



**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

DIE-SIZE BALL GRID ARRAY
FINE PITCH, THIN/VERY THIN/
EXTREMELY THIN PROFILE

PACKAGE DESIGNATOR
X-DSBGA

ISSUE
C

DATE
JUNE 2004

MO-211

SHEET
1 OF 7

TABLE 1: VARIATION CODING SUMMARY 

SYMBOL	Z _x				
	A _x	B _x	C _x	D _x	E _x
A (MAX)	1.20		1.00		0.50
e (BSC)	0.40	0.50	0.50	0.50	0.50
b (NOM)	0.17	0.17	0.17	0.30	0.17
NOTES	1,2				
REF	11-515		11.4-616		
ISSUE	A		B		

x = BODY/MATRIX SIZE VARIATION: A, B, C, ETC. (SEE TABLES 6 THROUGH 10)

TABLE 2: TOLERANCES OF FORM AND POSITION

SYMBOL	VARIATION				
	A _x	B _x	C _x	D _x	E _x
e	0.40 BSC	0.50 BSC	0.50 BSC	0.50 BSC	0.50 BSC
aaa	0.25	0.35	0.35	0.35	0.35
bbb	0.10	0.10	0.10	0.10	0.10
ccc	0.05	0.05	0.05	0.08	0.05
ddd	0.05	0.05	0.05	0.05	0.05
NOTES	1,2,14	1,2,14	1,2,14	1,2,14	1,2,14
REF	11-515	11-515	11.4-616	11.4-616	11.4-616
ISSUE	A	A	B	B	B

x = BODY/MATRIX SIZE VARIATION: A, B, C, ETC. (SEE TABLES 6 THROUGH 10)

TABLE 3: PROFILE DIMENSIONS - THIN

SYMBOL	VARIATION						NOTES
	A x			B x			
	MINIMUM	NOMINAL	MAXIMUM	MINIMUM	NOMINAL	MAXIMUM	
A	-	-	1.20	-	-	1.20	9
A1	0.10	-	0.15	0.10	-	0.15	
A2	-	-	1.00	-	-	1.00	
b	0.15	0.17	0.19	0.15	0.17	0.19	10
e	0.40 BASIC			0.50 BASIC			4
NOTES	1, 2, 14			1, 2, 14			
REF	11-515			11-515			
ISSUE	A			A			

x = BODY/MATRIX SIZE VARIATION: A, B, C, ETC. (SEE TABLES 6 THROUGH 10)

TABLE 4: PROFILE DIMENSIONS - VERY THIN

SYMBOL	VARIATION						NOTES
	C x			D x			
	MINIMUM	NOMINAL	MAXIMUM	MINIMUM	NOMINAL	MAXIMUM	
A	-	-	1.00	-	-	1.00	9
A1	0.10	-	0.15	0.15	-	0.35	
A2	-	-	0.85	-	-	0.65	
b	0.15	0.17	0.19	0.25	0.30	0.35	10
e	0.50 BASIC			0.50 BASIC			4
NOTES	1, 2, 14			1, 2, 14			
REF	11.4-616			11.4-616			
ISSUE	B			B			

x = BODY/MATRIX SIZE VARIATION: A, B, C, ETC. (SEE TABLES 6 THROUGH 10)

TABLE 5: PROFILE DIMENSIONS - EXTREMELY THIN

SYMBOL	VARIATION			NOTES
	E x			
	MINIMUM	NOMINAL	MAXIMUM	
A	-	-	0.50	9
A1	0.10	-	0.15	
A2	-	-	0.35	
b	0.15	0.17	0.19	10
e	0.50 BASIC			4
NOTES	1, 2, 14			
REF	11.4-616			
ISSUE	B			

x = BODY/MATRIX SIZE VARIATION: A, B, C, ETC. (SEE TABLES 6 THROUGH 10)

