



Spartan Families

High volume package solutions guide

Spartan™ families provide the low-cost, high-volume ASIC packages for applications that need low power, small form factors and high reliability. The Chip Scale Package (CSP) and the Fine Pitch BGA package (FG) provide higher I/O count in significantly less board space with the smallest form factor thus reducing the board space, and are ideal for high-volume and cost-sensitive designs. The plastic packages (QFP) provide the high-volume, low-cost packages. All of the Spartan packages provide low power and high reliability. This package solutions guide will allow you to quickly compare the board space requirements for the Chip Scale (CSP), Plastic Chip Carrier (PC), Plastic Quad Flat Pack (PQFP, TQFP, VQFP), Ball Grid Array (BG), and Fine-Pitch Ball Grid Array (FG) packages. It also shows the board layout guidelines for the CSP, BG, and FG packages.



Actual size shown

Packages by device

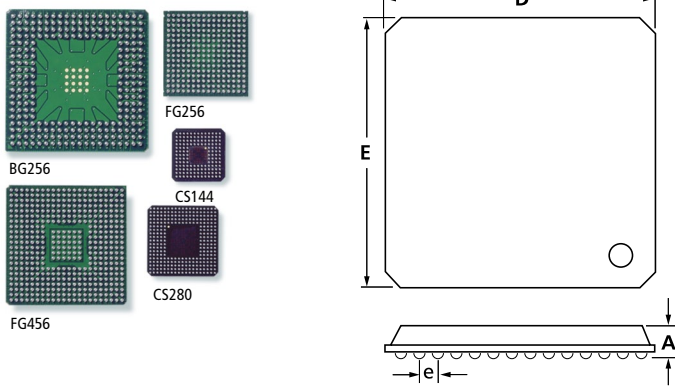
| | PC | CSP | | 1.0 mm FG | | 1.27 mm BG | TQ/VQ/PQFP | | | |
|-------------------|----|----------------|----------------|-----------|-----|------------|------------|-----|-----|-----|
| Leads/balls | 84 | 144 | 280 | 256 | 456 | 256 | 100 | 144 | 208 | 240 |
| Spartan/XL | | | | | | | | | | |
| XCS05/XL | X | | | | | | X | | | |
| XCS10/XL | X | X ¹ | | | | | X | X | | |
| XCS20/XL | | X ¹ | | | | | X | X | X | |
| XCS30/XL | | | X ¹ | | | X | X | X | X | X |
| XCS40/XL | | | X ¹ | | | X | | | X | X |
| Spartan-II | | | | | | | | | | |
| XC2S15 | | X | | | | | X | X | | |
| XC2S30 | | X | | | | | X | X | X | |
| XC2S50 | | | | X | | | | X | X | |
| XC2S100 | | | | X | X | | | X | X | |
| XC2S150 | | | | X | X | | | | X | |
| XC2S200 | | | | X | X | | | | X | |

Notes:

1. Only Spartan-XL device is offered in this package. For more information, see the Spartan/XL data sheet at <http://www.xilinx.com/partinfo/spartan.pdf>



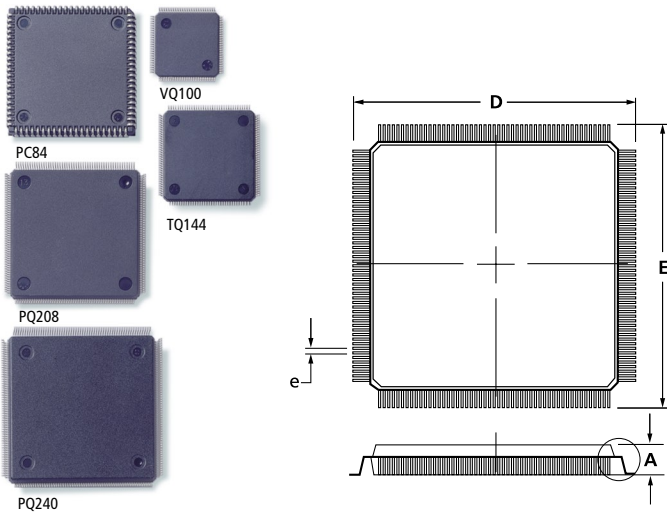
Chip Scale and Ball Grid Array



Chip Scale and Ball Array Packaging (CS/FG/BG)

| Package Leads | Chip Scale (CS) | | 1.0mm BGA (FG) | | 1.27mm BGA (BG) |
|------------------------|-----------------|-------|----------------|-------|-----------------|
| (All in mm) | CS144 | CS280 | FG256 | FG456 | BG256 |
| Ball spacing (e) | 0.8 | 0.8 | 1 | 1 | 1.27 |
| Height (A) | 1.2 | 1.2 | 1.7 | 2.2 | 2.3 |
| Width/length (D/E) | 12 | 16 | 17 | 23 | 27 |
| Theta JA still air C/W | 35 | 30 | 23-25 | 17-19 | 24-32 |

