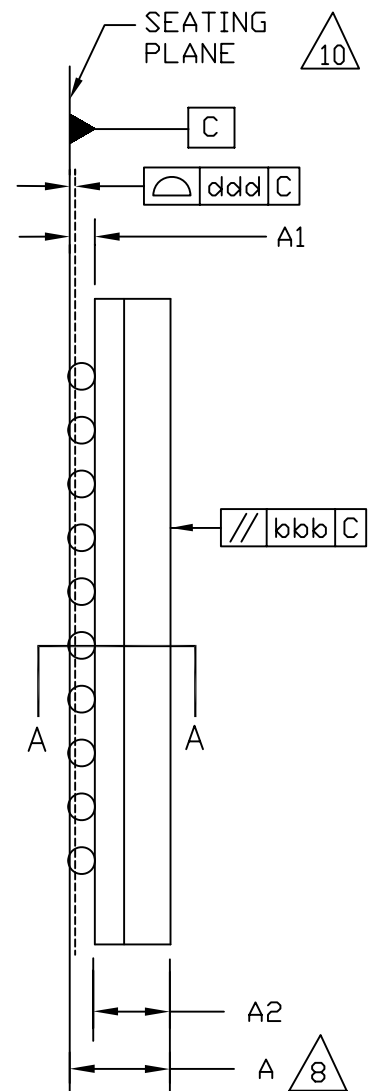
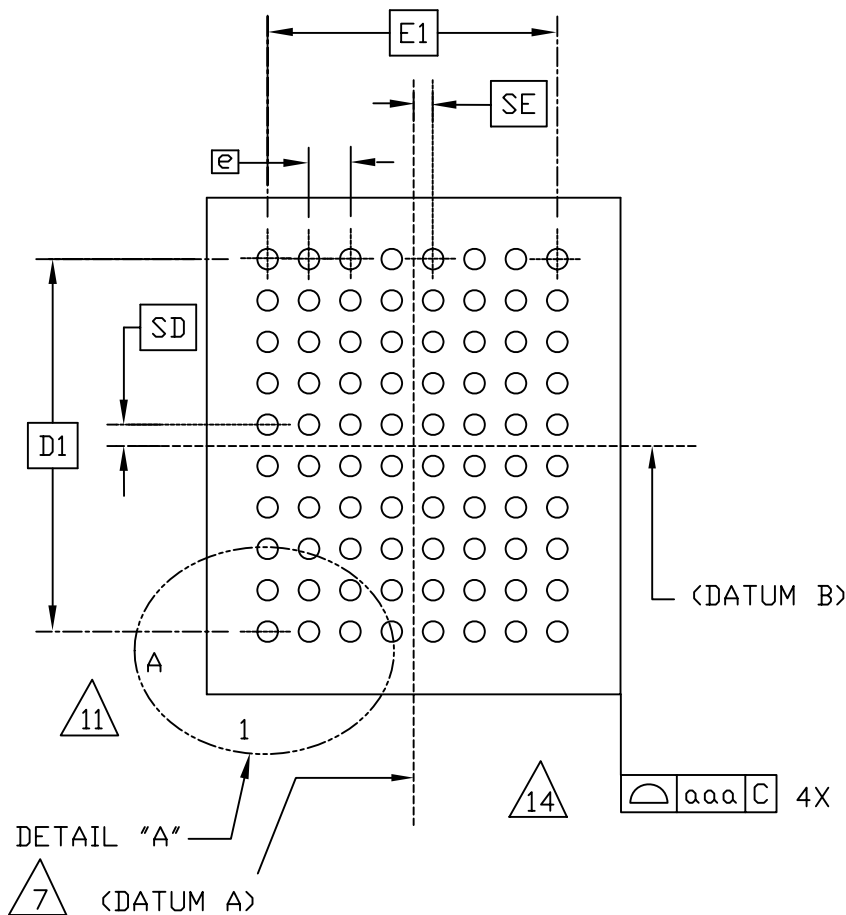


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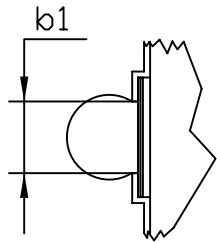
JEDEC
SOLID STATE
PRODUCT OUTLINE

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.