TABLE 6: VARIATIONS - THIN PROFILE

e = 0.40; b = 0.17 NOMINAL											
VARIATION	D	E	D1	E1	MD	ME	SD	SE	N	REF	ISSUE
AA	0.95	0.95	0.40	0.40	2	2	0.20	0.20	4	11-515	A
AB	1.35	0.95	0.80	0.40	3	2	0.00	0.20	6	11-515	A
AC	1.35	1.35	0.80	0.80	3	3	0.00	0.00	9	11-515	A
AD	1.75	1.75	1.20	1.20	4	4	0.20	0.20	16	11-515	A
AE	2.15	1.75	1.60	1.20	5	4	0.00	0.20	20	11-515	A
AF	2.15	2.15	1.60	1.60	5	5	0.00	0.00	25	11-515	A
AG	2.55	2.55	2.00	2.00	6	6	0.20	0.20	36	11-515	A
AH	1.75	1.35	1.20	0.80	4	3	0.20	0.00	12	4-631	C
AJ	2.55	2.15	2.00	1.60	6	5	0.20	0.00	30	4-631	C
NOTES					5	5	12	12	6, 13		
	1, 2, 14										

TABLE 7: VARIATIONS - THIN PROFILE

e = 0.50; b = 0.17 NOMINAL											
VARIATION	D	E	D1	E1	MD	ME	SD	SE	N	REF	ISSUE
BA	1.15	1.15	0.50	0.50	2	2	0.25	0.25	4	11-515	A
BB	1.65	1.15	1.00	0.50	3	2	0.00	0.25	6	11-515	A
BC	1.65	1.65	1.00	1.00	3	3	0.00	0.00	9	11-515	A
BD	2.15	2.15	1.50	1.50	4	4	0.25	0.25	16	11-515	A
BE	2.65	2.15	2.00	1.50	5	4	0.00	0.25	20	11-515	A
BF	2.65	2.65	2.00	2.00	5	5	0.00	0.00	25	11-515	A
BG	3.15	3.15	2.50	2.50	6	6	0.25	0.25	36	11-515	A
BH	2.15	1.65	1.50	1.00	4	3	0.25	0.00	12	4-631	C
BJ	3.15	2.65	2.50	2.00	6	5	0.25	0.00	30	4-631	C
NOTES					5	5	12	12	6,13		
	1, 2, 14										

TABLE 8: VARIATIONS - VERY THIN PROFILE

e = 0.50; b = 0.17 NOMINAL											
VARIATION	D	E	D1	E1	MD	ME	SD	SE	N	REF	ISSUE
CA	1.15	1.15	0.50	0.50	2	2	0.25	0.25	4	4-616	B
CB	1.65	1.15	1.00	0.50	3	2	0.00	0.25	6	4-616	B
CC	1.65	1.65	1.00	1.00	3	3	0.00	0.00	9	4-616	B
CD	2.15	2.15	1.50	1.50	4	4	0.25	0.25	16	4-616	B
CE	2.65	2.15	2.00	1.50	5	4	0.00	0.25	20	4-616	B
CF	2.65	2.65	2.00	2.00	5	5	0.00	0.00	25	4-616	B
CG	3.15	3.15	2.50	2.50	6	6	0.25	0.25	36	4-616	B
CH	2.15	1.65	1.50	1.00	4	3	0.25	0.00	12	4-631	C
CJ	3.15	2.65	2.50	2.00	6	5	0.25	0.00	30	4-631	C
NOTES					5	5	12	12	6,13		
	1, 2, 14										

TABLE 9: VARIATIONS - VERY THIN PROFILE

e = 0.50; b = 0.30 NOMINAL											
VARIATION	D	E	D1	E1	MD	ME	SD	SE	N	REF	ISSUE
DA	1.30	1.30	0.50	0.50	2	2	0.25	0.25	4	4-616	B
DB	1.80	1.30	1.00	0.50	3	2	0.00	0.25	6	4-616	B
DC	2.30	1.30	1.50	0.50	4	2	0.25	0.25	8	4-616	B
DD	1.80	1.80	1.00	1.00	3	3	0.00	0.25	9	4-616	B
DE	2.30	1.80	1.50	1.00	4	3	0.25	0.00	12	4-616	B
DF	2.30	2.30	1.50	1.50	4	4	0.25	0.25	16	4-616	B
DG	2.80	2.30	2.00	1.50	5	4	0.00	0.25	20	4-616	B
DH	2.80	2.80	2.00	2.00	5	5	0.00	0.00	25	4-616	B
DJ	3.30	2.80	2.50	2.00	6	5	0.25	0.00	30	4-616	B
DK	3.30	3.30	2.50	2.50	6	6	0.25	0.25	36	4-616	B
NOTES					5	5	12	12	6,13		
	1, 2, 14										

