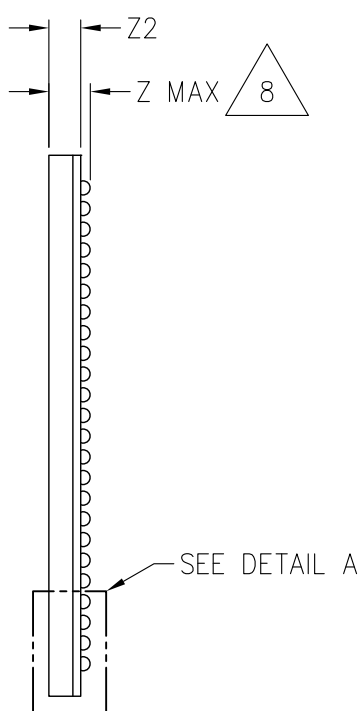
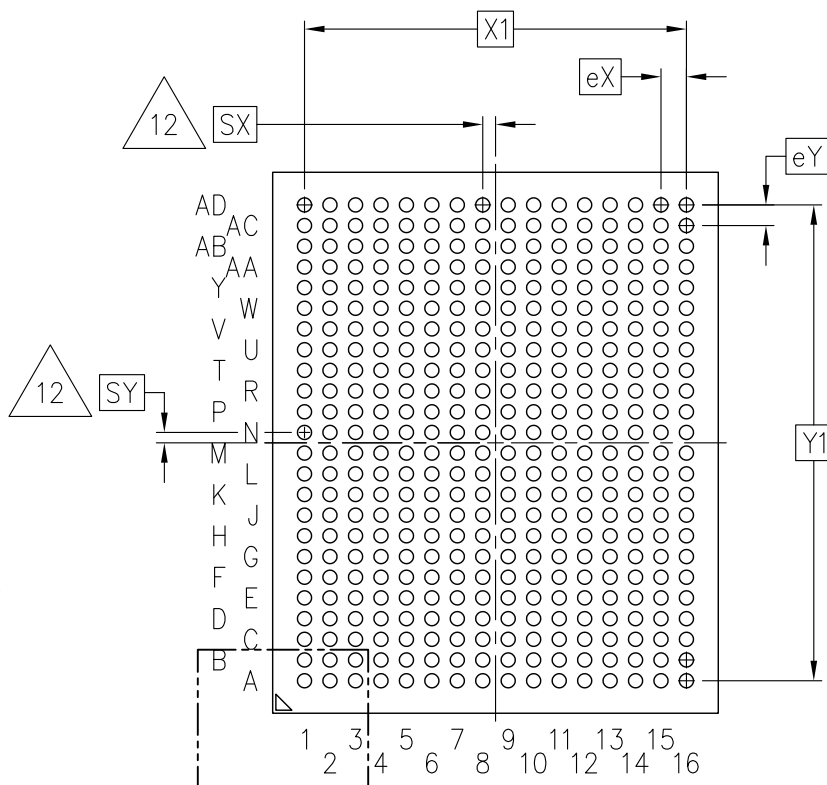


THE EXACT SHAPE AND
SIZE OF EACH CORNER
IS OPTIONAL

TOP VIEW



SIDE VIEW



DETAIL B

BOTTOM VIEW



JEDEC SOLID STATE
PRODUCT OUTLINE
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THIS **REGISTERED OUTLINE** HAS BEEN PREPARED BY THE JEDEC JC-11 COMMITTEE
AND REFLECTS A PRODUCT WITH ANTICIPATED USAGE IN THE ELECTRONICS INDUSTRY;
CHANGES ARE LIKELY TO OCCUR.

