

Welcome to **E-XFL.COM**

Understanding <u>Embedded - FPGAs (Field Programmable Gate Array)</u>

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/lfec33e-4f672i

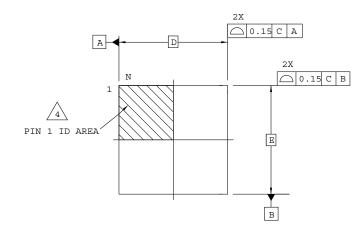
Email: info@E-XFL.COM

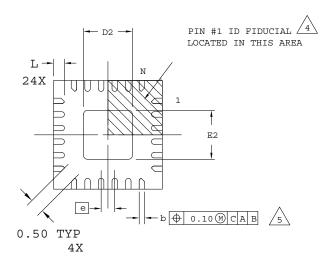
Address: Room A, 16/F, Full Win Commercial Centre, 573 Nathan Road, Mongkok, Hong Kong



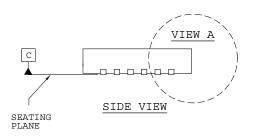
24-Pin QFNS Package

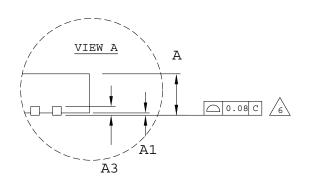
Dimensions in Millimeters





TOP VIEW





BOTTOM VIEW

NOTES: UNLESS OTHERWISE SPECIFIED

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

 $\sqrt{4}$

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

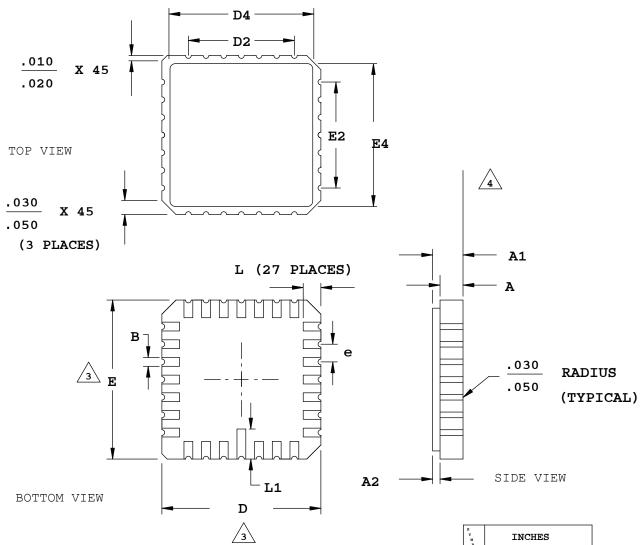
APPLIES TO EXPOSED PORTION OF TERMINALS.

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	
е	0.50 BSC			
L	0.45	0.50	0.55	



28-Pin LCC Package

Dimensions in Inches



NOTES:

- 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5.
- 2. ALL DIMENSIONS ARE IN INCHES.

<u>/3.</u>

DIMENSIONS D AND E MAY HAVE MATERIAL PROTRUSION OF .010 INCHES MAXIMUM ABOVE THE DIMENSION SHOWN NOT TO EXCEED .005 INCHES MAXIMUM PER SIDE.



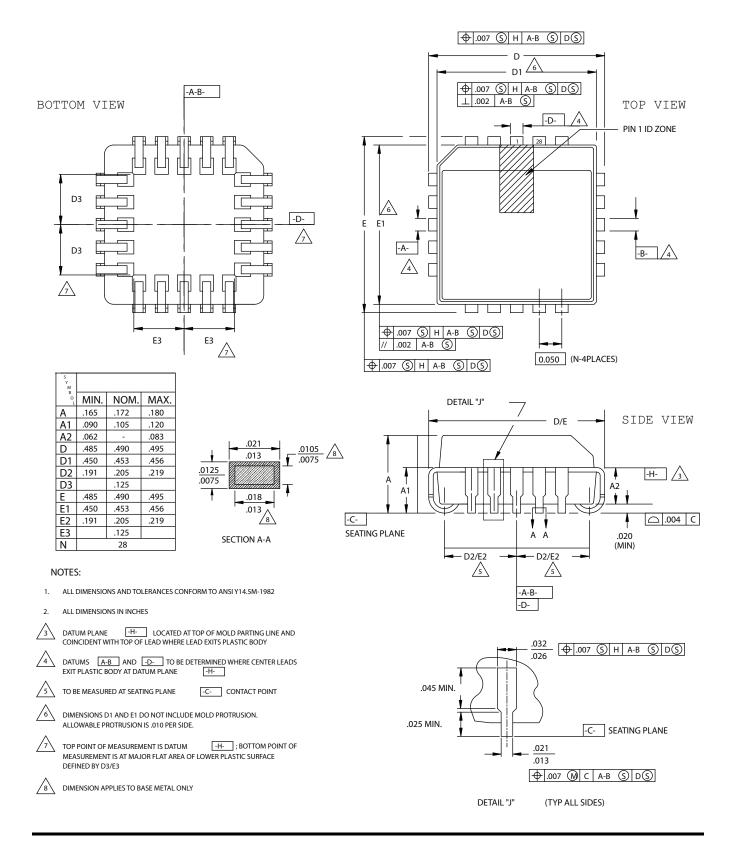
FLATNESS TOLERANCE IS .004 INCHES PER INCH.

