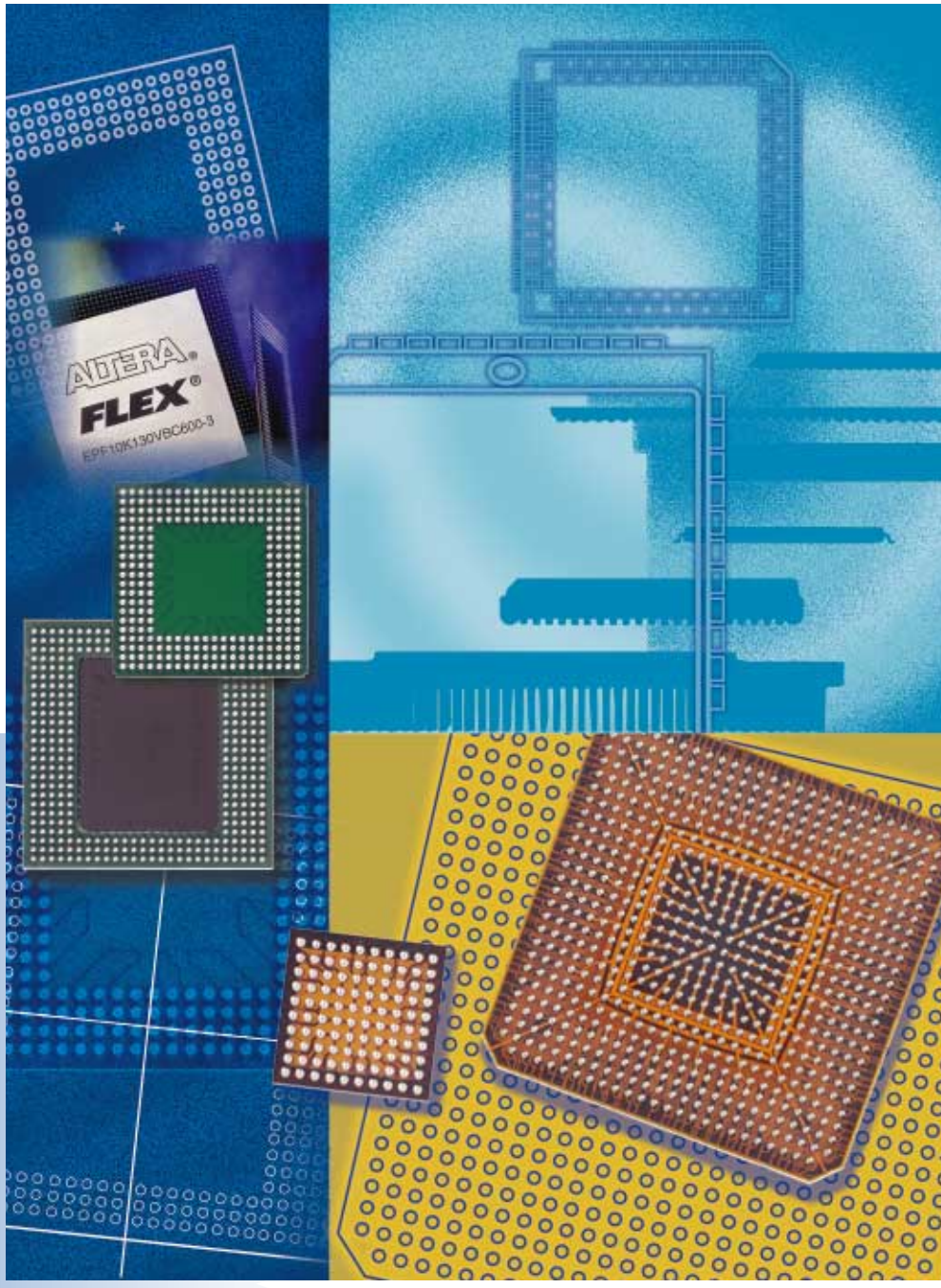
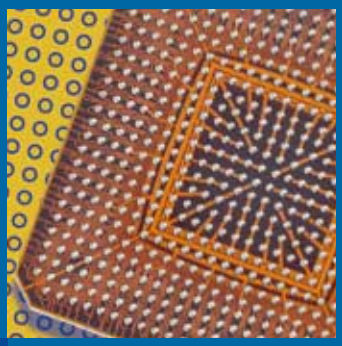
Packaging Solutions

Advanced Packaging Solutions for High-Density PLDs



June 1998

- package options
- pin compatibility
- design flexibility



Advanced Packaging Solutions

FineLine BGA

- vertical migration

- space efficiency

- cost-effectiveness

SameFrame pin-out

Table of Contents

Advanced Packaging Solutions 2

Altera Package Migration 4

FineLine Ball-Grid Array

100-Pin FineLine BGA 6

256-Pin FineLine BGA 7

484-Pin FineLine BGA 8

672-Pin FineLine BGA 9

Ball-Grid Array

225-Pin BGA 10

256-Pin BGA 11

356-Pin BGA 12

600-Pin BGA 13

Thin Quad Flat Pack

32-Pin TQFP 14

44-Pin TQFP 15

100-Pin TQFP 16

144-Pin TQFP 17

Quad Flat Pack

100-Pin PQFP 18

160-Pin PQFP 19

208-Pin PQFP 20

208-Pin RQFP 21

240-Pin PQFP 22

240-Pin RQFP 23

304-Pin RQFP 24

Plastic J-Lead Chip Carrier

20-Pin PLCC 25

44-Pin PLCC 26

84-Pin PLCC 27

Plastic Dual In-Line Package

8-Pin PDIP 28

Pin-Grid Array

403-Pin PGA 29

503-Pin PGA 30

599-Pin PGA 31

Supported Devices for Other Altera Packages 32

Device Package Dimension Formats 32

Device Package Guide . . . . . back cover

With an increasing trend toward systems on a chip, programmable logic device (PLD) vendors must supply increasingly complex products that meet new levels of I/O density and performance. To address these needs, PLD technology is advancing rapidly, allowing for more complex logic to be placed in an ever smaller die area. Today, entire digital subsystems can be implemented on a single PLD. As this trend toward system integration continues to drive the need for higher I/O counts in less board area, space-saving packaging technology is becoming a more critical factor. With an offering of complex, high-performance device families based on its high-density FLEX® and MAX® architectures, Altera has taken a leadership role in packaging innovation for users of high-density PLDs. These packaging solutions allow designers to fully harness the power of programmable logic devices for complex system integration.

Need for New Packaging Technologies

As increased system integration continues to drive the trend toward higher pin counts, traditional packages such as quad flat pack (QFP) packages can no longer provide the required board area efficiency for devices requiring greater than 240 pins. As shown in Figure 1, almost 50% of designs require more than 240 pins. The trend toward higher pin count has led to the emergence of new packages. Figure 2 shows the growth and decline of various package types.

The popularity of ball-grid array (BGA) packages, along with chip scale packages (CSP) and Flip Chip packages, is on the rise because they offer higher pin counts in significantly less board area than QFP packages. Also, BGA packages are robust, provide improved manufacturability, and have better thermal characteristics than most QFP packages.

Figure 2. IC Package Type Usage

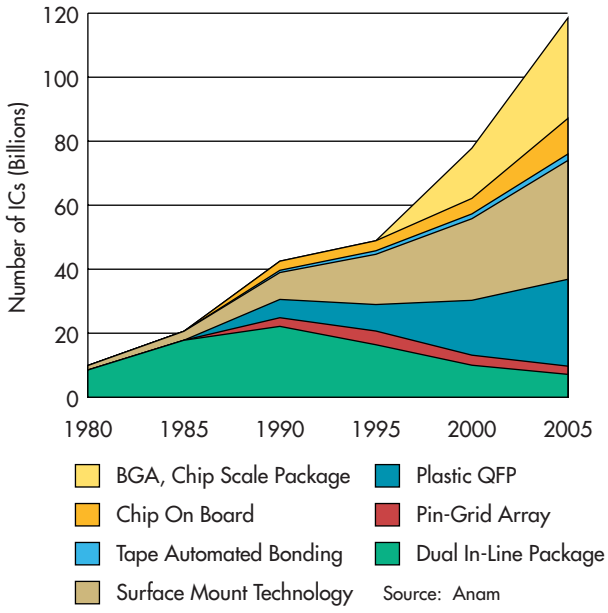
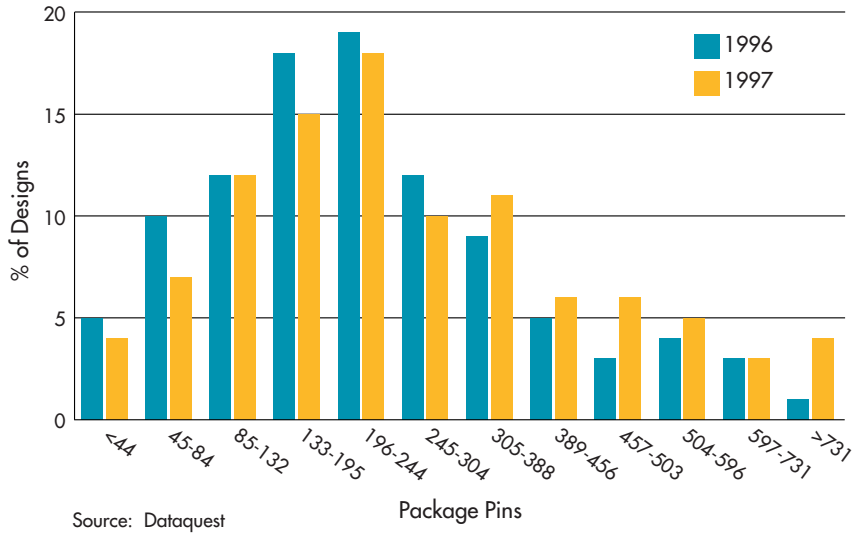


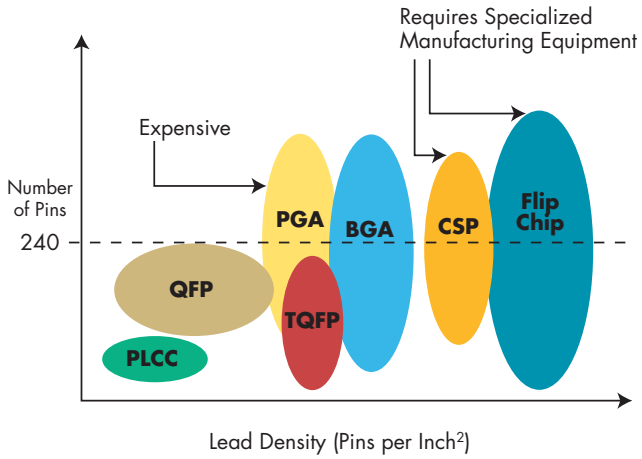
Figure 1. Percentage of ASIC Design Starts by Pin Count



Emergence of BGA Packages

At the forefront of packaging technologies, BGA packages have a distinct advantage in cost and ease of production (Figure 3). They are inexpensive and do not require any specialized manufacturing equipment. BGA packages are quickly becoming the most preferred packages for high-density PLD designs because they support high pin counts, easy handling, and volume manufacturing. As a result, Altera has introduced numerous devices in this package type.

Figure 3. Comparison of Packaging Solutions



Altera has taken a leadership position in providing advanced BGA packaging solutions. With the FineLine BGA™ package, Altera offers the most space-efficient and cost-effective packaging for high-pin-count devices in the PLD industry. Figure 4 shows the various package types with respect to package area and pin count.

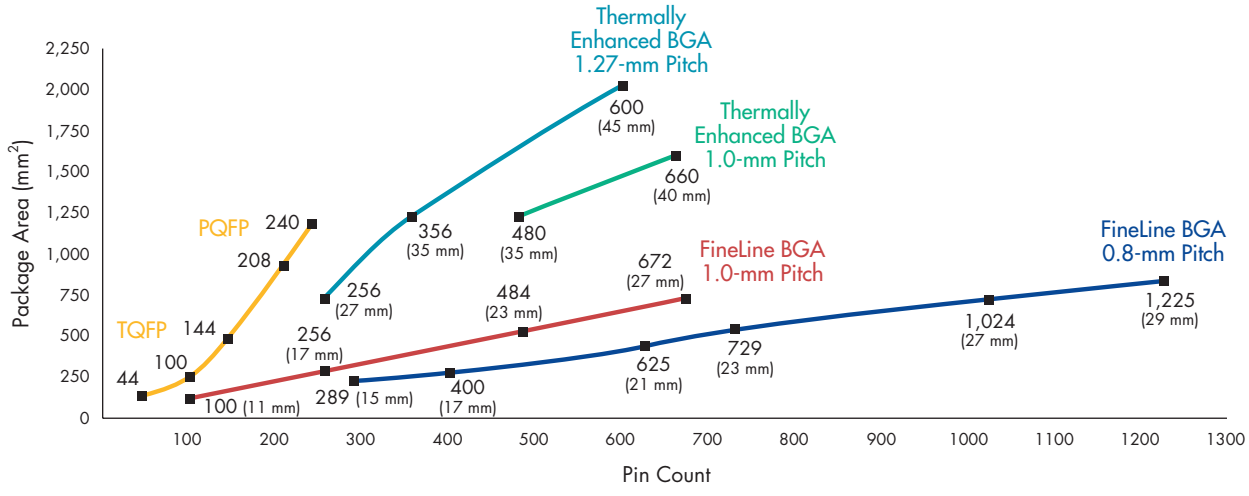
FineLine BGA Packaging

Altera's FineLine BGA strategy will provide a path for support of future PLDs with pin counts in excess of 1,000 pins. FineLine BGA packages currently are available in 1.0-mm ball pitch, and in the future will be offered in 0.8-mm and 0.5-mm ball pitch, supporting I/O count and board area requirements for system-level integration and the next generation of high-density PLDs.

