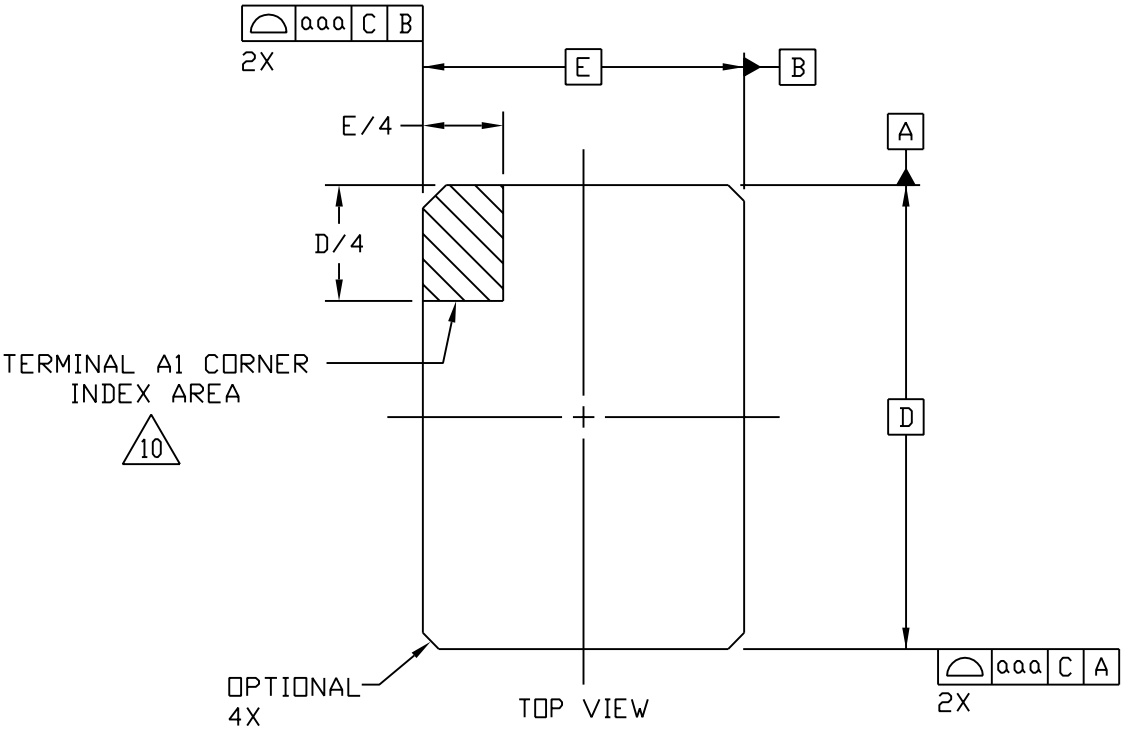
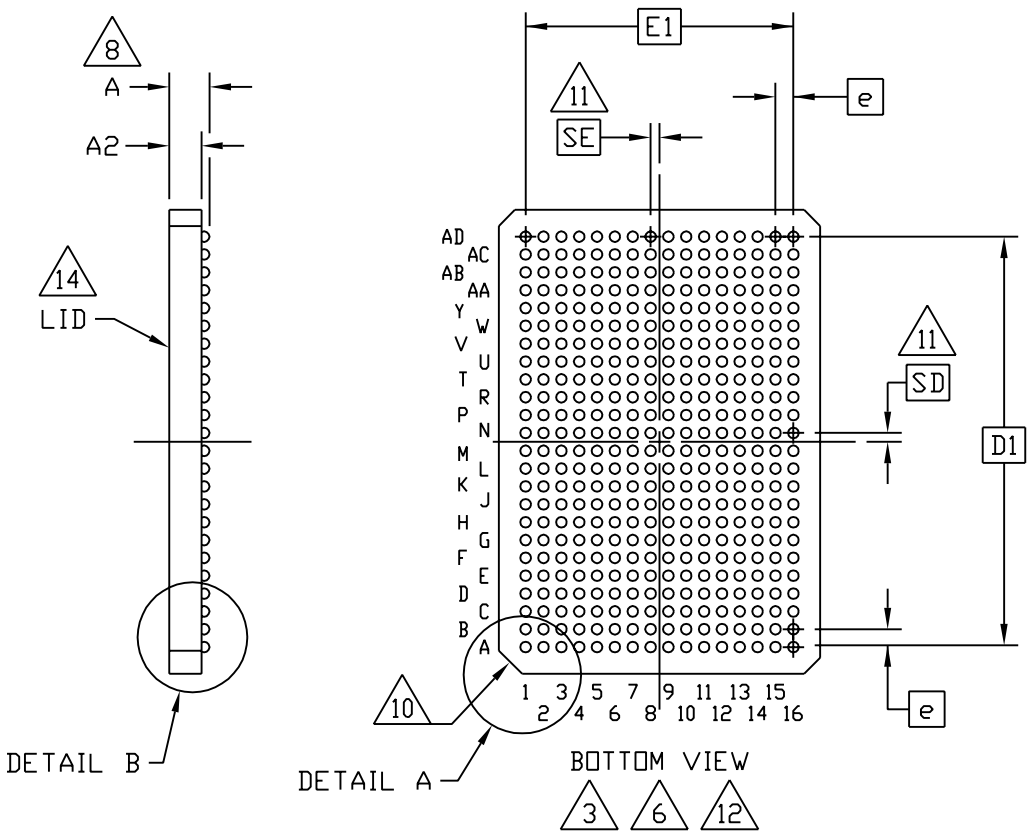
