatternGroupID>Pattern Group ID 2</FromPatternGroupID>
    <RelationshipTransformations>
      <ToPatternGroupID>Pattern Group ID 2</ToPatternGroupID>
      <Offset>
        <x>1900</x>
        <y>0</y>
      </Offset>
      <Mirror>
        <SelectionCenter/>
        <Horizontal/>
      </Mirror>
      <Mirror>
        <SelectionCenter/>
        <Vertical/>
      </Mirror>
    </RelationshipTransformations>
  </PatternRelationship>
</PatternGroup>
<PatternGroup>
  <ID>Pattern Group ID 4</ID>
  <Name>South_Inst1_Trm1Ptrn3-4</Name>
  <PatternRelationship>
    <TerminalPatternID>Terminal Pattern ID 3</TerminalPatternID>
    <TerminalPatternID>Terminal Pattern ID 4</TerminalPatternID>
  </PatternRelationship>
</PatternGroup>
<PatternGroup>
  <ID>Pattern Group ID 5</ID>
  <Name>South_Inst1, 3, 5_PtrnGrp4</Name>
  <PatternRelationship>
    <PatternGroupID>Pattern Group ID 4</PatternGroupID>
    <Duplicate>
      <nx>1</nx>
      <ny>3</ny>
      <Y-PrefixCode>Inst 1</Y-PrefixCode>
      <Y-PrefixCode>Inst 3</Y-PrefixCode>
      <Y-PrefixCode>Inst 5</Y-PrefixCode>
      <dy>1000.00</dy>
    </Duplicate>
  </PatternRelationship>
</PatternGroup>
<PatternGroup>
  <ID>Pattern Group ID 6</ID>
  <Name>South_Inst2_Trm1Ptrn6-7</Name>
  <PatternRelationship>
    <TerminalPatternID>Terminal Pattern ID 6</TerminalPatternID>
    <TerminalPatternID>Terminal Pattern ID 7</TerminalPatternID>
  </PatternRelationship>
</PatternGroup>

```

### 6.5.1.1.2 Pattern Group (cont'd)

```
<PatternGroup>
  <ID>Pattern Group ID 7</ID>
  <Name>South_Inst2, 4, 6_PtrnGrp6</Name>
  <PatternRelationship>
    <PatternGroupID>Pattern Group ID 6</PatternGroupID>
    <Duplicate>
      <nx>1</nx>
      <ny>3</ny>
      <Y-PrefixCode>Inst 2</Y-PrefixCode>
      <Y-PrefixCode>Inst 4</Y-PrefixCode>
      <Y-PrefixCode>Inst 6</Y-PrefixCode>
      <dy>1000.00</dy>
    </Duplicate>
  </PatternRelationship>
</PatternGroup>
<PatternGroup>
  <ID>Pattern Group ID 8</ID>
  <Name>South_Inst1-6_PtrnGrp5, 7</Name>
  <PatternRelationship>
    <PatternGroupID>Pattern Group ID 5</PatternGroupID>
    <PatternGroupID>Pattern Group ID 7</PatternGroupID>
  </PatternRelationship>
</PatternGroup>
<PatternGroup>
  <ID>Pattern Group ID 9</ID>
  <Name>South-North_Inst1-6_PtrnGrp8</Name>
  <PatternRelationship>
    <FromPatternGroupID>Pattern Group ID 8</FromPatternGroupID>
    <RelationshipTransformations>
      <ToPatternGroupID>Pattern Group ID 8</ToPatternGroupID>
      <Offset>
        <x>300</x>
        <y>0</y>
      </Offset>
    </RelationshipTransformations>
  </PatternRelationship>
</PatternGroup>
<PatternGroup>
  <ID>Pattern Group ID 10</ID>
  <Name>VSS Center Inst 1-6</Name>
  <PatternRelationship>
    <TerminalPatternID>Terminal Pattern ID 5</TerminalPatternID>
    <Duplicate>
      <nx>1</nx>
      <ny>6</ny>
      <dy>500.00</dy>
    </Duplicate>
  </PatternRelationship>
</PatternGroup>
```

6.5.1.1.2      Pattern Group (cont'd)

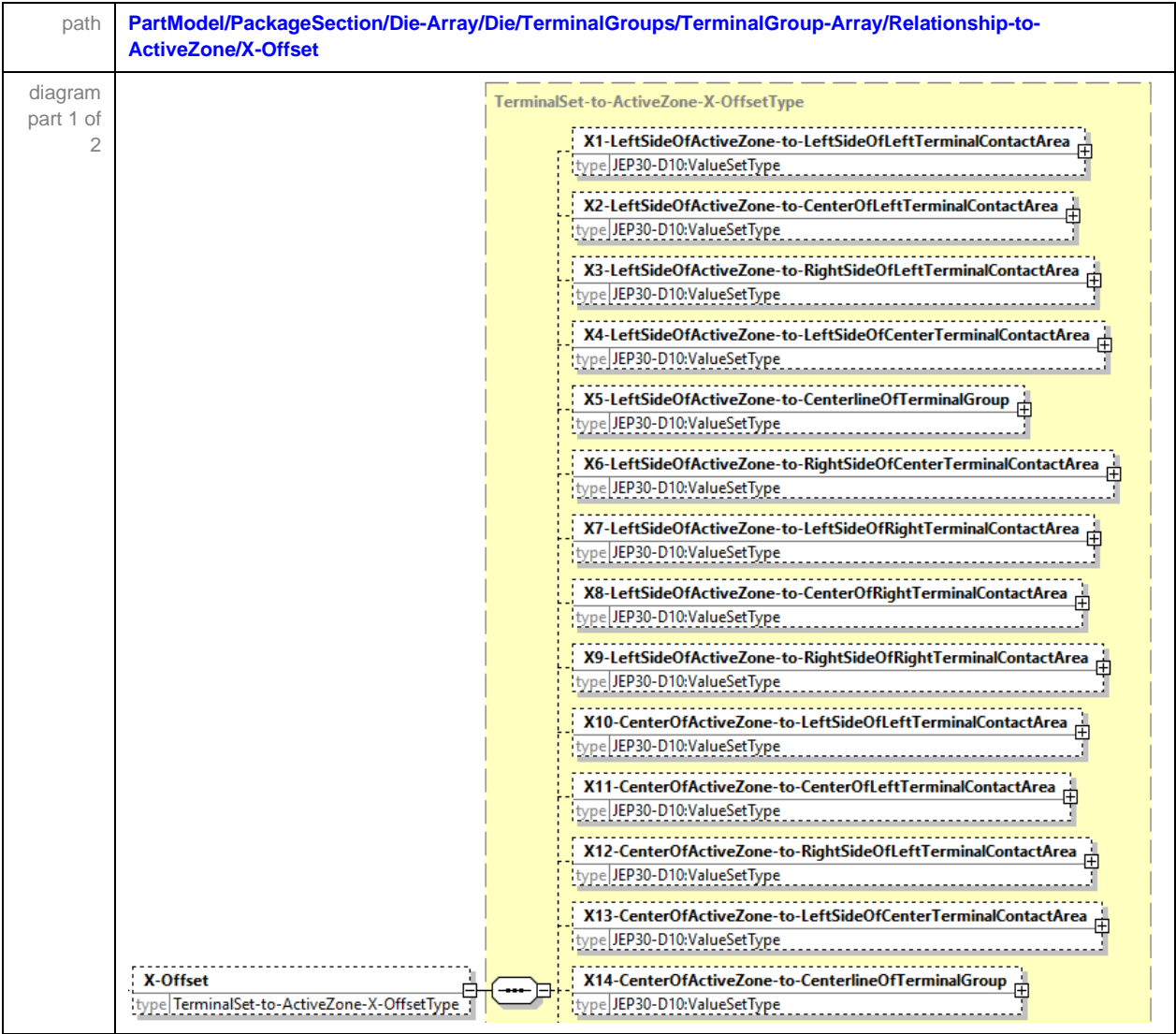
```
<PatternGroup>
  <ID>Pattern Group ID 11</ID>
  <Name>Bank 1</Name>
  <PatternRelationship>
    <PatternGroupID>Pattern Group ID 3</PatternGroupID>
    <PatternGroupID>Pattern Group ID 9</PatternGroupID>
    <PatternGroupID>Pattern Group ID 10</PatternGroupID>
  </PatternRelationship>
  :
  :
</PatternGroup>
```

6.5.1.2      Relationship – to – Active Zone

path	PartModel/PackageSection/Die-Array/Die/TerminalGroups/TerminalGroup-Array/Relationship-to-ActiveZone
diagram	<p>The diagram illustrates the 'Relationship-to-ActiveZoneType' structure. It features a dashed box on the left labeled 'Relationship-to-ActiveZone' with a multiplicity of '0..∞'. This box is connected to a main structure. The main structure includes three stacked fields: 'TerminalPatternID' (type xs:string), 'PatternGroupID' (type xs:string), and 'TerminalGroupID' (type xs:string). Below these is a container with two fields: 'X-Offset' (type TerminalSet-to-ActiveZone-X-OffsetType) and 'Y-Offset' (type TerminalSet-to-ActiveZone-Y-OffsetType). The entire main structure is enclosed in a yellow dashed box labeled 'Relationship-to-ActiveZoneType'.</p>
type	Relationship-to-ActiveZoneType, TerminalSet-to-ActiveZone-X-OffsetType, TerminalSet-to-ActiveZone-Y-OffsetType

For non-symmetrical Terminals around the *ActiveZone* center, offset dimensions may be referenced from the Terminal Contact Area to the *ActiveZone* area. This data can be captured in the *Relationship-to-ActiveZone* section.

6.5.1.2.1 X-Offset



### 6.5.1.2.1 X-Offset (cont'd)

diagram part 2 of 2	
type	TerminalSet-to-ActiveZone-X-OffsetType, JEP30-D10:ValueSetType

Table 51 - Terminal Group to Active Zone X-Offset lists out all the various dimensions that can be selected from any major point of the [ActiveZone](#) to any point of the terminal contact area in X direction.

Center of Center Terminal Contact Area is the same as Centerline of Terminal Group, however the use of the "...Centerline of Terminal Group" is more encompassing since it also includes the centerline of a row or column of an even number of terminals, i.e., midway between terminal 2 and terminal 3 of 4 terminals in a row or column.

#### 6.5.1.2.1 X-Offset (cont'd)

**Table 51 - Terminal Group to Active Zone X-Offset**

Symbol	Description
X1	Left side of Active Zone to Left Side of Left Terminal Contact Area
X2	Left side of Active Zone to Center of Left Terminal Contact Area
X3	Left side of Active Zone to Right side of Left Terminal Contact Area
X4	Left side of Active Zone to Left Side of Center Terminal Contact Area
X5	Left side of Active Zone to Centerline of Terminal Group
X6	Left side of Active Zone to Right side of Center Terminal Contact Area
X7	Left side of Active Zone to Left side of Right Terminal Contact Area
X8	Left side of Active Zone to Center of Right Terminal Contact Area
X9	Left side of Active Zone to Right side of Right Terminal Contact Area
X10	Center of Active Zone to Left side of Left Terminal Contact Area
X11	Center of Active Zone to Center of Left Terminal Contact Area
X12	Center of Active Zone to Right side of Left Terminal Contact Area
X13	Center of Active Zone to Left side of Center Terminal Contact Area
X14	Center of Active Zone to Centerline of Terminal Group
X15	Center of Active Zone to Right side of Center Terminal Contact Area
X16	Center of Active Zone to Left side of Right Terminal Contact Area
X17	Center of Active Zone to Center of Right Terminal Contact Area
X18	Center of Active Zone to Right side of Right Terminal Contact Area
X19	Right side of Active Zone to Left side of Left Terminal Contact Area
X20	Right side of Active Zone to Center of Left Terminal Contact Area
X21	Right side of Active Zone to Right side of Left Terminal Contact Area
X22	Right side of Active Zone to Left side of Center Terminal Contact Area
X23	Right side of Active Zone to Centerline of Terminal Group
X24	Right side of Active Zone to Right side of Center Terminal Contact Area
X25	Right side of Active Zone to Left side of Right Terminal Contact Area
X26	Right side of Active Zone to Center of Right Terminal Contact Area
X27	Right side of Active Zone to Right side of Right Terminal Contact Area

6.5.1.2.2 Y-Offset

path	PartModel/PackageSection/Die-Array/Die/TerminalGroups/TerminalGroup-Array/Relationship-to-ActiveZone/Y-Offset		
diagram part 1 of 2	<div><div>TerminalSet-to-ActiveZone-Y-OffsetType</div><div><div>Y1-BackSideOfActiveZone-to-BackSideOfBackTerminalContactArea</div><div>type JEP30-D10:ValueSetType</div></div><div><div>Y2-BackSideOfActiveZone-to-CenterOfBackTerminalContactArea</div><div>type JEP30-D10:ValueSetType</div></div><div><div>Y3-BackSideOfActiveZone-to-FrontSideOfBackTerminalContactArea</div><div>type JEP30-D10:ValueSetType</div></div><div><div>Y4-BackSideOfActiveZone-to-BackSideOfCenterTerminalContactArea</div><div>type JEP30-D10:ValueSetType</div></div><div><div>Y5-BackSideOfActiveZone-to-CenterlineOfTerminalGroup</div><div>type JEP30-D10:ValueSetType</div></div><div><div>Y6-BackSideOfActiveZone-to-FrontSideOfCenterTerminalContactArea</div><div>type JEP30-D10:ValueSetType</div></div><div><div>Y7-BackSideOfActiveZone-to-BackSideOfFrontTerminalContactArea</div><div>type JEP30-D10:ValueSetType</div></div><div><div>Y8-BackSideOfActiveZone-to-CenterOfFrontTerminalContactArea</div><div>type JEP30-D10:ValueSetType</div></div><div><div>Y9-BackSideOfActiveZone-to-FrontSideOfFrontTerminalContactArea</div><div>type JEP30-D10:ValueSetType</div></div><div><div>Y10-CenterOfActiveZone-to-BackSideOfBackTerminalContactArea</div><div>type JEP30-D10:ValueSetType</div></div><div><div>Y11-CenterOfActiveZone-to-CenterOfBackTerminalContactArea</div><div>type JEP30-D10:ValueSetType</div></div><div><div>Y12-CenterOfActiveZone-to-FrontSideOfBackTerminalContactArea</div><div>type JEP30-D10:ValueSetType</div></div><div><div>Y13-CenterOfActiveZone-to-BackSideOfCenterTerminalContactArea</div><div>type JEP30-D10:ValueSetType</div></div><div><div>Y14-CenterOfActiveZone-to-CenterlineOfTerminalGroup</div><div>type JEP30-D10:ValueSetType</div></div></div> <div><div>Y-Offset</div><div>type TerminalSet-to-ActiveZone-Y-OffsetType</div></div> <div><div></div><div></div></div>		

### 6.5.1.2.2 Y-Offset (cont'd)

diagram part 2 of 2	<p><b>Y-Offset</b> type TerminalSet-to-ActiveZone-Y-OffsetType</p> <p>Y14-CenterOfActiveZone-to-CenterlineOfTerminalGroup type JEP30-D10:ValueSetType</p> <p>Y15-CenterOfActiveZone-to-FrontSideOfCenterTerminalContactArea type JEP30-D10:ValueSetType</p> <p>Y16-CenterOfActiveZone-to-BackSideOfFrontTerminalContactArea type JEP30-D10:ValueSetType</p> <p>Y17-CenterOfActiveZone-to-CenterOfFrontTerminalContactArea type JEP30-D10:ValueSetType</p> <p>Y18-CenterOfActiveZone-to-FrontSideOfFrontTerminalContactArea type JEP30-D10:ValueSetType</p> <p>Y19-FrontSideOfActiveZone-to-BackSideOfBackTerminalContactArea type JEP30-D10:ValueSetType</p> <p>Y20-FrontSideOfActiveZone-to-CenterOfBackTerminalContactArea type JEP30-D10:ValueSetType</p> <p>Y21-FrontSideOfActiveZone-to-FrontSideOfBackTerminalContactArea type JEP30-D10:ValueSetType</p> <p>Y22-FrontSideOfActiveZone-to-BackSideOfCenterTerminalContactArea type JEP30-D10:ValueSetType</p> <p>Y23-FrontSideOfActiveZone-to-CenterlineOfTerminalGroup type JEP30-D10:ValueSetType</p> <p>Y24-FrontSideOfActiveZone-to-FrontSideOfCenterTerminalContactArea type JEP30-D10:ValueSetType</p> <p>Y25-FrontSideOfActiveZone-to-BackSideOfFrontTerminalContactArea type JEP30-D10:ValueSetType</p> <p>Y26-FrontSideOfActiveZone-to-CenterOfFrontTerminalContactArea type JEP30-D10:ValueSetType</p> <p>Y27-FrontSideOfActiveZone-to-FrontSideOfFrontTerminalContactArea type JEP30-D10:ValueSetType</p>
type	TerminalSet-to-ActiveZone-X-OffsetType, JEP30-D10:ValueSetType

Table 52 - Terminal Group to Active Zone Y-Offset lists out all the various dimensions that can be selected from any major point of the *ActiveZone* to any point of the terminal contact area in X direction.



6.5.1.2.2 Y-Offset (cont'd)

**Table 52 - Terminal Group to Active Zone Y-Offset**

Symbol	Description
Y1	Back side of Active Zone to Back side of Back Terminal Contact Area
Y2	Back side of Active Zone to Center of Back Terminal Contact Area
Y3	Back side of Active Zone to Front side of Back Terminal Contact Area
Y4	Back side of Active Zone to Back side of Center Terminal Contact Area
Y5	Back side of Active Zone to Centerline of Terminal Group
Y6	Back side of Active Zone to Front side of Center Terminal Contact Area
Y7	Back side of Active Zone to Back side of Front Terminal Contact Area
Y8	Back side of Active Zone to Center of Front Terminal Contact Area
Y9	Back side of Active Zone to Front side of Front Terminal Contact Area
Y10	Center of Active Zone to Back side of Back Terminal Contact Area
Y11	Center of Active Zone to Center of Back Terminal Contact Area
Y12	Center of Active Zone to Front side of Back Terminal Contact Area
Y13	Center of Active Zone to Back side of Center Terminal Contact Area
Y14	Center of Active Zone to Centerline of Terminal Group
Y15	Center of Active Zone to Front side of Center Terminal Contact Area
Y16	Center of Active Zone to Back side of Front Terminal Contact Area
Y17	Center of Active Zone to Center of Front Terminal Contact Area
Y18	Center of Active Zone to Front side of Front Terminal Contact Area
Y19	Front side of Active Zone to Back side of Back Terminal Contact Area
Y20	Front side of Active Zone to Center of Back Terminal Contact Area
Y21	Front side of Active Zone to Front side of Back Terminal Contact Area
Y22	Front side of Active Zone to Back side of Center Terminal Contact Area
Y23	Front side of Active Zone to Centerline of Terminal Group
Y24	Front side of Active Zone to Front side of Center Terminal Contact Area
Y25	Front side of Active Zone to Back side of Front Terminal Contact Area
Y26	Front side of Active Zone to Center of Front Terminal Contact Area
Y27	Front side of Active Zone to Front side of Front Terminal Contact Area

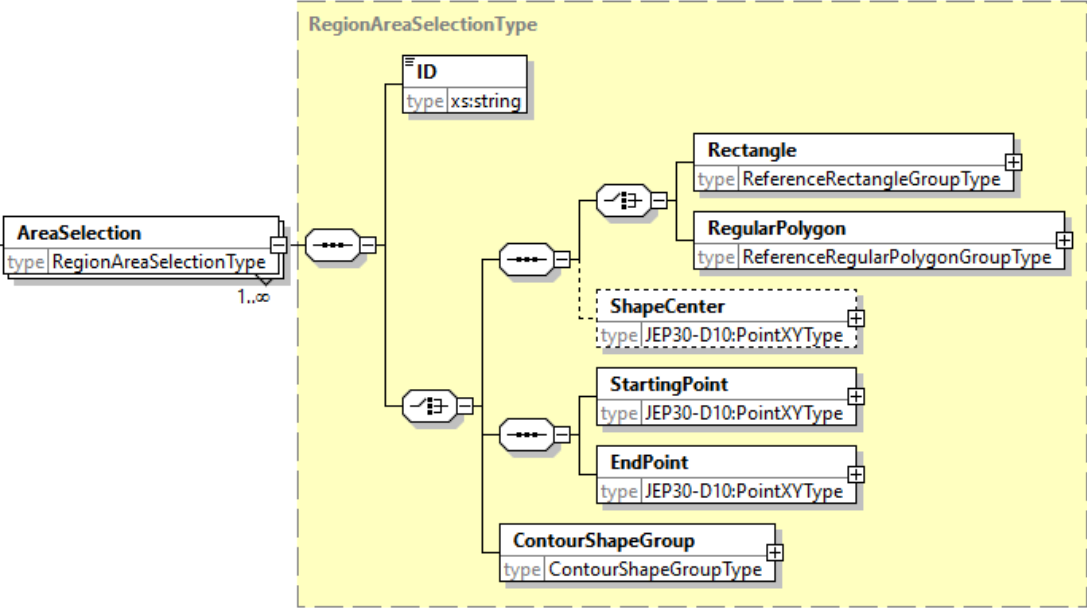
### 6.5.1.3 Terminal Group to Terminal Group Relationships

path	<a href="#">PartModel/PackageSection/Die-Array/Die/TerminalGroups/TerminalGroup-Array/TerminalGroupToTerminalGroupRelationships</a>
diagram	
type	<a href="#">DieTerminalGroupToTerminalGroupRelationshipsType</a> , <a href="#">JEP30-D10:PointXYType</a>

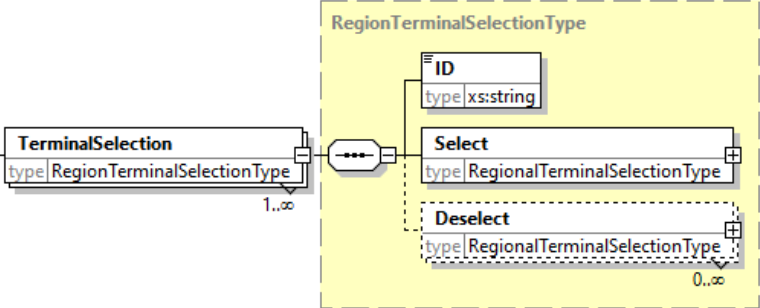
### 6.5.2 Terminal Regions - Array

path	<a href="#">PartModel/PackageSection/Die-Array/Die/TerminalGroups/Regions-Array</a>
diagram	
type	<a href="#">Region-ArrayType</a> , <a href="#">RegionType</a> , <a href="#">RegionAreaSelectionType</a> , <a href="#">RegionTerminalSelectionType</a> .

6.5.2.1      Area Selection

path	PartModel/PackageSection/Die-Array/Die/TerminalGroups/Regions-Array/Region/AreaSelection
diagram	 <p>The diagram illustrates the structure of the <b>AreaSelection</b> type. It is defined as a sequence of <b>RegionAreaSelectionType</b> elements, indicated by a multiplicity of 1..∞. The <b>RegionAreaSelectionType</b> is a complex type containing several elements: an <b>ID</b> element of type <b>xs:string</b>; a choice of two elements: a <b>Rectangle</b> element of type <b>ReferenceRectangleGroupType</b> and a <b>RegularPolygon</b> element of type <b>ReferenceRegularPolygonGroupType</b>; a <b>ShapeCenter</b> element of type <b>JEP30-D10:PointXYType</b>; a <b>StartingPoint</b> element of type <b>JEP30-D10:PointXYType</b>; an <b>EndPoint</b> element of type <b>JEP30-D10:PointXYType</b>; and a <b>ContourShapeGroup</b> element of type <b>ContourShapeGroupType</b>.</p>
type	RegionAreaSelectionType, ReferenceRectangleGroupType, ReferenceRegularPolygonGroupType, JEP30-D10:PointXYType, ContourShapeGroupType.

6.5.2.2      Terminal Selection

path	PartModel/PackageSection/Die-Array/Die/TerminalGroups/Regions-Array/Region/TerminalSelection
diagram	 <p>The diagram illustrates the structure of the <b>TerminalSelection</b> type. It is defined as a sequence of <b>RegionTerminalSelectionType</b> elements, indicated by a multiplicity of 1..∞. The <b>RegionTerminalSelectionType</b> is a complex type containing several elements: an <b>ID</b> element of type <b>xs:string</b>; a <b>Select</b> element of type <b>RegionalTerminalSelectionType</b>; and a <b>Deselect</b> element of type <b>RegionalTerminalSelectionType</b>. The <b>Deselect</b> element is shown with a dashed border and a multiplicity of 0..∞.</p>
type	RegionTerminalSelectionType, RegionalTerminalSelectionType.

6.5.2.2.1 Select

path	PartModel/PackageSection/Die-Array/Die/TerminalGroups/Regions-Array/Region/TerminalSelection/Select, PartModel/PackageSection/Die-Array/Die/TerminalGroups/Regions-Array/Region/TerminalSelection/Deselect
diagram	
type	RegionalTerminalSelectionType.

6.5.3 Terminal Materials - Array

path	PartModel/PackageSection/Die-Array/Die/TerminalGroups/TerminalMaterial-Array
diagram	
type	DieTerminalMaterial-ArrayType, DieTerminalMaterialType, J-Std-609AlloyCompositionType, J-Std-609e-codeType, BaseMaterialType, Plating-ArrayType.

The *J-Std-609AlloyComposition* and *J-Std-609e-code* enumerated values are defined in “Annex A (informative) Example Alloys and Associated Material Codes” in the J-Std-609, “Marking, Symbols, and Labels of Leaded and Lead-Free Terminal Finished Materials Used in Electronic Assembly” standard.

The is *PlatingThicknessUOM* specified in *um*.

6.5.4 Terminal Shape - Array

path	PartModel/PackageSection/Die-Array/Die/TerminalGroups/TerminalShape-Array
diagram	
type	DieTerminalShape-ArrayType, DieTerminalShapeType, DieTerminalStructuralType, DieTerminalSoldermaskOpeningType, DieTerminalPadType.

The *TerminalShape-Array* for Die’s is a subset of the shapes defined in section 5.13.1.7 Terminal Shape above.

6.5.4.1 Terminal

path	PartModel/PackageSection/Die-Array/Die/TerminalGroups/TerminalShape-Array/TerminalShape/Terminal
diagram	
type	DieTerminalStructuralType, JEP30-D10:EmptyType, ReferenceRectangleGroupType, ReferenceRoundedRectangleGroupType, ReferenceModifiedRectangleGroupType, ReferenceCircleGroupType, ReferenceDouble-DGroupType, ReferenceRegularPolygonType, ReferenceTerminalContourGroupType, JEP30-D10:UnspecifiedDimensionalValueSetType.

6.5.4.2      Soldermask Opening

path	PartModel/PackageSection/Die-Array/Die/TerminalGroups/TerminalShape-Array/TerminalShape/SoldermaskOpening
diagram	
type	DieTerminalSoldermaskOpeningType, JEP30-D10:UnspecifiedDimensionalValueSetType, ReferenceRectangleGroupType, ReferenceRoundedRectangleGroupType, ReferenceModifiedRectangleGroupType, ReferenceCircleGroupType, ReferenceDouble-DGroupType, ReferenceRegularPolygonType, ReferenceTerminalContourGroupType.

6.5.4.3 Pad

path	PartModel/PackageSection/Die-Array/Die/TerminalGroups/TerminalShape-Array/TerminalShape/Pad
diagram	<p>The diagram illustrates the structure of the <b>Pad</b> type. It is defined as a <b>DieTerminalPadType</b>. The <b>DieTerminalPadType</b> is a composite type that includes several subtypes, each associated with a specific group type:</p> <ul style="list-style-type: none"><li><b>PadThickness</b>: type <b>JEP30-D10:UnspecifiedDimensionalValueSetGroupType</b></li><li><b>Rectangle</b>: type <b>ReferenceRectangleGroupType</b></li><li><b>RoundedRectangle</b>: type <b>ReferenceRoundedRectangleGroupType</b></li><li><b>ModifiedRectangle</b>: type <b>ReferenceModifiedRectangleGroupType</b></li><li><b>Circle</b>: type <b>ReferenceCircleGroupType</b></li><li><b>Double-D</b>: type <b>ReferenceDouble-DGroupType</b></li><li><b>RegularPolygon</b>: type <b>ReferenceRegularPolygonType</b></li><li><b>Contour</b>: type <b>ReferenceTerminalContourGroupType</b></li></ul>
type	<b>DieTerminalPadType</b> , <b>JEP30-D10:UnspecifiedDimensionalValueSetType</b> , <b>ReferenceRectangleGroupType</b> , <b>ReferenceRoundedRectangleGroupType</b> , <b>ReferenceModifiedRectangleGroupType</b> , <b>ReferenceCircleGroupType</b> , <b>ReferenceDouble-DGroupType</b> , <b>ReferenceRegularPolygonType</b> , <b>ReferenceTerminalContourGroupType</b> .



6.5.5 Terminal Specification - Array

path	PartModel/PackageSection/Die-Array/Die/TerminalGroups/TerminalSpecification-Array
diagram	<p>The diagram illustrates the structure of the Terminal Specification - Array. It shows a <b>TerminalSpecification-Array</b> (type <code>DieTerminalSpecification-ArrayType</code>) containing a <b>TerminalSpecification</b> (type <code>DieTerminalSpecificationType</code>) with a cardinality of 1..∞. The <b>TerminalSpecification</b> is further detailed within a dashed box labeled <code>DieTerminalSpecificationType</code>, which includes: <b>TerminalPatternID</b> (type <code>xs:string</code>), <b>PatternGroupID</b> (type <code>xs:string</code>), <b>TerminalGroupID</b> (type <code>xs:string</code>), <b>TerminalRegionID</b> (type <code>xs:string</code>), <b>Mechanical</b> (type <code>JEP30-D10:EmptyType</code>), <b>Thermal</b> (type <code>JEP30-D10:EmptyType</code>), <b>Electrical</b> (type <code>JEP30-D10:EmptyType</code>), <b>TerminalMaterialID</b> (type <code>xs:string</code>), <b>CTE-ID</b> (type <code>xs:string</code>), and <b>TerminalShapeID</b> (type <code>xs:string</code>). The <b>TerminalSpecification</b> is connected to the <b>TerminalSpecification-Array</b> via a dashed line with a cardinality of 1..∞. The <b>TerminalSpecification</b> is also connected to the <b>TerminalSpecification-Array</b> via a dashed line with a cardinality of 1..∞.</p>
type	TerminalSpecification-ArrayType, TerminalSpecificationType, JEP30-D10:EmptyType

6.5.6 Terminal Detail - Array

path	PartModel/PackageSection/Die-Array/Die/TerminalGroups/TerminalDetail-Array
diagram	<p>The diagram illustrates the structure of the Terminal Detail - Array. It shows a <b>TerminalDetail-Array</b> (type <code>DieTerminalDetail-ArrayType</code>) containing a <b>DieTerminalDetail</b> (type <code>DieTerminalDetailType</code>) with a cardinality of 0..∞. The <b>DieTerminalDetail</b> is further detailed within a dashed box labeled <code>DieTerminalDetailType</code>, which includes: <b>FirstTerminalLocation</b> (type <code>DieFirstTerminalLocationType</code>), <b>TerminalNumberPattern</b> (type <code>DieTerminalNumberPatternType</code>) with a cardinality of 0..∞, and <b>TerminalDetailExceptions</b> (type <code>DieTerminalDetailExceptionsType</code>) with a cardinality of 0..∞. The <b>TerminalDetail-Array</b> is connected to the <b>DieTerminalDetail</b> via a dashed line with a cardinality of 0..∞. The <b>DieTerminalDetail</b> is also connected to the <b>TerminalDetail-Array</b> via a dashed line with a cardinality of 0..∞. A <b>constraints</b> box is shown at the bottom of the diagram.</p>
type	DieTerminalDetail-ArrayType, DieTerminalDetailType, DieFirstTerminalLocationType, DieTerminalNumberPatternType, DieTerminalDetailExceptionsType.

