

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, 0.65MM PITCH  
RECTANGULAR FAMILY PACKAGE

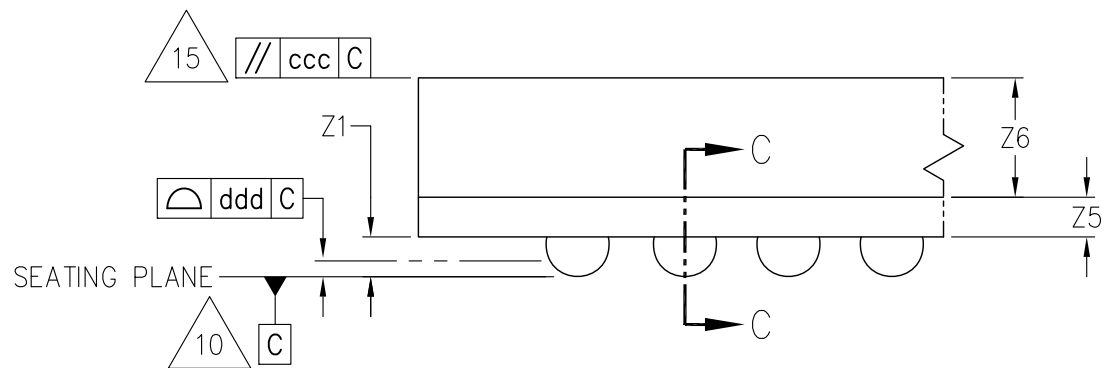
PACKAGE DESIGNATOR  
PBGA-B#[#]\_  
I0p65...

NUMBER  
**MO-246**

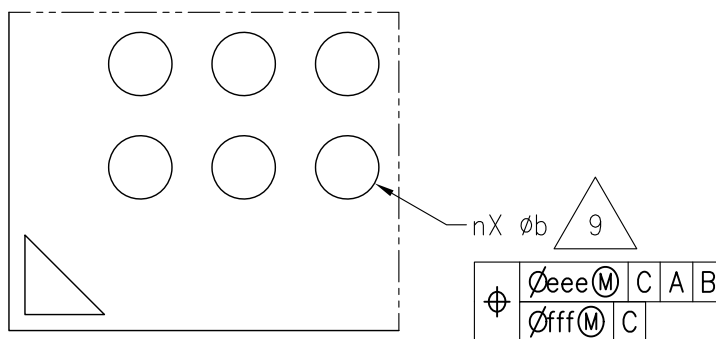
ISSUE  
**I**

DATE  
**AUG 2022**

SHEET  
**1 OF 12**



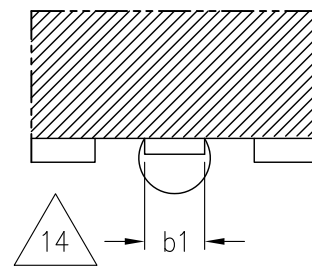
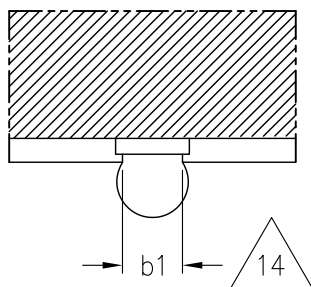
DETAIL A  
(ROTATED 90° CW)



DETAIL B

TYPE 1 – SMD  
(SOLDER MASK DEFINED)

TYPE 2 – NSMD  
(NON SOLDER MASK DEFINED)



SECTION C-C

TABLE 1

COMMON DIMENSIONS									
SYMBOL	P = PACKAGE PROFILE HEIGHT								
	T: THIN PROFILE			B: THICK			---		
	MIN	NOM	MAX	MIN	NOM	MAX	MIN	NOM	MAX
Z	1.00	----	1.20	2.45	----	----	----	----	----
Z2	----	----	0.99	----	----	----	----	----	----
e	0.65 BSC								
NOTES	1, 2								
REF	11-796, 11-904, 11-1024			11-906, 11-1024			-		
ISSUE	I			I			-		
VARIATIONS IN THIS TABLE DO NOT MEET JEDEC PROFILE HEIGHTS DEFINED IN JESD30 AND SHOULD NOT BE USED WHEN ADDING NEW VARIATIONS.									