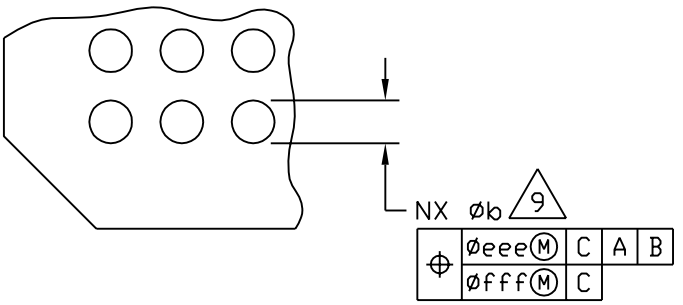
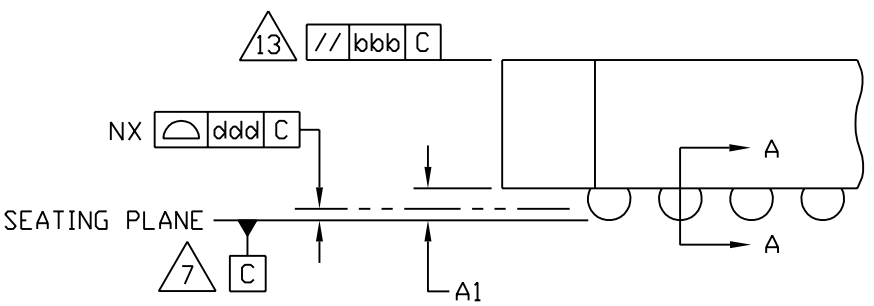




