

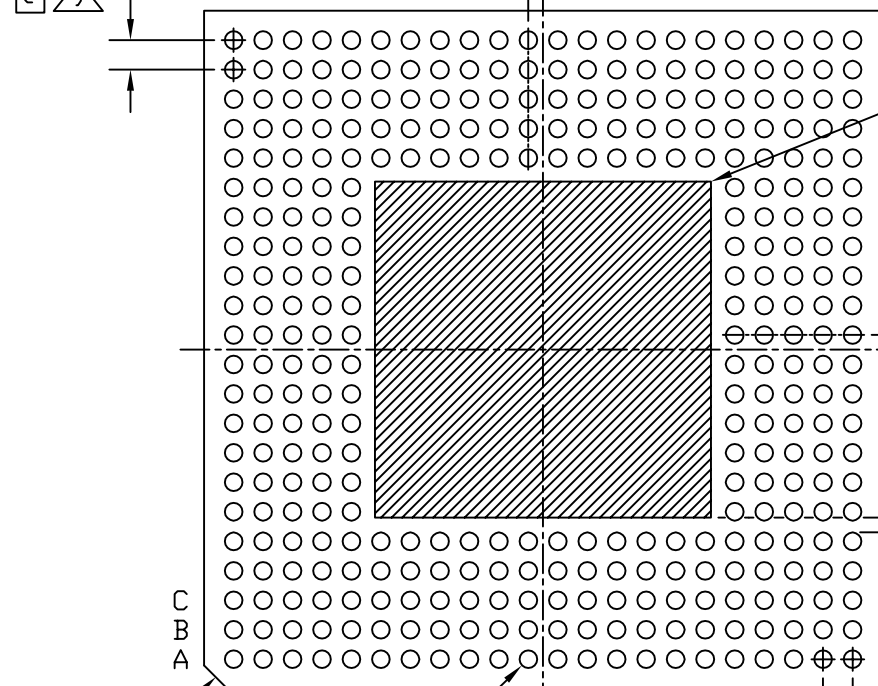
ALL DIMENSIONS  
IN MILLIMETERS

SEE NOTES

4X 15

TOP VIEW

9



A1 CORNER 3 12

1 2 3

N x  $\phi b$  5 14

$\phi eee$ (M)	Z	X	Y
$\phi fff$ (M)	Z		

BOTTOM VIEW

Z SEATING PLANE 7

// lbb Z

// ccc Z

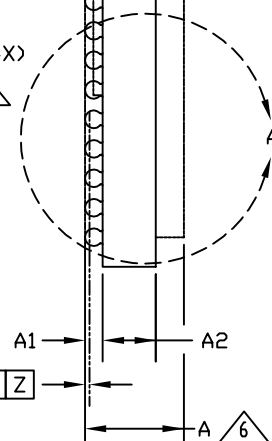
19

11

S 10

Q (4X) 16

LID 13  
(OPTIONAL)



e 9

N x ddd Z

JEDEC  
SOLID STATE  
PRODUCT OUTLINE

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  
TAPE BALL GRID ARRAY FAMILY