S Y M	INCHES			
0 L	MIN.		MAX.	
A	.054		.074	
A1	.064		.089	
A2	.007		.015	
В	.022		.028	
D	.440		.460	
D2		.300		
D4	.370		.403	
E	.440		.460	
E2		.300		
E4	.370		.403	
е	.050 BSC			
L	.042		.058	
L1	.075		.095	



28-Pin PLCC Package

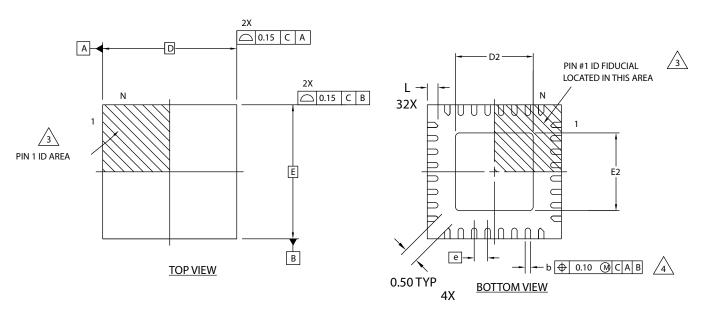
Dimensions in Inches

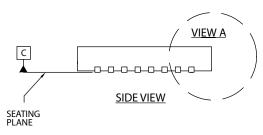


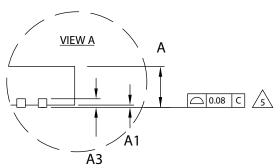


32-Pin QFN Package Option 1: Power Manager II, iCE40™

Dimensions in Millimeters







NOTES: UNLESS OTHERWISE SPECIFIED

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

EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL.

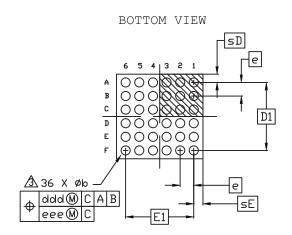
DIMENSION b APPLIES TO PLATED
TERMINAL AND IS MEASURED BETWEEN
0.15 AND 0.30 mm FROM TERMINAL TIP.

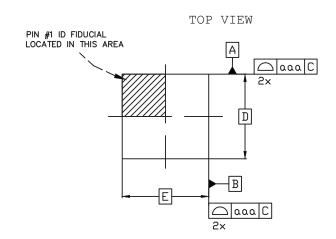
SYMBOL	MIN.	NOM.	MAX.
А	0.80	0.90	1.00
A1	0.00	0.02	0.05
A3		0.2 REF	
D	5.0 BSC		
D2	1.25	2.70	3.75
E	5.0 BSC		
E2	1.25	2.70	3.75
b	0.18	0.24	0.30
е	0.50 BSC		
L	0.30	0.40	0.50

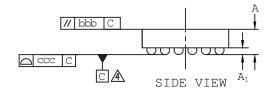


36-Ball WLCS Package Option 2: MachXO3[™]

Dimensions in Millimeters







NOTES:

