



CONNECTOR STANDARD FOR OUTLINES OF SOLID STATE AND RELATED PRODUCTS

PS-003

DDR4 260 Pin SODIMM Connector Performance Standard

(Double Data Rate 4)

JEDEC SOLID STATE TECHNOLOGY ASSOCIATION

**Date: JULY 2016
Item: 11.14-183E
Copyright © 2016 JEDEC**

Issue: A.01

DISCLAIMER

THIS DRAFT STANDARD IS PROVIDED "AS IS" WITH NO WARRANTIES WHATSOEVER, INCLUDING ANY WARRANTY OF MERCHANTABILITY, NONINFRINGEMENT, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY WARRANTY OTHERWISE ARISING OUT OF ANY PROPOSAL, STANDARD OR SAMPLE. JEDEC disclaims all liability, including liability for infringement of any proprietary rights, relating to use of information in this standard. No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted herein.

JEDEC retains the right to make changes to this document at any time, without notice.

JEDEC makes no warranty for the use of this document and assumes no responsibility for any error, which may appear in the document, nor does it make a commitment to update the information contained herein.

NOTE 1 Other brands and names are the property of their respective owners.

NOTE 2 Third-party brands and names may be claimed as the property of their respective owners.

DDR4 SODIMM CONNECTOR PERFORMANCE STANDARD

Contents

Sections		Page
1	Scope	1
1.1	Connector Overview	1
2	References	1
3	Acronyms, terms, and definitions	2
4	Pin Numbering	2
5	Connector Socket Outline	4
5.1	SODIMM DDR4 Connector Overview	5
5.2	Socket Outline	4
6	Module Outline	5
6.1	Module Mechanical Dimensions	5
6.2	DIMM gold finger plating options	5
7	Reliability Requirements	6
7.1	Mechanical and Other Requirements	6
7.2	Reliability Test Conditions	7
7.3	Environmental Requirements	9
7.4	Electrical Requirements	9
Annex A	LLCR Measurement	12
A.1	Reference Equipment	10
A.2	Test Fixture	10
Annex B	Current Carrying Capability Testing	11
B.1	Reference Equipment	11
B.2	Test Procedure	11
Annex C	Shock and Vibration Test Board	12
C.1	Shock and Vibration	12
C.2	Test Module - Weight and Center of Gravity	12
C.3	Shock Unpackaged	12
C.3.1	Purpose	12
C.3.2	Quantity	12
C.3.2	Test Conditions	12
C.4	Vibration Unpackaged	12
C.4.1	Purpose	12
C.4.2	Quantity	12
C.3.2	Test Conditions	12
Tables		
Table 3.1	Aronyms, Terms, and Definitions	2
Table 4.1	SODIMM DDR4 Number Sequence	2
Table 7.1	Mechanical and Other Requirements	6
Table 7.2	Reliability Test Sequence	8
Table 7.3	Reliability Test Conditions	7
Table 7.4	Connector Environmental Requirements	8
Table 7.5	Connector Electrical Requirements	9
Figures		
Figure 5.1	SODIMM DDR4 Module and Socket	4
Figure 5.2	SODIMM DDR4 Surface Mount (SMT) Connector Socket Outline 5.2mm height	5
Figure 6.1	SODIMM DDR4 Module Outline	5

DDR4 SODIMM CONNECTOR PERFORMANCE STANDARD

(From JEDEC Board Ballot JCB-15-57, formulated under the cognizance of the JC-11.14 Subcommittee on Microelectronic Assemblies.)

1 Scope

This standard defines the form, fit and function of SODIMM DDR4 connectors for modules supporting channels with transfer rates as high as 3.2 GT/S. It contains mechanical, electrical and reliability requirements for a one-piece connector mated to a module with nominal thickness of 1.20 mm. The intent of this document is to provide Performance Standards to enable connector, system designers and manufacturers to build, qualify and use the SODIMM DDR4 connectors in client and server platforms.

1.1 Connector Overview

SODIMM DDR4 connectors are 2 mm longer than the previous generation SODIMM DDR3 due to increase in pin count to 260 pins. The 260 pin, 0.50 mm pitch right angle connector is defined for applications where a 1.20 mm nominal thickness module card enters the connector on an angle and rotates parallel to the system board.

