

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	19700
Total RAM Bits	434176
Number of I/O	400
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/lfec20e-3f672i

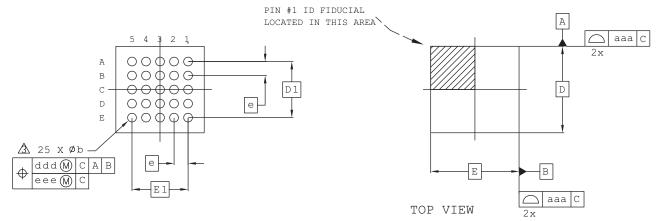
Email: info@E-XFL.COM

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

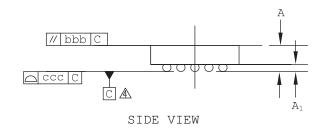


25-Ball WLCS Package (0.40 mm Pitch)

Dimensions in Millimeters



BOTTOM VIEW



Notes:

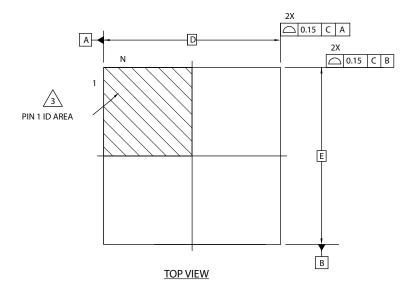
- 1 ALL DIMENSIONS AND TOLERANCE PER ASME Y 14.5M 1994.
- 2 ALL DIMENSIONS ARE IN MILLIMETERS.
- △ DIMENSION "b" IS MEASURED AT THE MAXIMUM BUMP DIAMETER PARALLEL TO PRIMARY DATUM C.
- A PRIMARY DATUM C AND SEATING PLANE ARE DEFINED BY THE SPHERICAL CROWNS OF THE SOLDER BUMPS.

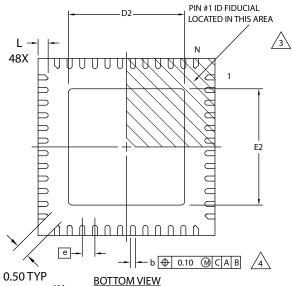
REF.	Min.	Nom.	Max.
A	0.535	0.575	0.615
A1	0.170	0.200	0.230
b	0.220	0.250	0.280
D	2	.492 BS	SC
E	2	.546 BS	SC
D1	1	.60 BSC	
E1	1.60 BSC		
е	0.40 BSC		
aaa	0.025		
bbb	0.060		
ccc	0.015		
ddd	0.150		
eee	0	.050	

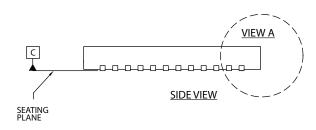


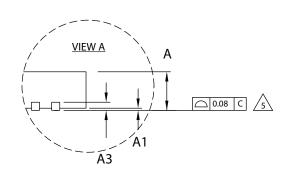
48-Pin QFN Package Option 1

Dimensions in Millimeters









NOTES: UNLESS OTHERWISE SPECIFIED

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

 $\underline{ \begin{tabular}{ll} λ & EXACT SHAPE AND SIZE OF THIS \\ FEATURE IS OPTIONAL. \end{tabular}$

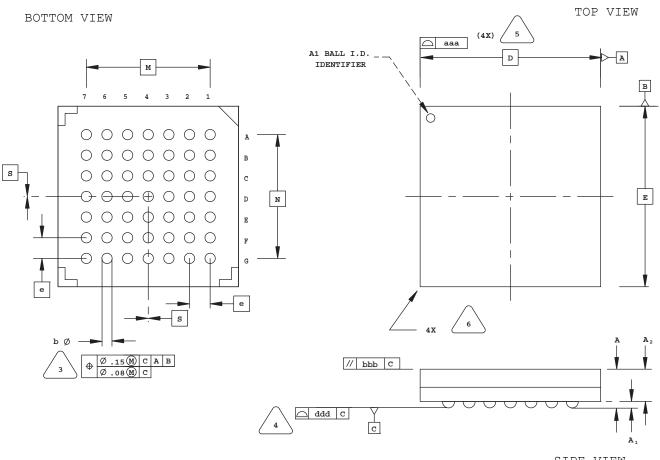
DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 mm FROM TERMINAL TIP.