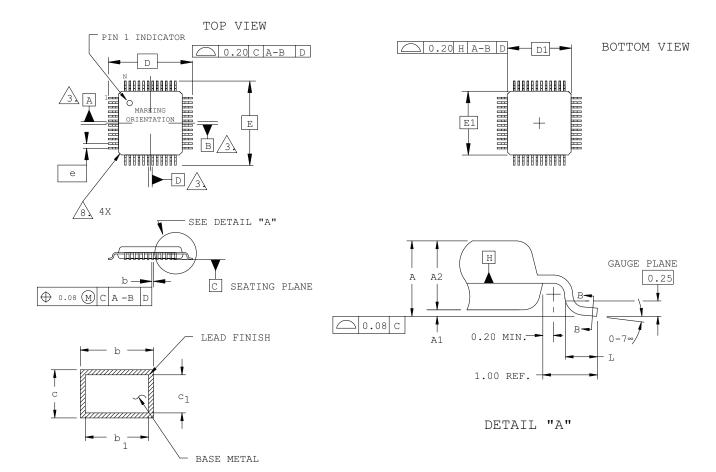
- 1. ALL DIMENSIONS AND TOLERANCE PER ASME Y 14.5M 1994.
- 2. ALL DIMENSIONS ARE IN MILLIMETERS.
- △ DIMENSION "b" IS MEASURES AT THE MAXIMUM BUMP DIAMETER PARALLEL TO PRIMARY DATUM [C].
- \triangle PRIMARY DATUM $\boxed{\text{C}}$ AND SEATING PLANE ARE DEFINED BY THE SPHERICAL CROWNS OF THE SOLDER BUMPS.

REF.	Min.	Nom.	Max.	
A	0.510	0.543	0.576	
A1	0.167	0.196	0.225	
b	0.239	0.266	0.319	
D		2.487 BS	C	
E		2.541 BS	C	
D1		2.00 BSC	:	
E1	2.00 BSC			
е		0.40 BSC	:	
sD	ı	0.244	1	
sE	ı	0.271	-	
aaa		0.025		
bbb	0.060			
ccc	0.030			
ddd	0.0150			
eee		0.050		



48-Pin TQFP Package (1.4 mm thick)

Dimensions in Millimeters



SECTION B - B

NOTES:

- 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5 1982.
- 2. ALL DIMENSIONS ARE IN MILLIMETERS.
- $\sqrt{3}$ DATUMS A, B AND D TO BE DETERMINED AT DATUM PLANE H.
- 4. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD PROTRUSION.
 ALLOWABLE MOLD PROTRUSION IS 0.254 MM ON D1 AND E1
- 5. THE TOP OF PACKAGE MAY BE SMALLER THAN THE BOTTOM OF THE PACKAGE BY 0.15 MM.
- 6. SECTION B-B:
 THESE DIMENSIONS APPLY TO THE FLAT SECTION OF THE
 LEAD BETWEEN 0.10 AND 0.25 MM FROM THE LEAD TIP.
- 7. A1 IS DEFINED AS THE DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT ON THE PACKAGE BODY.

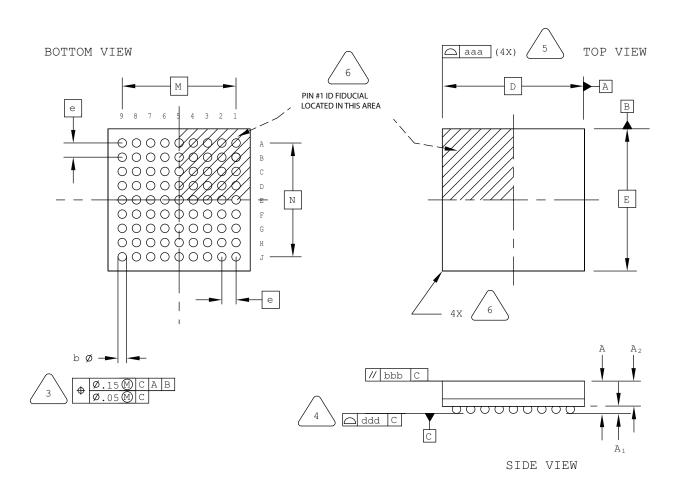
Λ								
/8\	7	EXACT	SHAPE	OF	EACH	CORNER	IS	OPTIONAL.

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		
е		0.50 BSC	
b	0.17	0.22	0.27
b1	0.17	0.20	0.23
С	0.09	0.15	0.20
c1	0.09	0.13	0.16



81-Ball ucBGA 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.

