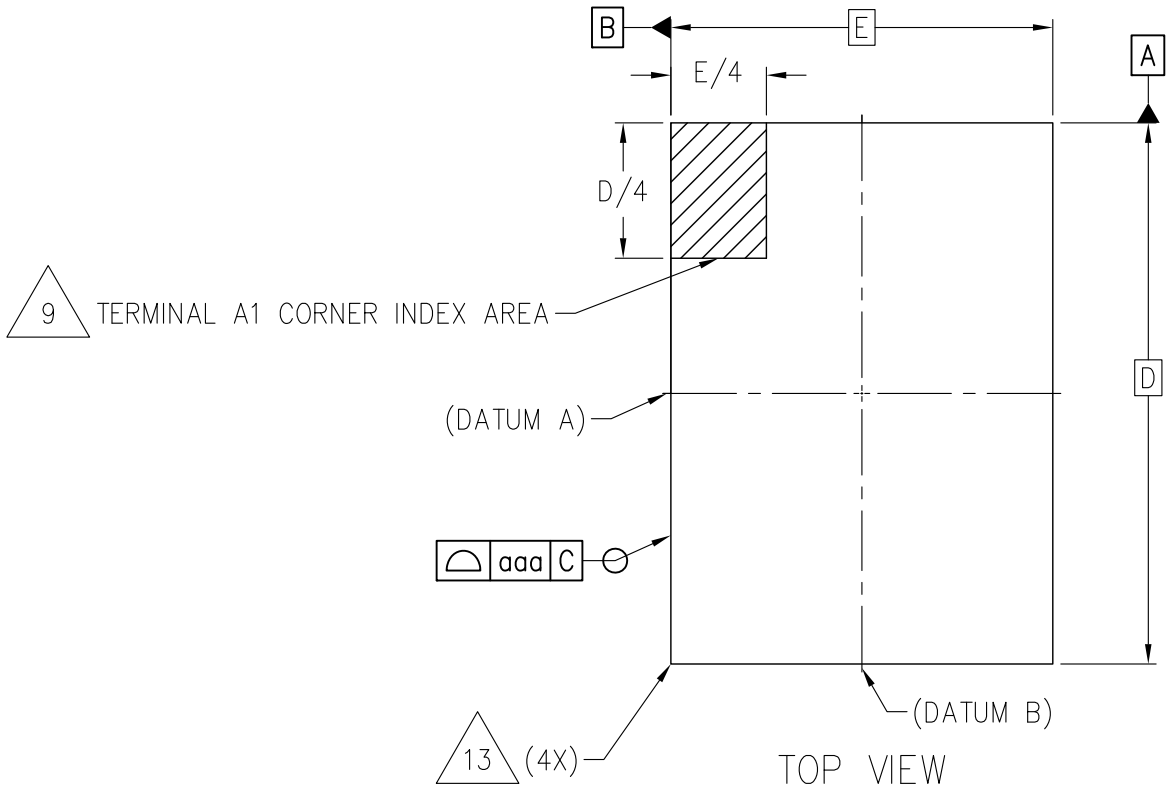
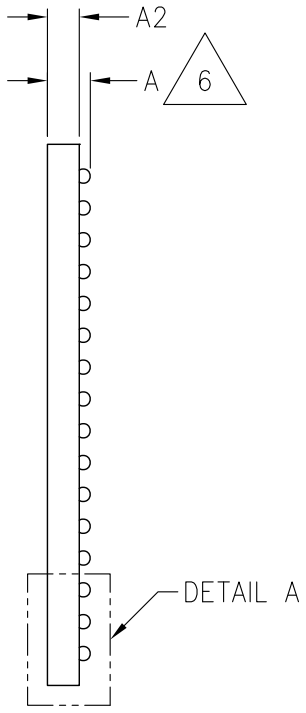
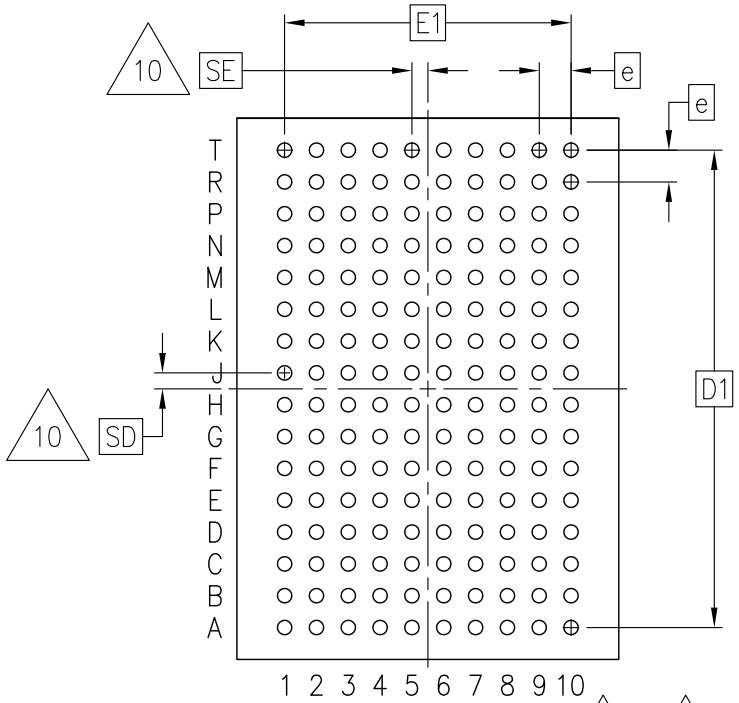