TITLE PLASTIC BOTTOM GRID
ARRAY BALL, 0.80MM X 0.65MM PITCH
RECTANGULAR FAMILY PACKAGE

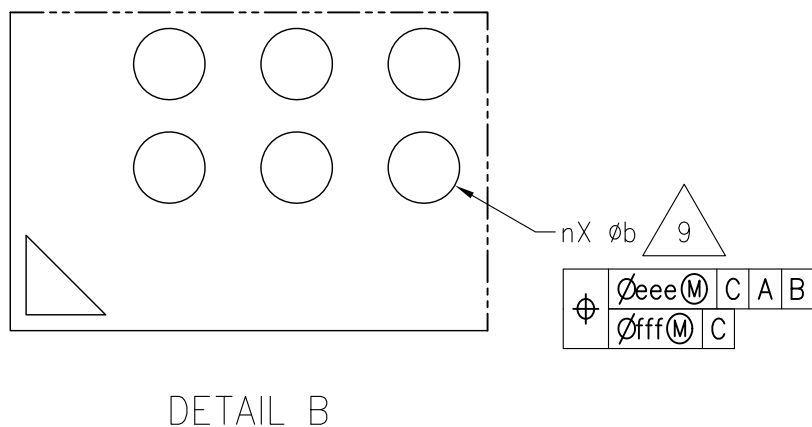
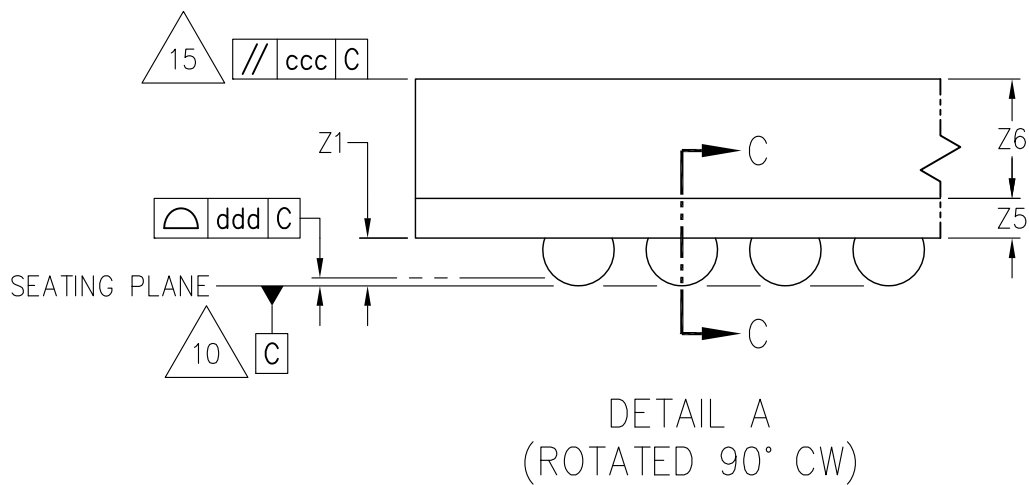
PACKAGE DESIGNATOR
PBGA-B#[#]
_I0p65...

NUMBER
MO-311

ISSUE
F

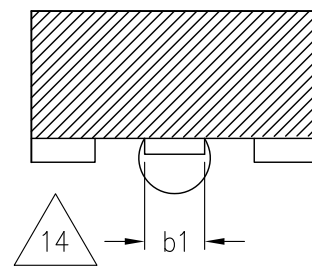
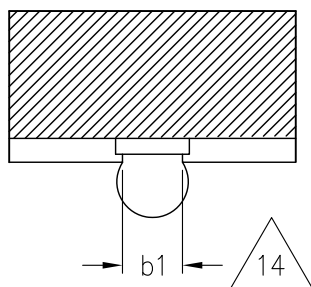
DATE
OCT 2022

SHEET
1 OF 11



TYPE 1 – SMD
(SOLDER MASK DEFINED)

TYPE 2 – NSMD
(NON SOLDER MASK DEFINED)



SECTION C-C

TABLE 1

COMMON DIMENSIONS									
VARIATION	Ax			Bx			Cx		
SYMBOL	V: VERY THIN PROFILE			T: THIN PROFILE			T: THIN PROFILE		
	MIN	NOM	MAX	MIN	NOM	MAX	MIN	NOM	MAX
Z	—	—	1.00	—	—	1.10	—	—	1.20
Z2	—	—	0.80	—	—	0.90	—	—	0.90
eY	0.65 BSC								
eX	0.80 BSC								
NOTES	1, 2								
REF	11–867			11–873					
ISSUE	A			B					
VARIATION Bx IN THIS TABLE DOES NOT MEET JEDEC PROFILE HEIGHTS DEFINED IN JESD30 AND SHOULD NOT BE USED WHEN ADDING NEW VARIATIONS. PLEASE USE TABLE 3 FOR ALL NEW PACKAGE PROFILE HEIGHTS.									