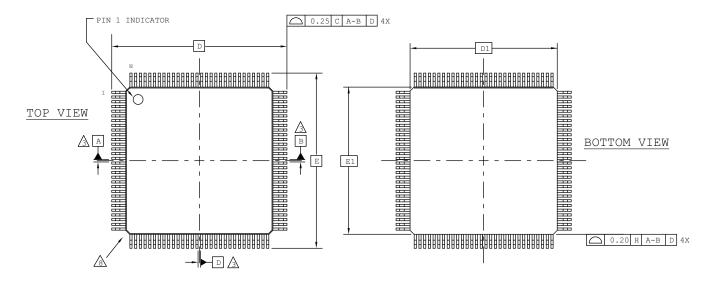


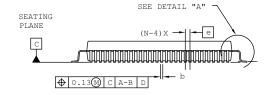
SYMBOL	MIN.	NOM.	MAX.
А	-	-	1.00
A1	0.10	_	-
A2	1	-	0.90
D/E	4.00 BSC		
M/N	3.20 BSC		
b	0.20	0.25	0.30
е	0.40 BSC		
aaa	_	_	0.10
bbb	-	_	0.10
ddd	-	_	0.10

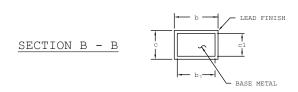


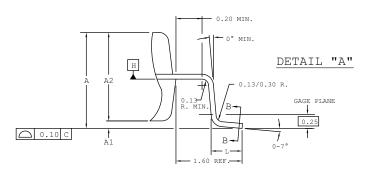
160-Pin PQFP Package

Dimensions in Millimeters









NOTES:

- 1.0 DIMENSIONING AND TOLERANCING PER ANSI Y14.5 1982.
- 2.0 ALL DIMENSIONS ARE IN MILLIMETERS.
- $\stackrel{\textstyle \wedge}{\Im}$ datums a, b and d to be determined at datum plane H.
- 4.0 DIMENSIONS D1 AND E1 D0 NOT INCLUDE MOLD PROTRUSION. ALLOWABLE MOLD PROTRUSION IS 0.254 MM ON D1 AND E1 DIMENSIONS.
- 5.0 THE TOP OF PACKAGE MAY BE SMALLER THAN THE BOTTOM OF THE PACKAGE BY 0.15 MM.
- 6.0 SECTION B-B:
 THESE DIMENSIONS APPLY TO THE FLAT SECTION OF THE
 LEAD BETWEEN 0.10 AND 0.25 MM FROM THE LEAD TIP.
- 7.0 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.

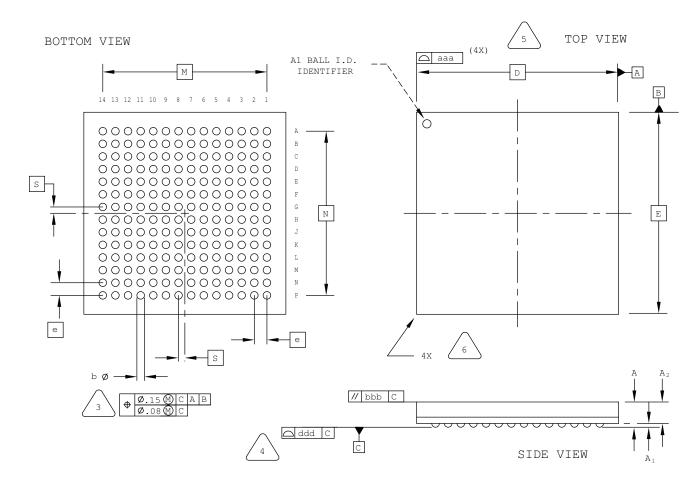
A EXACT SHAPE OF EXPOSED HEATSINK IS OPTIONAL.

SYMBOL	MIN.	NOM.	MAX.
A	=	-	4.10
A1	0.25	-	0.50
A2	3.20	3.40	3.60
D		31.20 BSC	
D1		28.00 BSC	!
E		31.20 BSC	!
E1		28.00 BSC	!
L	0.73 0.88		1.03
N	160		
е	0.65 BSC		
b	0.22	-	0.40
b1	0.22	0.30	0.36
С	0.11	-	0.23
c1	0.11	0.15	0.19



196-Ball csBGA 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.