Altera's Commitment

Altera is committed to offering its customers programmable logic solutions that are at the forefront of technology. At Altera, one of our goals is to improve your time-to-market with the latest technologies and package options so that our devices can meet your needs today and in the future.

Figure 4. FineLine BGA Package Efficiency



Vertical Migration Capability

Altera devices have been developed to offer maximum design flexibility and ease of use. Package migration, available in Altera's MAX and FLEX product families, allows users to move freely from one device to another without the need to change board layout. This flexibility enhances both ease of use and time-to-market. Vertical migration allows you to move your design from one density device to another density device in the same package and pin count, enabling you to maintain the same pin assignments while adding or removing logic requirements. The following pages contain actual-size photographs with dimensions for each package, as well as information on vertical migration. Table 1 below shows sample information on vertical migration; all devices that support vertical migration are highlighted in a common color.

Cross-Package Migration with SameFrame Pin-out

In addition to vertical migration, Altera's FineLine BGA packages offer migration capability between packages with different ball counts. Altera's innovative SameFrame™ pin-out makes this flexibility possible. With SameFrame pin-out, the layout of balls is such that the smaller ball-count packages form a footprint-compatible subset of the larger packages. This layout of balls gives you the benefit of migrating from one FineLine BGA package to another without having to re-layout your board. By laying out the board for the "worst case" FineLine BGA ball count, the designer maintains the flexibility to choose from any density or FineLine BGA ball count before the design is finalized.

Figure 5 illustrates a cross-package migration example in which you start your design in a 100-pin FineLine BGA and want the flexibility to move to a 256-pin FineLine BGA for a higher I/O count in the future. Similarly, you could start your design in the 256-pin FineLine BGA for maximum prototyping flexibility and then choose to migrate to the 100-pin FineLine BGA for lower cost. Either way, the SameFrame pin-out provides a new level of package migration flexibility.

Figure 5. SameFrame Pin-out Example

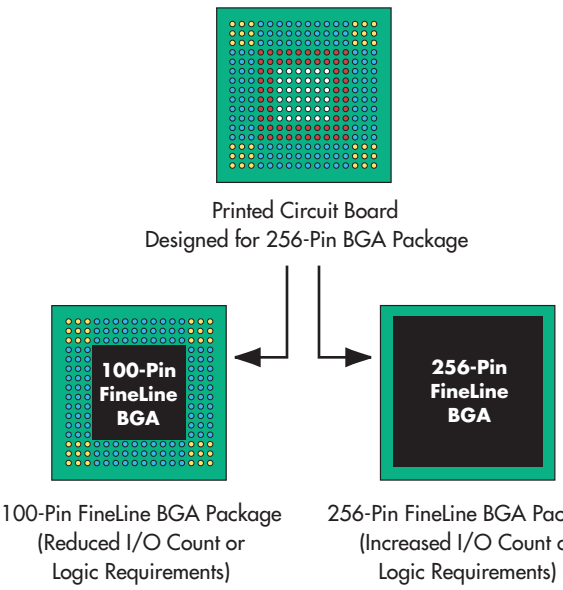


Table 1. Sample Vertical Migration Table

Package Type	MAX 7000A	FLEX 6000	FLEX 10KA	FLEX 10KE
256-Pin FineLine BGA	EPM7128A EPM7256A EPM7384AE EPM7512AE	EPF6010A EPF6016A EPF6024A	EPF10K10A EPF10K30A	EPF10K30E EPF10K50E EPF10K100B EPF10K100E

Vertical Migration | Vertical Migration | Vertical Migration

Figure 6. Cross-Package Migration Example

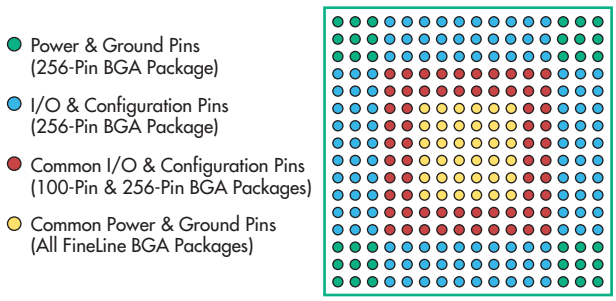


Figure 6 illustrates how the innovative concentric ball layout is achieved with the new packaging. The power and ground pins in yellow are common to all FineLine BGA packages. With higher ball-count packages, more power and ground pins are present, these pins are located in each corner and are shown in green.

Design Migration Flexibility

You can increase device density and/or I/O count without re-laying out your board. This density and I/O pin migration capability gives you additional design flexibility beyond what you can achieve with vertical migration.

Faster Time-to-Market

Because the SameFrame pin-out allows a single PCB layout to support multiple device density/package combinations, you can now layout your board prior to final device selection. This increased flexibility allows you to concentrate on your design functionality rather than focus on fitting your design in a particular device or package.

Dual Cost Savings

SameFrame pin-out allows you to start with a larger device for prototyping flexibility and migrate to a lower-density, lower-cost device for volume production. You also have the option to migrate from a higher pin-count package to a lower pin-count package to save even more.

Table 2 shows devices offered in FineLine BGA packages. Devices in the same color support cross-package migration.

Table 2. Altera Devices with SameFrame Pin-out

Devices	100-Pin FineLine BGA	256-Pin FineLine BGA	484-Pin FineLine BGA	672-Pin FineLine BGA
EPF10K10A		✔		
EPF10K30A		✔	✔	
EPF10K50A			✔	
EPF10K100A			✔	
EPF10K30E		✔	✔	
EPF10K50E		✔	✔	
EPF10K100B		✔		
EPF10K100E		✔	✔	
EPF10K130E			✔	✔
EPF10K200E				✔
EPF10K250E				✔
EPF6010A	✔	✔		
EPF6016A	✔	✔		
EPF6024A		✔		
EPM7064A	✔			
EPM7128A	✔	✔		
EPM7256A	✔	✔		
EPM7384A		✔		
EPM7512A		✔		

100-Pin FineLine BGA, 1.0-mm Ball Pitch

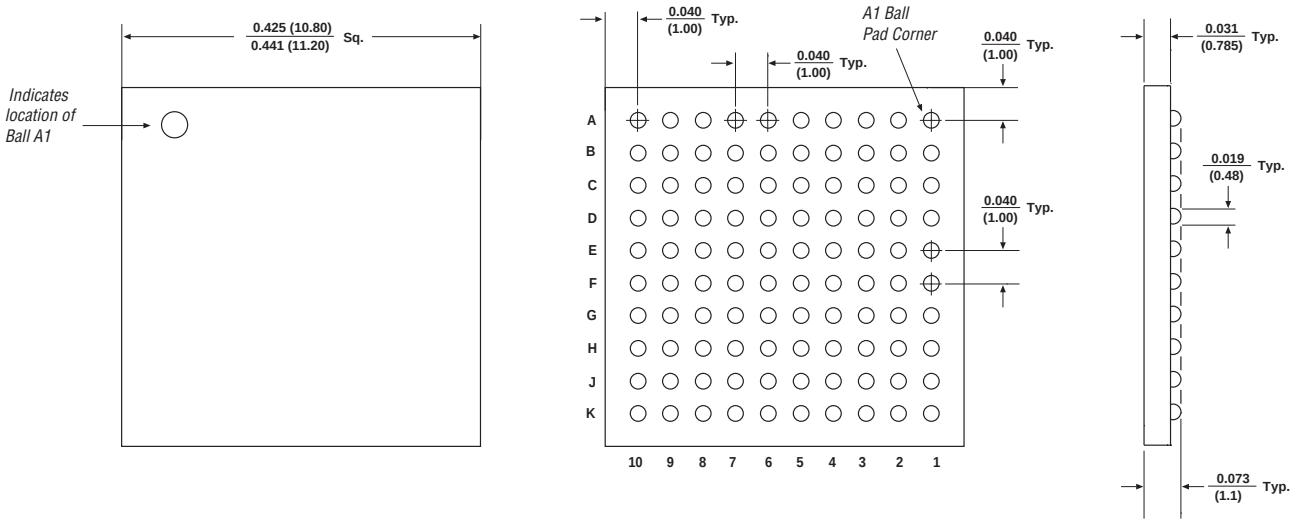
Package Views at Actual Size

Top

Bottom

Side

Package Dimensions at Scale (Preliminary)



Note: Controlling measurement is in millimeters, shown in parentheses. Inch measurements are for reference only.

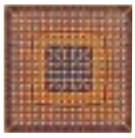
Supported Devices

Package Type	MAX 7000A	FLEX 6000
100-Pin FineLine BGA	EPM7064AE EPM7128A EPM7256A	EPF6010A EPF6016A

Note: Common color indicates pin migration. Within a given architecture, package migration across different FineLine BGA pin counts is also available.

Package Views at Actual Size

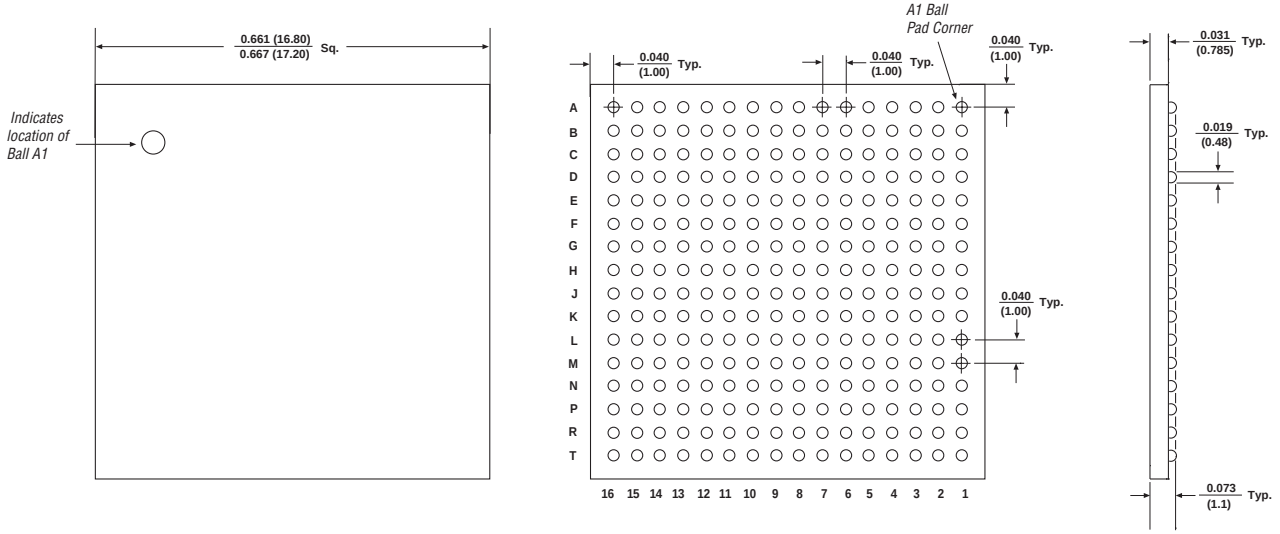
Top



Bottom

Side

Package Dimensions at Scale (Preliminary)



Note: Controlling measurement is in millimeters, shown in parentheses. Inch measurements are for reference only.

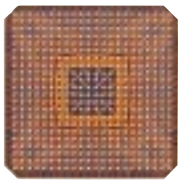
Supported Devices

Package Type	MAX 7000A	FLEX 6000	FLEX 10KA	FLEX 10KE
256-Pin FineLine BGA	EPM7128A EPM7256A EPM7384AE EPM7512AE	EPF6010A EPF6016A EPF6024A	EPF10K10A EPF10K30A	EPF10K30E EPF10K50E EPF10K100B EPF10K100E

Note: Common color indicates pin migration. Within a given architecture, package migration across different FineLine BGA pin counts is also available.