TABLE 2

COMMON DIMENSIONS		
SYMBOL		
Z		PACKAGE SPECIFIC
Z2	b(NOM) = 0.400	Z2(MAX) = Z(MAX) - Z1
	b(NOM) = 0.450	Z2(MAX) = Z(MAX) - Z1
Z5		OPTIONAL - PACKAGE SPECIFIC
Z6		OPTIONAL - PACKAGE SPECIFIC
e		0.65 BASIC
NOTES		1, 2, 8
REF		11-1024
ISSUE		I

$$b1 = b(\text{NOM}) * 0.667$$

TABLE 3

COMMON DIMENSIONS						
SYMBOL	SOLDER BALL DIAMETER					
	MIN	NOM	MAX	MIN	NOM	MAX
Z1	PACKAGE SPECIFIC	----	----	PACKAGE SPECIFIC	----	----
b	0.325	0.400	0.475	0.375	0.450	0.525
b1	TYPE 1	0.26	----	0.30	----	----
	TYPE 2	0.26	----	0.30	----	----
NOTES	1, 2, 17			1, 2, 17		
REF	11-796, 11-904, 11-1024			11-906, 11-1024		
ISSUE	I			I		

TABLE 4

TOLERANCE OF FORM AND POSITION			
SYMBOL	PACKAGE TYPE	VALUE	
		$\phi b$ NOM = 0.40	$\phi b$ NOM = 0.45
aaa	----	0.15	0.15
ccc	ENCAPSULATED	0.20	0.20
	BARE DIE	0.20	0.20
	LIDDED	0.35	0.35
ddd	----	0.10	0.20
eee	ENCAPSULATED	0.15	0.15
	BARE DIE	0.15	0.15
	LIDDED	0.20	0.20
fff	----	0.08	0.08
NOTES		1, 2	1, 2
REF		11-796, 11-904, 11-906	11-906
ISSUE		H	H

TABLE 5

$\phi b = 0.400 \text{ MM NOMINAL}$														
NEW VARIATION	OLD VARIATION	X BASIC	Y BASIC	X1 BASIC	Y1 BASIC	MX	MY	SX BASIC	SY BASIC	n	N	TERMINAL PATTERN	REF	ISSUE
*P15.0x6.0-HK-176D	B	6.00	15.00	4.55	13.65	8	22	0.325	0.325	176	176	D	11-695	B
PBGA-B176[176]_I0p65-R6p0x15p0Z#-C0p475Z#		6.00	15.00	4.55	13.65	8	22	0.325	0.325	176	176	D	11-1024	I
*P10.0x8.0-HK-108A	L	8.00	8.00	6.50	7.80	11	13	0.000	0.000	108	143	A	11-814	F
PBGA-B108[143]_I0p65-R8p0x8p0Z#-C0p475Z#		8.00	8.00	6.50	7.80	11	13	0.000	0.000	108	143	A	11-1024	I
*P13.5x8.0-HK-176E	F	8.00	13.50	6.50	12.35	11	20	0.000	0.325	176	220	E	11-809	E
PBGA-B176[220]_I0p65-R8p0x13p5Z#-C0p475Z#		8.00	13.50	6.50	12.35	11	20	0.000	0.325	176	220	E	11-1024	I
*P12.0x9.0-HK-108A	K	9.00	12.00	6.50	7.80	11	13	0.000	0.000	108	143	A	11-814	F
PBGA-B108[143]_I0p65-R9p0x12p0Z#-C0p475Z#		9.00	12.00	6.50	7.80	11	13	0.000	0.000	108	143	A	11-1024	I
*P12.0x9.0-HK-186F	H	9.00	12.00	7.80	10.40	13	17	0.000	0.000	186	221	F	11-814	F
PBGA-B186[221]_I0p65-R9p0x12p0Z#-C0p475Z#		9.00	12.00	7.80	10.40	13	17	0.000	0.000	186	221	F	11-1024	I
*P13.0x9.0-HK-160B	A	9.00	13.00	7.15	11.05	12	18	0.325	0.325	160	216	B	11-669	A
PBGA-B160[216]_I0p65-R9p0x13p0Z#-C0p475Z#		9.00	13.00	7.15	11.05	12	18	0.325	0.325	160	216	B	11-1024	I
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 C FOR EXPLANATION OF VARIATION SCHEME.  
THIS VARIATION SCHEME HAS BEEN REPLACED BY JESD30.

