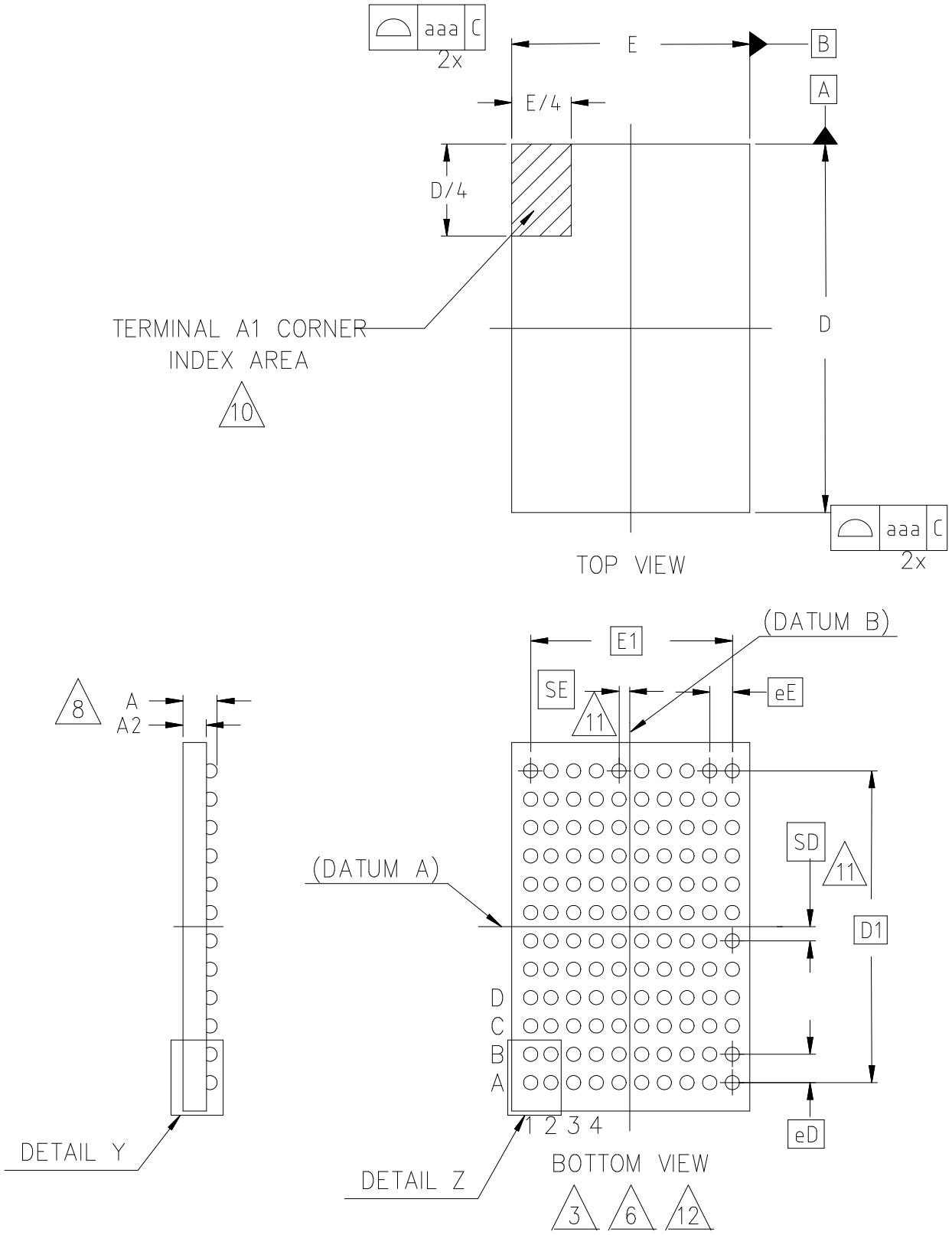
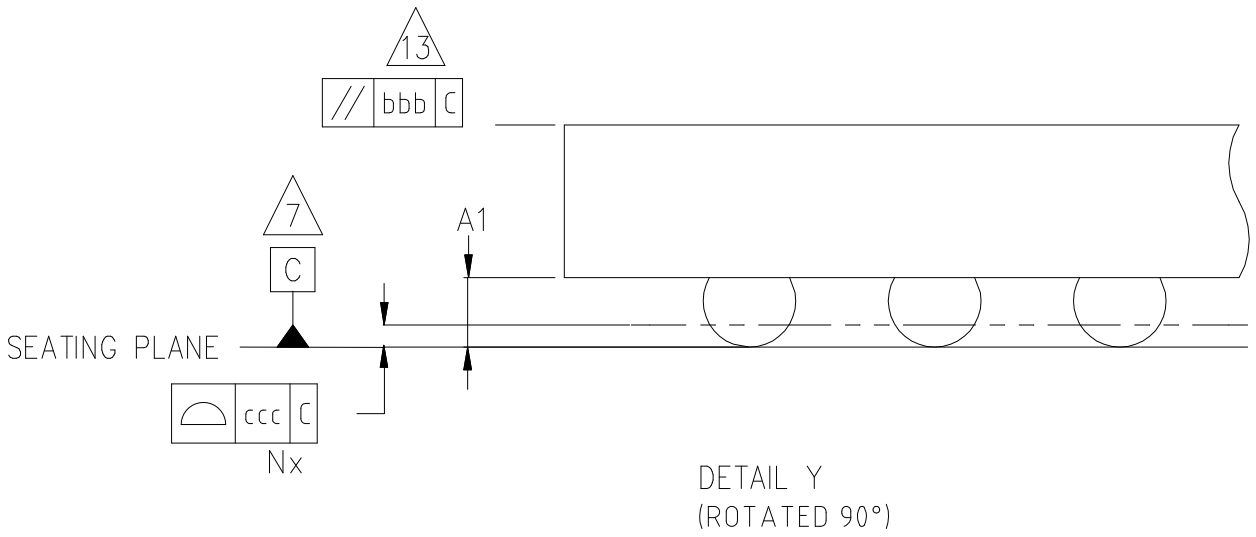