TABLE 2

COMMON DIMENSIONS									
SYMBOL	P = PACKAGE PROFILE HEIGHT								
	V: VERY THIN PROFILE			T: THIN PROFILE			---		
	MIN	NOM	MAX	MIN	NOM	MAX	MIN	NOM	MAX
Z	---	---	1.00	---	---	1.20	---	---	---
Z2	---	---	0.80	---	---	0.90	---	---	---
eY	0.65 BSC								
eX	0.80 BSC								
NOTES	1, 2								
REF	11-900			11-900			-		
ISSUE	D			D			-		
VARIATIONS IN THIS TABLE DO NOT MEET JEDEC PROFILE HEIGHTS DEFINED IN JESD30 AND SHOULD NOT BE USED WHEN ADDING NEW VARIATIONS.									

TABLE 3

COMMON DIMENSIONS		
SYMBOL		
Z		PACKAGE SPECIFIC
Z2	b(NOM) = 0.300	$Z2(\text{MAX}) = Z(\text{MAX}) - Z1$
	b(NOM) = 0.350	$Z2(\text{MAX}) = Z(\text{MAX}) - Z1$
	b(NOM) = 0.400	$Z2(\text{MAX}) = Z(\text{MAX}) - Z1$
Z5		OPTIONAL – PACKAGE SPECIFIC
Z6		OPTIONAL – PACKAGE SPECIFIC
eX		0.80 BASIC
eY		0.65 BASIC
NOTES		1, 2, 8
REF		11–970, 11–1026
ISSUE		F

TABLE 4


COMMON DIMENSIONS									
SYMBOL	SOLDER BALL DIAMETER								
	MIN	NOM	MAX	MIN	NOM	MAX	MIN	NOM	MAX
Z1	PACKAGE SPECIFIC	----	----	PACKAGE SPECIFIC	----	----	PACKAGE SPECIFIC	----	----
b	0.225	0.300	0.375	0.275	0.350	0.425	0.325	0.400	0.475
b1	TYPE 1	0.20	----	----	0.23	----	----	0.26	----
	TYPE 2	0.20	----	----	0.23	----	----	0.26	----
NOTES	1, 2			1, 2			1, 2		
REF	11-900, 11-970, 11-1026			11-970, 11-1026			11-900, 11-970, 11-2026		
ISSUE	F			F			F		

TABLE 5

TOLERANCE OF FORM AND POSITION				
SYMBOL	PACKAGE TYPE	VALUE		
		øb NOM = 0.300	øb NOM = 0.350	øb NOM = 0.400
aaa	----	0.10	0.10	0.10
ccc	ENCAPSULATED	0.10	0.10	0.10
ddd	----	0.08	0.10	0.10
eee	ENCAPSULATED	0.15	0.15	0.15
fff	----	0.08	0.08	0.08
NOTES		1,2	1,2	1,2
REF		11-900, 11-970	11-970	11-900, 11-970
ISSUE		E	E	E

$$b1 = b(NOM) * 0.667$$

TABLE 6

$\phi b = 0.300$ NOMINAL														
NEW VARIATION 	OLD VARIATION	X BASIC	Y BASIC	X1 BASIC	Y1 BASIC	MX	MY	SX BASIC	SY BASIC	n	N	TERMINAL PATTERN	REF	ISSUE
*P11.5x10.5-HxFM-178A	-	10.50	11.50	9.60	10.40	13	17	0.000	0.000	178	221	A	11-900	D
PBGA-B178[221]_I0p65-R10p5x11p5Z#-C0p375Z0p13	-	10.50	11.50	9.60	10.40	13	17	0.000	0.000	178	221	A	11-970	E
-	BA	11.00	11.50	9.60	10.40	13	17	0.000	0.000	178	221	A	11-867	A
*P11.5x11.0-HxFM-178A	AA, CA	11.00	11.50	9.60	10.40	13	17	0.000	0.000	178	221	A	11-867	A
PBGA-B178[221]_I0p65-R11p0x11p5Z#-C0p375Z0p13	-	11.00	11.50	9.60	10.40	13	17	0.000	0.000	178	221	A	11-970	E
-	BB	13.00	13.50	9.60	10.40	13	17	0.000	0.000	178	221	A	11-873	B
*P13.5x13.0-HxFM-178A	AB, CB	13.00	13.50	9.60	10.40	13	17	0.000	0.000	178	221	A	11-873	B
PBGA-B178[221]_I0p65-R13p0x13p5Z#-C0p375Z0p13	-	13.00	13.50	9.60	10.40	13	17	0.000	0.000	178	221	A	11-970	E
-	BC	10.00	15.00	8.80	13.65	12	22	0.400	0.325	200	264	B	11-891	C
*P15.0x10.0-HxFM-200B	AC, CC	10.00	15.00	8.80	13.65	12	22	0.400	0.325	200	264	B	11-891	C
PBGA-B200[264]_I0p65-R10p0x15p0Z#-C0p375Z0p13	-	10.00	15.00	8.80	13.65	12	22	0.400	0.325	200	264	B	11-970	E
*P15.0x10.0-HxFM-203C	-	10.00	15.00	8.80	13.00	12	21	0.400	0.650	203	262	C	11-900	D
PBGA-B203[262]_I0p65-R10p0x15p0Z#-C0p375Z0p13	-	10.00	15.00	8.80	13.65	12	22	0.400	0.325	203	262	C	11-970	E
NOTES		2	2	2	2	5	5	2, 12	2, 12	6, 13	6	13		