APPLIES TO EXPOSED PORTION OF TERMINALS.

SYMBOL	MIN.	NOM.	MAX.
А	0.80	0.90	1.00
A1	0.00	0.02	0.05
А3	0.2 REF		
D	7.0 BSC		
D2	3.00	-	5.80
E	7.0 BSC		
E2	3.00	-	5.80
b	0.18	0.24	0.30
е	0.50 BSC		
L	0.30	0.40	0.50



Dimensions in Millimeters



SIDE VIEW

NOTES: UNLESS OTHERWISE SPECIFIED

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



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.



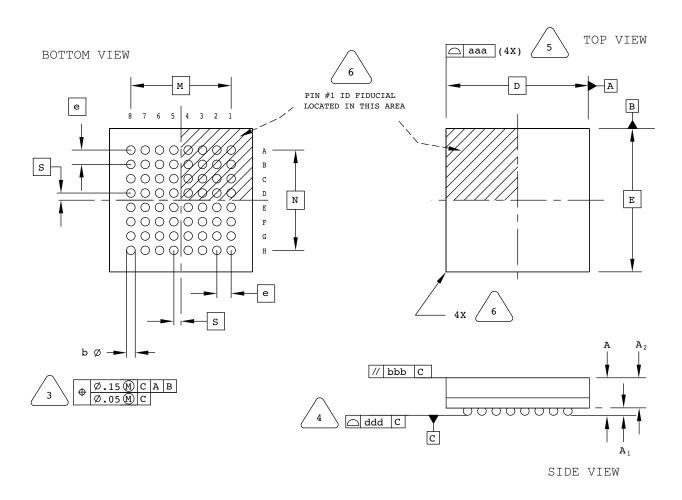
BILATERAL TOLERANCE ZONE IS APPLIED TO EACH SIDE OF THE PACKAGE BODY.



SYMBOL	MIN.	NOM.	MAX.
A	1.30	1.40	1.50
A1	0.31	0.36	0.41
A2	0.99	1.04	1.09
D/E	7	.00 BSC	
M/N	4	.80 BSC	
s		0 BSC	
b	0.40	0.46	0.52
е	0	.80 BSC	
aaa	-	-	0.10
bbb	-	-	0.10
ddd	-	-	0.12



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.



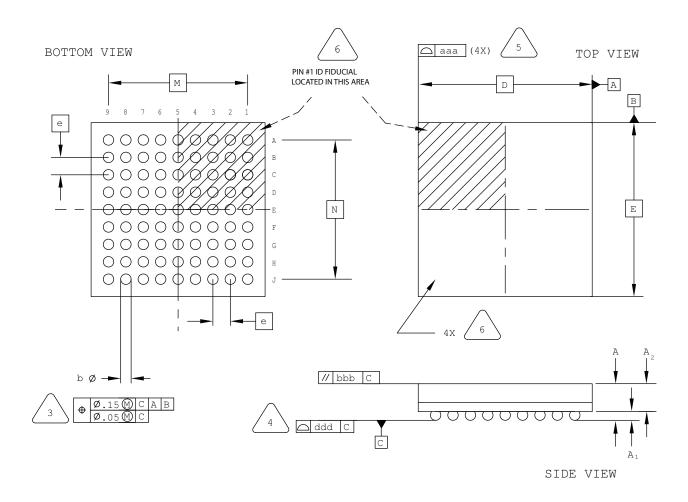
BILATERAL TOLERANCE ZONE IS APPLIED TO EACH SIDE OF THE PACKAGE BODY.



SYMBOL	MIN.	NOM.	MAX.
A	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
е	0.50 BSC		
aaa	_		
bbb	_	_	0.10
ddd	_	_	0.08



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.