2 References

The following references provide normative requirements as specified in the body of this standard:

JEDEC JEP95, MO-310, *SODIMM DDR4 Module Outline*

JEDEC JEP95, SO-018, *SODIMM DDR4 Socket Outlines*

EIA-364-1000, *Environmental Test Methodology for Assessing the Performance of Electrical Connectors and Sockets used in Controlled Environment*

EIA-364-05, *Contact Insertion, Release and Removal Force Test Procedure for Electrical Connectors*

EIA-364-13, *Mating and Unmating Force Test Procedure for Electrical Connectors and Sockets*

EIA 364-23, *Low Level Contact Resistance Test Procedures for Electrical Connectors and Sockets*

EIA-364-27, *Shock Test Procedure for Electrical Connectors*

EIA-364-28, *Vibration Test Procedure for Electrical Connectors and Sockets*

EIA-364-29, *Contact Retention Test Procedure for Electrical Connectors*

EIA-364-31, *Humidity Test Procedure for Electrical Connectors and Sockets*

EIA-364-32, *Thermal Shock Test Procedure for Electrical Connectors and Sockets*

EIA 364-70, *Temperature Rise Versus Current Test Procedure for Electrical Connectors and Sockets*

Agilent Product Note 8510-8A, Application Note, "Agilent Network Analysis Applying the 8510 TRL Calibration for Non-Coaxial Measurements"

JEDEC JESD22-B102, *Solderability*

JEDEC/ECA JS709A, *Definition of "Low-Halogen" for Electronic Product*

3 Acronyms, Terms, and Definitions

TABLE 3.1 — Acronyms, terms, and definitions

Term	Description
BOL	Beginning of Life
dB	Given in dB-volts, i.e., $20\log_{10}(V_2/V_1)$
DDR	Double Data Rate
DUT	Device under test=
EIA	Electronics Industry Alliance
EOL	End of Life
Horizontal connector	A connector that accepts a module parallel to the system board
JEDEC	JEDEC Solid State Technology Association
System board	PCB on which the SODIMM DDR4 connector is mounted

4 Pin Numbering

This section describes pin numbers in SODIMM DDR4 connectors. The SODIMM DDR4 connector pin list is shown in Table 4.1.

TABLE 4.1 — SODIMM DDR4 Number Sequence

Pin #				Pin #				Pin #			
1	Pin	Pin	2	73	Pin	Pin	74	145	Pin	Pin	146
3	Pin	Pin	4	75	Pin	Pin	76	147	Pin	Pin	148
5	Pin	Pin	6	77	Pin	Pin	78	149	Pin	Pin	150
7	Pin	Pin	8	79	Pin	Pin	80	151	Pin	Pin	152
9	Pin	Pin	10	81	Pin	Pin	82	153	Pin	Pin	154
11	Pin	Pin	12	83	Pin	Pin	84	155	Pin	Pin	156
13	Pin	Pin	14	85	Pin	Pin	86	157	Pin	Pin	158
15	Pin	Pin	16	87	Pin	Pin	88	159	Pin	Pin	160
17	Pin	Pin	18	89	Pin	Pin	90	161	Pin	Pin	162
19	Pin	Pin	20	91	Pin	Pin	92	163	Pin	Pin	164
21	Pin	Pin	22	93	Pin	Pin	94	165	Pin	Pin	166
23	Pin	Pin	24	105	Pin	Pin	106	169	Pin	Pin	170
25	Pin	Pin	26	107	Pin	Pin	108	171	Pin	Pin	172
27	Pin	Pin	28	109	Pin	Pin	110	173	Pin	Pin	174
29	Pin	Pin	30	111	Pin	Pin	112	175	Pin	Pin	176
31	Pin	Pin	32	113	Pin	Pin	114	177	Pin	Pin	178
33	Pin	Pin	34	115	Pin	Pin	116	179	Pin	Pin	180
35	Pin	Pin	36	117	Pin	Pin	118	181	Pin	Pin	182

TABLE 4.1 — SODIMM DDR4 Number Sequence (cont'd)