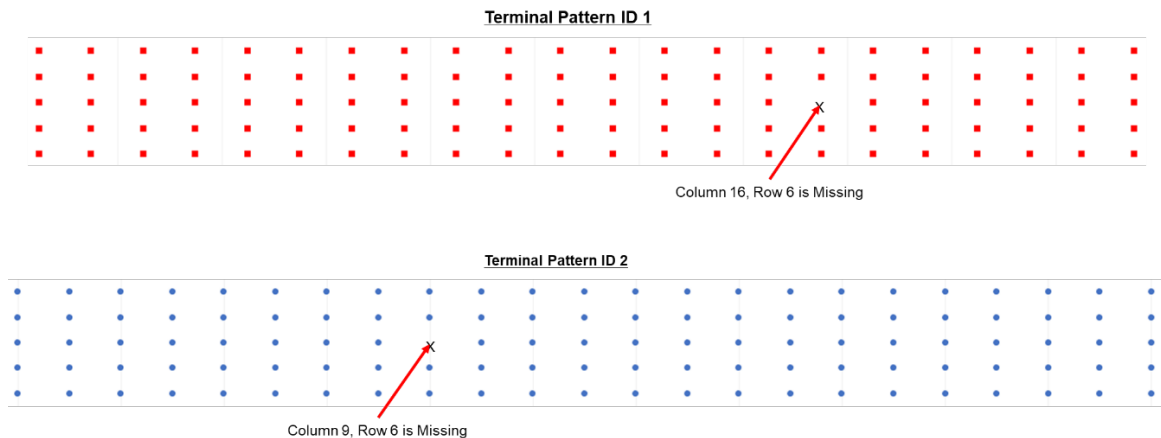
### 6.5.6.1 Terminal Detail

path	PartModel/PackageSection/Die-Array/Die/TerminalGroups/TerminalDetail-Array/TerminalDetail
diagram	<p>The diagram illustrates the structure of the <b>TerminalDetail</b> element. It is a sequence of the following elements:</p> <ul style="list-style-type: none"> <li><b>ID</b> (type: xs:string)</li> <li><b>TerminalNumber</b> (type: xs:string)</li> <li><b>TerminalCenter</b> (type: TerminalCenterType)</li> <li>A choice of one of the following: <ul style="list-style-type: none"> <li><b>TerminalPatternID</b> (type: xs:string)</li> <li><b>PatternGroupID</b> (type: xs:string)</li> <li><b>TerminalGroupID</b> (type: xs:string)</li> <li><b>RegionID</b> (type: xs:string)</li> </ul> </li> <li><b>ActiveZone</b> (type: JEP30-D10:EmptyType)</li> <li>A choice of one of the following: <ul style="list-style-type: none"> <li><b>RowTerminalIndex</b> (type: JEP30-D10:MinIntegerOfOneType, minIncl=1, maxIncl=1)</li> <li><b>ColumnTerminalIndex</b> (type: JEP30-D10:MinIntegerOfOneType, minIncl=1, maxIncl=1)</li> <li><b>PolarTerminalIndex</b> (type: JEP30-D10:MinIntegerOfOneType, minIncl=1, maxIncl=1)</li> </ul> </li> <li>A choice of one of the following: <ul style="list-style-type: none"> <li><b>TerminalStatus</b> (type: DieTerminalStatusType)</li> <li><b>IgnoreForLandPattern</b> (type: JEP30-D10:EmptyType)</li> </ul> </li> </ul> <p>The <b>DieTerminalStatusType</b> is further defined as a choice of one of the following:</p> <ul style="list-style-type: none"> <li><b>Missing</b> (type: JEP30-D10:EmptyType)</li> <li><b>Deleted</b> (type: JEP30-D10:EmptyType)</li> <li><b>Excluded</b> (type: JEP30-D10:EmptyType)</li> <li><b>Associated</b> (type: AssociatedDieTerminalStatusType)</li> </ul>
type	DieTerminalDetailType, TerminalCenterType, JEP30-D10:EmptyType, JEP30-D10:MinIntegerOfOneType, DieTerminalStatusType.

Similar to section 5.13.3.1 Terminal Detail above, this section identifies the relationship between the electrical *TerminalNumber* and the physical terminal location in the *ActiveZone*. The physical terminal location can be defined by a set of x,y coordinates, or by a combination of two choices, where the first choice is the identification of either the *TerminalPattern*, *PatternGroup* or the *TerminalGroup*, and the second choice is the combination of *RowTerminalIndex* and the *ColumnTerminalIndex* or the *PolarTerminalIndex*. TerminalDetail is primarily used when there is a need to specify the details for individual terminals that do not fit a pattern. This can be an excessive overhead for quantity of terminals, so it is preferred to use *TerminalNumberingPattern* as defined in section 6.5.7.2 below.

### 6.5.7.1 Terminal Detail (cont'd)

Based on Figure 22 - Single UCle Instantiation in South Channel Inst 1 above, *TerminalNumber* 196 is missing from *TerminalPatternID* 1, and *TerminalNumber* 234 is missing from *TerminalPatternID* 1. However, these Terminal numbers change from one instantiation to the next so a reference to the *TerminalNumber* for the purpose of specifying a missing status is incorrect, if you want to ensure that these relative locations are missing from every instantiation of these terminal patterns. In this case, reference to these missing terminals should be based their index location with respect to their terminal pattern, as shown in Figure 24.



**Figure 24 - Missing Terminal for Terminal Patterns**

Specifying the missing terminal from the Terminal Pattern by reference to its location as opposed to a specific terminal number, means that by duplicating this pattern to other locations, the same respective terminal location within that pattern ID would have the same terminal status.

The status of *Missing*, *Deleted* and *Excluded* are defined in section called “Terminal-count suffixes” of JESD30.

```
<TerminalDetail>
  <ID>1</ID>
  <TerminalPatternID>1</TerminalPatternID>
  <RowTerminalIndex>3</RowTerminalIndex>
  <ColumnTerminalIndex>16</ColumnTerminalIndex>
  <TerminalStatus>
    <Missing/>
  </TerminalStatus>
</TerminalDetail>
<TerminalDetail>
  <ID>2</ID>
  <TerminalPatternID>2</TerminalPatternID>
  <RowTerminalIndex>3</RowTerminalIndex>
  <ColumnTerminalIndex>9</ColumnTerminalIndex>
  <TerminalStatus>
    <Missing/>
  </TerminalStatus>
</TerminalDetail>
```

6.5.6.2 First Terminal Location

path	PartModel/PackageSection/Die-Array/Die/TerminalGroups/TerminalDetail-Array//FirstTerminalLocation
diagram	
type	DieFirstTerminalLocationType, JEP30-D10:EmptyType, TerminalCenterType, JEP30-D10:MinIntegerOfOneType, LocationRelative-to-SelectionCenterType, LocationRelative-to-SelectionCenterCodeType, LocationRelative-to-SelectionCenterDescriptionType.

The enumerated values for the *LocationRelative-to-SelectionCenter* (Code and Description) are defined in Table 53.

### 5.13.3.2.1 First Terminal Location (cont'd)

**Table 53 - Location Relative to Selection Center**

Code	Description
SW	Southwest
SE	Southeast
NE	Northeast
NW	Northwest
BL	Back-Left
BC	Back-Center
BR	Back-Right
FL	Front-Left
FC	Front-Center
FR	Front-Right
LB	Left-Bottom
LC	Left-Center
LT	Left-Top
RB	Right-Bottom
RC	Right-Center
RT	Right-Top
L	Left
B	Back
R	Right
F	Front

Reference the “Single Position” single terminal illustrations in JESD30, Annex A for graphical representations of some of the above descriptions.

6.5.6.3 Terminal Number Pattern

path	PartModel/PackageSection/Die-Array/Die/TerminalGroups/TerminalDetail-Array/TerminalNumberPattern
diagram	<p>The diagram illustrates the structure of the <code>DieTerminalNumberPatternType</code>. It is a complex type that can contain multiple instances (0..∞) of itself, as indicated by the <code>TerminalNumberPattern</code> element on the left. The structure includes an <code>ID</code> (xs:string), a choice of identifiers (<code>TerminalPatternID</code>, <code>PatternGroupID</code>, <code>TerminalGroupID</code>, or <code>RegionID</code>, all xs:string) with a cardinality of 1..∞, an <code>ActiveZone</code> (JEP30-D10:EmptyType), a choice of <code>Prefix</code> or <code>Suffix</code> (xs:string) with a cardinality of 0..2, and a choice of ordering types (<code>Sequential</code> or <code>Grid</code>) with a cardinality of 1..∞.</p>
type	DieTerminalNumberPatternType, SequentialTerminalNumberOrderingType, GridTerminalNumberOrderingType.
group	NumberingRestrictionGroup

The *TerminalNumberPattern* section that can be defined specifically to a *TerminalPattern*, *PatternGroup*, *TerminalGroup* or to all the terminals within a specific *TerminalRegion*, or finally to all the terminals within an *ActiveZone*.

6.5.6.4 Terminal Details Exception

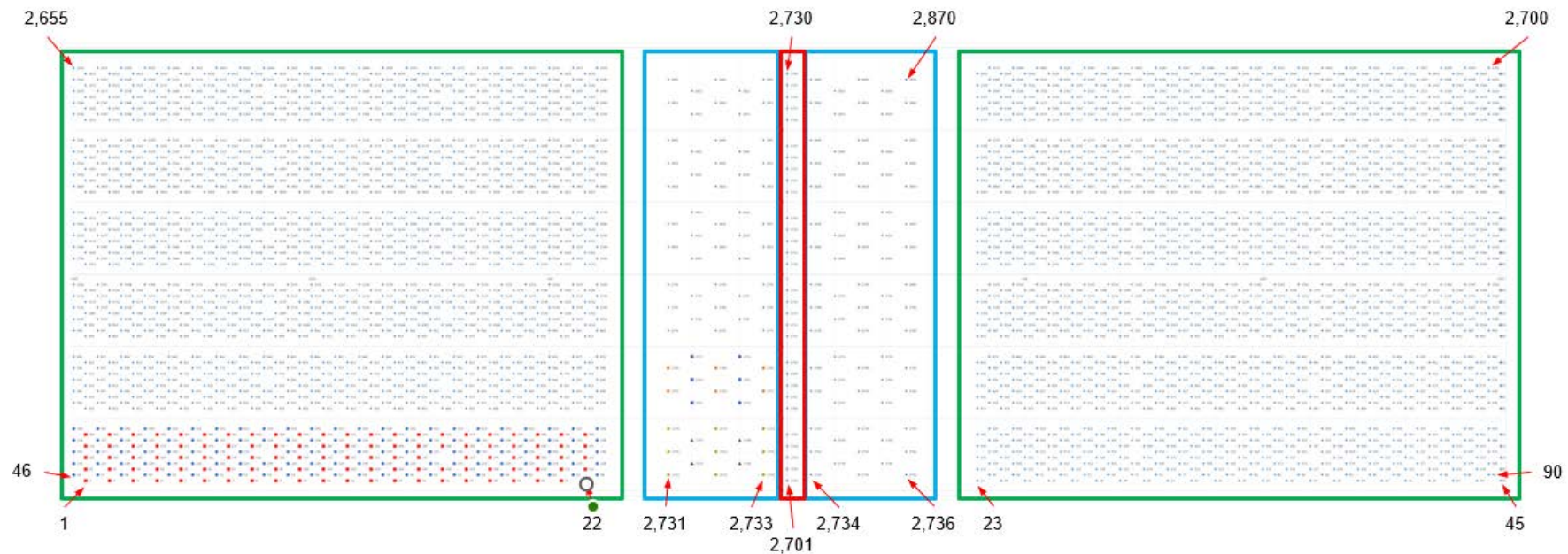
path	PartModel/PackageSection/Die-Array/Die/TerminalGroups/TerminalDetail-Array/TerminalDetailExceptions
diagram	<p>The diagram illustrates the structure of the <code>TerminalDetailExceptions</code> element. It is a sequence of elements within a container <code>DieTerminalDetailExceptionsType</code>. The elements are: <code>TerminalPatternID</code> (type <code>xs:string</code>), <code>PatternGroupID</code> (type <code>xs:string</code>), <code>TerminalGroupID</code> (type <code>xs:string</code>), <code>RegionID</code> (type <code>xs:string</code>), <code>ActiveZone</code> (type <code>JEP30-D10:EmptyType</code>), <code>TerminalCenter-Array</code> (type <code>JEP30-D10:TerminalCenter-ArrayType</code>), <code>TerminalIndex</code> (type <code>JEP30-D10:TerminalIndexType</code>), and <code>TerminalNumber</code> (type <code>JEP30-D10:TerminalNumberType</code>). A choice element for <code>TerminalStatus</code> (type <code>DieTerminalStatusType</code>) is also present, which contains a choice of <code>Missing</code> (type <code>JEP30-D10:EmptyType</code>), <code>Deleted</code> (type <code>JEP30-D10:EmptyType</code>), <code>Excluded</code> (type <code>JEP30-D10:EmptyType</code>), and <code>Associated</code> (type <code>AssociatedDieTerminalStatusType</code>). A <code>FootnoteID</code> (type <code>xs:string</code>, 0..∞) is also present.</p>
type	<code>DieTerminalDetailExceptionsType</code> , <code>JEP30-D10:EmptyType</code> , <code>TerminalCenter-ArrayType</code> , <code>TerminalIndexType</code> , <code>TerminalNumberType</code> , <code>DieTerminalStatusType</code> , <code>AssociatedDieTerminalStatusType</code> .

Referring to the example defined in section 6.5.1.1 Terminal Group above, Figure 25 shows the terminal numbering sequence for all the terminals that make up Bank 1. Here you can see 3 distinct patterns each with their own numbering sequence.

6.5.6.4.1 Associated

path	PartModel/PackageSection/Die-Array/Die/TerminalGroups/TerminalDetail-Array/TerminalDetailExceptions/TerminalStatus/Associated
diagram	<p>AssociatedDieTerminalStatusType</p> <ul style="list-style-type: none"><li>ReferenceTerminalPatternID (type xs:string)</li><li>ReferencePatternGroupID (type xs:string)</li><li>ReferenceTerminalGroupID (type xs:string)</li><li>ReferenceRegionID (type xs:string)</li><li>ActiveZone (type JEP30-D10:EmptyType)</li><li>TerminalCenter (type TerminalCenterType)</li><li>RowTerminalIndex (type JEP30-D10:MinIntegerOfOneType, minIncl/maxIncl 1)</li><li>ColumnTerminalIndex (type JEP30-D10:MinIntegerOfOneType, minIncl/maxIncl 1)</li><li>PolarTerminalIndex (type JEP30-D10:MinIntegerOfOneType, minIncl/maxIncl 1)</li><li>LocationRelative-to-PackageCenter (type LocationRelative-to-PackageCenterType)</li></ul>
type	AssociatedDieTerminalStatusType, JEP30-D10:EmptyType, TerminalCenterType, JEP30-D10:MinIntegerOfOneType, LocationRelative-to-PackageCenterType.





**Figure 25 - Terminal Numbering Sequence for Bank 1**

Pattern Group ID 3 is represented within the two extremity columns within the green outlines. Refer to Table 49 - Pattern Group Construction above for details of the Terminal patterns that makes the first pattern group which is duplicated 6 times to make the South channel before being duplicated again and mirrored to make the north channel. This pattern group has a terminal numbering sequence of Zig-Zag-Horizontal with a commencing location at the Back-left position starting at the number 1 and ends at 2700.

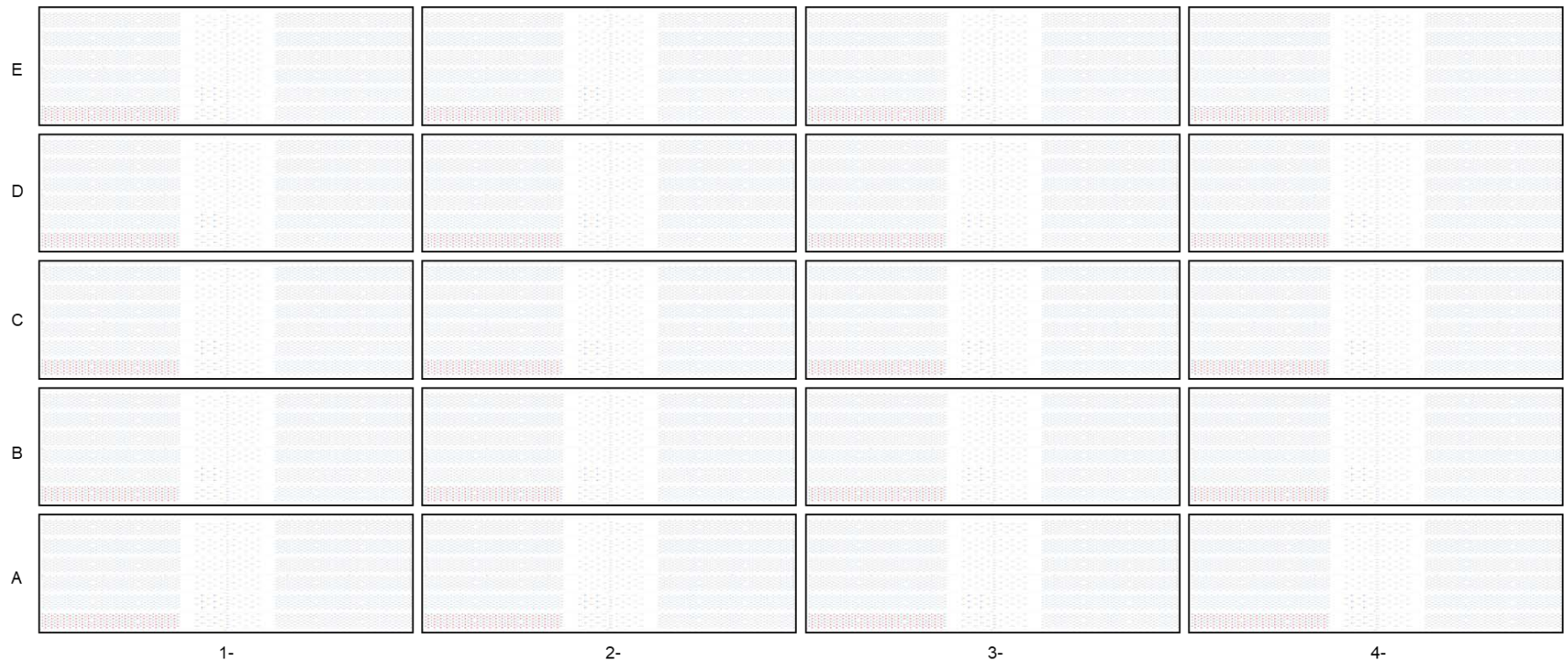
Pattern Group ID 10 is represented by the center red box and has a commencing location at the Back position starting at the number 2701 and ends at 2730 in the front position.

Pattern Group ID 9 is represented by the blue boxes on either side of pattern group 10 and has a commencing location at the Back-left (Southwest or Left-Bottom) position starting at the number 2731 and ends at 2870 in the Front-right (Northeast or Right-Top) position.

The xml representation for this terminal numbering for Bank 1 is as follows:

```
<TerminalDetail-Array>
  <TerminalNumberPattern>
    <ID>Terminal Number Pattern ID 1</ID>
    <PatternGroupID>Pattern Group ID 3</PatternGroupID>
    <FirstTerminalLocation>
      <LocationRelative-to-SelectionCenter>
        <Description>Back-left</Description>
      </LocationRelative-to-SelectionCenter>
    </FirstTerminalLocation>
    <Sequential>
      <Description>Zig-Zag-Horizontal</Description>
    </Sequential>
  </TerminalNumberPattern>
  <TerminalNumberPattern>
    <ID>Terminal Number Pattern ID 2</ID>
    <PatternGroupID>Pattern Group ID 10</PatternGroupID>
    <FirstTerminalLocation>
      <LocationRelative-to-SelectionCenter>
        <Description>Back</Description>
      </LocationRelative-to-SelectionCenter>
    </FirstTerminalLocation>
    <Sequential>
      <Description>Back-to-Front</Description>
      <NumericalSequence>
        <Start>2701</Start>
      </NumericalSequence>
    </Sequential>
  </TerminalNumberPattern>
  <TerminalNumberPattern>
    <ID>Terminal Number Pattern ID 3</ID>
    <PatternGroupID>Pattern Group ID 9</PatternGroupID>
    <FirstTerminalLocation>
      <LocationRelative-to-SelectionCenter>
        <Description>Back</Description>
      </LocationRelative-to-SelectionCenter>
    </FirstTerminalLocation>
    <Sequential>
      <Description>Zig-Zag-Horizontal</Description>
      <NumericalSequence>
        <Start>2731</Start>
      </NumericalSequence>
    </Sequential>
  </TerminalNumberPattern>
</TerminalDetail-Array>
```

Assume now that Bank 1 is just one bank of an array of banks as shown in Figure 26 below



**Figure 26 - An Array of Banks in a Zone**

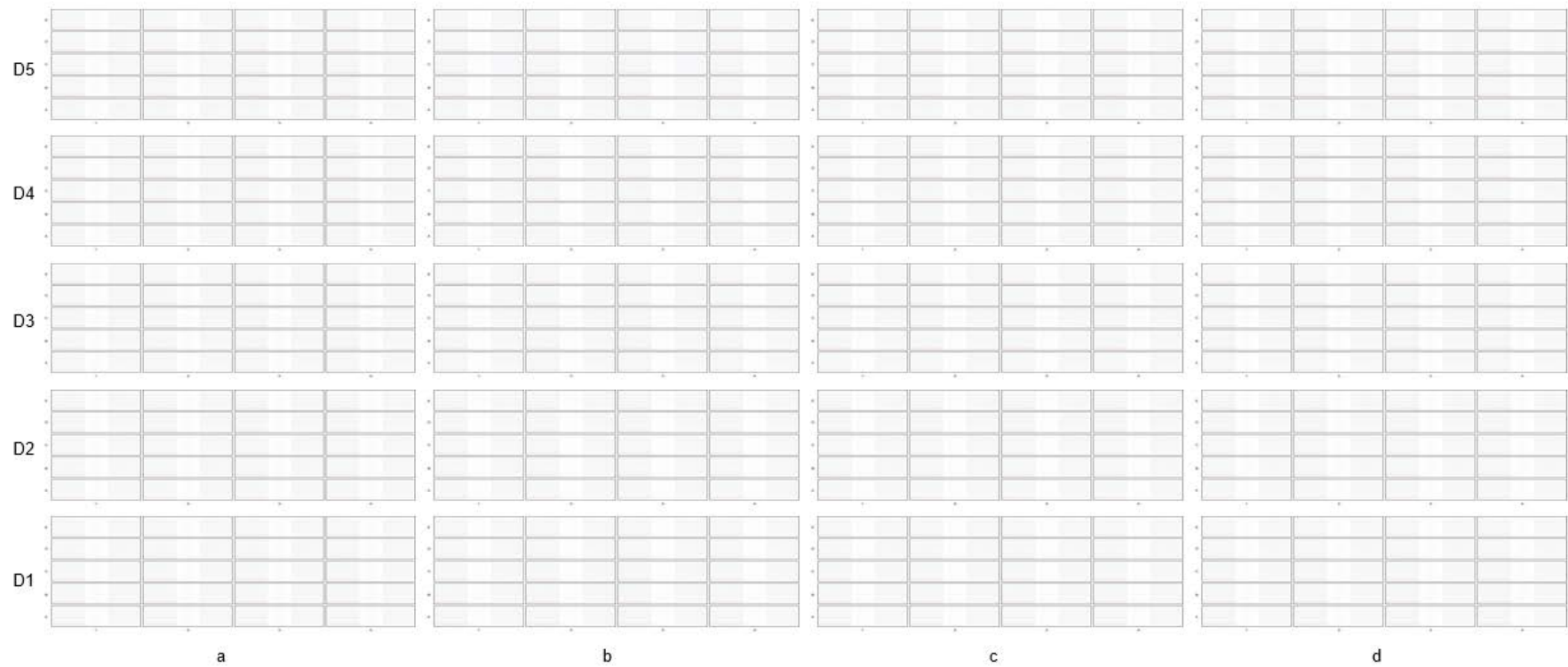
Bank 1 as defined in Figure 25 - Terminal Numbering Sequence for Bank 1 above is replicated in an array of 5 rows and 4 columns. Assume that the user wants to maintain the terminal numbering sequence as defined in Bank 1 for each of these blocks within the array, with the only difference being the pattern location within the array as the prefix before the terminal number.

```
<PatternGroup>
  <ID>Pattern Group ID 12</ID>
  <Name>South_Inst1-6_PtrnGrp1</Name>
  <PatternRelationship>
    <PatternGroupID>Pattern Group ID 11</PatternGroupID>
    <Duplicate>
      <nx>4</nx>
      <ny>5</ny>
      <Y-PrefixCode>A</Y-PrefixCode>
      <Y-PrefixCode>B</Y-PrefixCode>
      <Y-PrefixCode>C</Y-PrefixCode>
      <Y-PrefixCode>D</Y-PrefixCode>
      <Y-PrefixCode>E</Y-PrefixCode>
      <X-PrefixCode>1</X-PrefixCode>
      <X-PrefixCode>2</X-PrefixCode>
      <X-PrefixCode>3</X-PrefixCode>
      <X-PrefixCode>4</X-PrefixCode>
      <dx>4000.00</dx>
      <dy>3500.00</dy>
    </Duplicate>
  </PatternRelationship>
</PatternGroup>
```

Since the Y-PrefixCode is entered into the xml file before the X-PrefixCode, then the first terminal number for terminal 1 in Bank 1 in the zone position A1 becomes A1-1, The same respective terminal in the A2-1, A3-1, A4-1, B1-1, B2-1, and so on.

If nx and/or ny is a large number, then the prefix and/or suffix codes can be auto generated in a similar way as the numbering sequence is defined.

```
<PatternGroup>
  <ID>Pattern Group ID 12</ID>
  <Name>South_Inst1-6_PtrnGrp1</Name>
  <PatternRelationship>
    <PatternGroupID>Pattern Group ID 11</PatternGroupID>
    <Duplicate>
      <nx>4</nx>
      <ny>5</ny>
      <Y-PrefixColumnCode>
        <AlphabeticalSequence/>
        <Back-to-Front/>
      </Y-PrefixColumnCode>
      <X-PrefixRowCode>
        <NumericalSequence>
          <Suffix>-</Suffix>
        </NumericalSequence>
        <Left-to-Right/>
      </X-PrefixRowCode>
      <dx>4000.00</dx>
      <dy>3500.00</dy>
    </Duplicate>
  </PatternRelationship>
</PatternGroup>
```



**Figure 27 - An Array of Zones in One District**

Similar to the concepts of Banks within a Zone, an array of Zones can be embedded within a District. Each hierarchical level in the nesting of pattern groups brings with it a corresponding prefix/suffix that gets appended to the reference label of the terminal number. Therefore, in District D1a, Zone A1- the first terminal now becomes D1aA1-1.

## 6.6 GD and T Datum-to-Element Map Array

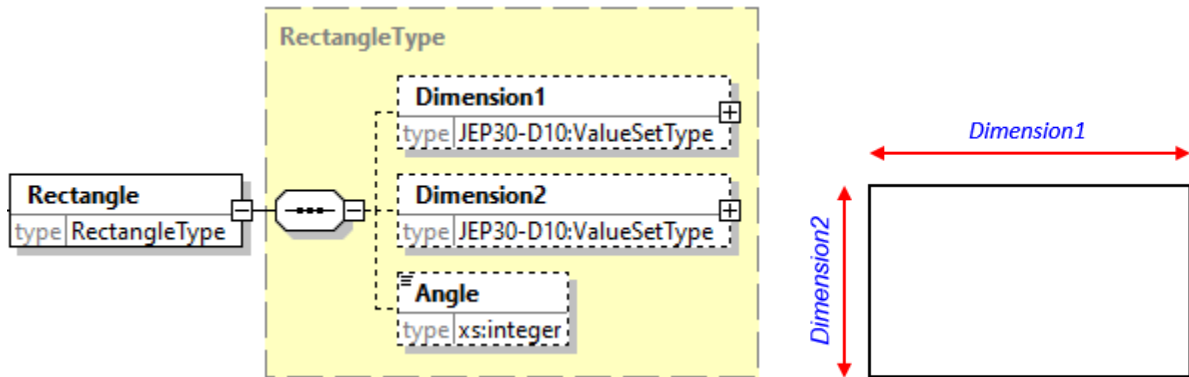
path	PartModel/PackageSection/Die-Array/Die/GDandTDatum-to-ElementMap-Array	
diagram	<pre> classDiagram     class GDA[GDandTDatum-to-ElementMap-Array] {         type DieGDandTDatum-to-ElementMap-ArrayType     }     class GDM[GDandTDatum-to-ElementMap] {         type DieGDandTDatum-to-ElementMapType     }     class ER[ElementRef] {         type xs:string     }     class Die {         type JEP30-D10:EmptyType     }     class TPR[TerminalPatternRef] {         type xs:string     }     class PGR[PatternGroupRef] {         type xs:string     }     class TGR[TerminalGroupRef] {         type xs:string     }     class TDR[TerminalDetailRef] {         type xs:string     }      GDA "0..*" -- "0..*" GDM     GDM "0..*" -- "0..*" ER     ER --&gt; Die     ER --&gt; TPR     ER --&gt; PGR     ER --&gt; TGR     ER --&gt; TDR </pre> <p>The diagram illustrates the structure of the <b>GDandTDatum-to-ElementMap-Array</b> type. It is an array of <b>GDandTDatum-to-ElementMap</b> types, which are themselves arrays of <b>ElementRef</b> types. The <b>ElementRef</b> types include <b>Die</b>, <b>TerminalPatternRef</b>, <b>PatternGroupRef</b>, <b>TerminalGroupRef</b>, and <b>TerminalDetailRef</b>.</p>	
type	DieGDandTDatum-to-ElementMap-ArrayType, DieGDandTDatum-to-ElementMapType, JEP30-D10:EmptyType	



## Annex A (informative) Shape Definitions & Dimensions

### A.1 Shape Definitions

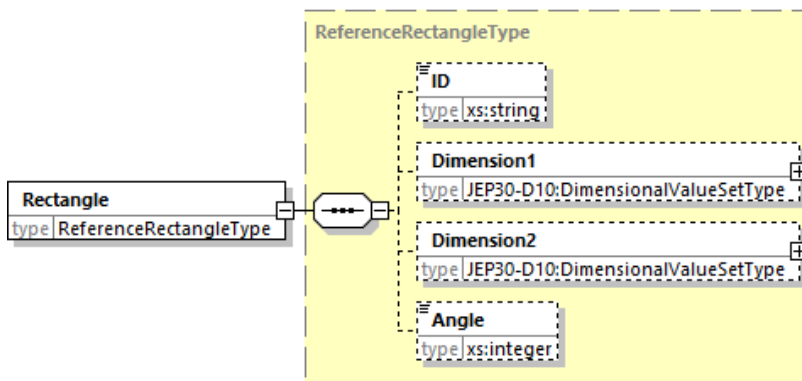
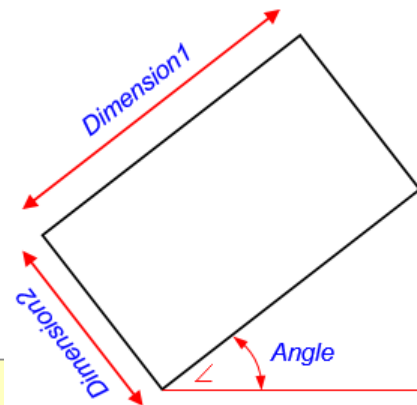
#### A.1.1 Rectangle



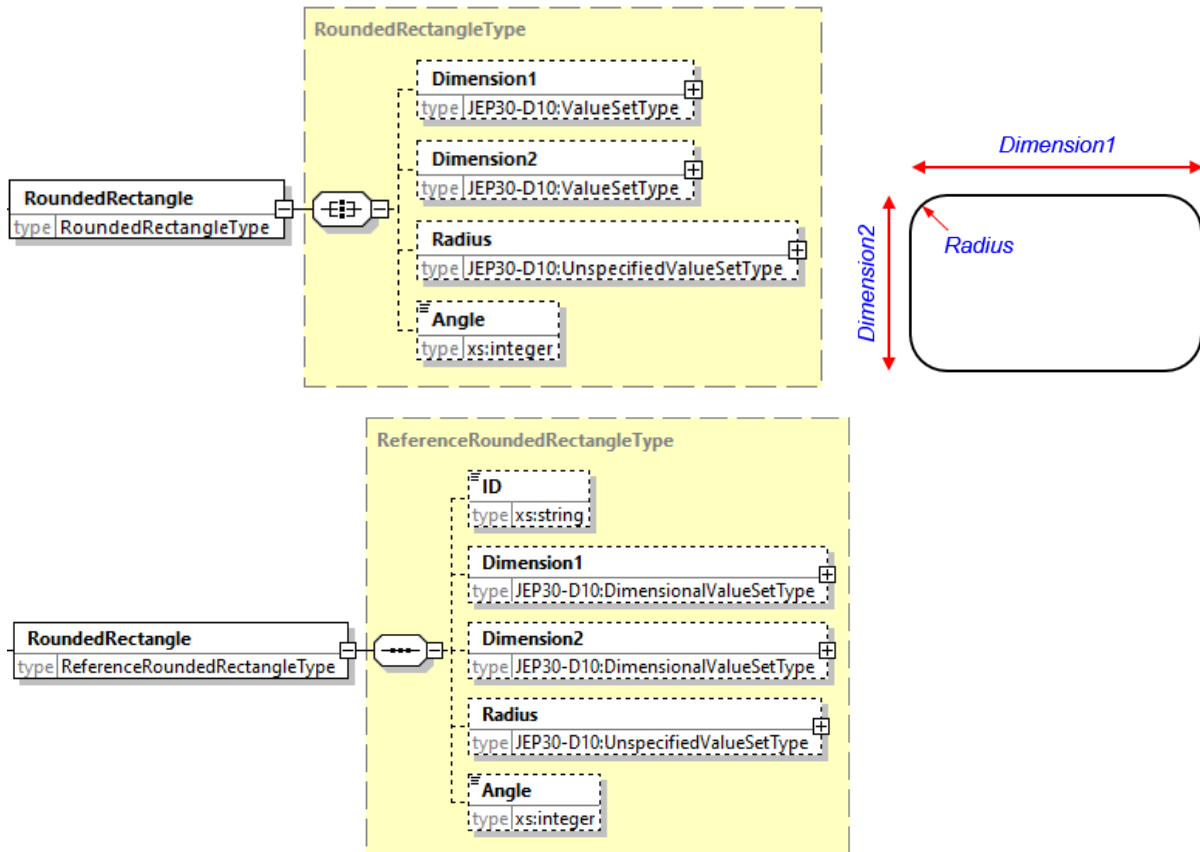
**Dimension1** is always in the x direction, horizontal direction, or in the direction from left-to-right.

**Dimension2** is always in the y direction, vertical direction, or in the direction from back-to-front.

The **Angle** is measured with respect to 3 o'clock or the horizontal line and is measured in a counter clockwise direction so 12 o'clock is considered 90 degrees, 9 o'clock is considered 180 degrees and 6 o'clock is considered 270 degrees.