Package Views at Actual Size

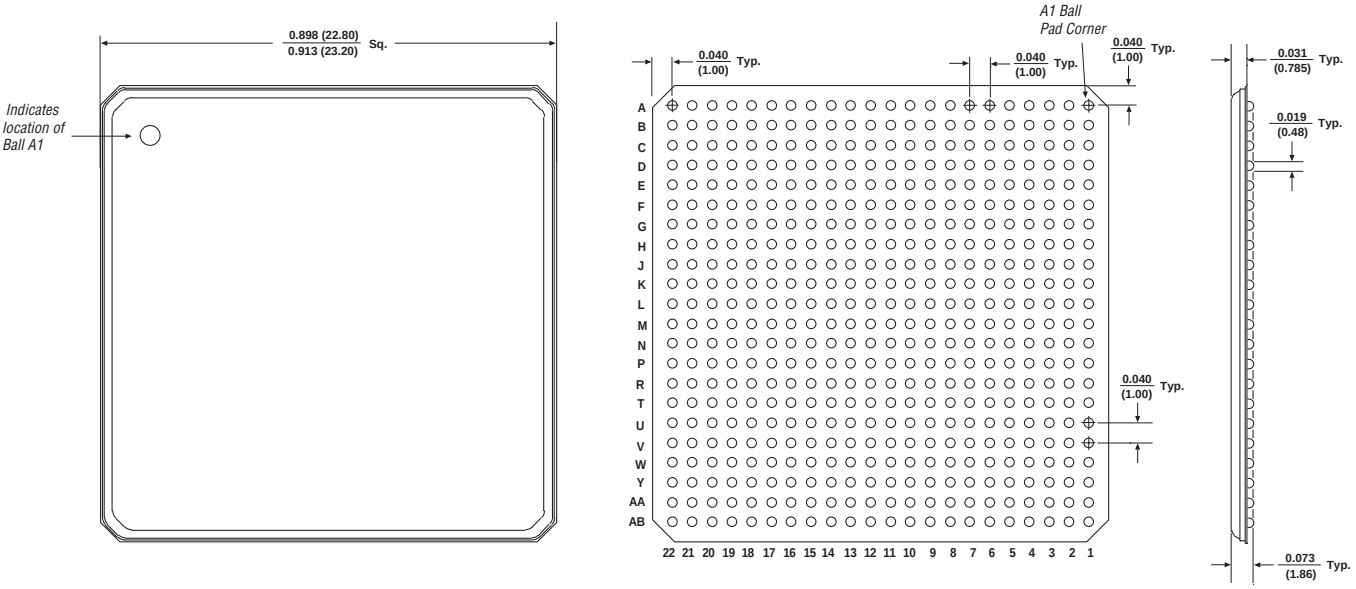
Top



Bottom

Side

Package Dimensions at Scale (Preliminary)



Note: Controlling measurement is in millimeters, shown in parentheses. Inch measurements are for reference only.

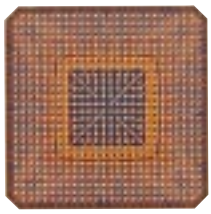
Supported Devices

Package Type	FLEX 10KA	FLEX 10KE
484-Pin FineLine BGA	EPF10K30A EPF10K50V EPF10K100A	EPF10K30E EPF10K50E EPF10K100E EPF10K130E

Note: Common color indicates pin migration. Within a given architecture, package migration across different FineLine BGA pin counts is also available.

Package Views at Actual Size

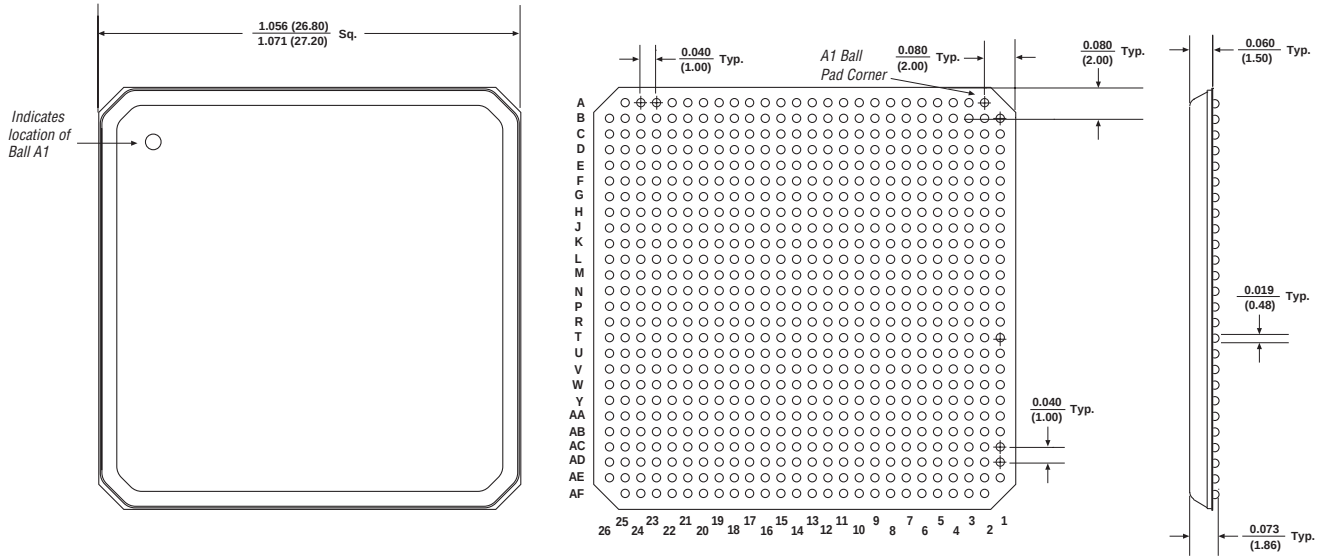
Top



Bottom

Side

Package Dimensions at Scale (Preliminary)



Note: Controlling measurement is in millimeters, shown in parentheses. Inch measurements are for reference only.

Supported Devices

Package Type	FLEX 10KE
672-Pin FineLine BGA	EPF10K130E EPF10K200E EPF10K250E

Note: Common color indicates pin migration. Within a given architecture, package migration across different FineLine BGA pin counts is also available.

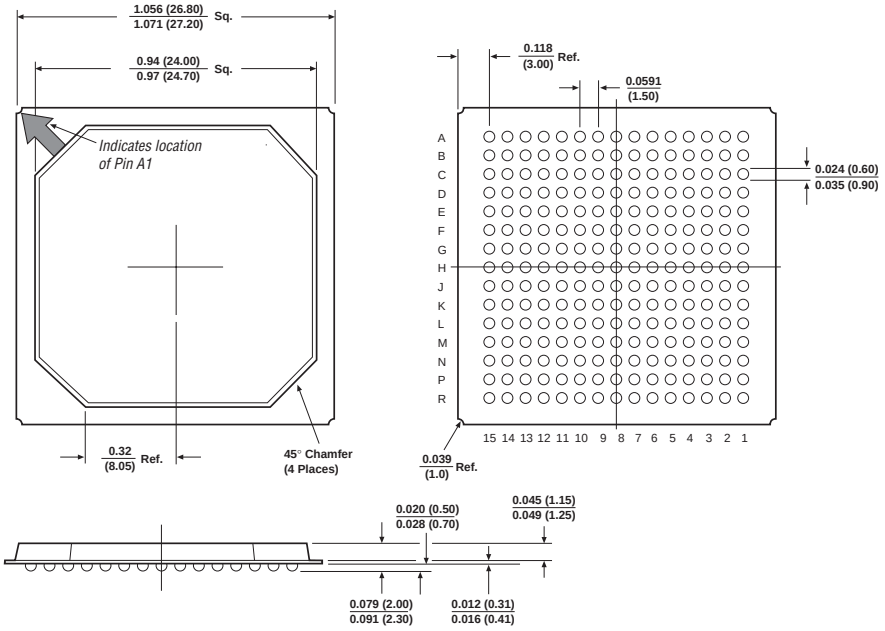
Package Views at Actual Size

Top

Bottom

Side

Package Dimensions at Scale



Note: Controlling measurement is in millimeters, shown in parentheses. Inch measurements are for reference only.

Supported Devices

Package Type	FLEX 8000
225-Pin BGA	EPF8820A

Note: Common color indicates pin migration.

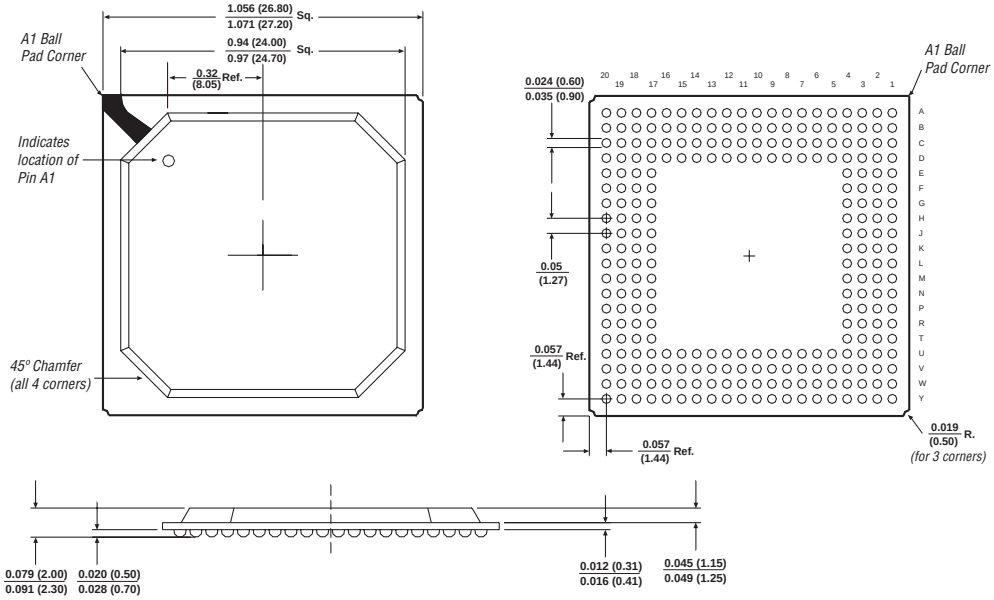
Package Views at Actual Size

Top

Bottom

Side

Package Dimensions at Scale



Note: Controlling measurement is in millimeters, shown in parentheses. Inch measurements are for reference only.

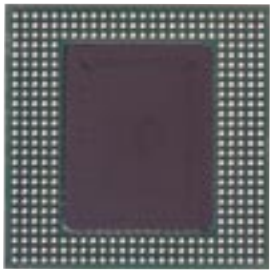
Supported Devices

Package Type	FLEX 6000
256-Pin BGA	EPF6016 EPF6024A

Note: Common color indicates pin migration.

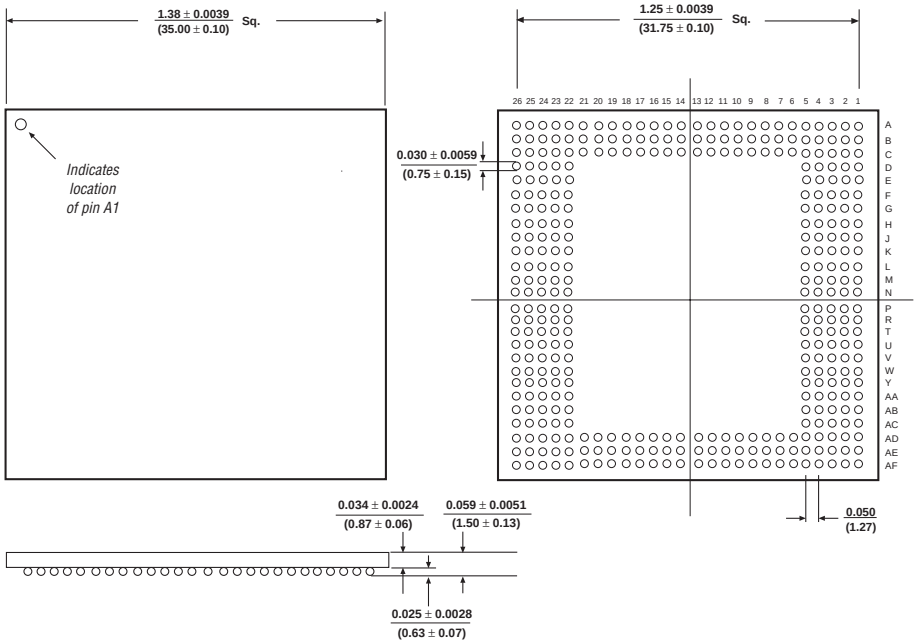
356-Pin BGA, 1.27-mm Ball Pitch

Package Views at Actual Size



Top Bottom Side

Package Dimensions at Scale



Note: Controlling measurement is in millimeters, shown in parentheses. Inch measurements are for reference only.