TOP VIEW

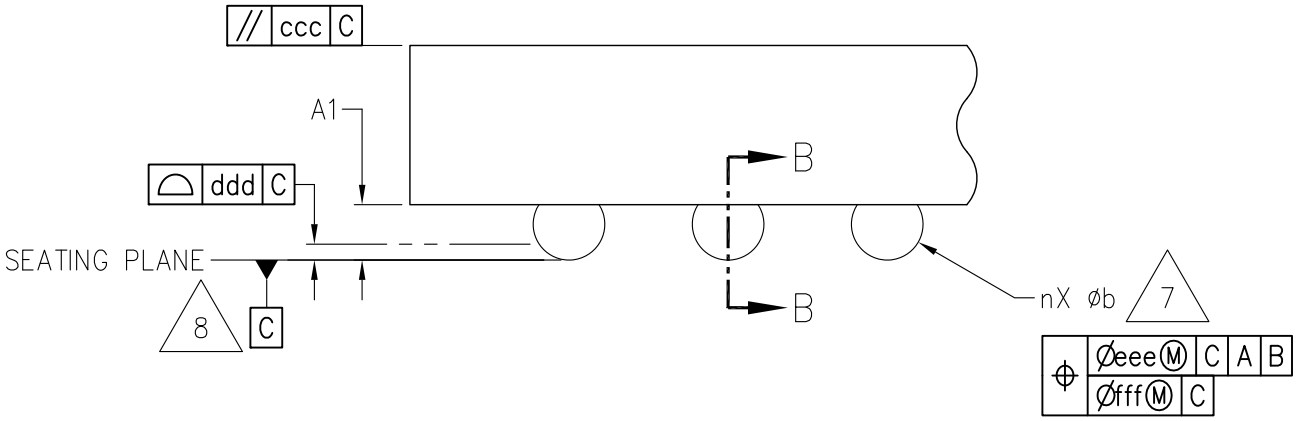


SIDE VIEW



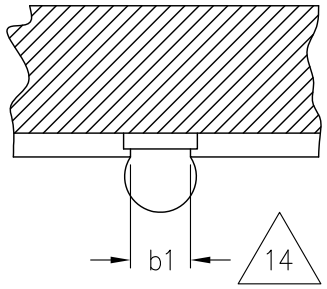
BOTTOM VIEW 2 5

JEDEC SOLID STATE PRODUCT OUTLINE Copyright © 2013 JEDEC	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 BALL GRID ARRAY FAMILY, RECTANGULAR, 1.00 mm PITCH	PACKAGE DESIGNATOR (V, T, L) R-PBGA	NUMBER MO-304	ISSUE D	DATE JUL 2013	SHEET 1 OF 11	