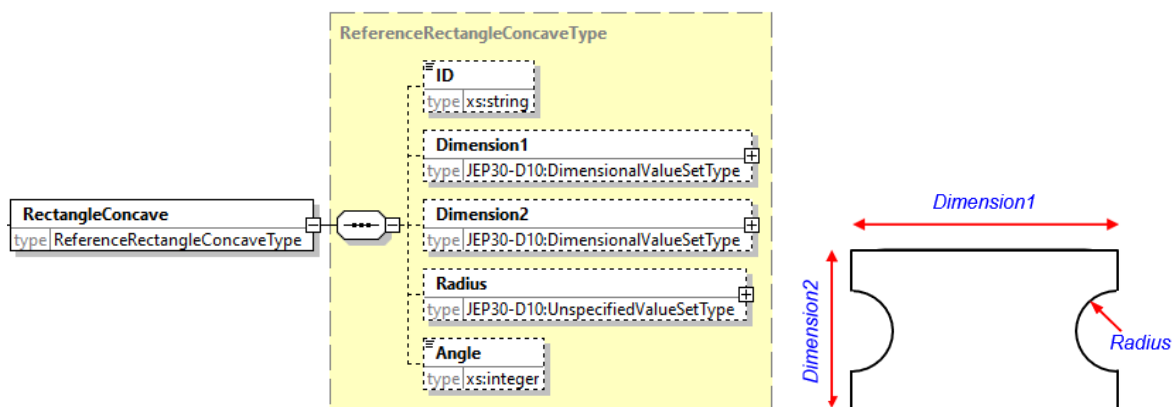
### A.1.2 Rounded Rectangle



*Dimension1*, *Dimension2* and *Angle* are the same as for *Rectangle*.

If all 4 corners have the same radius, then *RoundedRectangle* can be used. If the radius is different in any one corner, then *ModifiedRectangle* should be used.

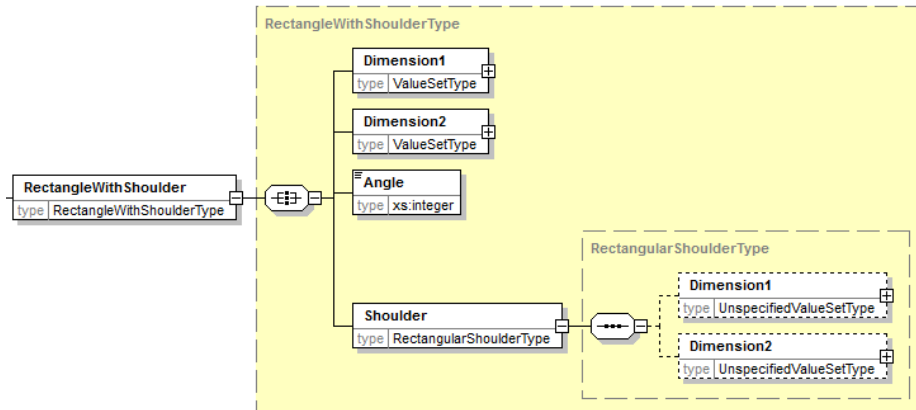
### A.1.3 Rounded Concave



*Dimension1*, *Dimension2* and *Angle* are the same as for *Rectangle*.



#### A.1.4 Rectangle with Shoulder

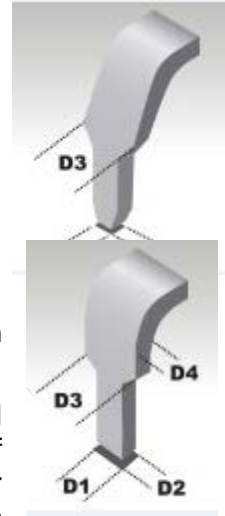


Some terminals have shoulders to control the depth of insertion into the printed board. Because hole diameter on the printed board is dependant upon many factors, one of which is the thickness of the printed board, due to aspect ratio due to ensure hole fill, some of these parts are unsuitable for thicker printed boards. If the hole size increases to be greater than the shoulder dimension, then the part can fall deeper into the hole. For this and similar reasons, shoulder dimensions should be captured.

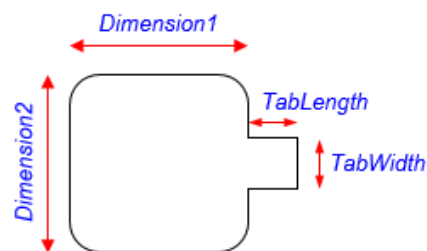
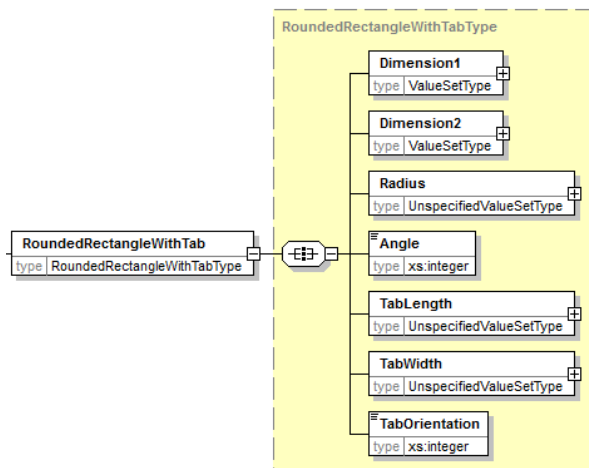
The [RectangleWithShoulder/Dimension1](#) (D1) is in the same direction as [RectangleWithShoulder/Shoulder/Dimension1](#) (D3).

Similarly the [RectangleWithShoulder/Dimension2](#) (D2) is in the same direction as [RectangleWithShoulder/Shoulder/Dimension2](#) (D4)

The [RectangleWithShoulder/Shoulder/Dimension1](#) and [RectangleWithShoulder/Shoulder/Dimension2](#) are optional, since either of these dimensions as [RectangleWithShoulder/Dimension1](#) or [RectangleWithShoulder/Dimension2](#), as can be seen from the 2<sup>nd</sup> image where D2 = D4. However this is not always the case, and if different, but unspecified, then the [Unspecified](#) element should be set under the [UnspecifiedValueSetType](#) as opposed to not populating the branches under the [Shoulder](#).

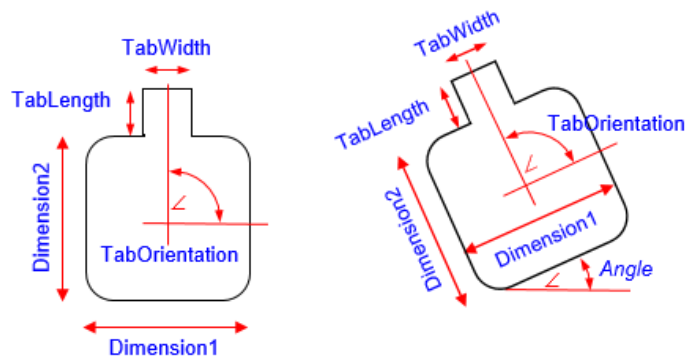


#### A.1.5 Rounded Rectangle with Tab

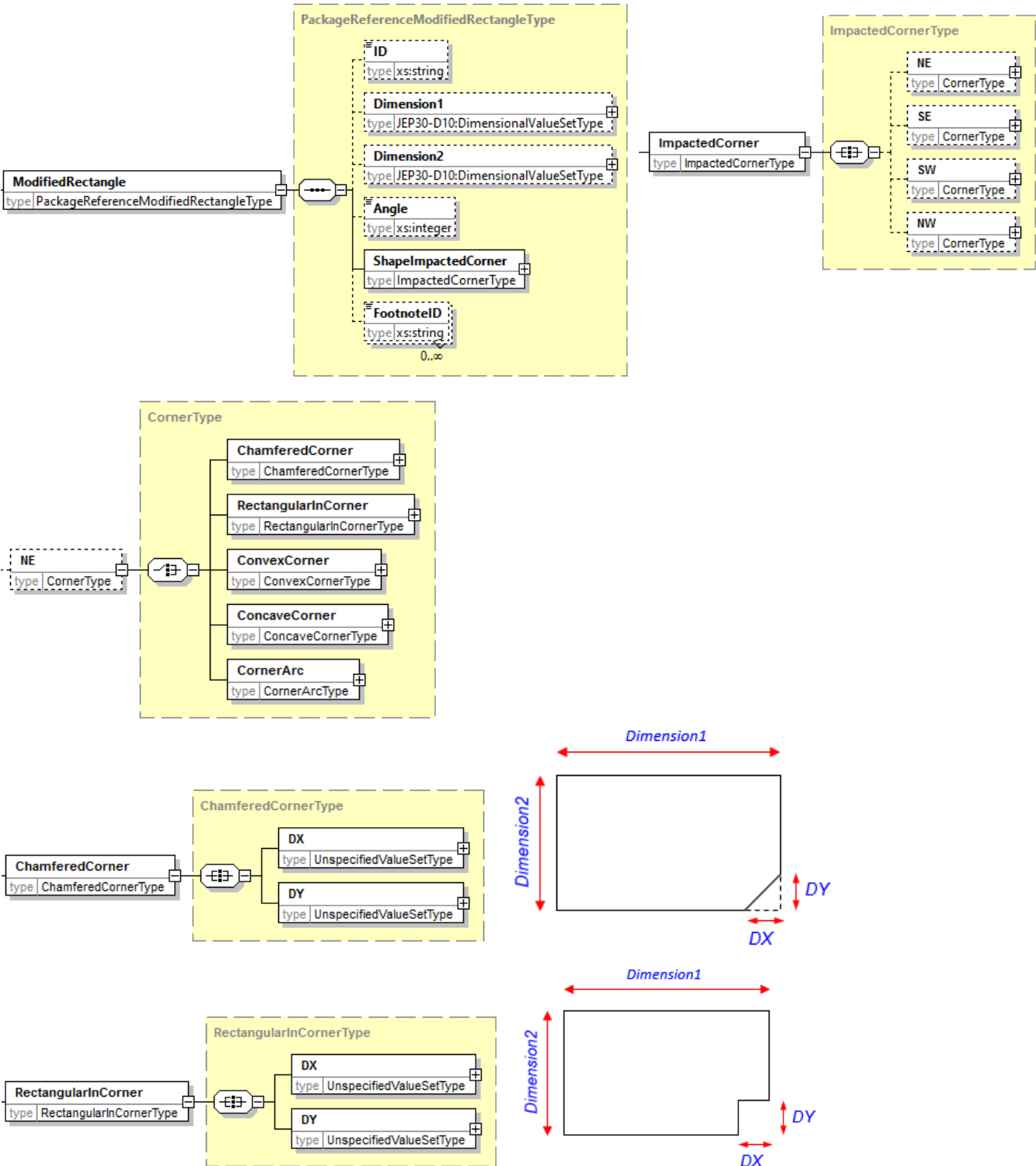


Irrespective of the orientation of the Tab, the *TabLength* is considered the direction away from the package body, while the *TabWidth* is considered the width of the tab parallel to the package body. The *TabOrientation* here is at 0 degrees, since the orientation follows the same rules as the *Angle*.

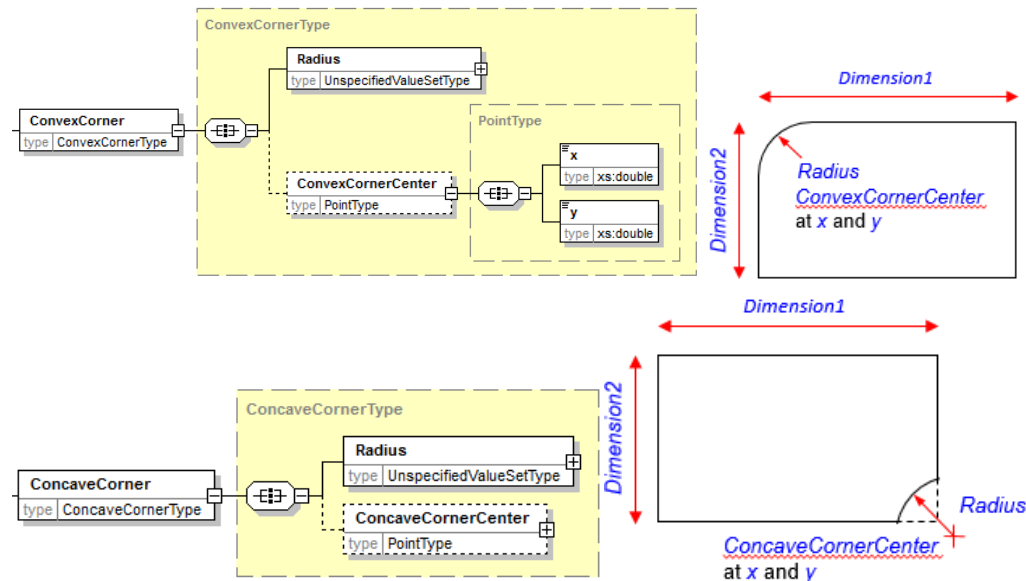
The *TabOrientation* is still captured with respect to the package body, In these 2 images, the *TabOrientation* is at 90° even if the package is rotated at an *Angle*.



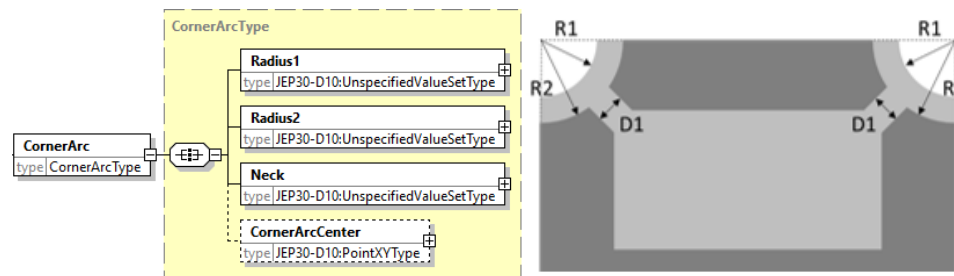
A.1.6 Modified Rectangle



## A.1.6 Modified Rectangle (cont'd)



Note that the **ConcaveCornerCenter** point of **x** and **y** is not necessary to be at the same point as the corner of the **ModifiedRectangle**. If unspecified, then it is defaulted to the corner of the **ModifiedRectangle**.

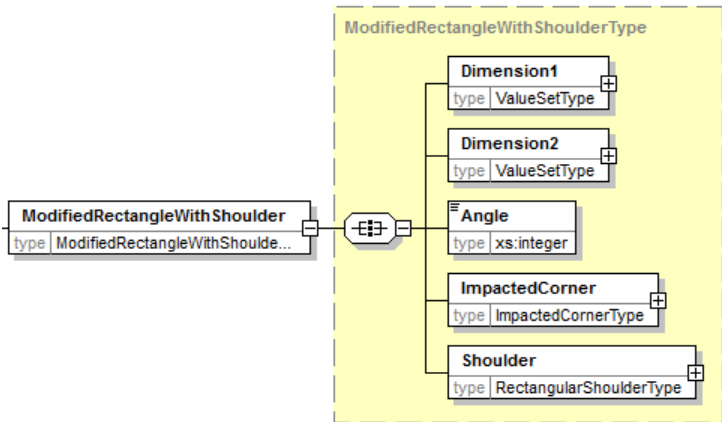


A **ModifiedRectangle** with **CornerArc** usually occurs when the Surface terminal is pulled back from the edge of the Package outline. In the majority of cases including those where the data is unspecified on the datasheet, we can assume that the center of the Arc from which (R1) **Radius1** and (R2) **Radius2** are defined, occurs at the linear intersection of the projection of the sides of the package body. This image shows that there are 2 **CornerArcs** connected to the same surface terminal in the **NW** and **NE** corners.

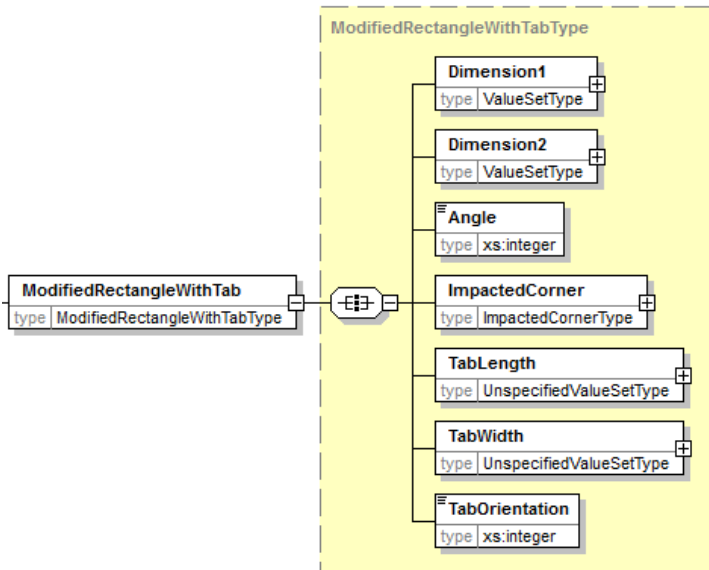
The trace **Neck** width (D1) connects the terminal shape to the arc along the line that would intersect with the center of the arc to the projected corner of the terminal shape.

Note that the **ConcaveArcCenter** point of **x** and **y** is not necessary to be at the same point as the corner of the **ModifiedRectangle**. If unspecified, then it is defaulted to the corner of the **ModifiedRectangle**.

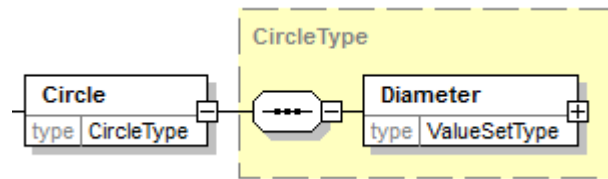
A.1.7 Modified Rectangle with Shoulder



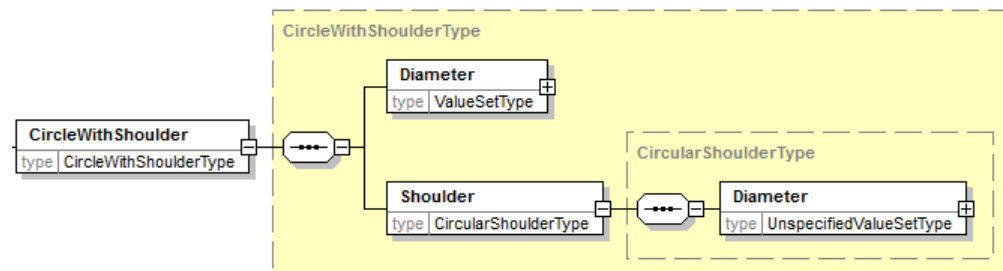
A.1.8 Modified Rectangle with Tab



### A.1.9 Circle



### A.1.10 Circle with Shoulder

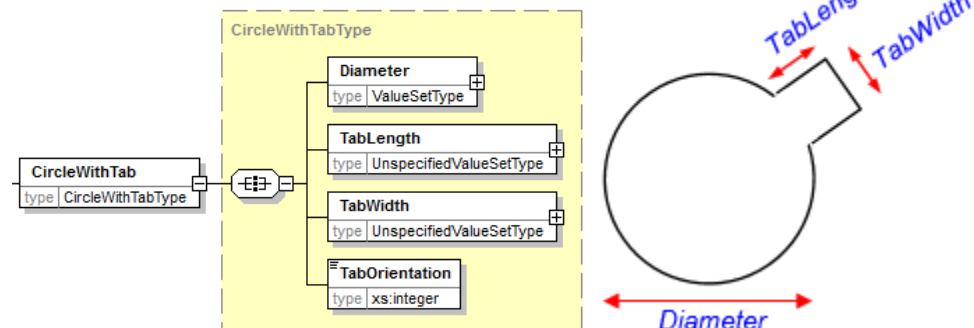


The **CircleWithShoulder/Diameter** (D1) is the diameter of the terminal that inserts into the printed board.

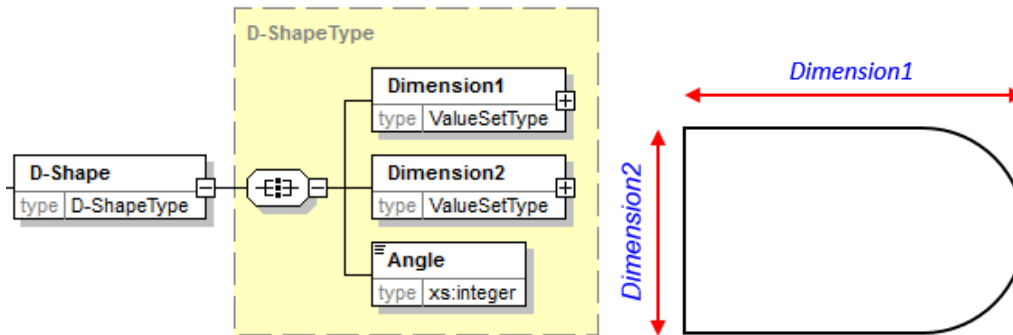
The **CircleWithShoulder/Shoulder/Diameter** (D2) is the diameter of the terminal shoulder that is typically not intended for insertion into the printed board.



### A.1.11 Circle with Tab



### A.1.12 D-Shape

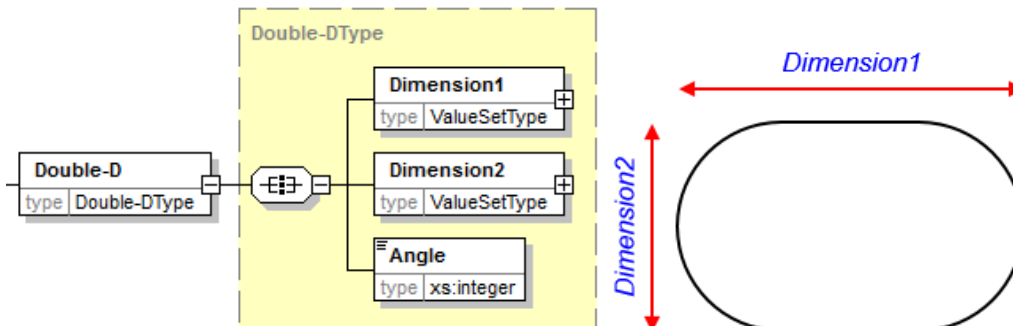


A **D-Shape** is where a semi-circle is attached to the end of a Rectangular shape. Note that radius is not required since it is 50% of **Dimension2**.

**Dimension1** is the distance from the end of the rectangle to the outside edge of the semicircle.

The side with the curved end is defaulted towards the package center. If the curve is on a different side, then Modified Rectangle should be used.

### A.1.13 Double-D

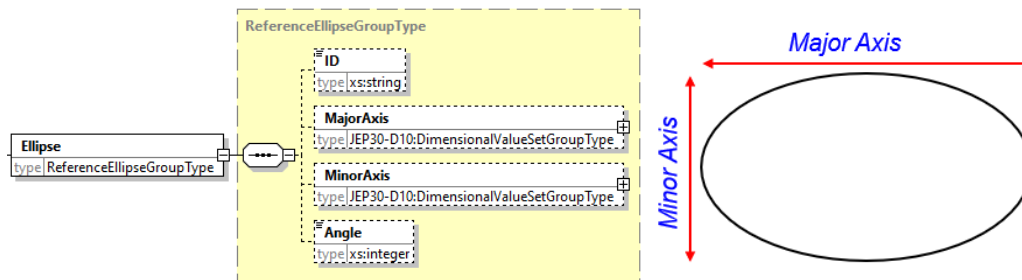


A **Double-D** shape is where a semi-circle is attached to the end of a Rectangular shape. Note that radius is not required since it is 50% of **Dimension2**.

**Dimension1** is the distance from the outside edges of each of the semicircle at opposite ends of the rectangle.

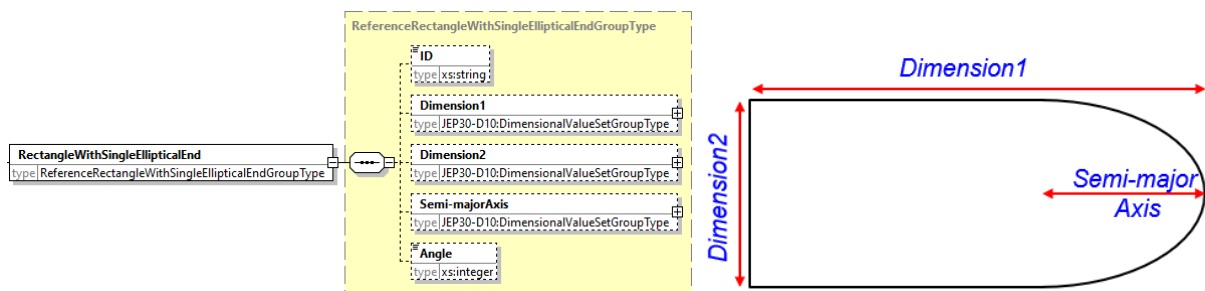
The curve sides occur on the shortest side of Dimension 1 or Dimension 2.

### A.1.14 Ellipse



An **Ellipse** is a closed curve whose shape is determined by its **MajorAxis** (the longest diameter) and its **MinorAxis** (the shortest diameter), which are perpendicular and intersect at its center.

### A.1.15 Rectangle with Single Elliptical End

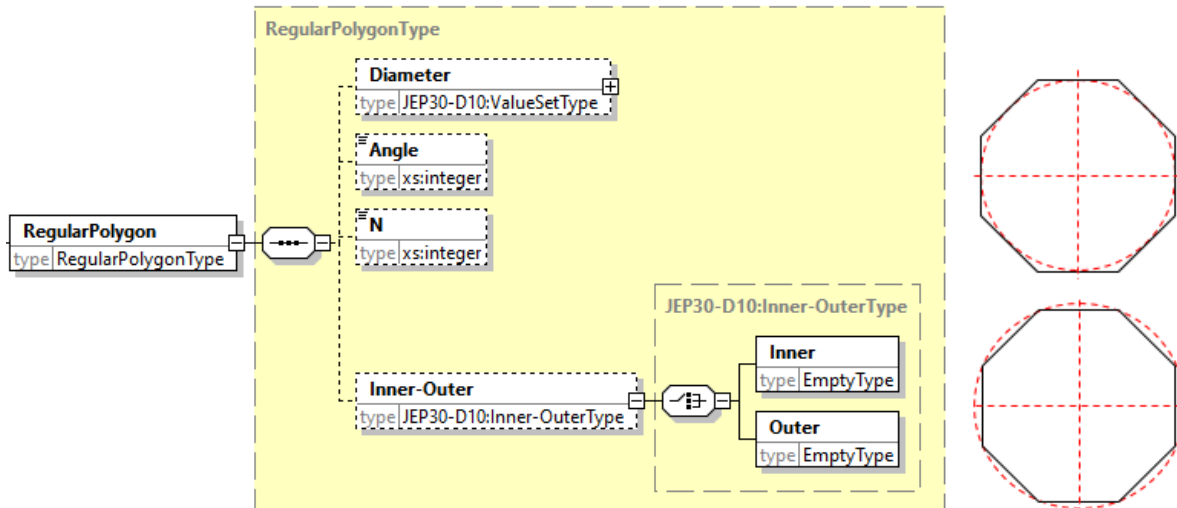


This shape is composed of a rectangular section joined at one of its ends by a semi-elliptical section.

- **Dimension1** denotes the total overall length of the entire shape, measured from the flat, rectangular end to the outermost point of the curved elliptical end. The Semi-major Axis is the length of the elliptical portion, extending from where it meets the rectangle to the outermost curved point.
- **Dimension2** represents the constant width of the rectangular part, which also defines the length of the minor axis for the semi-elliptical end.
- The **Semi-majorAxis** is the length of the elliptical portion, extending from where it meets the rectangle to the outermost curved point.