JESD-30 DESIGNATOR  
XBGA-B/TBGA

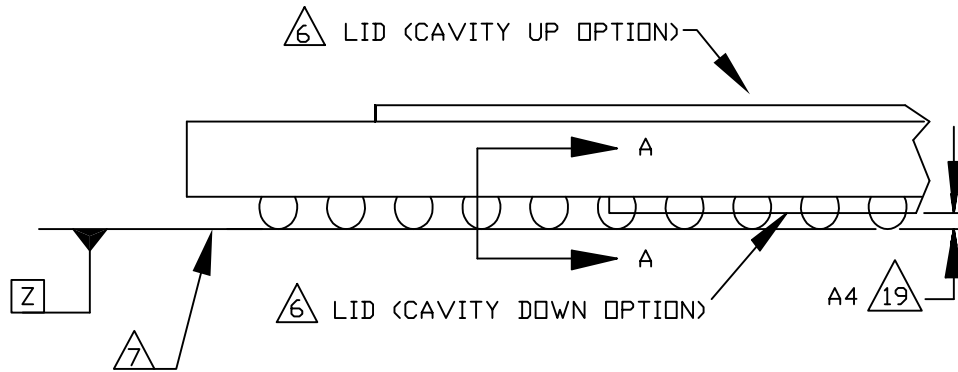
ISSUE  
F

DATE  
OCT. 2003

MO-149

SHEET  
1/8

# DETAIL "A"



# SECTION A-A

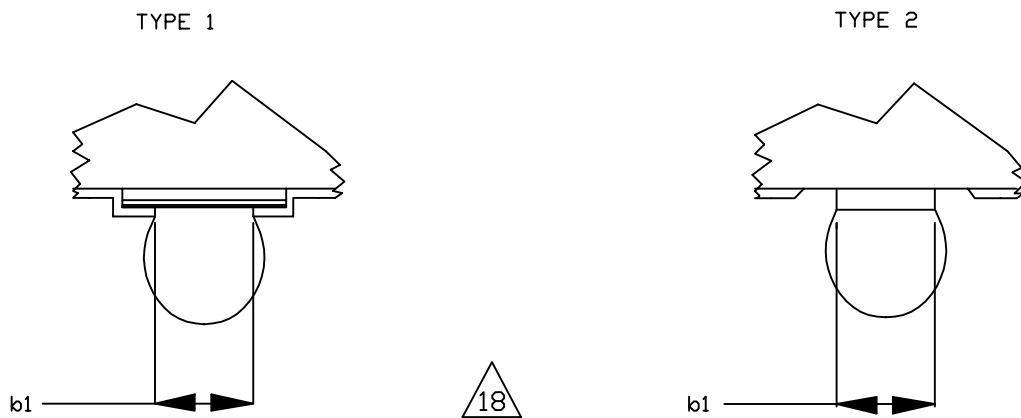


TABLE 1  
COMMON DIMENSIONS

DIMENSION	e = 1.00			e = 1.27			e = 1.50			NOTES
	MINIMUM	NOMINAL	MAXIMUM	MINIMUM	NOMINAL	MAXIMUM	MINIMUM	NOMINAL	MAXIMUM	
A	----	----	3.40	----	----	3.40	----	----	3.40	6
A2	0.30	----	1.80	0.30	----	1.80	0.30	----	1.80	
A4	0.10	----	----	0.10	----	----	0.10	----	----	19
Q	0.25	----	----	0.25	----	----	0.25	----	----	16
aaa	----	----	0.20	----	----	0.20	----	----	0.20	13
bbb	----	----	0.25	----	----	0.25	----	----	0.25	
ccc	----	----	0.35	----	----	0.35	----	----	0.35	
eee	----	----	0.30	----	----	0.30	----	----	0.30	
fff	----	----	0.10	----	----	0.15	----	----	0.15	
NOTES:	1, 2									
REF	11-665									
ISSUE	F									

TABLE 2  
FOR APPLICATIONS UTILIZING HIGH MELT SOLDER BALLS

DIMENSION	e = 1.00			e = 1.27			e = 1.50			NOTES
	MINIMUM	NOMINAL	MAXIMUM	MINIMUM	NOMINAL	MAXIMUM	MINIMUM	NOMINAL	MAXIMUM	
A1	0.45	0.55	0.65	0.45	0.55	0.65	0.45	0.55	0.65	
b	0.57	0.63	0.70	0.57	0.63	0.70	0.57	0.63	0.70	
ddd	0.15			0.15			0.15			
NOTES:	1, 2									
REF	11.4-488									
ISSUE	D									

TABLE 3  
FOR APPLICATIONS UTILIZING LOW MELT SOLDER BALLS

DIMENSION		e = 1.00			e = 1.27			e = 1.50			NOTES
		MINIMUM	NOMINAL	MAXIMUM	MINIMUM	NOMINAL	MAXIMUM	MINIMUM	NOMINAL	MAXIMUM	
A1		0.40	0.50	0.60	0.50	0.60	0.70	0.50	0.60	0.70	18  18
b		0.50	0.60	0.70	0.60	0.75	0.90	0.60	0.75	0.90	
k1	TYPE1	0.45	----	----	0.55	----	----	0.55	----	----	
	TYPE2	0.50	----	----	0.60	----	----	0.60	----	----	
ddd		0.20			0.20			0.20			
NOTES:		1, 2									
REF		11-665									
ISSUE		F									