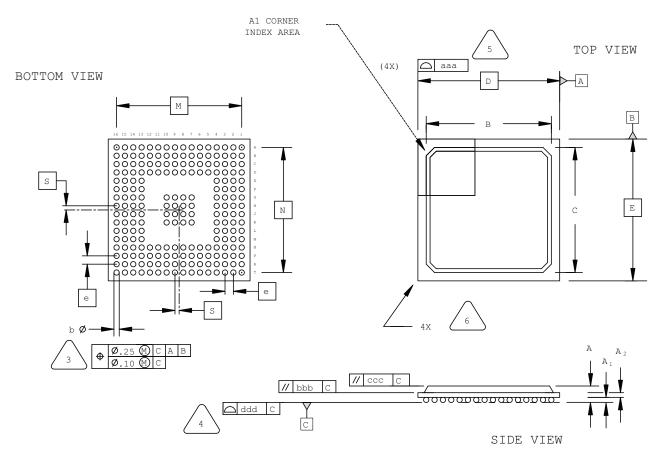


SYMBOL	MIN.	NOM.	MAX.	
А	-	-	1.00	
A1	0.15	_	_	
A2	_	_	0.85	
D/E	8.00 BSC			
M/N	6.50 BSC			
S	0	.25 BSC		
b	0.25	0.30	0.35	
е	0.50 BSC			
aaa	_	_	0.10	
bbb	_	_	0.10	
ddd	_	_	0.08	



208-Ball fpBGA Package

Dimensions in Millimeters



NOTES: UNLESS OTHERWISE SPECIFIED

- 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.

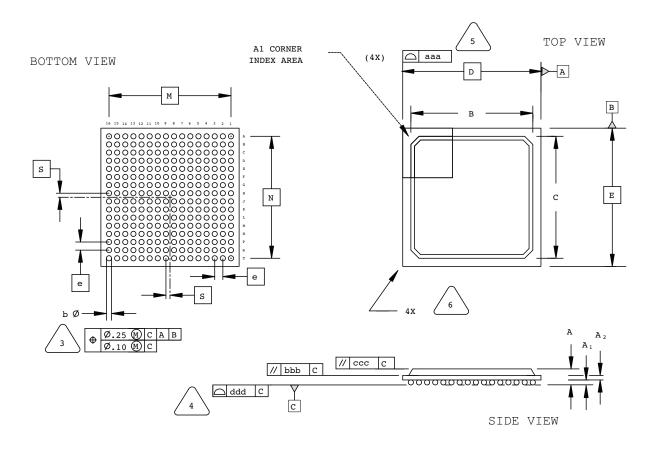


	ı	I		
SYMBOL	MIN.	NOM.	MAX.	
А	1.30	1.70	2.10	
A1	0.30	0.50	0.70	
A2	0.30	0.50	0.70	
B/C	14.80	15.30	15.80	
D/E	1	7.00 BSC		
M/N	15.00 BSC			
S		0.50 BSC		
b	0.50	0.60	0.70	
е	1	.00 BSC		
aaa	_	_	0.20	
bbb	_	_	0.25	
ccc	_		0.35	
ddd	_	_	0.20	



256-Ball fpBGA 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.

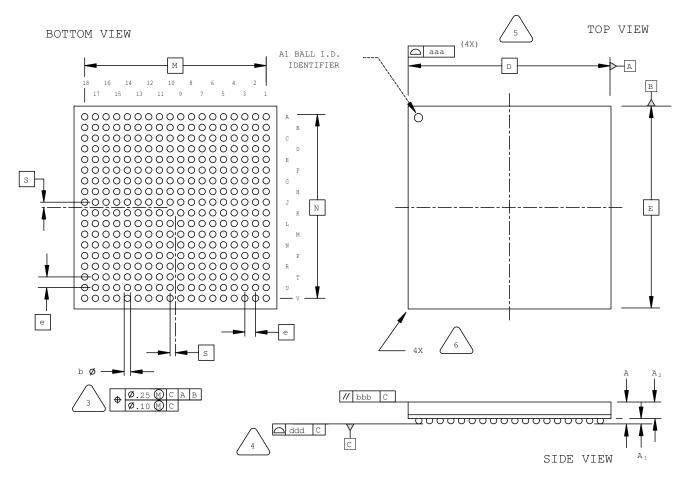


			-	
SYMBOL	MIN.	NOM.	MAX.	
A	1.30	1.70	2.10	
A1	0.30	0.50	0.70	
A2	0.30	0.50	0.70	
в/с	14.80	15.30	15.80	
D/E	17	7.00 BSC		
M/N	15.00 BSC			
S	-	0.50 BSC		
b	0.50	0.60	0.70	
е	1	.00 BSC		
aaa	-	-	0.20	
bbb	-	_	0.25	
ccc	-	_	0.35	
ddd	-	_	0.20	



324-Ball ftBGA 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.

