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Understanding Embedded - FPGAs (Field Programmable Gate Array)

Embedded - FPGAs, or Field Programmable Gate Arrays, are advanced integrated circuits that offer unparalleled flexibility and performance for digital systems. Unlike traditional fixed-function logic devices, FPGAs can be programmed and reprogrammed to execute a wide array of logical operations, enabling customized functionality tailored to specific applications. This reprogrammability allows developers to iterate designs quickly and implement complex functions without the need for custom hardware.

Applications of Embedded - FPGAs

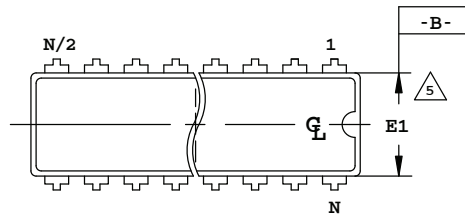
The versatility of Embedded - FPGAs makes them indispensable in numerous fields. In telecommunications.

Details

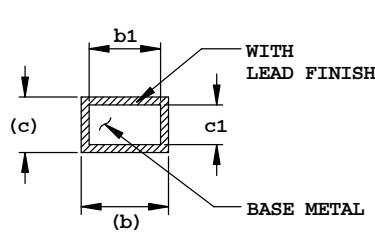
Product Status	Obsolete
Number of LABs/CLBs	-
Number of Logic Elements/Cells	32800
Total RAM Bits	434176
Number of I/O	496
Number of Gates	-
Voltage - Supply	1.14V ~ 1.26V
Mounting Type	Surface Mount
Operating Temperature	-40°C ~ 100°C (TJ)
Package / Case	672-BBGA
Supplier Device Package	672-FPBGA (27x27)
Purchase URL	https://www.e-xfl.com/product-detail/lattice-semiconductor/lfecp33e-3f672i

20-Pin Plastic DIP Package

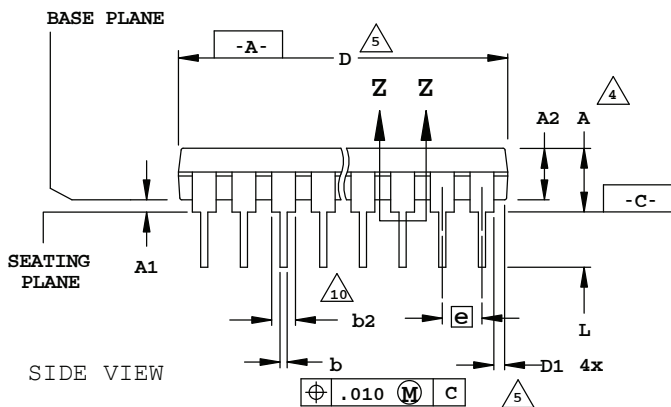
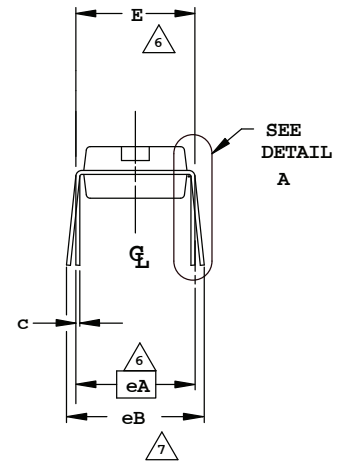
Dimensions in Inches



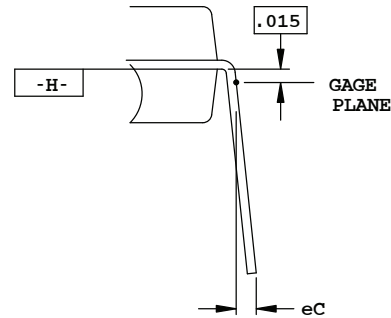
TOP VIEW



SECTION Z-Z



SIDE VIEW



DETAIL A

NOTES:

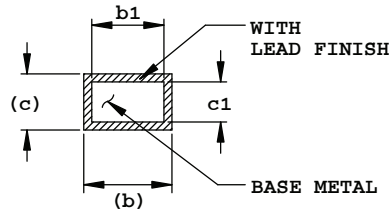
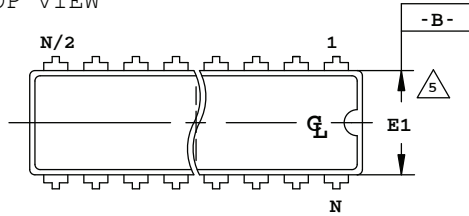
1. CONTROLLING DIMENSION: INCH.
2. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M
3. DISTANCE BETWEEN LEADS INCLUDING DAMBAR PROTRUSIONS TO BE .005 MINIMUM.
4. DIMENSIONS A, A1 & L ARE MEASURED WITH THE PACKAGE SEATED IN JEDEC SEATING PLANE GAUGE GS-3.
5. DIMENSIONS D, D1 AND E1 DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS. MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED .010
6. E AND eA MEASURED WITH THE LEADS CONSTRAINED TO BE PERPENDICULAR TO DATUM -C-
7. eB AND eC ARE MEASURED AT THE LEAD TIPS WITH THE LEADS UNCONSTRAINED.
8. N IS THE MAXIMUM NUMBER OF LEAD POSITIONS.
9. POINTED OR ROUNDED LEAD TIPS ARE PREFERRED TO EASE INSERTION
10. b2 MAXIMUM DIMENSION DOES NOT INCLUDE DAMBAR PROTRUSIONS. DAMBAR PROTRUSIONS SHALL NOT EXCEED .010
11. DATUM PLANE -H- COINCIDENT WITH THE BOTTOM OF LEAD, WHERE LEAD EXITS BODY

N = 20				
SYMBOL	INCHES			NOTES
	MIN.	NOM.	MAX.	
A	-	-	.210	4
A1	.015	-	-	4
A2	.115	.130	.195	
b	.014	.018	.022	
b1	.014	.018	.020	
b2	.045	.060	.070	10
C	.008	.010	.014	
C1	.008	.010	.011	
D	.980	1.030	1.060	5
D1	.005	-	-	5
E	.300	.310	.325	6
E1	.240	.250	.280	5
e	.100 BSC			
eA	.300 BSC			6
eB	-	-	.430	7
eC	.000	-	.060	7
L	.115	.130	.150	4

24-Pin Plastic DIP

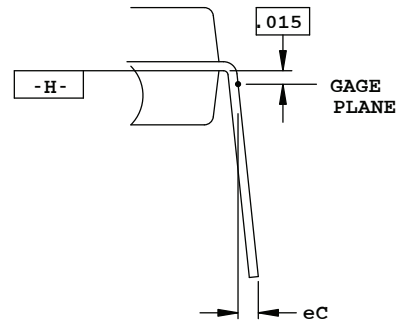
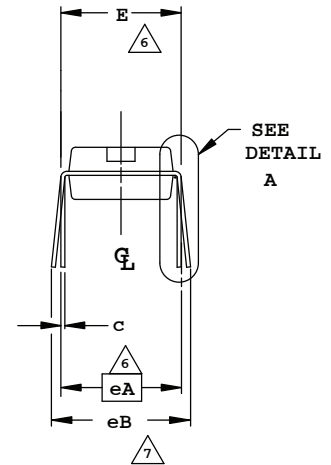
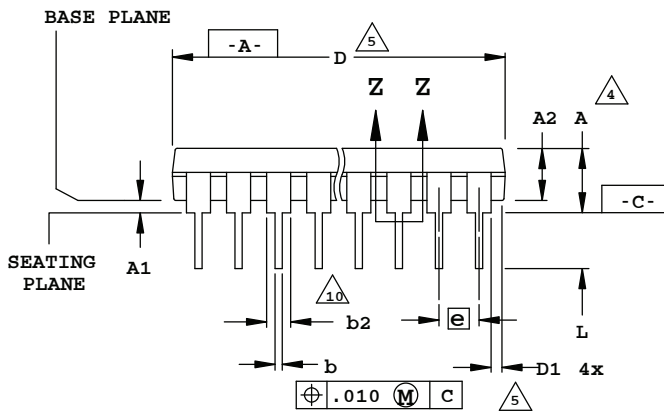
Dimensions in Inches

TOP VIEW



SECTION Z-Z

SIDE VIEW



DETAIL A

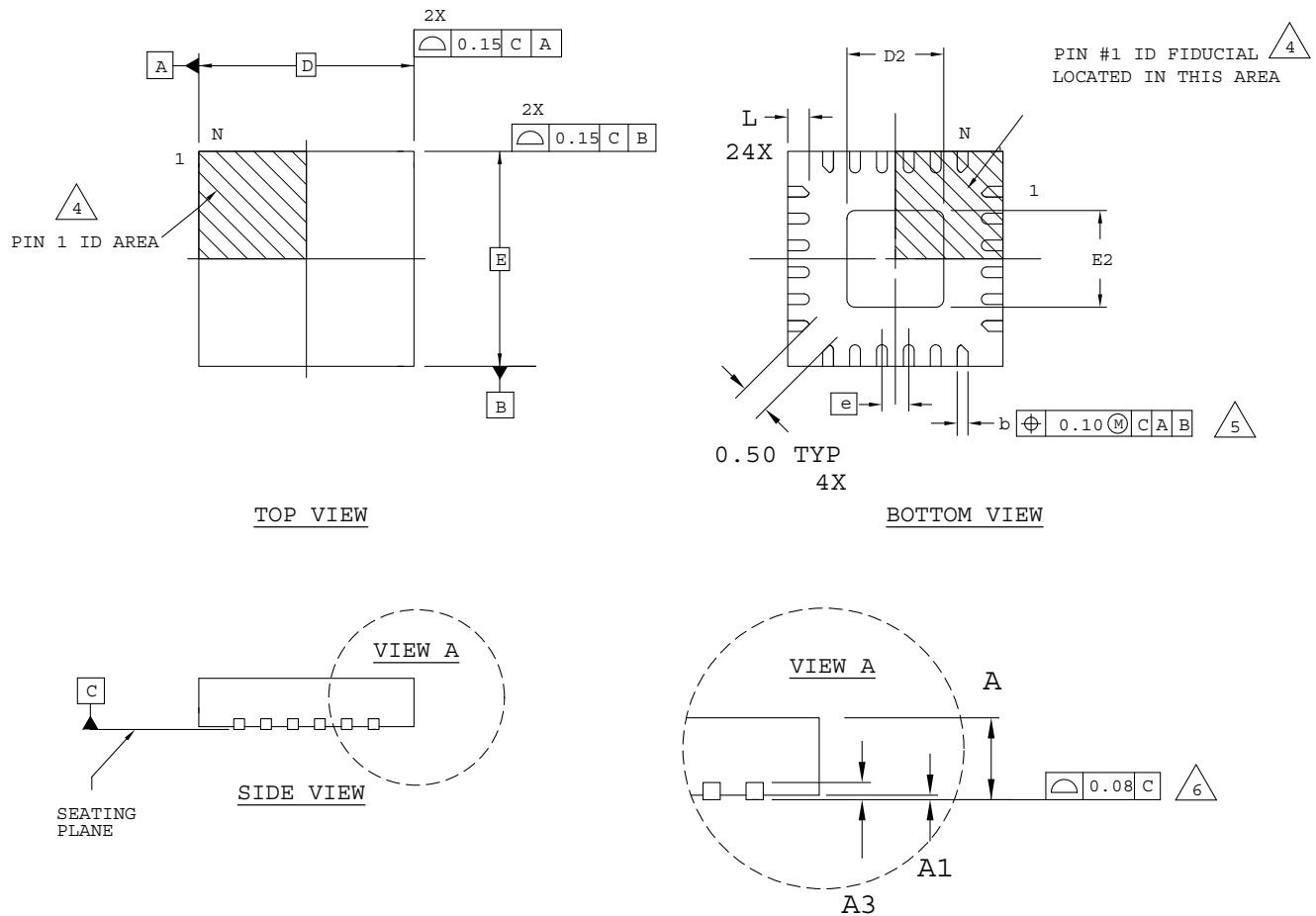
NOTES:

1. CONTROLLING DIMENSION: INCH.
2. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M
3. DISTANCE BETWEEN LEADS INCLUDING DAMBAR PROTRUSIONS TO BE .005 MINIMUM.
4. DIMENSIONS A, A1 & L ARE MEASURED WITH THE PACKAGE SEATED IN JEDEC SEATING PLANE GAUGE GS-3.
5. DIMENSIONS D, D1 AND E1 DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS. MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED .010
6. E AND eA MEASURED WITH THE LEADS CONSTRAINED TO BE PERPENDICULAR TO DATUM -C-
7. eB AND eC ARE MEASURED AT THE LEAD TIPS WITH THE LEADS UNCONSTRAINED.
8. N IS THE MAXIMUM NUMBER OF LEAD POSITIONS.
9. POINTED OR ROUNDED LEAD TIPS ARE PREFERRED TO EASE INSERTION
10. b2 MAXIMUM DIMENSIONS DOES NOT INCLUDE DAMBAR PROTRUSIONS. DAMBAR PROTRUSIONS SHALL NOT EXCEED .010
11. DATUM PLANE -H- COINCIDENT WITH THE BOTTOM OF LEAD, WHERE LEAD EXITS BODY

N = 24				
SYMBOL	INCHES			HOLE
	MIN.	NOM.	MAX.	
A	-	-	.210	4
A1	.015	-	-	4
A2	.115	.130	.195	
b	.014	.018	.022	
b1	.014	.018	.020	
b2	.045	.060	.070	10
c	.008	.010	.014	
c1	.008	.010	.011	
D	1.230	1.250	1.280	5
D1	.005	-	-	5
E	.300	.310	.325	6
E1	.240	.250	.280	5
e	.100 BSC			
eA	.300 BSC			6
eB	-	-	.430	7
eC	.000	-	.060	7
L	.115	.130	.150	

24-Pin QFNS Package

Dimensions in Millimeters



NOTES: UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M.
2. ALL DIMENSIONS ARE IN MILLIMETERS.
3. DRAWING CONFORMS TO JEDEC MO-220, VARIATION VGGD-9.

△ 4 EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL.

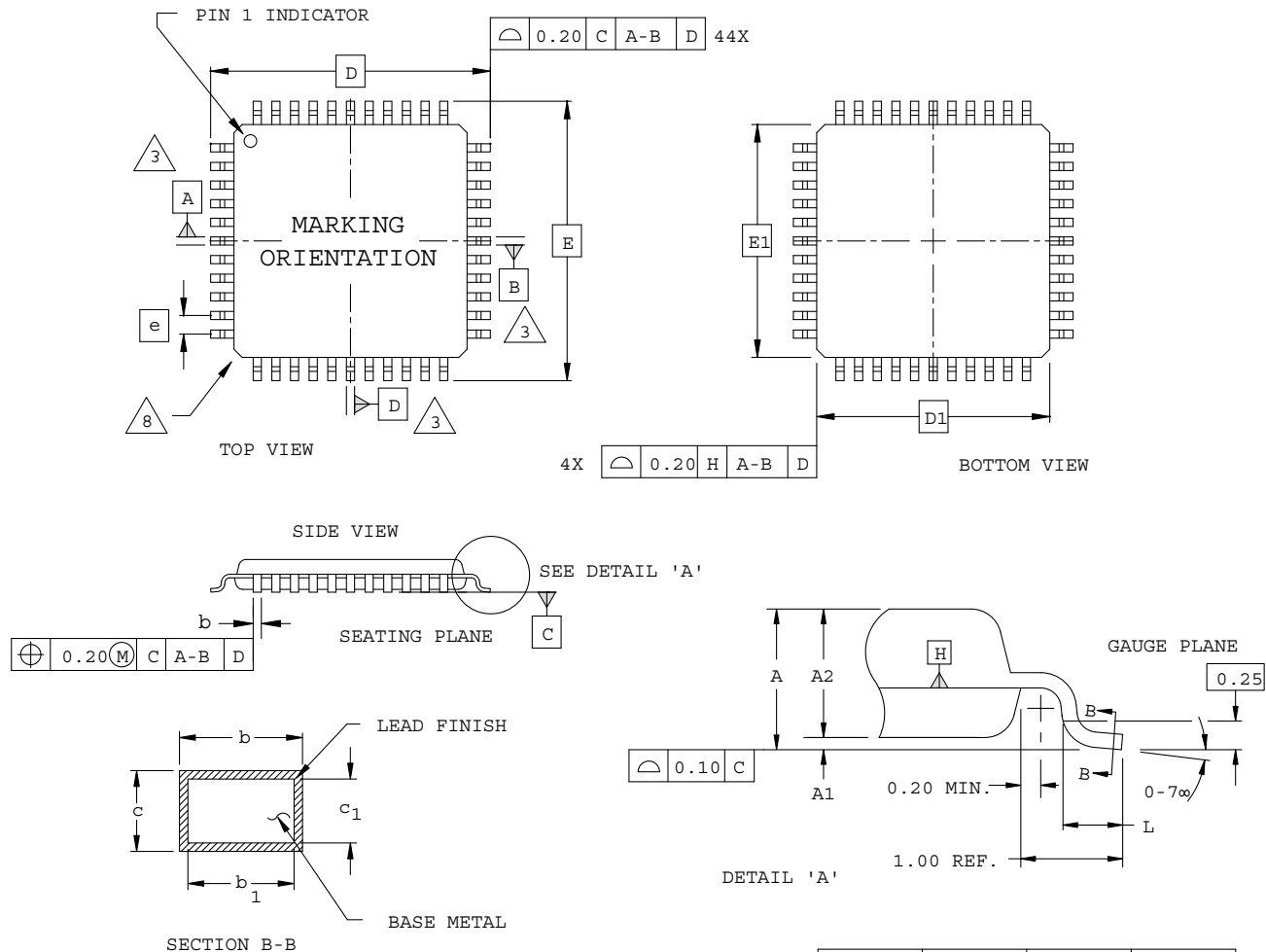
△ 5 DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 mm FROM TERMINAL TIP.

△ 6 APPLIES TO EXPOSED PORTION OF TERMINALS.

SYMBOL	MIN.	NOM.	MAX.
A	0.80	0.90	1.00
A1	0.00	0.02	0.05
A3	0.2 REF		
D	4.0 BSC		
D2	1.05	-	2.45
E	4.0 BSC		
E2	1.05	-	2.45
b	0.18	0.25	0.30
e	0.50 BSC		
L	0.45	0.50	0.55

44-Pin TQFP Package (1.4 mm thick)

Dimensions in Millimeters



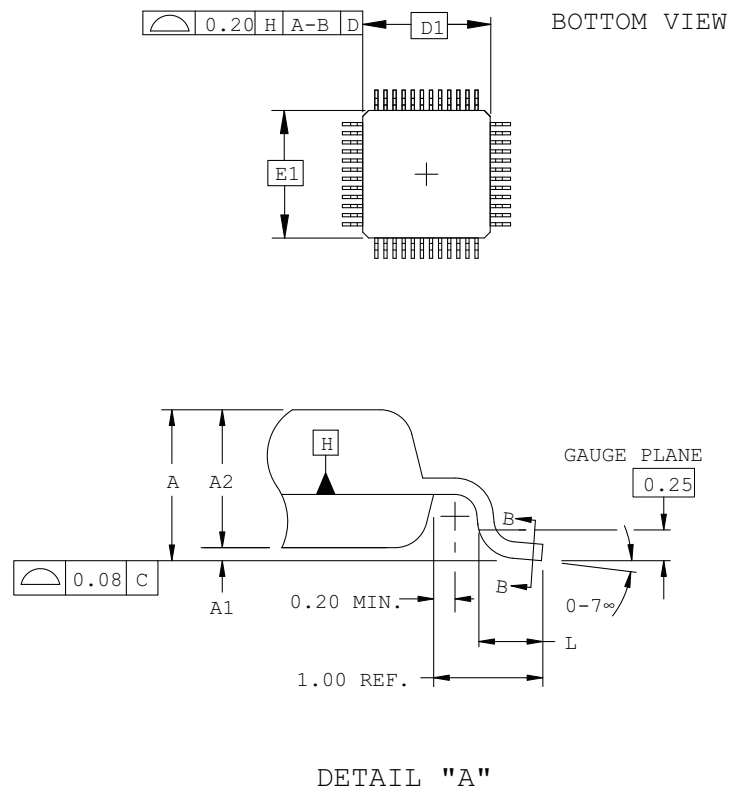
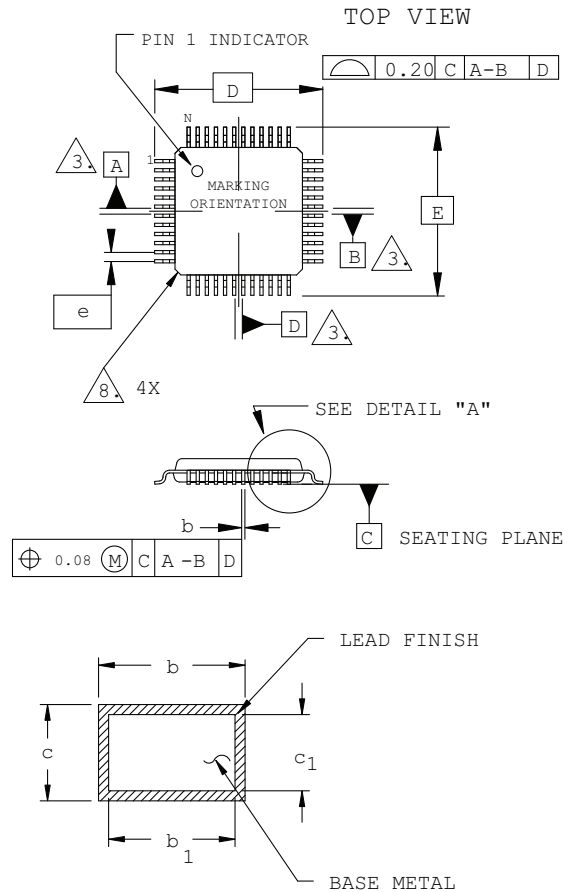
NOTES:

- DIMENSIONING AND TOLERANCING PER ANSI Y14.5 - 1982.
- ALL DIMENSIONS ARE IN MILLIMETERS.
- DATUMS A, B AND D TO BE DETERMINED AT DATUM PLANE H.
- DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE MOLD PROTRUSION IS 0.254 MM ON D1 AND E1 DIMENSIONS.
- THE TOP OF PACKAGE MAY BE SMALLER THAN THE BOTTOM OF THE PACKAGE BY 0.15 MM.
- SECTION B-B:
THESE DIMENSIONS APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.10 AND 0.25 MM FROM THE LEAD TIP.
- A1 IS DEFINED AS THE DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT ON THE PACKAGE BODY.
- EXACT SHAPE OF EACH CORNER IS OPTIONAL.