37	Pin	Pin	38	119	Pin	Pin	120	183	Pin	Pin	184
39	Pin	Pin	40	121	Pin	Pin	122	185	Pin	Pin	186
41	Pin	Pin	42	123	Pin	Pin	124	187	Pin	Pin	188
43	Pin	Pin	44	125	Pin	Pin	126	189	Pin	Pin	190
45	Pin	Pin	46	127	Pin	Pin	128	191	Pin	Pin	192
47	Pin	Pin	48	129	Pin	Pin	130	193	Pin	Pin	194
49	Pin	Pin	50	131	Pin	Pin	132	195	Pin	Pin	196
51	Pin	Pin	52	133	Pin	Pin	134	197	Pin	Pin	198
53	Pin	Pin	54	135	Pin	Pin	136	199	Pin	Pin	200
55	Pin	Pin	56	137	Pin	Pin	138	201	Pin	Pin	202
57	Pin	Pin	58	139	Pin	Pin	140	203	Pin	Pin	204
59	Pin	Pin	60	141	Pin	Pin	142	205	Pin	Pin	206
61	Pin	Pin	62	143	Pin	Pin	144	207	Pin	Pin	208
63	Pin	Pin	64	Key Key Key Key Key				209	Pin	Pin	210
65	Pin	Pin	66					211	Pin	Pin	212
67	Pin	Pin	68					213	Pin	Pin	214
69	Pin	Pin	70					215	Pin	Pin	216
71	Pin	Pin	72					217	Pin	Pin	218
219	Pin	Pin	220	233	Pin	Pin	234	247	Pin	Pin	248
221	Pin	Pin	222	235	Pin	Pin	236	249	Pin	Pin	250
223	Pin	Pin	224	237	Pin	Pin	238	251	Pin	Pin	252
225	Pin	Pin	226	239	Pin	Pin	240	253	Pin	Pin	254
227	Pin	Pin	228	241	Pin	Pin	242	255	Pin	Pin	260
229	Pin	Pin	230	243	Pin	Pin	244	257	Pin	Pin	258
231	Pin	Pin	232	245	Pin	Pin	246	259	Pin	Pin	260

5 Connector Socket Outline

5.1 SODIMM DDR4 Connector Overview

A primary consideration for SODIMM DDR4 development objective was to scale the connector in an evolutionary manner and minimize the platform volumetric and cost constraints. The mounting technology is surface mount (SMT). SODIMM DDR4 connectors are uniquely keyed to prevent interchangeability with the previous connector generations. The keying capability supports module variations across all SODIMM form factors. The pin count increase to 260 pins is primarily due to 1:1 S:G ratio required by signaling performance scalability. In order to keep similar volumetric parameters comparable to previous generation DIMMs and provide a higher pin count, the connector pin pitch was reduced to 0.5 mm and the module length was increased by 2 mm. The tighter pitch was considered conducive for high volume manufacturing and assembly.

5.2 Socket Outline

A general view of the SODIMM DDR4 DIMM connector with inserted module is shown in FIGURE 5.1. An example of the socket outlines is shown in Figure 5.2. For the detailed socket outline profiles, refer to SO-018 Outline. All dimensions are in millimeters.

