Altera Device Package Information

June 1998, ver. 7.01 Data Sheet

Introduction

This data sheet provides the following package information for all Altera® devices:

- Lead materials
- Thermal resistance
- Package weights
- Package outlines

In this data sheet, packages are listed in order of ascending pin count.

Lead Materials

Table 1 shows the available package types, package acronyms, lead materials, and lead finishes for all Altera device packages.

Table 1. Altera Device Lead Materials

Package Type	Package Acronym	Lead Material	Lead Finish *Note (1)*
Ceramic dual in-line	CerDIP	Alloy 42	Solder dip
Plastic dual in-line	PDIP	Copper	Solder plate
Ceramic J-lead chip carrier	JLCC	Alloy 42	Solder dip
Plastic J-lead chip carrier	PLCC	Copper	Solder plate
Ceramic pin-grid array *Note (2)*	PGA	Alloy 42	Gold over nickel plate
Plastic small-outline integrated circuit	SOIC	Copper	Solder plate
Ceramic quad flat pack	CQFP	Alloy 42	Tin plate: 100-pin commercial Solder dip: 208-pin
Plastic quad flat pack	PQFP	Copper	Solder plate
Plastic thin quad flat pack	TQFP	Copper	Solder plate
Power quad flat pack	RQFP	Copper	Solder plate
Ball-grid array	BGA	Tin-lead alloy (63/37)	–

Note:
(1) Solder dip lead finishes are 60/40 typical, and solder plate lead finished are 85/15 typical.
(2) An industry-standard lead glass called T-187 (lead oxide glass) is used to seal PGA packages. This material is manufactured by Sumitomo Corporation.

Thermal Resistance

Tables 2 through 9 provide θ_{JA} (junction-to-ambient thermal resistance) and θ_{JC} (junction-to-case thermal resistance) values for Altera FLEX® 10K, FLEX 8000, FLEX 6000, MAX® 9000, MAX 7000, MAX 5000, Classic™, and Configuration EPROM devices.

Table 2. Thermal Resistance of FLEX 10K Devices (Part 1 of 2) *Notes (1), (2)*

Device	Pin Count	Package	θ_{JC} (° C/W)	θ_{JA} (° C/W) Still Air	θ_{JA} (° C/W) 100 ft./min.	θ_{JA} (° C/W) 200 ft./min.	θ_{JA} (° C/W) 400 ft./min.
EPF10K10 EPF10K10A	84	PLCC	11	35	23	18	14
	144	TQFP	9	33	26	22	20
	208	PQFP	7	35	24	18	14
EPF10K20	144	TQFP	9	33	26	22	20
	208	RQFP	2	18	12	9	7
	240	RQFP	2	20	13	10	8
EPF10K30 EPF10K30A EPF10K30B	144	TQFP	9	33	26	22	20
	208	PQFP	7	35	24	18	14
		RQFP	2	18	12	9	7
	240	PQFP	7	30	22	17	14
		RQFP	2	20	13	10	8
	256	BGA	6	28	22	20	19
	356	BGA	7	30	22	17	14
EPF10K40	208	RQFP	2	18	12	9	7
	240	RQFP	2	20	13	10	8
EPF10K50 EPF10K50V EPF10K50B	208	PQFP	7	35	24	18	14
	240	PQFP	7	30	22	17	14
		RQFP	2	20	13	10	8
	256	BGA	6	28	22	20	19
	356	BGA	2	15	12	9	8
	403	PGA	**3**	**12**	**10**	**9**	**8**
		PGA, *Note (3)*	**3**	**10**	**8**	**7**	**6**
EPF10K70	240	RQFP	2	20	13	10	8
	503	PGA	1	8	7	6	4

Table 2. Thermal Resistance of FLEX 10K Devices (Part 2 of 2) *Notes (1), (2)*

Device	Pin Count	Package	θ_{JC} (° C/W)	θ_{JA} (° C/W) Still Air	θ_{JA} (° C/W) 100 ft./min.	θ_{JA} (° C/W) 200 ft./min.	θ_{JA} (° C/W) 400 ft./min.
EPF10K100	208	PQFP	7	35	24	18	14
EPF10K100A	240	PQFP	7	30	22	17	14
EPF10K100B		RQFP	2	20	13	10	8
	256	BGA	6	28	22	20	19
	356	BGA	2	15	12	9	8
	503	PGA	**1**	**8**	**7**	**6**	**4**
		PGA, *Note (3)*	1	6	5	4	3
		PGA, *Note (4)*	–	**2**	–	–	–
	599	PGA	1	8	7	6	4
	600	BGA	2	13	10	8	7
EPF10K130V	599	PGA	1	8	7	6	4
	600	BGA	2	13	10	8	7
EPF10K180B	240	RQFP	2	20	13	10	8
	356	BGA	2	15	12	9	8
	600	BGA	2	13	10	8	7
EPF10K250A	356	BGA	2	15	12	9	8
EPF10K250B	599	PGA	1	8	7	6	4
	600	BGA	2	13	10	8	7

Notes:
(1) Bold type designates measured values.
(2) Thermal resistance values for FLEX 10KA and FLEX 10KB devices are preliminary.
(3) Attached pin-fin heat sink.
(4) Attached motor driven fan heat sink.

Table 3. Thermal Resistance of FLEX 8000 Devices (Part 1 of 2) *Note (1)*

Device	Pin Count	Package	θ_{JC} (° C/W)	θ_{JA} (° C/W) Still Air	θ_{JA} (° C/W) 100 ft./min.	θ_{JA} (° C/W) 200 ft./min.	θ_{JA} (° C/W) 400 ft./min.
EPF8282	84	PLCC	**11**	**35**	**23**	**18**	**14**
EPF8282A	100	TQFP	**10**	**44**	**38**	**34**	**31**
EPF8282AV							
EPF8452	84	PLCC	**11**	**35**	**23**	**18**	**14**
EPF8452A	100	TQFP	**10**	**44**	**38**	**34**	**31**
	160	PQFP	**7**	**35**	**26**	**20**	**16**
	160	PGA	**6**	**20**	**13**	**10**	**8**

Table 3. Thermal Resistance of FLEX 8000 Devices (Part 2 of 2) *Note (1)*

EPF8636 EPF8636A	84	PLCC	**11**	**35**	**23**	**18**	**14**
	160	PQFP	**6**	**20**	**13**	**10**	**8**
	192	PGA	**6**	**16**	**11**	**8**	**6**
	208	PQFP	7	35	24	18	14
	208	RQFP	**2**	**18**	**12**	**9**	**7**
EPF8820 EPF8820A	144	TQFP	9	33	26	22	20
	160	PQFP	**6**	**20**	**13**	**10**	**8**
	192	PGA	**6**	**16**	**11**	**8**	**6**
	208	PQFP	7	35	24	18	14
	208	RQFP	**2**	**18**	**12**	**9**	**7**
	225	BGA	**6**	**28**	**19**	**14**	**11**
EPF81188 EPF81188A	208	PQFP	7	35	24	18	14
	232	PGA	**2**	**14**	**10**	**7**	**5**
	240	PQFP	7	30	22	17	14
	240	RQFP	**2**	**20**	**13**	**10**	**8**
EPF81500 EPF81500A	240	PQFP	7	30	22	17	14
	240	RQFP	**2**	**20**	**13**	**10**	**8**
	280	PGA	**2**	**14**	**10**	**7**	**5**
	304	RQFP	**1**	**20**	**13**	**10**	**8**

Note:
(1) Bold type designates measured values.

Table 4. Thermal Resistance of FLEX 6000 Devices

Device	Pin Count	Package	θ_{JC} (° C/W)	θ_{JA} (° C/W) Still Air	θ_{JA} (° C/W) 100 ft./min.	θ_{JA} (° C/W) 200 ft./min.	θ_{JA} (° C/W) 400 ft./min.
EPF6016 EPF6016A	144	TQFP	9	33	26	22	20
	208	PQFP	7	35	24	18	14
	240	PQFP	7	30	22	17	14
	256	BGA	6	28	22	20	19
EPF6024A	144	TQFP	9	33	26	22	20
	208	PQFP	7	35	24	18	14
	240	PQFP	7	30	22	17	14
	256	BGA	6	28	22	20	19

Table 5. Thermal Resistance of MAX 9000 Devices *Notes (1), (2)*

Device	Pin Count	Package	θ_{JC} (° C/W)	θ_{JA} (° C/W) Still Air	θ_{JA} (° C/W) 100 ft./min.	θ_{JA} (° C/W) 200 ft./min.	θ_{JA} (° C/W) 400 ft./min.
EPM9320 EPM9320A	84	PLCC	**11**	**35**	**23**	**18**	**14**
	208	RQFP	**2**	**18**	**12**	**9**	**7**
	280	PGA	**2**	**14**	**10**	**7**	**5**
	356	BGA	2	15	12	9	8
EPM9400	84	PLCC	**11**	**35**	**23**	**18**	**14**
	208	RQFP	**2**	**18**	**12**	**9**	**7**
	240	RQFP	**2**	**20**	**13**	**10**	**8**
EPM9480 EPM9480A	208	RQFP	**2**	**18**	**12**	**9**	**7**
	240	RQFP	**2**	**20**	**13**	**10**	**8**
EPM9560 EPM9560A	208	RQFP	**2**	**18**	**12**	**9**	**7**
	240	RQFP	**2**	**20**	**13**	**10**	**8**
	280	PGA	**2**	**14**	**10**	**7**	**5**
	304	RQFP	**1**	**20**	**13**	**10**	**8**
	356	BGA	2	15	12	9	8

Note:
(1) Bold type designates measured values.
(2) Thermal resistance values for MAX 9000 devices are preliminary.

Table 6. Thermal Resistance of MAX 7000 Devices (Part 1 of 2) *Note (1)*

Device	Pin Count	Package	θ_{JC} (° C/W)	θ_{JA} (° C/W) Still Air	θ_{JA} (° C/W) 100 ft./min.	θ_{JA} (° C/W) 200 ft./min.	θ_{JA} (° C/W) 400 ft./min.
EPM7032 EPM7032S EPM7032A	44	PLCC	**9**	**52**	45	41	36
		PQFP	**18**	**63**	55	48	43
		TQFP	**19**	**64**	56	50	45
EPM7032V	44	PLCC	**9**	**52**	45	41	36
		TQFP	**19**	**64**	56	50	45
EPM7064 EPM7064S EPM7064A	44	PLCC	**11**	**35**	**23**	**18**	**14**
		TQFP	**10**	**44**	**38**	**34**	**31**
	68	PLCC	**12**	**44**	33	25	20
	84	PLCC	**11**	**35**	**23**	**18**	**14**
	100	PQFP	**11**	**50**	43	38	34
		TQFP	**10**	**44**	**38**	**34**	**31**

Table 6. Thermal Resistance of MAX 7000 Devices (Part 2 of 2) *Note (1)*

Device	Pin Count	Package	θ_{JC} (° C/W)	θ_{JA} (° C/W) Still Air	θ_{JA} (° C/W) 100 ft./min.	θ_{JA} (° C/W) 200 ft./min.	θ_{JA} (° C/W) 400 ft./min.
EPM7096	68	JLCC	**12**	**48**	39	28	22
		PLCC	**12**	**44**	33	25	20
	84	JLCC	**4**	**30**	22	16	10
		PLCC	**11**	**35**	**23**	**18**	**14**
	100	PQFP	**11**	**50**	43	38	34
EPM7128E EPM7128S EPM7128A	84	PLCC	**11**	**35**	**23**	**18**	**14**
	100	TQFP	**10**	**44**	**38**	**34**	**31**
		PQFP	**11**	**50**	43	38	34
	144	TQFP	9	33	26	22	20
	160	PQFP	**7**	**35**	**26**	**20**	**16**
EPM7160E EPM7160S	84	PLCC	**11**	**35**	**23**	**18**	**14**
	100	PQFP	**11**	**50**	43	38	34
	160	PQFP	**7**	**35**	**26**	**20**	**16**
EPM7192E EPM7192S	160	PGA	**6**	**20**	**13**	**10**	**8**
		PQFP	**7**	**35**	**26**	**20**	**16**
EPM7256E EPM7256S EPM7256A	100	TQFP	10	44	38	34	31
	144	TQFP	9	33	26	22	20
	160	PGA	**6**	**20**	**13**	**10**	**8**
		PQFP	**7**	**35**	**26**	**20**	**16**
	192	PGA	**6**	**16**	**11**	**8**	**6**
	208	PQFP	7	35	24	18	14
		RQFP	**2**	**18**	**12**	**9**	**7**
	256	BGA	6	28	22	20	19
EPM7384A	144	TQFP	9	33	26	22	20
	208	PQFP	7	35	24	18	14
	256	BGA	6	28	22	20	19
EPM7512A	144	TQFP	9	33	26	22	20
	208	PQFP	7	35	24	18	14
	256	BGA	6	28	22	20	19
EPM71024A	208	PQFP	7	35	24	18	14
	256	BGA	6	28	22	20	19

Note:
(1) Bold type designates measured values.

Table 7. Thermal Resistance of MAX 5000 Devices *Note (1)*				
Device	**Pin Count**	**Package**	**θ_{JC} (° C/W)**	**θ_{JA} (° C/W)**
EPM5032	28	CerDIP	**12**	**44**
		PDIP	**19**	**48**
		JLCC	**9**	**69**
		PLCC	**10**	**59**
EPM5064	44	JLCC	**15**	**62**
		PLCC	**9**	**52**
EPM5128	68	JLCC	**11**	**39**
		PLCC	**12**	**44**
		PGA	**2**	**32**
EPM5130	84	JLCC	**4**	**30**
		PLCC	**11**	**35**
	100	CQFP	**11**	**50**
		PQFP	**10**	**50**
		PGA	**4**	**26**
EPM5192	84	JLCC	**4**	**30**
		PLCC	**11**	**35**
		PGA	**2**	**27**

Note:
(1) Bold type designates measured values.

Table 8. Thermal Resistance of Classic Devices *Note (1)*

Device	Pin Count	Package	θ_{JC} (° C/W)	θ_{JA} (° C/W)
EP610	24	CerDIP	**10**	**60**
		PDIP	**18**	**55**
		SOIC	**17**	**77**
	28	PLCC	**13**	**74**
EP610I	24	CerDIP	**18**	**60**
		PDIP	**22**	**67**
	28	PLCC	**16**	**64**
EP910	40	CerDIP	**12**	**40**
		PDIP	**23**	**49**
	44	PLCC	**10**	**58**
EP910I	40	CerDIP	**17**	**44**
		PDIP	**29**	**51**
	44	PLCC	**16**	**55**
EP1810	68	JLCC	**12**	**47**
		PLCC	**13**	**44**
		PGA	**6**	**38**

Table 9. Thermal Resistance of Configuration EPROM Devices *Note (1)*

Device	Pin Count	Package	θ_{JC} (° C/W)	θ_{JA} (° C/W)
EPC1064	8	PDIP	**19**	**48**
EPC1064V	20	PLCC	**18**	**80**
	32	TQFP	**17**	**75**
EPC1213	8	PDIP	**19**	**48**
	20	PLCC	**18**	**80**
	32	TQFP	**17**	**75**
EPC1441	8	PDIP	**19**	**48**
	20	PLCC	**18**	**80**
	32	TQFP	**17**	**75**
EPC1	8	PDIP	**16**	**70**
	20	PLCC	**18**	**80**

Note to tables:
(1) Bold type designates measured values.

Package Weights

Table 10 shows the package weights for Altera devices.

Table 10. Package Weights for Altera Devices (Part 1 of 2)

Pins	Package	Weight (in grams)
8	PDIP	0.5
8	CerDIP	1.4
20	CerDIP	3.2
20	SOIC	0.5
20	PLCC	0.8
24	CerDIP	4.1
24	PDIP	1.7
24	SOIC	0.6
28	SOIC	0.7
28	PLCC	1.1
32	TQFP	0.2
40	PDIP	6.0
40	CerDIP	13.2
44	PLCC	2.3
44	JLCC	2.8
44	PQFP	0.5
44	TQFP	0.3
68	PGA	10.4
68	JLCC	7.1
68	PLCC	4.6
84	PLCC	6.8
84	JLCC	10.9
84	PGA	10.6
100	PQFP	1.6
100	CQFP	2.1
100	PGA	14.2
100	TQFP	0.5
132	PQFP	4.4
144	TQFP	1.3
160	PQFP	5.4
160	PGA	19.9
192	PGA	24.1
208	PQFP	5.7
208	RQFP	10.8
208	CQFP	8.5

Table 10. Package Weights for Altera Devices (Part 2 of 2)

Pins	Package	Weight (in grams)
225	BGA	2.1
232	PGA	25.5
240	RQFP	15.1
240	PQFP	7.0
256	BGA	2.1
280	PGA	29.5
304	RQFP	26.3
356	BGA	7.0
403	PGA	29.5
503	PGA	59.0
599	PGA	69.0
600	BGA	12.0

Package Outlines

Package outlines are listed in order of ascending pin count. Altera package outlines meet the requirements of ***JEDEC Publication No. 95***. Table 11 lists the JEDEC package outlines that are used with Altera devices.

Table 11. JEDEC Package Outline Cross Reference (Part 1 of 2) *Note (1)*

Pins	Package	JEDEC Outline
8	PDIP	MS-001
20	CerDIP	MO-036
20	SOIC	MS-013
24	CerDIP	MO-036
24	PDIP	MS-001
24	SOIC	MS-013
28	SOIC	MS-013
28	PLCC	MS-018
28	JLCC	MO-087
28	PDIP	MS-001
28	CerDIP	MO-058
32	TQFP	MO-136
40	PDIP	MS-011
40	CerDIP	MS-103
44	PLCC	MS-018

Table 11. JEDEC Package Outline Cross Reference (Part 2 of 2) Note (1)		
Pins	**Package**	**JEDEC Outline**
44	JLCC	MO-087
44	PQFP	MO-108
44	TQFP	MO-136
68	PGA	MO-067
68	JLCC	MO-087
68	PLCC	MS-018
84	JLCC	MO-087
84	PLCC	MS-018
84	PGA	MO-067
100	PQFP	MO-108
100	TQFP	MO-136
100	PGA	MO-067
132	PQFP	MO-069
144	TQFP	MO-136
160	PQFP	MO-108
160	PGA	MO-067
192	PGA	MO-067
208	PQFP	MO-143
208	RQFP	MO-143
208	CQFP	MO-114
225	BGA	MO-151
232	PGA	MO-067
240	RQFP	MO-143
240	PQFP	MO-143
256	BGA	MO-151
280	PGA	MO-067
304	RQFP	MO-143
356	BGA	MO-192
403	PGA	–
503	PGA	–
599	PGA	–
600	BGA	MO-192

Note to table:
(1) For more information, contact Altera Applications at (800) 800-EPLD.

Table 12 shows the different packages and pin counts for Altera devices.

Table 12. Packages & Pin Counts (Part 1 of 2)

Package	Code	Pin Count
BGA	B	225
		356
		600
CerDIP	D	20
		24
		40
PGA	G	68
		84
		100
		160
		192
		232
		280
		403
		503
		599
JLCC	J	28
		44
		68
		84
PLCC	L	20
		28
		44
		68
		84
PDIP	P	8
		24
		40

Table 12. Package Codes & Lead Counts (Part 2 of 2)		
Package	**Code**	**Lead Count**
PQFP	Q	44
		100
		132
		160
		208
		240
RQFP	R	208
		240
		304
SOIC	S	20
		24
		28
TQFP	T	32
		44
		100
		144
CQFP	W	208

Table 13 summarizes the maximum lead coplanarity for Altera J-lead and QFP packages.

Table 13. Maximum Lead Coplanarity for J-Lead & QFP Packages	
Package	**Maximum Lead Coplanarity**
JLCC	0.006 inches (0.15 mm)
PLCC	0.004 inches (0.10 mm)
QFP packages with a lead pitch of 0.65 mm or greater	0.004 inches (0.10 mm)
CQFP packages with a lead pitch of 0.5 mm	0.004 inches (0.10 mm)
QFP packages with a lead pitch of 0.5 mm	0.003 inches (0.08 mm)
QFP packages with 208 pins or greater	0.003 inches (0.08 mm)
BGA	0.008 inches (0.20 mm)

For information on device package ordering codes, see *Ordering Information* in this data book.

Dimension Formats

Package outline dimensions are shown in the following formats:

min. inches (min. millimeters)
max. inches (max. millimeters)

or:

nominal inches ± tolerance
(nominal millimeters ± tolerance)

or:

inches
(millimeters) BSC, Min., Max., Ref., Typ., R, Dia., Sq.

Table 14 shows the units used to describe package outline dimensions.

Table 14. Package Outline Units

Unit	Description
BSC	Basic. Represents theoretical exact dimension 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.

The following figures show the package outlines for all Altera devices.

Figure 1. 8-Pin Plastic Dual In-Line Package (PDIP)

Controlling measurement is in inches. Millimeter measurements, shown in parentheses, are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats.