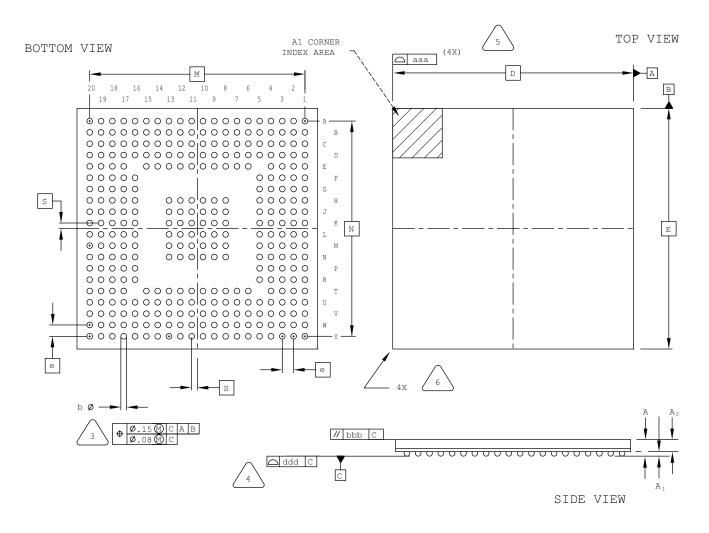


SYMBOL	MIN.	NOM.	MAX.
A	1.25	1.50	1.70
A1	0.30	-	1
A2	-	-	1.40
D/E	19.0 BSC		
M/N	17.0 BSC		
S	0.50 BSC		
b	0.40	0.60	0.70
е	1.00 BSC		
aaa	_	_	0.20
bbb	_	_	0.25
ddd	-	-	0.20



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.

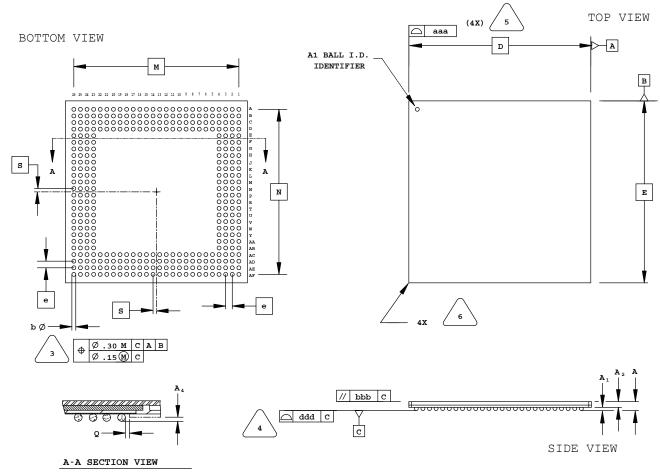


SYMBOL	MIN.	NOM.	MAX.
А	-	-	2.00
A1	0.25	_	_
A2	0.65	_	_
D/E	17.0 BSC		
M/N	15.2 BSC		
S	0.40 BSC		
b	0.40	0.45	0.50
е	0.80 BSC		
aaa	-	-	0.15
bbb	_	-	0.20
ddd	_	-	0.20



352-Ball SBGA 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.

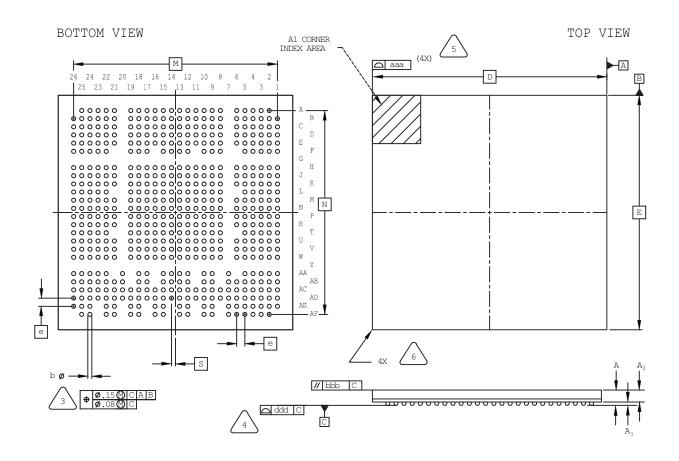


SYMBOL	MIN.	NOM.	MAX.
A	-	-	1.70
A1	0.50	0.65	0.80
A2	0.80	0.90	1.00
D/E	35	5.00 BSC	
M/N	31.75 BSC		
s	0.	.635 BSC	
b	0.60	0.75	0.90
е	1.27 BSC		
Q	0.25	-	-
A4	0.10	-	-
aaa	-	-	0.20
bbb	-	-	0.25
ddd	-	-	0.20



554-Ball caBGA Package

Dimensions in Millimeters



NOTES: UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M.