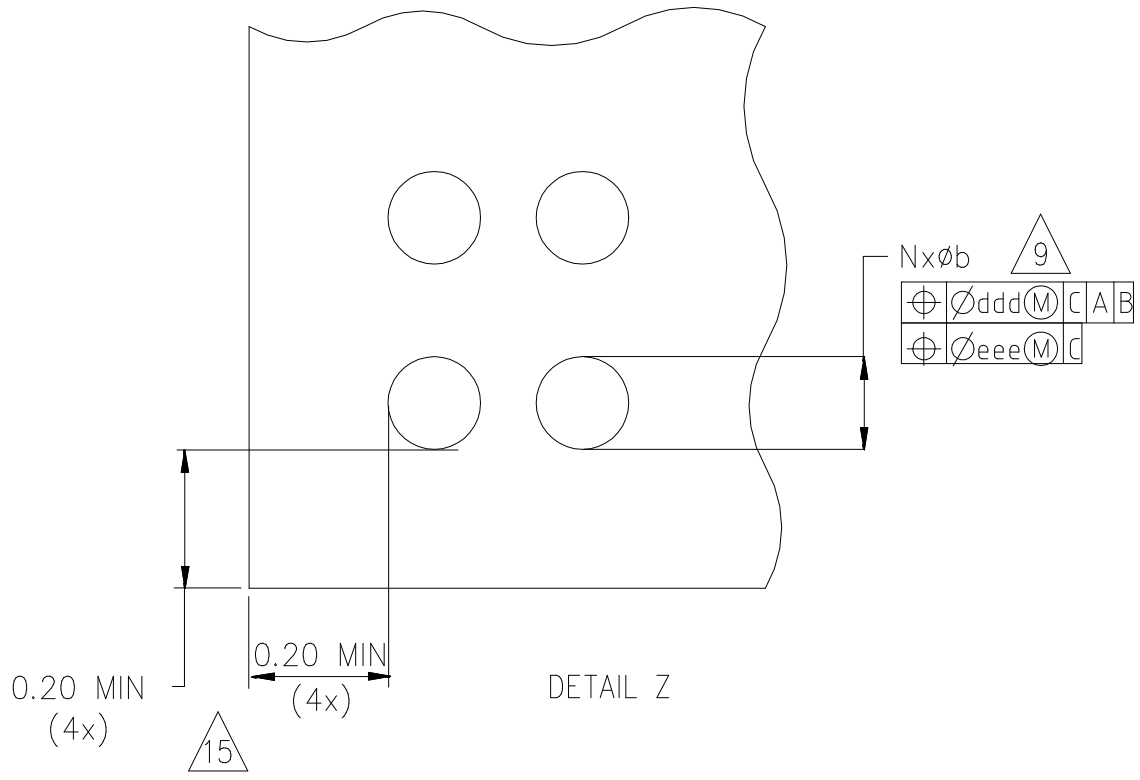