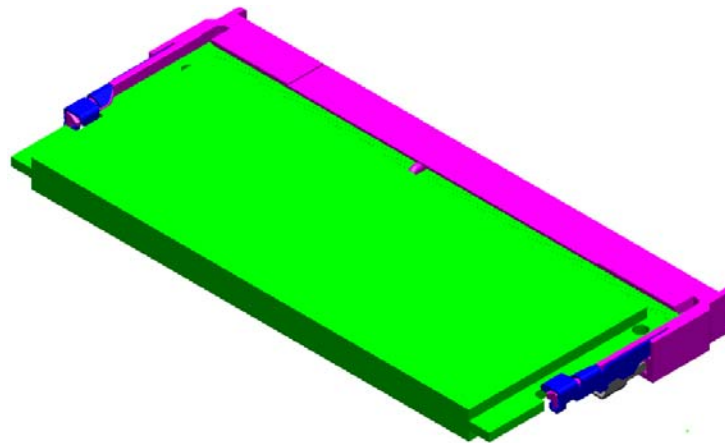


FIGURE 5.1 — SODIMM DDR4 Module and Socket

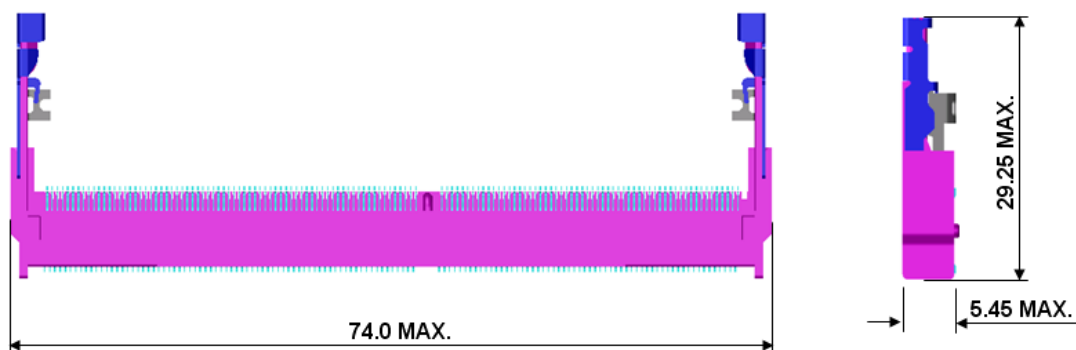


FIGURE 5.2 — SODIMM DDR4 Surface Mount (SMT) Connector Socket Outline
5.2 mm height

6 Module Outline

6.1 Module Mechanical Dimensions

SODIMM DDR4 modules are 2mm longer (69.60 mm) and 0.2 mm thicker (1.20 mm) than the SODIMM DDR3. Tightened tolerances on module slot and pad dimensions, in addition to smaller sized pads, are necessary for equivalent mating/shorting performance compared to SODIMM DDR3. The SODIMM DDR4 DIMM outline is shown in FIGURE 6.1.

For the detailed outline, refer to JEP95, MO-310.

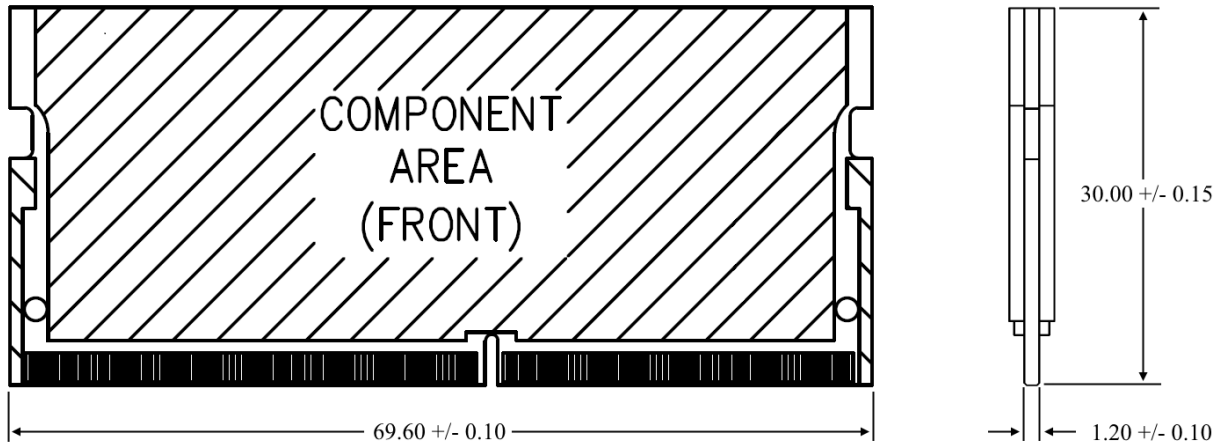


FIGURE 6.1 — SODIMM DDR4 Module Outline

6.2 DIMM gold finger plating options

Gold contact plating options are for reference, see MO-310.

7 Reliability Requirements

Testing shall be performed per EIA 364-1000 test groups 1, 2, 3, and 4 for 3, 5, or 7 year lifecycle requirements. A minimum 5 samples are to be tested per subgroup.

7.1 Mechanical and Other Requirements

TABLE 7.1 — Mechanical and Other Requirements

Mechanical Test Description	Procedure	Requirement
Visual and dimensional inspections	Meets product drawing	Gauge accuracy shall be 10 times more accurate than tolerance specified on drawing and be traceable to NIST
Insertion Force (Module to Connector)	EIA-364-13 Axial Tension/Compression machine such as an Instron Tensile Tester. Rate: 25.4 mm/min.	59.8 N Maximum (with 1.3 mm maximum PCB thickness)
Retention Force - Terminal	EIA 364-29	100 gf minimum per pin; maximum movement of contact of 0.38 mm
Durability (mating/unmating)	EIA 364-99 Perform 25 cycles plug and unplug cycles at a rate of 25.4 mm/minute	LLCR and no nickel plating exposed
Additional Tests	Procedure	Requirement
Solderability - Lead Free	JESD22-B102; Condition C, 8 hours \pm 15 minutes steam precondition.	95% coverage minimum
Lead Free Process ability	260 °C, 5 seconds.	No physical damage to connector per visual inspection at 24 inches. No magnification