SYMBOL	MIN.	NOM.	MAX.
A	-	-	1.60
A1	0.05	-	0.15
A2	1.35	1.40	1.45
D	12.00 BSC		
D1	10.00 BSC		
E	12.00 BSC		
E1	10.00 BSC		
L	0.45	0.60	0.75
N	44		
e	0.80 BSC		
b	0.30	0.37	0.45
b1	0.30	0.35	0.40
c	0.09	0.15	0.20
c1	0.09	0.13	0.16

48-Pin TQFP Package (1.4 mm thick)

Dimensions in Millimeters



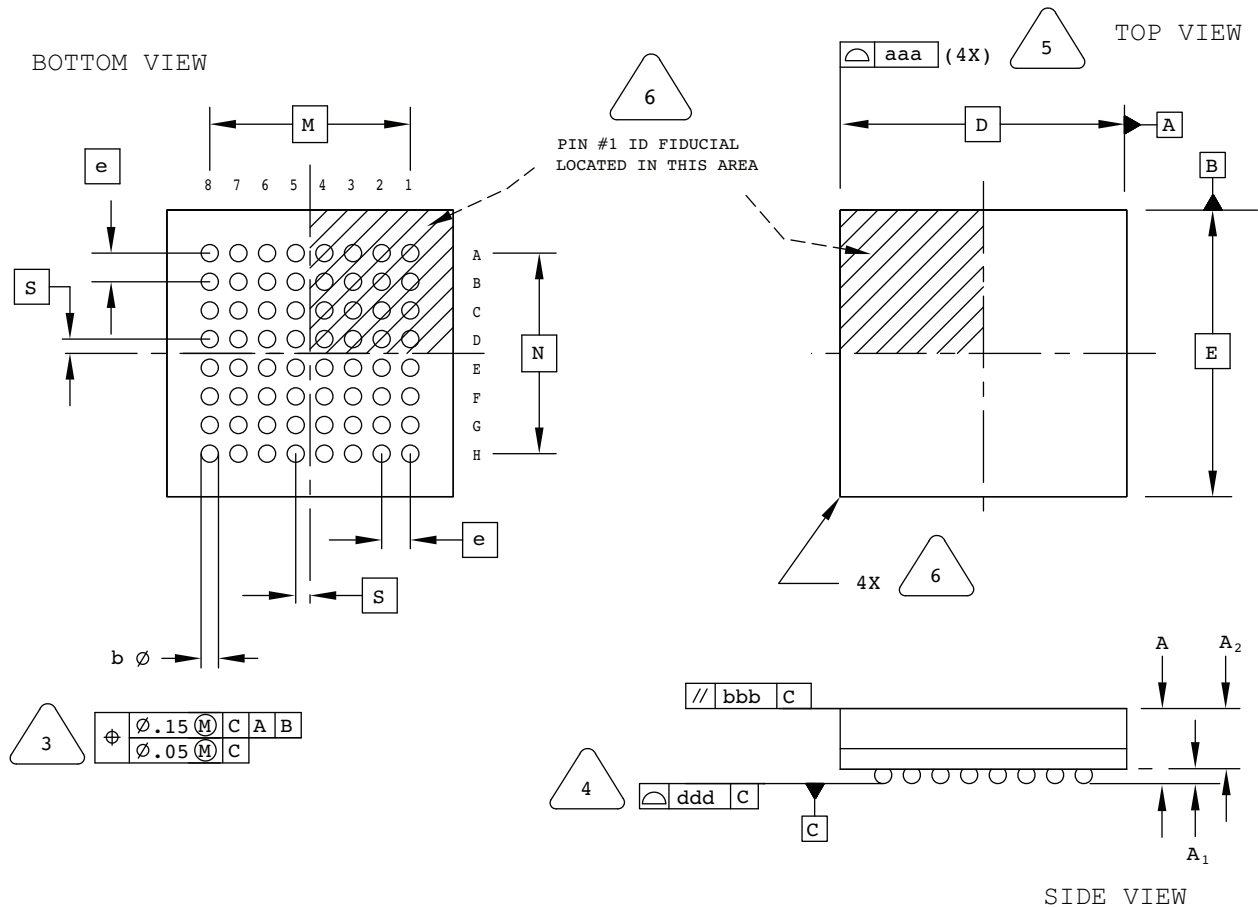
NOTES:

- DIMENSIONING AND TOLERANCING PER ANSI Y14.5 - 1982.
- ALL DIMENSIONS ARE IN MILLIMETERS.
- DATUMS A, B AND D TO BE DETERMINED AT DATUM PLANE H.
- DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE MOLD PROTRUSION IS 0.254 MM ON D1 AND E1 DIMENSIONS.
- THE TOP OF PACKAGE MAY BE SMALLER THAN THE BOTTOM OF THE PACKAGE BY 0.15 MM.
- SECTION B-B:
THESE DIMENSIONS APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.10 AND 0.25 MM FROM THE LEAD TIP.
- A1 IS DEFINED AS THE DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT ON THE PACKAGE BODY.
- EXACT SHAPE OF EACH CORNER IS OPTIONAL.

SYMBOL	MIN.	NOM.	MAX.
A	-	-	1.60
A1	0.05	-	0.15
A2	1.35	1.40	1.45
D	9.00 BSC		
D1	7.00 BSC		
E	9.00 BSC		
E1	7.00 BSC		
L	0.45	0.60	0.75
N	48		
e	0.50 BSC		
b	0.17	0.22	0.27
b1	0.17	0.20	0.23
c	0.09	0.15	0.20
c1	0.09	0.13	0.16

64-Ball csBGA Package

Dimensions in Millimeters



NOTES: UNLESS OTHERWISE SPECIFIED

- DIMENSIONS AND TOLERANCES PER ANSI Y14.5M.
- ALL DIMENSIONS ARE IN MILLIMETERS.



DIMENSION "b" IS MEASURED AT THE MAXIMUM SOLDER BALL DIAMETER, PARALLEL TO PRIMARY DATUM $\square C$



PRIMARY DATUM $\square C$ AND SEATING PLANE ARE DEFINED BY THE SPHERICAL CROWNS OF THE SOLDER BALLS.



BILATERAL TOLERANCE ZONE IS APPLIED TO EACH SIDE OF THE PACKAGE BODY.

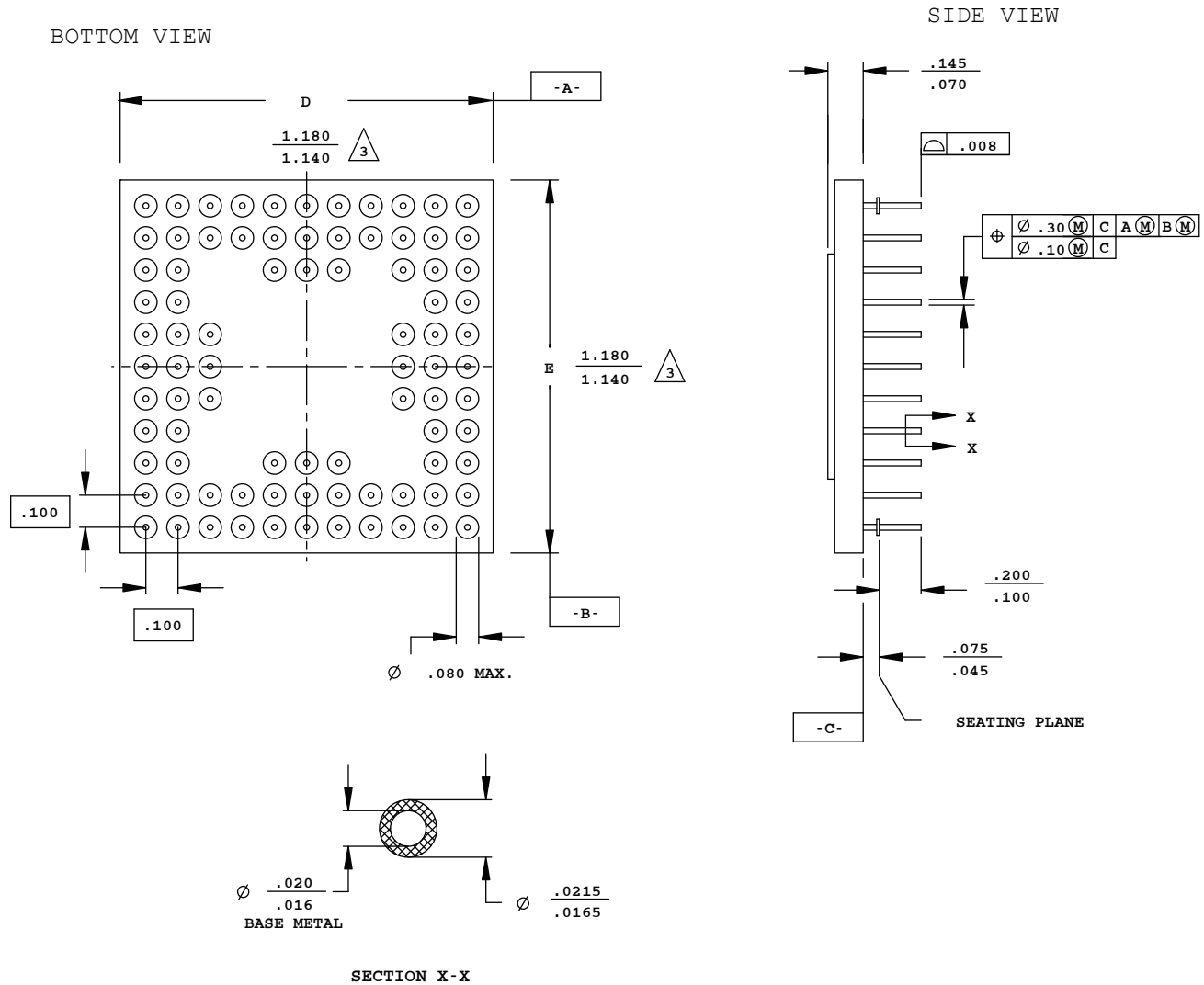


EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL.