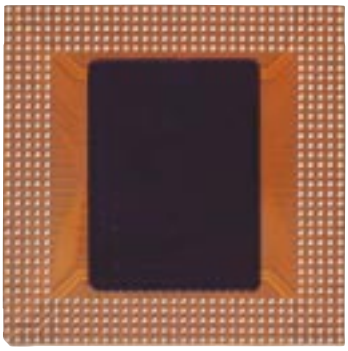
Supported Devices

Package Type	MAX 9000	FLEX 10K	FLEX 10KA	FLEX 10KE
356-Pin BGA	EPM9320 EPM9320A EPM9560 EPM9560A	EPF10K30 EPF10K50	EPF10K30A EPF10K50V EPF10K100A	EPF10K100E

Note: Common color indicates pin migration.

Package Views at Actual Size

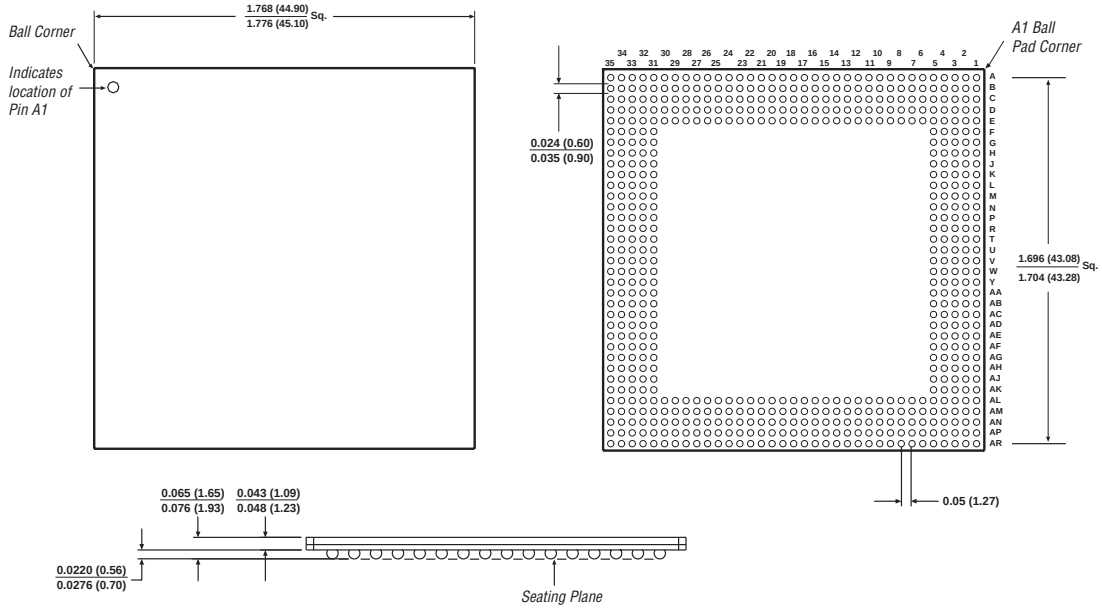
Top



Bottom

Side

Package Dimensions at Scale



Note: Controlling measurement is in millimeters, shown in parentheses. Inch measurements are for reference only.

Supported Devices

Package Type	FLEX 10KA	FLEX 10KE
600-Pin BGA	EPF10K100A EPF10K130V EPF10K250A	EPF10K200E

Note: Common color indicates pin migration.

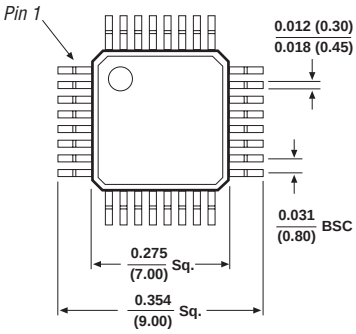
Package Views at Actual Size

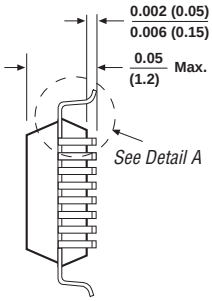
Top

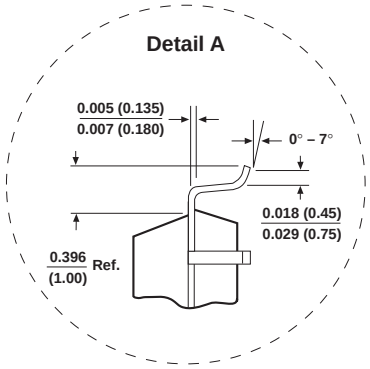
Bottom

Side

Package Dimensions at Scale







Note: Controlling measurement is in millimeters, shown in parentheses. Inch measurements are for reference only.

Supported Devices

Package Type	Configuration EPROM
32-Pin TQFP	EPC1064 EPC1064V EPC1441 EPC2

Note: Common color indicates pin migration.

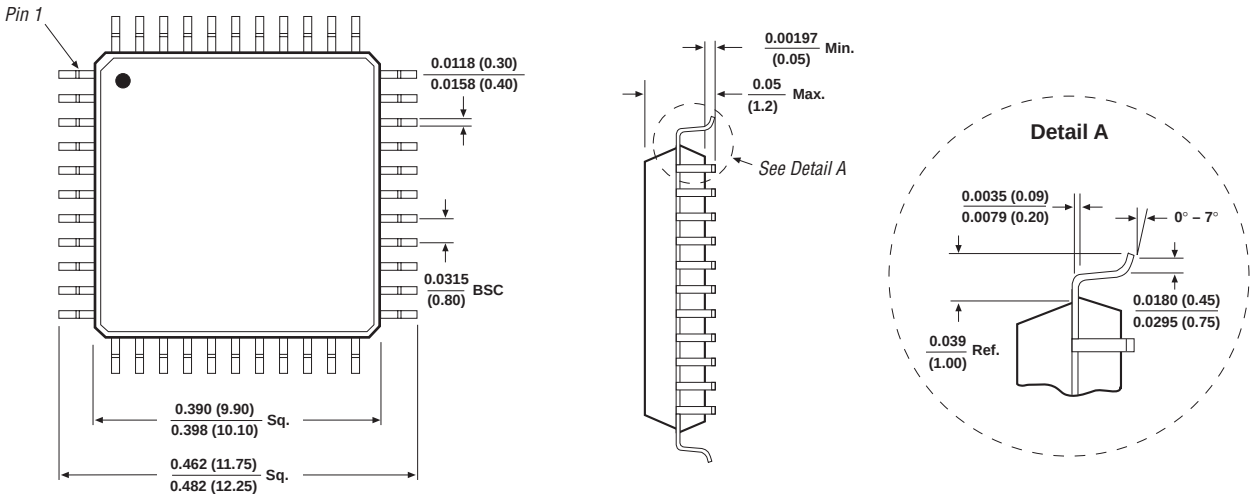
Package Views at Actual Size

Top

Bottom

Side

Package Dimensions at Scale



Note: Controlling measurement is in millimeters, shown in parentheses. Inch measurements are for reference only.

Supported Devices

Package Type	MAX 7000	MAX 7000S	MAX 7000A
44-Pin TQFP	EPM7032 EPM7032V EPM7064	EPM7032S EPM7064S	EPM7032AE EPM7064AE

Note: Common color indicates pin migration.

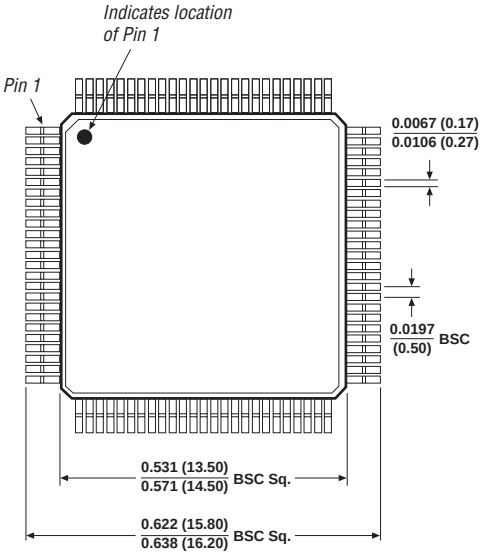
Package Views at Actual Size

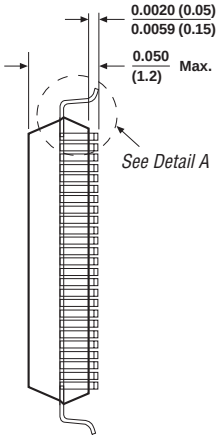
Top

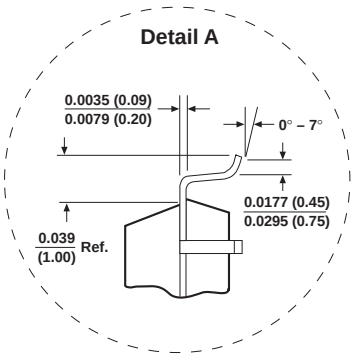
Bottom

Side

Package Dimensions at Scale







Note: Controlling measurement is in millimeters, shown in parentheses. Inch measurements are for reference only.

Supported Devices

Package Type	MAX 7000S	MAX 7000A	FLEX 6000	FLEX 8000	FLEX 10KA
100-Pin TQFP	EPM7064S EPM7128S EPM7160S	EPM7064AE EPM7128A EPM7256A	EPF6010A EPF6016A	EPF8282A* EPF8282AV* EPF8452A*	EPF10K10A

Note: Common color indicates pin migration.
** No vertical migration.*

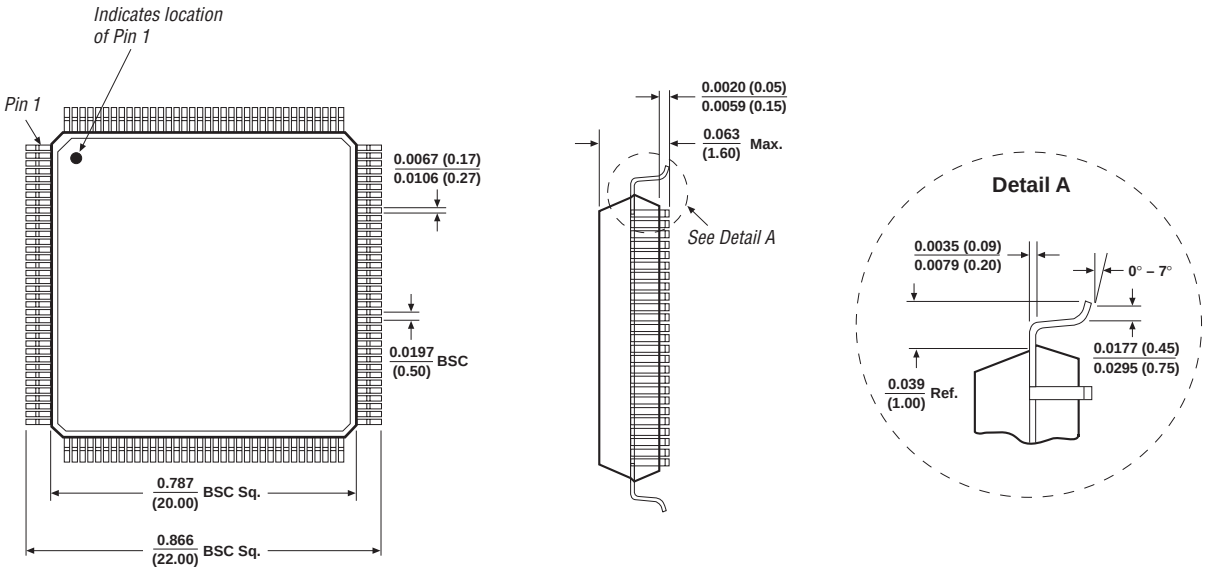
Package Views at Actual Size

Top

Bottom

Side

Package Dimensions at Scale



Note: Controlling measurement is in millimeters, shown in parentheses. Inch measurements are for reference only.

Supported Devices

Package Type	MAX 7000A	FLEX 6000	FLEX 8000	FLEX 10K	FLEX 10KA	FLEX 10KE
144-Pin TQFP	EPM7128A EPM7256A EPM7384AE EPM7512AE	EPF6010A EPF6016 EPF6016A EPF6024A	EPF8820A	EPF10K10 EPF10K20	EPF10K10A EPF10K30A	EPF10K30E EPF10K50E

Note: Common color indicates pin migration.