JEDEC SOLID STATE PRODUCT OUTLINE	THIS **REGISTERED OUTLINE** HAS BEEN PREPARED BY THE JEDEC JC-11 COMMITTEE AND REFLECTS A PRODUCT WITH ANTICIPATED USAGE IN THE ELECTRONICS INDUSTRY; CHANGES ARE LIKELY TO OCCUR.

TITLE: RECTANGULAR DIE-SIZE, FINE DUAL PITCH BALL GRID ARRAY FAMILY	PACKAGE DESIGNATOR: TFR-XBGA-N	ISSUE: C	DATE: FEB 2003	MO-233	SHEET: 1 OF 5



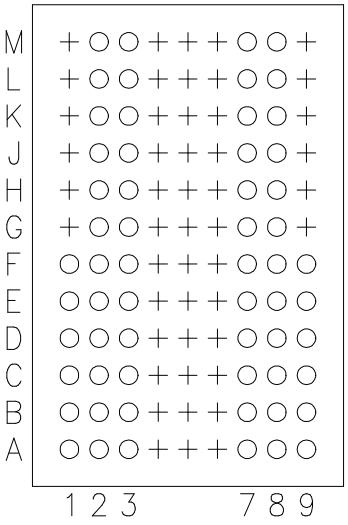


JEDEC SOLID STATE PRODUCT OUTLINE	TITLE: RECTANGULAR DIE–SIZE, FINE DUAL PITCH BALL GRID ARRAY FAMILY	ISSUE: C	DATE: FEB 2003	MO–233	SHEET: 2 OF 5

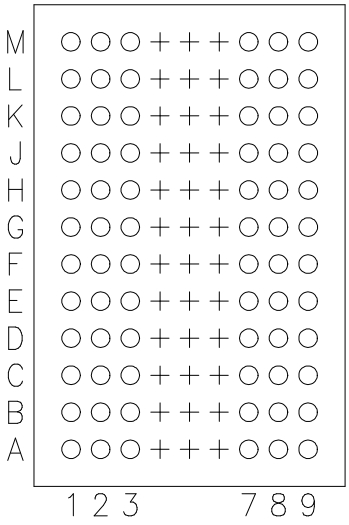
SOLDER BALL PATTERN EXAMPLES (BOTTOM VIEWS)

3 12

AA



AB



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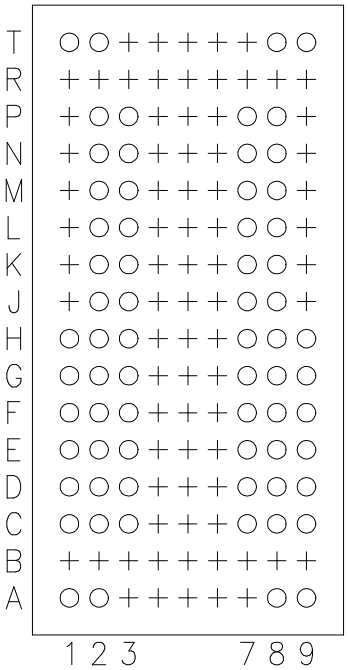
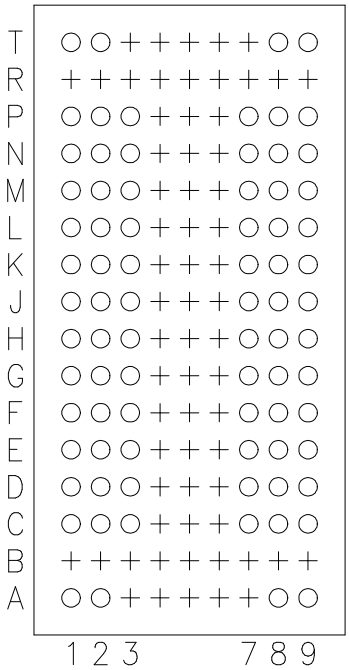