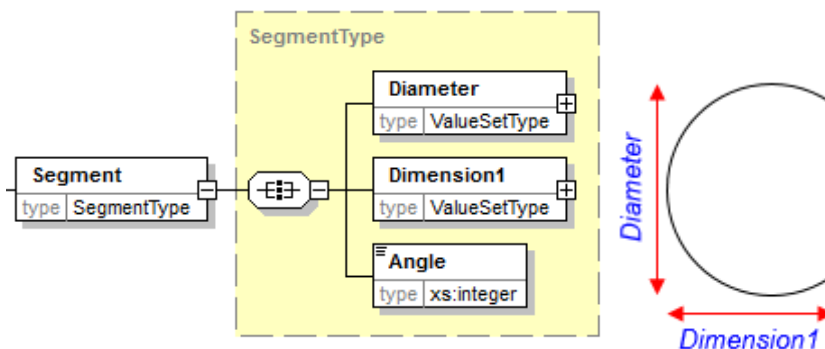


### A.1.16 Regular Polygon



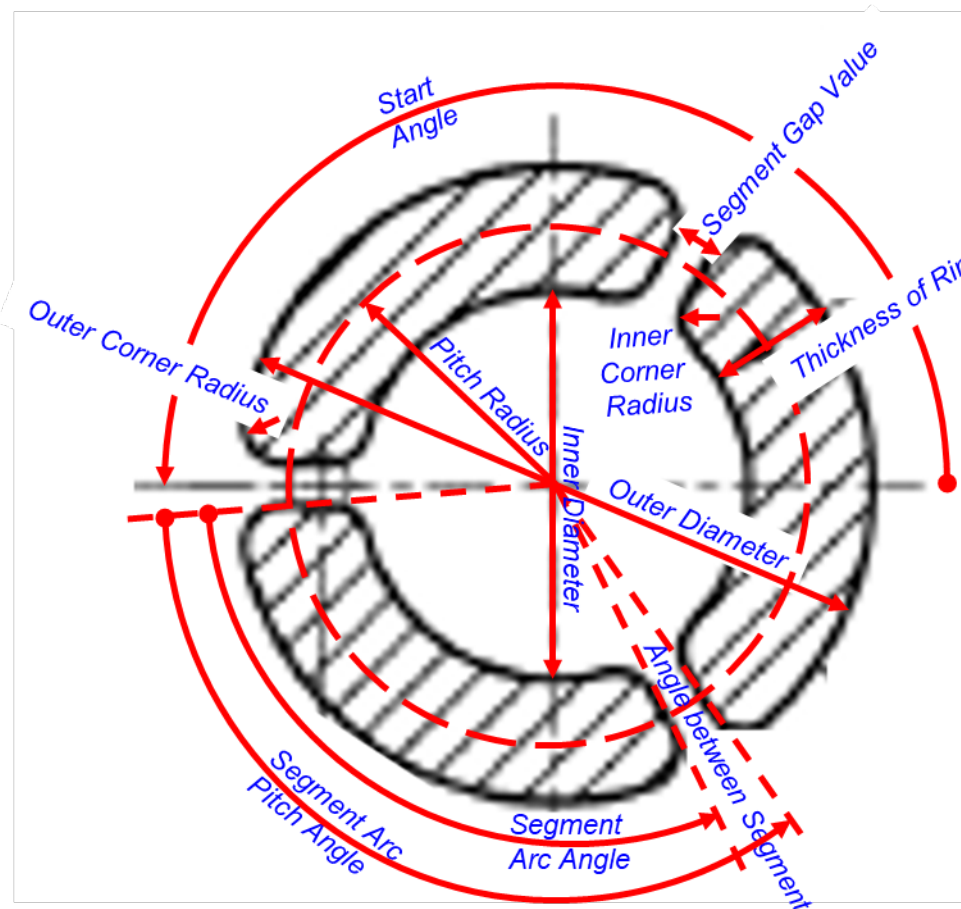
The most common Polygons required to represent package body shapes are **RegularPolygon**, that are equiangular (all its corner angles are equal), Cyclic (all its corners lie on a single circle) and equilateral (all its edges are the same length). These Polygons are also tangential (all sides are tangent to an inscribed circle and are convex (all angles are < 180 degrees). Polygons dimensions can be captured by knowing the number of sides **N** and the **Diameter** of either the circumcircle (**Outer** circle that intersect with the corners of the polygon) or the inscribed circle (**Inner** circle which is tangential to all the sides within the polygon). All other forms of Polygons component shapes must be drawn via the **Contour** branch.

### A.1.17 Segment



The **Angle** here defines the rotation in the counter clockwise direction of the straight edge from the 3 o'clock position. The image here shows 90°.

### A.1.18 Segmented Ring

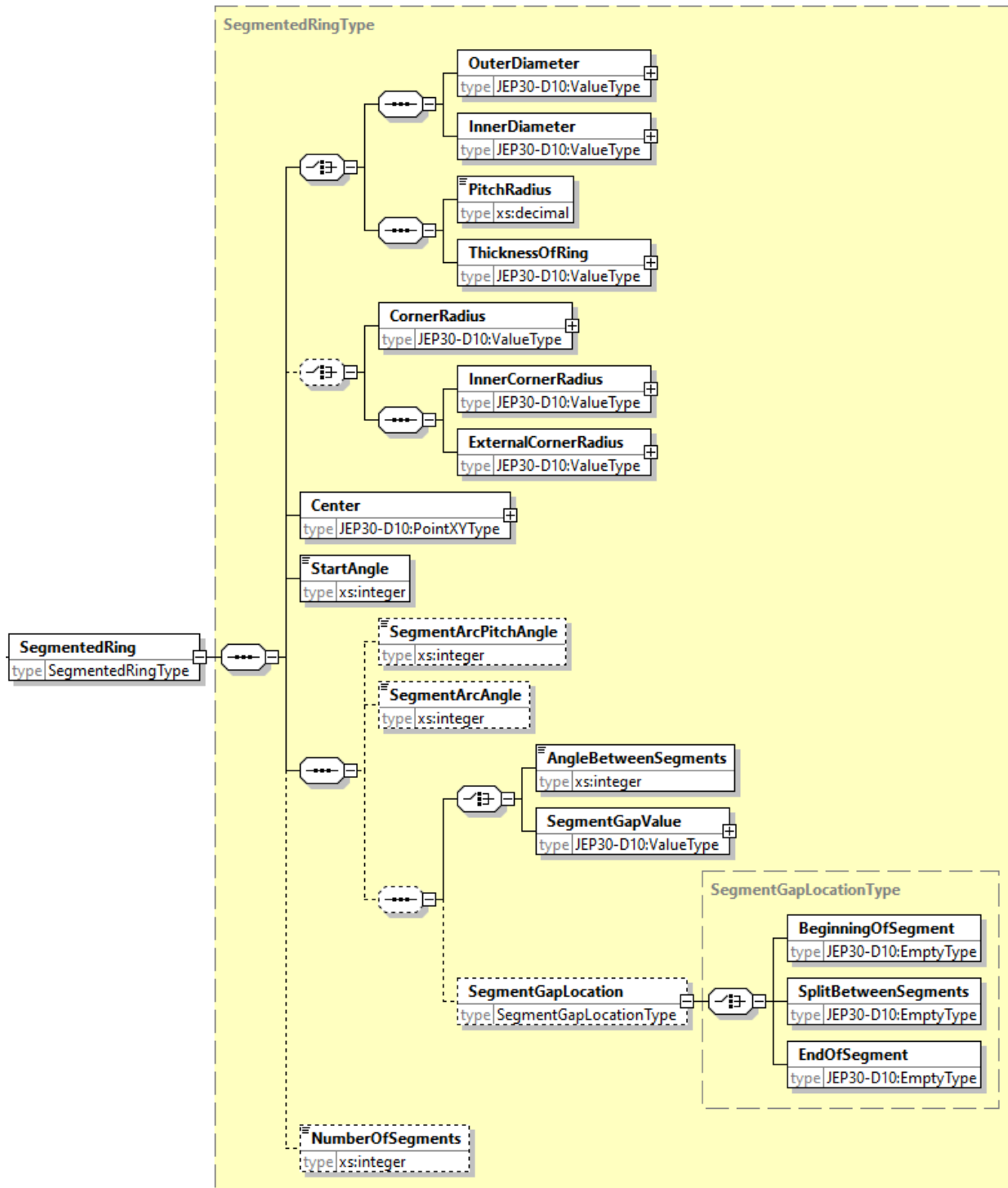


The thickness of the segment can be defined by either the combination of the *OuterDiameter* and the *InnerDiameter*, or the *PitchRadius* and the *ThicknessOfRing*. The *CornerRadius* of the segment can be optionally defined, however if the inner and outer corners are different, then this can be individually defined via the *InnerCornerRadius* and the *OuterCornerRadius*.

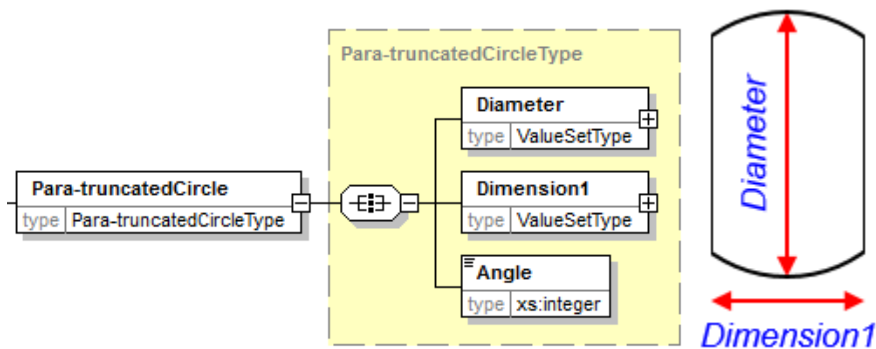
The *StartAngle* here defines the rotation in the counterclockwise direction of the straight edge from the 3 o'clock position. The image here shows 180°. The *SegmentArcPitchAngle* is the angle from any point in the Segment arc to the same point on the next segment. The *SegmentArcAngle* is the angle of one segment arc. When the segment is separated from the next segment, this can be defined by either the *AngleBetweenSegments* or the *SegmentGapValue*. If there are more than 1 segment arc in the *SegmentedRing*, then the *SegmentArcPitchAngle* equals the sum of the *SegmentArcAngle* plus the *AngleBetweenSegment*.

The *SegmentGapLocation* is dependent upon how the start angle is defined. Here in this diagram, the *StartAngle* is defined as 180° from the 3 o'clock position. The segment gap at that point shows that it is evenly split between the top and bottom segments. This is defined by the *SegmentGapLocation*, and is defined as a choice between *BeginningOfSegment*, *SplitBetweenSegments* or *EndOfSegment*.

### A.1.18 Segmented Ring (cont'd)

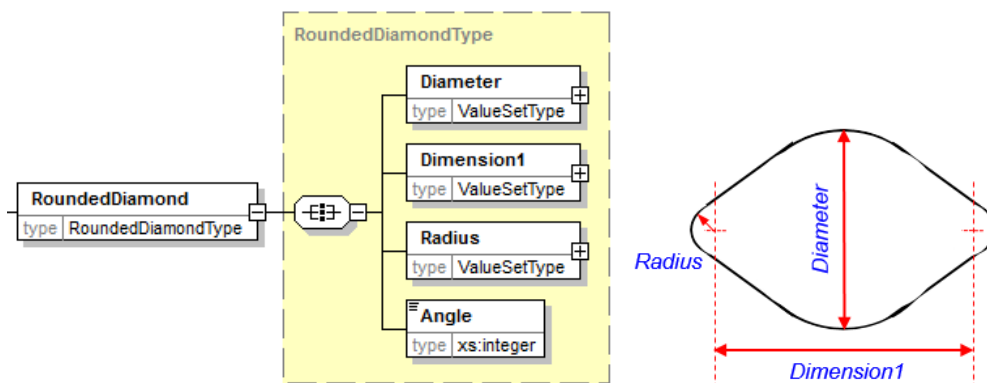


### A.1.19 Para-truncated Circle



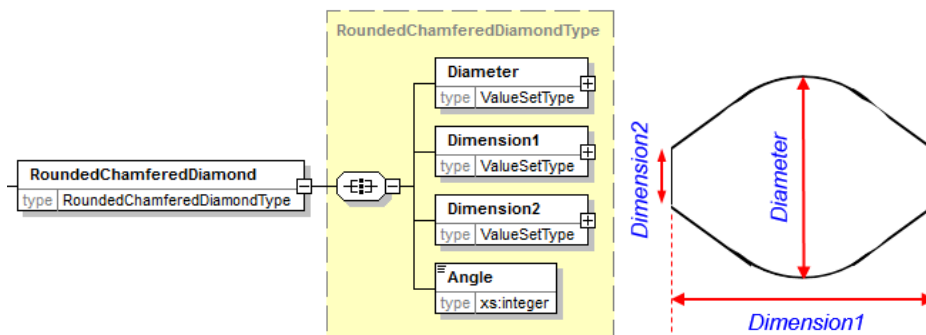
A **Para-truncatedCircle** is a circle with equal segments removed from opposite's sides.

### A.1.20 Rounded Diamond



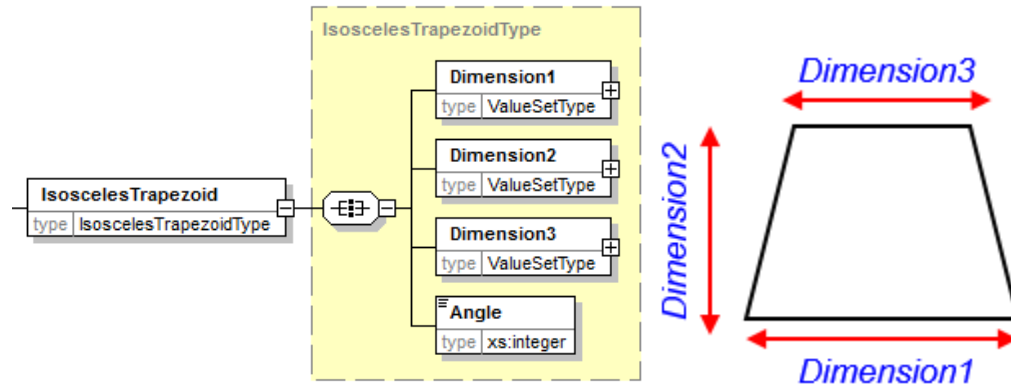
**Dimension1** specifies the distance between the centers of the 2 end circles, while the **Radius** specifies the curvature of the 2 end circles. The **Diameter** specifies the dimension of the center circle. The 4 straight sides intersect tangentially with their respective two circles.

### A.1.21 Rounded Chamfered Diamond

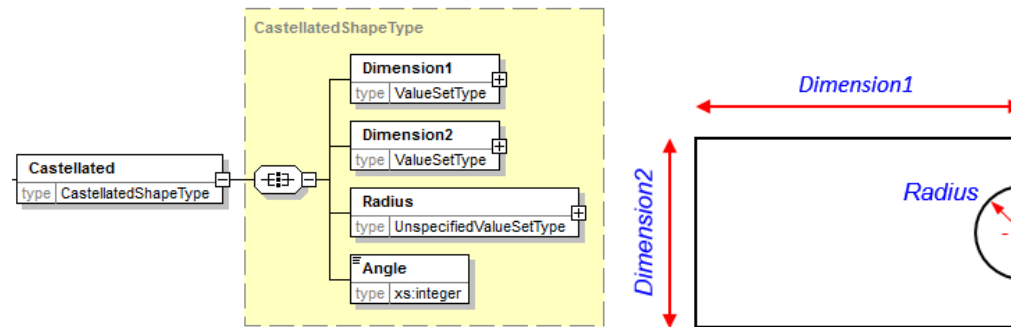


**Dimension1** specifies the distance between the end straight edges, while **Diameter** specifies the dimension of the center circle. The straight sides have a length of **Dimension2**.

### A.1.22 Isosceles Trapezoid

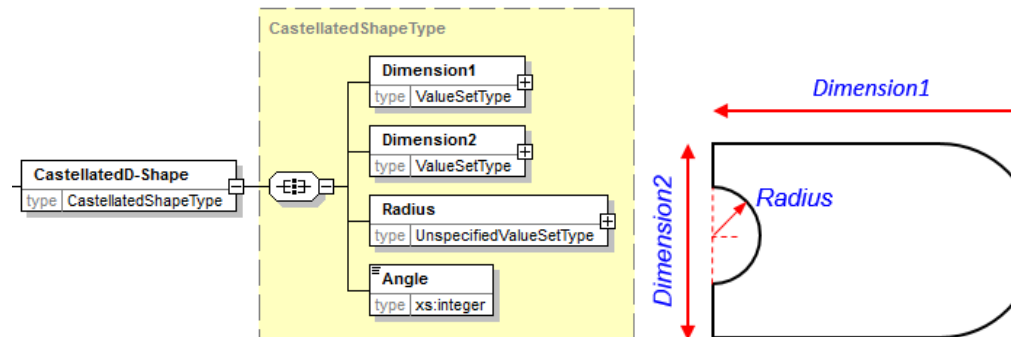


### A.1.23 Castellated Shape

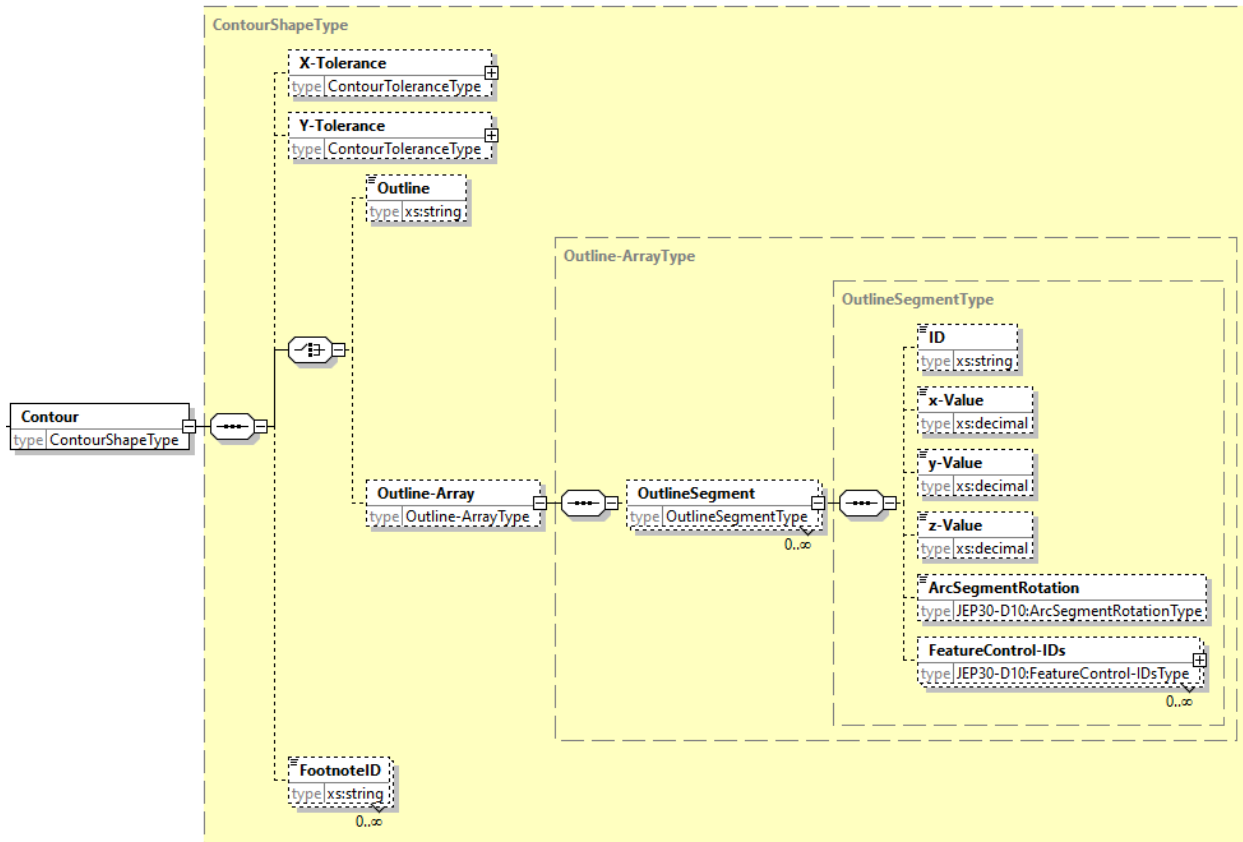


**Castellated** is shape with a recess in it. The **Radius** of this concave is less than the width of the shape side to which it is attached. The recess is also centered along that side of the shape.

### A.1.24 Castellated D-Shape Shape



## A.1.25 Contour



The **Outline** is a list of points representing the outline of the shape. In the XML it is defined as a string. This string must have a specific structure. The structure is  $(X_1, Y_1, R_1), (X_2, Y_2, R_2), \dots (X_n, Y_n, R_n)$ . The points are defined such that the (0, 0) location of the resulting shape is the reference point of the shape. Contour shaped terminal contacts that are positioned randomly will be positioned using the (0, 0) location of the terminal.

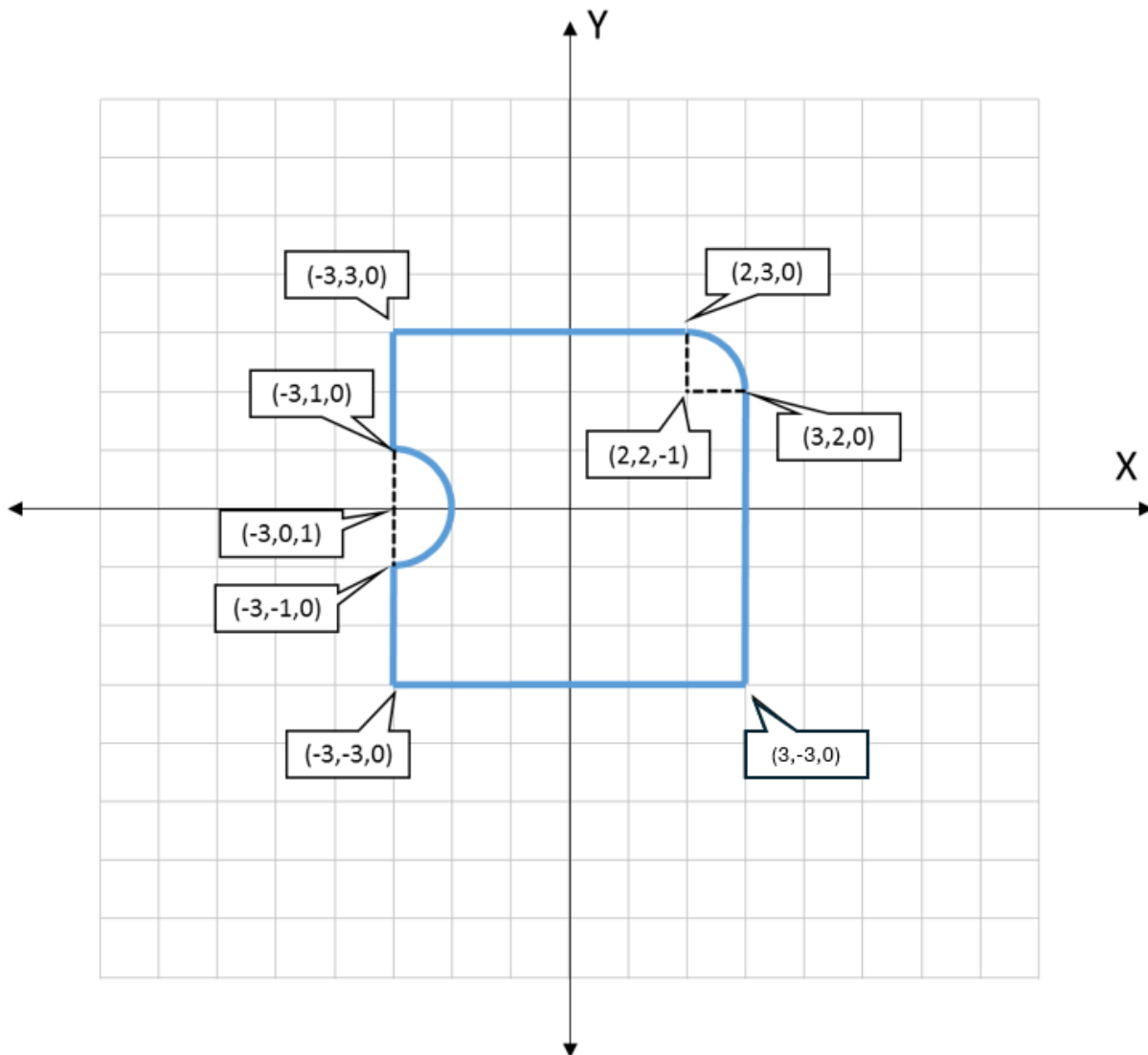
Non-arcs points are defined with an X, Y coordinate, The R value is always 0.

Arcs are defined with 3 points.

- The first point is the start point of the arc (R value is 0).
- The second point is the center point of the arc. The R value for this point is equal to the radius of the arc. If the R value is negative, a counter-clockwise arc is defined. If the R value is positive, a clockwise arc is defined.
- The third point is the end point of the arc (R value is 0).

The last point does not need to be repeated in the case of Segments as all are closed shapes. You may begin with any point except a radius point. The points must be order properly from that starting point.

A.1.25 Contour (cont'd)



Example 1. The string value that will be present in *Outline* to represent this shape would be

- $(-3,-3,0),(3,-3,0),(3,2,0),(2,2,-1),(2,3,0),(-3,3,0),(-3,1,0),(-3,0,1),(-3,-1,0)$

### A.1.26 Reference Terminal Contour

path	<a href="#">PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/ModifiedCorner</a>
diagram	<pre> classDiagram     class Contour {         type ReferenceTerminalContourType     }     class ReferenceTerminalContourType {         ID xs:string         X-Tolerance ContourToleranceType         Y-Tolerance ContourToleranceType         OutlineReference OutlineReferenceType         ImpactedTerminal ImpactedTerminalType         Impact-to-TerminalGroup Impact-to-TerminalGroupType         FeatureControl-IDs JEP30-D10FeatureControl-IDsType     }     Contour --&gt; ReferenceTerminalContourType     </pre>
type	<a href="#">ModifiedCornerType</a> , <a href="#">ImpactedTerminalType</a> , <a href="#">TerminalCenterType</a> , <a href="#">Impact-to-TerminalGroupType</a> , <a href="#">Apply-to-all-TerminalsType</a> , <a href="#">SymmetryType</a> , <a href="#">ImpactedCornerType</a> , <a href="#">CornerType</a> .

### A.1.27 Modified Corner

path	<a href="#">PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/ModifiedCorner</a>
diagram	<pre> classDiagram     class ModifiedCorner {         type ModifiedCornerType     }     class ModifiedCornerType {         ImpactedTerminal ImpactedTerminalType         Impact-to-TerminalGroup Impact-to-TerminalGroupType         ShapeImpactedCorner ImpactedCornerType     }     class ImpactToTerminalGroupType {         Apply-to-all-Terminals Apply-to-all-TerminalsType         Symmetry SymmetryType     }     ModifiedCorner --&gt; ModifiedCornerType     ModifiedCornerType --&gt; ImpactToTerminalGroupType     </pre>
type	<a href="#">ModifiedCornerType</a> , <a href="#">ImpactedTerminalType</a> , <a href="#">TerminalCenterType</a> , <a href="#">Impact-to-TerminalGroupType</a> , <a href="#">Apply-to-all-TerminalsType</a> , <a href="#">SymmetryType</a> , <a href="#">ImpactedCornerType</a> , <a href="#">CornerType</a> .



### A.1.25.1 Impacted Terminal

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/ModifiedCorner/ImpactedTerminal
diagram	
type	ImpactedTerminalType, TerminalCenterType, JEP30-D10:PointXYType.

### A.1.25.2 Impact – to – Terminal Group

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/ModifiedCorner/Impact-to-TerminalGroup
diagram	
type	Impact-to-TerminalGroupType, Apply-to-all-TerminalsType, SymmetryType, SymmetryRotationType, ReflectionType,

### A.1.25.2.1 Apply – to – all - Terminals

path	<a href="#">PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/ModifiedCorner/ShapeImpactedCorner</a>
diagram	
type	<a href="#">Apply-to-all-TerminalsType</a> , <a href="#">CornerImpact-to-StandardArrayType</a> , <a href="#">JEP30-D10:EmptyType</a> .

### A.1.25.2.2 Rotation

path	<a href="#">PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/ModifiedCorner/Impact-to-TerminalGroup/Symmetry/Rotation</a>
diagram	
type	<a href="#">SymmetryRotationType</a> , <a href="#">SymmetryRotationAxisType</a> , <a href="#">SymmetryRotationCenterType</a> , <a href="#">JEP30-D10:EmptyType</a> .

A.1.25.2.3      Reflection

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/ModifiedCorner/Impact-to-TerminalGroup/Symmetry/Reflection
diagram	<p>The diagram illustrates the class hierarchy for ReflectionType. It is enclosed in a yellow dashed box labeled 'ReflectionType'. Inside, there are two main branches: 'ReflectionAxisType' and 'ReflectionInversionCenterType'. 'ReflectionAxisType' contains 'MirrorPlane' (type ReflectionAxisType) and three empty types: 'xyPlane', 'yzPlane', and 'xzPlane' (all type JEP30-D10:EmptyType). 'ReflectionInversionCenterType' contains 'TerminalCenter' (type JEP30-D10:EmptyType) and 'PackageBodyCenter' (type JEP30-D10:EmptyType). A 'Reflection' class (type ReflectionType) is shown outside the yellow box, connected to the 'ReflectionType' box via a composition relationship (indicated by a solid line with an open square at the ReflectionType end and a solid line with a filled square at the Reflection end).</p>
type	ReflectionType, ReflectionAxisType, JEP30-D10:EmptyType, ReflectionInversionCenterType.

A.1.25.3 Shape Impacted Corner

path	PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/ModifiedCorner/ShapeImpactedCorner
diagram	<p>The diagram illustrates the structure of the Shape Impacted Corner. It features a class <b>ShapeImpactedCorner</b> with a type <b>ImpactedCornerType</b>. This class is connected via a composition relationship (indicated by a solid line with a filled square at the <b>ShapeImpactedCorner</b> end and a hollow square at the <b>ImpactedCornerType</b> end) to a large dashed box representing the <b>ImpactedCornerType</b> hierarchy. Inside this hierarchy, there are several classes: <b>NE</b>, <b>SE</b>, <b>SW</b>, and <b>NW</b>, all with a type <b>CornerType</b>. These are connected to a central composition node (a circle with a cross) which is also connected to a dashed box labeled <b>CornerType</b>. Inside the <b>CornerType</b> box, there are four classes: <b>ChamferedCorner</b> (type <b>ChamferedCornerType</b>), <b>RectangularInCorner</b> (type <b>RectangularInCornerType</b>), <b>ConvexCorner</b> (type <b>ConvexCornerType</b>), and <b>ConcaveCorner</b> (type <b>ConcaveCornerType</b>). Additionally, there is a <b>CornerArc</b> class (type <b>CornerArcType</b>) connected to the same central composition node. Each class has a small '+' icon in the top right corner, indicating a multiplicity of one.</p>
type	ImpactedCornerType, CornerType, ChamferedCornerType, RectangularInCornerType, ConvexCornerType, ConcaveCornerType, CornerArcType.