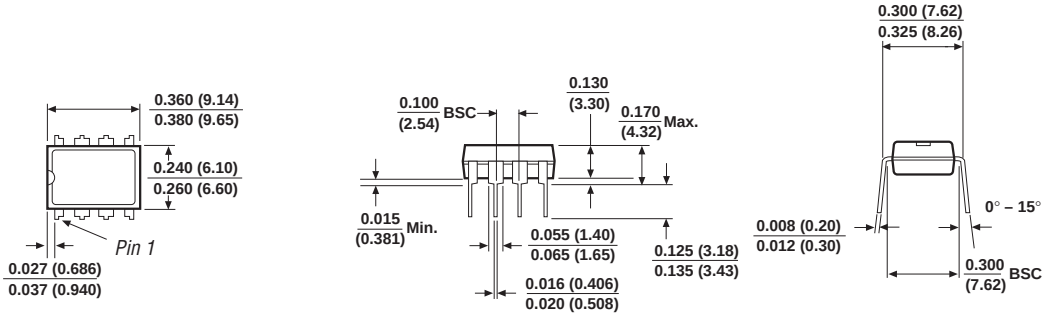


Figure 2. 20-Pin Ceramic Dual In-Line Package (CerDIP)

Controlling measurement is in inches. Millimeter measurements, shown in parentheses, are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats.

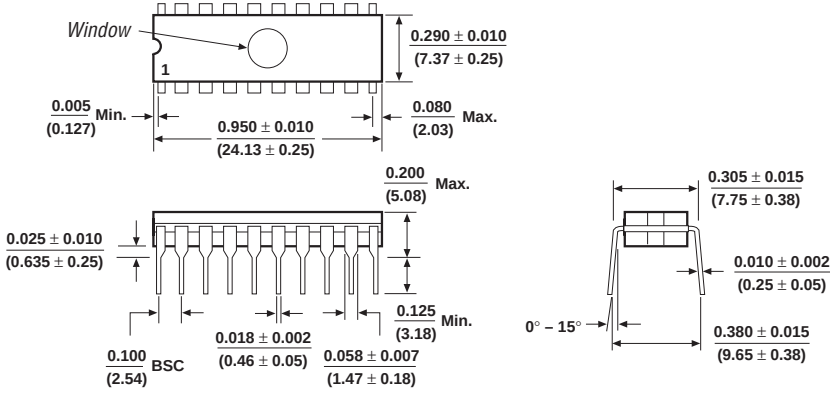


Figure 3. 20-Pin Plastic Dual In-Line Package (PDIP)

Controlling measurement is in inches. Millimeter measurements, shown in parentheses, are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats.

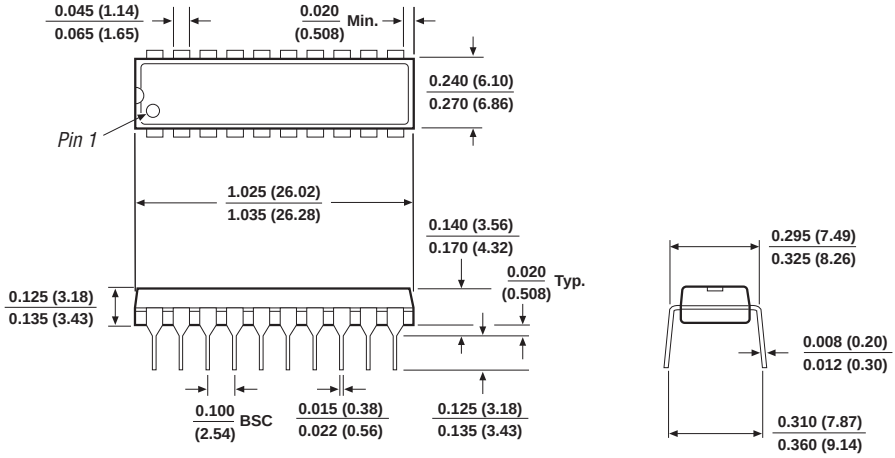
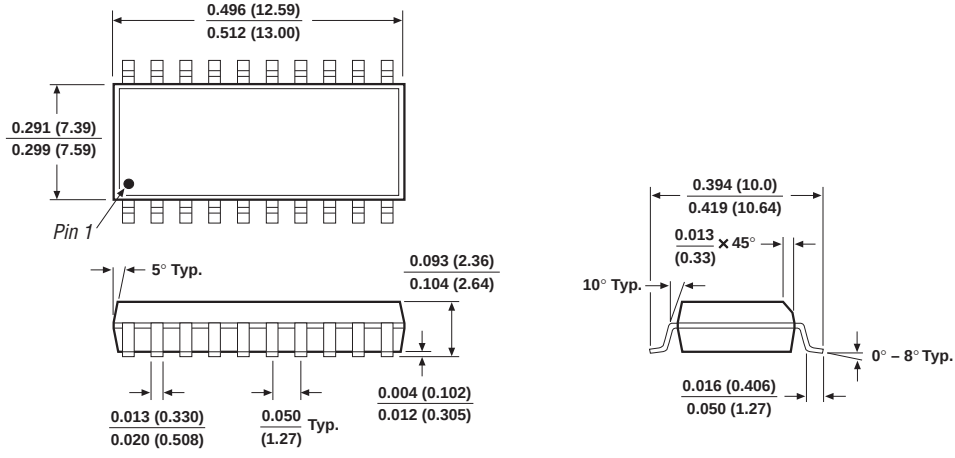


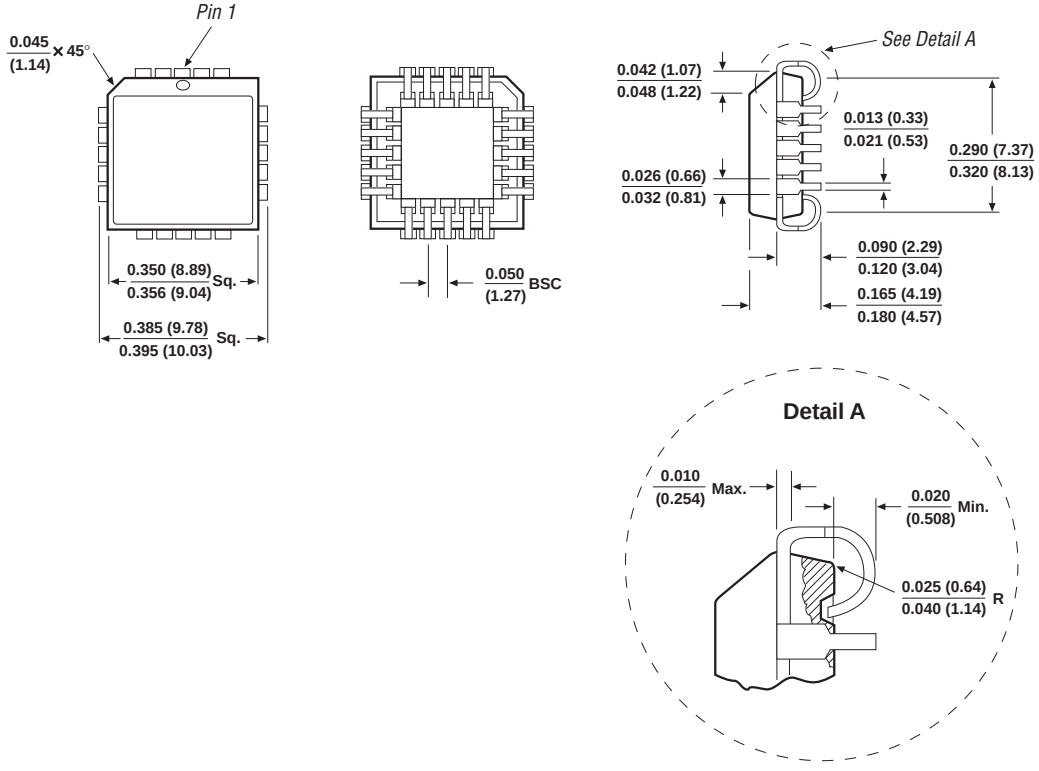
Figure 4. 20-Pin Plastic Small-Outline Integrated Circuit (SOIC)

Controlling measurement is in inches. Millimeter measurements, shown in parentheses, are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats.



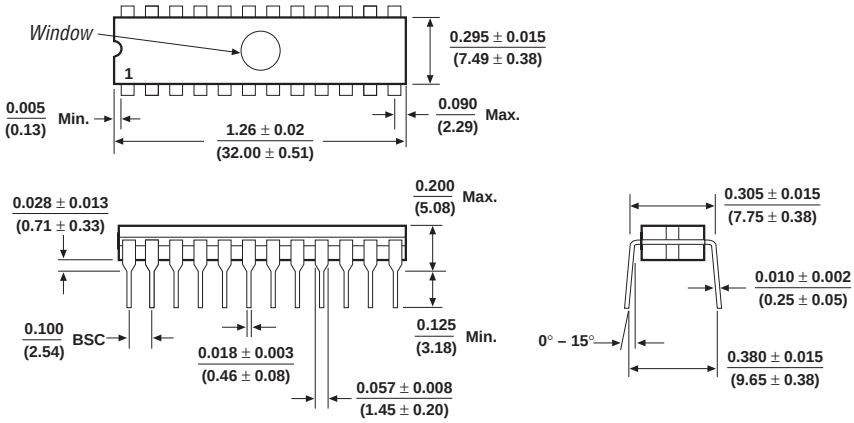
20-Pin Plastic J-Lead Chip Carrier (PLCC)

Controlling measurement is in inches. Millimeter measurements, shown in parentheses, are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats.



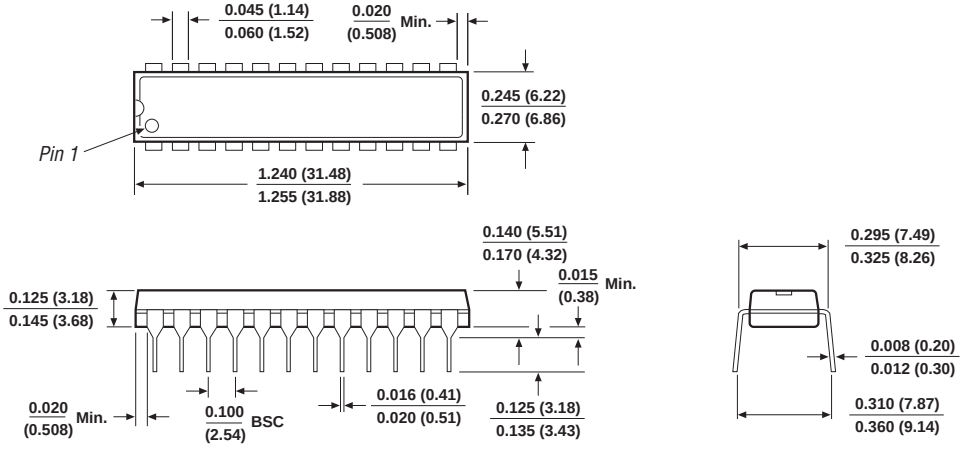
24-Pin Ceramic Dual In-Line Package (CerDIP)

Controlling measurement is in inches. Millimeter measurements, shown in parentheses, are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats.



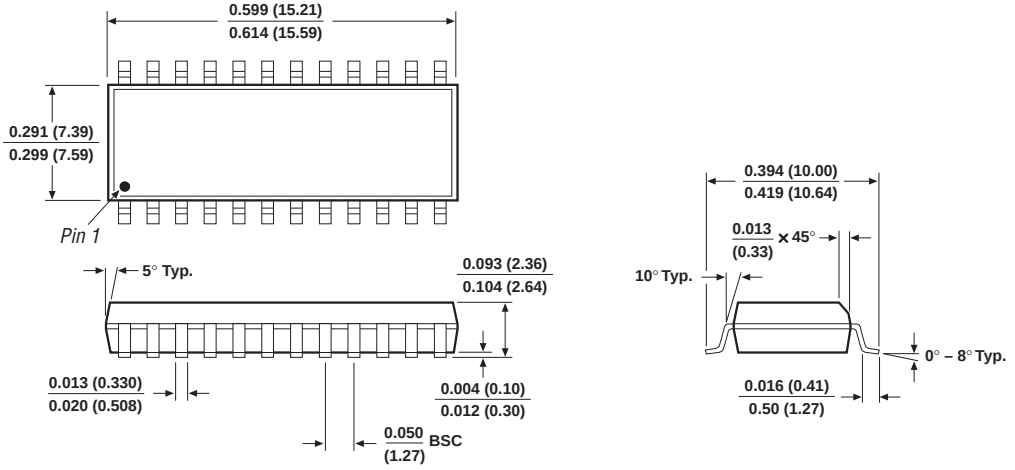
24-Pin Plastic Dual In-Line Package (PDIP)

Controlling measurement is in inches. Millimeter measurements, shown in parentheses, are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats.



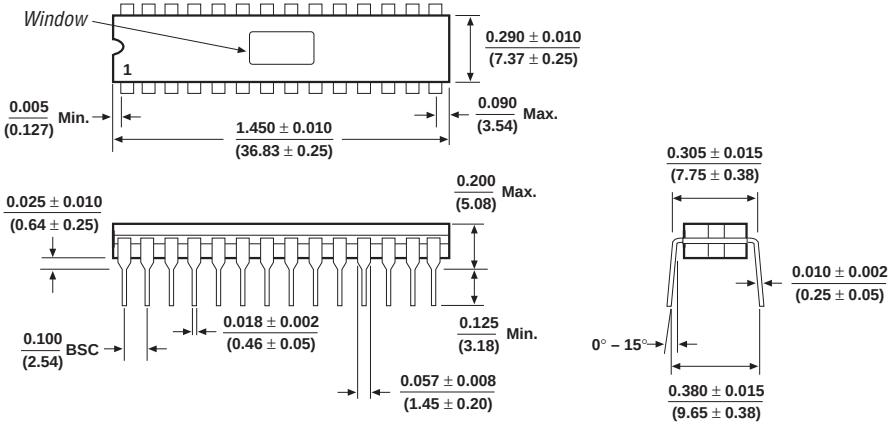
24-Pin Plastic Small-Outline Integrated Circuit (SOIC)

Controlling measurement is in inches. Millimeter measurements, shown in parentheses, are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats.



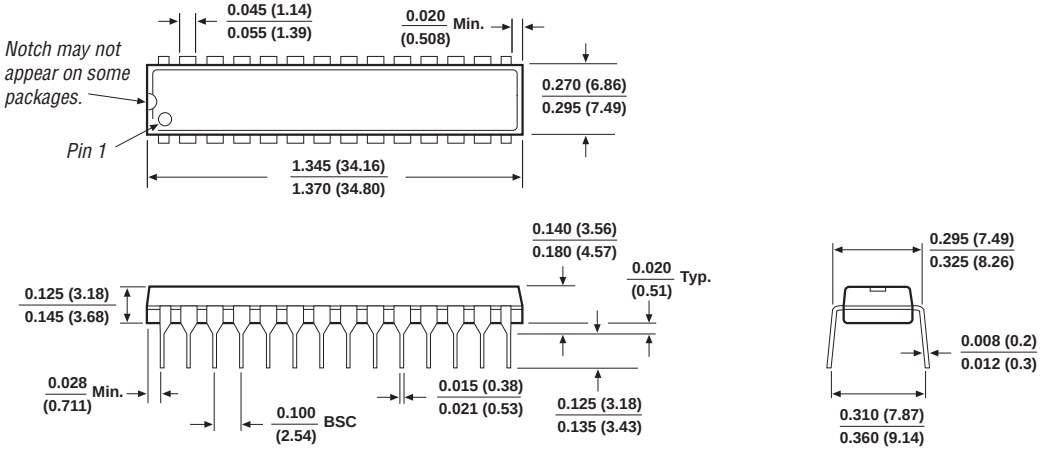
28-Pin Ceramic Dual In-Line Package (CerDIP)

Controlling measurement is in inches. Millimeter measurements, shown in parentheses, are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats.



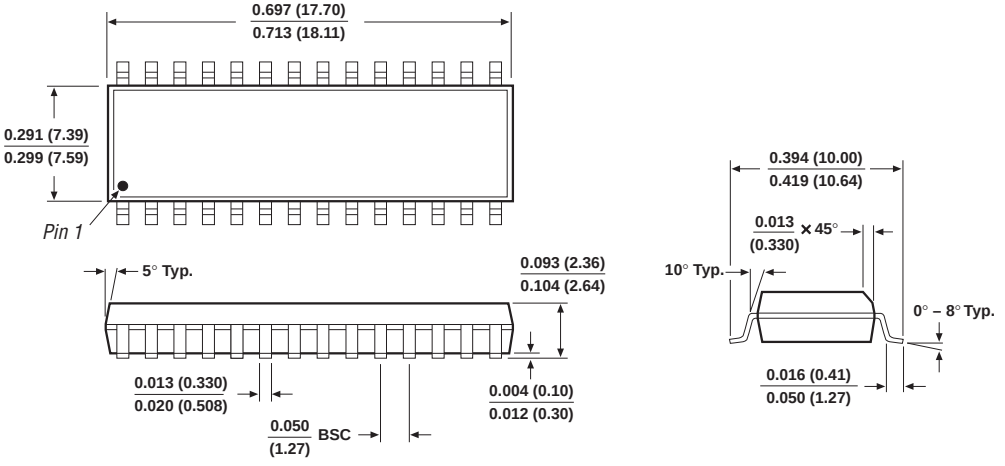
28-Pin Plastic Dual In-Line Package (PDIP)

Controlling measurement is in inches. Millimeter measurements, shown in parentheses, are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats.



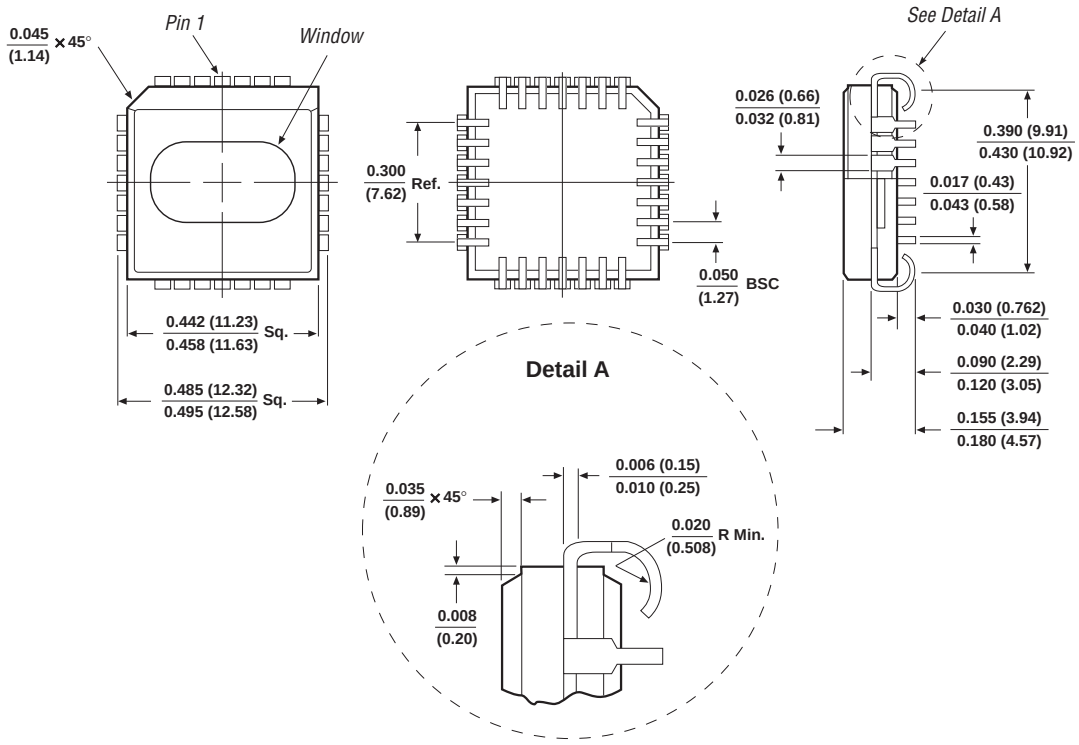
28-Pin Plastic Small-Outline Integrated Circuit (SOIC)

Controlling measurement is in inches. Millimeter measurements, shown in parentheses, are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats.