TABLE 5 CONTINUED

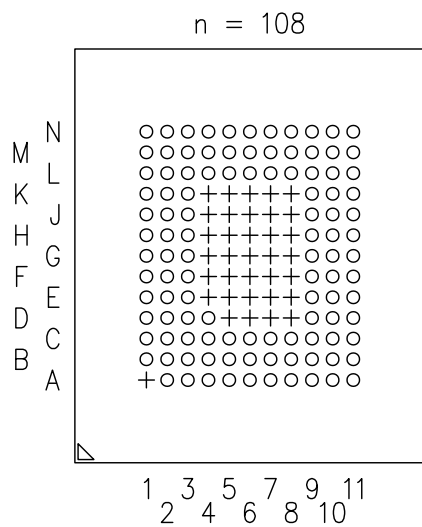
$\phi b = 0.400 \text{ MM NOMINAL}$														
NEW VARIATION	OLD VARIATION	X BASIC	Y BASIC	X1 BASIC	Y1 BASIC	MX	MY	SX BASIC	SY BASIC	n	N	TERMINAL PATTERN	REF	ISSUE
*P12.0x10.0-HK-165C	C	10.00	12.00	7.15	9.10	12	15	0.325	0.000	165	180	C	11-709	C
PBGA-B165[180]_I0p65-R10p0x12p0Z#-C0p475Z#		10.00	12.00	7.15	9.10	12	15	0.325	0.000	165	180	C	11-1024	I
*P13.0x11.0-HK-108A	J	11.00	13.00	6.50	7.80	11	13	0.000	0.000	108	143	A	11-814	F
PBGA-B108[145]_I0p65-R11p0x13p0Z#-C0p475Z#		11.00	13.00	6.50	7.80	11	13	0.000	0.000	108	143	A	11-1024	I
*P13.0x11.0-HK-165C	D	11.00	13.00	7.15	9.10	12	15	0.325	0.000	165	180	C	11-709	C
PBGA-B165[180]_I0p65-R11p0x13p0Z#-C0p475Z#		11.00	13.00	7.15	9.10	12	15	0.325	0.000	165	180	C	11-1024	I
*P14.0x10.0-HK-190G	-	10.00	14.00	8.45	11.70	14	19	0.325	0.000	190	266	G	11-904	G
PBGA-B190[266]_I0p65-R10p0x14p0Z#-C0p475Z#		10.00	14.00	8.45	11.70	14	19	0.325	0.000	190	266	G	11-1024	I
*P13.0x11.0-HK-186F	G	11.00	13.00	7.80	10.40	13	17	0.000	0.000	186	221	F	11-814	F
PBGA-B186[221]_I0p65-R11p0x13p0Z#-C0p475Z#		11.00	13.00	7.80	10.40	13	17	0.000	0.000	186	221	F	11-1024	I
*P16.0x12.0-HK-199H	E	12.00	16.00	9.75	13.65	16	22	0.325	0.325	199	352	H	11-796	D
PBGA-B199[352]_I0p65-R12p0x16p0Z#-C0p475Z#		12.00	16.00	9.75	13.65	16	22	0.325	0.325	199	352	H	11-1024	I
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 C FOR EXPLANATION OF VARIATION SCHEME.  
THIS VARIATION SCHEME HAS BEEN REPLACED BY JESD30.