NOTE:
FOR VARIATIONS THAT BEGIN WITH *, SEE SPP-025 ISSUE A FOR EXPLANATION OF VARIATION SCHEME.
THIS VARIATION SCHEME HAS BEEN REPLACED BY JESD30.

TABLE 7



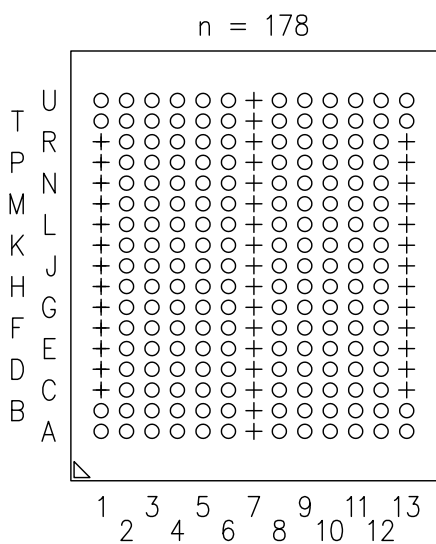
$\phi b = 0.350$ NOMINAL														
NEW VARIATION	OLD VARIATION	X BASIC	Y BASIC	X1 BASIC	Y1 BASIC	MX	MY	SX BASIC	SY BASIC	n	N	TERMINAL PATTERN	REF	ISSUE
 PBGA-B200[264]_J0p65-R10p0x14p5Z#-C0p425Z0p16	-	10.00	14.50	8.80	13.65	12	22	0.400	0.325	200	264	B	11-970	E
NOTES		2	2	2	2	5	5	2, 12	2, 12	6, 13	6	13		