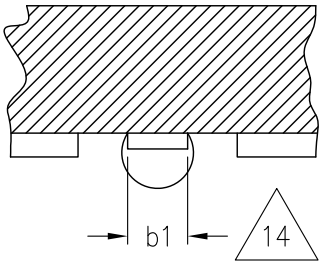


DETAIL A
(ROTATED 90° CW)

TYPE 1 – SMD
(SOLDER MASK DEFINED)



TYPE 2 – NSMD
(NON SOLDER MASK DEFINED)



SECTION B–B

TABLE 1

COMMON DIMENSIONS									
SYMBOL	P = PACKAGE PROFILE HEIGHT								
	V: VERY THIN PROFILE			T: THIN PROFILE			L: LOW PROFILE		
	MIN	NOM	MAX	MIN	NOM	MAX	MIN	NOM	MAX
A	>0.80	–	1.00	>1.00	–	1.20	>1.20	–	1.70
A2	–	–	0.75	–	–	0.95	–	–	1.15
e	1.00 BASIC								
NOTES	1, 2, 6								
REF	11–828, 11–848, 11–872								
ISSUE	C								

TABLE 2

COMMON DIMENSIONS										
SYMBOL		(b) SOLDER BALL DIAMETER								
		MIN	NOM	MAX	MIN	NOM	MAX	MIN	NOM	MAX
b		0.40	0.45	0.50	0.45	0.50	0.55	0.50	0.55	0.60
A1		0.25	---	---	0.25	---	---	0.25	---	---
b1	TYPE1	0.35	---	---	0.40	---	---	0.42	---	---
	TYPE2	0.30	---	---	0.35	---	---	0.42	---	---
NOTES		1, 2								
REF		11–882								
ISSUE		D								

TABLE 3

TOLERANCE OF FORM AND POSITION	
SYMBOL	VALUE
aaa	0.10
ccc	0.20
ddd	0.12
eee	0.15
fff	0.10
NOTES	1, 2, 6
REF	11-828, 11-848
ISSUE	B

TABLE 4

øb = 0.45 MM NOMINAL														
NEW VARIATION △15	OLD VARIATION	D BASIC	E BASIC	D1 BASIC	E1 BASIC	MD	ME	SD BASIC	SE BASIC	n	N	FOOT PRINT	REF	ISSUE
P16.5x14.0–EJ–136C	AC	16.50	14.00	14.00	12.00	15	13	0.00	0.00	136	195	C	11–848	B
P18.0x12.0–EJ–100A	AA	18.00	12.00	16.00	9.00	17	10	0.00	0.50	100	170	A	11–828	A
P18.0x12.0–EJ–132B	AB	18.00	12.00	16.00	10.00	17	11	0.00	0.00	132	187	B	11–848	B
P18.0x12.0–EJ–170E	AE	18.00	12.00	16.00	9.00	17	10	0.00	0.50	170	170	E	11–828	A
P18.0x14.0–EJ–100A	–	18.00	14.00	16.00	9.00	17	10	0.00	0.50	100	170	A	11–882	D
P18.0x14.0–EJ–152D	AD	18.00	14.00	16.00	12.00	17	13	0.00	0.00	152	221	D	11–848	B
NOTES		12	12	12	12	3	3	10, 12	10, 12	4, 11	4	11		