SYMBOL	MIN.	NOM.	MAX.
A	0.90	1.00	1.10
A1	0.15	-	-
A2	-	-	0.85
D/E	5.00 BSC		
M/N	3.50 BSC		
S	0.25 BSC		
b	0.25	0.30	0.35
e	0.50 BSC		
aaa	-	-	0.10
bbb	-	-	0.10
ddd	-	-	0.08

84-Pin CPGA Package

Dimensions in Inches

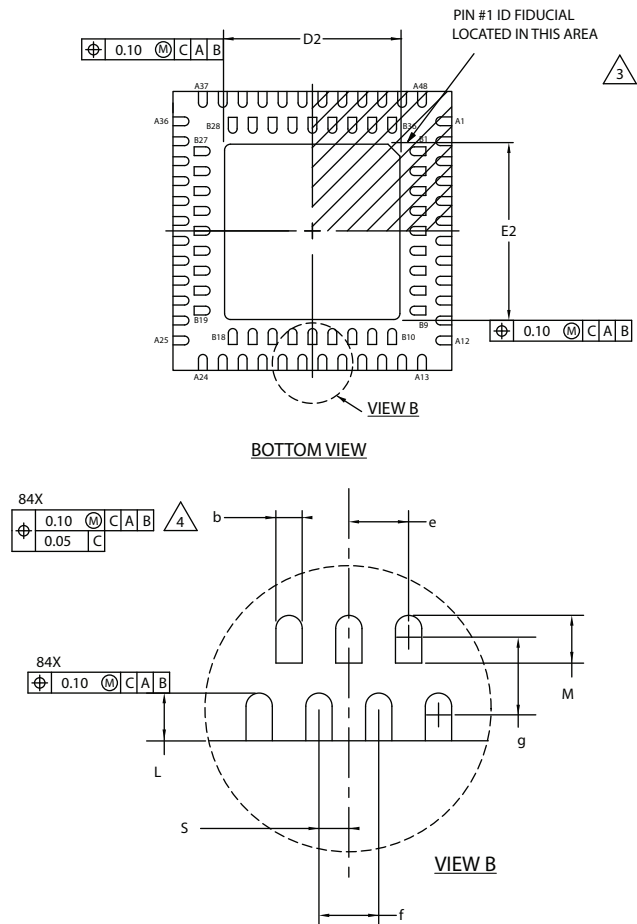
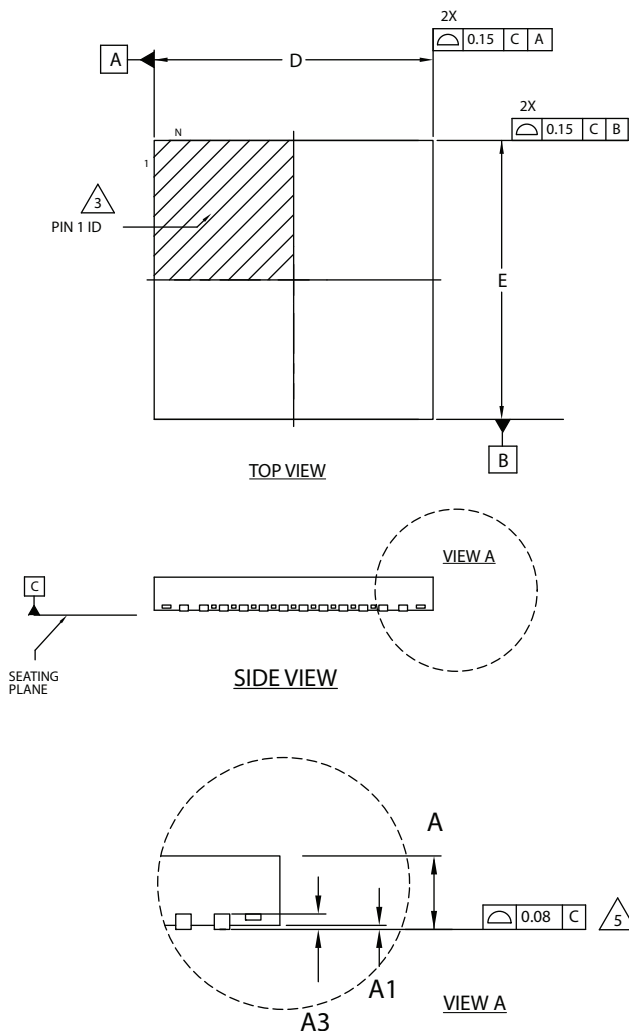


NOTES :

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M.
 2. ALL DIMENSIONS ARE IN INCHES.
-  DIMENSIONS D AND E MAY HAVE MATERIAL PROTRUSION OF .006 INCHES MAXIMUM ABOVE THE DIMENSION SHOWN NOT TO EXCEED .003 INCHES MAXIMUM PER SIDE.

84-Pin QFN Package

Dimensions in Millimeters



NOTES: UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M.
2. ALL DIMENSIONS ARE IN MILLIMETERS.

3 EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL.

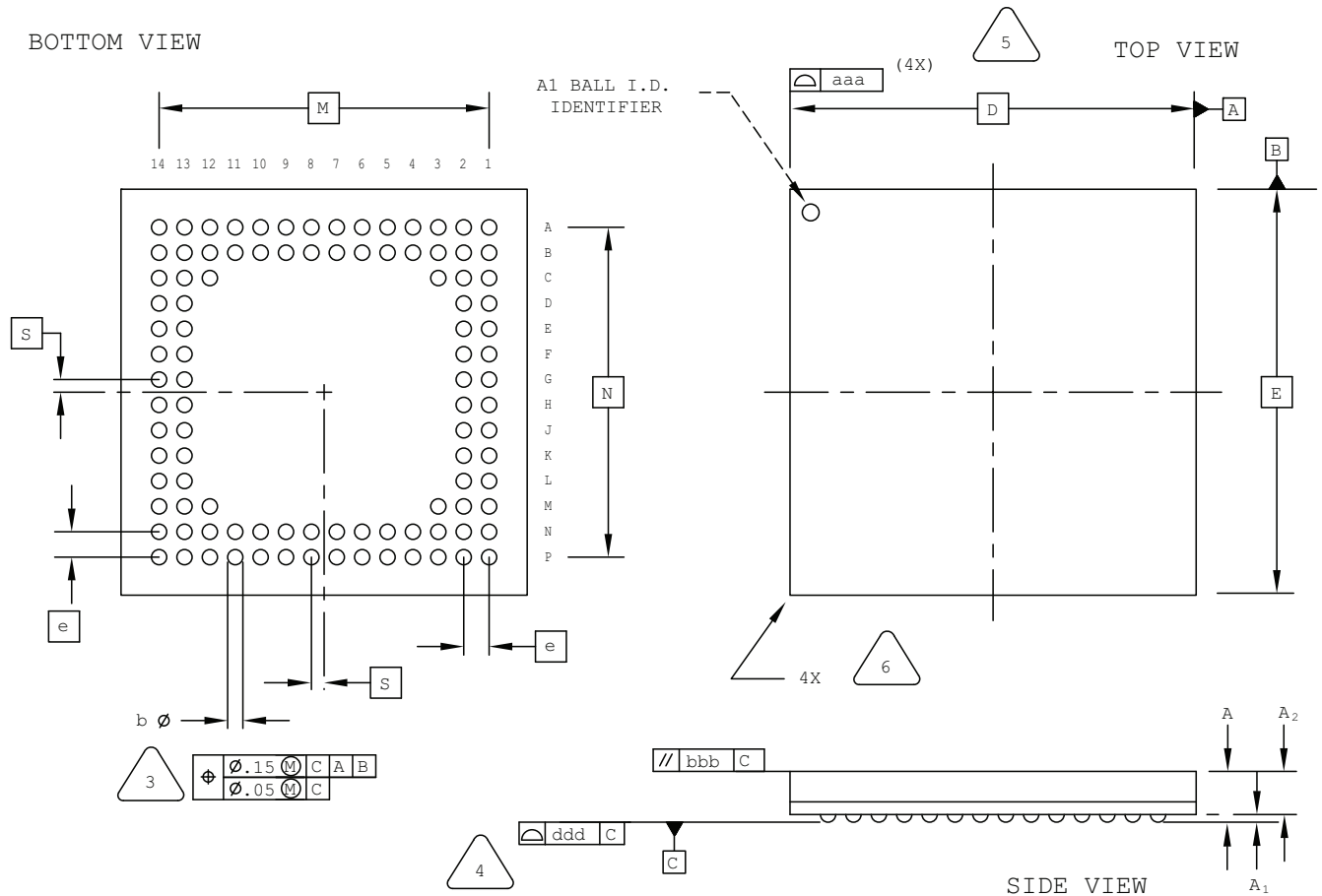
4 DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 mm FROM TERMINAL TIP.

5 APPLIES TO EXPOSED PORTION OF TERMINALS.

SYMBOL	MIN.	NOM.	MAX.
A	0.75	0.85	0.95
A1	0.00	0.02	0.05
A3	0.15 REF		
D	7.0 BSC		
D2	4.30	-	4.50
E	7.0 BSC		
E2	4.30	-	4.50
b	0.17	0.22	0.27
e	0.50 BSC		
f	0.50 BSC		
g	0.65 BSC		
S	0.25 BSC		
L	0.30	0.40	0.50
M	0.30	0.40	0.50

100-Ball csBGA Package

Dimensions in Millimeters



NOTES: UNLESS OTHERWISE SPECIFIED

- DIMENSIONS AND TOLERANCES PER ANSI Y14.5M.
- ALL DIMENSIONS ARE IN MILLIMETERS.



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



PRIMARY DATUM **C** AND SEATING PLANE ARE DEFINED BY THE SPHERICAL CROWNS OF THE SOLDER BALLS.



BILATERAL TOLERANCE ZONE IS APPLIED TO EACH SIDE OF THE PACKAGE BODY.

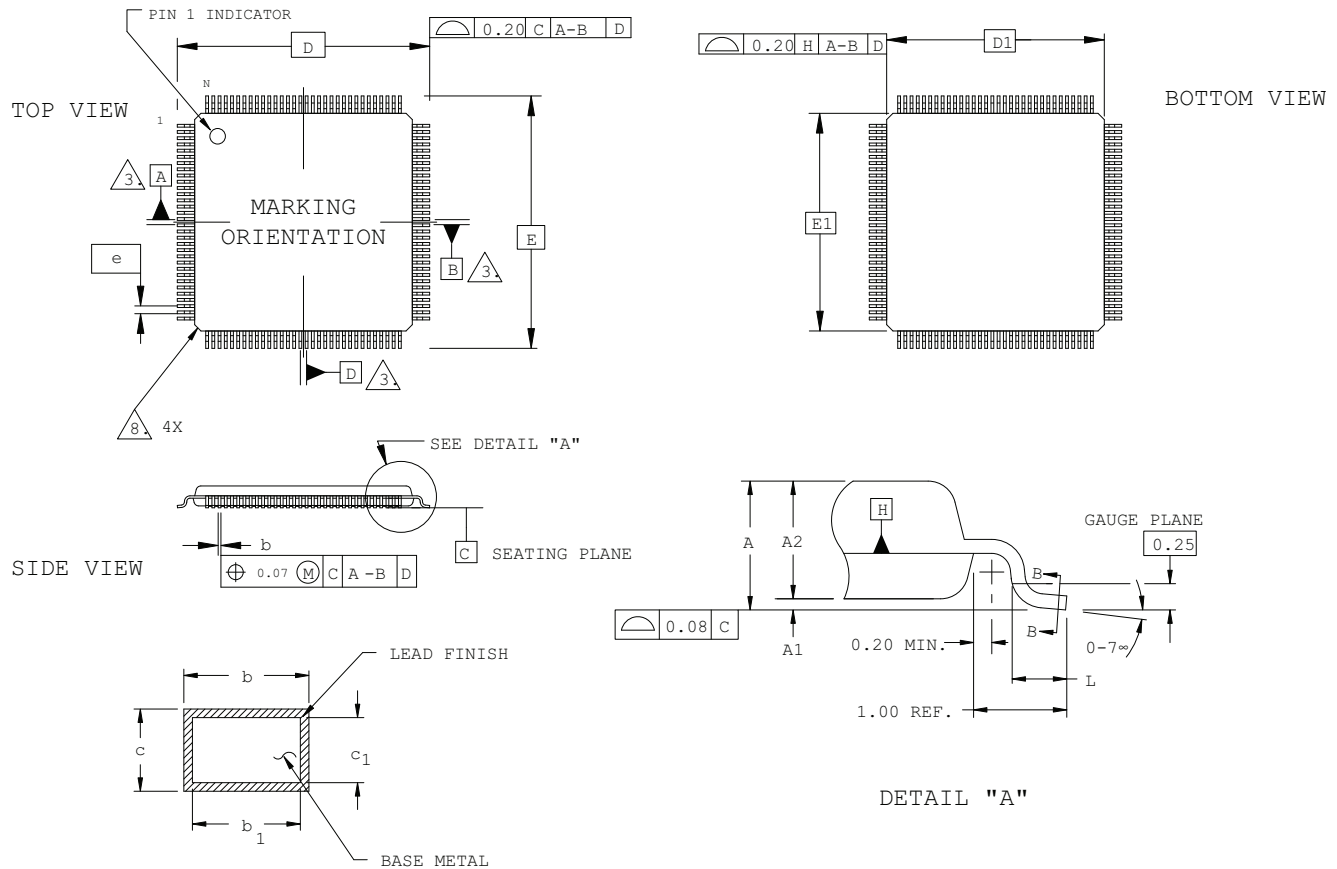


EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL.