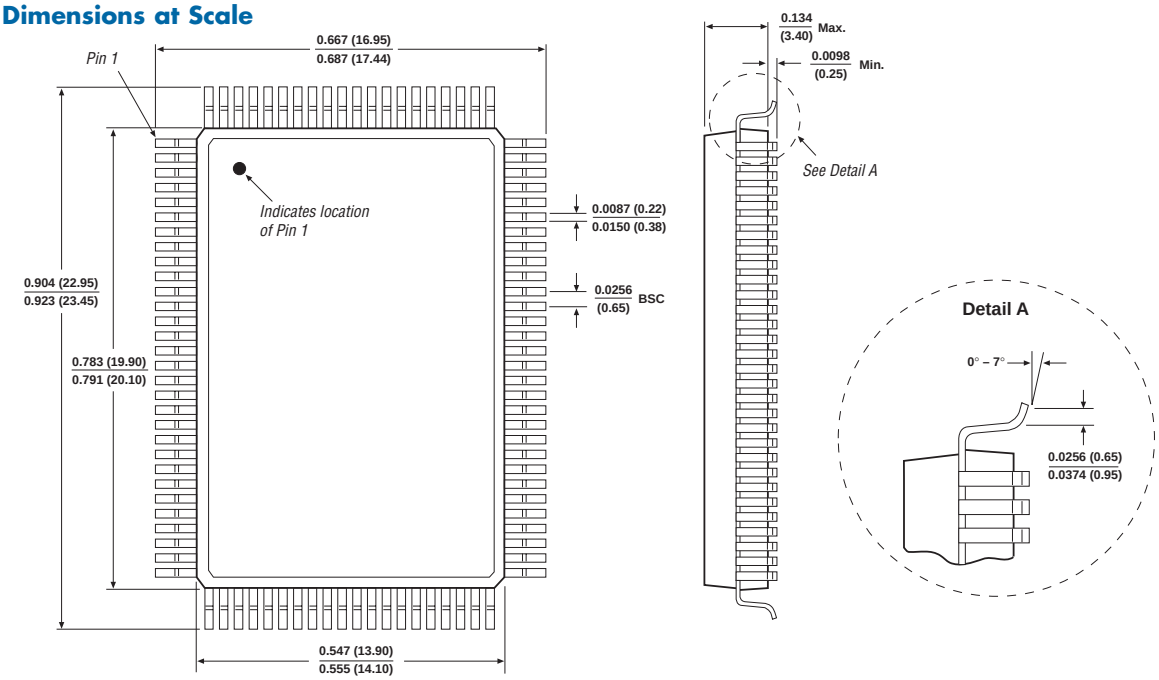
Package Views at Actual Size

Top

Bottom

Side

Package Dimensions at Scale



Note: Controlling measurement is in millimeters, shown in parentheses. Inch measurements are for reference only.

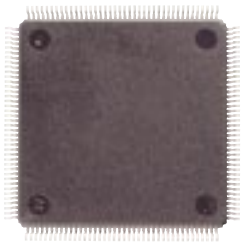
Supported Devices

Package Type	MAX 7000	MAX 7000S
100-Pin PQFP	EPM7064 EPM7096 EPM7128E EPM7160E	EPM7128S EPM7160S

Note: Common color indicates pin migration.

Package Views at Actual Size

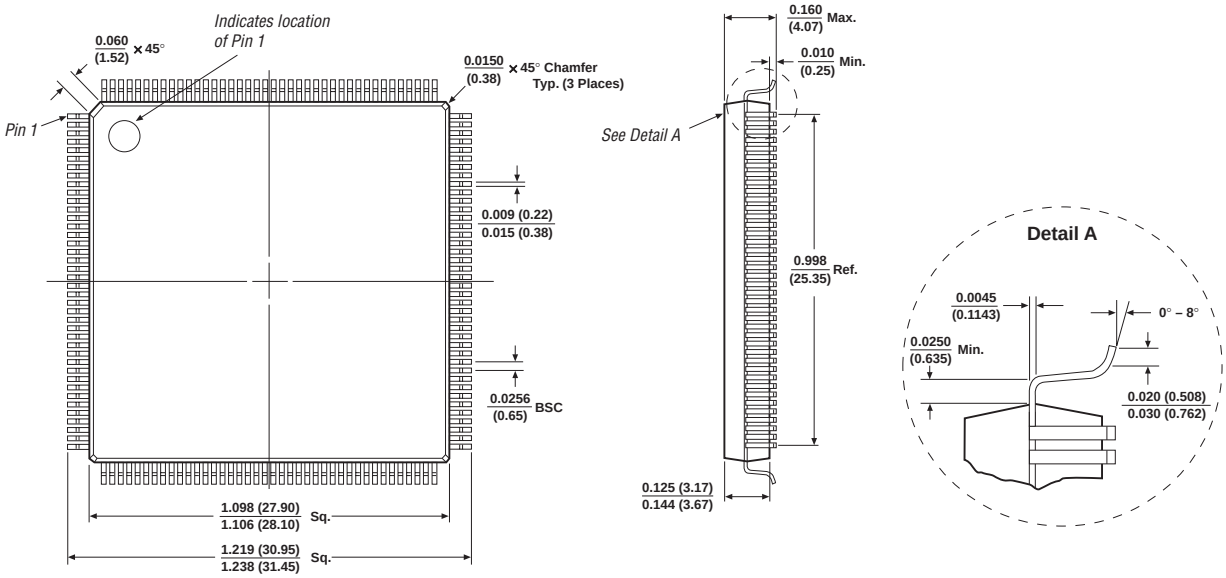
Top



Bottom

Side

Package Dimensions at Scale



Note: Controlling measurement is in millimeters, shown in parentheses. Inch measurements are for reference only.

Supported Devices

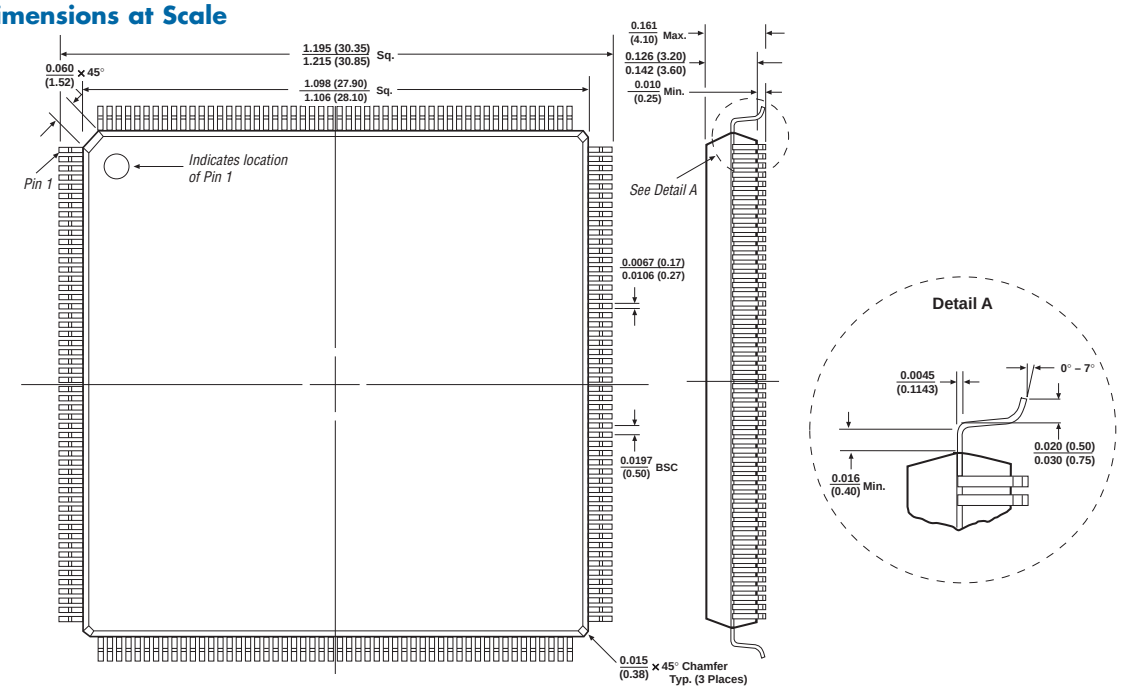
Package Type	MAX 7000	MAX 7000S	FLEX 8000
160-Pin PQFP	EPM7128E	EPM7128S	EPF8452A*
	EPM7160E	EPM7160S	EPF8636A*
	EPM7192E	EPM7192S	EPF8820A*
	EPM7256E		

Note: Common color indicates pin migration.
** No pin migration.*

Package Views at Actual Size

Top Bottom Side

Package Dimensions at Scale



Note: Controlling measurement is in millimeters, shown in parentheses. Inch measurements are for reference only.

Supported Devices

Package Type	MAX 7000S	MAX 7000A	FLEX 6000	FLEX 8000	FLEX 10K	FLEX 10KA	FLEX 10KE
208-Pin PQFP**	EPM7256S	EPM7256A EPM7384AE EPM7512AE	EPF6016 EPF6016A EPF6024A	EPF8636A* EPF8820A* EPF81188A*	EPF10K10	EPF10K10A EPF10K30A	EPF10K30E EPF10K50E EPF10K100B EPF10K100E

Note: Common color indicates pin migration.
** No pin migration.*
*** Pin migration available with 208-Pin RQFP package. See page 21.*

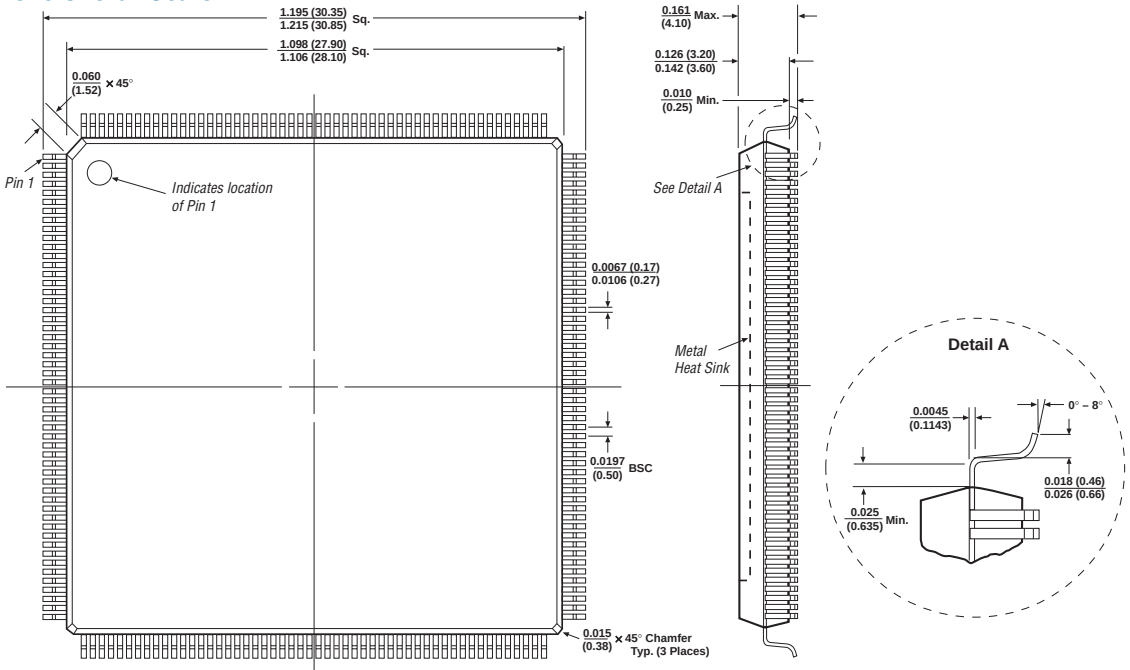
Package Views at Actual Size

Top

Bottom

Side

Package Dimensions at Scale



Note: Controlling measurement is in millimeters, shown in parentheses. Inch measurements are for reference only.