7.2 Reliability Test Conditions

TABLE 7.2 — Reliability Test Sequence

Test	Test Group			
	1	2	3	4
Low Level Contact Resistance	1,4,6	1,4,6,8	1,4,6	1,4,6,8,10
Reseating	5	7		9
Vibration			3	
Mechanical Shock			5	
Durability (preconditioning)	2	2	2	2
Temperature Life	3			
Temperature Life (preconditioning)				3
Thermal Shock		3		
Cyclic Temp and Humidity		5		
Mixed Flowing Gas				5
Thermal Disturbance				7

7.3 Reliability Test Conditions

TABLE 7.3 — Reliability Test Conditions

Reliability Test Description	Procedure	Requirement
Durability (preconditioning)	EIA-364-09, perform 5 plug/unplug cycles	no evidence of physical damage
Temperature Life	EIA-364-17, Method A (without electrical load) 60 °C field temperature. Test Temperature and Test Duration per EIA 364-1000 Table 8.	electrical, mechanical and environmental criteria
Temperature Life (preconditioning)	60°C field temperature. Test Temperature and Test Duration per EIA 364-1000 Table 9	
Low Level Contact Resistance (LLCR)	EIA-364-23 (termination of connector to board carrier shall be included in the measurements)	Refer to Table 5.4.2
Shock Unpackaged	EIA-364 -27 Trapezoidal shock 50 g, $\pm 10\%$ Duration 11 ms Velocity change 170 inches/sec, $\pm 10\%$ Three drops in each of six directions are applied to each of the three samples	electrical, mechanical and environmental criteria Reference Annex C

TABLE 7.3 — Reliability Test Conditions (cont'd)

Vibration Unpackaged	EIA-364 -28 Random profile: 5 Hz @ 0.01 g ² /Hz to 20 Hz @ 0.02 g ² /Hz (slope up) 20 Hz to 500 Hz @ 0.02 g ² /Hz (flat) Input acceleration is 3.13 g RMS 10 minutes per axis for all 3 axes on all samples Random control limit tolerance is ± 3 dB	no discontinuities of ≥ 1 microsecond electrical, mechanical and environmental criteria Reference Annex C
Cyclic Temperature & Humidity	EIA-364-31B, Method III without conditioning, initial measurements, cold shock and vibration. Ramp times should be 0.5 hour and dwell times should be 1.0 hour. Dwell times start when the temperature and humidity have stabilized within specified levels, perform 24 cycles in mated condition	electrical, mechanical and environmental criteria
Thermal Shock	EIA-364-32, Method A, Table 2, Test Condition 1, -55 °C to 85 °C, perform 5 cycles in mated condition	electrical, mechanical and environmental criteria
Thermal Disturbance	EIA-364-1000, Cycle the connector between 15 °C ± 3 °C and 85 °C ± 3 °C, as measured on the part. Ramps should be a minimum of 2 °C/minute. Dwell times should ensure that the contacts reach the temperature extremes (a minimum of 5 minutes), humidity is not controlled; perform 10 cycles in mated condition.	electrical, mechanical and environmental criteria
Mixed Flowing Gas	EIA-364-65, class IIA, Option 4. Expose all specimens in the mated condition for the total mixed flowing gas exposure duration per EIA 364-1000, Table 4.1.	electrical, mechanical and environmental criteria
Reseating	Manually unplug/plug the connector. Perform 3 cycles	No evidence of physical damage

7.4 Environmental Requirements

TABLE 7.4 — Connector Environmental Requirements

Environmental Requirements	Procedure	Requirement
Flammability	UL 94 V-0	
Lead Free	RoHS compliant per IEC 62474	RoHS directive (2011/65/EU)
Low Halogen	1000 ppm max Cl when used in a flame retardant 1000 ppm max Br when used in a flame retardant Per JS-709A Standard (Clause 4)	Sample combustion followed by ion chromatography as specified in British Standard Methods BS EN 114582/2007, Characterization of waste – Halogen and sulfur content – Oxygen combustion in closed systems and determination methods OR US EPA-5050 (BOM Preparation Method for Solid Waste)