#### A.1.25.4 Corner Type

path	<p><a href="#">PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/ModifiedCorner/ShapeImpactedCorner/NE</a></p> <p><a href="#">PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/ModifiedCorner/ShapeImpactedCorner/SE</a></p> <p><a href="#">PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/ModifiedCorner/ShapeImpactedCorner/SW</a></p> <p><a href="#">PartModel/PackageSection/Package-Array/Package/TerminalGroups/TerminalGroup-Array/TerminalGroup/TerminalShape/ModifiedCorner/ShapeImpactedCorner/NW</a></p>
diagram	<p>The diagram illustrates the structure of the <b>CornerType</b> and its subclasses. <b>CornerType</b> is the base class, which is further specialized into <b>NE</b> (a specific instance or subclass). The subclasses are grouped into five categories, each with its own set of attributes:</p> <ul style="list-style-type: none"> <li><b>ChamferedCornerType</b> (includes <b>ChamferedCorner</b>): <ul style="list-style-type: none"> <li><b>DX</b>: type JEP30-D10:UnspecifiedValueSetType</li> <li><b>DY</b>: type JEP30-D10:UnspecifiedValueSetType</li> </ul> </li> <li><b>RectangularInCornerType</b> (includes <b>RectangularInCorner</b>): <ul style="list-style-type: none"> <li><b>DX</b>: type JEP30-D10:UnspecifiedValueSetType</li> <li><b>DY</b>: type JEP30-D10:UnspecifiedValueSetType</li> </ul> </li> <li><b>ConvexCornerType</b> (includes <b>ConvexCorner</b>): <ul style="list-style-type: none"> <li><b>Radius</b>: type JEP30-D10:UnspecifiedValueSetType</li> <li><b>ConvexCornerCenter</b>: type JEP30-D10:PointXYType</li> </ul> </li> <li><b>ConcaveCornerType</b> (includes <b>ConcaveCorner</b>): <ul style="list-style-type: none"> <li><b>Radius</b>: type JEP30-D10:UnspecifiedValueSetType</li> <li><b>ConcaveCornerCenter</b>: type JEP30-D10:PointXYType</li> </ul> </li> <li><b>CornerArcType</b> (includes <b>CornerArc</b>): <ul style="list-style-type: none"> <li><b>Radius1</b>: type JEP30-D10:UnspecifiedValueSetType</li> <li><b>Radius2</b>: type JEP30-D10:UnspecifiedValueSetType</li> <li><b>Neck</b>: type JEP30-D10:UnspecifiedValueSetType</li> <li><b>CornerArcCenter</b>: type JEP30-D10:PointXYType</li> </ul> </li> </ul> <p>Each subclass box contains a 'type' attribute pointing to its respective type name. The diagram uses dashed boxes to group related attributes and solid lines to show inheritance and associations.</p>
type	<p><a href="#">ImpactedCornerType</a>, <a href="#">CornerType</a>, <a href="#">ChamferedCornerType</a>, <a href="#">RectangularInCornerType</a>, <a href="#">ConvexCornerType</a>, <a href="#">ConcaveCornerType</a>, <a href="#">CornerArcType</a>.</p>

## A.2 Terminal Dimensions

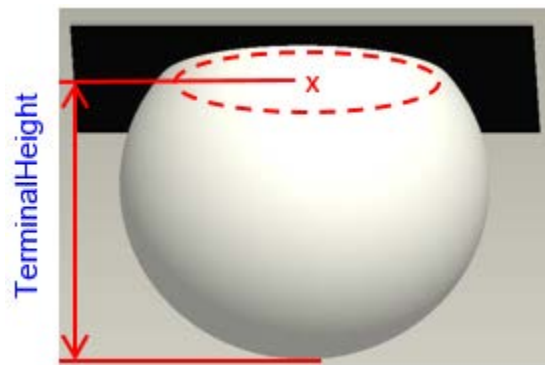
The following sections outlines the vertical dimensions that are required for each terminal.

### A.2.1 Ball

The Height of the Ball is dependent upon the *Ball* type and is mandatory.

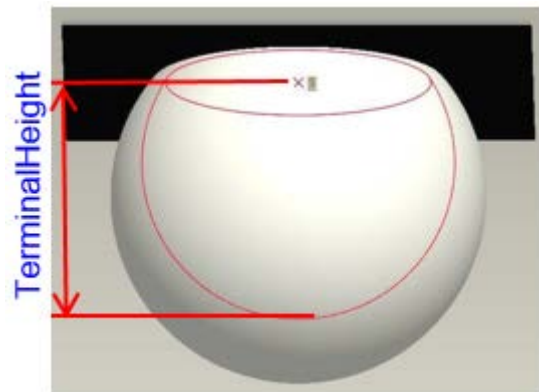
#### A.2.1.1 Collapsing Ball

For the *Ball/Collapsing* and for the *Ball/Bump*, the *TerminalHeight* is given as the dimension from the Seating Plane to the underside of the Package.



#### A.2.1.2 Non-collapsing Ball

For the *Ball/Non-collapsing*, the *TerminalHeight* is given as the dimension from the Seating Plane to the underside of the Package after the Package is soldered to the PCB Substrate. A Non-collapsing Ball has a high temperature ball within a ball, so that during reflow, only the outer ball reflows and the inner ball does not. This inner ball holds the package up from the printed board and prevents it from collapsing any further. This is the height that needs to be captured.

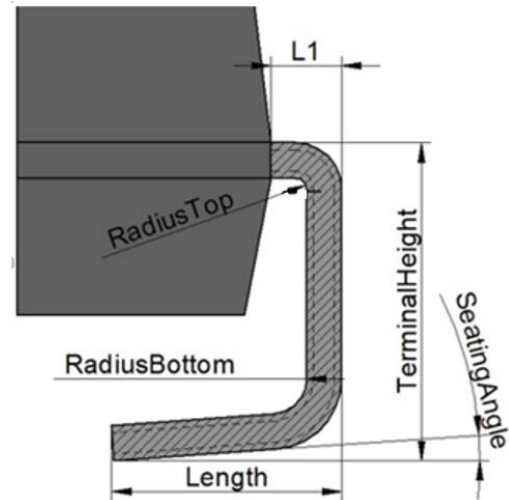


### A.2.2 C-Bend

C-bend compliant terminal extend from the sides of the body, bend down, and form a flat contact area with the board under the package body. It is similar to a J-bend terminal except that the bottom of the J-terminal is flat, and not rounded up under the part body.

When terminals are in a Dual position on the device, then the dimension *Length* can be derived from alternative dimensions provided, such as

- 1)  $(\text{Terminal Span} - \text{Terminal Spacing})/2$ ,
- 2)  $\text{Terminal Span} - \text{Terminal Span Pitch}$ ,
- 3) etc.

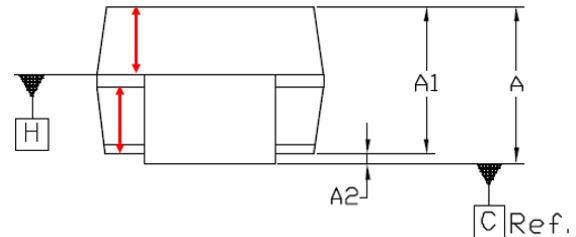


Similarly, the *PackageEdge-to-end-of-Terminal* can be derived from alternative dimensions provided if the terminals are in a Dual position, such as

- 1)  $(\text{Terminal Span} - \text{Package dimension})/2$ ,
- 2) etc.

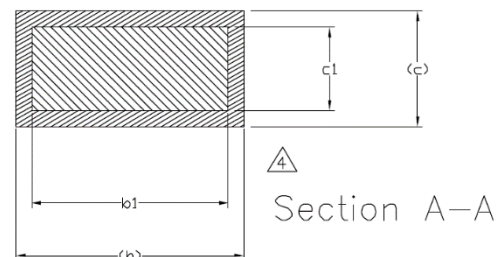
The *Width* (b) of the terminal is necessary to accurately calculate the width of the land pattern and is therefore mandatory to be captured.

*TerminalHeight* is the dimension from the Seating Plane to the highest point where the Terminal exits the Package Body as defined by the datum H in this drawing. The provision of this dimension will facilitate a more accurate representation of a 3D model created from this content. This data is mandatory to be provided, but if unavailable, it can be assumed that the portion of the package height above the terminal frame is also the same height of the package body below the terminal frame.



- 1)  $\text{Terminal Height} = (\text{Package Body Height (A1)} - \text{Terminal Thickness})/2 + \text{Terminal Thickness} + \text{Standoff (A2)}$

*TerminalThickness* is defined as the thickness of the terminal (c). It is the same value on the horizontal portion as it is on the vertical portion. This is the dimension that drives the Toe of the Land Pattern in the land pattern calculation and is therefore mandatory. The Plating thickness is the value of the outer dimensions – base metal dimensions (i.e., b-b1 or c-c1 which should result in the same value).



The *RadiusTop* and *RadiusBottom* of the terminal is optional but preferred to accurately represent the 3D model of the part. When unspecified, it can be assumed to be equal to the terminal thickness.

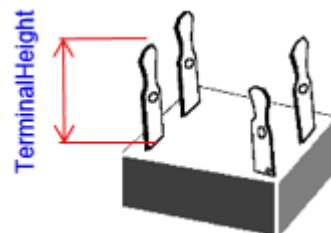
### A.2.2 C-Bend (cont'd)

The *SeatingAngle* of the terminal is optional but preferred to accurately represent the 3D model of the part. When unspecified, it can be assumed to be 4 degrees, with a min of 0 degrees and a max of 8 degrees.

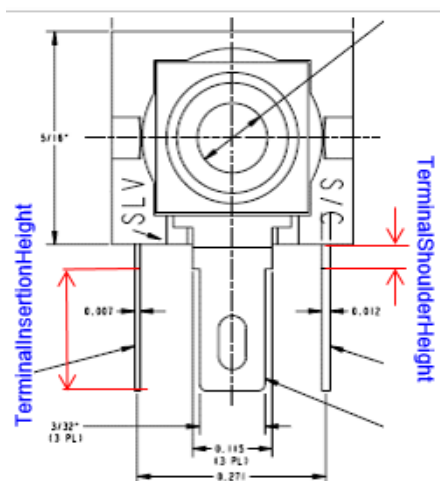
The *RiseAngle* of the terminal is optional but preferred to accurately represent the 3D model of the part. When unspecified, it can be assumed to be 90 degrees for a c-bend terminal.

### A.2.3 Lug

Lugs typically are not soldered to the PCB. Instead they have mating connectors or wires connected to them. However some are soldered to the printed board and some penetrate the printed board to be connected on the other side. Therefore if the Lug is vertical off the upperside of the Package, then the *TerminalHeight* is captured as shown here.



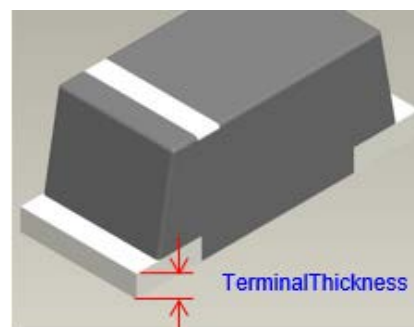
When the Terminals exit from the underside of the body, with the intention of penetrating the PCB, then the *TerminalInsertionLength* and the *TerminalShoulderHeight* are required. If either of the data is unavailable, then the User should state *Unspecified* for that respective dimension that is unavailable.



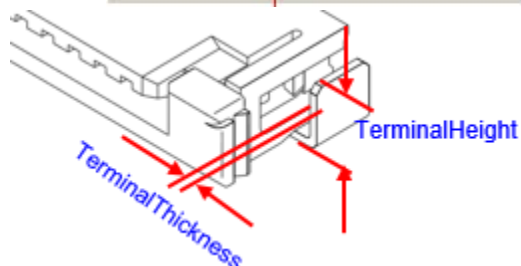
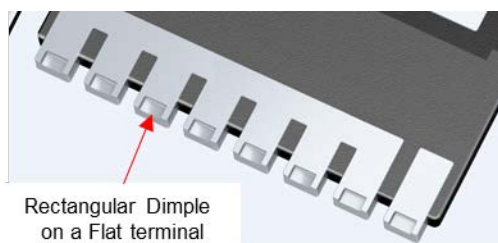
### A.2.4 Flat Terminal

*TerminalThickness* is required for *Flat/Elevated*, *Flat/Hole*, *Flat/With-opening* terminals or for a normal *Flat* terminal.

The variant *Flat-L-bend* terminal however does have both the *TerminalThickness* plus the *TerminalHeight* requirements. The thickness of the Terminal will determine the side fillets outside the Body outline, whereas the height of the outer L-Bend will determine the Toe.



*Flat* terminals can also have horizontal castellations *Rectangular Dimple*



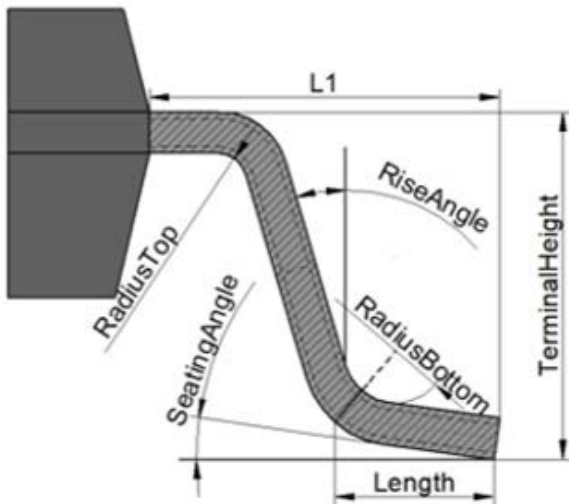


## A.2.5 Gull-wing Terminal

Gull-wing compliant terminal extend from the sides of the body, bend down, and form a flat contact area with the board outside the package body. It is similar to a C-terminal except that the bottom of the J-terminal points away from the package center and not towards the package center..

As with the C-bend, when terminals are in a Dual position on the device, then the dimension *Length* can be derived from alternative dimensions provided, such as

- 1)  $(\text{Terminal Span} - \text{Terminal Spacing})/2$ ,
- 2)  $\text{Terminal Span} - \text{Terminal Span Pitch}$ ,
- 3) etc.

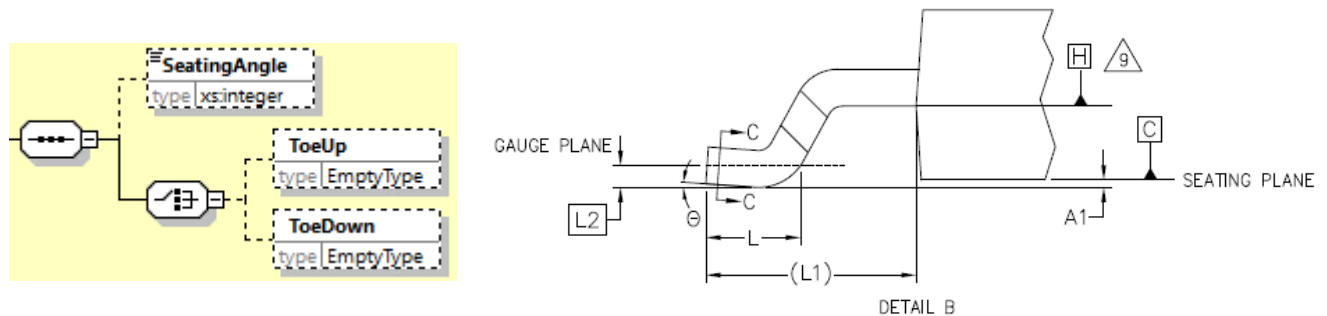


Similarly, the *PackageEdge-to-end-of-Terminal* can be derived from alternative dimensions provided if the terminals are in a Dual position, such as

- 1)  $(\text{Terminal Span} - \text{Package dimension})/2$ ,
- 2) etc.

The elements *Width*, *TerminalHeight*, *TerminalThickness*, *RadiusTop*, *RadiusBottom*, *SeatingAngle*, and *RiseAngle*, follow the same definitions as that provided for the C-bend.

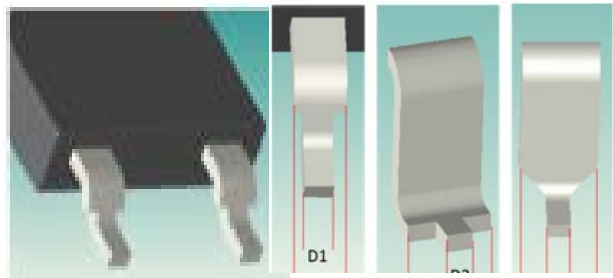
The above image shows that the Gull-wing terminal toe is pointing downwards, but an option is available for Gull-wing terminals whose Toe is pointing upwards.



The above concepts apply to all variants types of the Gull Wing Terminal with Modifications. There are several basis types of gull-wing modifications as defined herein.

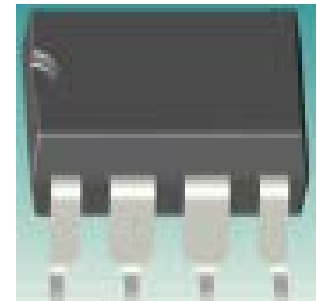
### A.2.5 Gull-wing Terminal (cont'd)

When a Gull-wing has a shoulder, this is typically centered across the terminal contact area with the printed board. Notice that the variations can have the transition from the narrow portion of the terminal to the wider portion of the terminal at right angles or at a taper. The schema has the option to capture the details for either options. The schema provides 4 options to capture the dimensional details, namely:



- 1) From the end of terminal to the Start/End of the Shoulder taper transition,
- 2) From the Package edge to the Start/End of the Shoulder taper transition,
- 3) From the Seating Plane to the Start/End of the Shoulder taper transition,
- 4) From the top of the Terminal Exit from the Package to the Start/End of the Shoulder taper transition.

A DIP TH terminal can be prepped to be surface mounted as opposed to be TH mounted. In this situation, the element *TH-PreppedShoulder* should be selected.



For Inner and Outer configurations, we can assume that the edge of the terminal contact area aligns perfectly with the edge of the neck (or Shoulder). No Offset needs to be specified.

When the edge of the terminal contact area does not align perfectly with the edge of the neck (or Shoulder), then the *Offset* can be set under the *Configuration*.



Configuration = Inward



Configuration = Center

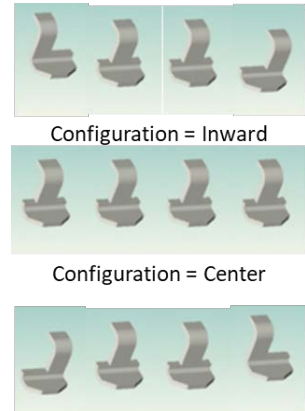
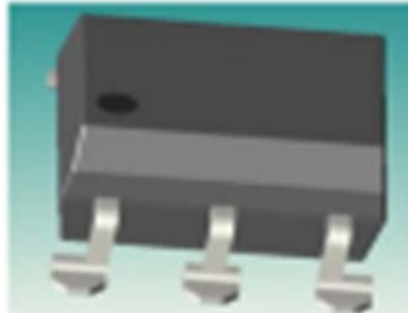


Configuration = Outward

### A.2.5 Gull-wing Terminal (cont'd)

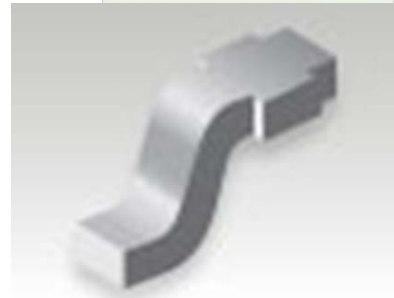
A Neck is very similar to a Shoulder except that the width of the neck is narrower than the width of the terminal contact area.

Typically, these Dimensions are “Unspecified Value Set type”, meaning that if the datasheet does not provide these values, we will set them to defaults.



The final gull-wing modification is a Dambar as shown here. The Dambar protrusion is a remnant from tie bar cutting.

The terminal width dimension “b” does not include dambar protrusion, but most manufacturers will specify the allowable dambar protrusion as not causing the terminal width to exceed the maximum terminal width dimension by a specified amount.

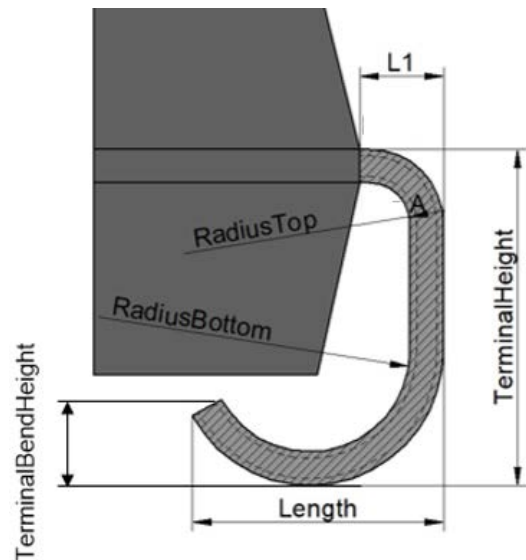


### A.2.6 J-Bend

J-bend compliant terminal extend from the sides of the body, bend down, and form a curved contact area with the board under the package body. It is similar to a C-bend terminal except that the bottom of the J-terminal is curved and rounded up under the part body.

When terminals are in a Dual position on the device, then the dimension *Pitch* in the direction across the package body for the terminals in the dual position is normally provided, in addition to the terminal *Length*.

The elements *PackageEdge-to-end-of-Terminal*, *Width*, *TerminalHeight*, *TerminalThickness*, *RadiusTop*, *RadiusBottom*, and *RiseAngle*, follow the same definitions as that provided for the C-bend. *TerminalBendHeight* is useful for the purpose of generating more accurate 3D models and is therefore optional.



The applicable shoulder elements for the *ShoulderTransition/Tapered* shoulder are as follows:

- 1) *SeatingPlane-to-start-of-ShoulderTaperTransition*, and *SeatingPlane-to-start-of-ShoulderTaperTransition*,

### A.2.6 J-Bend (cont'd)

or

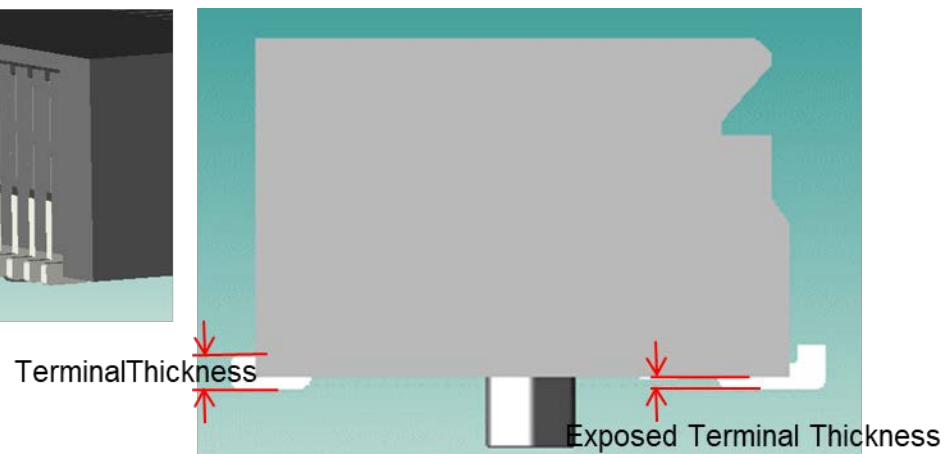
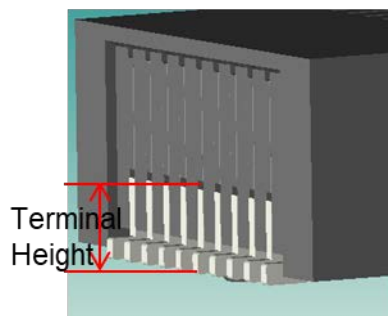
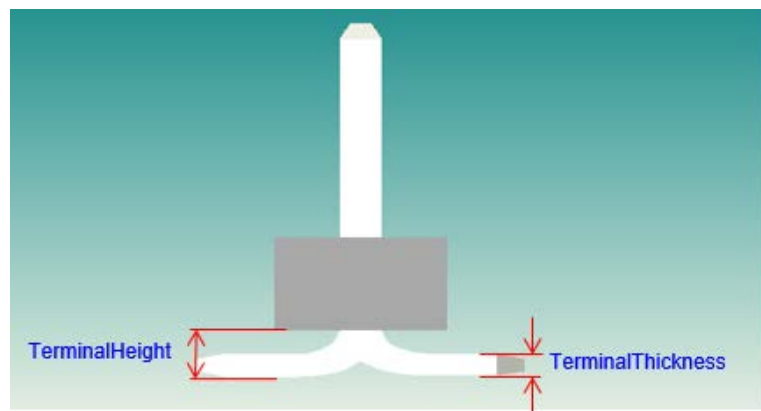
- 2) *Top-of-TerminalExit-from-Package-to-start-of-ShoulderTaperTransition*, and *Top-of-TerminalExit-from-Package-to-start-of-ShoulderTaperTransition*.

The applicable shoulder elements for the *ShoulderTransition/RightAngled* shoulder are the

- 1) *SeatingPlane-to-ShoulderTransition*, or *Top-of-TerminalExit-from-Package-to-ShoulderTransition*.

### A.2.7 L-bend

The *L-bend* terminals exits vertically from the bottom of the package and then turns horizontal. Irrespective of whether, the terminal variant is *Inward*, *Outward*, *SideInward*, *SideOutward* or it is a normal *L-bend* in which the position is one of *Single*, *Dual*, *Triple* or *Quad*, the *TerminalThickness* drives the Toe calculation of the land pattern, while the *TerminalHeight* drives the heel portion of the calculation.

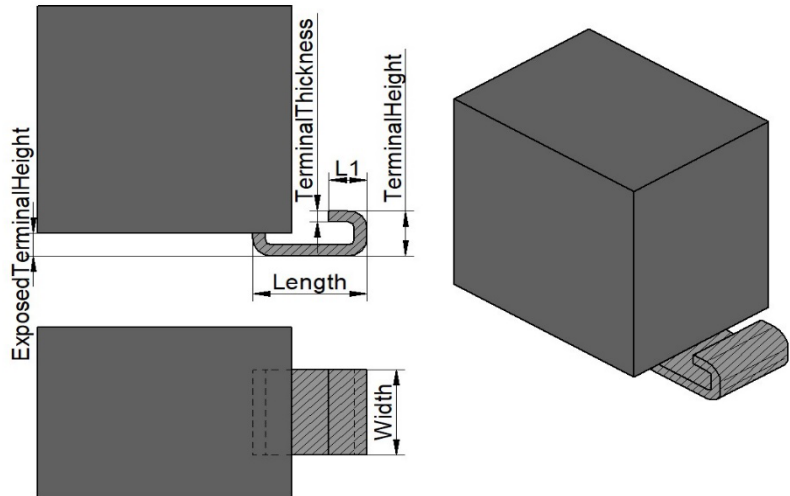


Sometimes as shown here in the 2nd image, the package body sits on the top surface of the horizontal portion of the L-Bend, in which case the *TerminalHeight* is reduced to the *TerminalThickness*.

## A.2.7 L-Bend (cont'd)

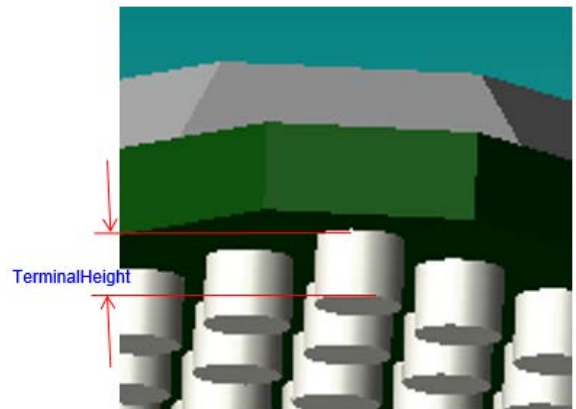
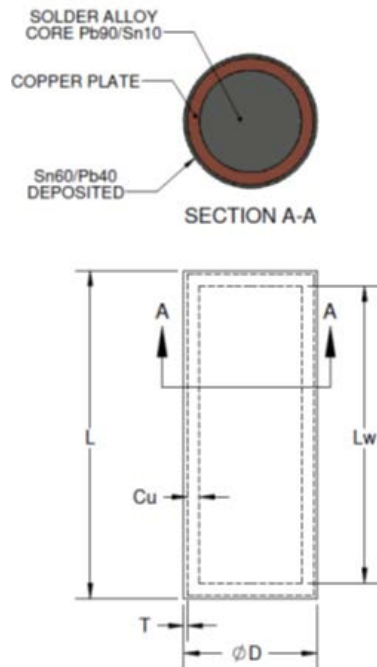
For Side-L-Bends, the terminal is partially immersed into the package body, in which case the *ExposedTerminalThickness* may be reduced to less than the *TerminalThickness*. In this case, the *ExposedTerminalThickness* is mandatory, while the *TerminalThickness* is optional.

*LC-bends* follows the same rule as the Side-L-Bend in which the *ExposedTerminalThickness* under the package body is the critical measurement.

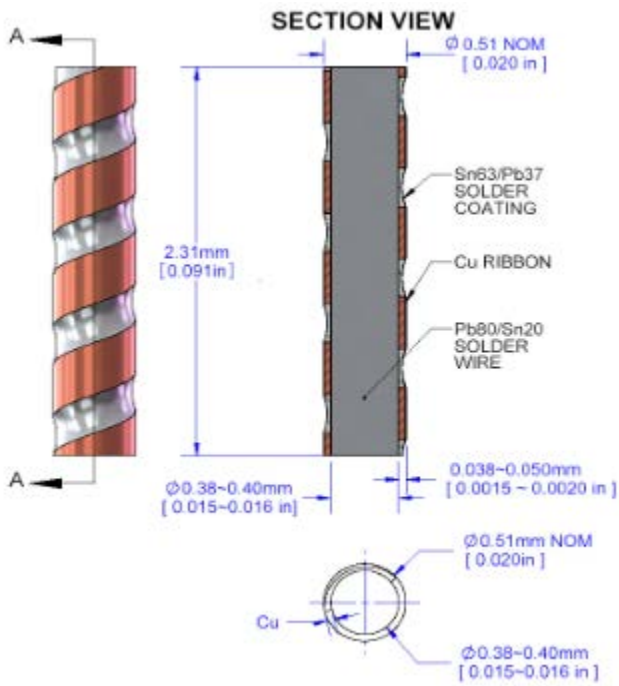


## A.2.8 Column

The Column *TerminalHeight* is the same as the Standoff for the Part, provided that there are no bumps on the package body.



### A.2.8 Column (cont'd)

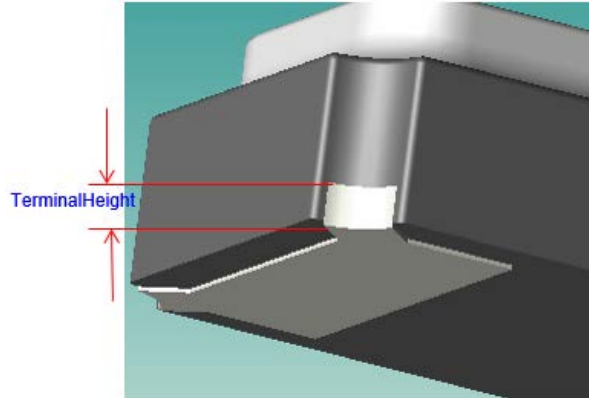


### A.2.9 Surface Terminal

The majority of *SurfaceTerminals* are under the bottom of the Package where the Terminal Contact Area is Inside the package outline. Such Terminals have no Terminal Thickness or Terminal Height as these 3 images indicate.

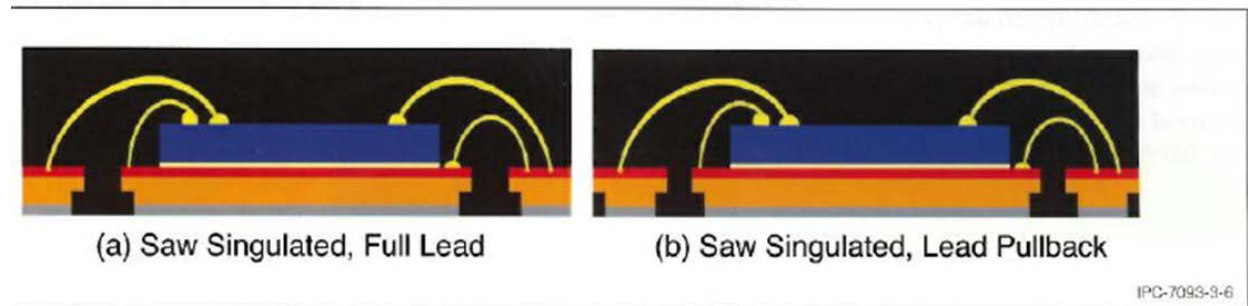
However there are variants where the edge of the *SurfaceTerminal* is touching the edge of the Body and sometime wrap up the side of the body. In such cases, *TerminalHeight* shall be captured.

Refer to the *ModifiedRectangle* and the *CornerArc* within the Modified Rectangle structure to capture the details of this terminal shape in this image to the right.