SYMBOL	MIN.	NOM.	MAX.
A	0.90	1.23	1.35
A1	0.15	-	-
A2	-	-	1.10
D/E	8.00 BSC		
M/N	6.50 BSC		
S	0.25 BSC		
b	0.25	0.30	0.35
e	0.50 BSC		
aaa	-	-	0.10
bbb	-	-	0.10
ddd	-	-	0.08

128-Pin TQFP Package

Dimensions in Millimeters



SECTION B - B

SIDE VIEW

NOTES:

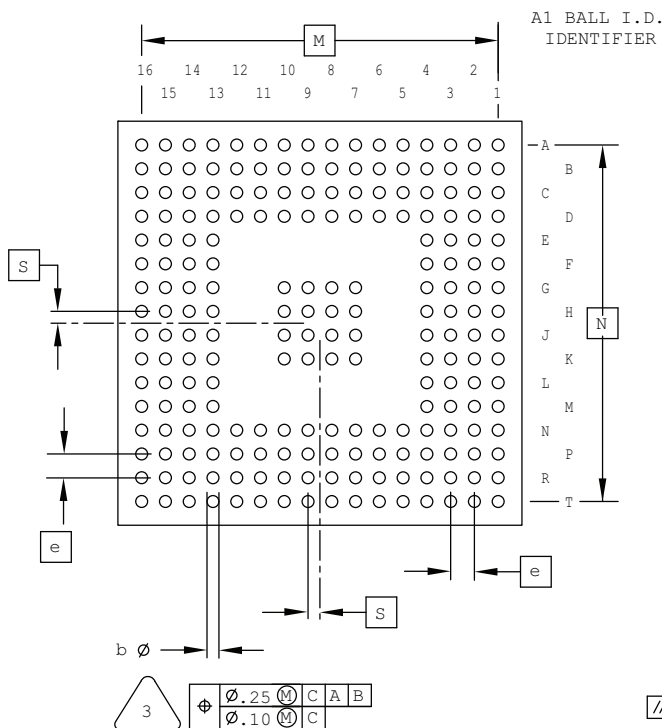
- DIMENSIONING AND TOLERANCING PER ANSI Y14.5 - 1982.
- ALL DIMENSIONS ARE IN MILLIMETERS.
- DATUMS A, B AND D TO BE DETERMINED AT DATUM PLANE H.
- DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE MOLD PROTRUSION IS 0.254 MM ON D1 AND E1 DIMENSIONS.
- THE TOP OF PACKAGE MAY BE SMALLER THAN THE BOTTOM OF THE PACKAGE BY 0.15 MM.
- SECTION B-B: THESE DIMENSIONS APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.10 AND 0.25 MM FROM THE LEAD TIP.
- A1 IS DEFINED AS THE DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT ON THE PACKAGE BODY.
- EXACT SHAPE OF EACH CORNER IS OPTIONAL.

SYMBOL	MIN.	NOM.	MAX.
A	-	-	1.60
A1	0.05	-	0.15
A2	1.35	1.40	1.45
D	16.00 BSC		
D1	14.00 BSC		
E	16.00 BSC		
E1	14.00 BSC		
L	0.45	0.60	0.75
N	128		
e	0.40 BSC		
b	0.13	0.18	0.23
b1	0.13	0.16	0.19
c	0.09	0.15	0.20
c1	0.09	0.13	0.16

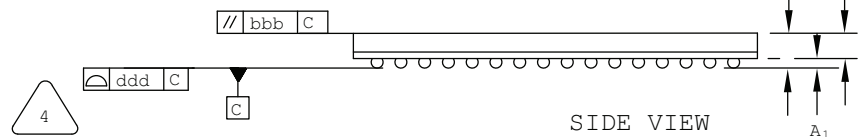
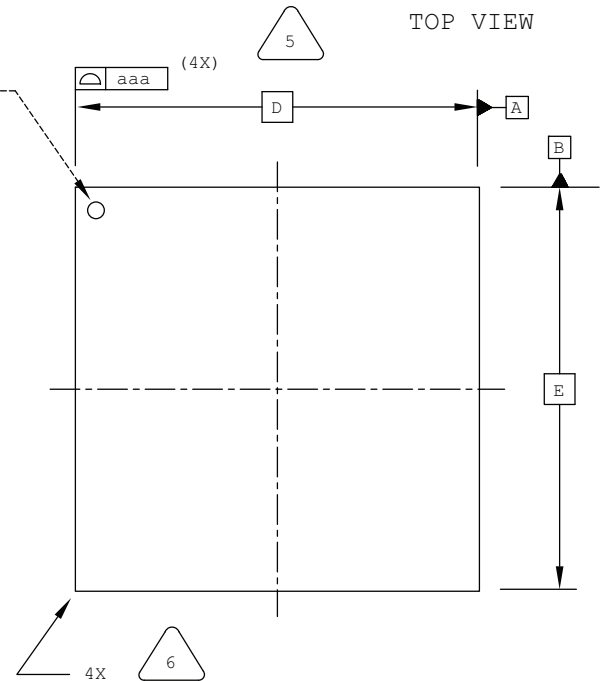
208-Ball ftBGA Package

Dimensions in Millimeters

BOTTOM VIEW



TOP VIEW



NOTES: UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M.
2. ALL DIMENSIONS ARE IN MILLIMETERS.



DIMENSION "b" IS MEASURED AT THE MAXIMUM SOLDER BALL DIAMETER, PARALLEL TO PRIMARY DATUM [C]



PRIMARY DATUM [C] AND SEATING PLANE ARE DEFINED BY THE SPHERICAL CROWNS OF THE SOLDER BALLS.



BILATERAL TOLERANCE ZONE IS APPLIED TO EACH SIDE OF THE PACKAGE BODY.

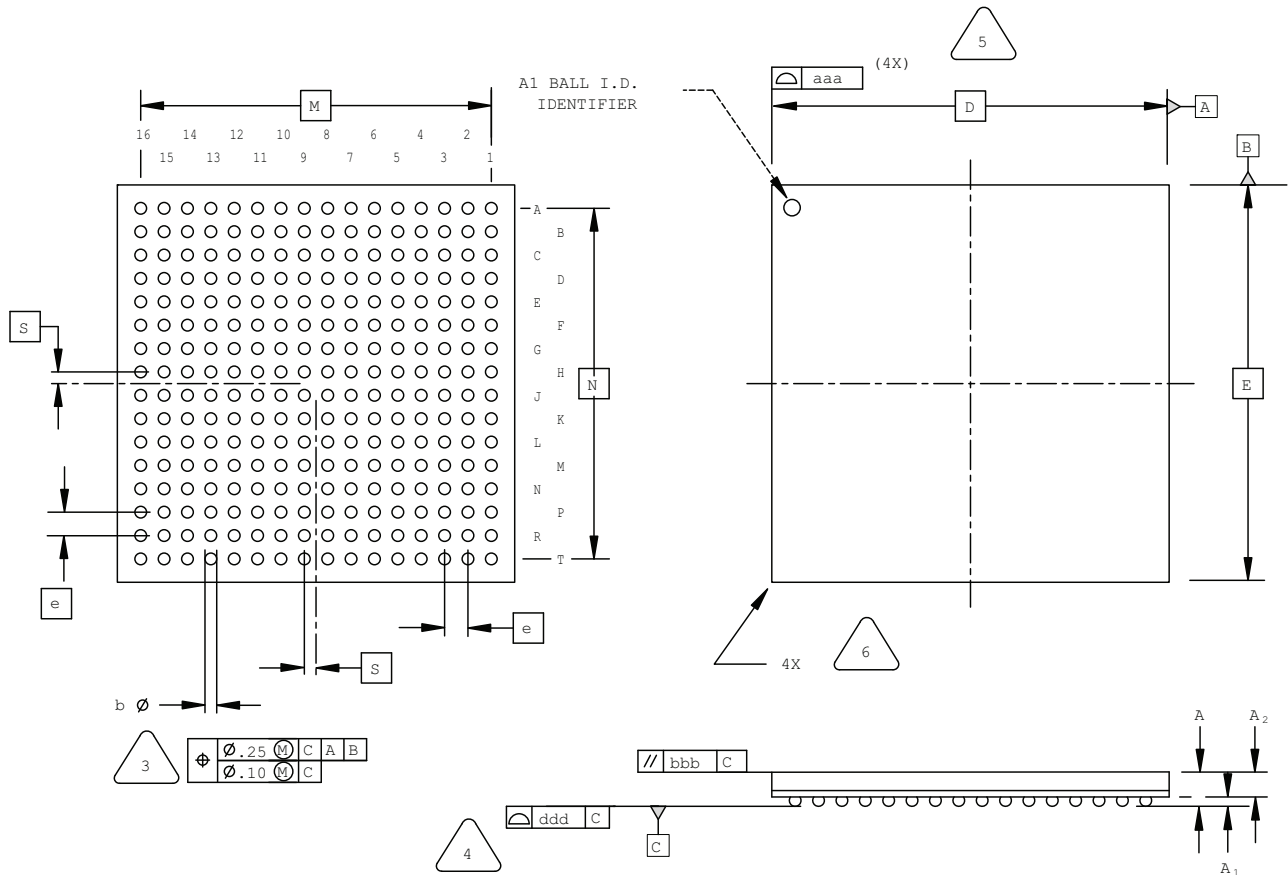


EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL.