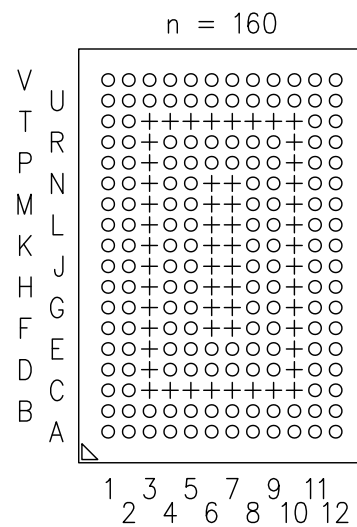
TABLE 6

øb = 0.450 MM NOMINAL															
NEW VARIATION		OLD VARIATION	X BASIC	Y BASIC	X1 BASIC	Y1 BASIC	MBX	MEY	SX BASIC	SY BASIC	n	N	TERMINAL PATTERN	REF	ISSUE
PBGA-B308[368]_I0p65-R11p5x15p5Z#-C0p525Z#			11.50	15.50	9.75	14.30	16	23	0.325	0.000	308	368	J	11-1024	I
*P19.5x16.0-HJ-666I		---	16.00	19.50	14.30	18.20	23	29	0.000	0.000	666	667	I	11-906	H
PBGA-B666[667]_I0p65-R16p0x19p5Z#-C0p525Z#			16.00	19.50	14.30	14.30	23	29	0.000	0.000	666	667	I	11-1024	I
NOTES			2	2	2	2	5	5	2, 12	2, 12	6, 13	6	13		

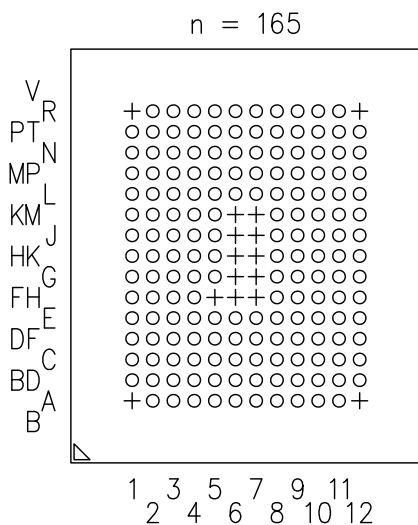
NOTE:  
FOR VARIATIONS THAT BEGIN WITH \*, SEE SPP-025 ISSUE C FOR EXPLANATION OF VARIATION SCHEME.  
THIS VARIATION SCHEME HAS BEEN REPLACED BY JESD30.