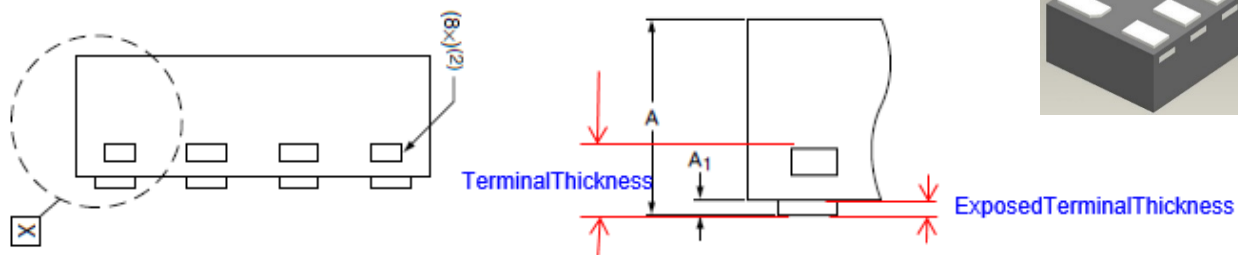


There are also some variants in which the side wrap is the same height as the package body. This is almost considered a *Wraparound* terminal, but if the terminal does not wrap around the top surface, then it is still a *SurfaceTerminal*. In these cases, the *TerminalHeight* is equal to the Body Height.

*SurfaceTerminal* variants that are *Pullback*, have an exposed thickness of the terminal under the bottom surface of the package body.



The *ExposedTerminalThickness* is critical for the calculation of Land Patterns and should be captured. The *TerminalThickness* as defined in this image is not used for land pattern generation, since the exposed piece on the side is typically not plated.

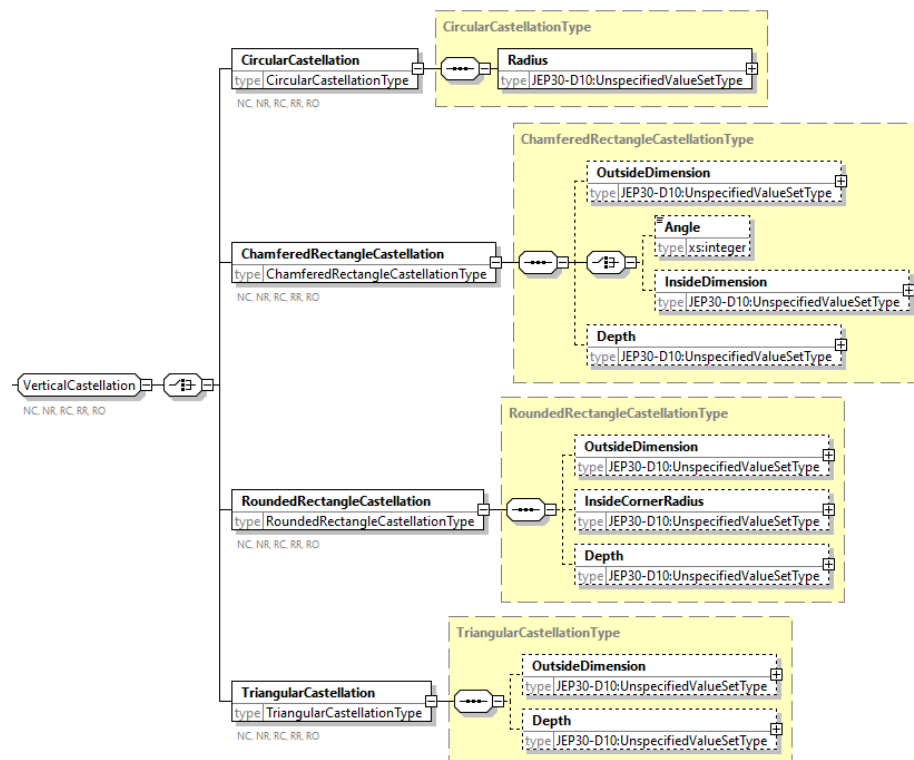
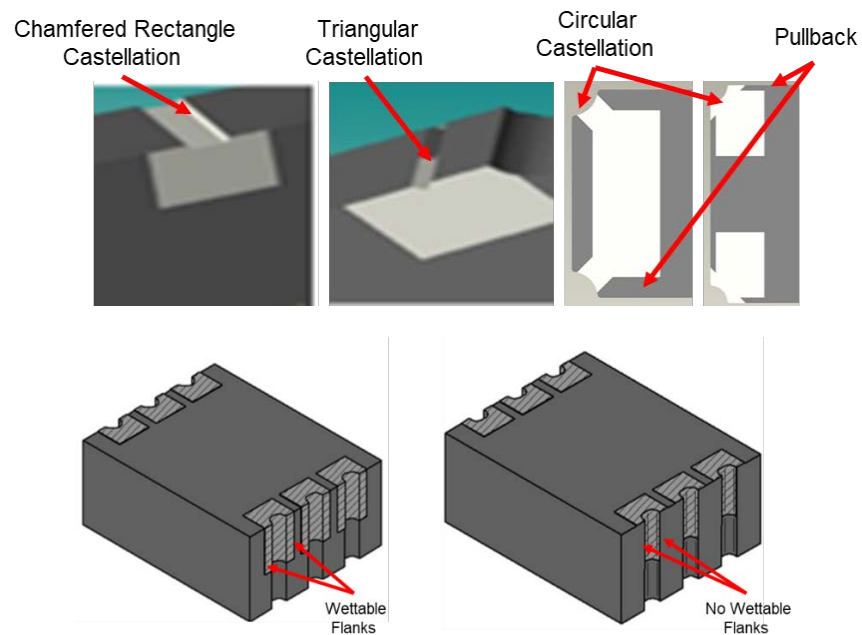




### A.2.9.1 Vertical Castellation

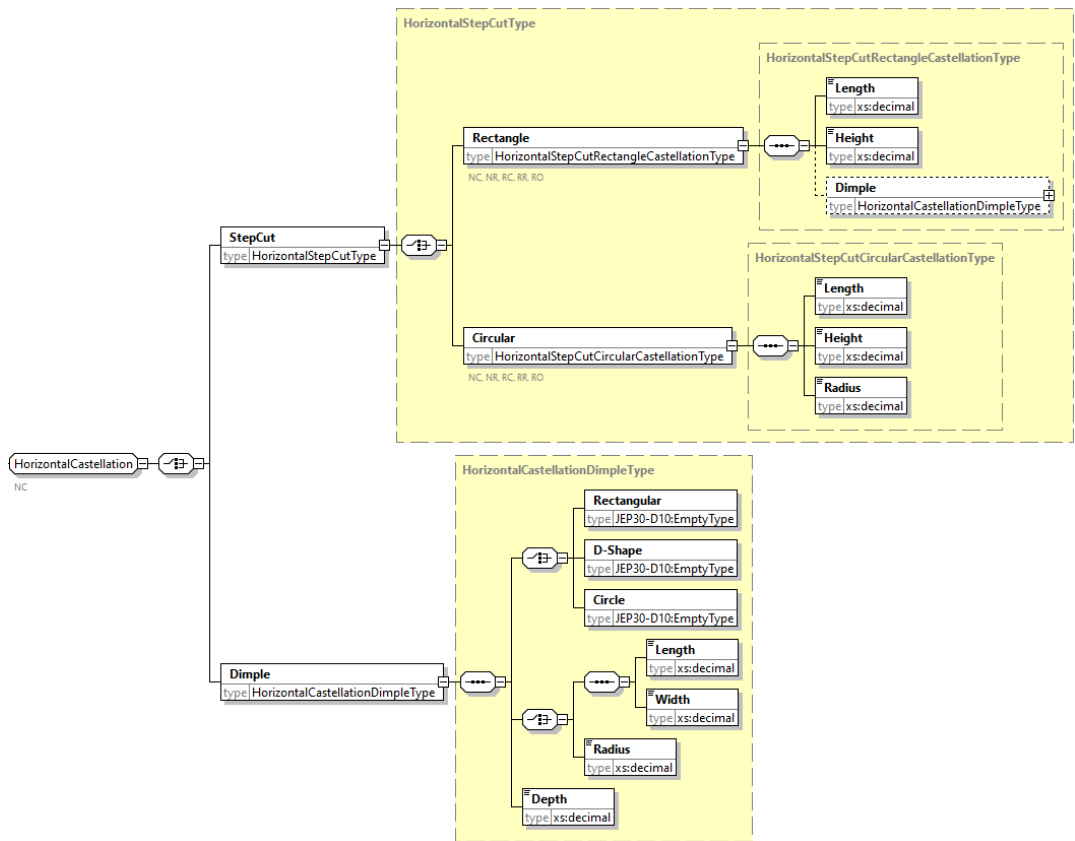
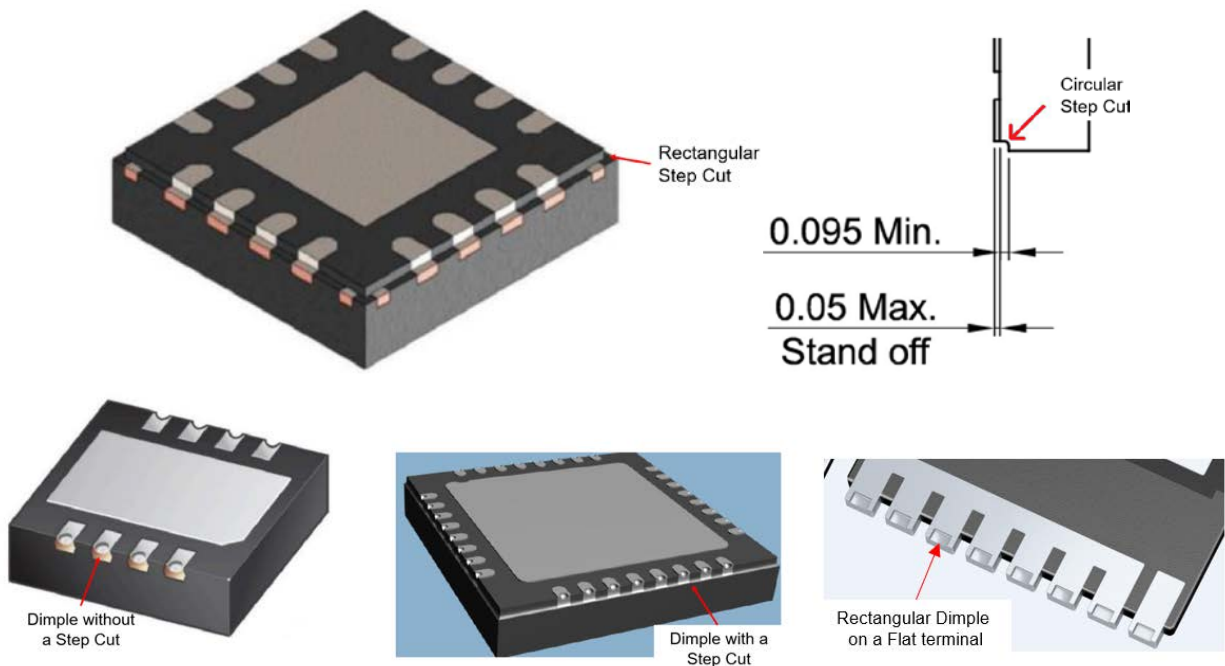
There are several different kinds of vertical castellations such as

- 1) Triangular Castellation,
- 2) Chamfered Rectangle Castellation,
- 3) Rounded Rectangle Castellation, and
- 4) Circular Castellation.

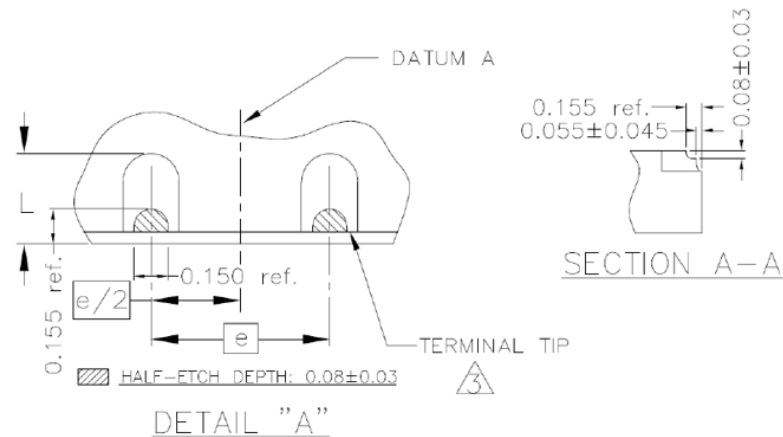




A.2.9.2 Horizontal Castellation



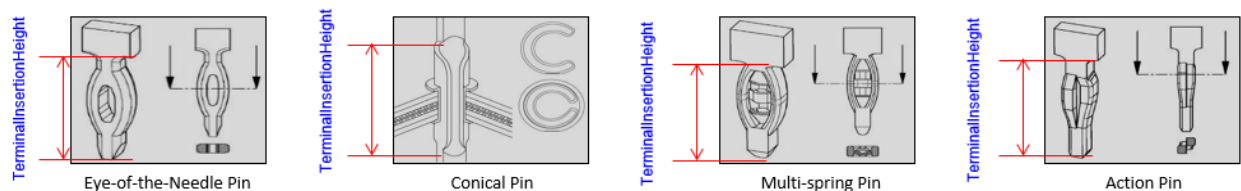
### A.2.9.2 Horizontal Castellation (cont'd)



The above example shows a Rectangular Step Cut of Length =  $0.555 \pm 0.045$ . The Dimple is a D-Shape where the Length is measured from the package body edge and therefore is 0.155. The Width of the Dimple is 0.150. While the radius of the dimple is half of 0.150 ref (i.e. 0.075), at nominal dimensions, this provides a straight edge of the D-Shape of  $0.155 - 0.075 = 0.08$ . When the length of the Step Cut is at its maximum value of  $0.055 + 0.045 = 0.1$ , then this means that the length of the dimple D-Shape is reduced to 0.055, which is less than the diameter of the D-Shape and thus a circle. However, this is ignored since the shape determination is defined at nominal dimensions.

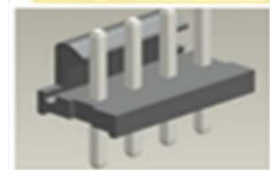
### A.2.10 Pressfit

There are 4 types of *Pressfit/Compliant* terminals plus a Non-Compliant terminal. In all cases, the dimension to be captured is the length of the terminal from the end point to the point of maximum insertion of the terminal through the hole. This stopping point can be a shoulder on the pin, or it can be the package body. This is defined as the *TerminalInsertionHeight*.

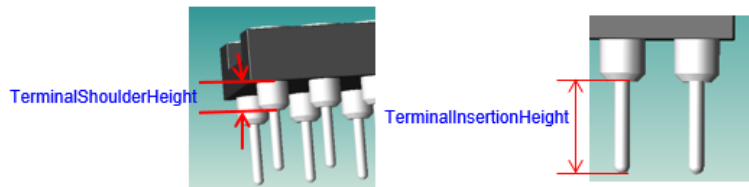


## A.2.11 Pin

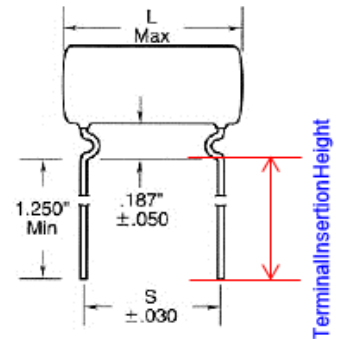
A *Pin* can be straight, *Kinked* or come with a *Shoulder*. There is also 3 additional variants, notably a *Press-inSolderable*, *Press-inNon-Solderable*, or a *SwageFasteningPin*.



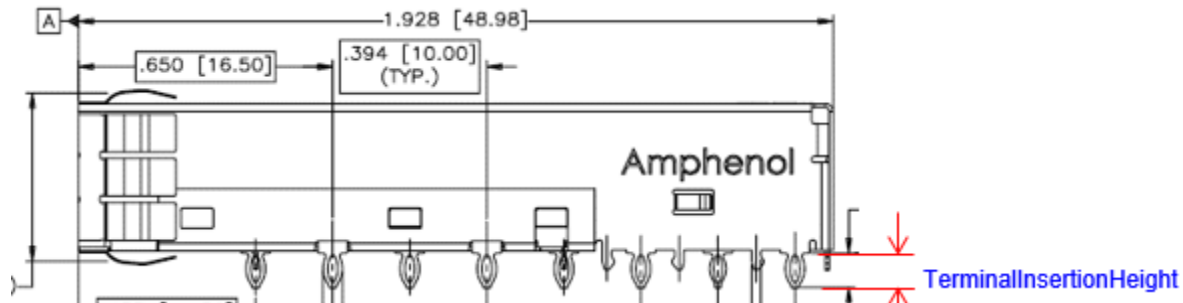
A *Pin* with a *Shoulder* will have a *TerminalInsertionHeight* that goes through the printed board. Plus a *TerminalShoulderHeight* that is typically the same as the Stand-off height.



The *Pin* with the variant *Kinked* acts in the same way as the *Pin* with the *Shoulder*. The dimension of the terminal that can penetrate the printed board (i.e. the section of the *Pin* below the *Kink*”) is considered the *TerminalInsertionHeight*. The distance from the bottom of the “kink” to the underside of the package body is the considered the standoff.

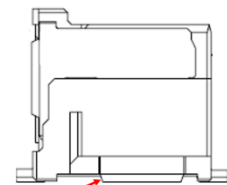


For *Press-inSolderable* terminals, the *TerminalInsertionHeight* is considered the section of the terminal below the shoulder or below the Package body in the absence of a shoulder.



The same concept applies to the *Press-inNon-Solderable* terminals. The *TerminalInsertionHeight* is the length of the terminal that could penetrate the printed board.

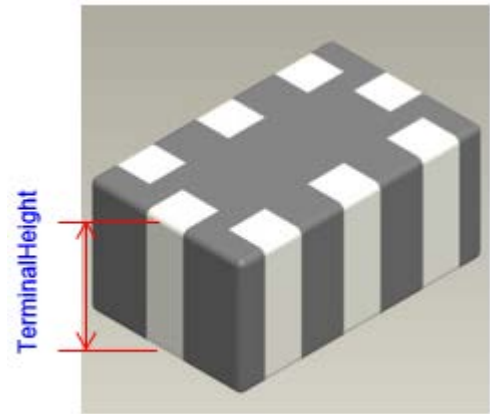
Some *Pins* are designed to be *Surface-mount* where the base of the pin is tapered.



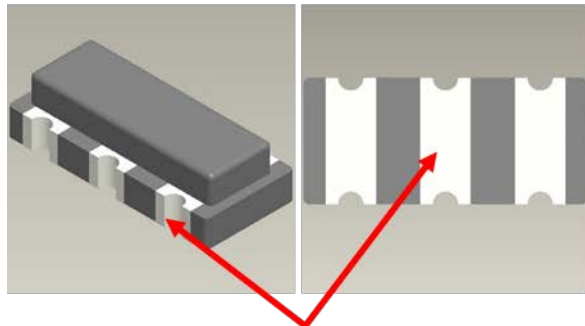
### A.2.12 Wraparound

*Wraparound* terminals are like *SurfaceTerminals* in that the surface of the terminal is on the same plane as the surface of the package body, hence the term surface terminal. *TerminalThickness* may be “0” but the *TerminalHeight* is the height of the terminal when looking at the side elevation.

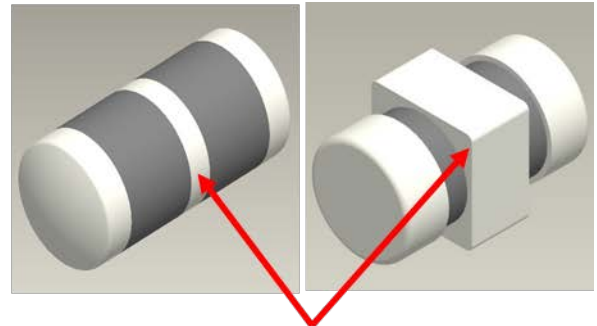
Some Parts can have a wraparound terminal that does not cover the same height as the Package Body. In this case the Terminal Height is still captured and is mandatory.



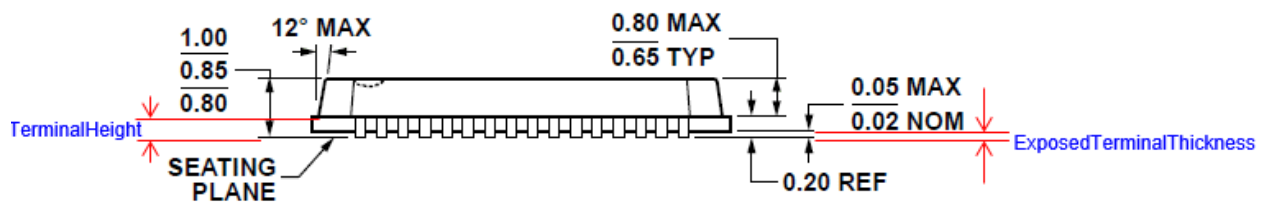
There are various options for Wraparound terminals. The castellation structure for *Wraparound* terminals is the same as for *Surface-terminals*.



Open Ring

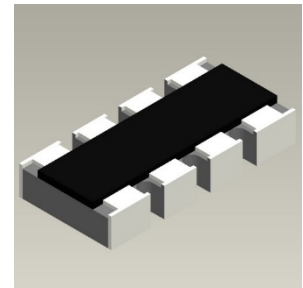


Ring



It is also possible that the surface of the wraparound terminal is not flush with the surface of the package body. This becomes particularly important on the underside of the part that connects with the land pattern. Since these terminals are embedded into the Package body material, only a portion of the terminal thickness is exposed. This *ExposedTerminalThickness* is a mandatory dimension to be collected.

Convex-S has the end Terminals larger than the terminal in between the ends.



### A.2.13 S-Bend

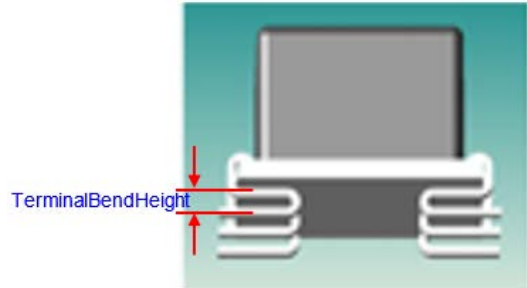
*S-bend* has a terminal contact area similar to a *C-bend*, or a *J-bend*.

The critical dimension for footprints is the *TerminalThickness* as shown here.

Similar to the J-bend, other dimensions can also be captured to facilitate more accurate 3D representation.

The *TerminalHeight* is useful only for the purpose of generating more accurate 3D models, and is therefore optional to be captured.

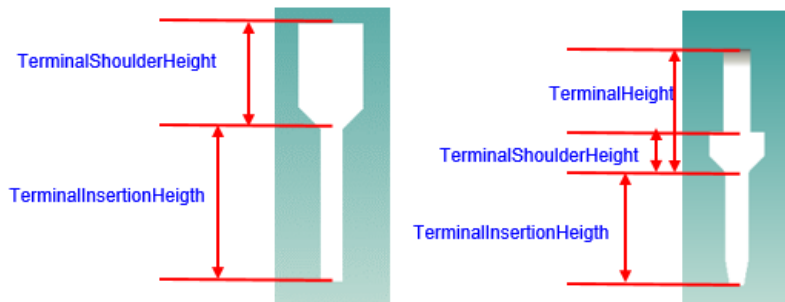
The *TerminalBendHeight* is also only useful only for the purpose of generating more accurate 3D models. It is also assumed that for S-bends, both the *TerminalHeight* and the *TerminalBendHeight* are well in excess of the max height that the solder will creep up the terminals, from which the projection to the land pattern for the toe or heel is defined. Therefore the *TerminalHeight* and the *TerminalBendHeight* are optional data to be captured.



### A.2.14 Through-Hole

Through-hole terminals can exit from the side of the package or from the underside of the Package body.

As can be seen from the different types, the terminal shoulder can travel up all the way to reach the Package body. The *TerminalShoulderHeight* is the distance from the bottom of the Shoulder to the top of the terminal shoulder, irrespective of whether or not the Terminal exits from the side of the body or from the underside of the package body.

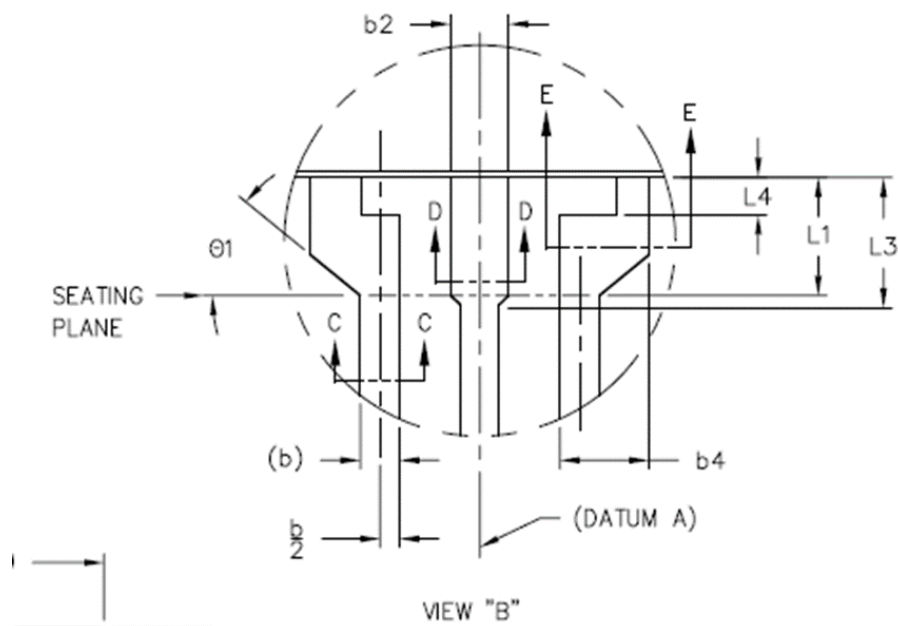
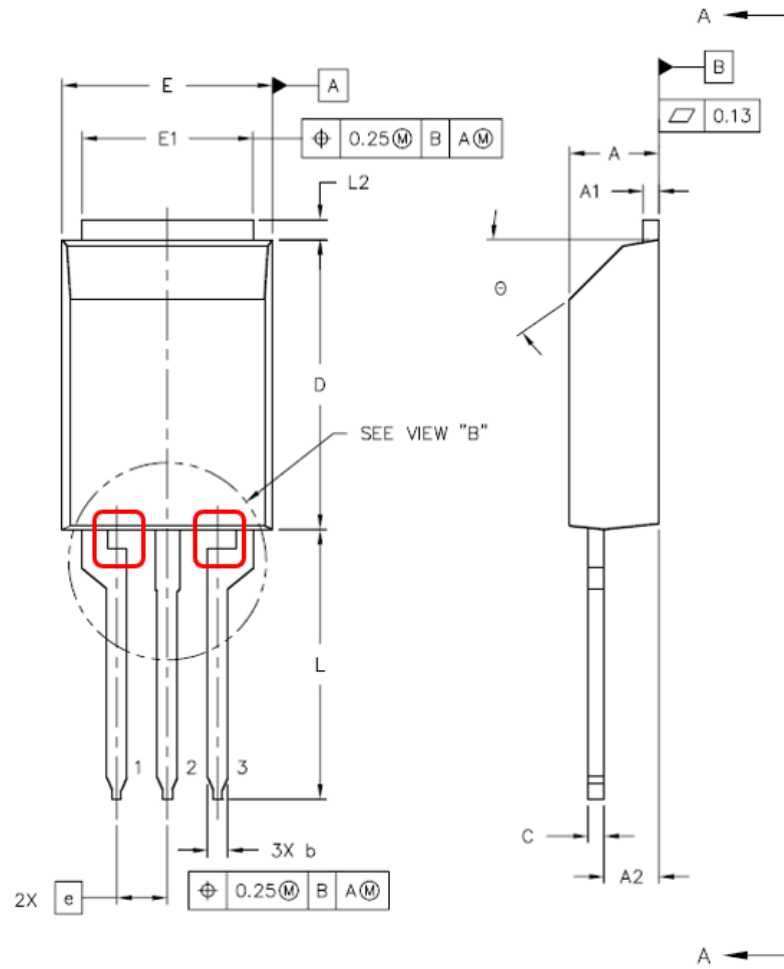


However in 2<sup>nd</sup> image, the shoulder does not reach the Package body. In this case the dimension from the bottom of the Shoulder to the top of the Terminal is called the *TerminalHeight*, whereas the distance from the bottom of the Shoulder to the top of the Shoulder remains the *TerminalShoulderHeight*.

In all types, the *TerminalInsertionHeight* is the distance from the bottom of the Shoulder to the end of the Terminal. This dimension is critical.

*Through-Hole* terminals such as those on Flange Mount devices can have cutouts at the top of the terminals. The details of these cutouts can be captured via the *TH-ShoulderCutout* section of the schema. An example of cutouts is shown below.

### A.3.4 Through Hole (cont'd)

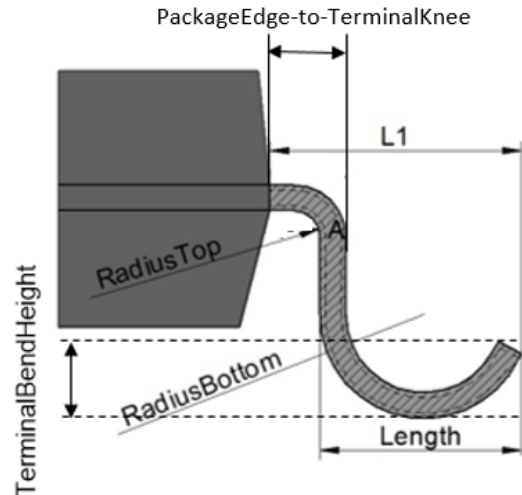


### A.2.15 J-Inverted

J-inverted compliant terminal extends from the sides of the body, bend down, and form a curved contact area with the board outside the package body. It is similar to a J-bend terminal except that the bottom of the J-terminal is outside the package as opposed to under the package.

When terminals are in a Dual position on the device, then the dimension *Pitch* in the direction across the package body for the terminals in the dual position is normally provided, in addition to the terminal *Length*.

The element the *PackageEdge-to-TerminalKnee* measures the distance from the edge of the package to the intersection of the projection of the vertical portion of the terminal as defined by the rise angle. If the rise angle is 90 degrees, then this *PackageEdge-to-TerminalKnee* dimension equals the span  $Pitch - Length + TerminalThickness \cdot 2$



The elements *Width*, *TerminalHeight*, *TerminalThickness*, *RadiusTop*, *RadiusBottom*, and *RiseAngle*, follow the same definitions as that provided for the C-bend. *TerminalBendHeight* is useful for the purpose of generating more accurate 3D models and is therefore optional.

The applicable shoulder elements for the *ShoulderTransition/Tapered* shoulder are as follows:

- 1) *SeatingPlane-to-start-of-ShoulderTaperTransition*, and *SeatingPlane-to-start-of-ShoulderTaperTransition*,
- or
- 2) *Top-of-TerminalExit-from-Package-to-start-of-ShoulderTaperTransition*, and *Top-of-TerminalExit-from-Package-to-start-of-ShoulderTaperTransition*.

The applicable shoulder elements for the *ShoulderTransition/RightAngled* shoulder are the

- 2) *SeatingPlane-to-ShoulderTransition*, or *Top-of-TerminalExit-from-Package-to-ShoulderTransition*.