TABLE 4  
VARIATION - 1.00 PITCH

D / E	e = 1.00							
	VARIATION	M1	N1	S	VARIATION	M2	N2	S
15.00	AA-1X	14	196	0.50	AA-2X	13	169	0.00
17.00	AB-1X	16	256	0.50	AB-2X	15	225	0.00
19.00	AC-1X	18	324	0.50	AC-2X	17	324	0.00
21.00	AD-1X	20	400	0.50	AD-2X	19	361	0.00
23.00	AE-1X	22	484	0.50	AE-2X	21	441	0.00
25.00	AF-1X	24	576	0.50	AF-2X	23	529	0.00
27.00	AG-1X	26	676	0.50	AG-2X	25	625	0.00
29.00	AH-1X	28	784	0.50	AH-2X	27	729	0.00
31.00	AJ-1X	30	900	0.50	AJ-2X	29	841	0.00
33.00	AK-1X	32	1024	0.50	AK-2X	31	961	0.00
35.00	AL-1X	34	1156	0.50	AL-2X	33	1089	0.00
37.50	AM-1X	37	1369	0.00	AM-2X	36	1296	0.50
40.00	AN-1X	39	1521	0.00	AN-2X	38	1444	0.50
42.50	AP-1X	42	1764	0.50	AP-2X	41	1681	0.00
45.00	AR-1X	44	1936	0.50	AR-2X	43	1849	0.00
47.50	AT-1X	47	2209	0.00	AT-2X	46	2116	0.50
50.00	AU-1X	49	2401	0.00	AU-2X	48	2304	0.50
NOTES:	17	4, 9	10	17	4, 9	10		
	1, 2							
REF	ITEM 11.4-004				ITEM 11.4-488			
ISSUE	B				D			

TABLE 5  
VARIATION - 1.27 PITCH

D / E	e = 1.27							
	VARIATION	M1	N1	S	VARIATION	M2	N2	S
15.00	BA-1X	11	121	0.00	BA-2X	10	100	0.635
17.00	BB-1X	13	169	0.00	BB-2X	12	144	0.635
19.00	BC-1X	15	225	0.00	BC-2X	14	196	0.635
21.00	BD-1X	16	256	0.635	BD-2X	15	225	0.00
23.00	BE-1X	18	324	0.635	BE-2X	17	289	0.00
25.00	BF-1X	19	361	0.00	BF-2X	18	324	0.635
27.00	BG-1X	21	441	0.00	BG-2X	20	400	0.635
29.00	BH-1X	22	484	0.635	BH-2X	21	441	0.00
31.00	BJ-1X	24	576	0.635	BJ-2X	23	529	0.00
33.00	BK-1X	26	676	0.635	BK-2X	25	625	0.00
35.00	BL-1X	27	729	0.00	BL-2X	26	676	0.635
37.50	BM-1X	29	841	0.00	BM-2X	28	784	0.635
40.00	BN-1X	31	961	0.00	BN-2X	30	900	0.635
42.50	BP-1X	33	1089	0.00	BP-2X	32	1024	0.635
45.00	BR-1X	35	1225	0.00	BR-2X	34	1156	0.635
47.50	BT-1X	37	1369	0.00	BT-2X	36	1296	0.635
50.00	BU-1X	39	1521	0.00	BU-2X	38	1444	0.635
NOTES:	17	4, 9	10	17	4, 9	10		
	1, 2							
REF	ITEM 11.4-002				ITEM 11.4-425			
ISSUE	A				C			

TABLE 6  
VARIATION - 1.50 PITCH

D / E	e = 1.50							
	VARIATION	M1	N1	S	VARIATION	M2	N2	S
15.00	CA-1X	10	100	0.75	CA-2X	9	81	0.00
17.00	CB-1X	11	121	0.00	CB-2X	10	100	0.75
19.00	CC-1X	12	144	0.75	CC-2X	11	121	0.00
21.00	CD-1X	14	196	0.75	CD-2X	13	169	0.00
23.00	CE-1X	15	225	0.00	CE-2X	14	196	0.75
25.00	CF-1X	16	256	0.75	CF-2X	15	225	0.00
27.00	CG-1X	18	324	0.75	CG-2X	17	289	0.00
29.00	CH-1X	19	361	0.00	CH-2X	18	324	0.75
31.00	CJ-1X	20	400	0.75	CJ-2X	19	361	0.00
33.00	CK-1X	22	484	0.75	CK-2X	21	441	0.00
35.00	CL-1X	23	529	0.00	CL-2X	22	484	0.75
37.50	CM-1X	25	625	0.00	CM-2X	24	576	0.75
40.00	CN-1X	26	676	0.75	CN-2X	25	625	0.00
42.50	CP-1X	28	784	0.75	CP-2X	27	729	0.00
45.00	CR-1X	30	900	0.75	CR-2X	29	841	0.00
47.50	CT-1X	31	961	0.00	CT-2X	30	900	0.75
50.00	CU-1X	33	1089	0.00	CU-2X	32	1024	0.75
NOTES:	17	4, 9	10	17	4, 9	10		
	1, 2							
REF	ITEM 11.4-004				ITEM 11.4-425			
ISSUE	B				C			

## NOTES:

- 1 DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.
- 2 ALL DIMENSIONS ARE IN MILLIMETERS.
- 3 TERMINAL POSITION DESIGNATION PER JEDEC PUBLICATION 95, SECTION 4.3, SPP-010
- 4 SYMBOL "M1" AND "M2" ARE THE SOLDER BALL MATRIX SIZE: FOR (-) VARIATIONS "M1" REPRESENTS THE MAXIMUM SOLDER BALL MATRIX SIZE POSSIBLE USING THE FOLLOWING DESIGN ALGORITHM (TRUNCATE TO THE NEAREST INTEGER):

$$M1 = \frac{(X - b_{\max} - Y - Z)}{e} + 1$$

$$M2 = (M1 - 1)$$

X = PACKAGE BODY SIZE (DIMENSION  $\boxed{D}$  OR  $\boxed{E}$ ).

b<sub>max</sub> = MAXIMUM ALLOWABLE SOLDER BALL SIZE.