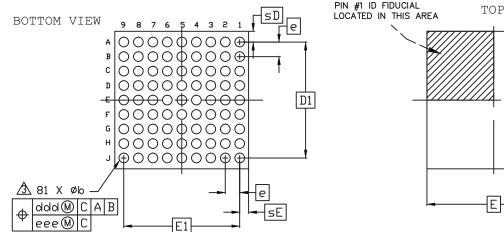


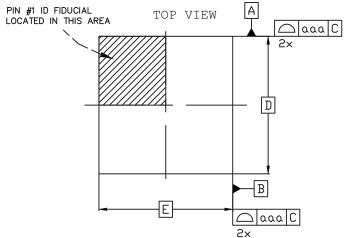
SYMBOL	MIN.	NOM.	MAX.
А	-	ı	1.00
A1	0.10	-	-
A2	-	-	0.90
D/E	5.00 BSC		
M/N	4.00 BSC		
b	0.20	0.25	0.30
е	0.50 BSC		
aaa	-	_	0.10
bbb	-	_	0.10
ddd	_	_	0.10

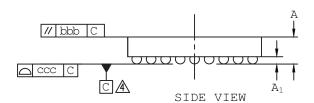


81-Ball WLCS Package

Dimensions in Millimeters







Notes:

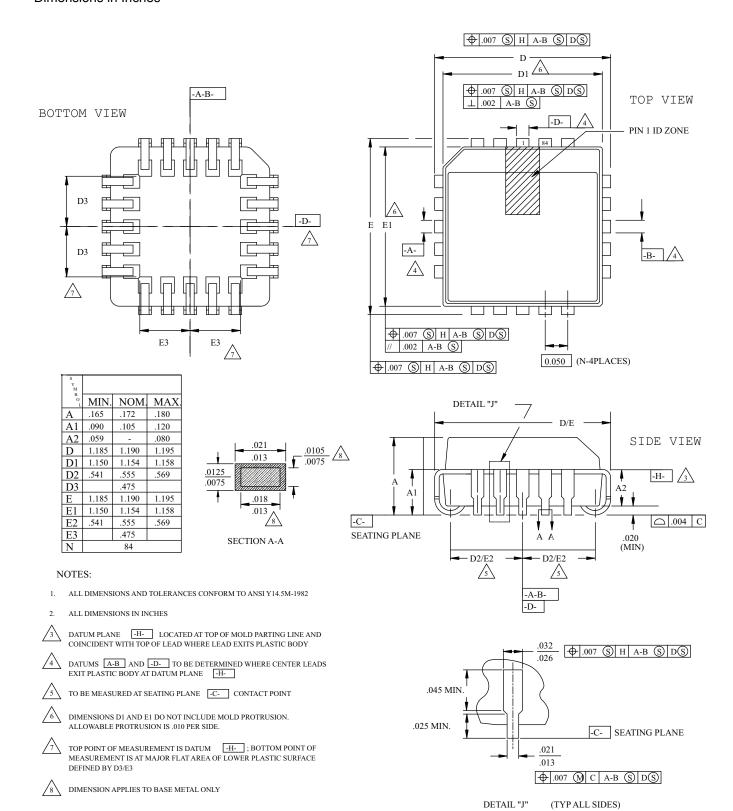
- 1 ALL DIMENSIONS AND TOLERANCE PER ASME Y 14.5M 1994.
- 2 ALL DIMENSIONS ARE IN MILLIMETERS.
- \triangle DIMENSION "b" IS MEASURED AT THE MAXIMUM BUMP DIAMETER PARALLEL TO PRIMARY DATUM $\boxed{\mathbb{C}}$.
- A PRIMARY DATUM C AND SEATING PLANE ARE DEFINED BY THE SPHERICAL CROWNS OF THE SOLDER BUMPS.