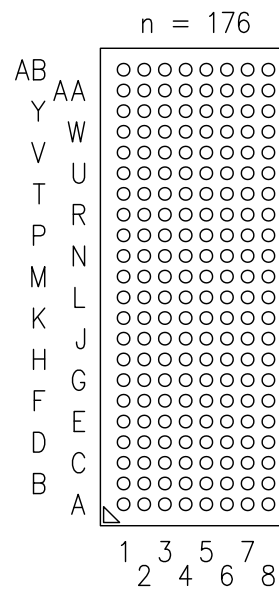
TERMINAL PATTERN A



TERMINAL PATTERN B



TERMINAL PATTERN C

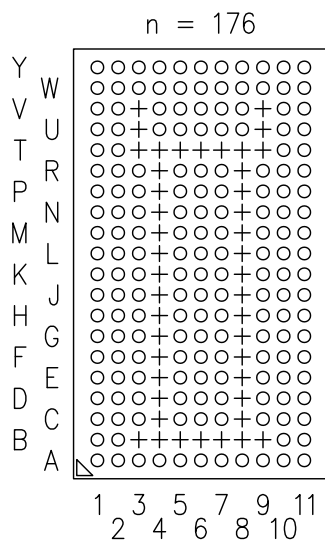


TERMINAL PATTERN D

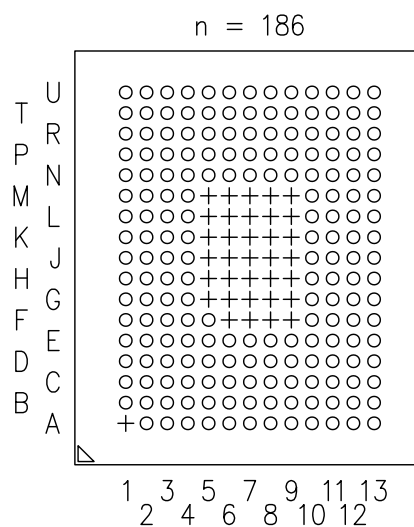


+ = DEPOPULATED BALL POSITIONS

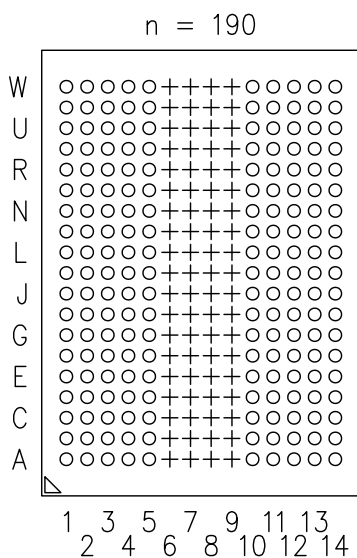




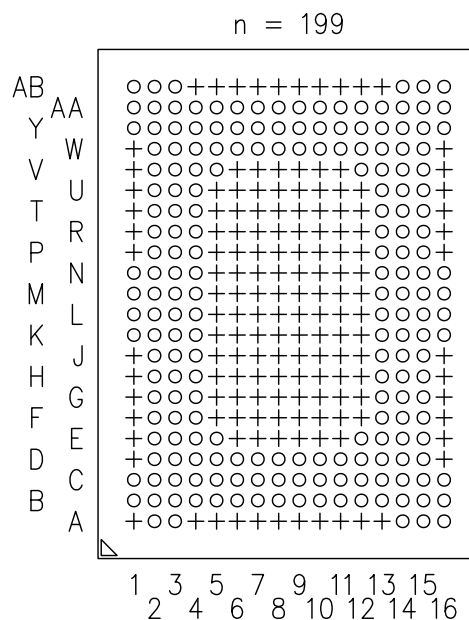
TERMINAL PATTERN E



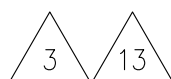
TERMINAL PATTERN F



TERMINAL PATTERN G

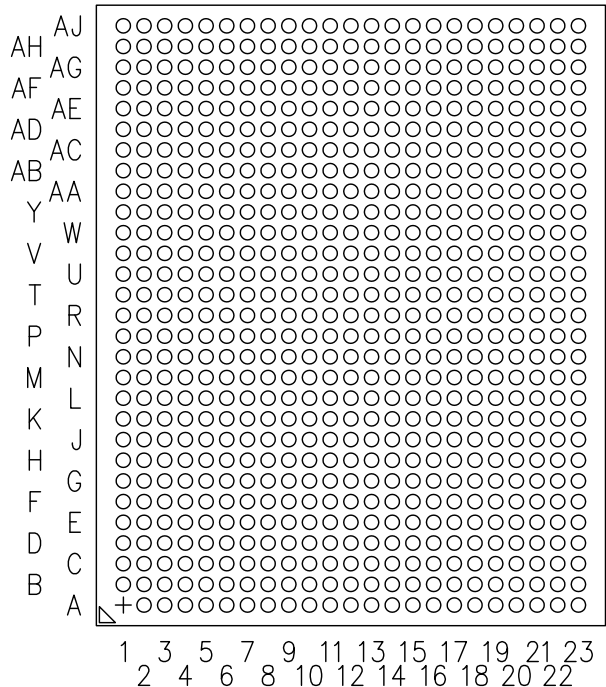


TERMINAL PATTERN H



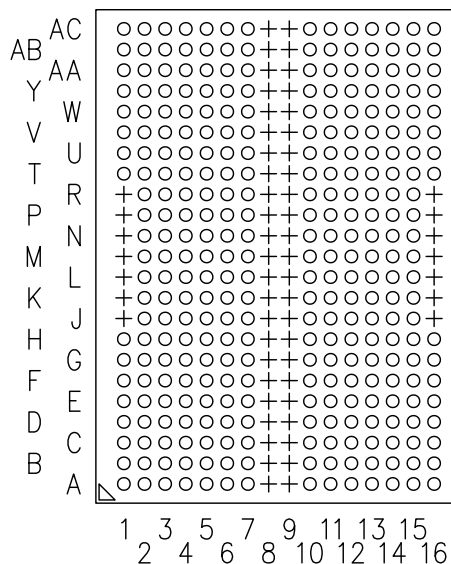
+ = DEPOPULATED BALL POSITIONS

n = 666



TERMINAL PATTERN I

n = 308



TERMINAL PATTERN J



+ = DEPOPULATED BALL 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–010.
4. "e" REPRESENT THE SOLDER BALL GRID PITCH.
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 MY, MX.

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 AND LID 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 CORNER A1 MUST BE IDENTIFIED ON BOTH THE BOTTOM AND TOP SIDES OF THE PACKAGE, THE IDENTIFICATION FEATURE CAN BE MADE USING INK OR METALIZED MARKINGS, IDENTATIONS, OR OTHER FEATURES. THE EXACT SHAPE OF EACH CORNER IS OPTIONAL.

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 SD = e/2.

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

14 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 ELLIPTICAL PROVIDED THE RATIO OF MAJOR TO MINOR AXES IS NO GREATER THAN 2/1 AND THE SURFACE AREA IS NO LESS THAN THE MINIMUM FOR A CIRCULAR PAD. FOR TYPE 2 DESIGNS, EXPOSED COPPER TRACES ARE PERMITTED OUTSIDE THE b1 PAD AREA.