2. ALL DIMENSIONS ARE IN MILLIMETERS.

 $\sqrt{3}$

DIMENSION "b" IS MEASURED AT THE MAXIMUM SOLDER BALL DIAMETER, PARALLEL TO PRIMARY DATUM $\boxed{\mathbb{C}}$



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.

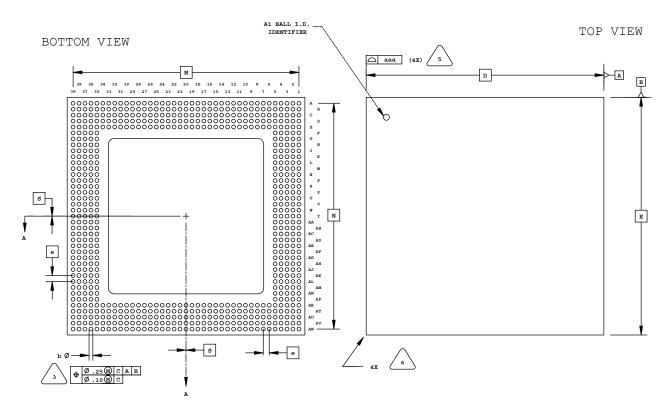


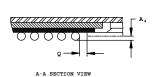
SYMBOL	MIN.	NOM.	MAX.
А	-	-	1.76
A1	0.25	0.30	0.35
A2	0.80	-	-
D/E	23.0 BSC		
M/N	20.0 BSC		
S	0.40 BSC		
b	0.35	0.40	0.45
е	0.80 BSC		
aaa	_	_	0.15
bbb	-	_	0.20
ddd	_	_	0.12

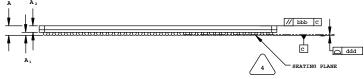


680-Ball fpSBGA Package

Dimensions in Millimeters







SIDE VIEW

NOTES: UNLESS OTHERWISE SPECIFIED

- 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.

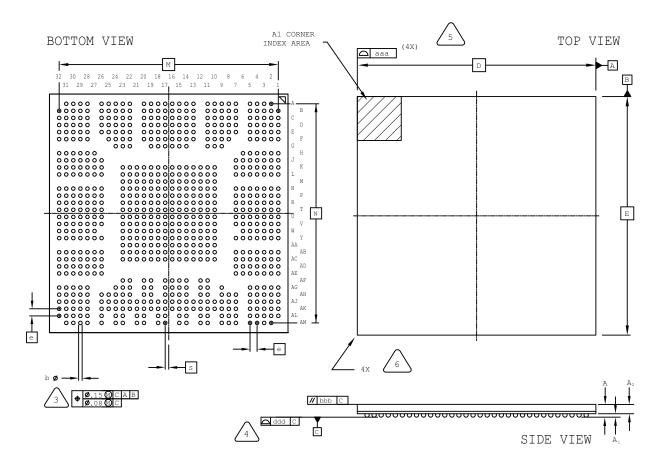


SYMBOL	MIN.	NOM.	MAX.
A	-	-	1.70
A1	0.45	0.53	0.60
A2	0.90	0.98	1.05
D/E	40	0.00 BSC	
M/N	31	3.00 BSC	
s	0.00 BSC		
b	0.50	0.65	0.80
е	1.00 BSC		
Q	0.25	-	-
A4	0.10	-	-
aaa	-	-	0.20
bbb	-	-	0.25
ddd	-	-	0.20



756-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.

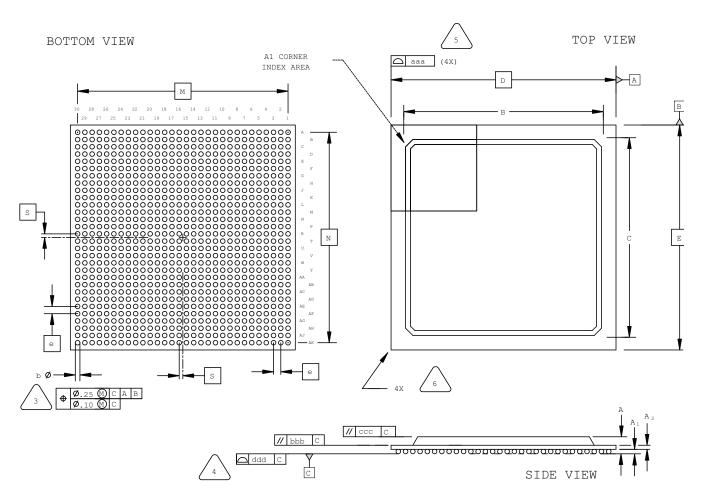


SYMBOL	MIN.	NOM.	MAX.
A	-	-	1.76
A1	0.25	0.30	0.35
A2	0.80	-	-
D/E	27.00 BSC		
M/N	24.80 BSC		
S	0.40 BSC		
b	0.35	0.40	0.45
е	0.80 BSC		
aaa	_	-	0.15
bbb	_	-	0.20
ddd	_	-	0.12



900-Ball fpBGA 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.