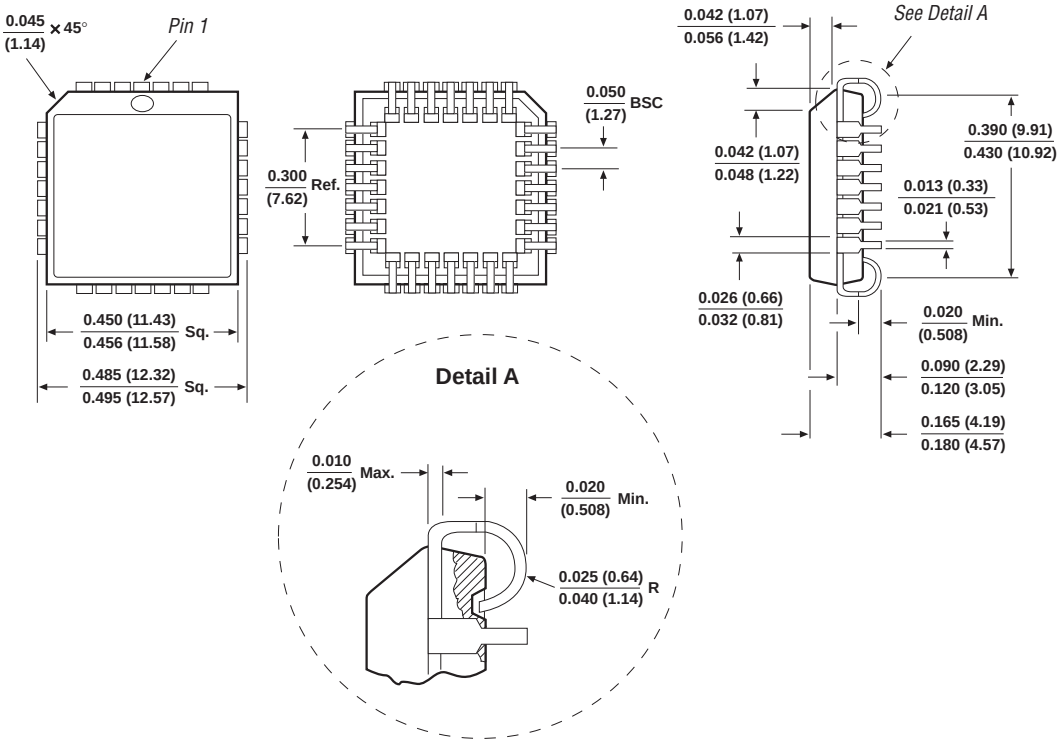
28-Pin Ceramic J-Lead Chip Carrier (JLCC)

Controlling measurement is in inches. Millimeter measurements, shown in parentheses, are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats.



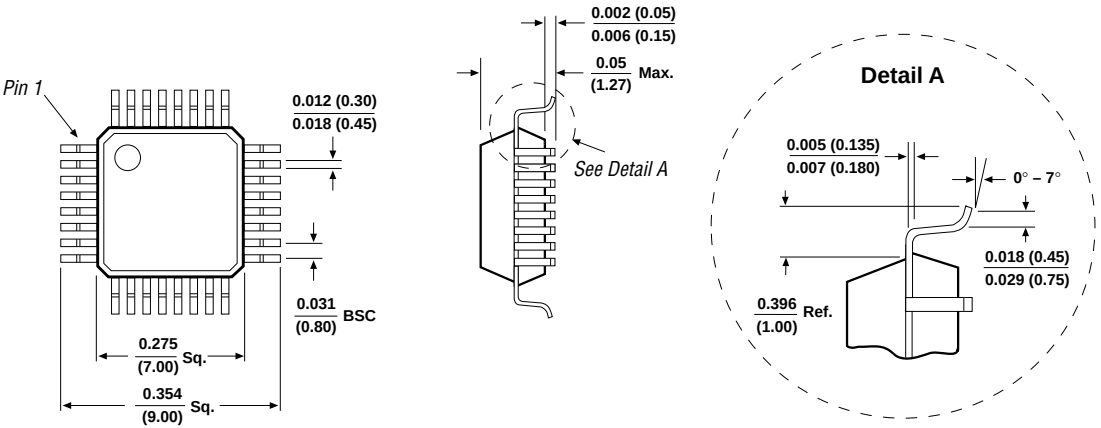
28-Pin Plastic J-Lead Chip Carrier (PLCC)

Controlling measurement is in inches. Millimeter measurements, shown in parentheses, are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats.



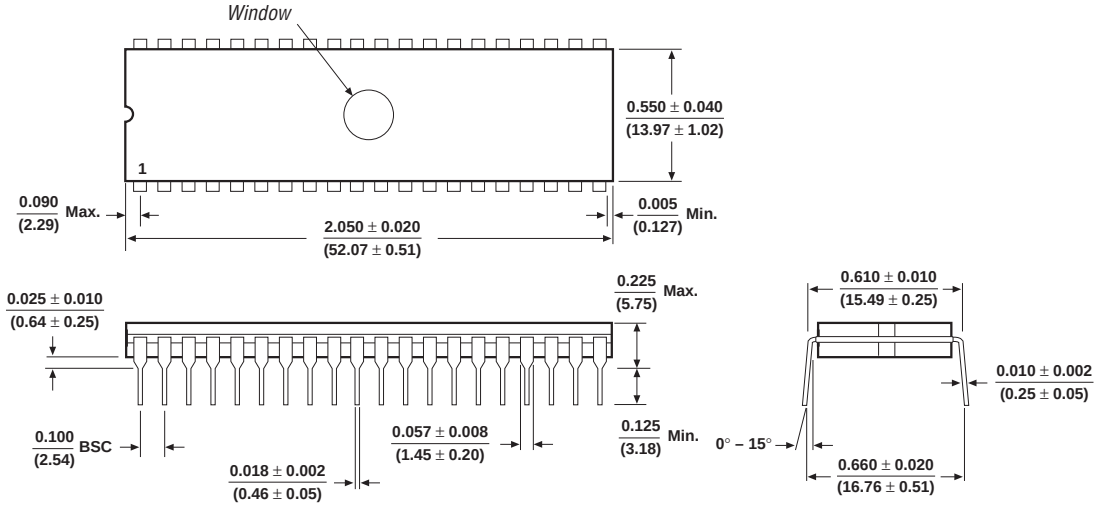
32-Pin Plastic Thin Quad Flat Pack (TQFP)

Controlling measurement is in millimeters, shown in parentheses. Inch measurements are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats.



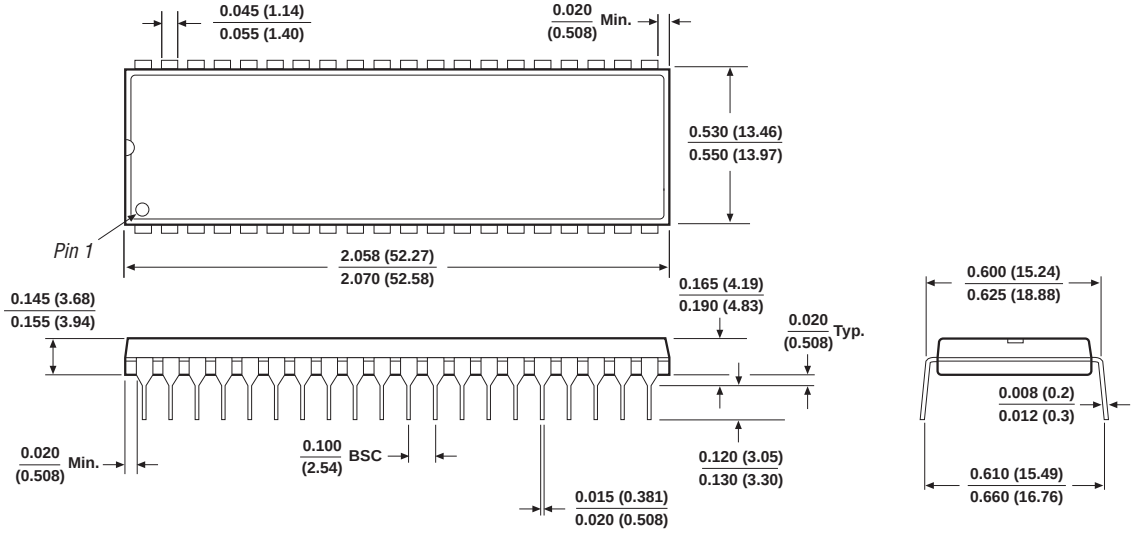
40-Pin Ceramic Dual In-Line Package (CerDIP)

Controlling measurement is in inches. Millimeter measurements, shown in parentheses, are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats.



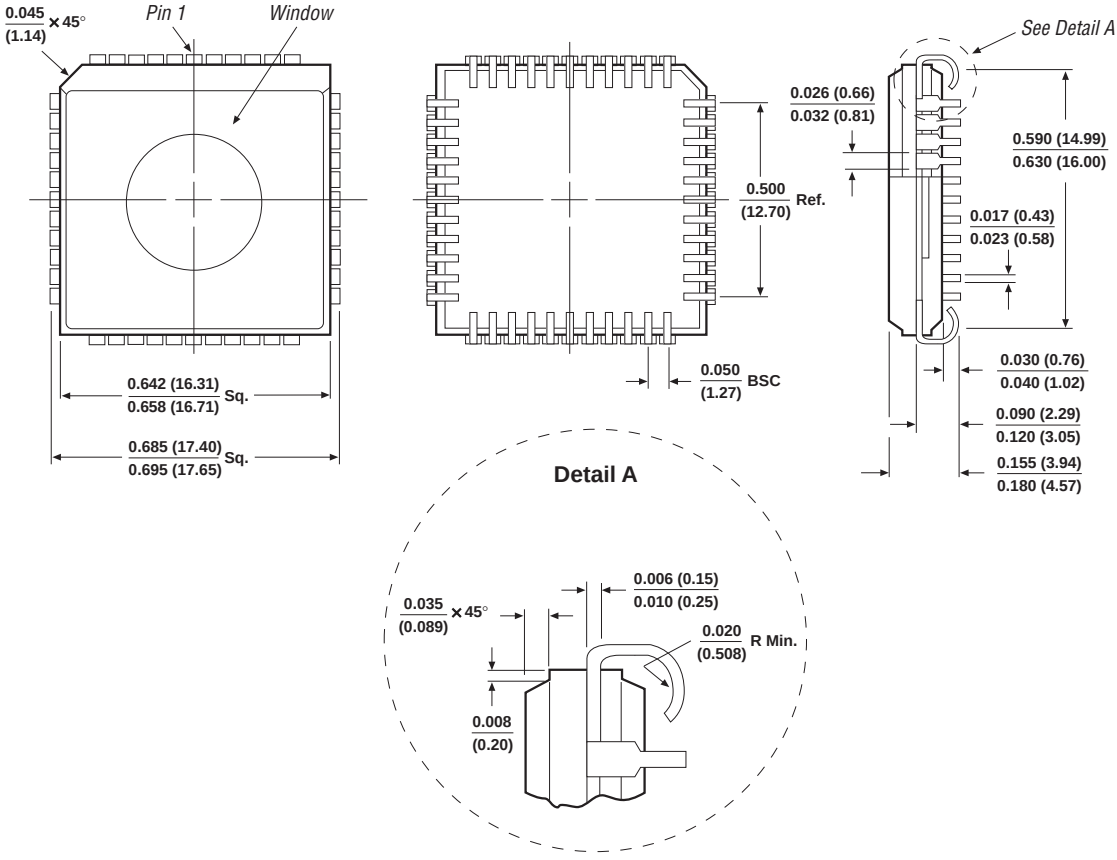
40-Pin Plastic Dual In-Line Package (PDIP)

Controlling measurement is in inches. Millimeter measurements, shown in parentheses, are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats.



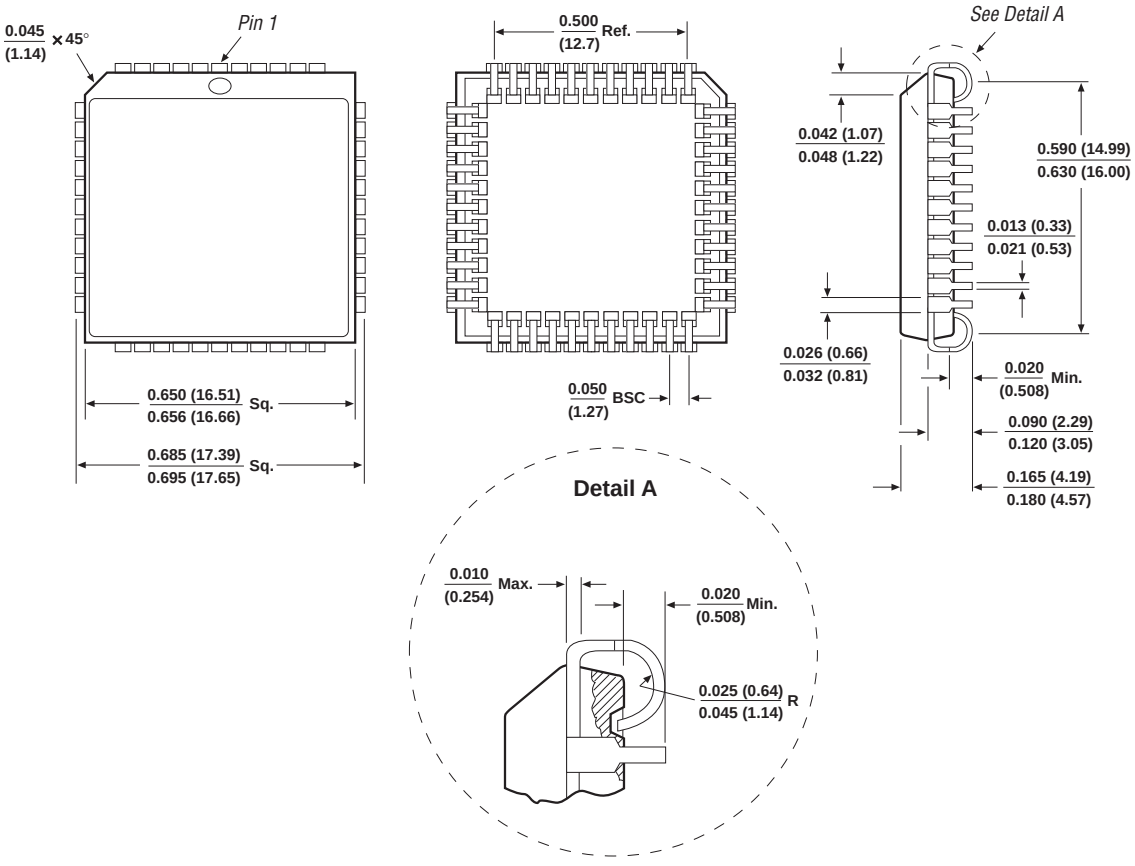
44-Pin Ceramic J-Lead Chip Carrier (JLCC)

Controlling measurement is in inches. Millimeter measurements, shown in parentheses, are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats.



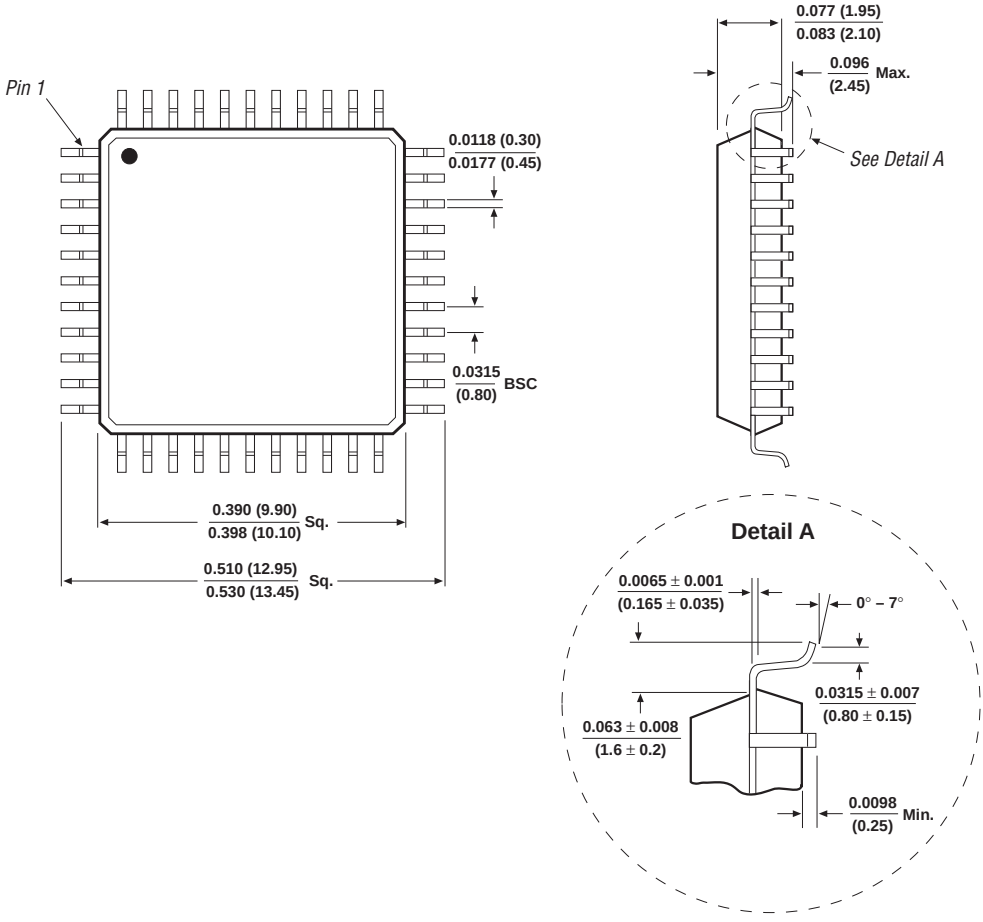
44-Pin Plastic J-Lead Chip Carrier (PLCC)

Controlling measurement is in inches. Millimeter measurements, shown in parentheses, are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats.



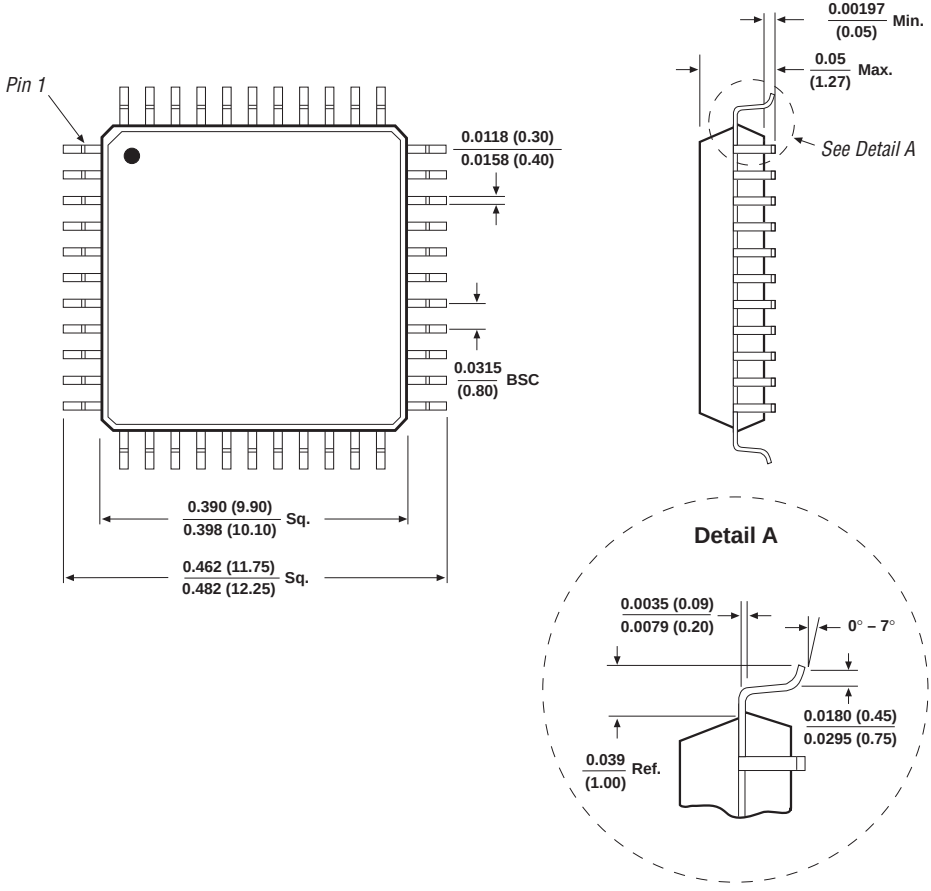
44-Pin Plastic Quad Flat Pack (PQFP)

Controlling measurement is in millimeters, shown in parentheses. Inch measurements are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats.



