# E · ) C Futtce Semiconductor Corporation - ISPLSI 2096VE-100LTN128 Datasheet



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#### Understanding <u>Embedded - CPLDs (Complex</u> <u>Programmable Logic Devices)</u>

Embedded - CPLDs, or Complex Programmable Logic Devices, are highly versatile digital logic devices used in electronic systems. These programmable components are designed to perform complex logical operations and can be customized for specific applications. Unlike fixedfunction ICs, CPLDs offer the flexibility to reprogram their configuration, making them an ideal choice for various embedded systems. They consist of a set of logic gates and programmable interconnects, allowing designers to implement complex logic circuits without needing custom hardware.

#### **Applications of Embedded - CPLDs**

#### Details

Product Status	Obsolete
Programmable Type	In System Programmable
Delay Time tpd(1) Max	10 ns
Voltage Supply - Internal	3V ~ 3.6V
Number of Logic Elements/Blocks	24
Number of Macrocells	96
Number of Gates	4000
Number of I/O	96
Operating Temperature	0°C ~ 70°C (TA)
Mounting Type	Surface Mount
Package / Case	128-LQFP
Supplier Device Package	128-TQFP (14x14)
Purchase URL	https://www.e-xfl.com/product-detail/lattice-semiconductor/isplsi-2096ve-100ltn128

Email: info@E-XFL.COM

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



# 20-Pin (300-Mil) CERDIP Package

Dimensions in Inches



#### NOTES:

- 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M.
- 2. ALL DIMENSIONS ARE IN INCHES.
- 3. MEASUREMENTS TO BE TAKEN AT A MINIMUM OF .060 INCHES FROM THE LEAD TIP.
- dimensions d and e1 include allowance for glass overrun and meniscus, and lid to base mismatch.
- DIMENSIONS A, A1 AND L ARE MEASURED WITH THE PACKAGE SEATED IN JEDEC SEATING PLANE GAUGE GS-003.
- 6. E3 IS TO BE MEASURED AT THE LEAD TIPS.
- 7. ALLOWED LEAD TIP POSITION RANGE.

S Y M B	INCHES			
° L	MIN.	NOM.	MAX.	
A	-	-	.200	
A1	.015	-	-	
A2	.140	-	.175	
b	.015	-	.023	
b1	.015	.018	.021	
b2	.045	-	.065	
b3	.023	-	.045	
С	.008	-	.014	
c1	.008	.010	.012	
D	.942	.950	.970	
Е	.308	-	.325	
E1	.280	.288	.296	
E2	.300 REF			
Е3	.325	-	.410	
е	.1	00 BSC	2	
L	.125200			
N	20			



#### **30-Ball WLSC Package**

**Dimensions in Millimeters** 





Notes:

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

REF.	Min.	Nom.	Max.
Α	-	-	0.600
A1	0.140	-	-
b	0.230	0.260	0.290
D	2.5	537 BSC	2
E	2	.114 BSC	·
D1	í	2.00 BSC	2
E1	1.60 BSC		
e		0.40 BSC	2
sD	-	0.26	-
sE	-	0.27	-
۵۵۵		0.030	
ССС	0.050		
ddd	0.015		
eee		0.050	



# 36-Ball ucBGA Package Option 1



SIDE VI

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	-	-	1.00
A1	0.10	-	-
A2	-	-	0.90
D/E	2.50 BSC		
M/N	2.00 BSC		
S	0.20 BSC		
b	0.20	0.25	0.30
е	0.40 BSC		
aaa	-	-	0.10
bbb	_	-	0.10
ddd	_	-	0.10



#### 44-Pin TQFP Package (1.0 mm thick)

Dimensions in Millimeters



NOTES:

- 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5 1982.
- 2. ALL DIMENSIONS ARE IN MILLIMETERS.
- $/_3$  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 DIMENSIONS.
- 5. The top of package may be smaller than the bottom of the package by 0.15  $\,\rm MM.$
- 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.
- /8 EXACT SHAPE OF EACH CORNER IS OPTIONAL.

SYMBOL	MIN.	NOM.	MAX.
A	-	-	1.20
Al	0.05	-	0.15
A2	.95	1.00	1.05
D		12.00 BSC	
D1		10.00 BSC	
E	12.00 BSC		
El	10.00 BSC		
L	0.45	0.60	0.75
N	44		
е	0.80 BSC		
b	0.30 0.37 0.45		
bl	0.30	0.35	0.40
С	0.09	0.15	0.20
cl	0.09	0.13	0.16



7.0 BSC

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7.0 BSC

\_

0.24

0.40

0.50 BSC

5.80

5.80

0.30

0.50

D2

Е

E2

b

е

L

3.00

3.00

0.18

0.30

#### 48-Pin QFN Package Option 1



- ALL DIMENSIONS ARE IN MILLIMETERS. 2.
- EXACT SHAPE AND SIZE OF THIS /3FEATURE IS OPTIONAL.
- DIMENSION b APPLIES TO PLATED 4 TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 mm FROM TERMINAL TIP.
- ∕₅∖ APPLIES TO EXPOSED PORTION OF TERMINALS.