REF.	Min.	Nom.	Max.
A	0.510	0.543	0.567
A1	0.167	0.196	0.225
b	0.239	0.266	0.319
D	3	.797 BS	С
E	3	.693 BS	С
D1	3	.20 BS0	2
E1	3.20 BSC		
е	0	.40 BS0	2
sD	_	0.299	_
sE	_	0.247	-
aaa	0.025		
bbb	0.060		
ccc	0.030		
ddd	0.015		
eee		0.050	



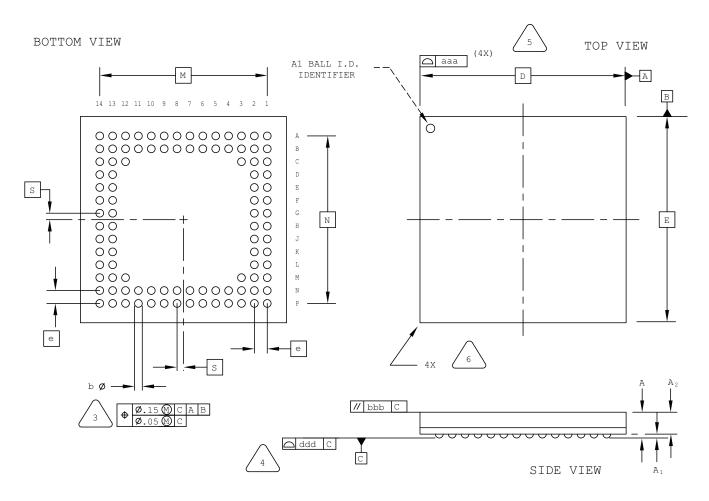
84-Pin PLCC Package

Dimensions in Inches





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.

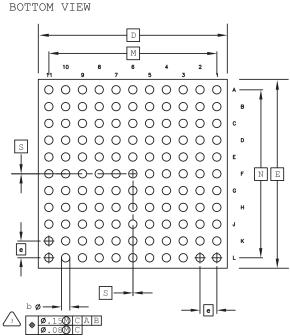


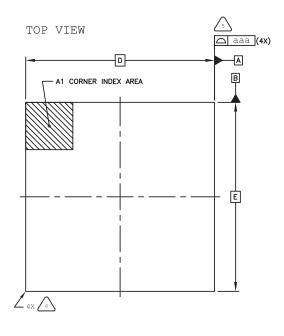
SYMBOL	MIN.	NOM.	MAX.
А	0.90	1.23	1.35
A1	0.15	_	-
A2	-	-	1.10
D/E	8	.00 BSC	
M/N	6.50 BSC		
S	0	.25 BSC	
b	0.25	0.30	0.35
е	0.50 BSC		
aaa	-	_	0.10
bbb	-	-	0.10
ddd	_	_	0.08

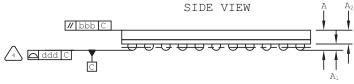


121-Ball caBGA Package (9x9 mm Body)

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.



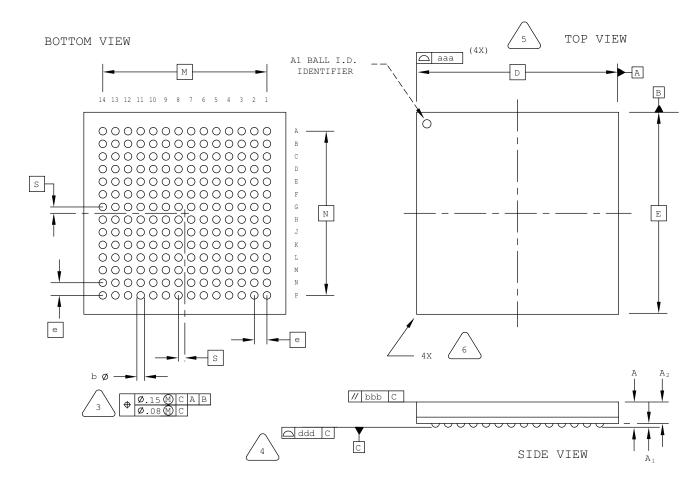
BILATERAL TOLERANCE ZONE IS APPLIED TO EACH SIDE OF THE PACKAGE BODY.