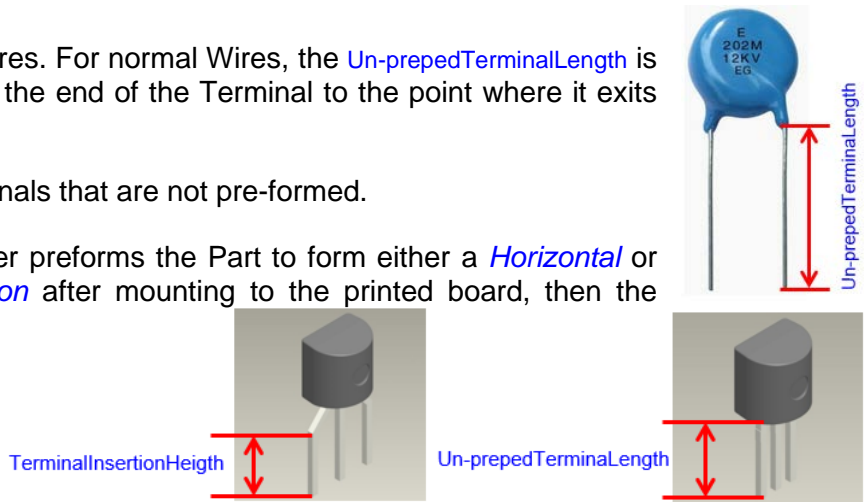


### A.2.16 Wire

There are several types of wires. For normal Wires, the **Un-preppedTerminalLength** is defined as the distance from the end of the Terminal to the point where it exits from the Package body.

This applies to all Wire Terminals that are not pre-formed.

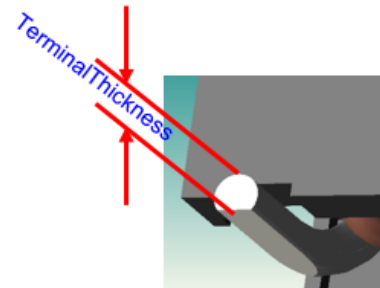
Where the Product Assembler preforms the Part to form either a **Horizontal** or **Vertical PackageBodyDirection** after mounting to the printed board, then the dimensions captured should reflect the prepped part. After prepping, the distance from the end of the Terminal to the Kink in the Terminal is defined as the **TerminalInsertionHeight**.



**Un-preppedTerminalLength** dimension is required to enable the various Terminal Insertion Spans to be calculated.



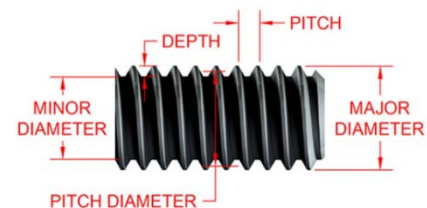
A **Wire** can also be surface mounted to the printed board, as in this image. Most **SM-Wires** are flattened so that the terminal does not roll off the pad, and this results in a lower vertical **TerminalThickness** dimension than the terminal diameter.



### A.2.17 Screw

Major diameter (outside diameter) is the largest material diameter of the thread feature. Outside or external thread diameter means the diameter of a screw and includes a raised helix height around the thread.

Minor diameter can be defined as an imaginary cylinder that can touch the roots of the thread crests.



Effective or pitch diameter is the diameter of an imaginary co-axial cylinder that can intercept the surface of the thread. Pitch diameter can cross so that the intercept on a cylinder generator at the point where pitch diameter meets the opposite flanks of the thread groove. The thread groove is equal to half of the nominal pitch of the screw thread.

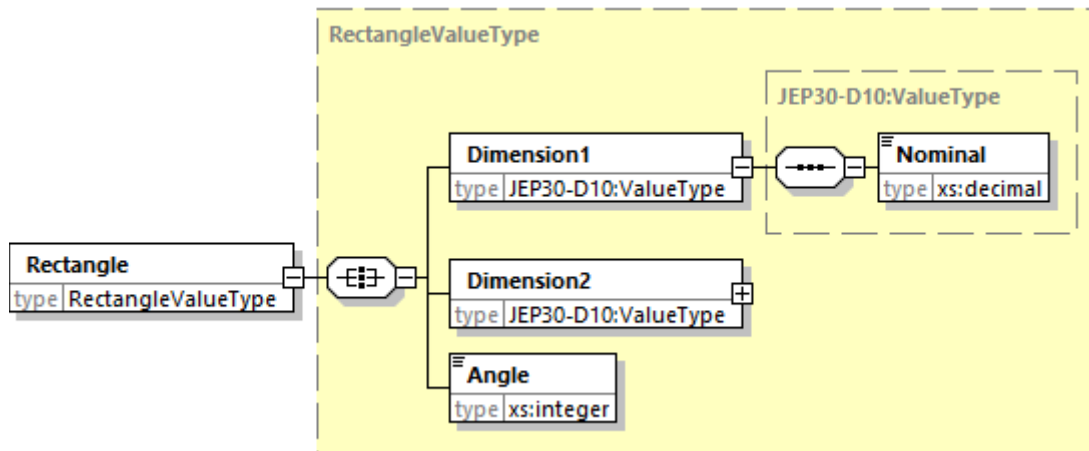
The Thread Pitch is a distance from a point on the same screw thread to a corresponding threshold.



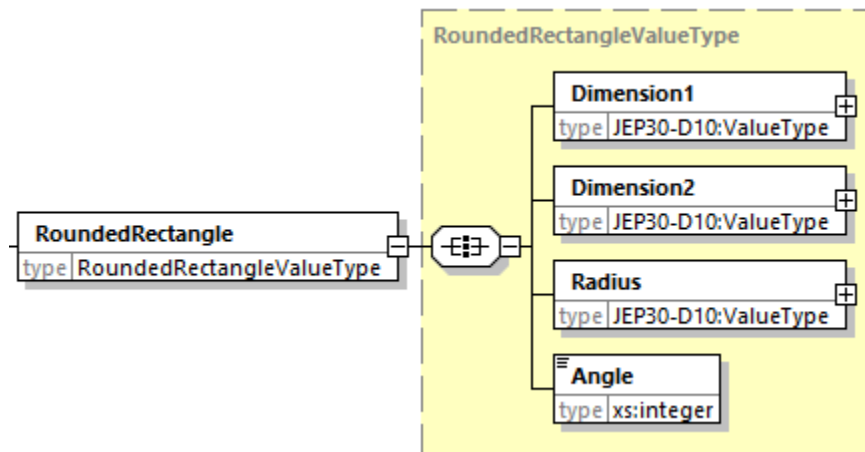
### A.3 Land Pattern Shapes

The following sections outlines the recommended land pattern shapes. All shapes defined for design tools will only contain the Nominal value, since this is the target value that is defined in the software tools for which the design is intended.

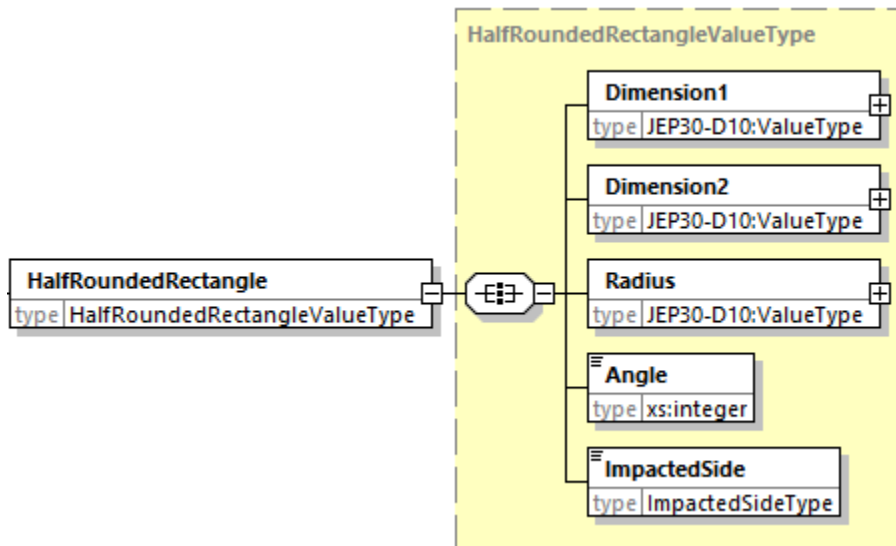
#### A.3.1 Rectangle



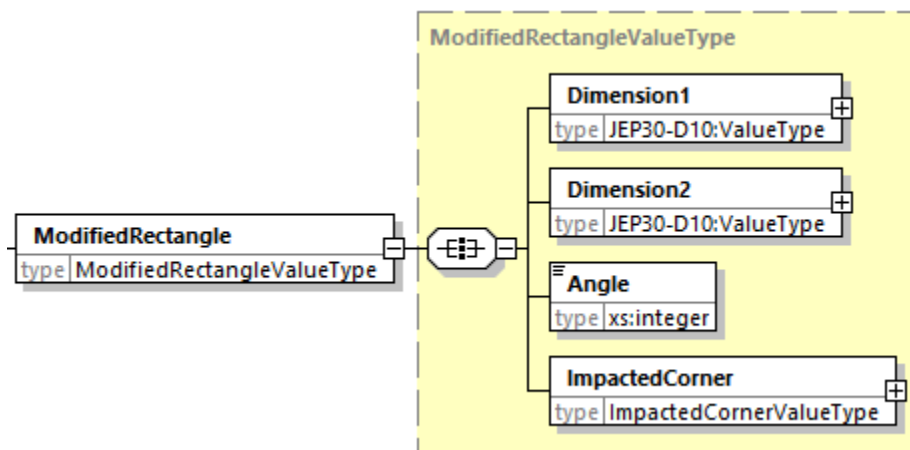
#### A.3.2 Rounded Rectangle



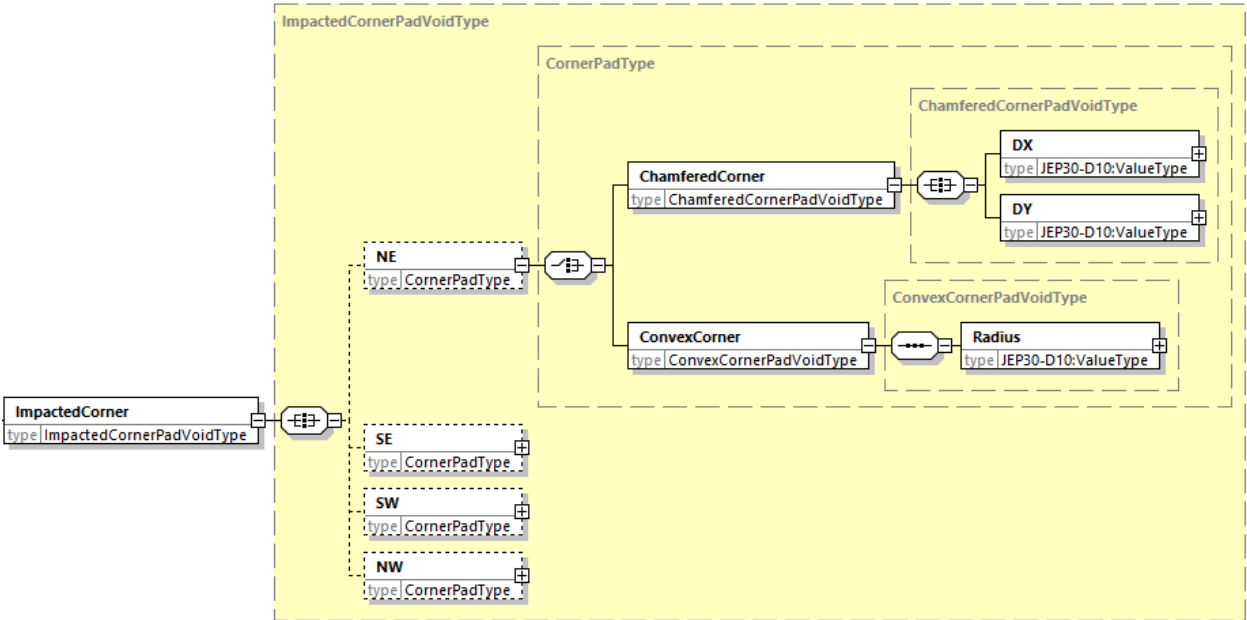
### A.3.3 Half Rounded Rectangle



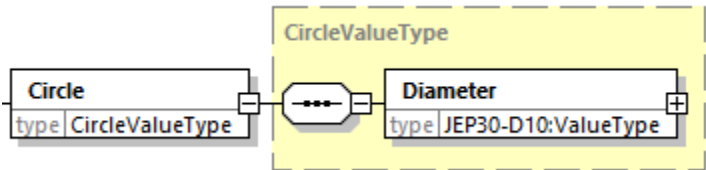
### A.3.4 Modified Rectangle



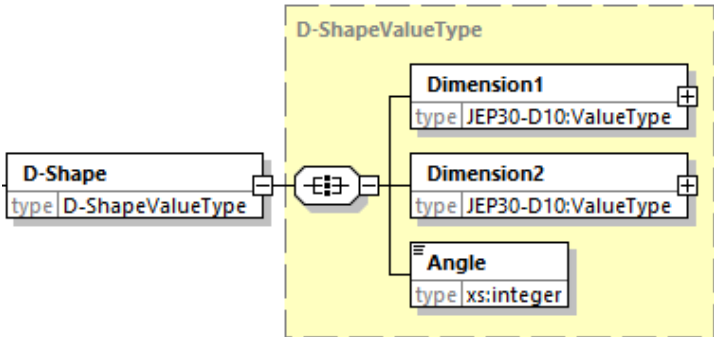
A.3.4 Modified Rectangle (cont'd)



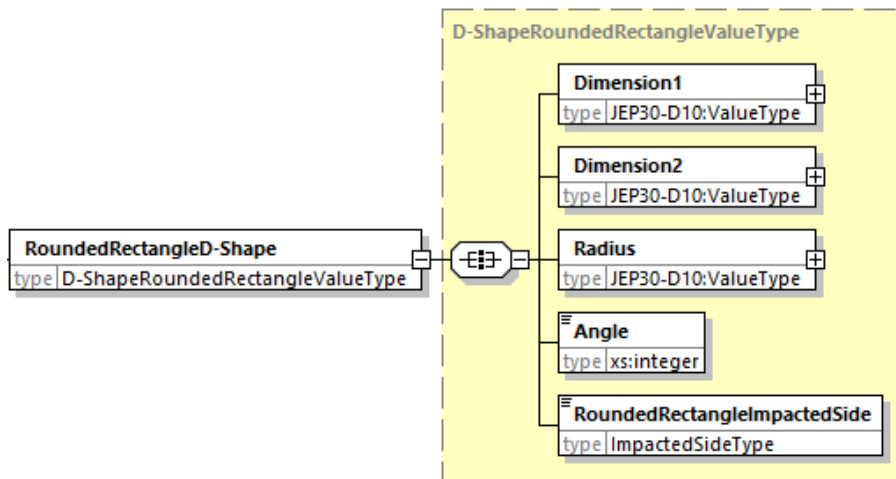
A.3.5 Circle



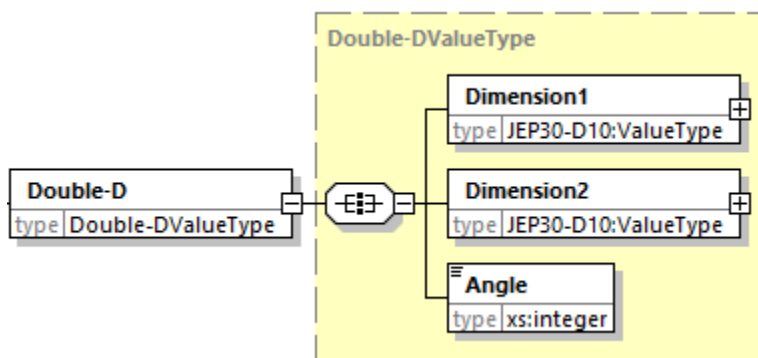
A.3.6 D-Shape



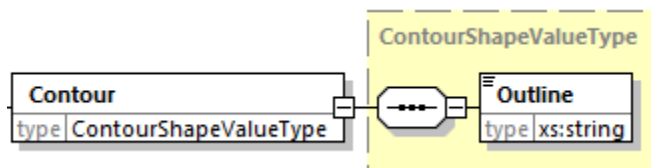
### A.3.7 Rounded Rectangle D-Shape



### A.3.8 Double-D

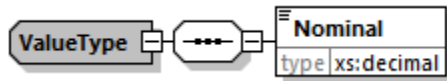


### A.3.9 Contour



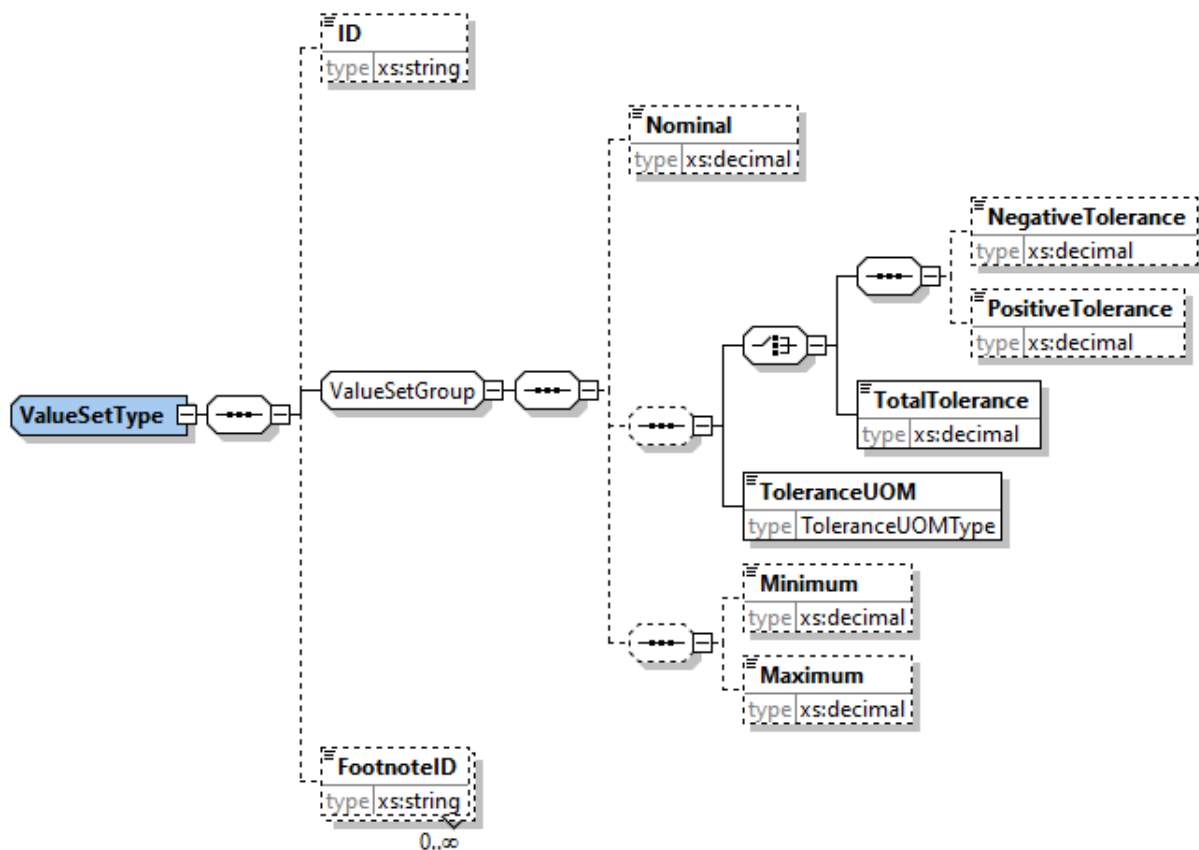
## A.4 Value Set Types

### A.4.1 Value Type



Recommended land pattern shapes, only requires the nominal to be defined and not any of the tolerances nor the min and max values

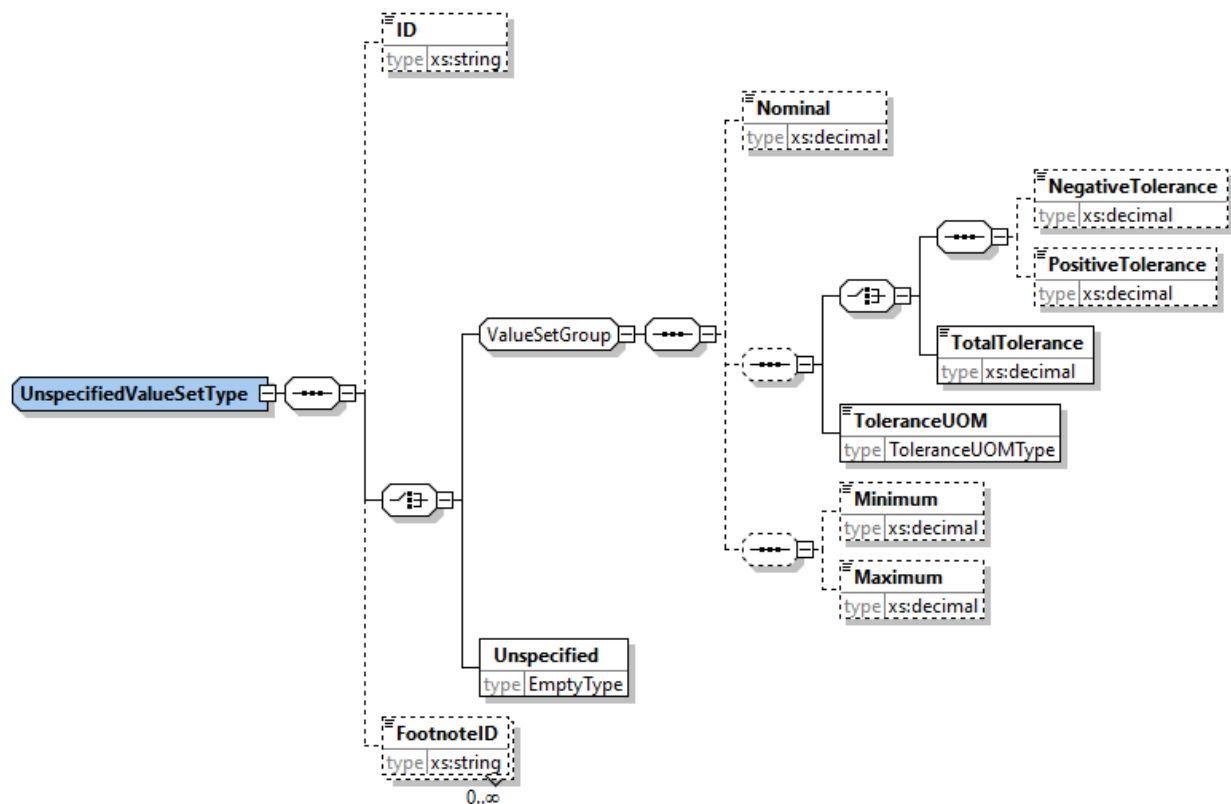
### A.4.2 Value Set Type



The following set of data can be captured for each dimension via the *ValueSetType*:

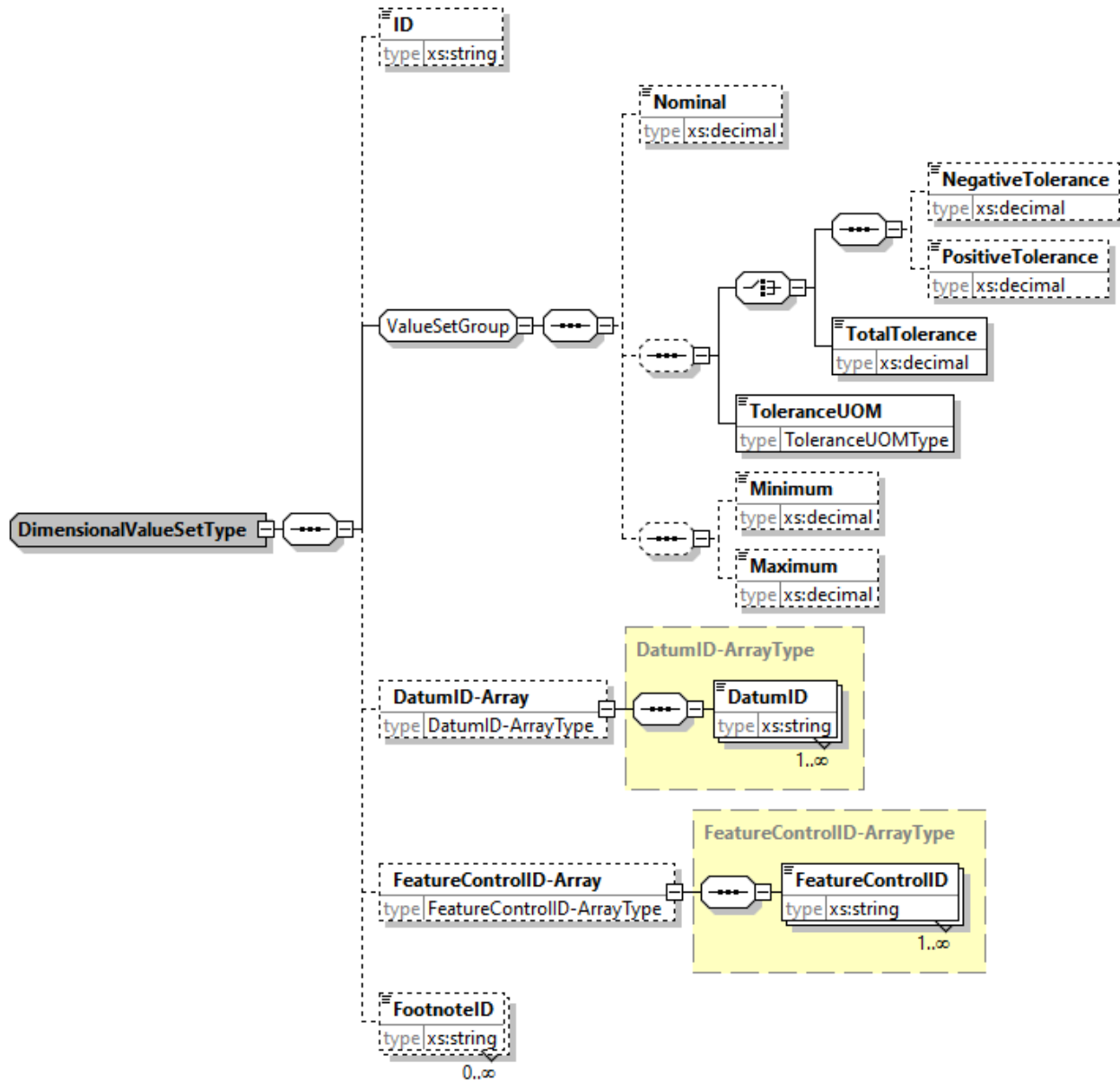
- *Nominal*,
- *Negative* and *Positive* Tolerance, or *Total* Tolerance. The *UOM* (*ToleranceUOMType*), defines whether the tolerance value is a percentage of the Nominal or in absolute values, according to the *DimensionUOM* selected.
- *Minimum*,
- *Maximum*.

### A.4.3 Unspecified Value Set Type



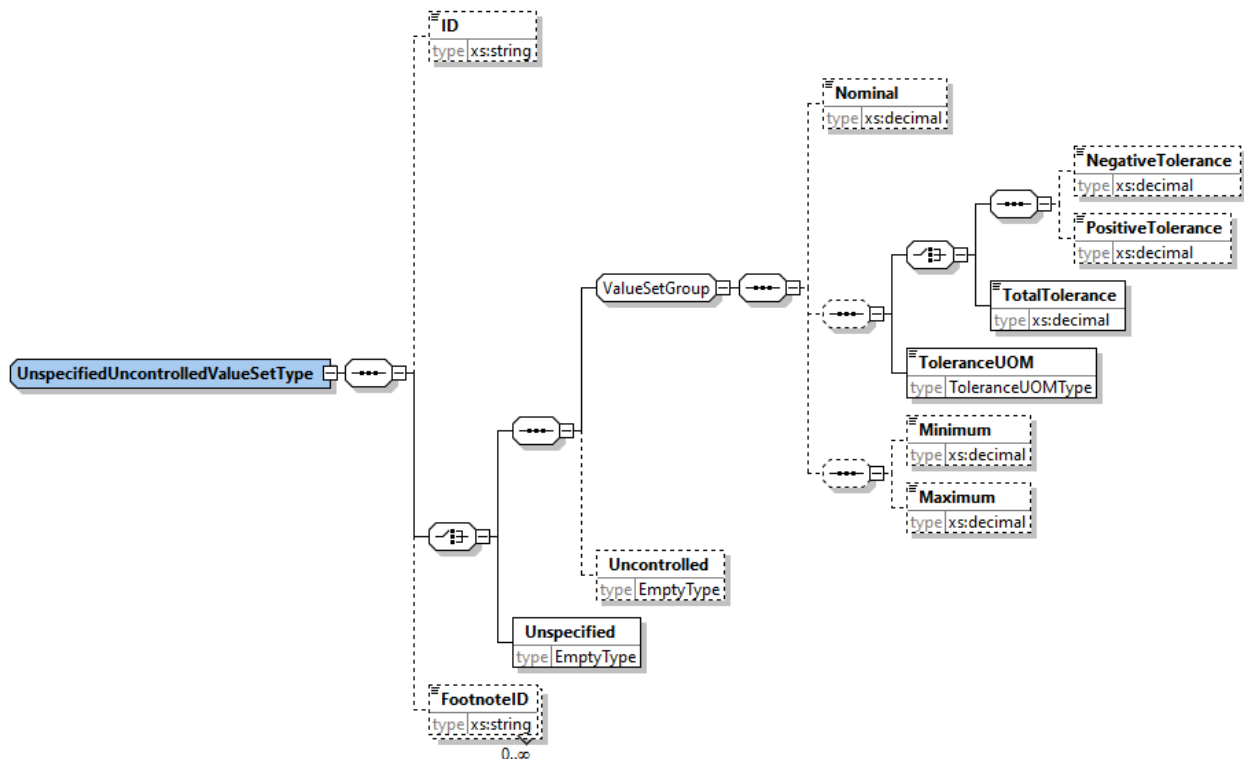
This is the same as the *ValueSetType* with the exception that *Unspecified* can be chosen in the event that that particular dimension is not specified. This is only applied to non-critical dimensions.

#### A.4.4 Dimensional Value Set Type



This is the same as the [ValueSetType](#) with the exception that [DatumID-Array](#) and [FeatureControlID-Array](#) are added structures to support GD&T. The FeatureControlPlacement-ID represents the location in the drawing where the feature is drawn, i.e. on the right side or the left side .