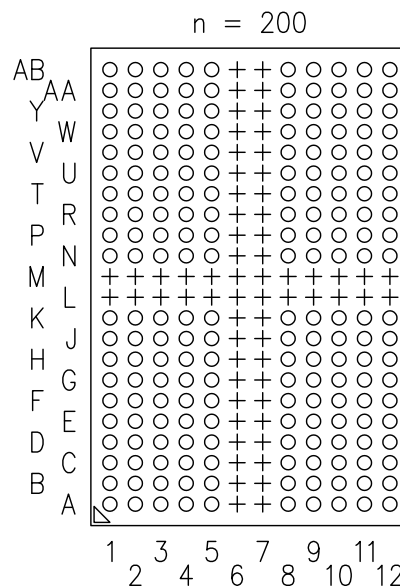
TABLE 8

$\phi b = 0.400$ NOMINAL														
NEW VARIATION 	OLD VARIATION	X BASIC	Y BASIC	X1 BASIC	Y1 BASIC	MX	MY	SX BASIC	SY BASIC	n	N	TERMINAL PATTERN	REF	ISSUE
*P11.5x10.5-HxFK-178A	-	10.50	11.50	9.60	10.40	13	17	0.000	0.000	178	221	A	11-900	D
PBGA-B178[221]_I0p65-R10p5x11p5Z#-C0p475Z0p19	-	10.50	11.50	9.60	10.40	13	17	0.000	0.000	178	221	A	11-970	E
-	BA	11.00	11.50	9.60	10.40	13	17	0.000	0.000	178	221	A	11-867	A
*P11.5x11.0-HxFK-178A	AA, CA	11.00	11.50	9.60	10.40	13	17	0.000	0.000	178	221	A	11-867	A
PBGA-B178[221]_I0p65-R11p0x11p5Z#-C0p475Z0p19	-	11.00	11.50	9.60	10.40	13	17	0.000	0.000	178	221	A	11-970	E
-	BB	13.00	13.50	9.60	10.40	13	17	0.000	0.000	178	221	A	11-873	B
*P13.5x13.0-HxFK-178A	AB, CB	13.00	13.50	9.60	10.40	13	17	0.000	0.000	178	221	A	11-873	B
PBGA-B178[221]_I0p65-R10p5x13p5Z#-C0p475Z0p19	-	10.50	13.50	9.60	10.40	13	17	0.000	0.000	178	221	A	11-970	E
-	BC	10.00	15.00	8.80	13.65	12	22	0.400	0.325	200	264	B	11-891	C
*P15.0x10.0-HxFK-200B	AC, CC	10.00	15.00	8.80	13.65	12	22	0.400	0.325	200	264	B	11-891	C
PBGA-B200[264]_I0p65-R10p0x15p0Z#-C0p475Z0p19	-	10.00	15.00	8.80	13.65	12	22	0.400	0.325	200	264	B	11-970	E
*P15.0x10.0-HxFK-203C	-	10.00	15.00	8.80	13.00	12	21	0.400	0.650	203	262	C	11-900	D
PBGA-B203[262]_I0p65-R10p0x15p0Z#-C0p475Z0p19	-	10.00	15.00	8.80	13.00	12	21	0.400	0.650	203	262	C	11-970	E
PBGA-B100[120]_I0p65-R10p0x7p5Z#-C0p475Z#	-	10.00	7.50	8.80	5.85	12	10	0.400	0.325	100	120	D	11-1026	F
NOTES		2	2	2	2	5	5	2, 12	2, 12	6, 13	6	13		

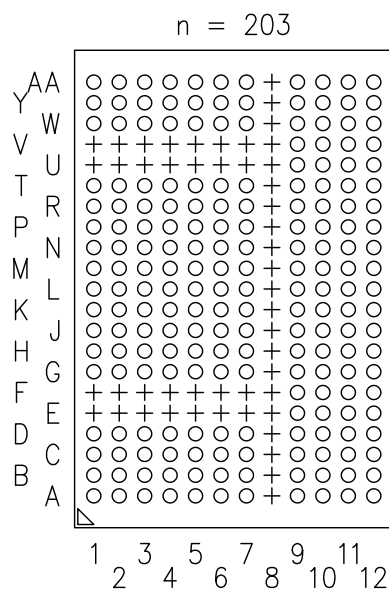
NOTE:
FOR VARIATIONS THAT BEGIN WITH *, SEE SPP-025 ISSUE A FOR EXPLANATION OF VARIATION SCHEME.
THIS VARIATION SCHEME HAS BEEN REPLACED BY JESD30.



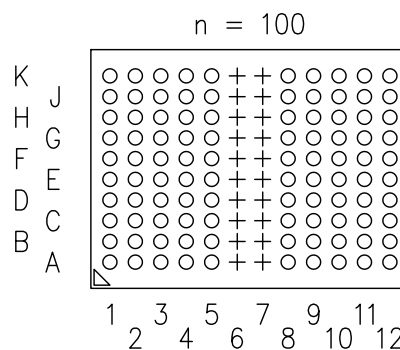
TERMINAL PATTERN A



TERMINAL PATTERN B



TERMINAL PATTERN C



TERMINAL PATTERN D



+ = DEPOPULATED TERMINAL POSITIONS

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5–2009.
THIS OUTLINE CONFORMS TO JEP95, SECTION 4.5.

2. ALL DIMENSIONS ARE IN MILLIMETERS.



3. SOLDER BALL POSITION DESIGNATOR PER JEP95, SECTION 3, SPP–020.

4. eX AND eY REPRESENT THE SOLDER BALL GRID PITCH CORRESPONDING TO THE
X AND Y DIRECTIONS RESPECTIVELY.