Supported Devices

Package Type	MAX 7000E	MAX 7000S	MAX 9000	FLEX 8000	FLEX 10K
208-Pin RQFP**	EPM7256E	EPM7256S	EPM9320 EPM9320A EPM9400 EPM9480 EPM9480A EPM9560 EPM9560A	EPF8820A	EPF10K20 EPF10K30 EPF10K40

Note: Common color indicates pin migration.
*** Pin migration available with 208-Pin PQFP package. See page 20.*

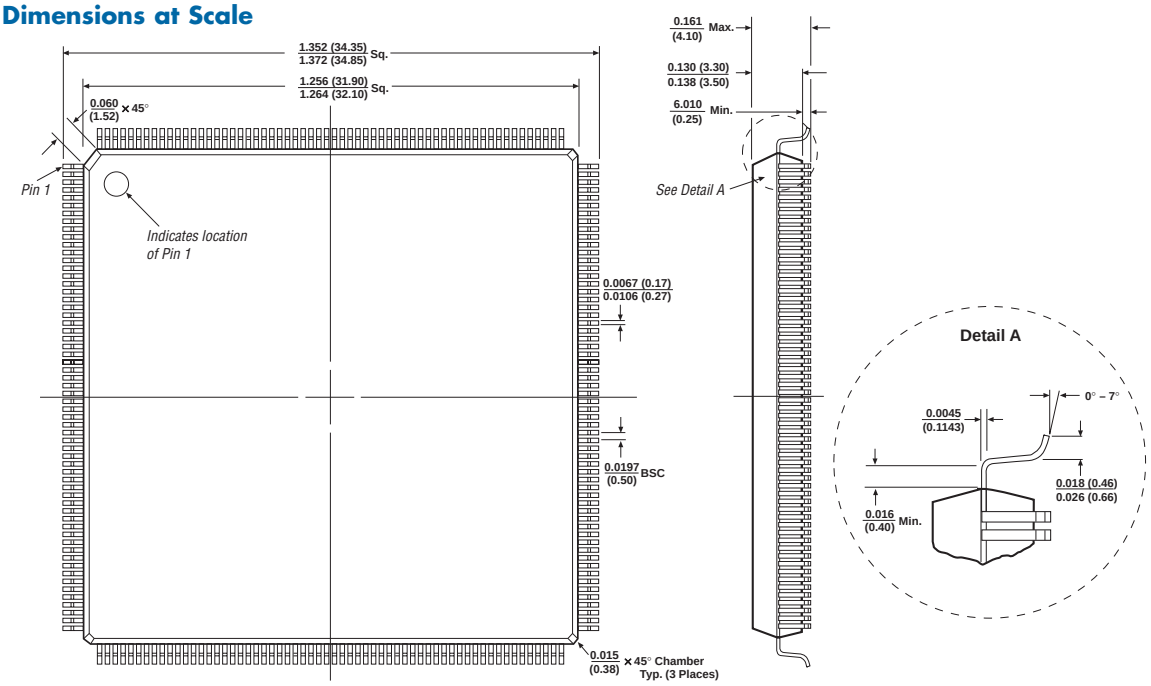
Package Views at Actual Size

Top

Bottom

Side

Package Dimensions at Scale



Note: Controlling measurement is in millimeters, shown in parentheses. Inch measurements are for reference only.

Supported Devices

Package Type	FLEX 6000	FLEX 8000	FLEX 10KA	FLEX 10KE
240-Pin PQFP**	EPF6016 EPF6024A	EPF81188A EPF81500A	EPF10K30A	EPF10K50E EPF10K100B EPF10K100E EPF10K130E

Note: Common color indicates pin migration.
*** Pin migration available with 240-Pin RQFP package. See page 23.*

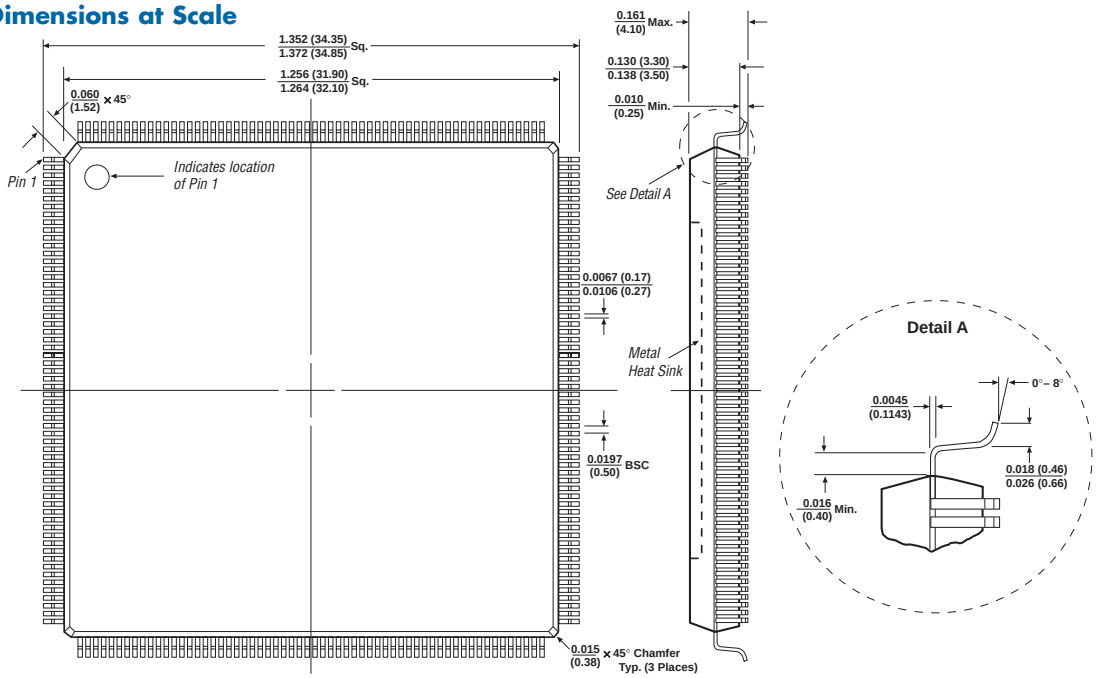
Package Views at Actual Size

Top

Bottom

Side

Package Dimensions at Scale



Note: Controlling measurement is in millimeters, shown in parentheses. Inch measurements are for reference only.

Supported Devices

Package Type	MAX 9000	FLEX 8000	FLEX 10K	FLEX 10KA	FLEX 10KE
240-Pin RQFP**	EPM9400	EPF81188A	EPF10K20	EPF10K50V	EPF10K200E
	EPM9480	EPF81500A	EPF10K30	EPF10K100A	EPF10K250E
	EPM9480A		EPF10K40		
	EPM9560		EPF10K50		
	EPM9560A		EPF10K70		

Note: Common color indicates pin migration.
*** Pin migration available with 240-Pin PQFP package. See page 22.*

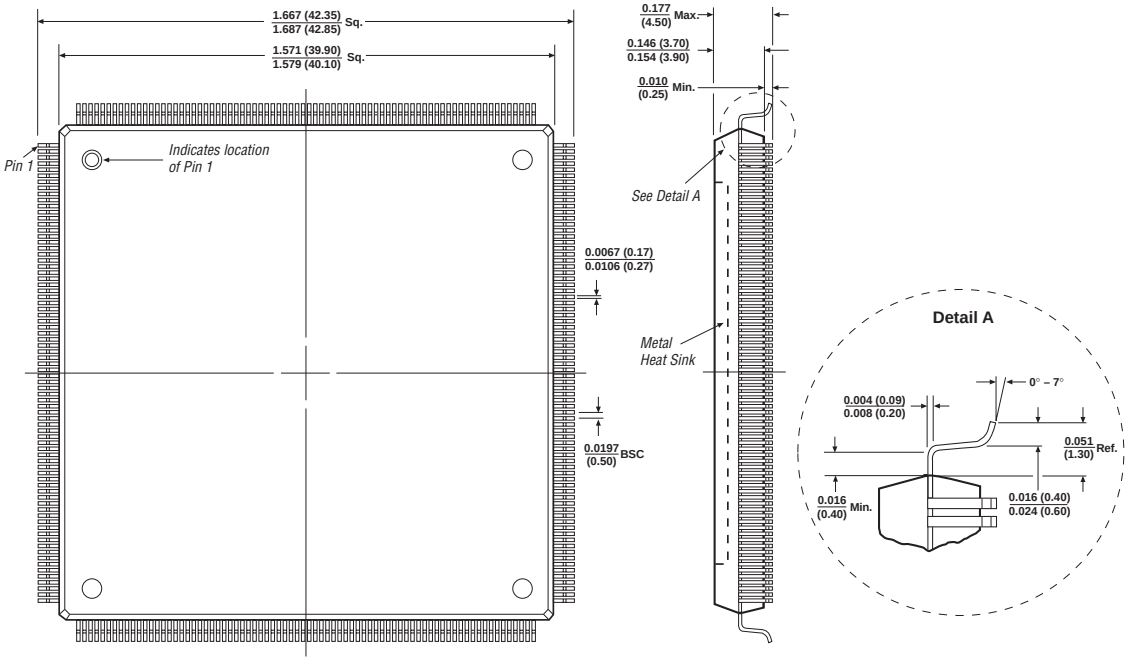
Package Views at Actual Size

Top

Bottom

Side

Package Dimensions at Scale



Note: Controlling measurement is in millimeters, shown in parentheses. Inch measurements are for reference only.

Supported Devices

Package Type	MAX 9000	FLEX 8000
304-Pin RQFP	EPM9560	EPF81500A

Note: Common color indicates pin migration.

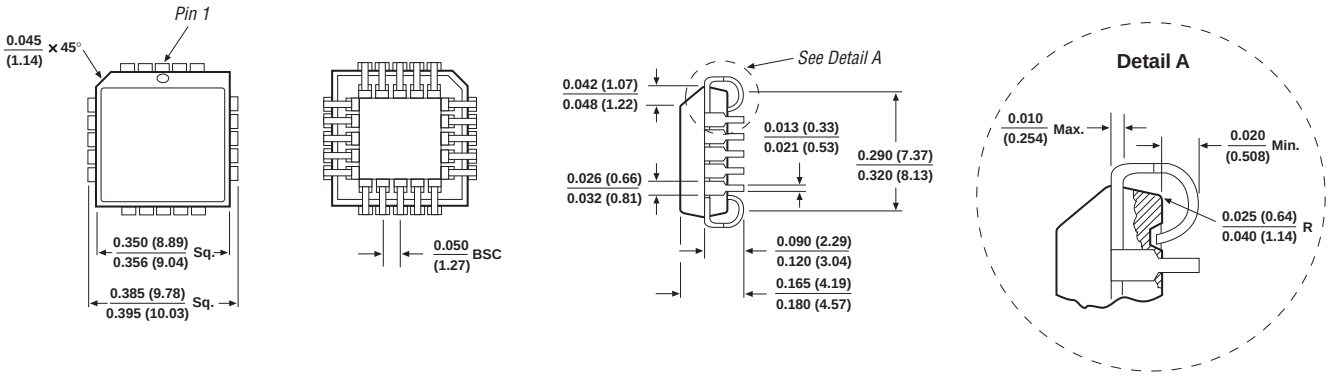
Package Views at Actual Size

Top

Bottom

Side

Package Dimensions at Scale



Note: Controlling measurement is in inches. Millimeter measurements (shown in parentheses) are for reference only.

Supported Devices

Package Type	Configuration EPROM
20-Pin PLCC	EPC1064 EPC1064V EPC1213 EPC1441 EPC1 EPC2

Note: Common color indicates pin migration.

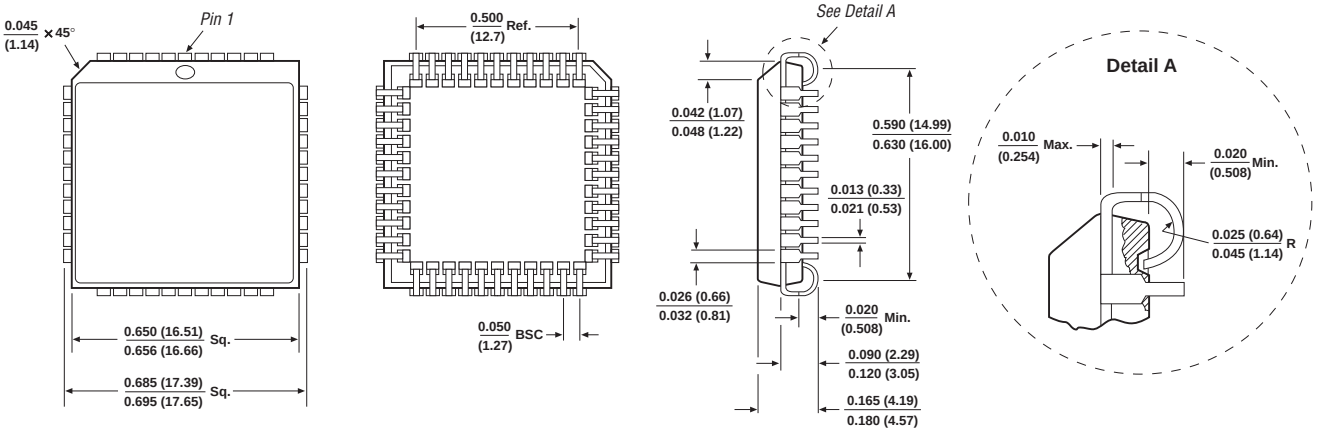
Package Views at Actual Size

Top

Bottom

Side

Package Dimensions at Scale



Note: Controlling measurement is in inches. Millimeter measurements (shown in parentheses) are for reference only.