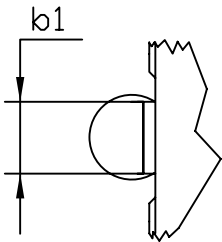
TITLE	PACKAGE DESIGNATOR	ISSUE	DATE	ITEM	SHEET
LOW PROFILE RECTANGULAR BALL GRID ARRAY FAMILY	LR-PBGA	B	09/05	MD-234	1 OF 5

SECTION A-A

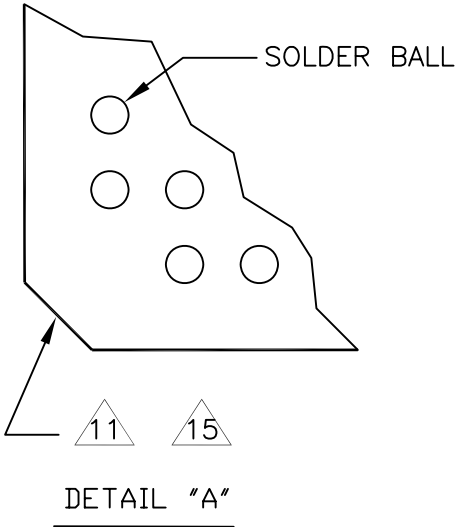
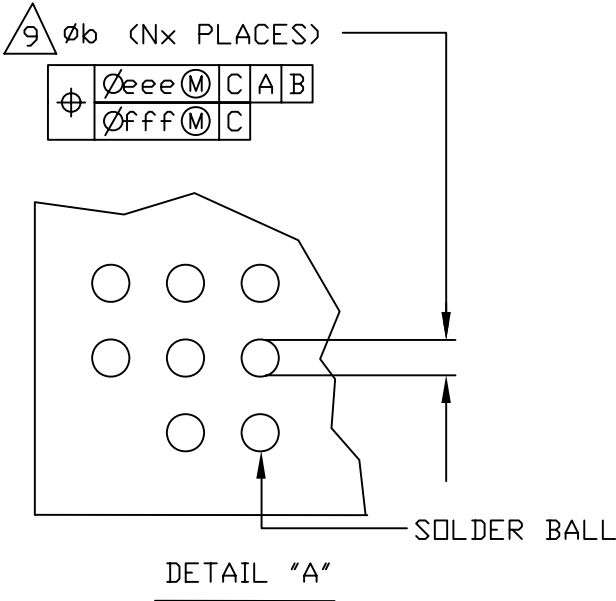
Type 1 SMD
(Solder Mask Defined)



Type 2, NSMD
(Not Solder Mask Defined)



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CORNER A1
OPTIONAL CONFIGURATION

JEDEC SOLID STATE PRODUCT OUTLINE	TITLE LOW PROFILE RECTANGULAR BALL GRID ARRAY FAMILY	ISSUE B	DATE 09/05	ITEM MD-234	SHEET 2 OF 5
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TABLE1: COMMON DIMENSIONS

VARIATION	Ax			Bx			
SYMBOL	MIN	NOM	MAX	MIN	NOM	MAX	NOTES
A	—	—	1.70	—	—	1.70	
A1	0.25	—	—	0.30	—	—	
A2	0.25	—	1.10	0.25	—	1.10	
b	0.45	0.50	0.55	0.50	0.60	0.70	9
b1	0.40	—	—	0.45	—	—	16
e	1.00 BSC			1.00 BSC			3
Notes:	1, 6			1, 6			
Ref							
Issue							

TABLE 2: TOLERANCES OF FORM AND POSITION

SYMBOL		NOTES
aaa	0.20	14
bbb	0.25	
ccc	0.35	
ddd	0.15	
eee	0.25	
fff	0.10	
Notes:	1, 6	
Ref	11–626	
Issue	A	

TABLE 3: RECTANGULAR VARIATIONS – 1.00 PITCH

VARIATION										
	D	E	D1	E1	SD/SE	MD	ME	N	REF	ISSUE
AA	12.00	10.00	9.00	7.00	0.50	10	8	80	11–626	A
AB	16.00	12.00	14.00	10.00	0	15	11	165	11–626	A
AC	17.00	13.00	15.00	11.00	0.50	16	12	192	11–717	B
BA	17.00	13.00	15.00	11.00	0.50	16	12	192	11–717	B
Notes:					12	4	4	5,13		
	1, 6									

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994
2. SOLDER BALL POSITION DESIGNATION PER JEP95, SECTION 3.0, SPP-010
3. "e" REPRESENTS THE SOLDER BALL GRID PITCH.
4. SYMBOL 'MD' IS THE BALL MATRIX SIZE IN THE 'D' DIRECTION, 'ME' IS THE BALL MATRIX SIZE IN THE 'E' DIRECTION.
5. N IS THE MAXIMUM ALLOWABLE NUMBER OF SOLDER BALLS.
6. ALL DIMENSIONS ARE IN MILLIMETERS.