SYMBOL	MIN.	NOM.	MAX.
A	1.25	1.40	1.55
A1	0.30	-	-
A2	-	-	1.25
D/E	17.0 BSC		
M/N	15.0 BSC		
S	0.50 BSC		
b	0.40	0.50	0.60
e	1.0 BSC		
aaa	-	-	0.20
bbb	-	-	0.25
ddd	-	-	0.12

256-Ball ftBGA Package Option 1: ispMACH 4000, MachXO, LatticeXP2

Dimensions in Millimeters



NOTES: UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M.
2. ALL DIMENSIONS ARE IN MILLIMETERS.



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



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



BILATERAL TOLERANCE ZONE IS APPLIED TO EACH SIDE OF THE PACKAGE BODY.

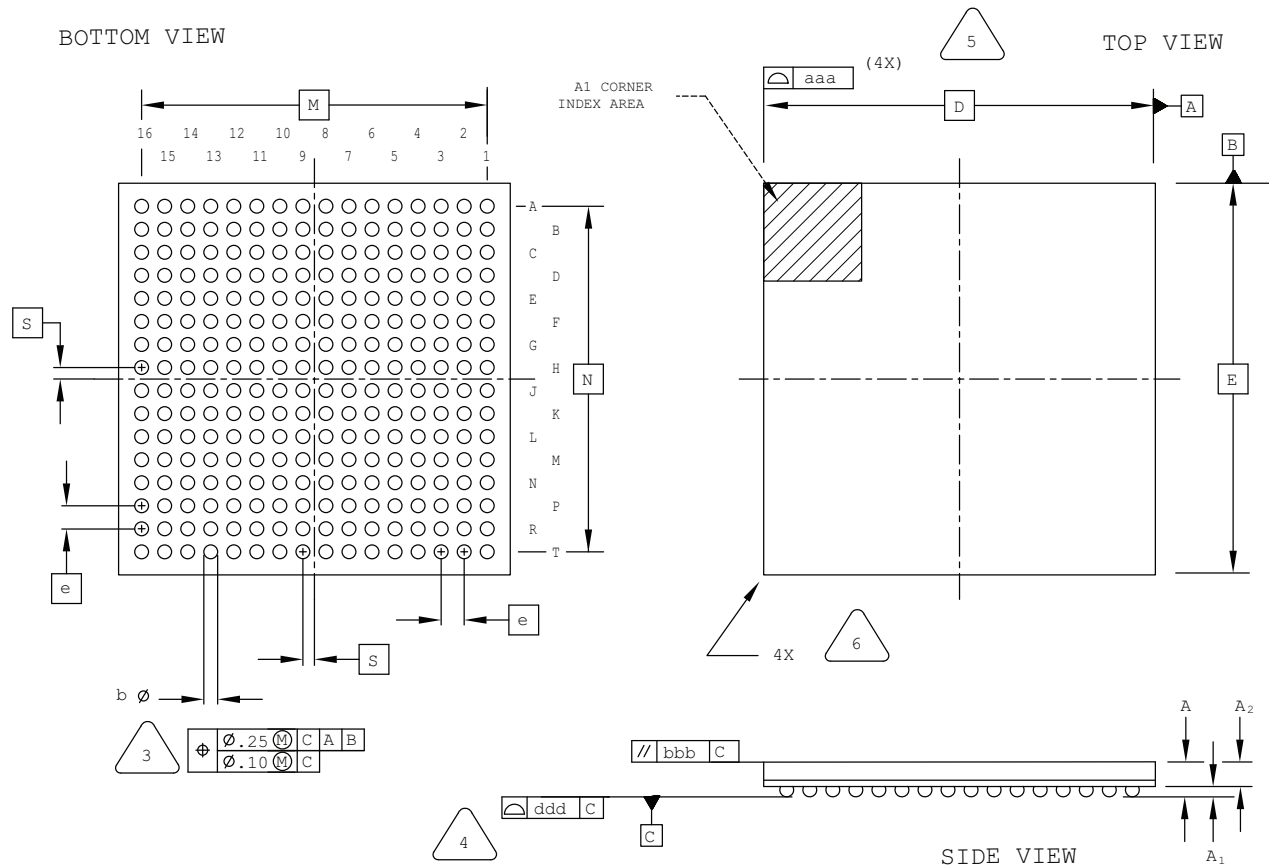


EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL.

SYMBOL	MIN.	NOM.	MAX.
A	1.25	1.40	1.55
A1	0.30	-	-
A2	-	-	1.25
D/E	17.0 BSC		
M/N	15.0 BSC		
S	0.50 BSC		
b	0.40	0.50	0.60
e	1.00 BSC		
aaa	-	-	0.20
bbb	-	-	0.25
ddd	-	-	0.12

256-Ball ftBGA Package Option 2: LatticeECP3™

Dimensions in Millimeters



NOTES: UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M.
2. ALL DIMENSIONS ARE IN MILLIMETERS.



DIMENSION "b" IS MEASURED AT THE MAXIMUM SOLDER BALL DIAMETER, PARALLEL TO PRIMARY DATUM [C]



PRIMARY DATUM [C] AND SEATING PLANE ARE DEFINED BY THE SPHERICAL CROWNS OF THE SOLDER BALLS.



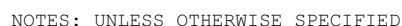
BILATERAL TOLERANCE ZONE IS APPLIED TO EACH SIDE OF THE PACKAGE BODY.



EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL.

SYMBOL	MIN.	NOM.	MAX.
A	1.30	1.70	2.10
A1	0.30	0.50	0.70
A2	1.40 REF		
D/E	17.0 BSC		
M/N	15.0 BSC		
S	0.50 BSC		
b	0.50	0.60	0.70
e	1.0 BSC		
aaa	-	-	0.20
bbb	-	-	0.25
ddd	-	-	0.20

Dimensions in Millimeters

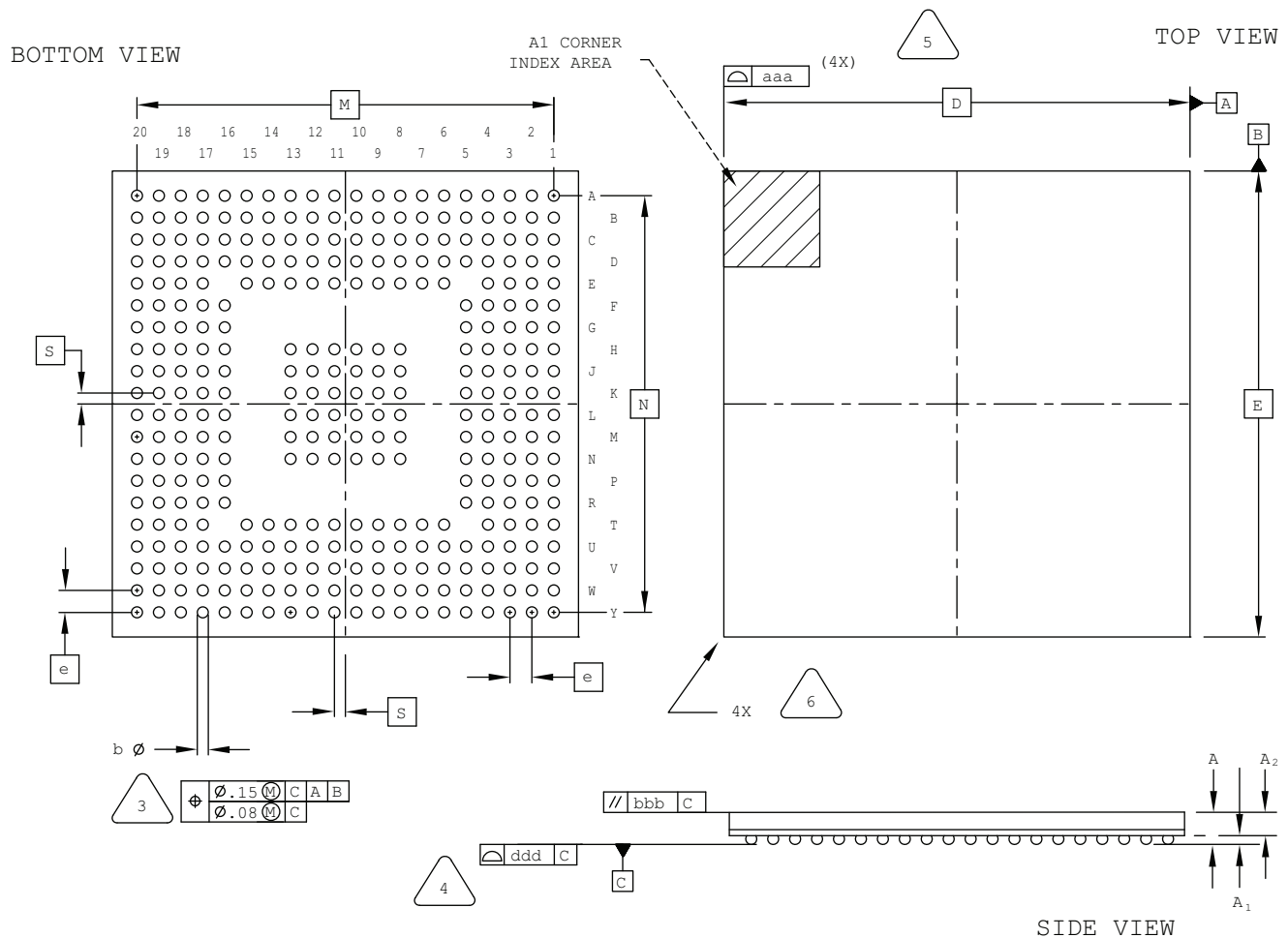


- 1
- 2
- 3
- 4
- 5
- 6
- DIMENSION "b" IS MEASURED AT THE
MAXIMUM SOLDER BALL DIAMETER,
PARALLEL TO PRIMARY DATUM [C]
- PRIMARY DATUM [C] AND SEATING
PLANE ARE DEFINED BY THE SPHERICAL
CROWNS OF THE SOLDER BALLS.
- BILATERAL TOLERANCE ZONE IS APPLIED
TO EACH SIDE OF THE PACKAGE BODY.
- EXACT SHAPE AND SIZE OF THIS FEATURE
IS OPTIONAL.

SYMBOL	MIN.	NOM.	MAX.
A	1.25	1.50	1.70
A1	0.30	-	-
A2	-	-	1.40
D/E	19.0 BSC		
M/N	17.0 BSC		
S	0.50 BSC		
b	0.40	0.60	0.70
e	1.00 BSC		
aaa	-	-	0.20
bbb	-	-	0.25
ddd	-	-	0.20

332-Ball caBGA Package

Dimensions in Millimeters



NOTES: UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M.
2. ALL DIMENSIONS ARE IN MILLIMETERS.



DIMENSION "b" IS MEASURED AT THE MAXIMUM SOLDER BALL DIAMETER, PARALLEL TO PRIMARY DATUM [C]

PRIMARY DATUM [C] AND SEATING PLANE ARE DEFINED BY THE SPHERICAL CROWNS OF THE SOLDER BALLS.