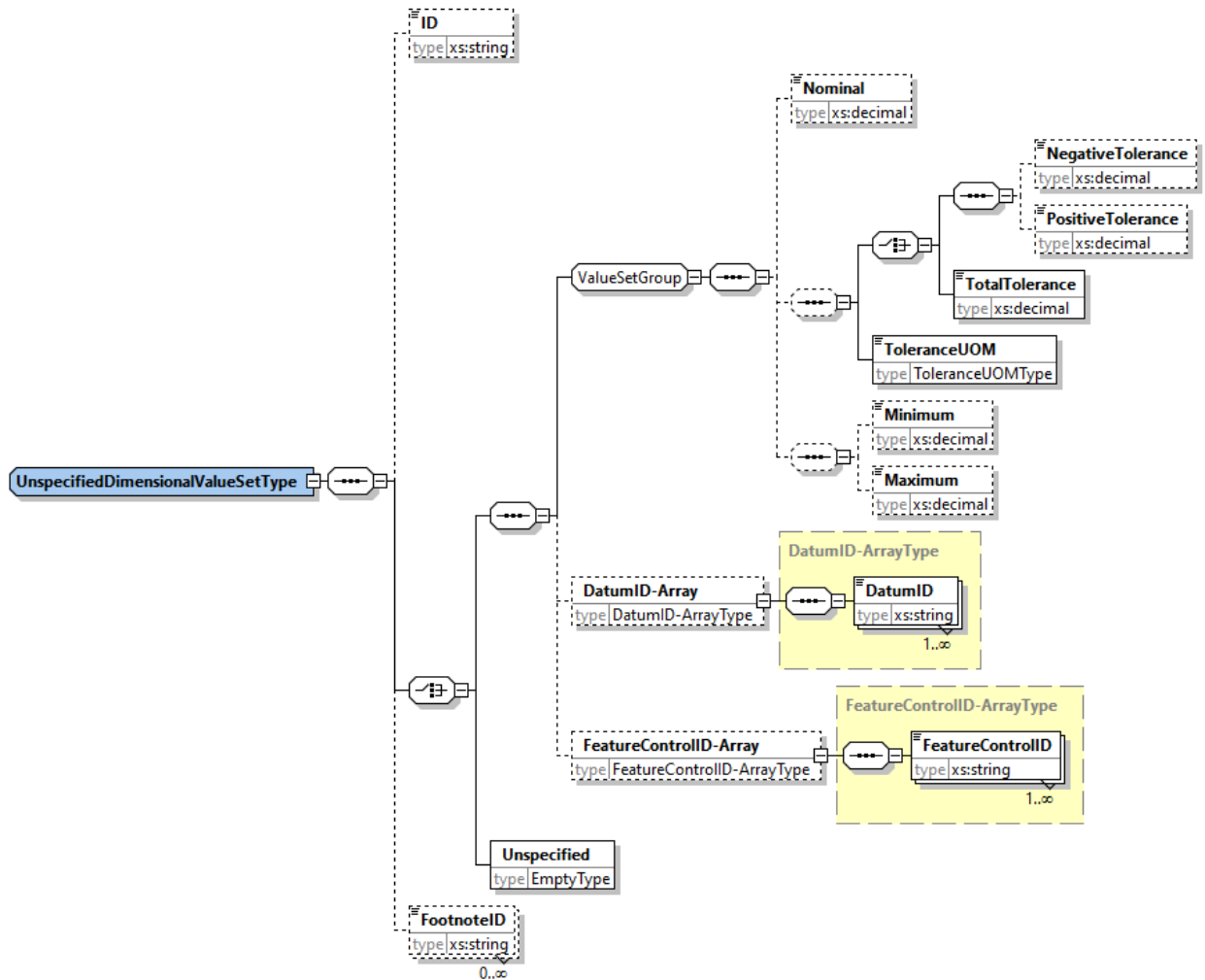
#### A.4.5 Unspecified and Uncontrolled Value Set Type



This is the same as *ValueSetType* with the exception that even when dimensions are provided, that these dimensions are un-controlled. Often, these dimensions are omitted from the drawing, hence *Unspecified* can be chosen in the event that that particular dimension is not specified. This is only applied to non-critical dimensions.

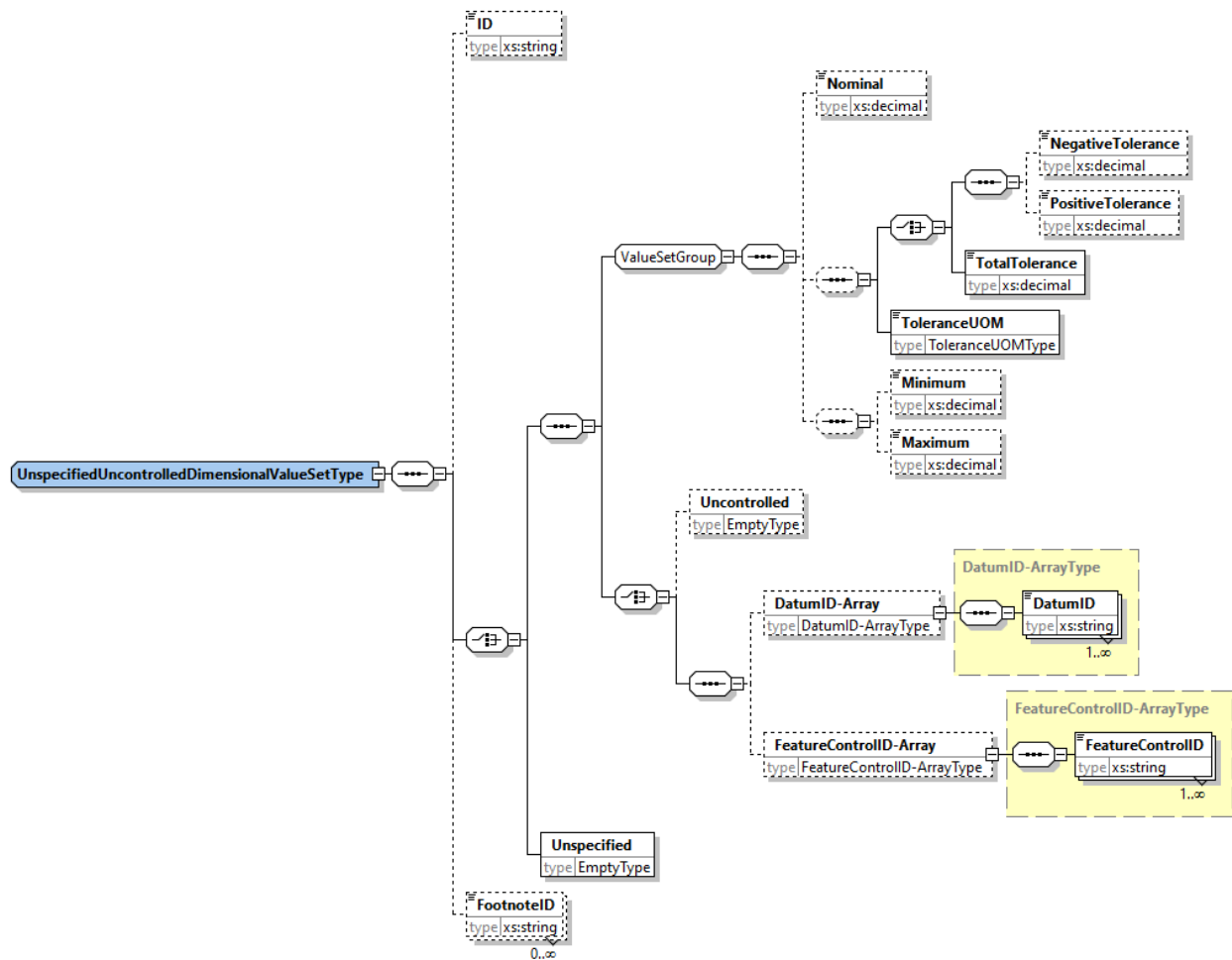


#### A.4.6 Unspecified Dimensional Value Set Type



This is the same as the *DimensionalValueSetType* with the exception that *Unspecified* can be chosen in the event that that particular dimension is not specified. This often occurs on terminal shoulders where some situations these critical shoulders definitions require GD&T references, and in other in other situations, the shoulder is not critical and can be left unspecified.

#### A.4.7 Unspecified and Uncontrolled Dimensional Value Set Type



This is the same as the [UnspecifiedDimensionalValueSetType](#) with the exception of the addition of the *Uncontrolled* element as a choice to the combination of *DatumID-Array* and the *FeatureControlID-Array*. Often, these dimensions are omitted from the drawing, hence *Unspecified* can be chosen in the event that that particular dimension is not specified. This is only applied to non-critical dimensions.

## Annex B (informative) Differences between JEP30-P100 and its predecessors

This table briefly describes most of the changes made to entries that appear in this standard, JEP30-P100, compared to its predecessor; Punctuation changes may or may not be included.

Initial Issue:	Date: May 2018	Item Number: 11.2-938
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### Change Record History

Issue: A	Date: March 2023	Item Number: 11.2-839S
Section 2.1 Applicable Documents JEDEC – Added in reference to new document SPP-010		
Section 2.1 Applicable Documents ASME – Added in reference to new document ASME Y14.5-2009		
Section 4.4 Package-Array – Updated Package Type to include <i>GDA</i> and <i>T</i> section.		
Updated all diagrams in all sections that had elements with no type to now have an JEP30-D10:EmptyType.		
Section 4.5 Package Terminal Position – Added Internal position to align with JESD30J Also changed MultiPosition to MixedPosition.		
Section 4.6.1 Microelectronics Assembly: Added new extended package outline option for “Chiplets”		
Section 4.6.2 Post Mount: Changed “Sequence” to “Choice”		
Removed Section 4.6.3 <i>Switch</i> , since the extended package outline section for Switch is moved to Part Classification under JEP30-E101		
Section 4.7.13 Through-Hole: Added missing diagram for Through-Hole		
Section 4.14 Keepout Region – Make Component Optional		
Section 4.19 Terminal Function – Added Thermal as an additional function.		
Sections 4.20.2, 4.21.2.2 and 4.22.3.2 Circular Array – Updated <i>RotateWithCircle</i> and <i>RotationAngle</i> types		
Section 4.22.3.3 Pad-or-Hole Status is updated to enable the center and Index to be unbounded.		
Section 4.25 Updated Table 8 - Terminal Group to Package Body Relationship Dimension Variations to replace “Lower” and “Upper” with “Back” and “Front in Y1-Y27 Offsets. Also added Offsets for the Z-direction		
Section 4.26 Added in the <i>Z-Direction</i> to <i>TerminalSpan</i> and <i>TerminalSpacing</i> into <i>TerminalGroupToTerminalGroupRelationships-Array</i>		
Section 4.27 Changed <i>TerminalDetails-Array</i> from a Choice to a Sequence		
Section 4.27.1 Terminal Details - Added " <i>PolarTerminalIndex</i> " to " <i>TerminalDetailsType</i> " and to " <i>FirstTerminalLocationType</i> " in Section 4.27.2.1		
Section 4.27.1.1 – Added new section for Terminal Center to include polar coordinates		
Section 4.27.1.2 – Added " <i>Excluded</i> " to " <i>TerminalStatus</i> "		
Section 4.27.2.1 First Terminal Location		
Section 4.27.2.2 Terminal Numbering Pattern		
Section 4.27.2.3 Added Grid Terminal Numbering Pattern		

## Annex B (cont'd)

Section 4.27.2.4 Terminal Details Exceptions - Added " <i>Excluded</i> " to " <i>TerminalStatus</i> "
Section 4.27.2.4.1 Terminal Index - Added " <i>PolarTerminalIndex</i> " to " <i>AssociatedTerminalStatus</i> "
Section 4.27.2.4.2 Terminal Number – Added " <i>FromNumber</i> " and " <i>ToNumber</i> " to " <i>TerminalNumberType</i> "
Section 4.28 Updated Via Array
Section 4.29 Added a new section for 4.29 Geometric Dimensioning and Tolerancing
Section 4.30 Added a new section for Physical Model
Annex A Section A.1 – Update Contour example to fix one of the coordinates
Revised Table of Contents

Issue: B	Date: Jun 2023	Item Number: 11.2-1032
Section 2.1 Applicable Documents: Update reference to JESD30K		
Section 2.3 JEDEC/IPC: Added new reference to J-Std-609 Standard		
Section 4.4 Package: Added <i>AssemblyTechnologyType</i> , <i>CTE-ArrayType</i> , and <i>YoungsModulus-ArrayType</i> to <i>PackageType</i> .		
Section 4.5 Package Terminal Position: Updated Package Terminal Position / Upper position to be consistent with Bottom position to support Chiplets		
Section 4.5.8 Upper: Added new section for upper terminal position		
Section 4.7.4 Gull-wing: Renamed extended terminal code from Shoulder to Modified to align with JESD30K		
Section 4.11 Package Shape: Add in a new primitive shape <i>RectangleConcave</i>		
Section 4.15.1 Terminal Position: Updated Terminal Group Terminal Position / Upper position to be consistent with Bottom position to support Chiplets		
Added new section 4.16 for Assembly Technology		
Added new section 4.17 for CTE - Array		
Added new section 4.17 for Young Modulus		
Section 4.18.1 Terminal Group – Array: Added Terminal Material and CTE-Array to Terminal Group Type		
Section 4.18.3.1 Terminal Detail: Added ID key under terminal Details array for reference by the Fiducial Array		
Section 4.19 Fiducial: Added new section for Fiducial Marking		
Section 4.20 : Changed GD&T Datum-to-Element Map to unbounded under GD&T Datum-to-Element Map - Array		
Section 4.20.2.1 Recommended Pad Or Hole Shape: Moved this structure from under Terminal Groups to an array under Recommended Footprints		
Section 4.20.8 Keepout Region -Array: Moved this structure from under Package to under Recommended Footprints		

## Annex B (cont'd)

Issue: C	Date: November 2023	Item Number: 11.2-1040
Section 2.1 Applicable Documents: Update reference to JESD30L		
Section 4.5.2 Dual: Added “Bottom-to-Upper” as a new Dual position to support Compressed Mount Technology terminal types.,		
Section 4.5.2.2 Dual Bottom-to-Upper: Added new structure for Bottom-to-Upper position		
Section 4.7 Package Terminal Code: Updated diagram to include “Compressed Mount Technology” as a new Terminal type.		
Section 4.17.1.2 Terminal: Added Compressed Mount Technology as a new terminal type		

Issue: D	Date: February 2024	Item Number: 11.2-1053
Description of Change		
Section 4.3 Linking the MPN to a specific Package Family Data set: Update section to include reference from Part Number to Die		
Section 4.3.2 Linking the Manufacturing Part Number to Physical Model Content: Corrected the PhysicalModelKey assignment to PhysicalModel/ID,		
Added new Section 4.3.3 “Linking the Manufacturing Part Number to Die Content”		
Section 5 Package Section - Package: Updated diagram to include the addition of Die-Array		
Updated images in sections 5.6, 5.8, and A.4.2 thru A.4.7 to include ValueSetGroup		
Updated image in section 5.7.1 to include Outline-Array		
Section 5.13.3 Terminal Detail – Array: “Terminal Number Pattern” is made unbounded		
Section 5.13.3.2 Terminal Number Pattern: Added Prefix and Suffix under Terminal Number Pattern		
Section 5.13.3.2.2 Sequential: Added Prefix, Start and Suffix under both Numerical and Alphabetical Sequence.		
Section 5.13.3.2.3 Grid: Updated image.		
Section 5.13.3.2.1 First Terminal Location: Updated elements in “Location Relative-to-Package Center” type from optional to mandatory under choice.		
Section 5.13.3.2.2 Sequential: Updated Numerical and Alphabetical Sequence		
Added new Section 6 “Package Section – Die-Array”		

## Annex B (cont'd)

Issue: E	Date: August 2024	Item Number: 11.2-1059
Description of Change		
Section 4.1, and section 4.2: Update sections to align with modifications performed at the JEP30 parent structure		
Section 5 Package Section – Package: Updated name of the JESD30 document. Added Package Status. Changed xs:integer with Min of 1 to		
Changed xs:integer with Min of 1 to “Min Integer Of One Type” throughout the document		
Section 5.13.1 Terminal Group – Array: Make Terminal Location unbounded. Added Pattern Group section.		
Section 5.13.1.5 Terminal Location: Updated Terminal location to make it unbounded.		
Section 5.13.1.5.1 Standard Array: Make Angle optional		
Section 5.13.1.6: Added new section for Pattern Groups		
Section 5.13.1.7.22.3: Updated image for Void Status		
Section 5.13.3.2.1: Update image to include choice of Terminal Pattern ID or Pattern Group ID.		
Section 5.13.3.2.4.1: Update Image to include Terminal Location ID, and Pattern Group ID		
Section 5.13.3.2.4.2: Updated image to make various branches unbounded		
Section 5.16 Recommended Footprint – Array: Updated section with Footprint Name, Footprint Extended Name, Polarity. Made Soldermask and Pastemask Layer arrays optional.		
Section 5.16.2 Recommended Pad Or Hole Shape – Array: Added new element for Pad Group To Pad Group Relationship		
Section 5.16.2.1 Recommended Pad Or Hole Shape: Make Location unbounded. Added Pattern Group.		
Section 5.16.2.1.1.1.1.1 Standard Array: Make dx, dy, Angle and VoidGroupLowerLeftVoidCenter optional.		
Section 5.16.2.1.3 Location: Updated Location image to make it unbounded.		
Section 5.16.2.1.3.1 Standard Array: Updated image to make dx, dy, Angle and LandGroupLowerLeftPad-or-HoleCenter optional		
Section 5.16.2.1.4: Added new section for Pattern Groups		
Section 5.16.2.1.5: Added new section for Land Pattern Span		
Section 5.16.2.1.6: Added new section for Land Pattern Spacing		
Section 5.16.2.2: Added new section for Pad Group To Pad Group Relationship		
Section 5.16.7.1 Restrictive layer: Update element name to InnerLayer		
Section 5.16.9 Soldermask Layer – Array: Make Soldermask Layer – Array optional		
Section 5.16.10 Pastemask Layer – Array: Revised section to align with previous sections		
Section 6 Package Section – Die-Array: Added Process Technology		

## Annex B (cont'd)

Issue: F	Date: November 2024	Item Number: 11.2-1070
Description of Change		
Section 5.3.8 Surface Terminal: Added choice for Horizontal versus Vertical Castellation		
Section 5.7 Package Shape: Add recommendation of how to represent the package outline shape when the shape is a modified rectangle and when the corner dimensions are unspecified.		
Section 5.13.1 Terminal Group – Array: Change schema type from “All” to “Sequence”.		
Section 5.13.1.7 Terminal Shape:		
<ol style="list-style-type: none"> <li>1. Update diagram 1 of 9 to create structure to capture the dimensions for the Pad-on-Package, Soldermask Opening-on-Package, Ball and Column. Added diagrams 1.1 to 1.4 that defines each structure</li> <li>2. Update diagram 3 of 9 to change Rise Angle and Seating Angle from xs:integer to JEP30-D10:UnspecifiedValueSetGroupType and all respective tables.</li> <li>3. Update diagram 9 of 9 to insert Castellation Array</li> </ol>		
Section 5.13.1.7.1 Ball Types: Update Ball Dimension Table to add Regular Polygon, and added notes to highlight the preferred process of gathering the relevant information for this terminal.		
Section 5.13.1.7.9 Column Types: Update Column Dimension Table to add UpperSide-of-Column and LowerSide-of-Column structures. Also added notes to highlight the preferred process of gathering the relevant information for this terminal.		
Section 5.13.1.7.22 Castellation – Array: Added new section to define the vertical and horizontal castellations.		
Section 5.13.1.7.23 Terminal Void – Array: Added Cavity Depth for embedded cavity within void.		
Section 5.13.3 Terminal Detail Array: Relocate First terminal location and Terminal Detail Exceptions directly under Terminal Detail Array.		
Section 5.13.3.1.2 Terminal Status: Extend “Associated” to have a choice of “Terminal Pattern ID”, “Pattern Group ID”, or “Terminal Group ID” for the association to apply to.		
Section 5.13.3.3 Terminal Number Pattern: Update image based on changes to section 5.13.3, and extend to reference a choice of “Terminal Pattern ID”, “Pattern Group ID”, or “Terminal Group ID”.		
Section 5.13.3.3.1 Sequential: Add a choice under Row and Column for both “Numerical Sequence” and “Alphabetical Sequence” between included and excluded Numbers/Characters.		
Section 5.13.3.3.2 Grid: Updated image to correct Numerical Sequence Type and Alphabetical Sequence Type.		
Section 5.16.10.1 Aperture Shape: Added Segmented Ring to Aperture Shape.		
Section 6.5.7 Terminal Detail Array: Relocate First terminal location and Terminal Detail Exceptions directly under Terminal Detail Array.		
Section 6.5.7.1 Terminal Detail, Section 6.5.7.2 First Terminal Location and Section 6.5.7.4 Terminal Detail Exceptions: Extend structures to have a choice of “Terminal Pattern ID”, “Pattern Group ID”, “Terminal Group ID”, RegionID or Active Zone.		
Section 6.5.7.3 Terminal Number Pattern: Update image based on changes to section 6.5.7, and extend to reference a choice of “Terminal Pattern ID”, “Pattern Group ID”, “Terminal Group ID”, RegionID or Active Zone.		

## Annex B (cont'd)

Section A.1.16 Segmented Ring: Added new shape called Segmented Ring to support Pastemask Apertures
Section A.2.9 Surface Terminal: Enhanced section for the vertical and horizontal castellations

Issue: G	Date: February 2025	Item Number: 11.2-1073
Description of Change		
Change xs:all to xs:sequence throughout schema to facilitate lower level extensions with Choices and to simplify file comparisons.		
Section 5 Package Section: Add Attributes to Package Section in diagram 1 of 4. Update diagram part 4 of 4 to move CTE Array and Youngs Modulus Array to JEP30-D10 dictionary, and to add Heat Capacity, and Footnote Array.		
Section 5.3.10: Pin: Updated image to include Surface-mount as a new type of pin		
Sections A.4.X – All ValueSetType(s): Updated images to include Footnote, Added the word Tolerance to Negative, Positive, Total and UOM under the ValueSetGroup		
Section 5.7.1 Contour: Update image to make the contour tolerance type align with the value set group. Add Arc Segment Rotation and Footnote ID.		
Section 5.8 Part Height: Update image for Value Set Type		
Section 5.9 Clearance Region – Array: Update image to move Unspecified in under Standoff via Unspecified Value Set Type. Add Footnote ID to Standoff.		
Section 5.11 CTE - Array: Update entire section to align the CTE structure with that used in the Material Design Kit under JEP30-K101.		
Section 5.12 Young Modulus – Array: Update entire section to align the Young Modulus structure with that used in the Material Design Kit under JEP30-K101.		
Section 5.14.1 Terminal Group – Array: Update image to move CTE Array to Dictionary.		
Section 5.14.1.7 Terminal Shape: Update image part 2, 5 and 8 of 9, to add in PM code to the relevant terminal shape dimensions.		
Section 5.14.1.7.5.2.1 Reference Terminal Contour Type: Update Contour structure to align with other Contour structures. Add Footnotes to structure.		
Section 5.14.1.7.11 Pin: Update table 14 to support new Surface-mount Pin.		
Section 5.15: Add new section for Tiebar - Array		
Section 5.18.10.1.2.2 Duplicate: Added Footnote ID to the duplicate structure for aperture shapes.		
Section 6 Package Section – Die-Array: Update diagram part 3 of 3 to add Footnote Array		
Section A.1.1 Rectangle: Update image to change xml type from All to Sequence		
Section A.1.23 Contour: Updated Contour structure to capture the Arc direction and corrected the sample image with the contour points		
Section A.2.4 Flat Terminal: Add Flat Terminals can also have rectangular Dimples via horizontal castellations.		
Section A.2.9.2 Horizontal Castellation: Update image to add Rectangular Dimples		
Section A.2.11 Pin: Update section to add Terminal End Shape		



## Annex B (cont'd)

Section A.4.1 Value Type: Do we need to add Footnotes & Rules to structure
Section A.4.2 Value Set Type: Update to add Footnotes. Also update the images in section 5.6, A.4.3, A.4.4, A.4.5, A.4.6, A.4.7.
Section A.4.4: Added Unspecified Value Set Group Type.
Section A.4.6: Added Dimensional Value Set Group Type

Issue: H	Date: September 2025	Item Number: 11.2-1083
Description of Change		
Changed signature element names to ds:Signature in all sections		
Section 4.1 PartModel - SupplyChain Section: Updated images to match changes in the JEP30 parent schema		
Section 4.2 Manufacturer Part Number-Array: Updated images to match changes in the JEP30 parent schema		
Section 4.3 Standards Identifier Array: Added new section to connect Standards Identifiers to the Package content.		
Section 5 Package: Re-label Dimension UOM Type to Length UOM Type for IEC Compliance and changed um to $\mu m$ . Replaced CTE with two units called Linear Expansion Coefficient and Cubic Expansion Coefficient. Changed Youngs Modulus to Elastic Modulus. Added Dambar spacing, DatumID-Array, and FeatureControllID-Array. Removed the "GD and T Datum-to-ElementMapType" element.		
Section 5.1.2 Dual: Added Bottom-to-Upper in the Dual Position Configuration Type as per the JESD30 publication.		
Section 5.6 Mass: Update image to remove Standards and Limits since structure is covered by Value Set Group		
Section 5.7 Package Shape: Added Ellipse and "Rectangle with Single Elliptical End" as new shapes to Package shape. Also, added Mold Chamfer - Array, Excess Material Protrusion - Array, Package Cutout - Array, Package Protrusion - Array, Dambar spacing, DatumID-Array and FeatureControllID-Array.		
Section 5.7.4 Added new section called Mold Chamfer - Array and Mold Orientation Chamfer.		
Section 5.7.5 Added new section called Excess Material Protrusion - Array.		
Section 5.7.6 Added new section called Cutout - Array.		
Section 5.7.7 Added new section called Package Protrusion - Array.		
Section 5.9 Clearance Region Array: Changed Standoff type from JEP30-D10:UnspecifiedValueType to JEP30-D10:UnspecifiedDimensionalValueType		
Section 5.10 Updated Assembly Technology into an Array and moved to dictionary.		
Section 5.11 Changed CTE-Array to Linear Expansion Coefficient - Array		
Section 5.12 Added section for Cubic Expansion Coefficient - Array		
Section 5.13 Changed Young Modulus Array to Elastic Modulus Array		
Section 5.14 Heat Capacity - Array: Update units to comply with IEC definition.		

## Annex B (cont'd)

Section 5.15 Terminal Groups: Added Region Array to Package Terminal Groups similar to Die terminal Groups
Section 5.15.1 Terminal Group Array: Changed CTE-Array to Linear Expansion Coefficient – Array and Added section for Cubic Expansion Coefficient – Array. Added Dambar Spacing.
Section 5.15.1.4 Terminal Function: Added Non-Solderable to Terminal Basic Function
Section 5.15.1.5 Terminal Pattern: Renamed Terminal Location to Terminal Pattern to be consistent with other sections of the schema especially the Die section.
Section 5.15.1.5.1 Standard Array: Changed Pitch Cumulative Tolerance from xs:boolean to optional EmptyType.
Section 5.15.1.7 Terminal Shape: Update diagram 1 of 8 to add Surface-terminal. Added new diagram 1.5 of 8 for Surface-terminal shape. Added “Specific Package Edge-to-End-of-Terminal Type” to Terminal Shape in diagram 2 of 8. Added “Base Metal” in diagram 4 of 8. Change Choice to Sequence for Configurable Shoulder Type, Neck Type, Dambar Type, and Kinked Type in diagram 5 of 8. Added Ellipse and Rectangle with Single Elliptical End as new shapes to Terminal Shape in diagram 6 of 8.
Section 5.15.1.7.4 Flat: Changed Exposed Terminal thickness from JEP30-D10:UnspecifiedValueSetType to JEP30-D10:UnspecifiedDimensionalValueSetType
Section 5.15.1.8 Terminal Span: Added reference to Terminal Pattern or Pattern Group. Also added Z direction spacing. Added X-Span, Y-Span and Z-Span to capture the either the outside to outside or center to center dimension
Section 5.15.1.9 Terminal Spacing: Added reference to Terminal Pattern or Pattern Group. Also added Z direction spacing.
Section 5.15.1.7.4 Flat: Added new dimension into the table of dimensions for Flat terminal called “Specific Package Edge-to-End-of-Terminal”
Added new section 5.15.1.7.4.1 for Specific Package Edge-to-End-of-Terminal
Section 5.15.1.7.5.4 Dambar: Updated types to ...ValueSetGroups
Section 5.15.1.7.10 Surface-terminal: Added new terminal shapes for Surface-terminal called Ellipse and Rectangle with Single Elliptical End. Added new dimension into the table of dimensions for Surface-terminal called “Specific Package Edge-to-End-of-Terminal”
Section 5.15.1.7.11 Pin: Added new dimension into the table of dimensions for Pin terminal called “Specific Package Edge-to-End-of-Terminal”
Section 5.15.1.7.14 Through-Hole: Added new dimension into the table of dimensions for Through-Hole terminal called “Specific Package Edge-to-End-of-Terminal”
Section 5.15.1.7.18.3 TH – Shoulder Cutout: Added "Shoulder Edge-to-Terminal Center" to TH-Shoulder Cutout Type
Section 5.15.1.7.20 Terminal End Shape: Added “Rectangular In Terminal End Shape” to “Terminal End Shape Type”
Section 5.15.1.7.21 Terminal Shape versus Dimensions: Updated table with dimensions required for Ellipse and Elliptical End Shape
Section 5.15.1.7.23.5 Vertical Castellation Location on Terminal: Added a Z option to the Vertical Castellation Location on Terminal Type.

## Annex B (cont'd)

Section 5.15.1.10 Terminal Group to Body Relationship: Added optional reference to Terminal Pattern ID or to Terminal Pattern Group ID.
Section 5.15.2 Copied Terminal Regions – Array section from 6.5.2 under Die to Package and updated references to both the Die and Package structures.
Section 5.15.3 5.15.3 Terminal Group to Terminal Group Relationship Array: Added Z direction.
Section 5.15.4 Terminal Detail Array: Make First Terminal Location unbounded.
Section 5.15.4.1 Terminal Detail: Changed Terminal Location ID to Terminal Pattern ID.
Section 5.15.4.1.2 Terminal Status: Changed Reference Terminal Location ID to Reference Terminal Pattern ID
Section 5.15.4.2 First Terminal Location: Changed Terminal Location ID to Terminal Pattern ID.
Section 5.15.4.3 Terminal Number Pattern: Changed “Sequential/GridTerminal Number Ordering Type” to “Sequential/Grid Terminal Nomenclature Ordering Type” and moved to dictionary for use in other sub-schemas. Changed Terminal Location ID to Terminal Pattern ID.
Section 5.15.4.4 Terminal Detail Exceptions: Changed Terminal Location ID to Terminal Pattern ID. Added unbounded optional Footnote ID to Terminal Status.
Section 5.15.5.4 Via Detail: Add reference to Terminal Pattern ID and Pattern Group ID
Section 5.15.5 Feature Control Placement Array: Added Terminal Frame as a reference for Datum placement on Packages with Terminal Frames.
Section 5.18 Geometric Dimensioning and Tolerancing: Updated image to remove GDandTDatum-to-Element Map-Array”.
Section 5.19 Recommended Footprint Array: Moved types to Dictionary for use in other schemas.
Section 6 Package Section Die-Array: Added GD&T to Die and to Physical Die Size.
Section 6.5 Terminal Groups: Updated image to replace CTE-Array with Linear Expansion Coefficient – Array and added section for Cubic Expansion Coefficient – Array.
Section 6.5.1.1 Terminal Group: Updated image due to change from “Package Terminal Pattern Group Type” to “Terminal Pattern Group Type”, due to normalization in Package section. This makes the Terminal Pattern Group consistent between Package and Sie sections.
Section 6.5.6.4 Terminal Details Exception: Added unbounded optional Footnote ID to Terminal Status.
Added new Section A.1.14 for Ellipse shape and details
Added new Section A.1.15 for Elliptical End Shape and details
Section A.4.4, A.4.6 and A.4.7 various Dimensional Value Set Types: Removed “Feature Control Placement-ID” from “Feature Control-IDs Type”. Changed “FeatureControl-IDs” to “FeatureControlID-Array”. Added DatumID-Array. Updated structures throughout schema.
Section A.4 Value Set Types: Removed the structures Standard and Limits for all Value Set Types and removed duplicates. Added ID to all Value Set Type structures.

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**Standard Improvement Form****JEDEC Standard No. JEP30-P100H**

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The purpose of this form is to provide the Technical Committees of JEDEC with input from the industry regarding usage of the subject standard. Individuals or companies are invited to submit comments to JEDEC. All comments will be collected and dispersed to the appropriate committee(s).

If you can provide input, please complete this form and return to:

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1. I recommend changes to the following:

☐ Requirement, clause number \_\_\_\_\_

☐ Test method number \_\_\_\_\_ Clause number \_\_\_\_\_

The referenced clause number has proven to be:

☐ Unclear ☐ Too Rigid ☐ In Error

☐ Other \_\_\_\_\_

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2. Recommendations for correction:


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3. Other suggestions for document improvement:


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Submitted by

Name: \_\_\_\_\_

Company: \_\_\_\_\_

Address: \_\_\_\_\_

City/State/Zip: \_\_\_\_\_

Phone: \_\_\_\_\_

E-mail: \_\_\_\_\_

Date \_\_\_\_\_

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