AD



+ = DEPOPULATED BALL POSITION

JEDEC SOLID STATE PRODUCT OUTLINE	TITLE: RECTANGULAR DIE-SIZE, FINE DUAL PITCH BALL GRID ARRAY FAMILY	ISSUE: C	DATE: FEB 2003	MO-233	SHEET: 3 OF 5

SYMBOL	COMMON DIMENSIONS				SYMBOL	TOLERANCES OF FORM and POSITION	
	MIN	NOM	MAX	NOTES			NOTES
A	---	---	1.20	8	aaa	0.20	
A1	0.25	---	---		bbb	0.10	13
A2	0.60	---	---		ccc	0.10	
b	0.40	0.45	0.50	9	ddd	0.15	
NOTES	1, 2				eee	0.08	
REF	11.04-617				NOTES	1, 2	
ISSUE	B				REF	11.04-617	
					ISSUE	B	

VARIATIONS

VARIATION	D	E	D1	E1	MD	ME	SD	SE	eD	eE	n	REF	ISSUE
	MAX	MAX	BSC	BSC			BSC	BSC	BSC	BSC			
AA	18.00	10.00	11.00	6.40	12	9	0.50	0	1.00	0.80	60	11.04-611	A
AB	18.00	10.00	11.00	6.40	12	9	0.50	0	1.00	0.80	72	11.04-611	A
AC	18.00	10.00	15.00	6.40	16	9	0.50	0	1.00	0.80	68	11.04-617	B
AD	18.00	10.00	15.00	6.40	16	9	0.50	0	1.00	0.80	80	11.04-617	B
NOTES	14, 16	14			4	4	11	11			5		
NOTES	1, 2												

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M–1994.
2. DIMENSIONS ARE IN MILLIMETERS.
3. SOLDER BALL POSITION DESIGNATION PER JEDEC PUBLICATION 95, SECTION 4.3, SPP–010.
4. "MD" AND "ME" REPRESENT THE BALL MATRIX SIZE IN THE "D" AND "E" DIRECTIONS RESPECTIVELY.
5. "n" IS THE NUMBER OF BALLS FOR A SPECIFIED MATRIX SIZE "MD x ME".
6. 12 X 10 MATRIX PATTERN IS SHOWN FOR ILLUSTRATION ONLY.
7. PRIMARY DATUM C (SEATING PLANE) IS DEFINED BY THE SPHERICAL CROWNS OF THE SOLDER BALLS.
8. DIMENSION "A" INCLUDES STANDOFF HEIGHT "A1" AND PACKAGE BODY THICKNESS "A2". BUT DOES NOT INCLUDE ATTACHED FEATURES, E.G., EXTERNAL HEAT SINK OR CHIP CAPACITOR. AN INTEGRAL HEATSLUG 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 INK OR METALIZED MARKINGS, INDENTATIONS, OR OTHER FEATURES. THE EXACT SHAPE OF EACH CORNER IS OPTIONAL.
SOME ORIENTATION FEATURE ON THE BALL ATTACH SIDE IS RECOMMENDED.
11. DIMENSIONS SD AND SE ARE MEASURED WITH RESPECT TO DATUMS A AND B AND DEFINE THE POSITION OF THE CENTER BALL IN THE OUTER ROW FOR A FULLY POPULATED MD x ME MATRIX. WHERE THERE IS AN ODD NUMBER OF BALLS IN THE OUTER ROW SD OR SE = 0 BSC; WHEN THERE IS AN EVEN NUMBER OF CONTACT BALLS IN THE OUTER ROW, THE VALUE OF SD OR SE = e/2 BSC.
12. SOLDER BALL ARRAY MAY BE DEPOPULATED IN ANY PATTERN. DEPOPULATION IS THE OMISSION OF BALLS FROM A FULL MATRIX DEFINED BY MD AND ME.
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 ANY FILLET OR SLOPED REGION OF THE ENCAPSULANT.
14. MAXMUM BODY SIZE ("D" AND "E") ARE DERIVED FROM ACTUAL BODY SIZES ROUNDED TO THE NEXT HEIGHT 0.50 MM INCREMENT (X.00 OR X.50). ACTUAL VALUES FOR "D" AND "E" MUST BE OBTAINED FROM PACKAGE PRODUCER.
15. THIS IS THE CONTROLLING DIMENSION
16. VARIATIONS "AC" AND "AD" INCLUDE SUPPORT BALLS AND ARE OPTIONAL FOR PACKAGE SIZE D LARGER THAN 17MM.