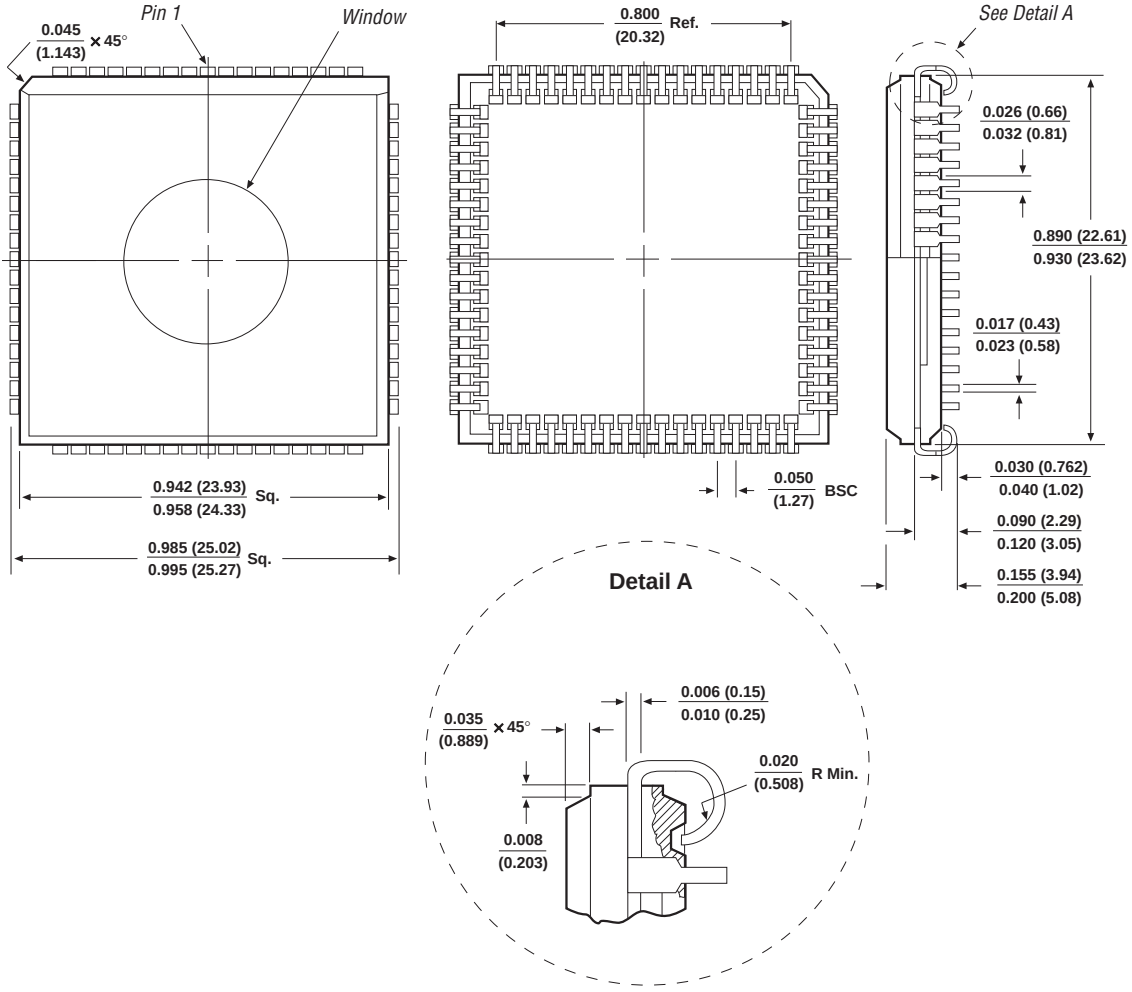
44-Pin Plastic Thin Quad Flat Pack (TQFP)

Controlling measurement is in millimeters, shown in parentheses. Inch measurements are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats.



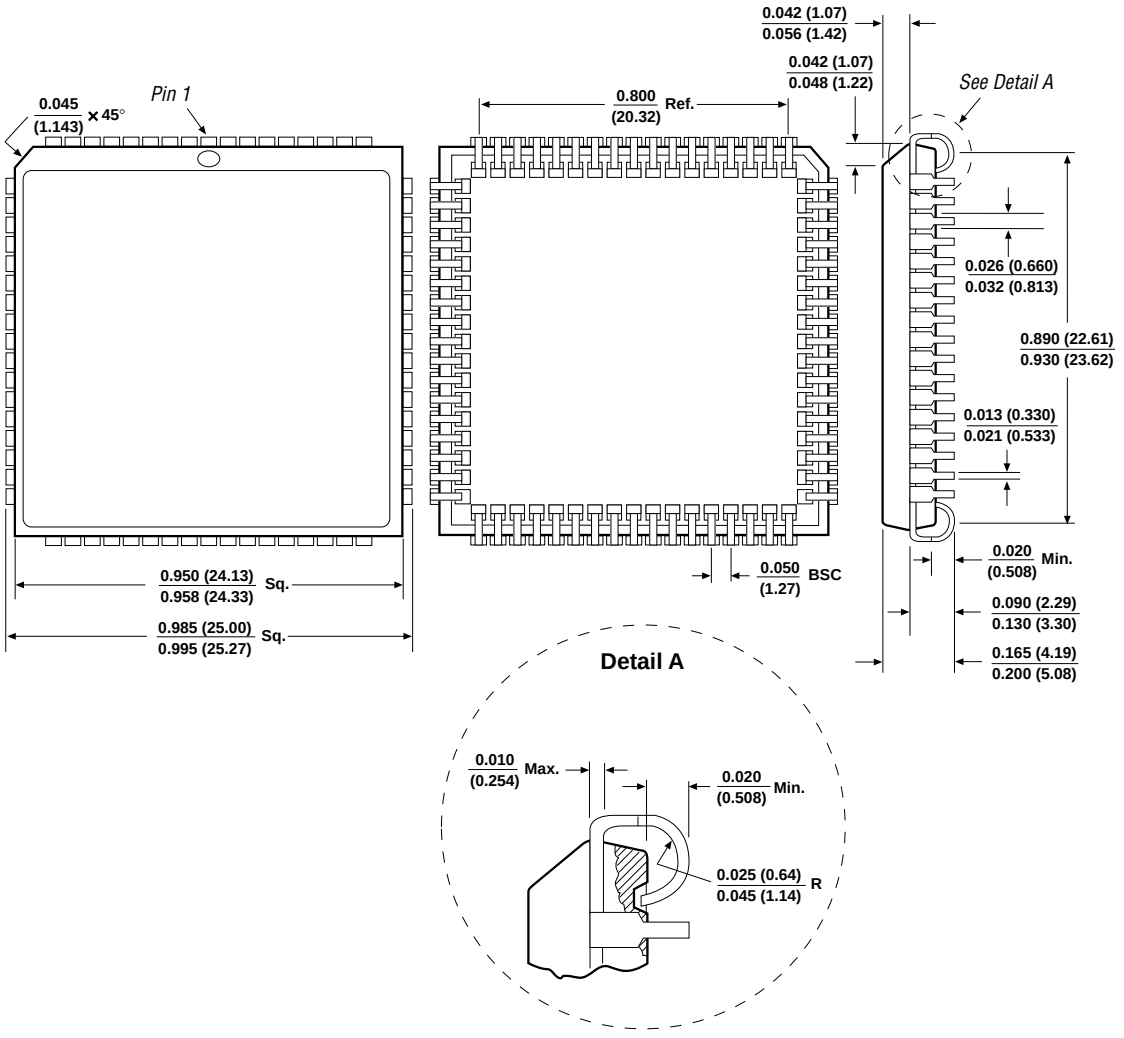
68-Pin Ceramic J-Lead Chip Carrier (JLCC)

Controlling measurement is in inches. Millimeter measurements, shown in parentheses, are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats.



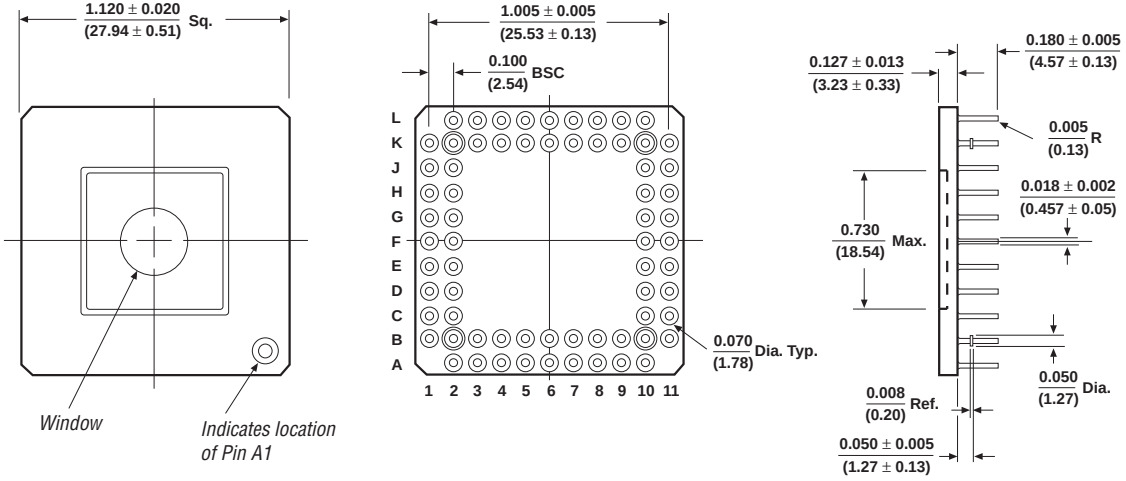
68-Pin Plastic J-Lead Chip Carrier (PLCC)

Controlling measurement is in inches. Millimeter measurements, shown in parentheses, are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats.



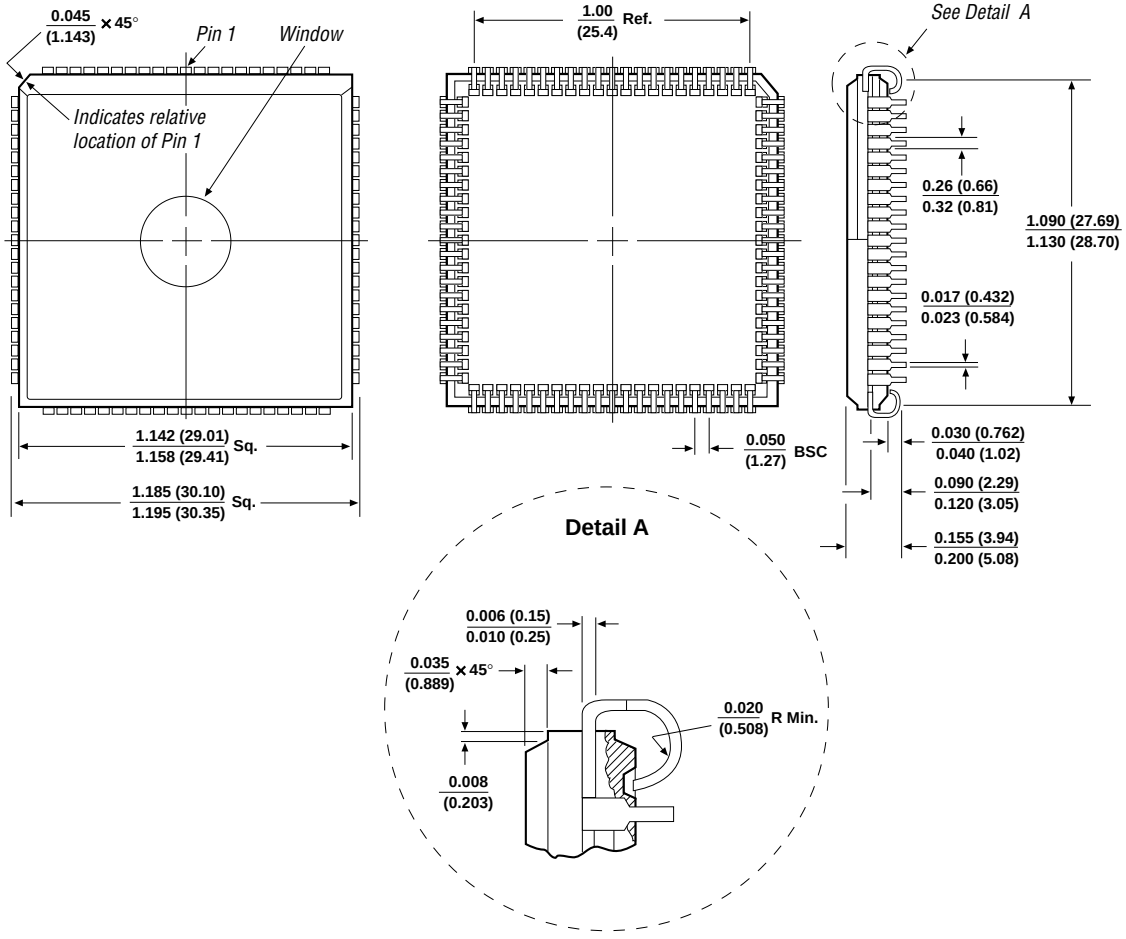
68-Pin Small Outline Ceramic Pin-Grid Array (PGA)

Controlling measurement is in inches. Millimeter measurements, shown in parentheses, are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats.



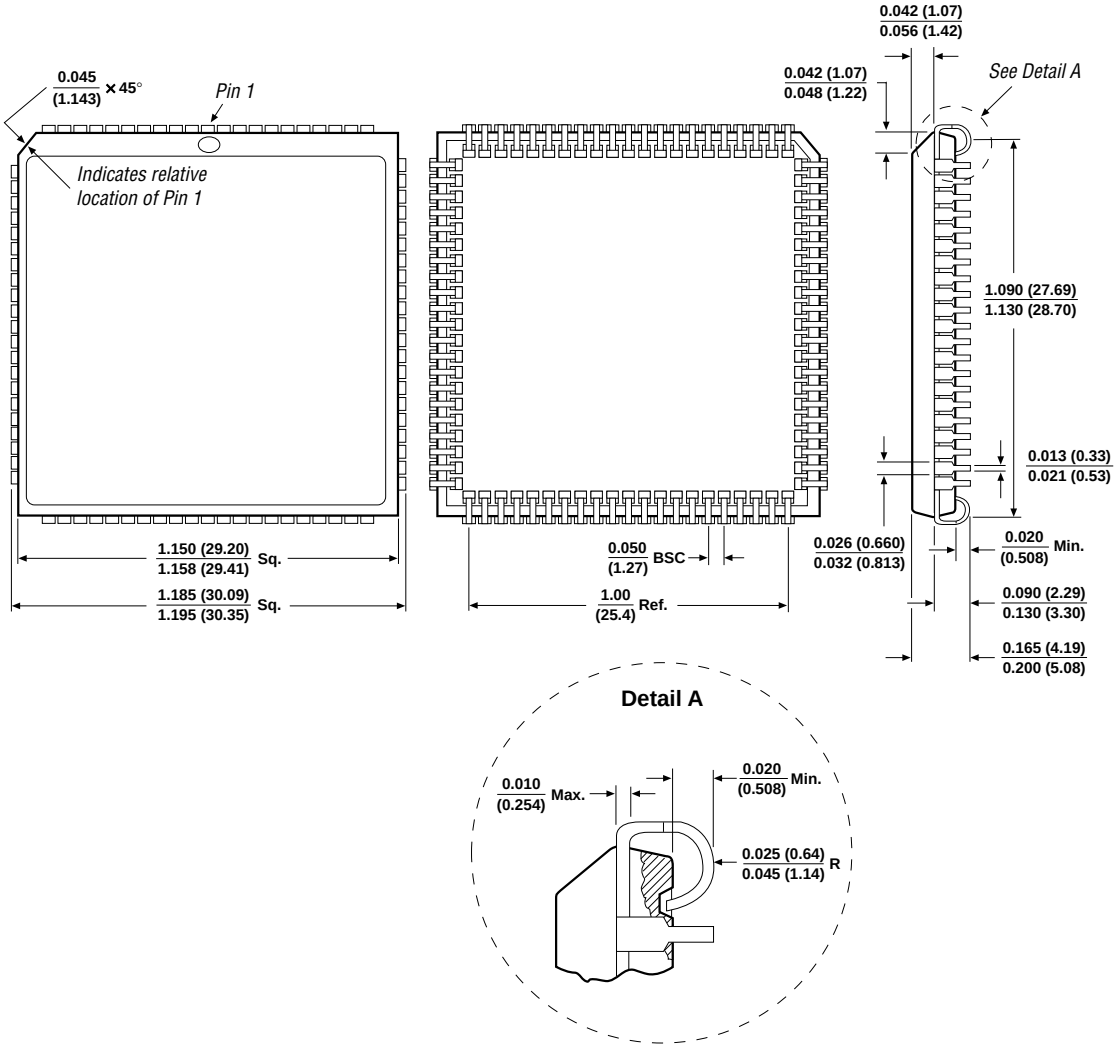
84-Pin Ceramic J-Lead Chip Carrier (JLCC)

Controlling measurement is in inches. Millimeter measurements, shown in parentheses, are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats.



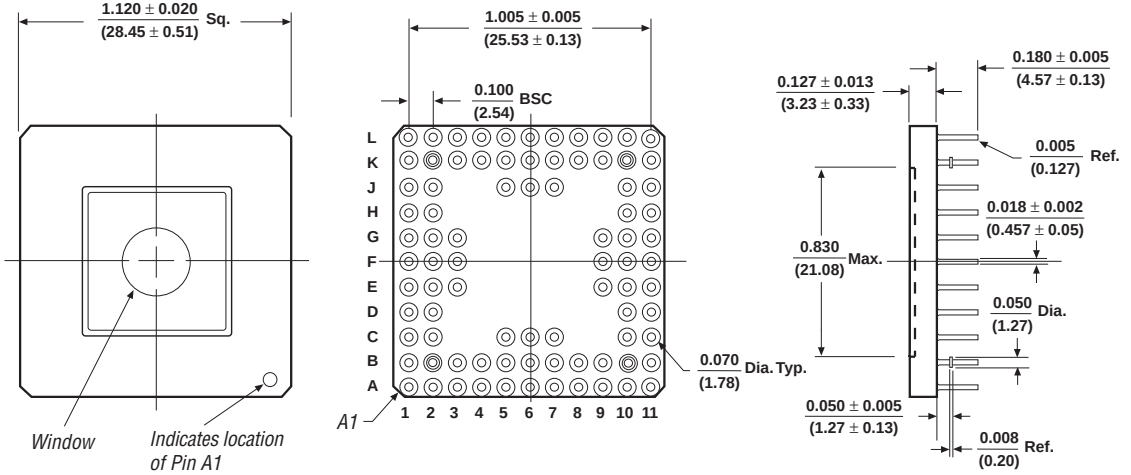
84-Pin Plastic J-Lead Chip Carrier (PLCC)

Controlling measurement is in inches. Millimeter measurements, shown in parentheses, are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats.



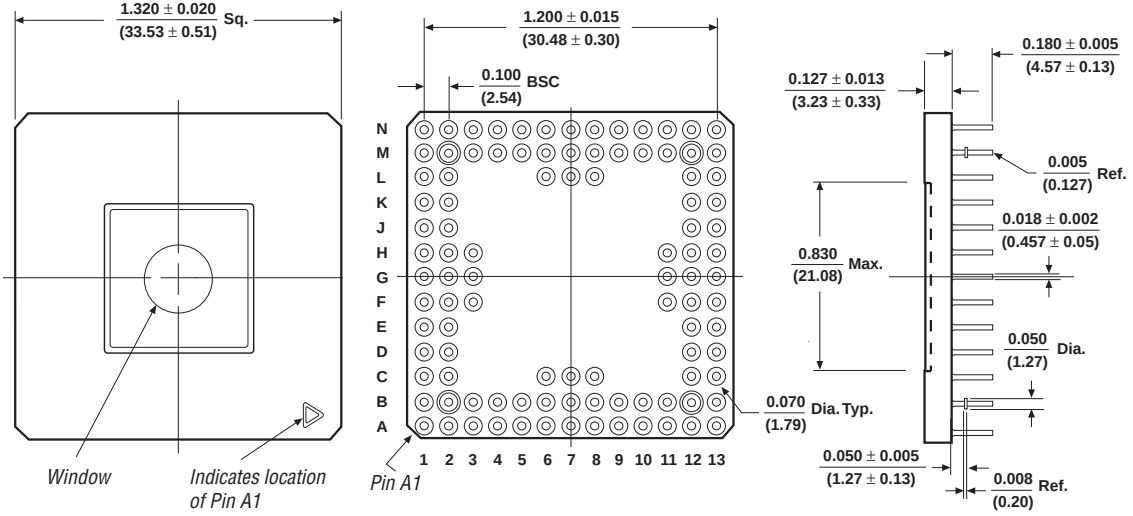
84-Pin Ceramic Pin-Grid Array (PGA)

Controlling measurement is in inches. Millimeter measurements, shown in parentheses, are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats.