Y = PACKAGE BODY SIZE TOLERANCE.

Z = BALL TO PACKAGE POSITIONAL TOLERANCE.

e = BASIC SOLDER BALL PITCH (DIMENSION  $\boxed{e}$ ).

SYMBOL "N1" AND "N2" ARE THE MAXIMUM ALLOWABLE NUMBER OF SOLDER BALLS PRIOR TO DEPOPULATING.

- 5 22 X 22 MATRIX SHOWN FOR ILLUSTRATION ONLY.
- 6 THIS DIMENSION INCLUDES STAND-OFF HEIGHT "A1", PACKAGE BODY THICKNESS "A2", AND LID HEIGHT, BUT DOES NOT INCLUDE ATTACHED FEATURES, e.g. EXTERNAL HEATSINK. AN INTEGRAL HEATSLUG IS NOT CONSIDERED AN ATTACHED FEATURE.
- 7 PRIMARY DATUM Z AND SEATING PLANE ARE DEFINED BY THE SPHERICAL CROWNS OF THE SOLDER BALLS.
- 8 CORNERS OF THE PACKAGE BODY MAY HAVE CHAMFERS FOR MECHANICAL PROTECTION OR IDENTIFICATION.
- 9 SOLDER BALL ARRAY MAY BE DEPOPULATED. DEPOPULATION IS THE OMISSION OF SOLDER BALL(S) FROM A FULL MATRIX WITHOUT SHIFTING A GIVEN MATRIX M1 OR M2.
- 10  $\boxed{S}$  IS MEASURED WITH RESPECT TO X AND Y AND DEFINES THE POSITION OF THE CENTER SOLDER BALL IN THE OUTER ROW. WHEN THERE IS AN ODD NUMBER OF SOLDER BALLS IN THE OUTER ROW  $\boxed{S} = 0$ ; WHEN THERE IS AN EVEN NUMBER OF SOLDER BALLS IN THE OUTER ROW THE VALUE  $\boxed{S} = \boxed{e/2}$ .
- 11 CAVITY SIZE AND LOCATION WILL VARY WITH DIE SIZE AND LOCATION.
- 12 THERE MUST BE SOME TYPE OF A1 CORNER IDENTIFICATION ON TOP SURFACE OF THE PACKAGE. ID TYPE IS OPTIONAL AND MAY CONSIST OF CHAMFERS, NOTCHES, METALLIZED MARKINGS OR OTHER FEATURES.

- 13 LID MAY EXTEND TO PERIPHERY OF PACKAGE AND MAY CONSIST OF MOLDING COMPOUND, METAL, CERAMIC OR OTHER MATERIAL. LID MAY EXTEND ABOVE/BELOW PACKAGE BODY SURFACE OR MAY BE INCORPORATED WITHIN PACKAGE BODY, e.g. COMPLETE OVERBODY MOLD. FOR GLOB TOP AND FLIP CHIP CONFIGURATIONS, PARALLELISM (bbb) MUST BE INSURED ONLY ON THE SURFACE DIRECTLY ABOVE THE DIE AREA.
- 14 DIMENSION "b" IS MEASURED AT THE MAXIMUM SOLDER BALL DIAMETER, PARALLEL TO PRIMARY DATUM Z.
- 15 EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL.
- 16 THIS IS THE MINIMUM DISTANCE FROM LID EDGE TO THE CLOSEST SURFACE OF ANY SOLDER BALL OR COLUMN ON CAVITY DOWN CONFIGURATIONS.
- 17 X = H FOR APPLICATIONS UTILIZING HIGH MELT SOLDER BALLS, SEE TABLE 2.  
X = L FOR APPLICATIONS UTILIZING LOW MELT SOLDER BALLS, SEE TABLE 3.
- 18 SOLDERABLE SURFACE MAY BE DEFINED BY AN OPENING IN THE SOLDER RESIST LAYER (Type 1) OR BY THE SIZE OF A METALLIZED 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.
- 19 A4 IS DEFINED AS THE DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT ON THE PACKAGE LID FOR CAVITY DOWN CONFIGURATIONS.