TITLE: BALL GRID ARRAY FAMILY, RECTANGULAR, 1.00 mm PITCH

NUMBER: MO-304

ISSUE: D

DATE: JUL 2013

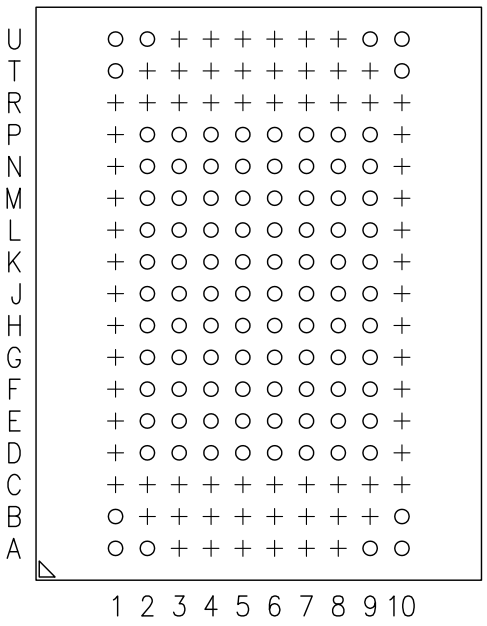
TABLE 5

ØB = 0.50 MM NOMINAL														
NEW VARIATION 15	OLD VARIATION	D BASIC	E BASIC	D1 BASIC	E1 BASIC	MD	ME	SD BASIC	SE BASIC	n	N	FOOT PRINT	REF	ISSUE
P16.5x14.0–EH–136C	AC	16.50	14.00	14.00	12.00	15	13	0.00	0.00	136	195	C	11–848	B
P18.0x12.0–EH–100A	AA	18.00	12.00	16.00	9.00	17	10	0.00	0.50	100	170	A	11–828	A
P18.0x12.0–EH–132B	AB	18.00	12.00	16.00	10.00	17	11	0.00	0.00	132	187	B	11–848	B
P18.0x12.0–EH–170E	AE	18.00	12.00	16.00	9.00	17	10	0.00	0.50	170	170	E	11–828	A
P18.0x14.0–EH–100A	–	18.00	14.00	16.00	9.00	17	10	0.00	0.50	100	170	A	11–882	D
P18.0x14.0–EH–152D	AD	18.00	14.00	16.00	12.00	17	13	0.00	0.00	152	221	D	11–848	B
NOTES		12	12	12	12	3	3	10, 12	10, 12	4, 11	4	11		

TABLE 6

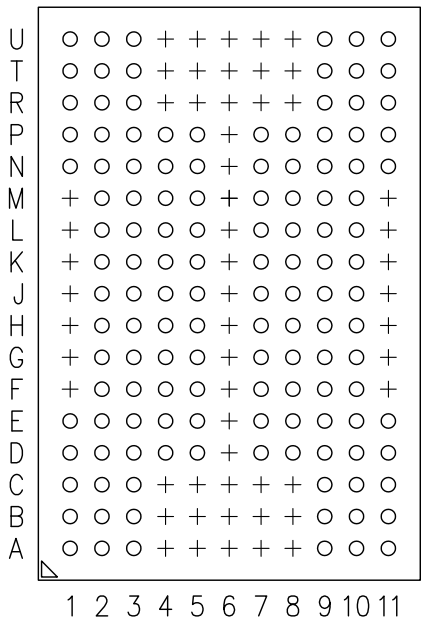
ØB = 0.55 MM NOMINAL														
NEW VARIATION △15	OLD VARIATION	D BASIC	E BASIC	D1 BASIC	E1 BASIC	MD	ME	SD BASIC	SE BASIC	n	N	FOOT PRINT	REF	ISSUE
P16.5x14.0–EG–136C	AC	16.50	14.00	14.00	12.00	15	13	0.00	0.00	136	195	C	11–848	B
P18.0x12.0–EG–100A	AA	18.00	12.00	16.00	9.00	17	10	0.00	0.50	100	170	A	11–828	A
P18.0x12.0–EG–132B	AB	18.00	12.00	16.00	10.00	17	11	0.00	0.00	132	187	B	11–848	B
P18.0x12.0–EG–170E	AE	18.00	12.00	16.00	9.00	17	10	0.00	0.50	170	170	E	11–828	A
P18.0x14.0–EG–100A	–	18.00	14.00	16.00	9.00	17	10	0.00	0.50	100	170	A	11–882	D
P18.0x14.0–EG–152D	AD	18.00	14.00	16.00	12.00	17	13	0.00	0.00	152	221	D	11–848	B
NOTES		12	12	12	12	3	3	10, 12	10, 12	4, 11	4	11		