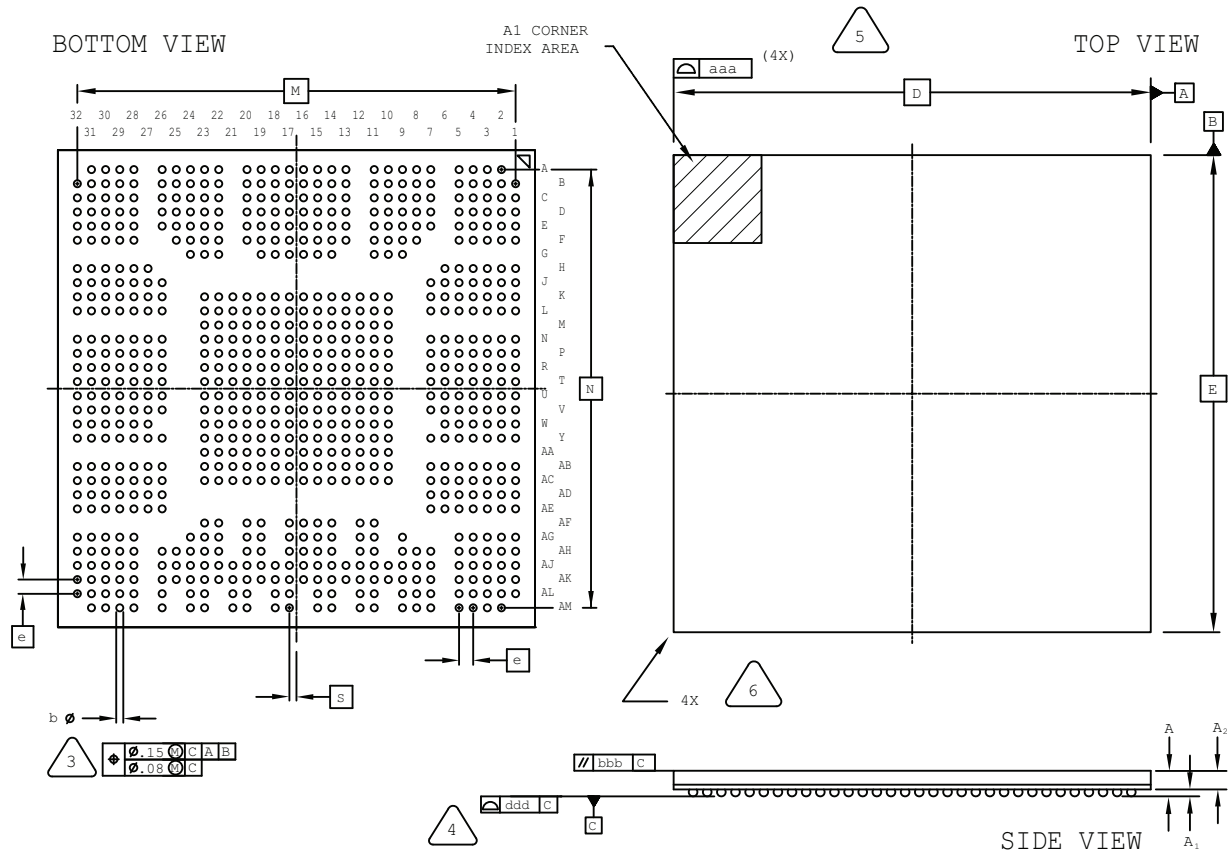
BILATERAL TOLERANCE ZONE IS APPLIED TO EACH SIDE OF THE PACKAGE BODY.

EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL.

SYMBOL	MIN.	NOM.	MAX.
A	-	-	2.00
A1	0.25	-	-
A2	0.65	-	-
D/E	17.0 BSC		
M/N	15.2 BSC		
S	0.40 BSC		
b	0.40	0.45	0.50
e	0.80 BSC		
aaa	-	-	0.15
bbb	-	-	0.20
ddd	-	-	0.20

756-Ball caBGA Package

Dimensions in Millimeters



NOTES: UNLESS OTHERWISE SPECIFIED

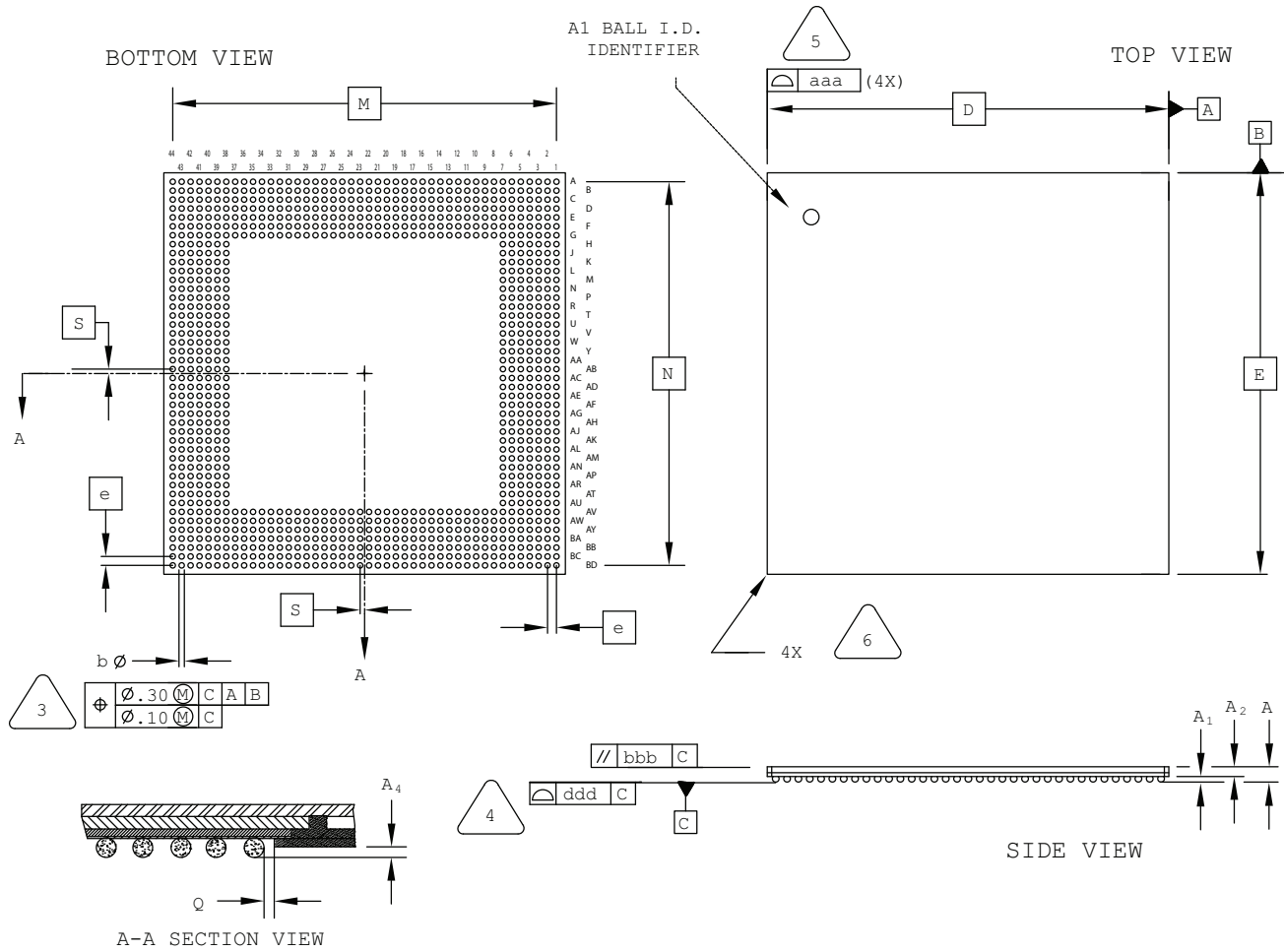
- DIMENSIONS AND TOLERANCES PER ANSI Y14.5M.
- ALL DIMENSIONS ARE IN MILLIMETERS.

- 3 DIMENSION "b" IS MEASURED AT THE MAXIMUM SOLDER BALL DIAMETER, PARALLEL TO PRIMARY DATUM [C]
- 4 PRIMARY DATUM [C] AND SEATING PLANE ARE DEFINED BY THE SPHERICAL CROWNS OF THE SOLDER BALLS.
- 5 BILATERAL TOLERANCE ZONE IS APPLIED TO EACH SIDE OF THE PACKAGE BODY.
- 6 EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL.

SYMBOL	MIN.	NOM.	MAX.
A	-	-	1.76
A1	0.25	0.30	0.35
A2	0.80	-	-
D/E	27.00 BSC		
M/N	24.80 BSC		
S	0.40 BSC		
b	0.35	0.40	0.45
e	0.80 BSC		
aaa	-	-	0.15
bbb	-	-	0.20
ddd	-	-	0.12

1036-Ball ftSBGA Package

Dimensions in Millimeters



NOTES: UNLESS OTHERWISE SPECIFIED

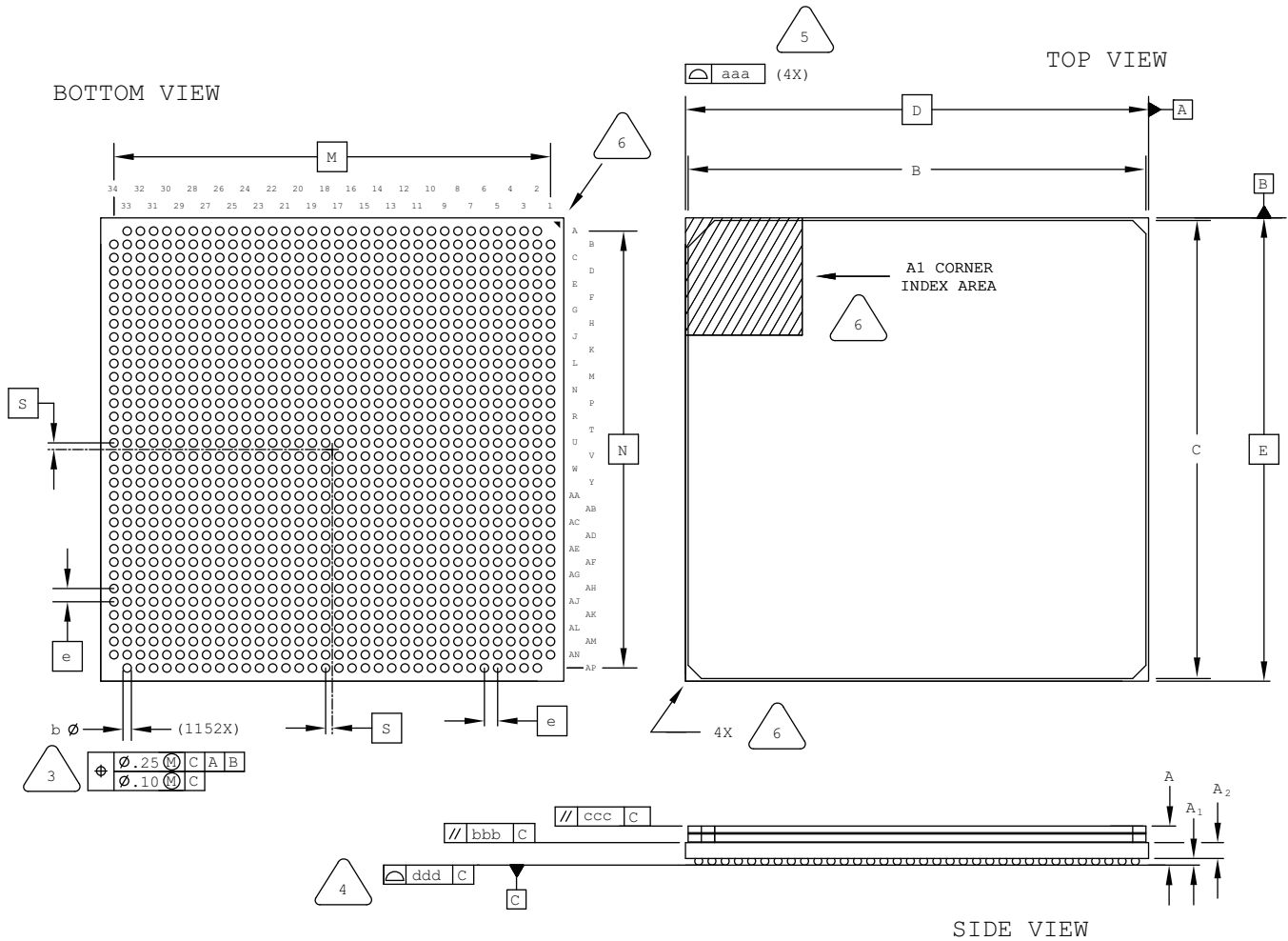
1. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M.
2. ALL DIMENSIONS ARE IN MILLIMETERS.