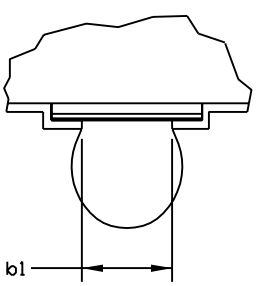
JEDEC SOLID STATE PRODUCT OUTLINE	THIS ***REGISTERED OUTLINE*** HAS BEEN PREPARED BY THE JEDEC JC-11 COMMITTEE AND REFLECTS A PRODUCT WITH ANTICIPATED USAGE IN THE ELECTRONICS INDUSTRY; CHANGES ARE LIKELY TO OCCUR.					
TITLE: THIN, FINE PITCH BALL GRID ARRAY FAMILY, 0.50 MM PITCH (SQ & RECT.)		PACKAGE DESIGNATOR: TF(R)-XBGA	ISSUE: D	DATE: MAY 2006	MO-195	SHEET: 1 OF 6



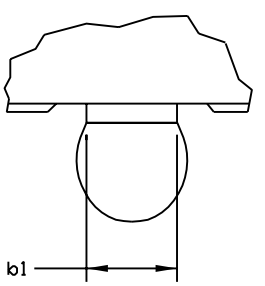
DETAIL A



DETAIL B



TYPE 1



TYPE 2

SECTION A-A 15

JEDEC SOLID STATE PRODUCT OUTLINE	TITLE THIN, FINE PITCH BALL GRID ARRAY FAMILY, 0.50 MM PITCH	ISSUE D	DATE MAY 2006	MO-195	SHEET 2 OF 6

TABLE 1: COMMON DIMENSIONS

Dimension		Minimum	Nominal	Maximum	NOTES
A		-	-	1.20	
A1		0.15	-	-	
A2		-	-	1.00	
b		0.25	0.30	0.35	
b1	TYPE1	0.20	-	-	15
	TYPE2	0.20	-	-	15
e		0.50 Basic			
NOTES		1, 2, 8, 9			
REF		11-650			
ISSUE		C			

TABLE 2: TOLERANCES OF FORM AND POSITION.

Symbol	Tolerance
aaa	0.10
bbb	0.10
ddd	0.08
eee	0.15
fff	0.05
NOTES	1, 2
REF	11-504
ISSUE	B

TABLE 3: SQUARE VARIATIONS

	ODD MATRIX (SD/SE=0.00)				EVEN MATRIX (SD/SE=0.25)			
D, E	D1, E1	MD, ME	N	VARIATION	D1, E1	MD-1, ME-1	N	VARIATION
2.00	1.00	3	9	AV	-	-	-	-
2.50	-	-	-	-	1.50	4	16	BV
3.00	2.00	5	25	AW	-	-	-	-
3.50	-	-	-	-	2.50	6	36	BW
4.00	3.00	7	49	AA	2.50	6	36	BA
4.50	-	-	-	-	3.50	8	64	BX
5.00	4.00	9	81	AB	3.50	8	64	BB
5.50	-	-	-	-	4.50	10	100	BY
6.00	5.00	11	121	AC	4.50	10	100	BC
6.50	-	-	-	-	5.50	12	144	BZ
7.00	6.00	13	169	AD	5.50	12	144	BD
7.50	-	-	-	-	6.50	14	196	BAA
8.00	7.00	15	225	AE	6.50	14	196	BE
8.50	-	-	-	-	7.50	16	256	BAB
9.00	8.00	17	289	AF	7.50	16	256	BF
9.50	-	-	-	-	8.50	18	324	BAC
10.00	9.00	19	361	AG	8.50	18	324	BG
11.00	10.00	21	441	AH	9.50	20	400	BH
12.00	11.00	23	529	AJ	10.50	22	484	BJ
13.00	12.00	25	625	AK	11.50	24	576	BK
14.00	13.00	27	729	AL	12.50	26	676	BL
15.00	14.00	29	841	AM	13.50	28	784	BM
16.00	15.00	31	961	AN	14.50	30	900	BN
17.00	16.00	33	1089	AP	15.50	32	1024	BP
18.00	17.00	35	1225	AQ	16.50	34	1156	BQ
19.00	18.00	37	1369	AR	17.50	36	1296	BR
20.00	19.00	39	1521	AT	18.50	38	1444	BT
21.00	20.00	41	1681	AU	19.50	40	1600	BU
NOTES		4	5			4	5	
REF	ITEM 4-439, ITEM 11-704				ITEM 4-439, ITEM 11-704			
ISSUE								