5. MX AND MY REPRESENT THE MAXIMUM MATRIX SIZE CORRESPONDING TO THE
X AND Y DIRECTIONS RESPECTIVELY.

6. n REPRESENTS THE ACTUAL NUMBER OF SOLDER BALLS AFTER DEPOPLUATION.
N REPRESENTS THE MAXIMUM NUMBER OF SOLDER BALLS FOR MATRIX SIZES MD, ME.



7. A FULLY POPULATED 16 X 24 MATRIX SIZE IS SHOWN FOR ILLUSTRATION ONLY.



8. DIMENSION Z INCLUDES STAND–OFF HEIGHT Z1, PACKAGE BODY THICKNESS
HEIGHT, BUT DOES NOT INCLUDE ATTACHED FEATURES, e.g., EXTERNAL
HEATSINK. AN INTEGRAL HEATSLUG IS NOT CONSIDERED AN ATTACHED FEATURE.



9. DIMENSION b IS MEASURED AT THE MAXIMUM SOLDER BALL DIAMETER PARALLEL
TO PRIMARY DATUM C.



10. PRIMARY DATUM C (SEATING PLANE) IS DEFINED BY THE PLANE ESTABLISHED BY THE
CONTACT POINTS OF THREE OR MORE SOLDER BALLS THAT SUPPORT THE DEVICE WHEN
IT IS PLACED ON TOP OF A PLANAR SURFACE.



11. THE A1 TERMINAL CORNER MUST BE IDENTIFIED ON BOTH THE BOTTOM AND TOP SIDES
OF THE PACKAGE, THE IDENTIFICATION FEATURE CAN BE MADE USING INK, METALIZED
MARKINGS, INDENTATIONS, OR OTHER FEATURES.



12. DIMENSIONS SX AND SY ARE MEASURED WITH RESPECT TO DATUMS A AND B
AND DEFINE THE POSITION OF THE CENTER SOLDER BALLS.
WHEN THERE IS AN ODD NUMBER OF SOLDER BALLS, SX OR SY = 0.00.
WHEN THERE IS IS AN EVEN NUMBER OF SOLDER BALLS, SX OR SY = eY/2.



13. SOLDER BALL DEPOPULATION IS ALLOWED. DEPOPULATION IS THE OMISSION OF SOLDER
OF BALLS FROM A FULL MATRIX (MX X MY).



14. THE SOLDERABLE SURFACE MAY BE DEFINED BY AN OPENING IN THE SOLDER RESIST LAYER
(TYPE 1) OR BY THE SIZE OF A METALIZED PAD (TYPE 2). IT MAY BE ELLIPITACL PROVIDED
THE RATIO OF THE MAJOR TO MINOR AXES IS NO GREATER THAN 2/1, AND THE SURFACE
AREA IS NO LESS THEN THE MINIMUM FOR A CIRCULAR PAD. FOR TYPE 2 DESIGNS, EXPOSED
COPPER TRACES ARE PERMITTED OUTSIDE THE b1 PAD AREA.

15 FOR GLOB TOP AND FLIP CHIP CONFIGURATIONS, PARALLELISM (ccc) APPLIES ONLY TO THE SURFACE DIRECTLY ABOVE THE DIE AREA. THE PARALLELISM SPECIFICALLY WILL NOT APPLY TO ANY FILLET OR SLOPED REGION OF THE ENCAPSULANT.

16 SEE JESD30 FOR EXPLANATION OF VARIATION SCHEME.
PACKAGE HEIGHT IS THE MAXIMUM PACKAGE THICKNESS.

17. THE Z1 HEIGHT NEEDS TO BE ACCEPTABLE TO MANUFACTURING STANDARDS.

STP (3D) FILE RECORD
3D FILE NAMES MAY EXCEED LENGTH REQUIREMENTS FOR SOME SOFTWARE TOOLS.

STP FILE NAME	DATE	ITEM NUMBER
MO-311E_PBGA-B200[264]_I0p65-R10p0x14p5Z#-C0p425Z0p16	FEB 2020	11-970
MO-311F_PBGA-B100[120]_I0p65-R10p0x7p5Z#-C0p425Z0p16	OCT 2022	11-1026

JEDEC SOLID STATE PRODUCT OUTLINE Copyright © 2020 JEDEC	TITLE PLASTIC BOTTOM GRID ARRAY BALL, 0.80MM X 0.65MM PITCH RECTANGULAR FAMILY PACKAGE	NUMBER MO-311	ISSUE F	DATE OCT 2022	SHEET i
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TASK GROUP CONTRIBUTORS

MICRON TECHNOLOGY INC.
WINBOND ELECTRONICS CORP.