SYMBOL	MIN.	NOM.	MAX.
А	_	_	1.10
A1	0.15	_	_
A2	0.55	_	_
D/E	9	.00 BSC	
M/N	8.00 BSC		
S	0.00 BSC		
b	0.30	0.40	0.50
е	0.80 BSC		
aaa	0.15		
bbb	0.20		
ddd		0.10	



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.

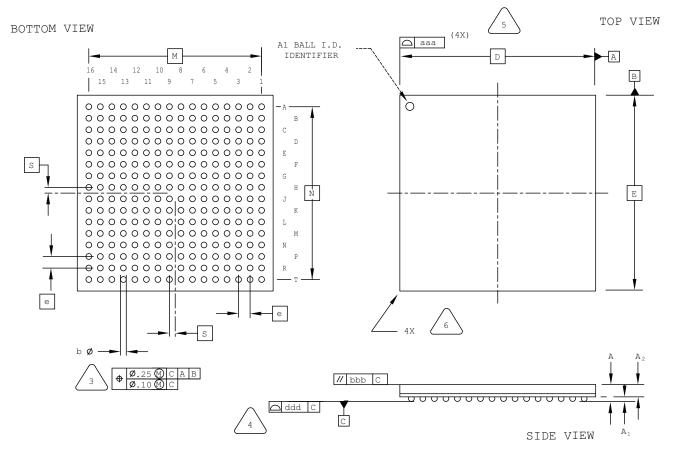


SYMBOL	MIN.	NOM.	MAX.
А	-	-	1.00
A1	0.15	_	_
A2	_	_	0.85
D/E	8.00 BSC		
M/N	6.50 BSC		
S	0	.25 BSC	
b	0.25	0.30	0.35
е	0	.50 BSC	
aaa	_	_	0.10
bbb	_	_	0.10
ddd	_	_	0.08



256-Ball ftBGA Package Option 3: MachXO2

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 $\boxed{\text{C}}$



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



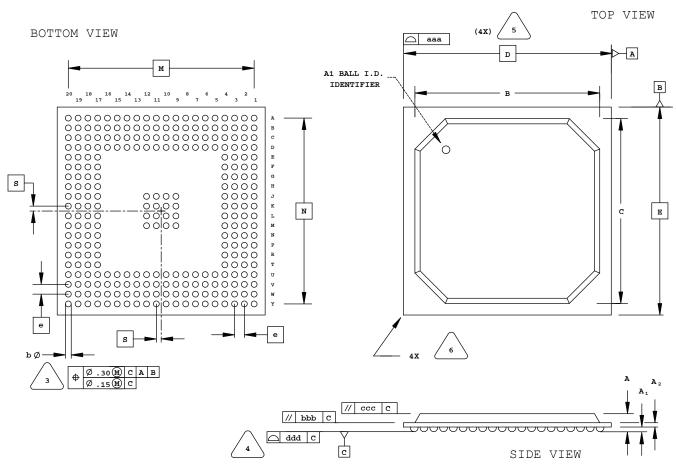
BILATERAL TOLERANCE ZONE IS APPLIED TO EACH SIDE OF THE PACKAGE BODY.



SYMBOL	MIN.	NOM.	MAX.
А	1.40	1.55	1.70
A1	0.30	_	-
A2	1.00	_	ı
D/E	1	7.0 BSC	
M/N	15.0 BSC		
S	0	.50 BSC	
b	0.40	0.50	0.60
е	1.0 BSC		
aaa	_	_	0.20
bbb	_	_	0.25
ddd	_	_	0.12



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.



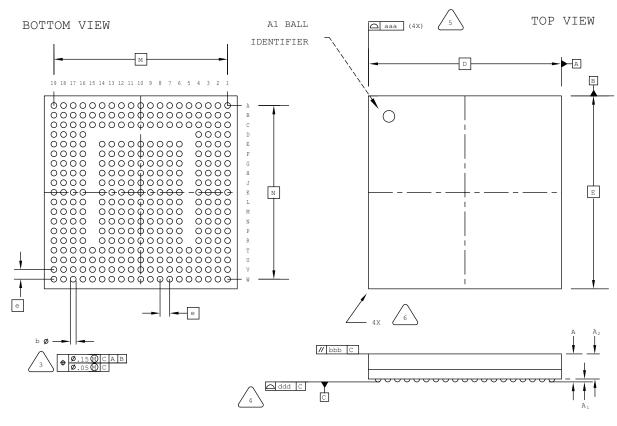
BILATERAL TOLERANCE ZONE IS APPLIED TO EACH SIDE OF THE PACKAGE BODY.