n=100 BALLS



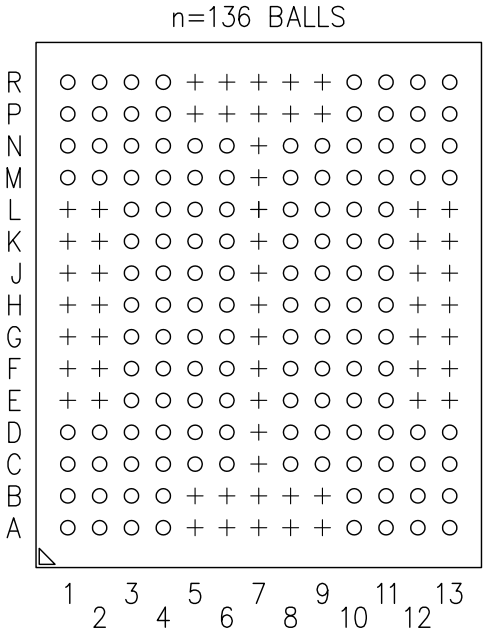
FOOTPRINT A

n=132 BALLS



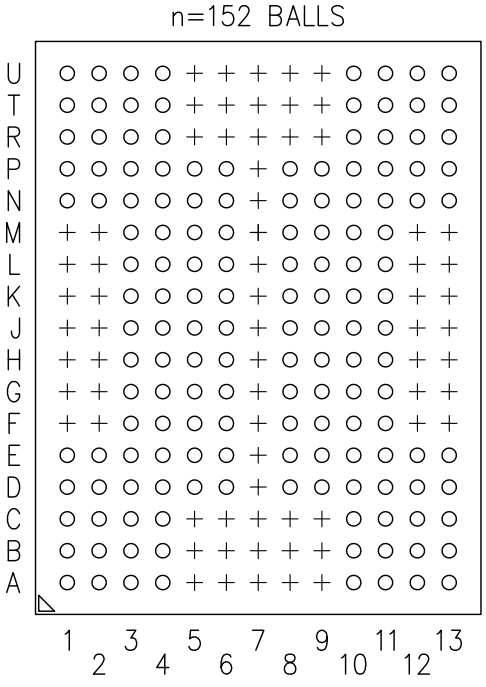
FOOTPRINT B

n=136 BALLS



FOOTPRINT C

n=152 BALLS



FOOTPRINT D

11 + = DEPOPULATED BALL POSITIONS

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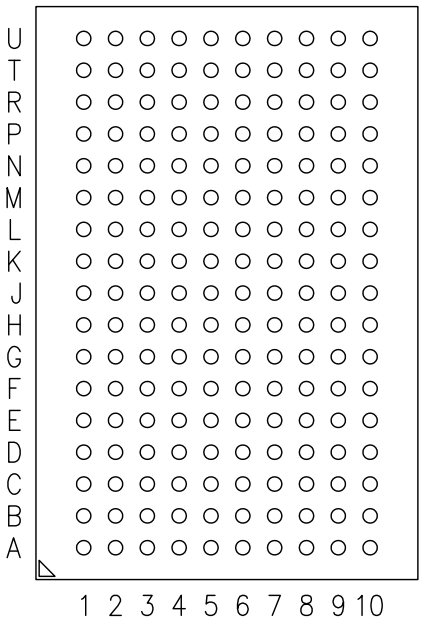
n=170 BALLS



FOOTPRINT E

11 + = DEPOPULATED BALL POSITIONS

JEDEC SOLID STATE PRODUCT OUTLINE	TITLE	NUMBER	ISSUE	DATE	SHEET
	BALL GRID ARRAY FAMILY, RECTANGULAR, 1.00 mm PITCH	MO-304	D	JUL 2013	9 OF 11

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5–2009.
THIS OUTLINE CONFORMS TO JEP95, SECTION 4.6.