Plastic Quad Flatpack

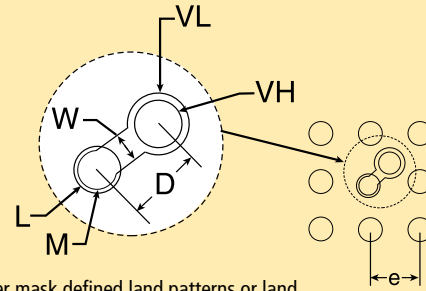


Plastic Leaded Chip Carrier (PC) and Plastic Quad Flat Pack Packaging (PQ/TQ/VQ)

| Package Leads | PC | PQ | | TQ | VQ |
|------------------------|------|-------|-------|-------|-------|
| (All in mm) | PC84 | PQ208 | PQ240 | TQ144 | VQ100 |
| Lead spacing (e) | 1.27 | 0.5 | 0.5 | 0.5 | 0.5 |
| Height (A) | 5.08 | 4.1 | 4.1 | 1.6 | 1.2 |
| Width/length (D/E) | 30.3 | 30.6 | 34.6 | 22 | 16 |
| Theta JA still air C/W | 41 | 26-35 | 19-28 | 30-35 | 32-47 |

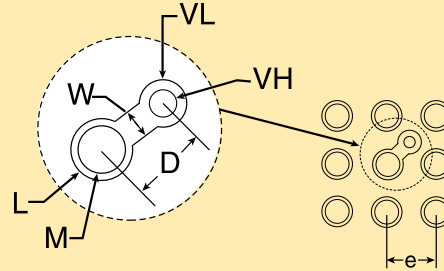
Recommended PCB Design Rules

Mask Opening Outside of Land



Non solder mask defined land patterns or land defined land patterns are recommended for CS.

Mask Opening Outside of Land



Non solder mask defined land patterns or land defined land patterns are recommended for CS.

| | CSP | | 1.0mm FG | |
|-------------------------------------|-----------|-----------|----------|-----------|
| | CS144 | CS280 | FG256 | FG456 |
| Solder land (L) diameter | 0.33 | 0.33 | 0.54 | 0.54 |
| Opening in solder mask (M) diameter | 0.44 | 0.44 | 0.45 | 0.45 |
| Solder (ball) land pitch (e) | 0.8 | 0.8 | 1 | 1 |
| Line width between via and land (W) | 0.25 | 0.25 | 0.3 | 0.3 |
| Distance between via and land (D) | 0.56 | 0.56 | 0.7 | 0.7 |
| Via Land (VL) diameter | 0.51 | 0.51 | 0.56 | 0.56 |
| Through Hole (VH), plated diameter | 0.25 | 0.25 | 0.3 | 0.3 |
| Pad Array | Periphery | Periphery | Full | Periphery |
| Matrix or external row | 13 x 13 | 19 x 19 | 16 x 16 | 22 x 22 |
| Periphery Rows | 4 | 5 | 4 | 7* |

Notes:

1. Dimensions in millimeters
2. 3 x 3 matrix for illustration only, one land pad shown with via connection to land pad
3. Reference J-STD-013, use 'dog-bone' design via connection to land pad
4. *FG has more solder balls in the center periphery rows of balls
5. Non Solder Mask Defined (NSMD) lands are recommended for CS packages

For detailed package information, see the Xilinx web site at: <http://www.xilinx.com/partinfo/databook.htm#Packages>

Corporate Headquarters

Xilinx, Inc.
2100 Logic Drive
San Jose, CA 95124
Tel: (408) 559-7778
Fax: (408) 559-7114
Web: www.xilinx.com

European Headquarters

Xilinx, Ltd.
Benchmark House
203 Brooklands Road
Weybridge
Surrey KT13 0RH
United Kingdom
Tel: (44) 1-932-349-401
Fax: (44) 1-932-349-499
e-mail: ukhelp@xilinx.com

Japan

Xilinx K.K.
Shinjuku Square Tower 18F
6-22-1 Nishi-Shinjuku
Shinjuku-ku, Tokyo
163-1118, Japan
Tel: (81) 3-5321-7711
Fax: (81) 3-5321-7765
Web: www.xilinx.co.jp

Hong Kong

Xilinx Asia Pacific
Unit 2520-2525, Tower 1
Metroplaza
Hing Fong Road
Kwai Fong, N.T.
Hong Kong
Tel: (852) 2-424-5200
Fax: (852) 2-494-7159
e-mail: hongkong@xilinx.com

XILINX[®]
The Programmable Logic CompanySM