TABLE 10: VARIATIONS - EXTREMELY THIN PROFILE

e = 0.50; b = 0.17 NOMINAL											
VARIATION	D	E	D1	E1	MD	ME	SD	SE	N	REF	ISSUE
EA	1.40	0.90	1.00	0.50	3	2	0.00	0.25	6	4-616	B
EB	1.90	0.90	1.50	0.50	4	2	0.25	0.25	8	4-616	B
EC	0.90	0.90	0.50	0.50	2	2	0.25	0.25	4	4-631	C
ED	1.40	1.40	1.00	1.00	3	3	0.00	0.00	9	4-631	C
EE	1.90	1.40	1.50	1.00	4	4	0.25	0.00	12	4-631	C
NOTES					5	5	12	12	6,13		
	1, 2, 14										

NOTES

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.

2. DIMENSIONS ARE IN MILLIMETERS.

3. CONTACT BALL DESIGNATION PER JESD 95-1, SPP-010.

4. SYMBOL "e" REPRESENTS THE SOLDER BALL GRID PITCH.

5. SYMBOL "MD" IS THE BALL MATRIX SIZE IN THE "D" DIRECTION.
SYMBOL "ME" IS THE BALL MATRIX SIZE IN THE "E" DIRECTION.

6. SYMBOL "N" REPRESENTS THE MAXIMUM ALLOWABLE NUMBER OF
CONTACT BALLS FOR MATRIX SIZE.

7. 6 X 6 AND 6 X 4 MATRIX PATTERNS ARE SHOWN FOR ILLUSTRATION ONLY.

8. PRIMARY DATUM C AND SEATING PLANE ARE DEFINED BY THE SPHERICAL
CROWNS OF THE CONTACT BALLS.

9. DIMENSION "A" INCLUDES STANDOFF HEIGHT "A1", PACKAGE BODY THICKNESS,
BUT DOES NOT INCLUDE ATTACHED FEATURES, e.g. EXTERNAL HEAT SINK OR
CHIP CAPACITOR. AN INTEGRAL HEAT SLUG IS NOT CONSIDERED AN ATTACHED
FEATURE.

10. DIMENSION "b" IS MEASURED AT THE MAXIMUM BALL DIAMETER, PARALLEL TO
PRIMARY DATUM C.

11. BALL A1 CORNER MUST BE IDENTIFIED ON THE TOP SURFACE BY CHAMFER,
INK MARK, METALLIZED MARKING, INDENTATION, OR OTHER MEANS ON THE
PACKAGE BODY, LID OR INTEGRAL HEAT SLUG.

12. DIMENSIONS "SD" AND "SE" ARE MEASURED WITH RESPECT TO DATUMS A AND B
AND DEFINE THE POSITION OF THE CENTER CONTACT BALL IN THE OUTER ROW.
WHEN THERE IS AN ODD NUMBER OF CONTACT BALLS IN THE OUTER ROW
PARALLEL TO THE D OR E DIMENSION RESPECTIVELY, "SD" OR "SE" = 0.00.
WHEN THERE IS AN EVEN NUMBER OF SOLDER BALLS IN THE OUTER ROW, "SD"
OR "SE" = $e/2$.

13. SOLDER BALL ARRAY MAY BE DEPOPULATED IN ANY PATTERN. DEPOPULATING IS
THE OMISSION OF BALLS FROM A FULL MATRIX.

14. VARIATION CODING FORM IS Zx PER TABLE 1, WHERE:
Z = A OR B FOR THIN PROFILE HEIGHT OF 1.20 MAX, C OR D FOR VERY
THIN PROFILE HEIGHT OF 1.00 MAX, AND E FOR EXTREMELY THIN
PROFILE HEIGHT OF 0.50 MAX.
x = A, B, C, ETC. CORRESPONDING TO BODY/MATRIX SIZE VARIATION
LISTED IN TABLES 6 THROUGH 10.