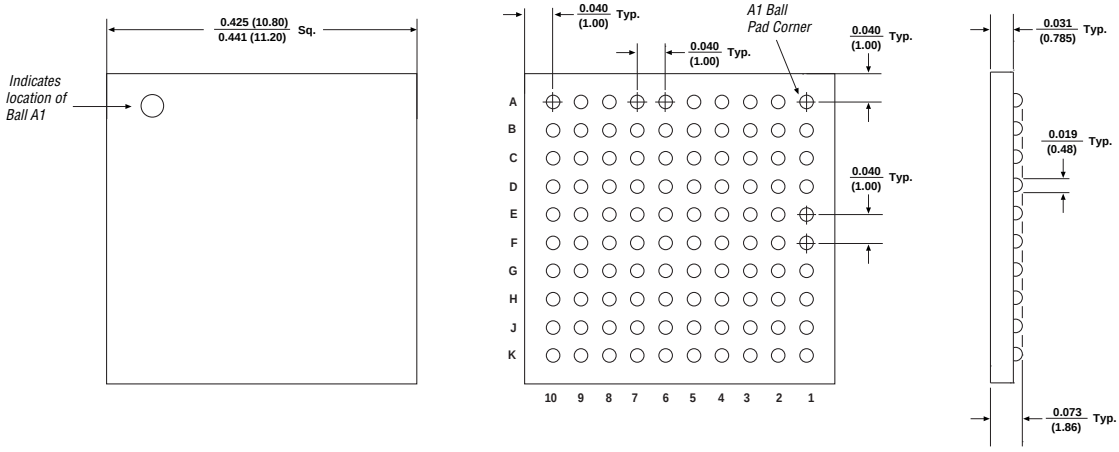
100-Pin Ceramic Pin-Grid Array (PGA)

Controlling measurement is in inches. Millimeter measurements, shown in parentheses, are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats.



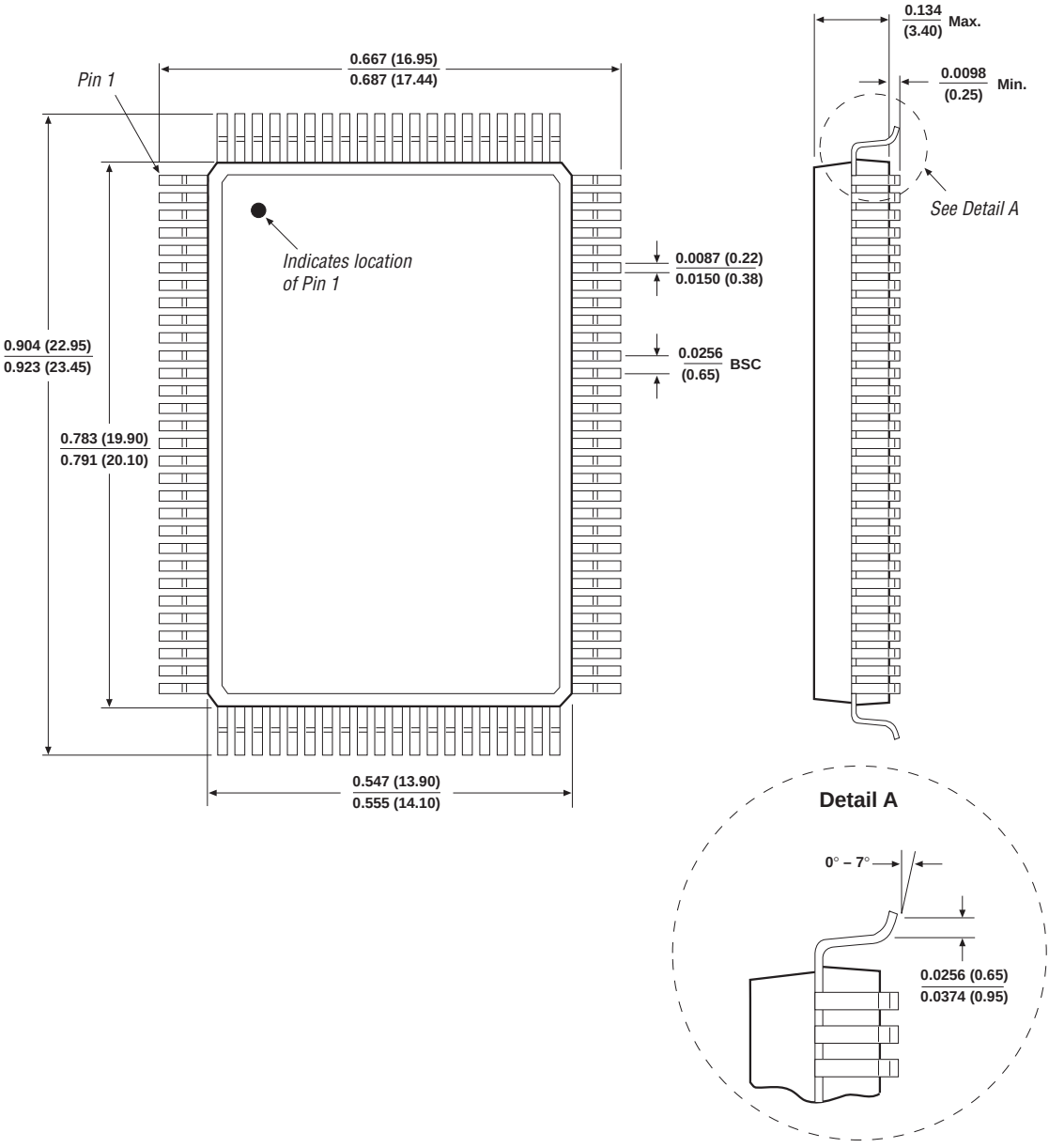
100-Pin FineLine Ball-Grid Array (FLBGA)

Controlling measurement is in inches. Millimeter measurements, shown in parentheses, are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats.



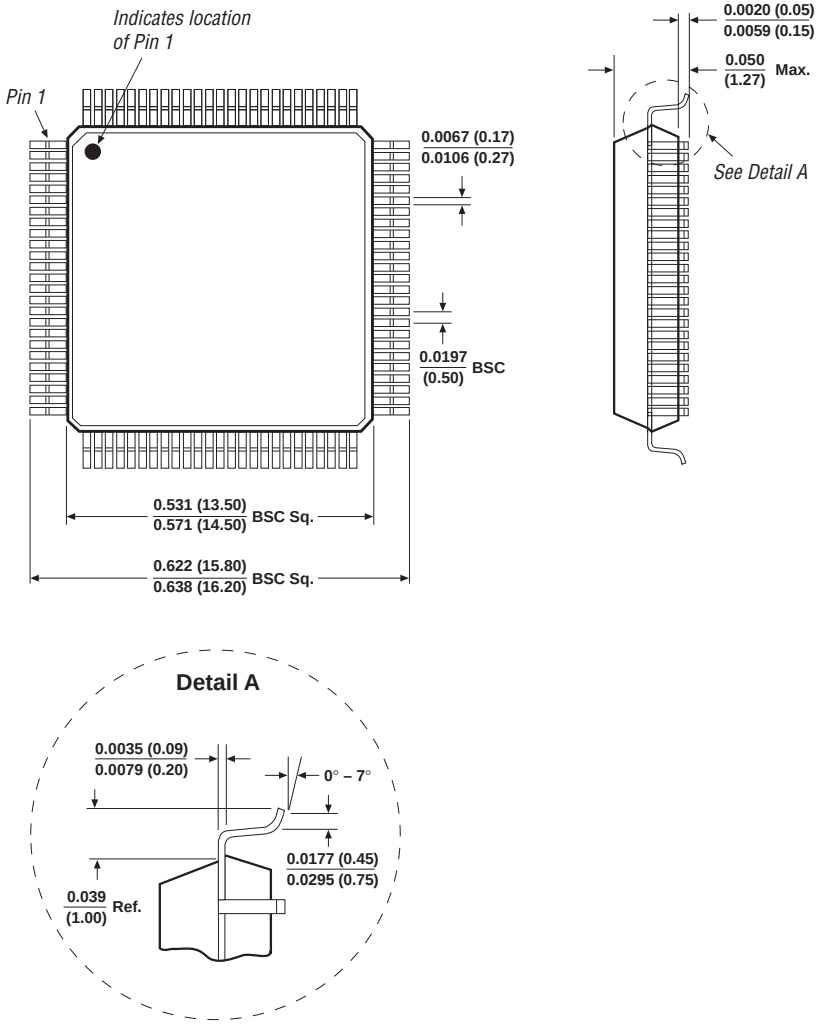
100-Pin Plastic Quad Flat Pack (PQFP)

Controlling measurement is in millimeters, shown in parentheses. Inch measurements are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats.



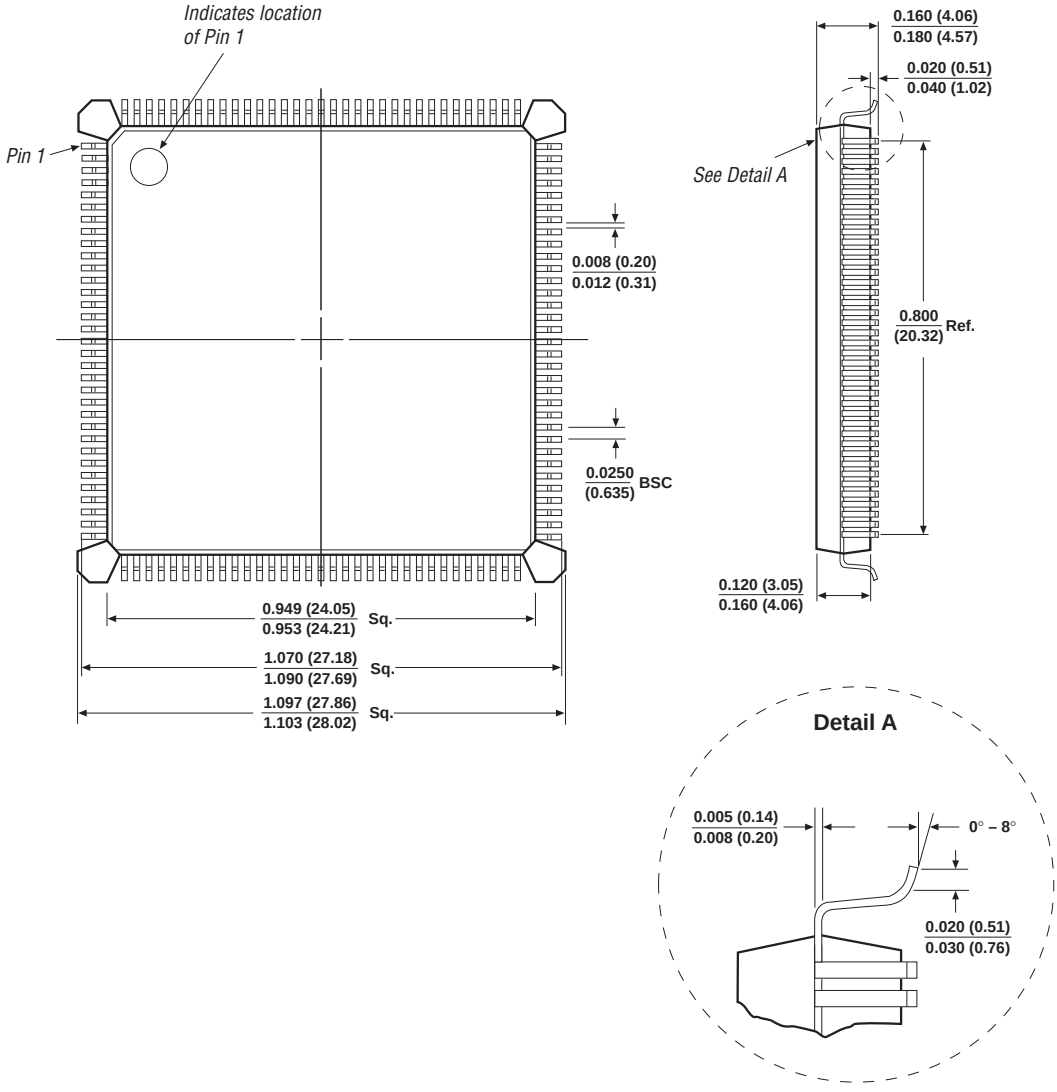
100-Pin Plastic Thin Quad Flat Pack (TQFP)

Controlling measurement is in millimeters, shown in parentheses. Inch measurements are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats.



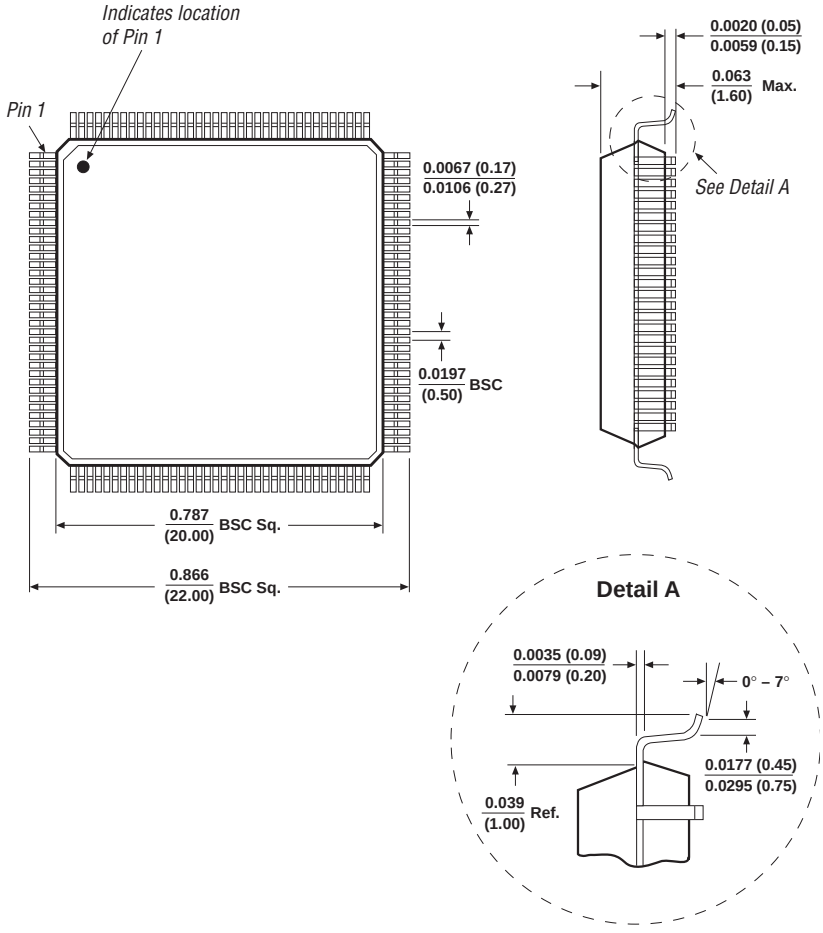
132-Pin Plastic Quad Flat Pack (PQFP)

Controlling measurement is in inches. Millimeter measurements, shown in parentheses, are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats.



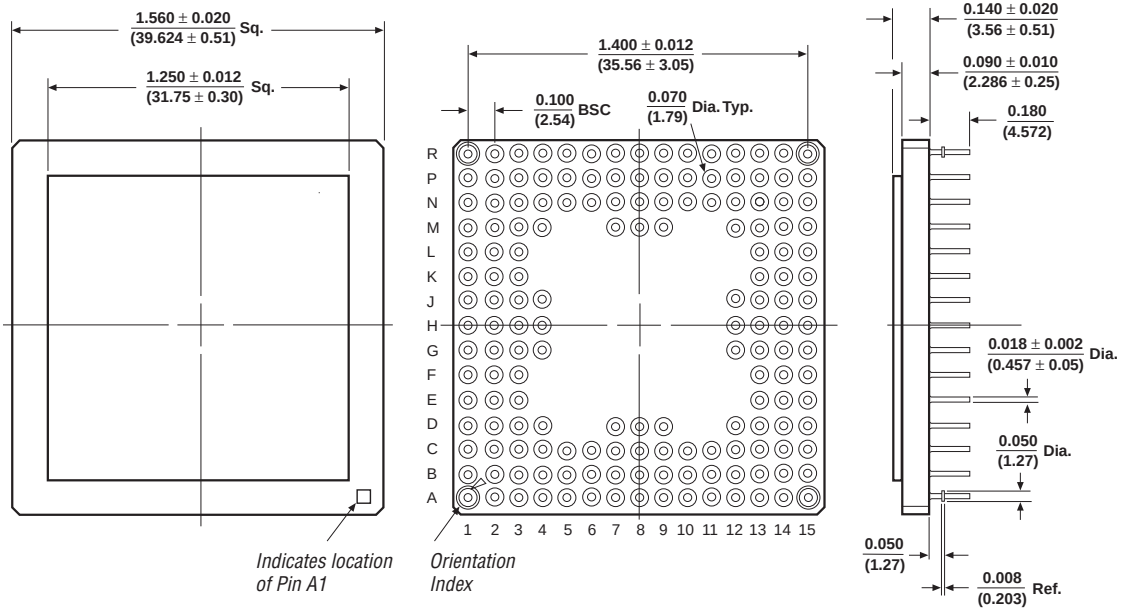
144-Pin Plastic Thin Quad Flat Pack (TQFP)

Controlling measurement is in millimeters, shown in parenthesis. Inch measurements are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats.



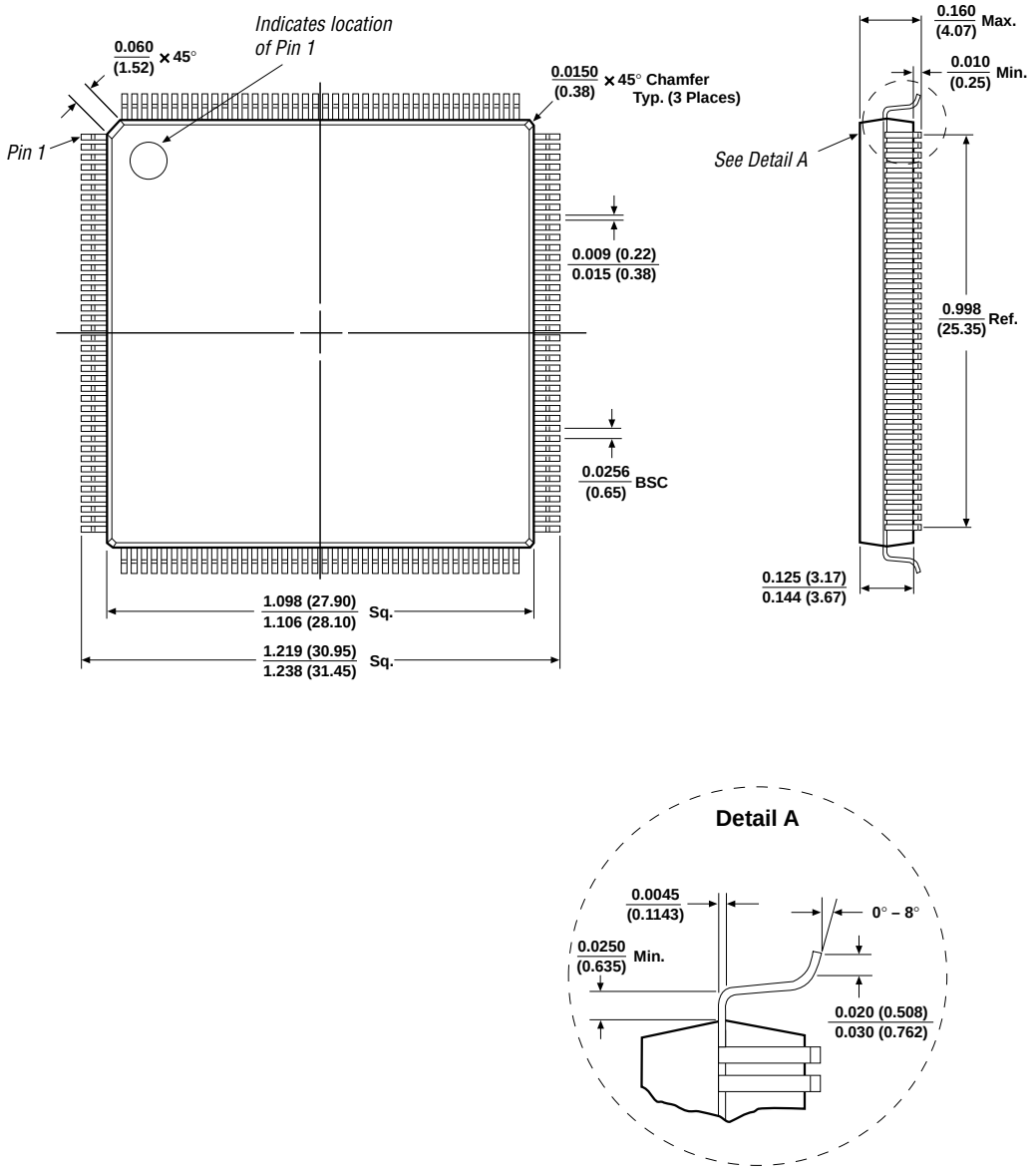
160-Pin Ceramic Pin-Grid Array (PGA)

Controlling measurement is in inches. Millimeter measurements, shown in parentheses, are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats.