3. DIMENSION "b" IS MEASURED AT THE MAXIMUM SOLDER BALL DIAMETER, PARALLEL TO PRIMARY DATUM [C]
4. PRIMARY DATUM [C] AND SEATING PLANE ARE DEFINED BY THE SPHERICAL CROWNS OF THE SOLDER BALLS.
5. BILATERAL TOLERANCE ZONE IS APPLIED TO EACH SIDE OF THE PACKAGE BODY.
6. EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL.

SYMBOL	MIN.	NOM.	MAX.
A	-	-	1.80
A1	0.40	0.55	0.70
A2	0.90	0.98	1.10
D/E	45.00 BSC		
M/N	43.00 BSC		
S	0.50 BSC		
b	0.50	0.65	0.80
e	1.00 BSC		
Q	0.25	-	-
A4	0.10	-	-
aaa	-	-	0.20
bbb	-	-	0.35
ddd	-	-	0.20

1152-Ball Organic fcBGA Package Option 2: LatticeSC/SCM80 & SC/SCM115

Dimensions in Millimeters



NOTES: UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M.
2. ALL DIMENSIONS ARE IN MILLIMETERS.



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



PRIMARY DATUM **C** AND SEATING PLANE ARE DEFINED BY THE SPHERICAL CROWNS OF THE SOLDER BALLS.



BILATERAL TOLERANCE ZONE IS APPLIED TO EACH SIDE OF THE PACKAGE BODY.



EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL.

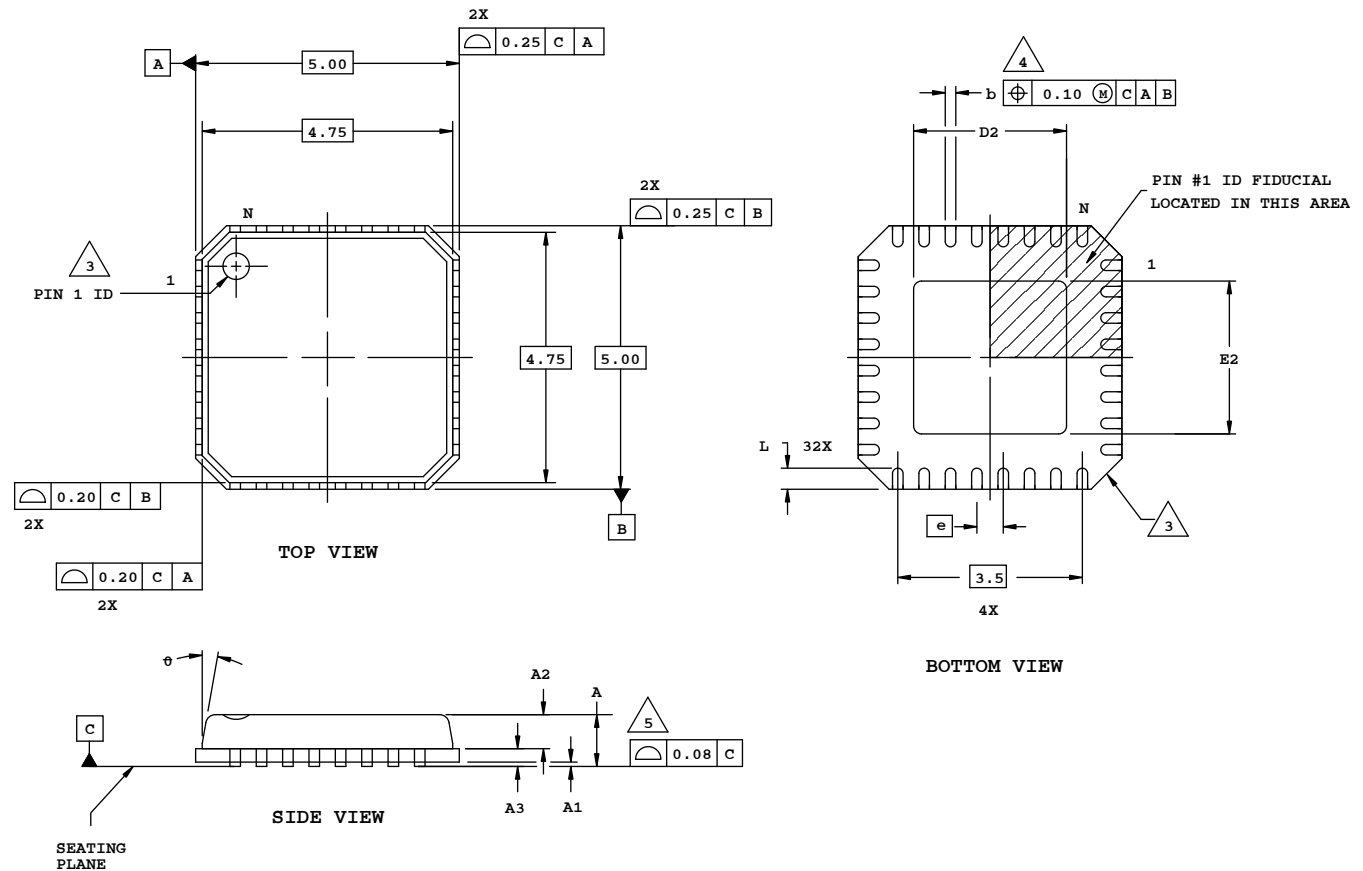
SYMBOL	MIN.	NOM.	MAX.
A	2.80	3.15	3.50
A1	0.35	0.50	0.65
A2	1.20 REF		
B/C	34.30	34.60	34.90
D/E	35.00 BSC		
M/N	33.00 BSC		
S	0.50 BSC		
b	0.50	0.60	0.70
e	1.00 BSC		
aaa	-	-	0.20
bbb	-	-	0.25
ccc	-	-	0.35
ddd	-	-	0.23

Date	Version	Change Summary
June 2014	4.4	Updated 48-Pin QFNS Package to 48-Pin QFN Package.
		Added 48-Pin QFN Package Option 2.
		Added 49-Ball WLCS Package.
		Added 237-Ball ftBGA Package.
		Added 285-Ball csfBGA Package.
		Added 20-Ball WLCS Package.
		Added 36-Ball WLCS Package.
March 2014	04.3	Restored references to indicate top, bottom, and side views.
		Added 381-Ball caBGA Package.
		Added 554-Ball caBGA Package.
		Added 756-Ball caBGA Package.
December 2013	04.2	Added "1" and "N" characters to 100-Pin TQFP Package Option 1: MachXO2, MachXO diagram (Top View).
September 2013	04.1	Added 16-ball WLCS package.
		Revised 25-Ball WLCS Package title to 25-Ball WLCS Package (0.40mm Pitch).
		Added 25-Ball WLCS Package (0.35mm Pitch).
		Added references to indicate top, bottom, and side views.
August 2013	04.0	Revised 144-pin TQFP package diagram.
February 2013	03.9	Added 184-ball csBGA package.
November 2012	03.8	Added iCE40 to the list of applicable products for the 32-pin QFNS Option 1 package.
October 2012	03.7	Revised 324-ball ftBGA package drawing.
September 2012	03.6	Nomenclature change – “iCE40 100-Pin TQFP Package Option 2” changed to “iCE40 100-Pin VQFP Package Option 2”.
August 2012	03.5	Added 36-ball ucBGA, 49-ball ucBGA, 81-ball ucBGA, 81-ball csBGA, 84-pin QFN, 100-pin TQFP Option 2, 121-ball csBGA, 121-ball ucBGA, 132-ball csBGA Option 2, 196-ball csBGA, 225-ball ucBGA, 284-ball csBGA packages.
July 2012	03.4	Added 676-ball fcBGA package.
March 2012	03.3	Added new 32-Pin QFNS Package Option 2 for MachXO2. Moved 32-pin QFN (punch singulated) package drawing to new Package Archive Appendix.
February 2012	03.2	Updated document with new corporate logo.
December 2011	03.1	Updated WLCS package offering.
October 2011	03.0	Added 49-ball WLCS package and updated 25-ball WLCS package.
		Added 328-ball csBGA package.
July 2011	02.8	Included revised diagrams for the following packages: 56-ball csBGA, 100-ball csBGA and 132-ball csBGA. Added new 256-ball ftBGA Option 3 package.
May 2011	02.7	Added MachXO2 to the list of applicable products for the 256 ftBGA Option 1 package outline.
November 2010	02.6	Added 25-ball WLCS and 332-ball caBGA package drawings. Revised 100-pin PQFP, 120-pin PQFP, 128-pin PQFP, 160-pin PQFP and 208-pin PQFP package drawings. Removed obsolete packages including 144-, 240- and 304-pin PQFP packages.
October 2010	02.5	Added 208-ball ftBGA package.
September 2010	02.4	Revised maximum coplanarity values on Organic 1152 Flip Chip BGA – Option 2 and on Organic 1704 Flip Chip BGA from 0.20 mm to 0.23 mm.
March 2010	02.3	Added new 1020-ball Organic fcBGA rev.2, 1152-ball Organic fcBGA, and 1704-ball Organic fcBGA package drawings. Removed obsolete 492-Ball BGA package.
February 2010	02.2	Revised 256-ball caBGA nominal solder ball diameter from 0.5 mm to 0.45 mm to better match actual dimension.
December 2009	02.1	Revised 256-ball caBGA package to specify correct JEDEC reference number.

Appendix A. Package Archive

32-Pin QFN (Punch Singulated) Package

Dimensions in Millimeters



NOTES: UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M.
2. ALL DIMENSIONS ARE IN MILLIMETERS.

EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL.

DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.20 AND 0.25 mm FROM TERMINAL TIP.

APPLIES TO EXPOSED PORTION OF TERMINALS.

SYMBOL	MIN.	NOM.	MAX.
A	-	0.85	1.00
A1	0.00	0.01	0.05
A2	0.00	0.65	1.00
A3	0.20 REF		
D2	1.25	2.70	3.25
E2	1.25	2.70	3.25
e	0.50 BSC		
b	0.18	0.24	0.30
L	0.30	0.40	0.50
θ	-	-	12