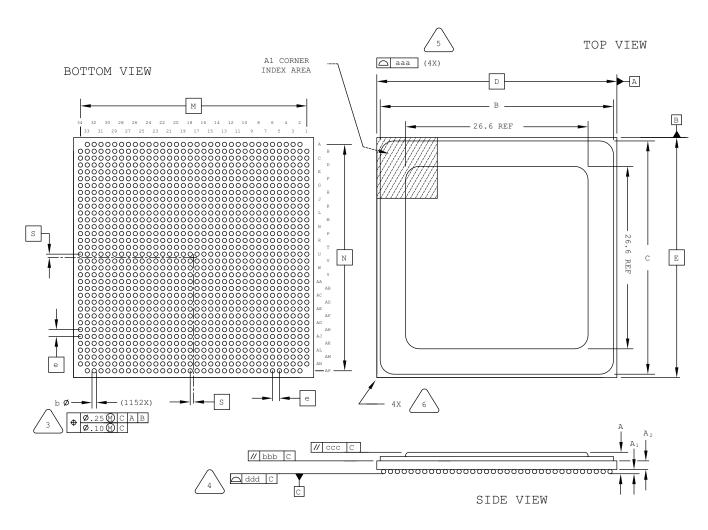


SYMBOL	MIN.	NOM.	MAX.
А	1.70	2.15	2.60
A1	0.30	0.50	0.70
A2	0.30	0.50	0.70
B/C	25.80	27.55	29.30
D/E	31.00 BSC		
M/N	29.00 BSC		
S	0.50 BSC		
b	0.50	0.60	0.70
е	1.00 BSC		
aaa	_	-	0.20
bbb	-	_	0.25
ccc	-		0.35
ddd	_	_	0.20



1152-Ball Organic fcBGA Package Option 1: LatticeSC/SCM40

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.



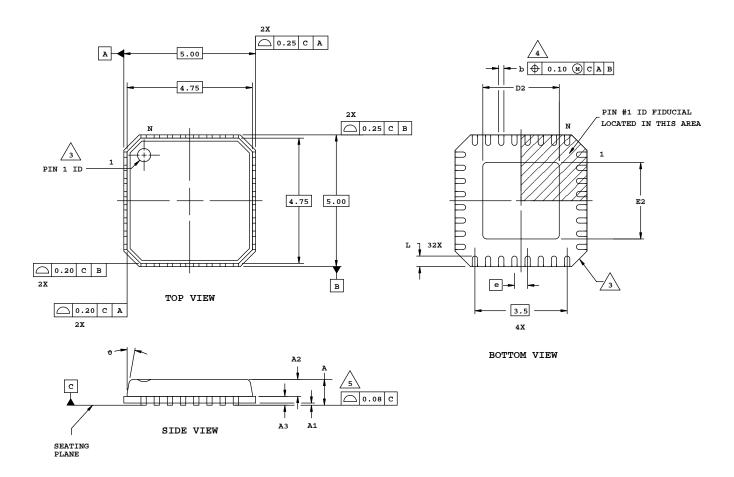
SYMBOL	MIN.	NOM.	MAX.
A	2.55	2.90	3.25
A1	0.35	0.50	0.65
A2	1	.20 REF	
B/C	34.25	34.50	34.75
D/E	35.00 BSC		
M/N	33.00 BSC		
S	0.50 BSC		
b	0.50	0.60	0.70
е	1.00 BSC		
aaa	-	-	0.20
bbb	-	-	0.25
ccc	-	-	0.35
ddd	_	_	0.20



Appendix A. Package Archive

32-Pin QFN (Punch Singulated) Package

Dimensions in Millimeters



NOTES: UNLESS OTHERWISE SPECIFIED

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

<u>3</u> H

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
A 3	0.20 REF		
D2	1.25	2.70	3.25
E2	1.25	2.70	3.25
е	0.50 BSC		
b	0.18	0.24	0.30
L	0.30	0.40	0.50
Ð	-	-	12