7. 8 X 10 MATRIX PATTERN (VARIATION AA) IS SHOWN FOR ILLUSTRATION ONLY.
8. THIS DIMENSION INCLUDES STAND-OFF HEIGHT "A1", PACKAGE BODY THICKNESS AND LID HEIGHT, BUT DOES NOT INCLUDE ATTACHED FEATURES, e.g., EXTERNAL HEATSINK OR CHIP CAPACITORS. 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 AND SEATING PLANE ARE DEFINED BY THE SPHERICAL CROWNS OF THE SOLDER BALLS.
11. A1 CORNER MUST BE IDENTIFIED BY CHAMFER, INK MARK, METALIZED MARKINGS, INDENTATION OR OTHER FEATURE OF PACKAGE BODY, LID OR INTEGRAL HEATSLUG, ON THE TOP SURFACE OF THE PACKAGE. IF THE OPTIONAL CHAMFERED CORNER IS USED, THE MAXIMUM NUMBER OF SOLDER BALLS N MAY BE REDUCED.
12. $\overline{SD/SE}$ ARE MEASURED WITH RESPECT TO DATUM A AND DATUM B AND DEFINE THE POSITION OF THE CENTER SOLDER BALL IN THE OUTER ROW. WHEN THERE IS AN ODD NUMBER OF SOLDER BALLS IN THE OUTER ROW $\overline{SD/SE} = 0.000$; WHEN THERE IS AN EVEN NUMBER OF SOLDER BALLS IN THE OUTER ROW, $\overline{SD/SE} = \frac{e}{2}$.
13. SOLDER BALL DEPOPULATION IS ALLOWED. DEPOPULATION IS THE OMISSION OF BALLS FROM A FULL MATRIX.
14. BILATERAL TOLERANCE ZONE IS APPLIED TO EACH SIDE OF THE PACKAGE BODY.
15. EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL
16. THE SOLDERABLE SURFACE MAY BE DEFINED BY AN OPENING IN THE SOLDER RESIST LAYER (Type 1 "SMD") OR BY THE SIZE OF A METALIZED PAD (Type 2 "NSMD"). IT MAY BE ELLIPTICAL PROVIDED THE RATIO OF THE 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.

PATENT CLAIMS:

17. NATIONAL SEMICONDUCTOR HAS STATED THAT U.S. PATENT NUMBERS 4688152, 4778641 AND 4868349 MAY RELATE TO A CERTAIN IMPLEMENTATION OF THIS PACKAGE OUTLINE. CITIZEN WATCH COMPANY HAS STATED THAT U.S. PATENT NUMBERS 4822550 AND 4935581 MAY RELATE TO A CERTAIN IMPLEMENTATION OF THIS PACKAGE OUTLINE.

JEDEC SOLID STATE PRODUCT OUTLINE	TITLE LOW PROFILE RECTANGULAR BALL GRID ARRAY FAMILY	ISSUE B	DATE 09/05	ITEM MQ-234	SHEET 4 OF 5
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Change Record

If the change 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:
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Revision History

Issue: B	Date: SEP05	Item: 11.11-717
Location	Changed from:	Changed to:
Page 3, Table 1	No variation options	Variation options Ax, Bx
Page 3, Table 3	Variations AA, AB	Add variations AC, BA
Page 4, Notes	Note 2: JESD 95-1	Note 2: JEP95, Section 3.0
Page 1, Designator	R-LBGA-B	LR-PBGA

Issue:	Date:	Item:
Location	Changed from:	Changed to:

Issue:	Date:	Item:
Location	Changed from:	Changed to:

JEDEC SOLID STATE PRODUCT OUTLINE	TITLE LOW PROFILE RECTANGULAR BALL GRID ARRAY FAMILY	ISSUE B	DATE 09/05	ITEM MD-234	SHEET 5 OF 5
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