TABLE 4: RECTANGULAR VARIATIONS

EVEN MATRIX (SD/SE=0.25)							
VARIATION	D BSC	E BSC	D1 BSC	E1 BSC	MD-1	ME-1	N
CA	10.00	7.00	8.50	5.50	18	12	216
CB	13.00	9.00	11.50	7.50	24	16	384
NOTES					4	4	5
REF	11-504						
ISSUE	B						

ODD MATRIX (SD/SE=0)							
VARIATION	D BSC	E BSC	D1 BSC	E1 BSC	MD	ME	N
DA	10.00	7.00	9.00	6.00	19	13	247
DB	13.00	9.00	12.00	8.00	25	17	425
NOTES					4	4	5
REF	11-504						
ISSUE	B						

NOTES:

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

2. DIMENSIONS ARE IN MILLIMETERS.

3. CONTACT BALL DESIGNATION PER JEDEC PUBLICATION 95, SECTION 3, SPP-010.

4. 'MD/ME' REPRESENTS THE MAXIMUM CONTACT BALL MATRIX SIZE.

5. 'N' REPRESENTS THE MAXIMUM ALLOWABLE NUMBER OF CONTACT BALLS FOR MATRIX SIZE.

6. 16 X 24 PERIPHERAL MATRIX PATTERN (VARIATION CB) IS SHOWN FOR ILLUSTRATION ONLY.

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

8. DIMENSION 'A' INCLUDES STANDOFF HEIGHT 'A1', PACKAGE BODY THICKNESS AND LID HEIGHT, BUT DOES NOT INCLUDE ATTACHED FEATURES, E.G., EXTERNAL HEAT SINK OR CHIP CAPACITORS. AN INTEGRAL HEAT SLUG IS NOT CONSIDERED AN ATTACHED FEATURE.

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

10. THE TERMINAL A1 CORNER MUST BE IDENTIFIED ON THE TOP SURFACE OF THE PACKAGE BY USING A CORNER CHAMFER, INK OR METALIZED MARKINGS, INDENTATION, OR OTHER FEATURE OF PACKAGE BODY, LID, OR INTEGRAL HEAT SLUG. IF THE OPTIONAL CHAMFERED CORNER IS USED, THE MAXIMUM NUMBER OF SOLDER BALLS 'N' MAY BE REDUCED. EXACT SHAPE OF EACH CORNER IS OPTIONAL, BUT TERMINAL A1 CORNER MUST BE UNIQUE.

11. BASIC 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 OF A FULL MATRIX, 'SD' AND 'SE'=0; WHEN THERE IS AN EVEN NUMBER OF CONTACT BALLS IN THE OUTER ROW, THE VALUE OF 'SD' AND 'SE' = $e/2$.

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

13. FOR GLOB TOP AND FLIP CHIP CONFIGURATIONS, PARALLELISM (bbb) MUST BE ENSURED ONLY ON THE SURFACE DIRECTLY ABOVE THE DIE AREA. THE PARALLELISM SPECIFICATION WILL NOT APPLY TO THE FILLET OR SLOPED REGION OF THE ENCAPSULANT.

14. LID MAY EXTEND TO PERIPHERY OF PACKAGE AND MAY CONSIST OF MOLDING COMPOUND , EPOXY, METAL, CERAMIC OR OTHER MATERIAL. LID MAY EXTEND ABOVE OR BELOW THE PACKAGE BODY SURFACE OR MAY BE INCORPORATED WITHIN THE PACKAGE BODY, E.G., COMPLETE BODY OVERMOLD.

15. THE 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.

Change Record

If the changes 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	Date	Item
A	April 1997	11.11-439

Revision History:

Issue: D	Date: May 2006	Item: 11.11-704
Location	Change from:	Change to:
Page 1, Top view	Chamfer - Optional 4X	10
Page 1, Bottom view	Bottom view note 10	Remove
Page 3, Table 3	Square variations	Add
	Odd matrix	AV, AW
	Even matrix	BV, BW, BX, BY, BZ, BAA, BAB & BAC
REF	Add item 11-704	Add item 11-704