SYMBOL	MIN.	NOM.	MAX.
A	1.90	2.25	2.80
A1	0.50	0.65	0.80
A2	0.28	0.54	0.80
B/C	23.80	24.30	24.80
D/E	2	7.00 BSC	
M/N	24	1.13 BSC	
s	0	.635 BSC	
b	0.60	0.75	0.90
е	1	.27 BSC	
aaa	-	-	0.20
bbb			0.25
ccc	-	-	0.35
ddd	-	-	0.20



Dimensions in Millimeters



SIDE 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.



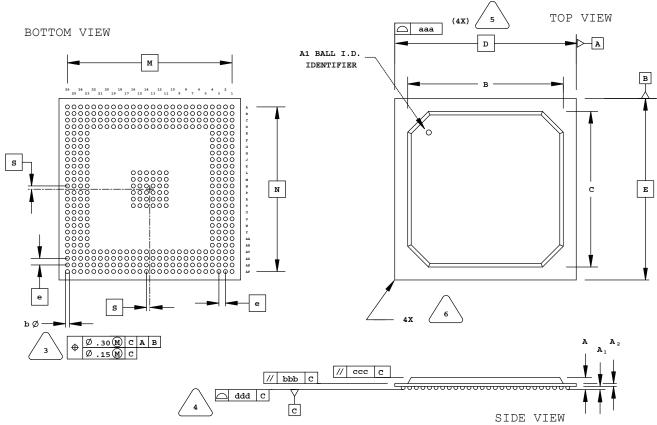
BILATERAL TOLERANCE ZONE IS APPLIED TO EACH SIDE OF THE PACKAGE BODY.



SYMBOL	MIN.	NOM.	MAX.
А	1.05	1.35	1.50
A1	0.15	_	_
A2	_	_	1.20
D/E	10.0 BSC		
M/N	9.00 BSC		
b	0.25	0.30	0.35
е	0.50 BSC		
aaa	_	-	0.10
bbb	-	-	0.10
ddd	_	_	0.08



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.

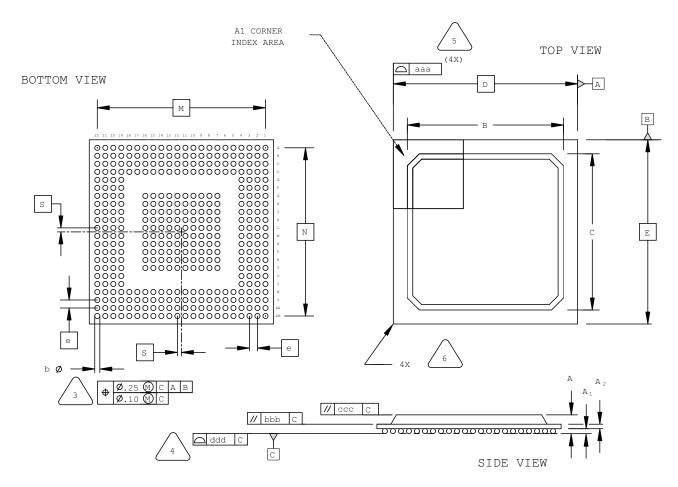


SYMBOL	MIN.	NOM.	MAX.
A	1.90	2.80	3.25
A1	0.50	0.65	0.80
A2	0.28	0.54	0.80
B/C	29.80	31.80	33.80
D/E	35.00 BSC		
M/N	31.75 BSC		
s	0.635 BSC		
b	0.60	0.75	0.90
е	1.27 BSC		
aaa	-	-	0.20
bbb	-	-	0.25
ccc	-	-	0.35
ddd	-	-	0.20



388-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.