NOTES CONTINUED:

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-246I_PBGA-B308[368]_I0p65-R11p5X15p5Z#-C0p525Z#	AUG 2022	11-1024

TASK GROUP CONTRIBUTORS

MICRON TECHNOLOGY INC.

# 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: SEPTEMBER 2003	ITEM NUMBER: 11-669
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CHANGE RECORD HISTORY:
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ISSUE: B	DATE: DECEMBER 2004	ITEM NUMBER: 11-695
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ISSUE: C	DATE: DECEMBER 2005	ITEM NUMBER: 11-709
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ISSUE: D	DATE: JULY 2008	ITEM NUMBER: 11-796
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LOCATION	CHANGED FROM:	CHANGED TO:
SHEET 3		ADD VARAITION E

ISSUE: E	DATE: JANUARY 2009	ITEM NUMBER: 11-809
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LOCATION	CHANGED FROM:	CHANGED TO:
SHEET 4		ADD VARAITION F

ISSUE: F	DATE: MARCH 2009	ITEM NUMBER: 11-814
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LOCATION	CHANGED FROM:	CHANGED TO:
SHEETS 4 AND 5		ADD VARAITIONS G, H, J, L, K

ISSUE: G	DATE: FEBRUARY 2015	ITEM NUMBER: 11-904
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LOCATION	CHANGED FROM:	CHANGED TO:
ALL SHEETS, FORMAT		CURRENT FORMAT
ALL SHEETS, TITLE	RECTANGULAR, FINE PITCH, THIN BALL GRID ARRAY (0.65 MM PITCH)	FINE PITCH BALL GRID ARRAY FAMILY, RECTANGULAR, 0.65 MM PITCH
SHEET 1	SOLDER BALL MATRIX WAS 18 X 20 DEPOPULATED	SOLDER BALL MATRIX NOW 16 X 24 FULLY POPULATED
SHEET 2	bbb	ccc
	ccc	ddd
	ddd	eee
	eee	fff