CHANGE RECORD

IF THE CHANGE INVOLVES ANY WORDS ADDED OR DELETED (EXCLUDING DELETION OF ACCIDENTALLY REPEATED WORDS), THE CHANGE IS TO BE INCLUDED BELOW. PUNCTUATION CHANGES MAY OR MAY NOT BE INCLUDED.

INITIAL ISSUE: A	DATE: OCTOBER 2012	ITEM NUMBER: 11-867
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CHANGE RECORD HISTORY:

ISSUE: B	DATE: DECEMBER 2013	ITEM NUMBER: 11-873
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LOCATION	CHANGED FROM:	CHANGED TO:
SHEET 1, PKG DESIGNATOR	VFR-XBGA	(T,V)FR-xDSBGA
SHEET 1, TOP VIEW	D , E	D, E
ALL SHEETS, TITLE	DUAL-PITCH, VERY THIN PROFILE, RECTANGULAR FINE PITCH BALL GRID ARRAY PACKAGE, 0.8 mm x 0.65 mm PITCH	DUAL PITCH THIN AND VERY THIN PROFILE RECTANGULAR DIE SIZE BGA 0.8 mm x 0.65 mm
SHEET 2, DETAIL B		ADDED 4X 0.13 MIN
SHEET 3, TABLE 1		ADDED ROW OF VARIATION
SHEET 3, TABLE 1		ADDED VARIATION Bx AND Cx
SHEET 3, TABLE 2		ADDED COLUMN FOR xB
SHEET 3, TABLE 2		ADDED (MAX) ON SYMBOL D AND E
SHEET 4		ADDED TABLE 4
SHEET 4	FOOTPRINT 1	FOOTPRINT A
SHEET 5, NOTE 6	12 X 16	14 X 24

ISSUE: C	DATE: AUGUST 2014	ITEM NUMBER: 11-891
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LOCATION	CHANGED FROM:	CHANGED TO:
SHEET 3, TABLE 2		ADDED COLUMN FOR xC
SHEET 4		ADDED ROW FOR 15.00X10.00
SHEET 5		FOOTPRINT B

CHANGE RECORD

IF THE CHANGE INVOLVES ANY WORDS ADDED OR DELETED (EXCLUDING DELETION OF ACCIDENTALLY REPEATED WORDS), THE CHANGE IS TO BE INCLUDED BELOW. PUNCTUATION CHANGES MAY OR MAY NOT BE INCLUDED.

ISSUE: D	DATE: DECEMBER 2014	ITEM NUMBER: 11-900
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LOCATION	CHANGED FROM:	CHANGED TO:
ALL SHEETS, TITLE	DUAL PITCH THIN AND VERY THIN PROFILE RECTANGULAR DIE SIZE BGA 0.8 mm x 0.65 mm	DUAL PITCH BALL GRID ARRAY FAMILY RECTANGULAR 0.80MM X 0.65MM PITCH
SHEET 1, PKG DESIGNATOR	(T,V)FR-xDSBGA	(T,V)FR-XBGA
SHEET 3		MOVED A1, b, AND b1 TO NEW TABLE 2 DELETED OLD TBL 2, BECOMES PART OF NEW TABLES 5 & 6
SHEET 4	A1 OF 0.40 BALL WAS 0.25	DELETED OLD TBL 4, BECOMES PART OF NEW TABLES 5 & 6 A1 OF 0.40 BALL IS 0.21 TO MATCH DR
SHEET 5	fff WAS 0.05	fff IS 0.08 TO MATCH DR
SHEET 6		ADDED TABLE 5 ADDED P11.5x10.5-HxFM-178A ADDED P15.0x10.0-HxFM-203C
SHEET 7		ADDED TABLE 6 ADDED P11.5x10.5-HxFK-178A ADDED P15.0x10.0-HxFK-203C
SHEET 8		ADDED FOOTPRINT C ADDED A1 INDICATOR
SHEET 9	NOTE 1: ...SECTION 4.7	NOTE 1: ...SECTION 4.5 NOTE 5: NEW NOTE 6: ADDED n...
SHEET 10		ADDED NOTE 14