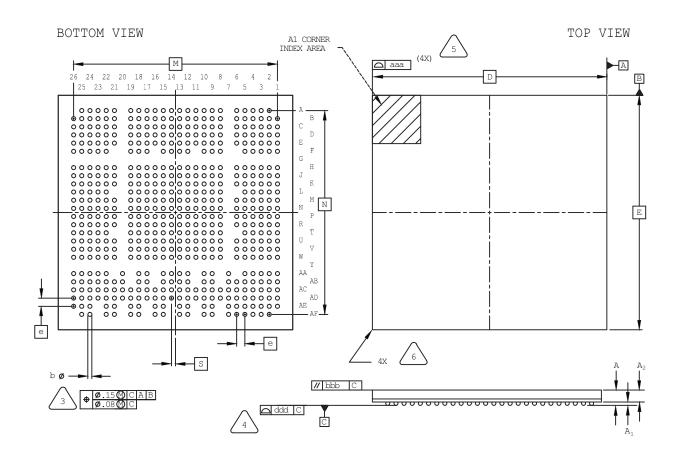
BILATERAL TOLERANCE ZONE IS APPLIED TO EACH SIDE OF THE PACKAGE BODY.



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	19.30	19.80	20.30
D/E	23.00 BSC		
M/N	21.00 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



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.

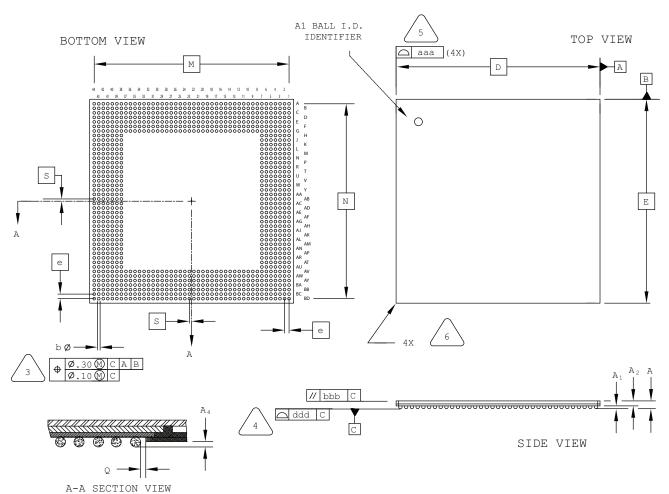


SYMBOL	MIN.	NOM.	MAX.
А	-	-	1.76
A1	0.25	0.30	0.35
A2	0.80	-	-
D/E	23.0 BSC		
M/N	20.0 BSC		
S	0.40 BSC		
b	0.35	0.40	0.45
е	0.80 BSC		
aaa	_	_	0.15
bbb	-	_	0.20
ddd	_	_	0.12



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



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.

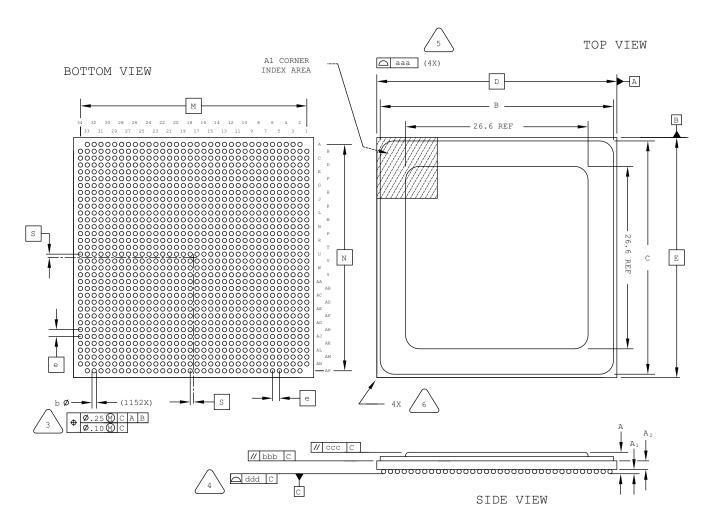


SYMBOL	MIN.	NOM.	MAX.
А	-	-	1.80
A1	0.40	0.55	0.70
A2	0.90	0.98	1.10
D/E	4.	5.00 BSC	
M/N	43.00 BSC		
S	0.50 BSC		
b	0.50	0.65	0.80
е	1.00 BSC		
Q	0.25	-	-
A4	0.10	-	-
aaa	-	-	0.20
bbb	-	-	0.35
ddd	-	-	0.20