2 SOLDER BALL POSITION DESIGNATOR PER JEP95, SECTION 3, SPP–020.

3. MD AND ME REPRESENT THE MATRIX SIZE CORRESPONDING TO THE D AND E DIRECTIONS RESPECTIVELY.

4. n REPRESENTS THE ACTUAL NUMBER OF SOLDER BALLS AFTER DEPOPLUATION.
N REPRESENTS THE MAXIMUM NUMBER OF SOLDER BALLS FOR A FULL MATRIX, MD X ME.

5 A FULLY POPULATED 10 X 16 MATRIX SIZE IS SHOWN FOR ILLUSTRATION ONLY.

6 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.

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

8 PRIMARY DATUM C (SEATING PLANE) IS DEFINED BY THE PLANE ESTABLISHED BY THE CONTACT POINTS OF THREE OR MORE SOLDER BALLS THAT SUPPORT THE DEVICE WHEN IT IS PLACED ON TOP OF A PLANAR SURFACE.

9 THE CORNER A1 MUST BE IDENTIFIED ON BOTH THE BOTTOM AND TOP SIDES OF THE PACKAGE, THE IDENTIFICATION FEATURE CAN BE MADE USING INK OR METALIZED MARKINGS, IDENTATIONS, OR OTHER FEATURES. THE EXACT SHAPE OF EACH CORNER IS OPTIONAL.

10 DIMENSIONS 'SD' AND 'SE' ARE MEASURED WITH RESPECT TO DATUM A AND DATUM B 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 'SD' OR 'SE' = 0
WHEN THERE IS AN EVEN NUMBER OF SOLDER BALLS IN THE OUTER ROW, 'SD' OR 'SE' = e/2.

11 SOLDER BALL DEPOPULATION IS ALLOWED. DEPOPULATION IS THE OMISSION OF SOLDER BALLS FROM A FULL MATRIX (MD, ME).

12. ALL DIMENSIONS ARE IN MILLIMETERS.

13 EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL.

14 SOLDERABLE SURFACE MAY BE DEFINED BY AN OPENING IN THE SOLDER RESIST LAYER (TYPE 1) OR BY THE SIZE OF A METALIZED 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.

15 EXPLANATION OF VARIATION SCHEME.

PDD.DxEE.E–eb–nF

P = PACKAGE PROFILE HEIGHT CODE PER JESD30.
DD.D = PACKAGE BODY SIZE IN THE D DIMENSION (Y AXIS) TO 1 DECIMAL PLACE.
EE.E = PACKAGE BODY SIZE IN THE E DIMENSION (X AXIS) TO 1 DECIMAL PLACE.
EXAMPLE: D = 55.00 mm TO BE LISTED AS 55.0
D = 5.50 mm TO BE LISTED AS 5.5.
e = BALL PITCH PER THE FOLLOWING CODES.
A = FUTURE NEW BALL PITCH.
B = FUTURE NEW BALL PITCH.
C = 1.50 mm
D = 1.27 mm
E = 1.00 mm
F = 0.80 mm
G = 0.75 mm
H = 0.65 mm
J = FUTURE NEW PITCH
K = FUTURE NEW PITCH
L = 0.50 mm
M = FUTURE NEW PITCH
N = 0.40 mm
b = NOMINAL BALL DIAMETER.
A = FUTURE NEW BALL DIAMETER.
B = FUTURE NEW BALL DIAMETER.
C = 0.75 mm
D = 0.70 mm
E = 0.65 mm
F = 0.60 mm
G = 0.55 mm
H = 0.50 mm
J = 0.45 mm
K = 0.40 mm
L = 0.35 mm
M = 0.30 mm
N = 0.25 mm
P = 0.20 mm
R = 0.17 mm
n = ACTUAL SOLDER BALL COUNT.
F = FOOTPRINT LETTER.