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# 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 2	SECTION A-A	SECTION C-C
SHEET 3, TABLE 1 AND 2	SHEET 5 COMMON DIMENSIONS	NEW SHEET
	A = --- MIN	A = 1.00
	A1 = 0.25 MIN	A1 = 0.21 MIN
	A2 = 0.75/0.80/0.85	A2 = 0.99
	b1 TYPE 1 AND 2 = 0.28	b1 TYPE 1 AND 2 = 0.30
SHEET 4, TABLE 3	SHEET 5 FORM AND POSITION	NEW SHEET
	bbb = 0.20	ccc = 0.20
	ddd = 0.15	eee = 0.15
	eee = 0.08	fff = 0.08
SHEET 5	OLD VARIATION NAMING SCHEME	NEW VARIATION NAMING SCHEME
SHEETS 6 AND 7	WAS SHEETS 3 AND 4	
	VARIATION A, B, C, ...	FOOTPRINT A, B, C, ...
		ADDED n, SOLDER BALL COUNT
		ADDED TERMINAL A1 INDICATOR
		ADDED FOOTPRINT G, 190 BALL
		ADDED MISSING DEPOPULED BALL POSITIONS TO FOOTPRINT H
SHEETS 8 AND 9	WAS SHEET 6	
		UPDATED NOTES TO CURRENT FORMAT AND UPDATED DELTAS TO MATCH

ISSUE: H	DATE: MAY 2015	ITEM NUMBER: 11-906
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LOCATION	CHANGED FROM:	CHANGED TO:
SHEET 1		ADDED 'B' TO PKG DESIGNATOR
SHEET 3, TABLE 1		ADDED PKG PROFILE HEIGHT 'B'
SHEET 3, TABLE 2		ADDED NOMINAL BALL DIA 0.45
SHEET 4, TABLE 3		ADDED NOMINAL BALL DIA 0.45 ADDED PACKAGE TYPE TO ccc AND eee
SHEET 6		ADDED TABLE 5
SHEET 9		ADDED FOOTPRINT 'I'



# 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: I	DATE: AUGUST 2022	ITEM NUMBER: 11-1024
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LOCATION:	CHANGED FROM:	CHANGED TO:
ALL SHEETS	FINE PITCH BALL GRID ARRAY FAMILY, RECTANGULAR, 0.65MM PITCH	PLASTIC BOTTOM GRID ARRAY BALL, 0.65MM PITCH RECTANGULAR FAMILY PACKAGE
SHEET 1, PKG DESIGNATOR	(T,B) FR-XBGA	PBGA-B#[#]_I0p65...
ALL SHEETS	SYMBOLS A, D, AND E	SYMBOLS Z, Y, AND X RESPECTIVELY
SHEET 1	Z	Z MAX
SHEET 2		ADDED Z5 AND Z6 DIMENSIONS
SHEET 3		ADDED VARIATION NOTE TO TABLE 1
		ADDED TABLE 2
SHEET 4	Z1(0.400 NOM BALL) = 0.21 Z1(0.450 NOM BALL) = 0.24	PACKAGE SPECIFIC PACKAGE SPECIFIC
	0.35 MIN/0.40 NOM/0.45 MAX 0.40 MIN/0.45 NOM/0.50 MAX	0.325 MIN/0.40 NOM/0.475 MAX 0.375 MIN/0.45 NOM/0.525 MAX
SHEETS 5 - 7		ADDED JESD30 VARIATION ADDED NOTE
SHEET 7		ADDED 11.50 x 15.50 308 BALL
SHEETS 8 - 10	FOOTPRINT	TERMINAL PATTERN
SHEET 10		ADDED TERMINAL PATTERN J
SHEET 11, NOTE 3	... SPP-020.	... SPP-010.
SHEET 12, NOTE 15		ADDED
SHEET 12, NOTE 16	EXPLANATION OF VARIATION SCHEME	SEE JESD30 FOR EXPLANATION OF VARIATION SCHEME
	PACKAGE PROFILE HEIGHT IS... IT IS THE RANGE... ...DESIGNATED PROFILE HEIGHT CODE.	PACKAGE HEIGHT IS THE MAXIMUM PACKAGE THICKNESS.
		REMOVED SPP-025 VARIATION SCHEME
SHEET 12, NOTE 17		ADDED

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