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.

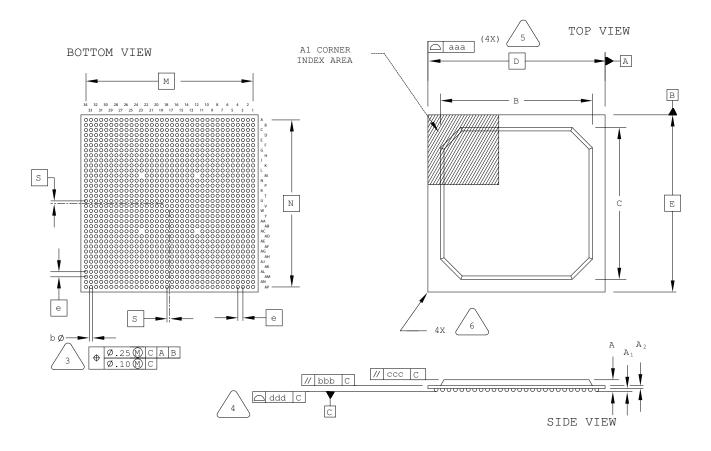


SYMBOL	MIN.	NOM.	MAX.
A	2.55	2.90	3.25
A1	0.35	0.50	0.65
A2	1	.20 REF	
B/C	34.25	34.50	34.75
D/E	35.00 BSC		
M/N	33.00 BSC		
S	0.50 BSC		
b	0.50	0.60	0.70
е	1.00 BSC		
aaa	-	-	0.20
bbb	-	-	0.25
ccc	-	-	0.35
ddd	_	_	0.20



1152-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.



EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL.

Note: Depopulated ball locations are M12, M23, AC12, and AC23.

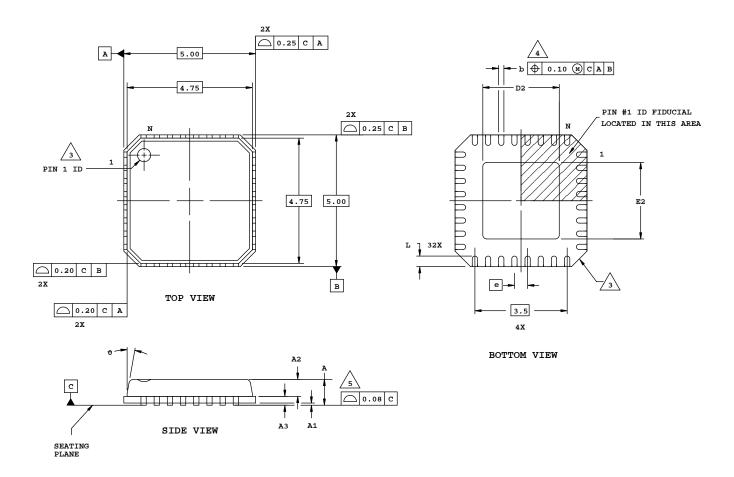
SYMBOL	MIN.	NOM.	MAX.
А	1.90	2.25	2.60
A1	0.30	0.50	0.70
A2	0.40	0.60	0.80
B/C	29.80	30.30	30.80
D/E	35.00 BSC		
M/N	33.00 BSC		
S	0.50 BSC		
b	0.50	0.60	0.70
е	1.00 BSC		
aaa	_	_	0.20
bbb	_	_	0.25
ccc	-	-	0.35
ddd	_	_	0.20



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> I

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