7.5 Electrical Requirements

TABLE 7.5 — Connector Electrical Requirements

DC Electrical Requirements	Procedure	Requirement
LLCR (Contact resistance)	EIA364-23B Subject mated contacts assembled in housing to 20 mV maximum voltage at 100 mA maximum current	Post Stress: the resistance change, which is defined as the change in LLCR between the reading after stress and the initial reading shall not exceed 10 mΩ
LLCR Contact resistance, Initial	EIA-364 -23	Mobile 60 mΩ Micro-server 30 mΩ
Withstanding Voltage	EIA-364-20, Condition I. 250 volts ac at sea level.	One minute hold with no breakdown or flashover.
Insulation resistance	EIA-364 -21	1 MΩ minimum
Current carrying capability at 30 °C temperature rise per contact	EIA-364 Test Procedure 70 Detail in Annex C	0.50 amp/pin De-rated

Annex A LLCR Measurements

A.1 Reference Equipment

Micro-ohmmeter (such as Keithly 580; Agilent 4338B)

Cable with clammer or pogo pins

A.2 Test Fixture

Figure A.1 and Figure A.2 illustrates LLCR measurement examples using 4-terminal technique.

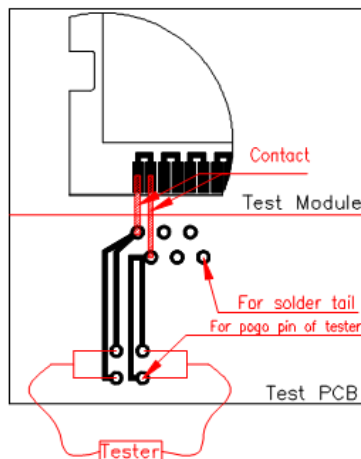


FIGURE A.1 — 4-wire connection example (two pins in series)

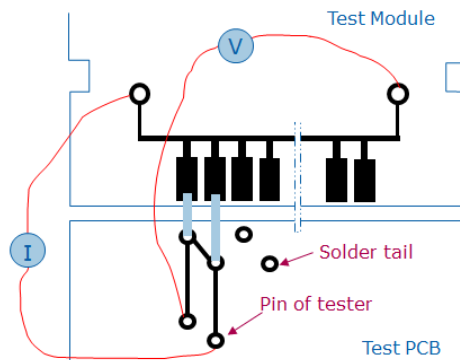


FIGURE A.2 — 4-wire connection example (two pins in parallel)

Annex B Current Carrying Capability Testing

B.1 Reference Equipment

T-Rise Method (Reference EIA 364-70 Method 2)

B.2 Test Procedure

The method summary as follows: Minimum of 5 connector samples.

- Ambient system temperature stabilized (testing to occur at ambient system temperature)
 - Current necessary to produce the specified temperature of 30 °C. (Do not exceed maximum connector temperature rating e.g., 105 °C)
 - Test multiple contacts in the same housing per wiring diagram.
 - Test single contact in housing per wiring diagram.

Report results per EIA 364-70 table “test documentation Annex”.