ISSUE: E	DATE: FEBRUARY 2020	ITEM NUMBER: 11-970
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LOCATION	CHANGED FROM:	CHANGED TO:
ALL SHEETS, TITLE	DUAL PITCH BALL GRID ARRAY FAMILY, RECTANGULAR, 0.80MM X 0.65MM PITCH	PLASTIC BOTTOM GRID ARRAY BALL, 0.80MM X 0.65MM PITCH RECTANGULAR FAMILY PACKAGE
SHEET 1, PKG DESIGNATOR	(T,V)FR-XBGA	PBGA-B#[#]_I0p65...
ALL SHEETS	SYMBOLS A, D, AND E	SYMBOLS Z, Y, AND X RESPECTIVELY

CHANGE RECORD

IF THE CHANGE INVOLVES ANY WORDS ADDED OR DELETED (EXCLUDING DELETION OF ACCIDENTALLY REPEATED WORDS), THE CHANGE IS TO BE INCLUDED BELOW. PUNCTUATION CHANGES MAY OR MAY NOT BE INCLUDED.

LOCATION	CHANGED FROM:	CHANGED TO:
SHEET 1	ADDED: THE EXACT SHAPE OF EACH CORNER IS OPTIONAL	
SHEET 2, DETAIL A	WAS TOLERANCE bbb	NOW TOLERANCE ccc ADDED NOTE 15 TO TOLERANCE
		ADDED DIMENSIONS Z5 & Z6
SHEET 3, TABLE 2		ADDED NOTE AT TABLE BOTTOM
SHEET 4		NEW TABLE
SHEET 5, TABLE 4	0.300 & 0.400 WAS +/-50	0.300 & 0.400 NOW +/-75
	0.300 Z1 WAS 0.15	0.300 Z1 NOW 0.13
	0.400 Z1 WAS 0.21	0.400 Z1 NOW 0.19
		ADDED 0.350 BALL DIAMETER
	0.400 b1 TYPE 1 WAS 0.28 0.400 b1 TYPE 2 WAS 0.30	0.400 b1 TYPE 1 NOW 0.26 0.400 b1 TYPE 2 NOW 0.26
SHEET 5, TABLE 5	WAS TOLERANCE bbb	NOW TOLERANCE ccc
		ADDED ϕ b NOM = 0.030
SHEET 6, TABLE 6		ADDED JESD30 VARIATIONS
		ADDED NOTE: FOR VARIATIONS...
SHEET 7, TABLE 7		ADDED TABLE 7
SHEET 8, TABLE 8		ADDED JESD30 VARIATIONS
		ADDED NOTE: FOR VARIATIONS...
SHEET 9	WAS FOOTPRINT	NOW TERMINAL PATTERN
SHEET 10	NOTES WITH SYMBOLS A, D, AND E	REPLACED WITH SYMBOLS Z, Y, AND X RESPECTIVELY
SHEET 10, NOTE 11		REMOVED: THE EXACT SHAPE OF EACH CORNER IS OPTIONAL
SHEET 11		ADDED NOTE 15
SHEET 13, NOTE 16	EXPLANATION OF VARIATION SCHEME	SEE JESD30 FOR EXPLANATION OF VARIATION SCHEME
		ADDED: PACKAGE HEIGHT IS... ...DESIGNATED HEIGHT.
		REMOVED SPP-025A VARIATION SCHEME

CHANGE RECORD

IF THE CHANGE INVOLVES ANY WORDS ADDED OR DELETED (EXCLUDING DELETION OF ACCIDENTALLY REPEATED WORDS), THE CHANGE IS TO BE INCLUDED BELOW. PUNCTUATION CHANGES MAY OR MAY NOT BE INCLUDED.

ISSUE: F	DATE: OCTOBER 2022	ITEM NUMBER: 11-1026
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LOCATION	CHANGED FROM:	CHANGED TO:
SHEET 5, TABLE 4	Z1(0.300 NOM BALL) = 0.13 Z1(0.350 NOM BALL) = 0.16 Z1(0.400 NOM BALL) = 0.19	PACKAGE SPECIFIC PACKAGE SPECIFIC PACKAGE SPECIFIC
SHEET 8		ADDED VARIATION PBGA-B460[598]_I0p50- R12p0x14p0Z#-C0p4Z#
SHEET 9		ADDED TERMINAL PATTERN D
SHEET 11, NOTE 17		ADDED