Supported Devices

Package Type	MAX 7000	MAX 7000S	MAX 7000A
44-Pin PLCC	EPM7032 EPM7032V EPM7064	EPM7032S EPM7064S	EPM7032AE EPM7064AE

Note: Common color indicates pin migration.

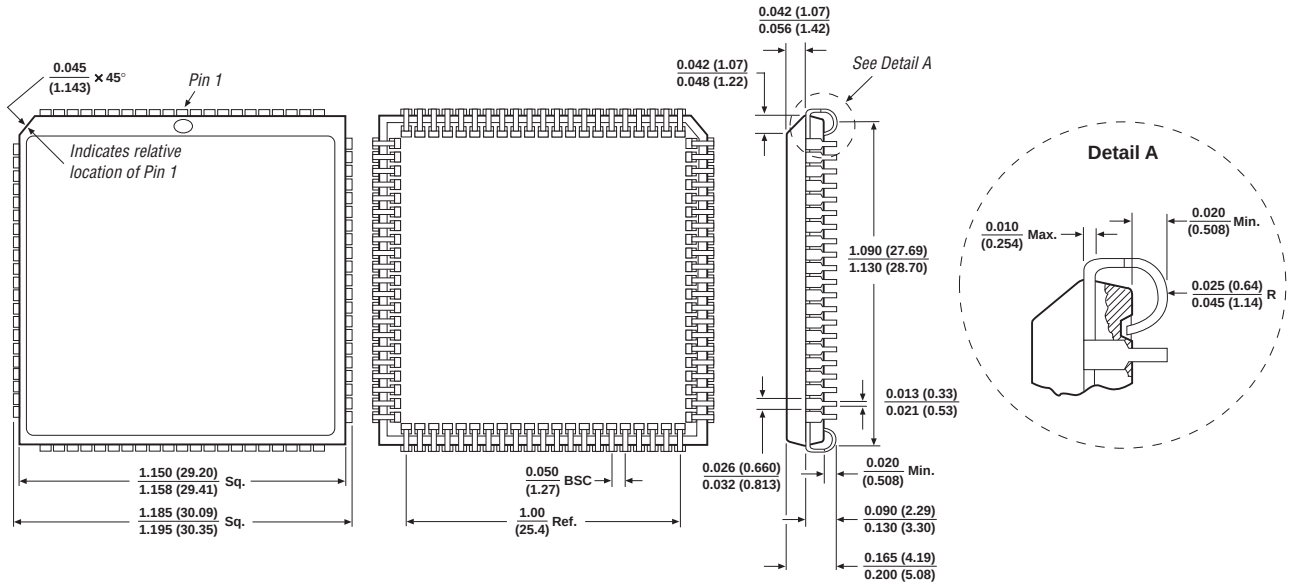
Package Views at Actual Size

Top

Bottom

Side

Package Dimensions at Scale



Note: Controlling measurement is in inches. Millimeter measurements (shown in parentheses) are for reference only.

Supported Devices

Package Type	MAX 7000	MAX 7000S	MAX 7000A	MAX 9000	FLEX 8000	FLEX 10K
84-Pin PLCC	EPM7064 EPM7096 EPM7128E EPM7160E	EPM7064S EPM7128S EPM7160S	EPM7064AE EPM7128A	EPM9320 EPM9320A EPM9400*	EPF8282A EPF8452A EPF8636A	EPF10K10

Note: Common color indicates pin migration.
** No vertical migration.*

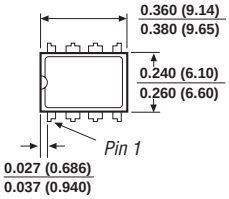
Package Views at Actual Size

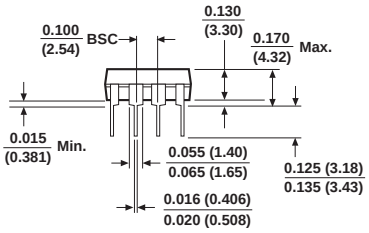
Top

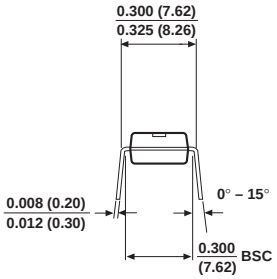
Bottom

Side

Package Dimensions at Scale







Note: Controlling measurement is in inches. Millimeter measurements (shown in parentheses) are for reference only.

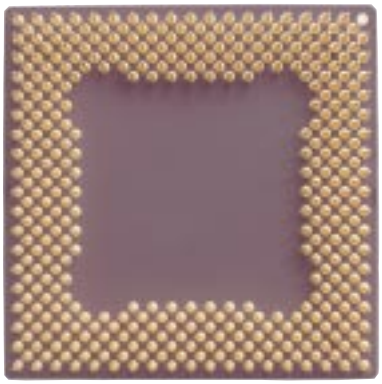
Supported Devices

Package Type	Configuration EPROM
8-Pin PDIP	EPC1064 EPC1064V EPC1213 EPC1441 EPC1

Note: Common color indicates pin migration.

Package Views at Actual Size

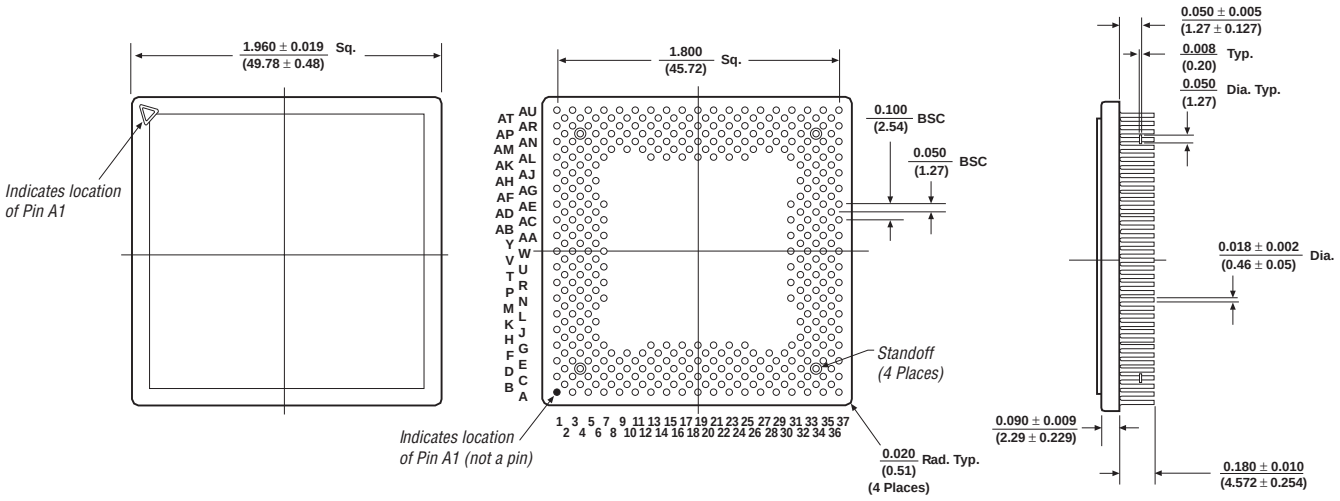
Top



Bottom

Side

Package Dimensions at Scale



Note: Controlling measurement is in inches. Millimeter measurements (shown in parentheses) are for reference only.

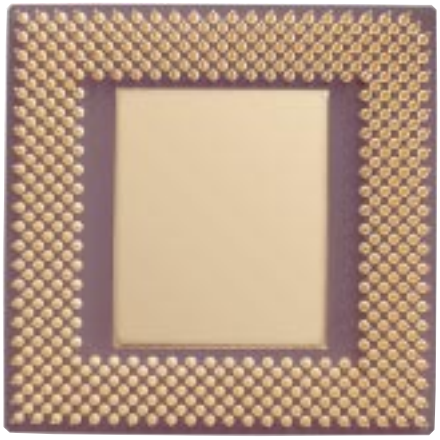
Supported Devices

Package Type	FLEX 10K
403-Pin PGA	EPF10K50

Note: Common color indicates pin migration.

Package Views at Actual Size

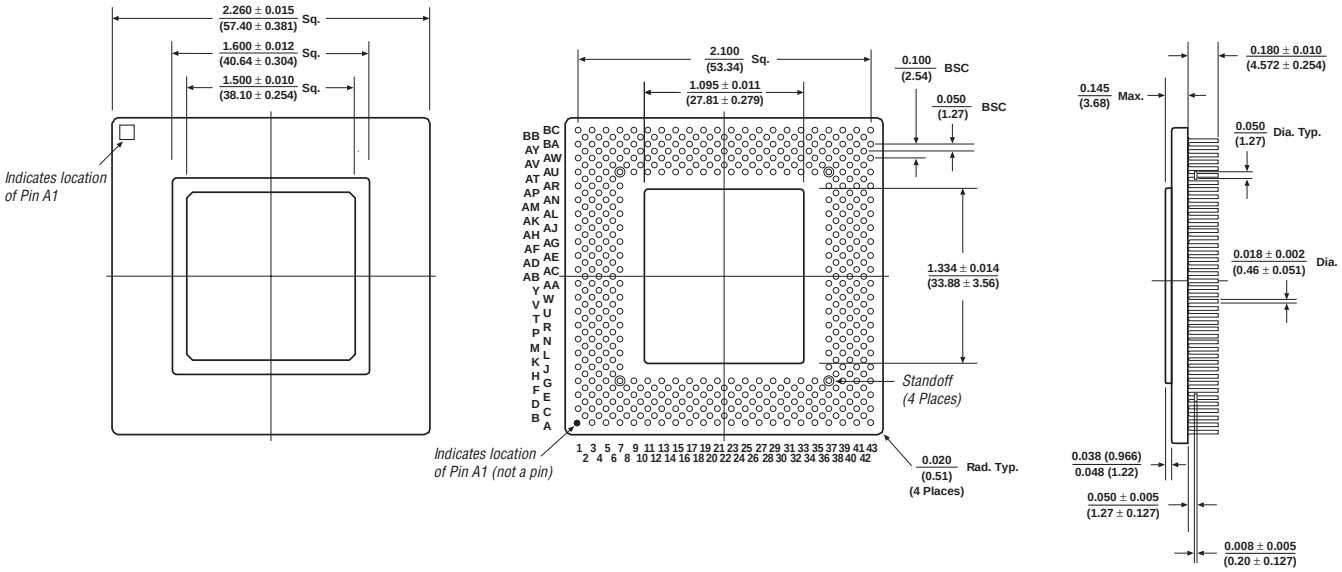
Top



Bottom

Side

Package Dimensions at Scale



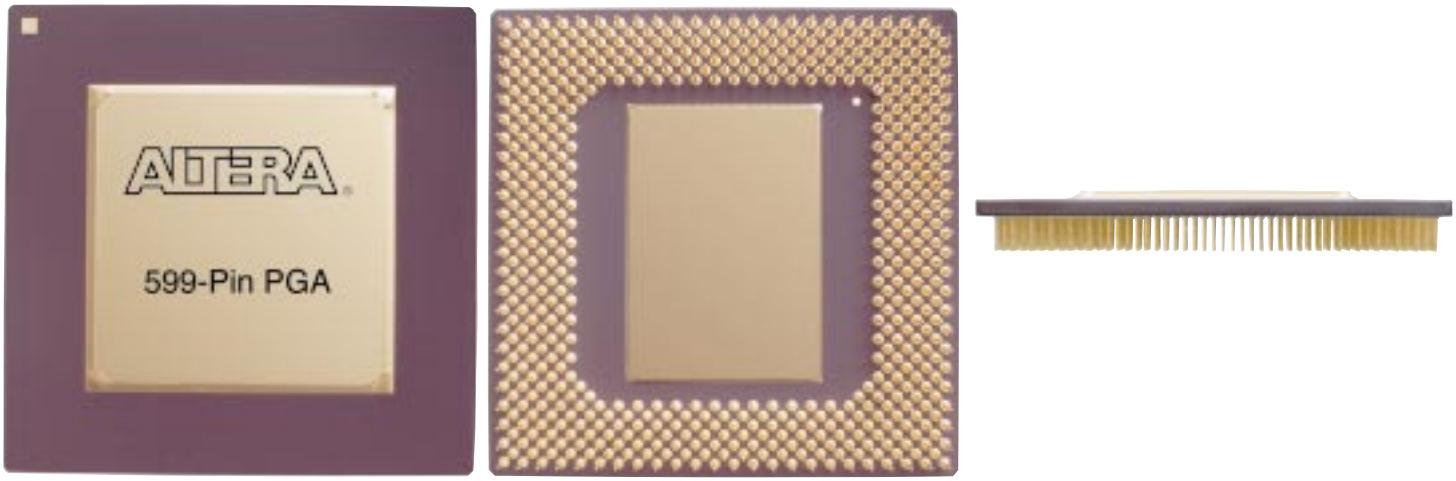
Note: Controlling measurement is in inches. Millimeter measurements (shown in parentheses) are for reference only.