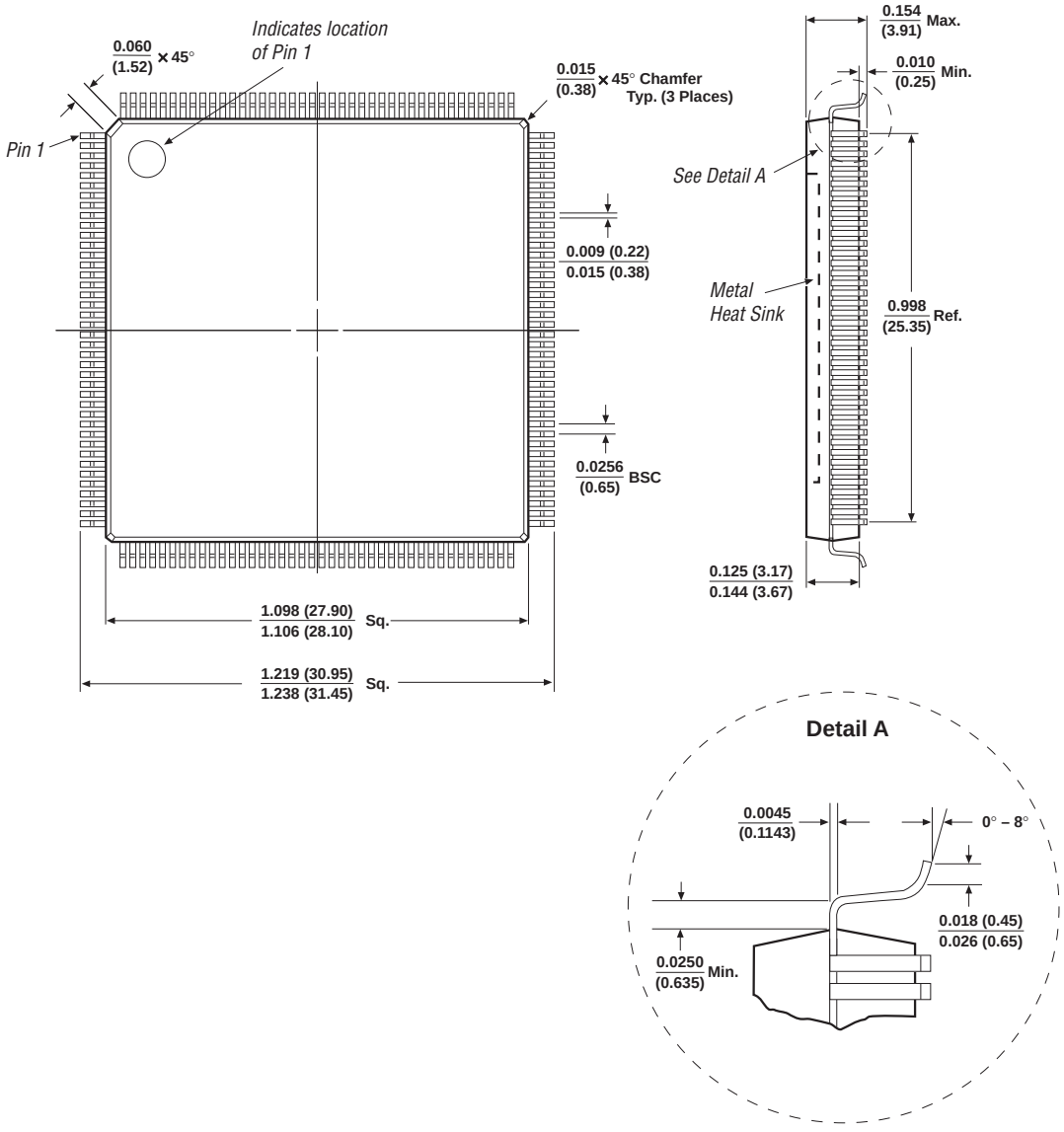
160-Pin Plastic Quad Flat Pack (PQFP)

Controlling measurement is in millimeters, shown in parentheses. Inch measurements are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats.



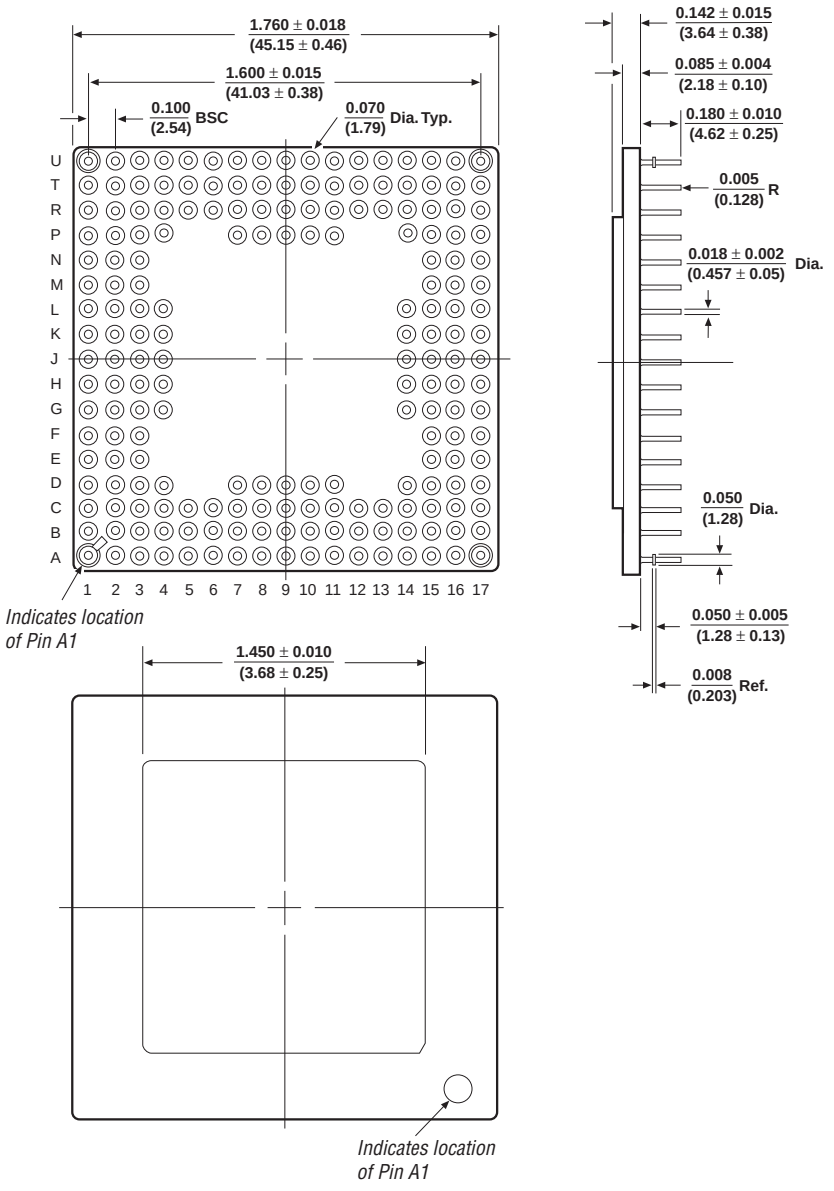
160-Pin Power Quad Flat Pack (RQFP)

Controlling measurement is in millimeters, shown in parentheses. Inch measurements are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats. Metal heat sink is shown in the side view.



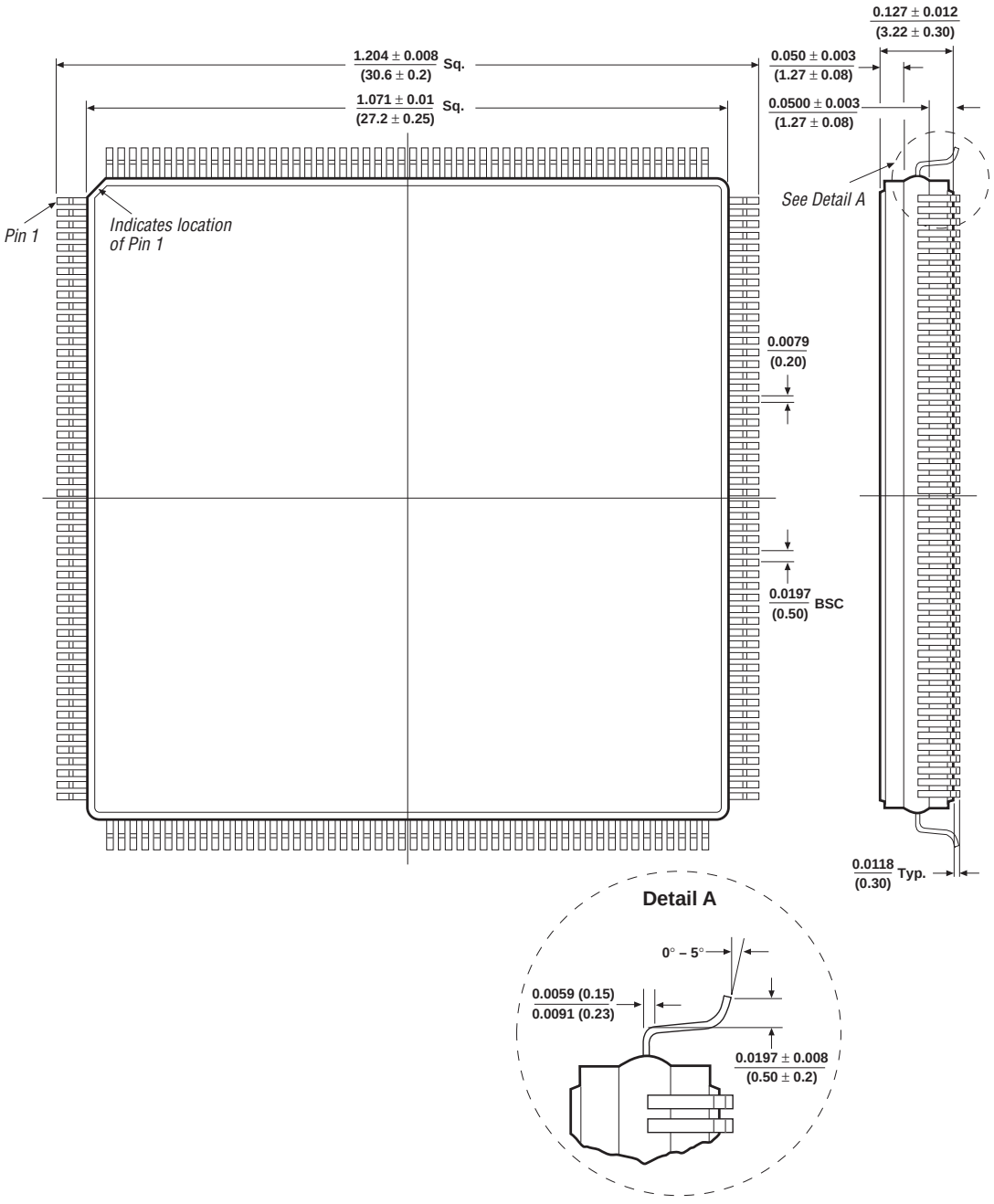
192-Pin Ceramic Pin-Grid Array (PGA)

Controlling measurement is in inches. Millimeter measurements, shown in parentheses, are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats.



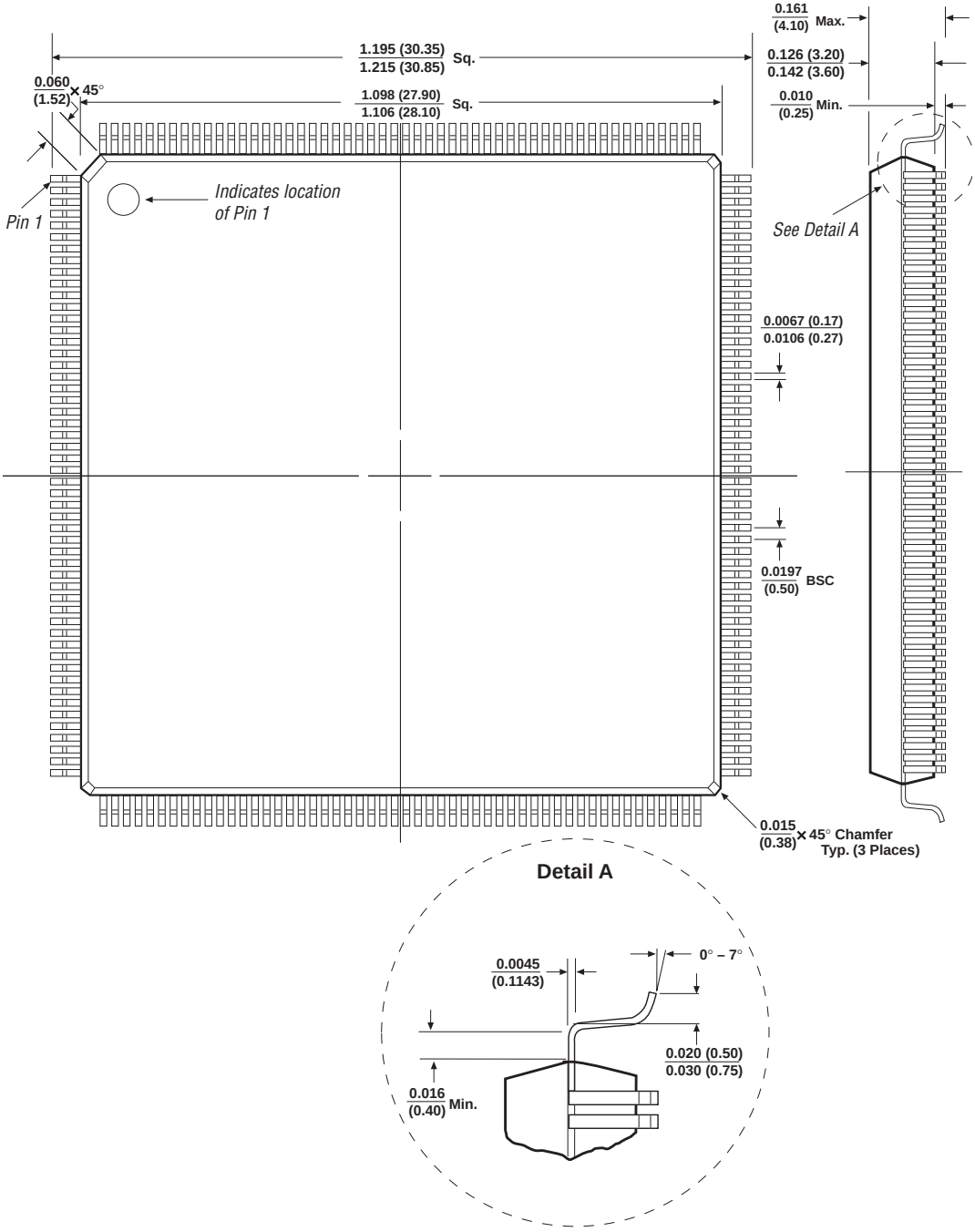
208-Pin Ceramic Quad Flat Pack (CQFP)

Controlling measurement is in millimeters, shown in parentheses. Inch measurements are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats.



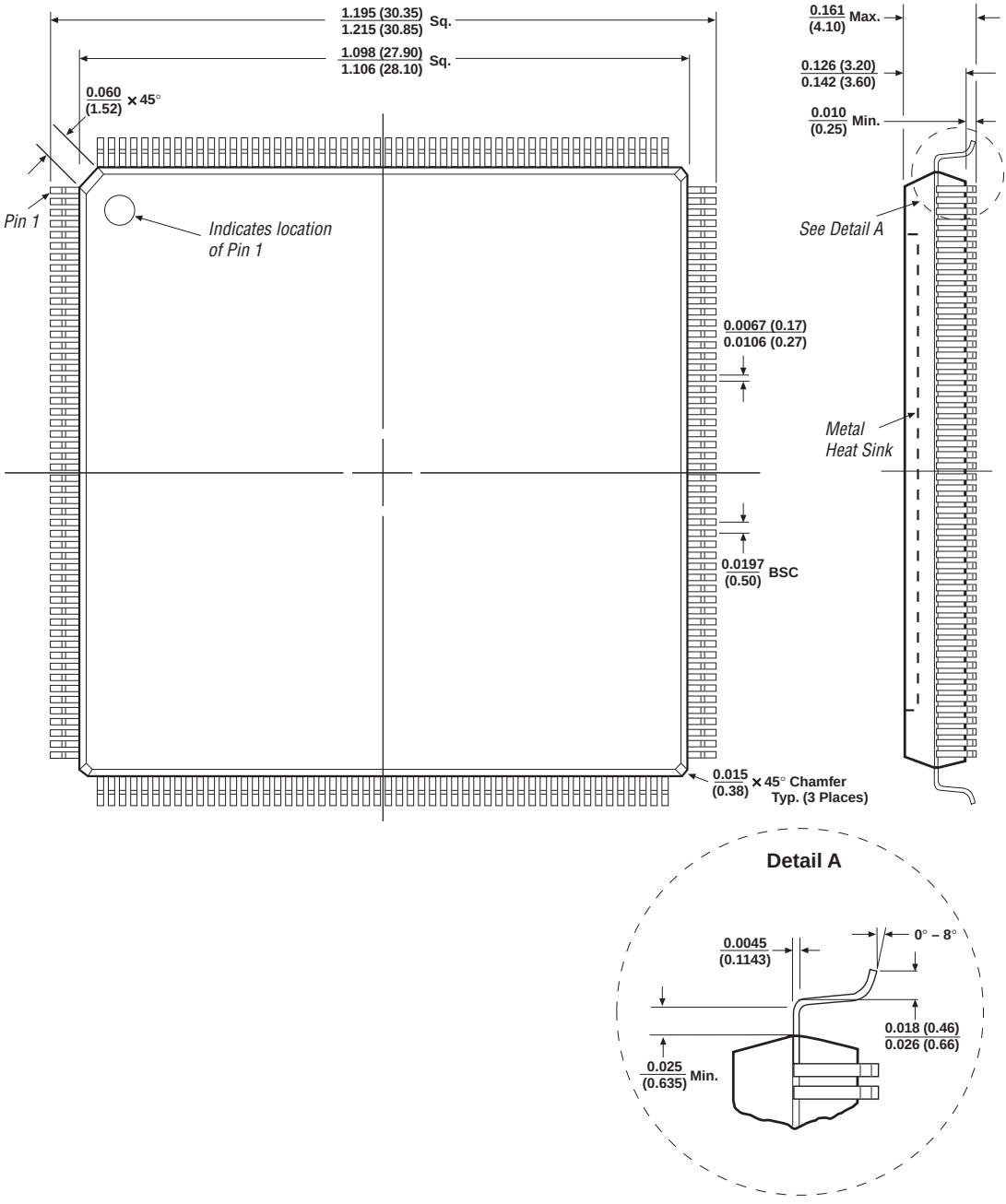
208-Pin Plastic Quad Flat Pack (PQFP)

Controlling measurement is in millimeters, shown in parentheses. Inch measurements are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats.



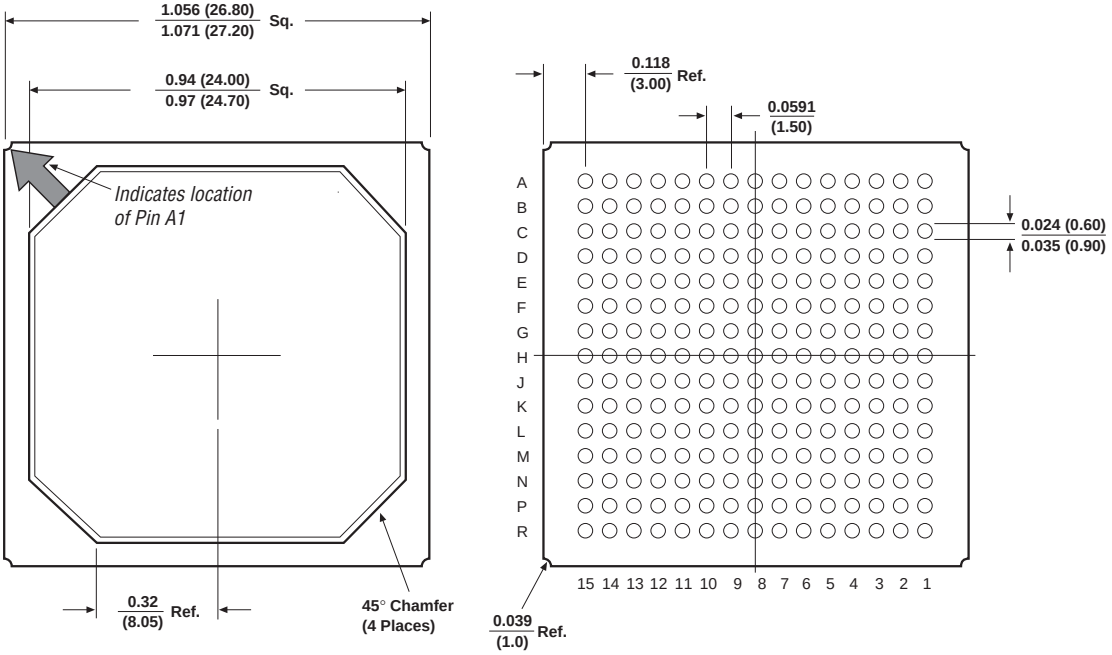
208-Pin Power Quad Flat Pack (RQFP)

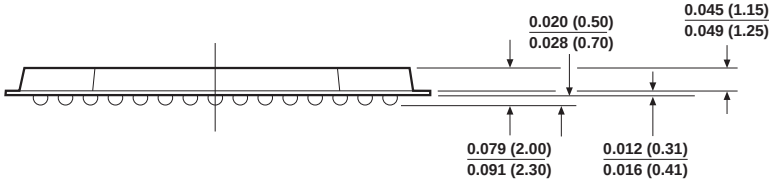
Controlling measurement is in millimeters, shown in parentheses. Inch measurements are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats. Metal heat sink is shown in the side view.