CHANGE RECORD

IF THE CHANGE INVOLVES ANY WORDS ADDED OR DELETED (EXCLUDING DELETION OF ACCIDENTALLY REPEATED WORDS), THE CHANGE IS TO BE INCLUDED BELOW. PUNCTUATION CHANGES MAY OR MAY NOT BE INCLUDED.

INITIAL ISSUE: A	DATE: FEB 2010	ITEM NUMBER: 11–828

CHANGE RECORD HISTORY:

ISSUE: B	DATE: JULY 2011	ITEM NUMBER: 11–848

LOCATION:	CHANGED FROM:	CHANGED TO:
PAGE 1	WAS TOP AND SIDE VIEW	UPDATED TO JEDEC STANDARD COMBINED PAGE 1 AND 2 TOGETHER
PAGE 2	WAS BOTTOM VIEW ONLY	COMBINED INTO PAGE 1
PAGE 3	WAS 100 BALL FOOTPRINT	MOVED TO PAGE 4
PAGE 4	WAS DETAIL A AND SECTION B–B	MOVED TO PAGE 2 ADDED 132, 136, AND 152 FOOTPRINTS
PAGE 5	WAS TABLES 1, 2, AND 3 VARIATION AB AC WAS 18 X 12, TABLE 2 VARIATION AE AF WAS 18 X 14, TABLE 2 fff WAS 0.05, TABLE 3	MOVED TO PAGE 3 ADDED MIN DIMENSION TO PROFILE, TABLE 1 ADDED 187, 195, AND 221 TO N, TABLE 2 CHANGED fff TO 0.10, TABLE 3
PAGE 6		CHANGED NOTES TO MATCH DG4.14

ISSUE: C	DATE: APRIL 2013	ITEM NUMBER: 11.872

LOCATION:	CHANGED FROM:	CHANGED TO:
ALL SHEETS		NEWEST JEDEC MO TEMPLATE
SHEET 1	X AND Y AXIS SURFACE PROFILE ANNOTATION	OVERALL SURFACE PROFILE ANNOTATION
SHEET 3, TABLE 1		ADDED TYPE 1, 2, & 3 FOR SYMBOL b
SHEET 4 & 5	XXX BALLS ℄ ON FOOTPRINTS ..UNPOPULATED BALL POSITIONS	n=XXX BALLS NO ℄ ON FOOTPRINTS, ..DEPOPULATED BALL POSITIONS
SHEET 6, NOTE 1	ASME Y14.5M–1994	ASME Y14.5–2009

CHANGE RECORD

IF THE CHANGE INVOLVES ANY WORDS ADDED OR DELETED (EXCLUDING DELETION OF ACCIDENTALLY REPEATED WORDS), THE CHANGE IS TO BE INCLUDED BELOW. PUNCTUATION CHANGES MAY OR MAY NOT BE INCLUDED.

ISSUE: D	DATE: JULY 2013	ITEM NUMBER: 11-882

LOCATION	CHANGED FROM:	CHANGED TO:
SHEET 3	0.30 FOR ALL MIN DIMENSIONS	ADDED: P = PACKAGE PROFILE HEIGHT TO TABLE 1 ADDED TABLE 2 CORRECTED b1 TO MATCH DR
SHEETS 5, 6, & 7	TABLE 2	ADDED TABLES 4, 5, & 6 FOR NEW VARIATION SCHEME ADDED P18.0x14.0-E?-100A FOR EACH BALL DIAMETER
SHEETS 8 & 9	FOOTPRINT 1 – 5 DELTA AT EACH FOOTPRINT	FOOTPRINT A – E ADDED A1 TRIANGLE DELTA AT DEPOPULATED BALL POSITION NOTE
SHEET 10	'e' REPRESENTS THE SOLDER BALL GRID PITCH	ADDED THIS OUTLINE... TO NOTE 1 MD AND ME REPRESENT THE MATRIX SIZE... n REPRESENTS THE ACTUAL NUMBER OF SOLDER...
SHEET 11		ADDED EXPLANATION OF VARIATION SCHEME