Supported Devices

Package Type	FLEX 10K
503-Pin PGA	EPF10K70 EPF10K100

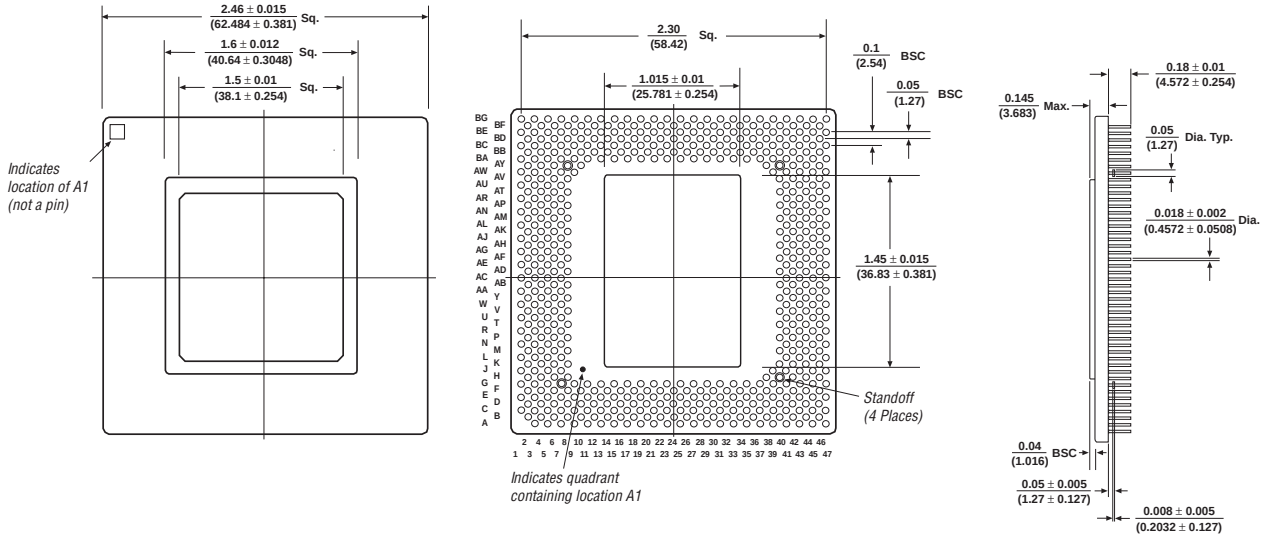
Note: Common color indicates pin migration.

Package Views at Actual Size



Top Bottom Side

Package Dimensions at Scale



Note: Controlling measurement is in inches. Millimeter measurements (shown in parentheses) are for reference only.

Supported Devices

Package Type	FLEX 10KA	FLEX 10KE
599-Pin PGA	EPF10K130V EPF10K250A	EPF10K200E EPF10K250E

Note: Common color indicates pin migration.

Supported Devices for Other Altera Packages

PQFP

Package Type	MAX 7000A
44-Pin PQFP	EPM7032AE

PLCC

Package Type	MAX 7000	MAX 7000A
68-Pin PLCC	EPM7096	EPM7064AE

PGA

Package Type	MAX 7000E	FLEX 8000
160-Pin PGA	EPM7192E	EPF8452A

Package Type	MAX 7000E	FLEX 8000
192-Pin PGA	EPM7256E	EPF8636A EPF8820A

Package Type	FLEX 8000
232-Pin PGA	EPF81188A

Package Type	MAX 9000	FLEX 8000
280-Pin PGA	EPM9320 EPM9560	EPF81500A

Note: Common color indicates pin migration.

Device Package Dimension Formats

Formats Used for Package Outline Dimensions
$\frac{\text{min. inches (min. millimeters)}}{\text{max. inches (max. millimeters)}}$ or $\frac{\text{nominal inches} \pm \text{tolerance}}{(\text{nominal millimeters} \pm \text{tolerance})}$ or $\frac{\text{inches}}{(\text{millimeters})}$ BSC, Min., Max., Ref., Typ., R, Dia., Sq.

Device Package Type
P: Plastic dual in-line (PDIP) L: Plastic J-lead chip carrier (PLCC) T: Thin plastic quad flat pack (TQFP) Q: Plastic quad flat pack (PQFP) R: Power quad flat pack (RQFP) G: Ceramic pin-grid array (PGA) B: Ball-grid array (BGA) F: FineLine ball-grid array (FineLine BGA)

Abbreviations Used for Package Outline Dimensions	
BSC	Basic. Represents theoretical exact dimensions or dimension target.
Min.	Minimum dimension specified.
Max.	Maximum dimension specified.
Ref.	Reference. Represents dimension for reference use only. This value is not a device specification.
Typ.	Typical. Provided as a general value. This value is not a device specification.
R	Radius. Represents curve dimension.
Dia.	Diameter. Represents curve dimension.
Sq.	Square. Indicates a square feature for a package with equal length and width dimensions.

Device Package Guide

MAX 7000 Family

		Page
EPM7032/V/S/AE	44-Pin PLCC	26
EPM7032/V/S/AE	44-Pin TQFP	15
EPM7032AE	44-Pin PQFP	32
EPM7064/S/AE	44-Pin PLCC	26
EPM7064/S/AE	44-Pin TQFP	15
EPM7064AE	68-Pin PLCC	32
EPM7064/S/AE	84-Pin PLCC	27
EPM7064	100-Pin PQFP	18
EPM7064S/AE	100-Pin TQFP	16
EPM7064AE	100-Pin FineLine BGA	6
EPM7096	68-Pin PLCC	32
EPM7096	84-Pin PLCC	27
EPM7096	100-Pin PQFP	18
EPM7128E/S/A	84-Pin PLCC	27
EPM7128E/S	100-Pin PQFP	18
EPM7128S/A	100-Pin TQFP	16
EPM7128A	100-Pin FineLine BGA	6
EPM7128A	144-Pin TQFP	17
EPM7128E/S	160-Pin PQFP	19
EPM7128A	256-Pin FineLine BGA	7
EPM7160E/S	84-Pin PLCC	27
EPM7160E/S	100-Pin PQFP	18
EPM7160S	100-Pin TQFP	16
EPM7160E/S	160-Pin PQFP	19
EPM7192E/S	160-Pin PQFP	19
EPM7192E	160-Pin PGA	32
EPM7256A	100-Pin TQFP	16
EPM7256A	144-Pin TQFP	17
EPM7256E	160-Pin PQFP	19
EPM7256E	192-Pin PGA	32
EPM7256S/A	208-Pin PQFP	20
EPM7256E/S	208-Pin RQFP	21
EPM7256A	100-Pin FineLine BGA	6
EPM7256A	256-Pin FineLine BGA	7
EPM7384AE	144-Pin TQFP	17
EPM7384AE	208-Pin PQFP	20
EPM7384AE	256-Pin FineLine BGA	7
EPM7512AE	144-Pin TQFP	17
EPM7512AE	208-Pin PQFP	20
EPM7512AE	256-Pin FineLine BGA	7

MAX 9000 Family

EPM9320/A	84-Pin PLCC	27
EPM9320/A	208-Pin RQFP	21
EPM9320	280-Pin PGA	32
EPM9320/A	356-Pin BGA	12
EPM9400	84-Pin PLCC	27
EPM9400	208-Pin RQFP	21
EPM9400	240-Pin RQFP	23
EPM9480/A	208-Pin RQFP	21
EPM9480/A	240-Pin RQFP	23
EPM9560/A	208-Pin RQFP	21
EPM9560/A	240-Pin RQFP	23
EPM9560	280-Pin PGA	32
EPM9560	304-Pin RQFP	24
EPM9560/A	356-Pin BGA	12

FLEX 6000 Family

		Page
EPF6010A	100-Pin TQFP	16
EPF6010A	144-Pin TQFP	17
EPF6010A	100-Pin FineLine BGA	6
EPF6010A	256-Pin FineLine BGA	7
EPF6016A	100-Pin TQFP	16
EPF6016A	100-Pin FineLine BGA	6
EPF6016/A	144-Pin TQFP	17
EPF6016/A	208-Pin PQFP	20
EPF6016	240-Pin PQFP	22
EPF6016	256-Pin BGA	11
EPF6016A	256-Pin FineLine BGA	7
EPF6024A	144-Pin TQFP	17
EPF6024A	208-Pin PQFP	20
EPF6024A	240-Pin PQFP	22
EPF6024A	256-Pin BGA	11
EPF6024A	256-Pin FineLine BGA	7

FLEX 8000 Family

EPF8282A	84-Pin PLCC	27
EPF8282A/AV	100-Pin TQFP	16
EPF8452A	84-Pin PLCC	27
EPF8452A	100-Pin TQFP	16
EPF8452A	160-Pin PQFP	19
EPF8452A	160-Pin PGA	32
EPF8636A	84-Pin PLCC	27
EPF8636A	160-Pin PQFP	19
EPF8636A	192-Pin PGA	32
EPF8636A	208-Pin PQFP	20
EPF8820A	144-Pin TQFP	17
EPF8820A	160-Pin PQFP	19
EPF8820A	192-Pin PGA	32
EPF8820A	208-Pin PQFP	20
EPF8820A	208-Pin RQFP	21
EPF8820A	225-Pin BGA	10
EPF81188A	208-Pin PQFP	20
EPF81188A	232-Pin PGA	32
EPF81188A	240-Pin PQFP	22
EPF81188A	240-Pin RQFP	23
EPF81500A	240-Pin PQFP	22
EPF81500A	240-Pin RQFP	23
EPF81500A	280-Pin PGA	32
EPF81500A	304-Pin RQFP	24

FLEX10K Family

EPF10K10	84-Pin PLCC	27
EPF10K10A	100-Pin TQFP	16
EPF10K10/A	144-Pin TQFP	17
EPF10K10/A	208-Pin PQFP	20
EPF10K10A	256-Pin FineLine BGA	7
EPF10K20	144-Pin TQFP	17
EPF10K20	208-Pin RQFP	21
EPF10K20	240-Pin RQFP	23
EPF10K30A/E	144-Pin TQFP	17
EPF10K30	208-Pin RQFP	21
EPF10K30A/E	208-Pin PQFP	20

		Page
EPF10K30	240-Pin RQFP	23
EPF10K30A	240-Pin PQFP	22
EPF10K30A/E	256-Pin FineLine BGA	7
EPF10K30/A	356-Pin BGA	12
EPF10K30A/E	484-Pin FineLine BGA	8
EPF10K40	208-Pin RQFP	21
EPF10K40	240-Pin RQFP	23
EPF10K50E	144-Pin TQFP	17
EPF10K50E	208-Pin PQFP	20
EPF10K50E	240-Pin PQFP	22
EPF10K50/V	240-Pin RQFP	23
EPF10K50E	256-Pin FineLine BGA	7
EPF10K50/V	356-Pin BGA	12
EPF10K50	403-Pin PGA	29
EPF10K50V/E	484-Pin FineLine BGA	8
EPF10K70	240-Pin RQFP	23
EPF10K70	503-Pin PGA	30
EPF10K100B/E	208-Pin PQFP	20
EPF10K100B/E	240-Pin PQFP	22
EPF10K100A	240-Pin RQFP	23
EPF10K100B/E	256-Pin FineLine BGA	7
EPF10K100A/E	356-Pin BGA	12
EPF10K100A/E	484-Pin FineLine BGA	8
EPF10K100	503-Pin PGA	30
EPF10K100A	600-Pin BGA	13
EPF10K130E	240-Pin PQFP	22
EPF10K130E	484-Pin FineLine BGA	8
EPF10K130V	599-Pin PGA	31
EPF10K130V	600-Pin BGA	13
EPF10K130E	672-Pin FineLine BGA	9
EPF10K200E	240-Pin RQFP	23
EPF10K200E	599-Pin PGA	31
EPF10K200E	600-Pin BGA	13
EPF10K200E	672-Pin FineLine BGA	9
EPF10K250E	240-Pin RQFP	23
EPF10K250A/E	599-Pin PGA	31
EPF10K250A	600-Pin BGA	13
EPF10K250E	672-Pin FineLine BGA	9

Configuration EPROM Family

EPC1064/V	8-Pin PDIP	28
EPC1064/V	20-Pin PLCC	25
EPC1064/V	32-Pin TQFP	14
EPC1213	8-Pin PDIP	28
EPC1213	20-Pin PLCC	25
EPC1441	8-Pin PDIP	28
EPC1441	20-Pin PLCC	25
EPC1441	32-Pin TQFP	14
EPC1	8-Pin PDIP	28
EPC1	20-Pin PLCC	25
EPC2	20-Pin PLCC	25
EPC2	32-Pin TQFP	14

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