225-Pin Ball-Grid Array (BGA)

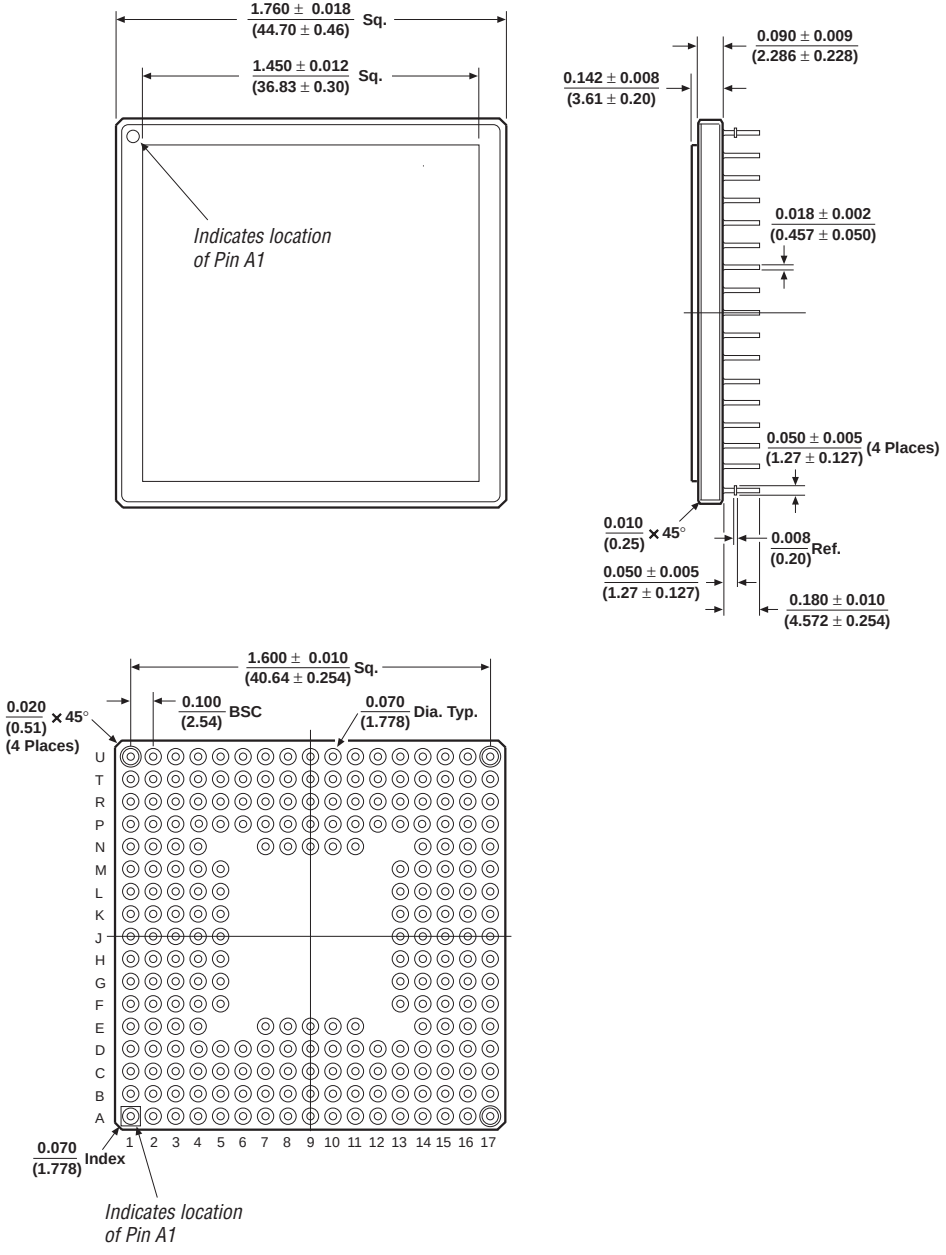
Controlling measurement is in millimeters, shown in parentheses. Inch measurements are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats.





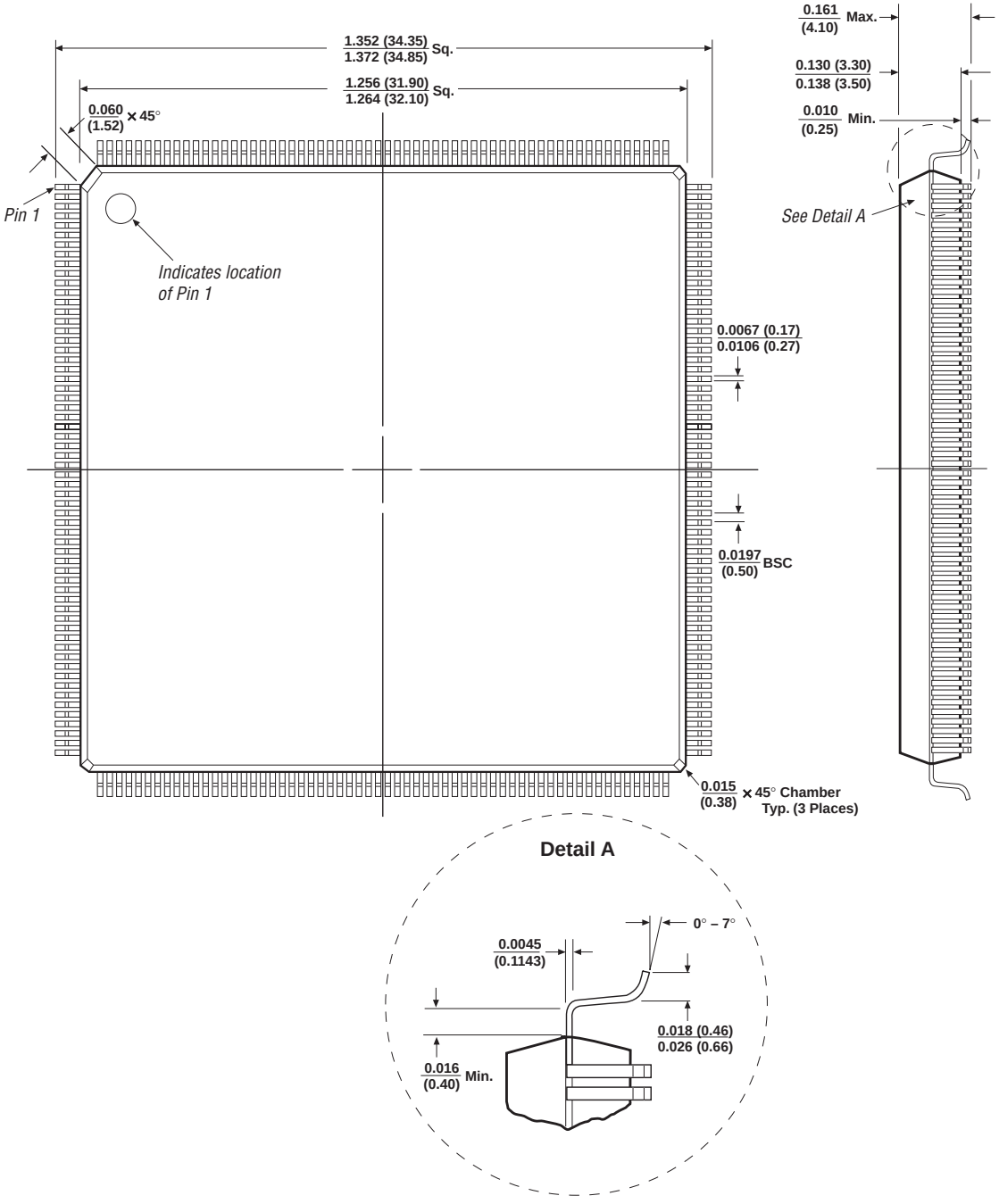
232-Pin Ceramic Pin-Grid Array (PGA)

Controlling measurement is in inches. Millimeter measurements, shown in parentheses, are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats.



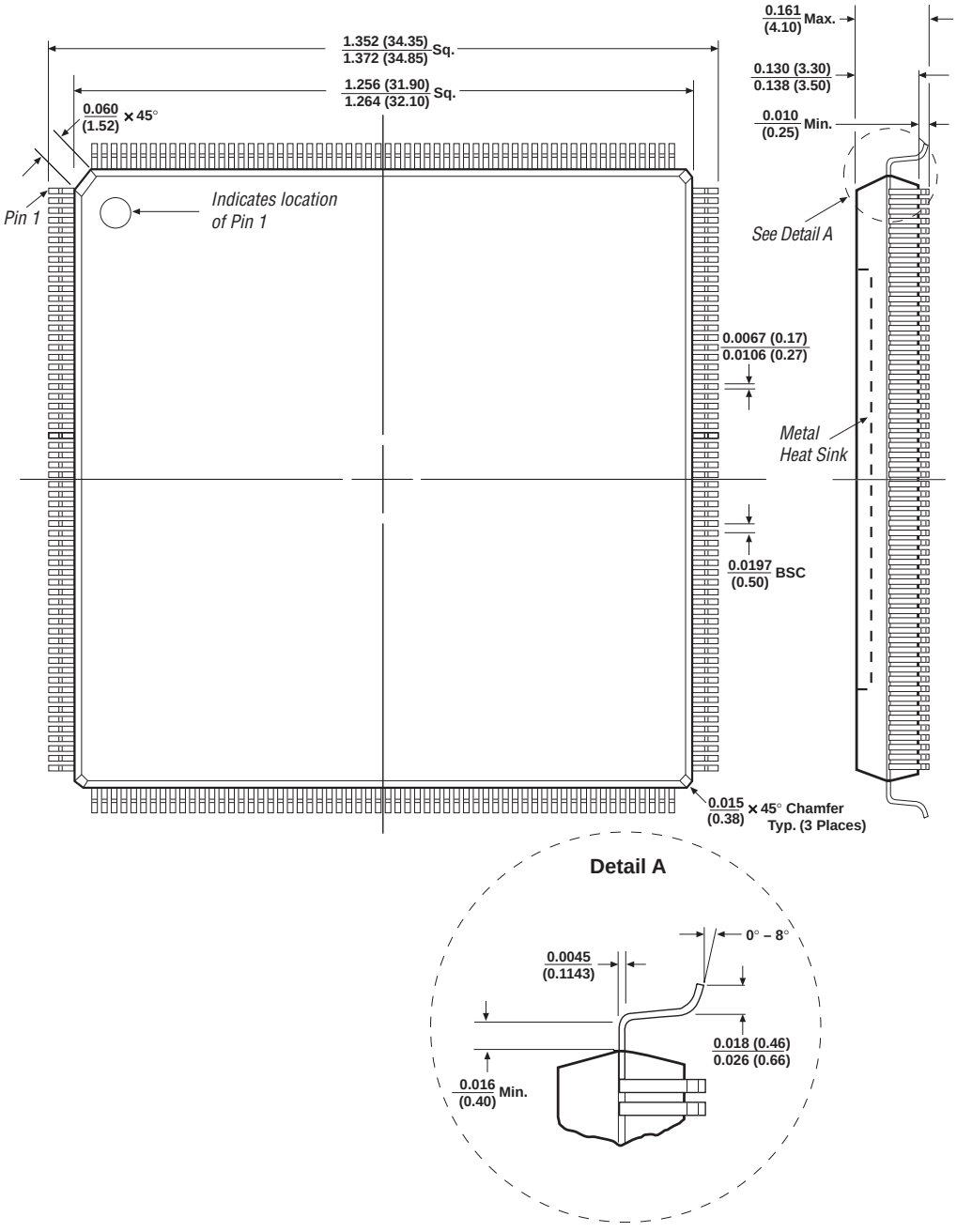
240-Pin Plastic Quad Flat Pack (PQFP)

Controlling measurement is in millimeters, shown in parentheses. Inch measurements are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats.



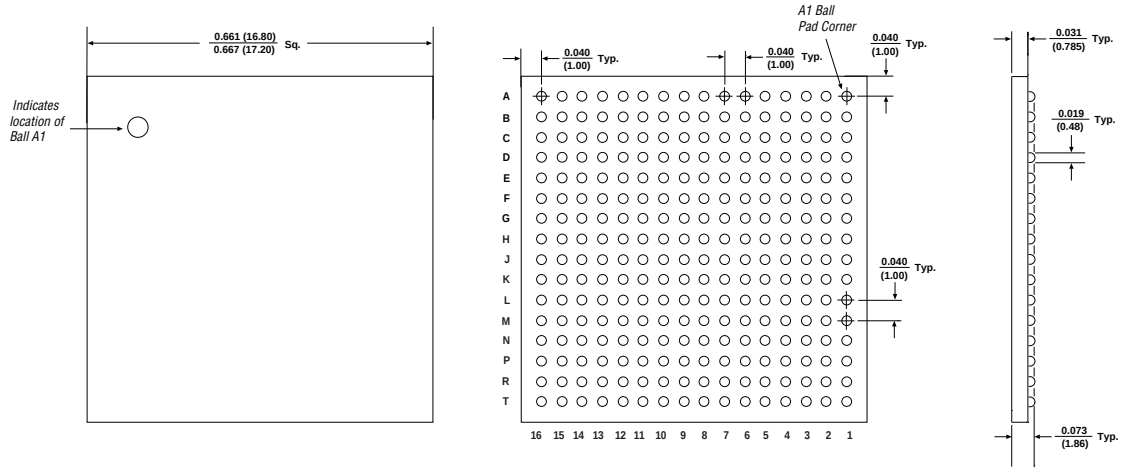
240-Pin Power Quad Flat Pack (RQFP)

Controlling measurement is in millimeters, shown in parentheses. Inch measurements are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats. Metal heat sink is shown in the side view.



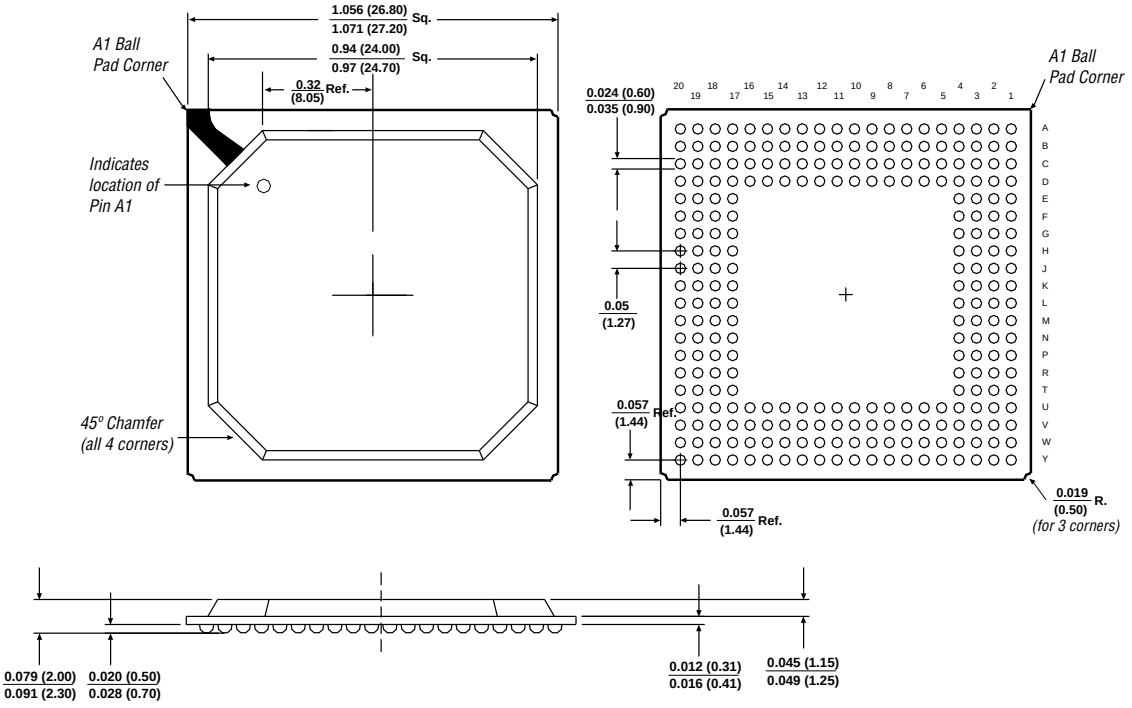
256-Pin FineLine Ball-Grid Array (FLBGA)

Controlling measurement is in inches. Millimeter measurements, shown in parentheses, are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats.



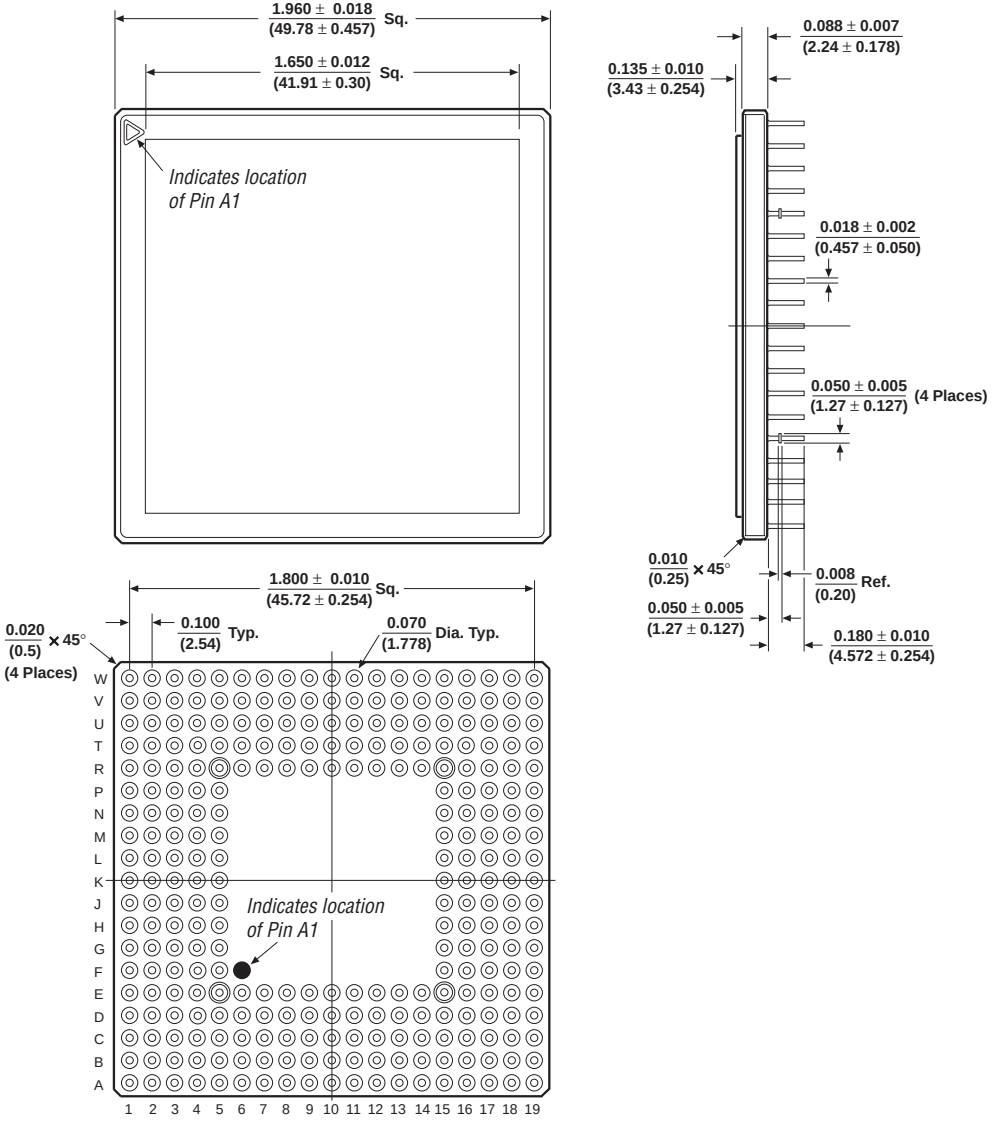
256-Pin Ball-Grid Array (BGA)

Controlling measurement is in millimeters, shown in parentheses. Inch measurements are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats. Metal heat sink is shown in the side view.