B.3 Test Board Daisy Chain Connection

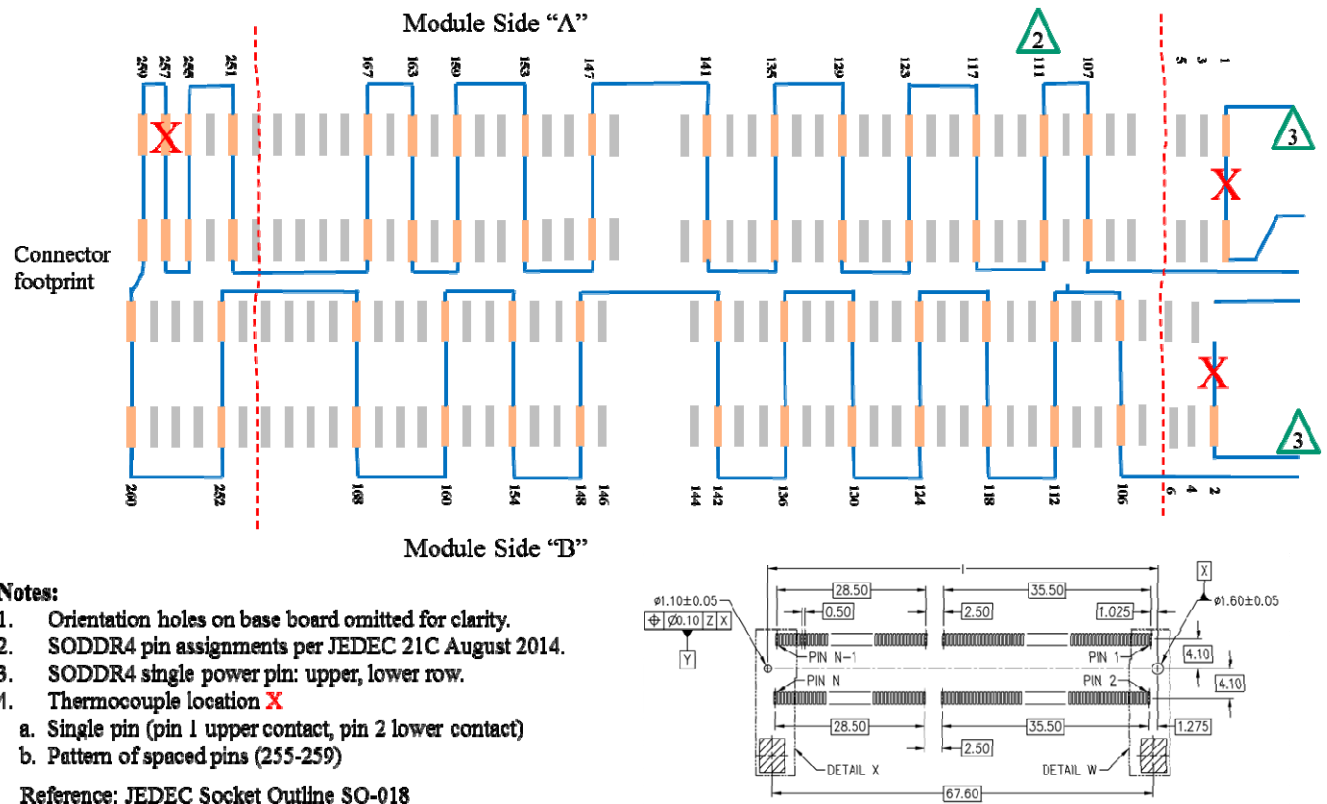


FIGURE B.1 — Daisy chain connection

Annex C Shock and Vibration Test Board

C.1 Shock and Vibration

Shock and Vibration Test Board to be specified by OEM/ODM due to various system layouts

C.2 Test Module - Weight and Center of Gravity

Module weight 9.1 ± 1 grams. Center of Gravity (COG): 35 mm, 17mm measured from Pin A1 corner of module

Module thickness: 1.10 ± 0.1 mm

Module to check continuity

C.3 Shock Unpackaged

C.3.1 Purpose

To ensure the boards are sufficiently robust to withstand shocks when shipped in a system. Board Un-packaged testing does not pre-qualify a board for shipping as an un-mounted unit inside a shipping container.

C.3.2 Quantity

Investigation: 1 Board

Validation: 3 Boards

C.3.2 Test Conditions

Trapezoidal shock 50 g, $\pm 10\%$

Velocity change 170 inches/sec, $\pm 10\%$

Three drops in each of six directions are applied to each of the three samples

C.4 Vibration Unpackaged

C.4.1 Purpose

To ensure the board is sufficiently robust to withstand vibration when mounted in a system, which is being shipped. Board unpackaged testing does not pre-qualify a board for shipping as an un-mounted unit inside a shipping container.

C.4.2 Quantity

Investigation: 1 Board

Validation: 3 Boards

C.3.2 Test Conditions

Random profile:

5 Hz @ 0.01 g²/Hz to 20 Hz @ 0.02 g²/Hz (slope up)

20 Hz to 500 Hz @ 0.02 g²/Hz (flat)

Input acceleration is 3.13 g RMS

10 minutes per axis for all 3 axes on all samples

Random control limit tolerance is ± 3 dB

Annex D Change Record History

If the change involves any words added or deleted (excluding deletion of accidentally repeated words), the change is included. Punctuation changes may or may not be included.

Initial Issue: A	Date: September 2015	Item Number: 11.14-179S
------------------	----------------------	-------------------------

Change Record History

Issue: A.01	Date: July 2016	Item Number: 11.14-183E
Location	Changed From:	Changed to:
All pages		Updated text to Arial 11pt
Page 1, Section 1.1	1 mm	2 mm
Page 10, Table 7.3 Thermal Disturbance	15°G	15°C
Page 10, Table 7.3 Mixed Flow Gas	Table 4.1	EIA 364-1000, Table 4.1
Page 15		Added Annex D and current Change Record History Table