### 49-Ball ucBGA Package

**Dimensions in Millimeters** 



SIDE VIEW

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.
А	-	-	1.00
A1	0.10	-	-
A2	_	-	0.90
D/E	3.00 BSC		
M/N	2.40 BSC		
b	0.20	0.25	0.30
e	0.40 BSC		
aaa	_	_	0.10
bbb	_	_	0.10
ddd	-	-	0.10



### 64-Ball csBGA Package



SIDE VIEW

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	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



# 81-Ball ucBGA Package

**Dimensions in Millimeters** 



SIDE VIEW

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	-	-	1.00
A1	0.10	-	-
A2	_	-	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



# 100-Ball fpBGA Package

**Dimensions in Millimeters** 



NOTES: UNLESS OTHERWISE SPECIFIED

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

3

4

5

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	1.50	1.70
A1	0.30	0.50	0.70
A2	1.	.10 REF	
D/E	11	L.00 BSC	
M/N	9.00 BSC		
S	0.50 BSC		
b	0.40 0.55		0.70
е	1.00 BSC		
aaa	_	_	0.20
bbb	_	_	0.25
ddd	-	-	0.20



#### 120-Pin PQFP Package

#### **Dimensions in Millimeters**



NOTES:

- 1.0 DIMENSIONING AND TOLERANCING PER ANSI Y14.5 1982.
- 2.0 ALL DIMENSIONS ARE IN MILLIMETERS.
- 3 datums a, b and d to be determined at datum plane H.
- 4.0 DIMENSIONS D1 AND E1 DO 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.
- $\underline{\land 8}$  exact shape of each corner is optional.
- /9 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
Ν	120		
е	0.80 BSC		
b	0.29	-	0.45
b1	0.29	0.35	0.41
С	0.11	-	0.23
c1	0.11	0.15	0.19



# 144-Ball csBGA Package



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	0.90	1.00	1.10
A1	0.15	-	-
A2	-	-	0.85
D/E	7.00 BSC		
M/N	5.50 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



# 144-Pin TQFP Package

#### **Dimensions in Millimeters**



NOTES:

- 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5 1982.
- 2. ALL DIMENSIONS ARE IN MILLIMETERS.
- 3 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.
- 5. 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.
- 7. Al is defined as the distance from the seating plane to the lowest point on the package body.
- /8 EXACT SHAPE OF EACH CORNER IS OPTIONAL.

SYMBOL	MIN.	NOM.	MAX.
A	-	-	1.60
Al	0.05	-	0.15
A2	1.35	1.40	1.45
D		22.00 BSC	
D1		20.00 BSC	
Е	22.00 BSC		
E1	20.00 BSC		
L	0.45	0.60	0.75
Ν	144		
e	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



#### 256-Ball SBGA Package

**Dimensions in Millimeters** 



MAXIMUM SOLDER BALL DIAMETER, PARALLEL TO PRIMARY DATUM C

4

5

6

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.

A	-	-	1.70
A1	0.50	0.65	0.80
A2	0.80	0.90	1.00
D/E	27	7.00 BSC	
M/N	24	1.13 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



# 328-Ball csBGA Package

#### **Dimensions in Millimeters**



SIDE VIEW

NOTES: UNLESS OTHERWISE SPECIFIED

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

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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.
А	1.05	1.35	1.50
Al	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



#### 381-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	-	-	1.76
A1	0.25	0.30	0.35
A2	0.80	-	-
D/E	1	7.00 BSC	
M/N	15.20 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 fpBGA Package

(with or without Internal Heat Spreader) 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.

EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL.

6

SYMBOL	MIN.	NOM.	MAX.
A	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	5.00 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



#### 680-Ball fpSBGA Package





#### 1036-Ball ftSBGA Package

**Dimensions in Millimeters** 



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

5

6

EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL.

117

aaa

bbb

ddd

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0.20

0.35

0.20



# 1704-Ball Organic fcBGA Package



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	2.55	2.90	3.25	
Al	0.35	0.50	0.65	
A2	1	L.20 REF		
B/C	41.70	42.00	42.30	
D/E	42.50 BSC			
M/N	42.50 BSC			
S	0.50 BSC			
b	0.50	0.60	0.70	
е	1	1.00 BSC		
aaa	-	-	0.20	
bbb	-	-	0.25	
ccc	-	-	0.35	
ddd	-	-	0.23	



# 1704-Ball Ceramic fcBGA Package

#### **Dimensions in Millimeters**



SYMBOL

А

A1

A2

D/E

M/N

S

b

е

aaa

bbb

ccc ddd MIN.

4.30

0.30

1.30

0.50

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NOM.

4.80

0.50

1.60

42.50 BSC

41.00 BSC

0.50 BSC

0.60

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1.00 BSC

MAX.

5.30

0.70

1.90

0.70

0.20

0.25

0.35

0.20

NOTES: UNLESS OTHERWISE SPECIFIED

DIMENSIONS AND TOLERANCES 1. 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. PACKAGE BODY INCLUDES SUBSTRATE AND LID.

MAXIMUM OFFSET: 0.20 mm



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EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL.

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