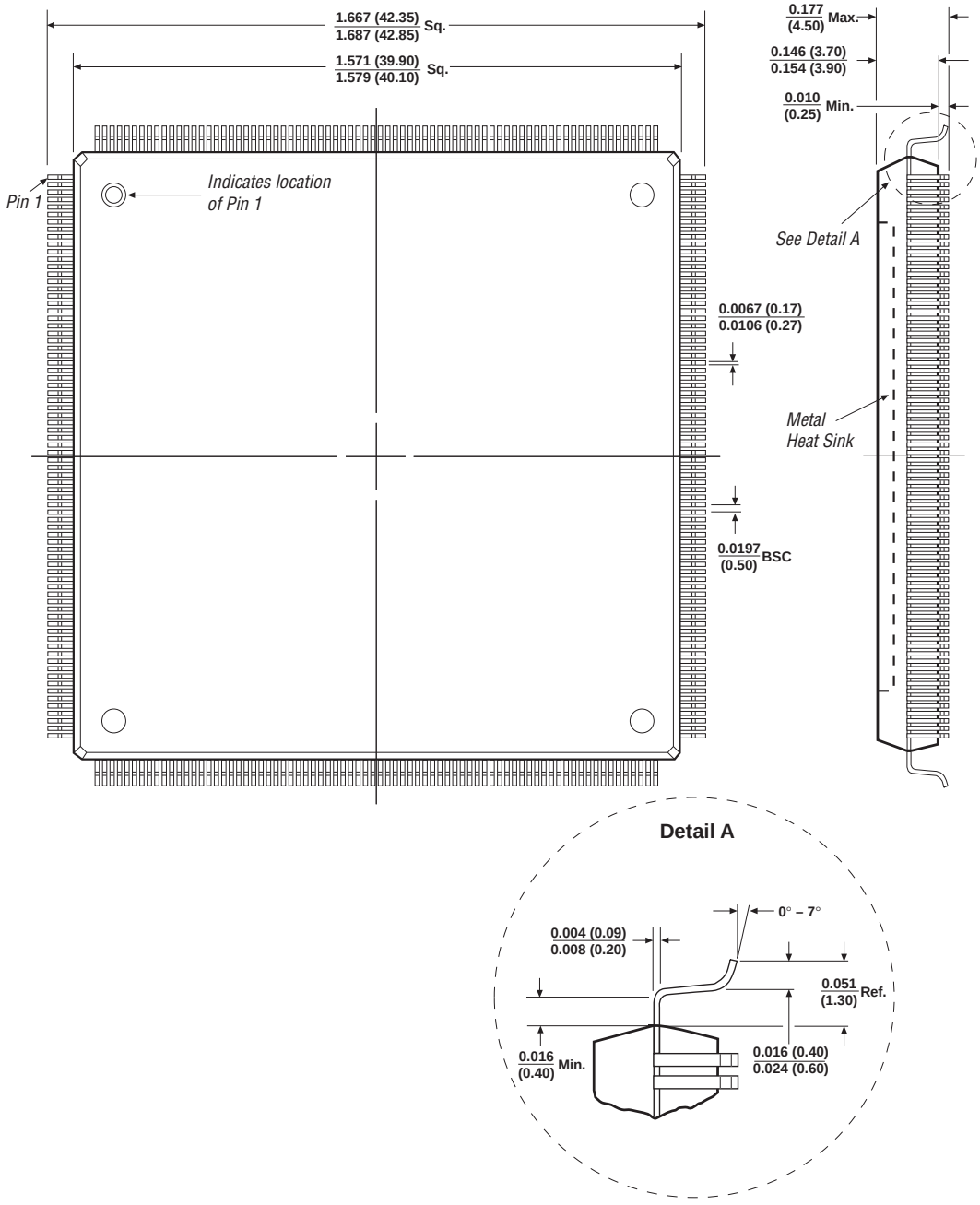
280-Pin Pin-Grid Array (PGA)

Controlling measurement is in inches. Millimeter measurements, shown in parentheses, are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats.



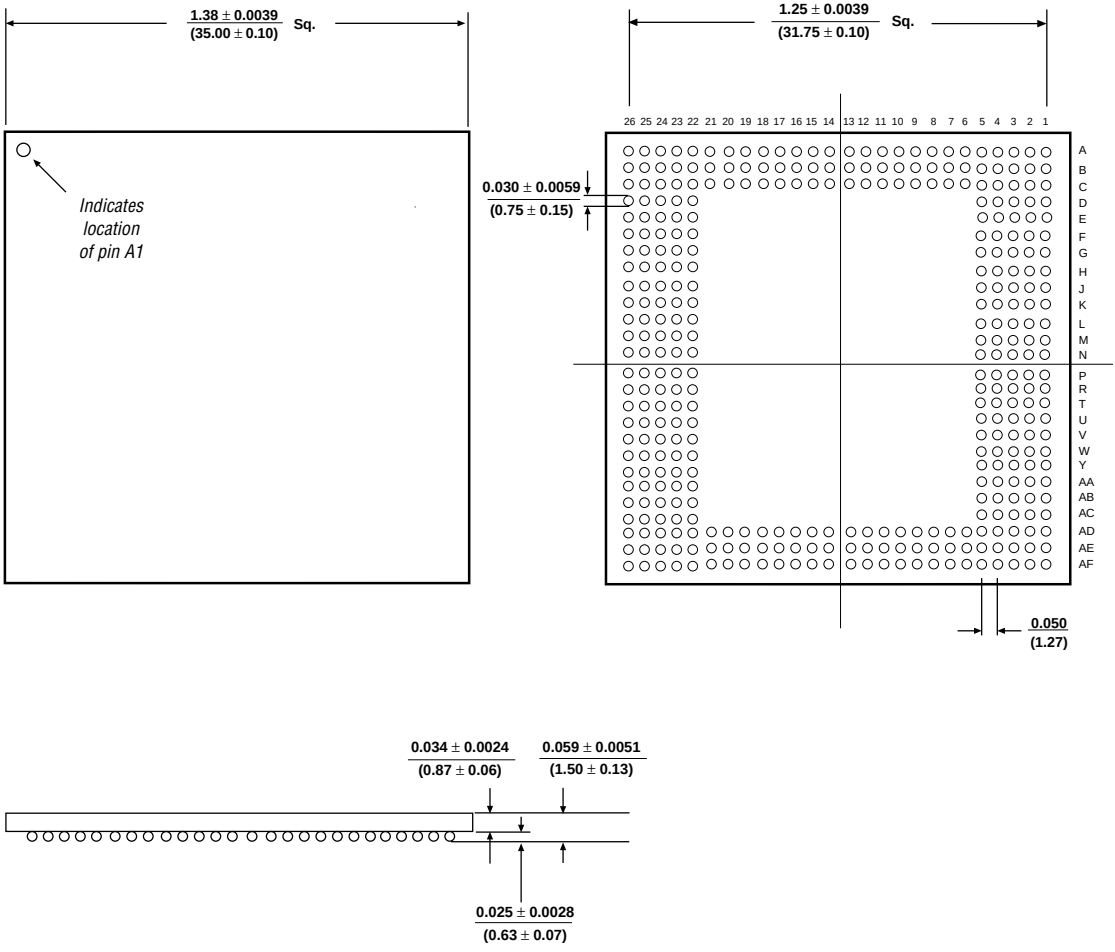
304-Pin Power Quad Flat Pack (RQFP)

Controlling measurement is in millimeters, shown in parentheses. Inch measurements are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats. Metal heat sink is shown in the side view.



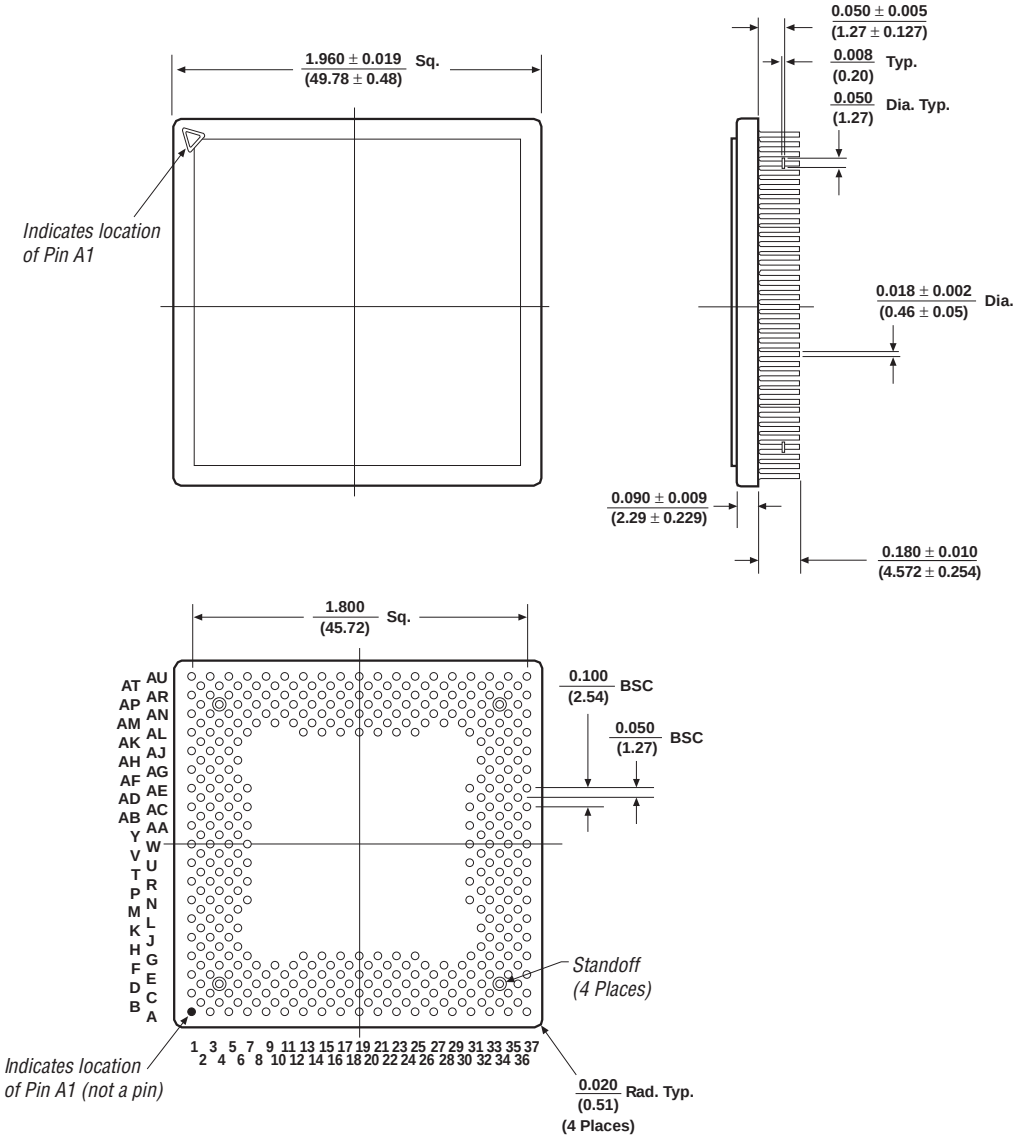
356-Pin Ball-Grid Array (BGA)

Controlling measurement is in millimeters, shown in parentheses. Inch measurements are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats. Metal heat sink is shown in the side view.



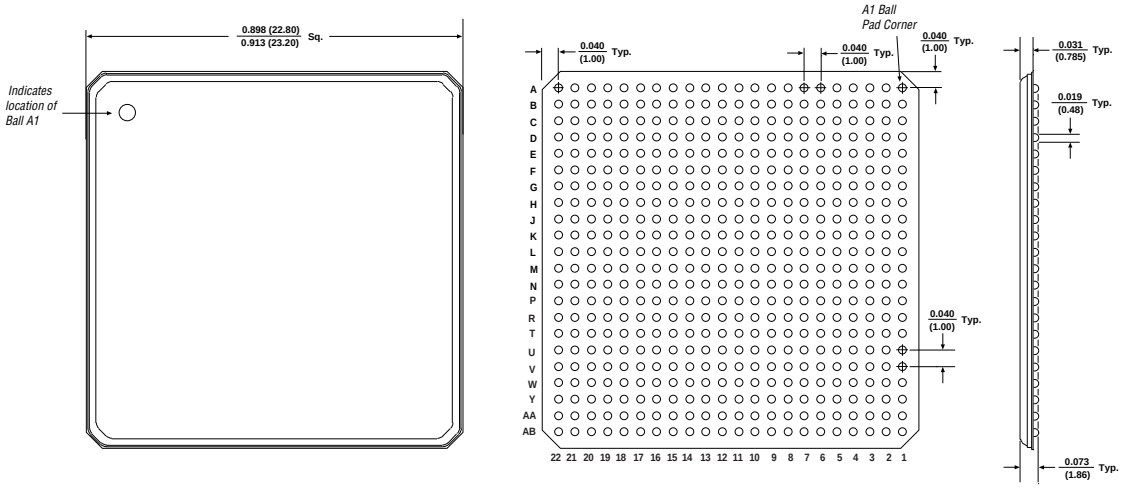
403-Pin Pin-Grid Array (PGA)

Controlling measurement is in inches. Millimeter measurements, shown in parenthesis, are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats.



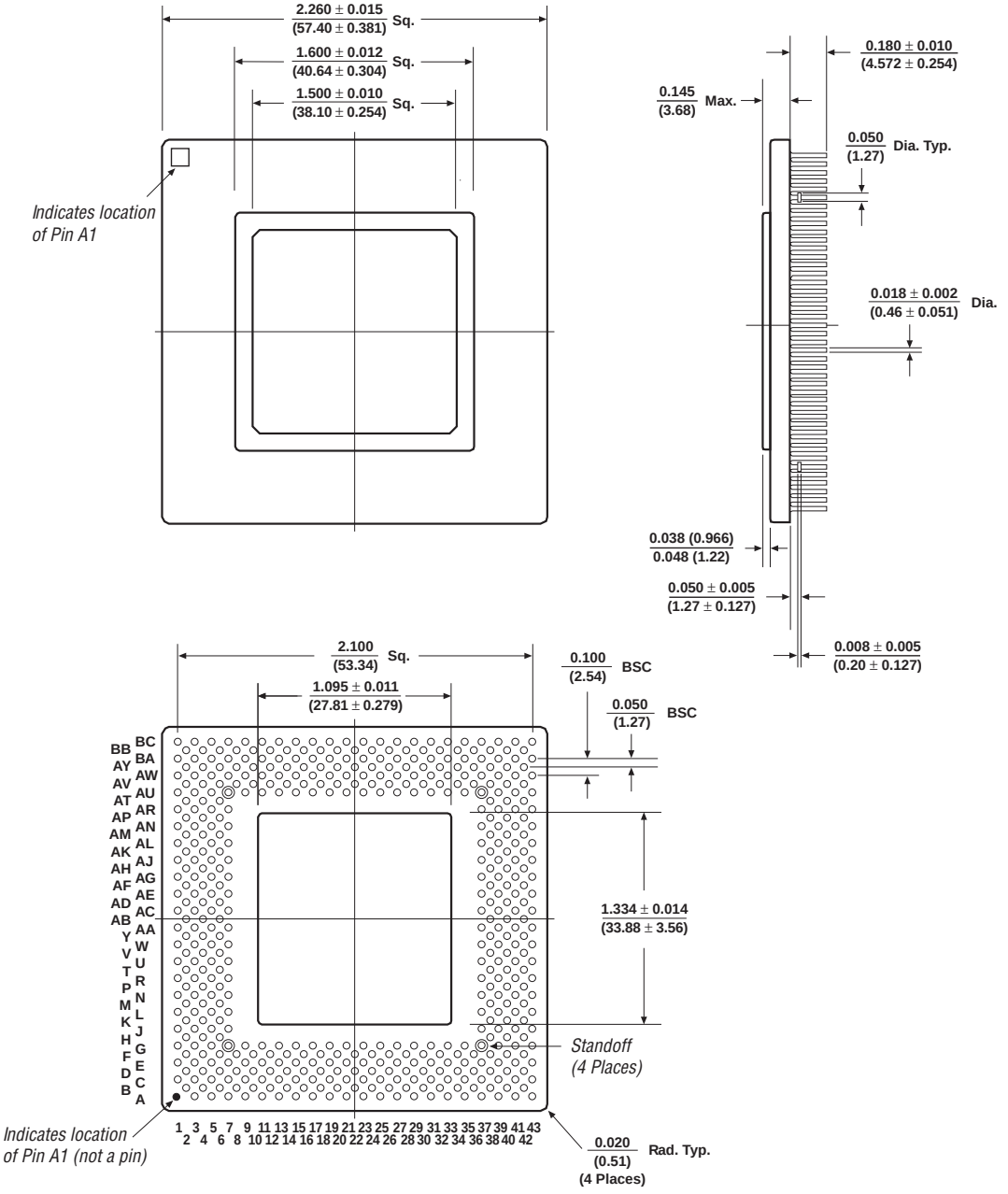
484-Pin FineLine Ball-Grid Array (FLBGA)

Controlling measurement is in inches. Millimeter measurements, shown in parentheses, are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats.



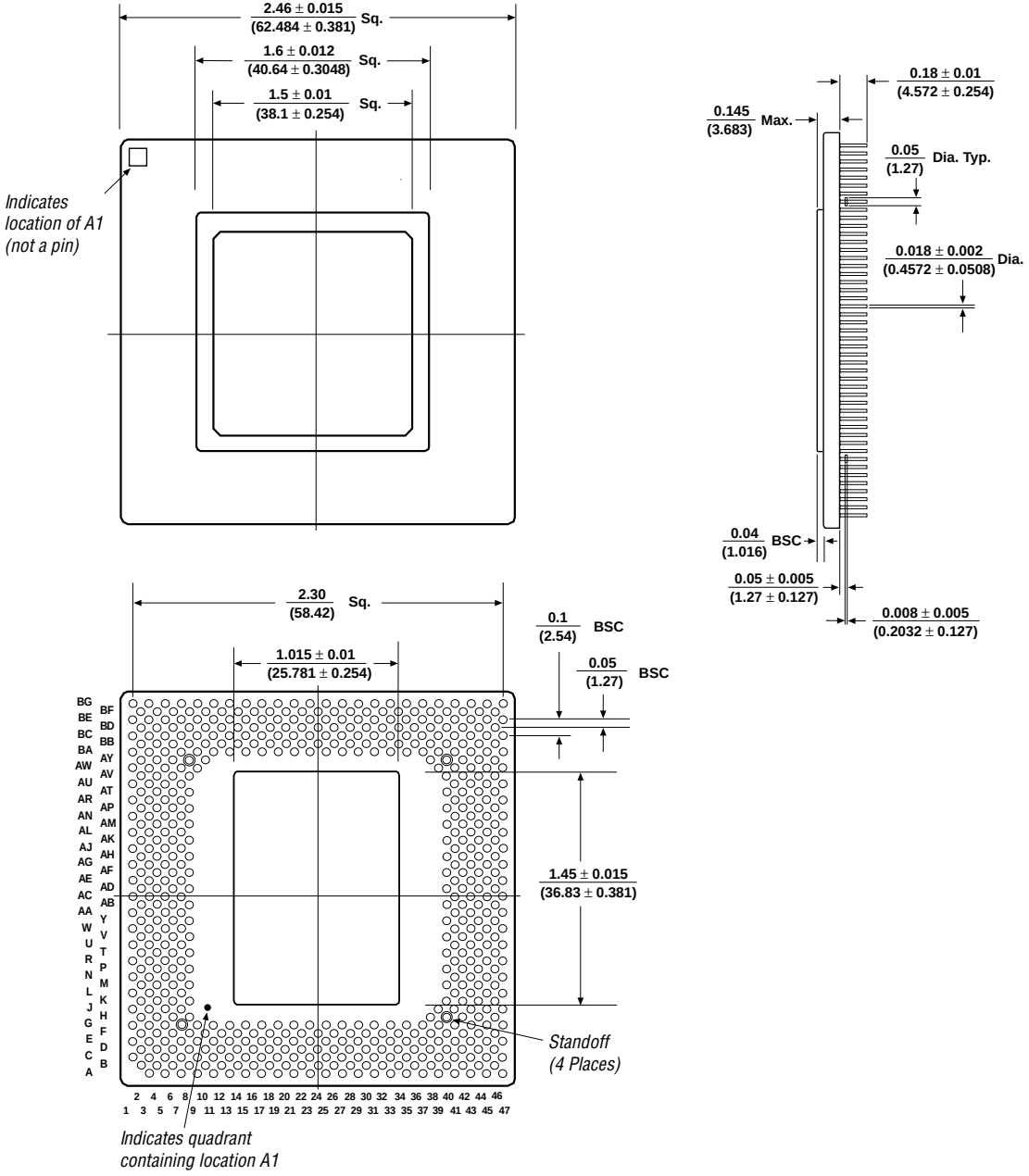
503-Pin Pin-Grid Array (PGA)

Controlling measurement is in inches. Millimeter measurements, shown in parentheses, are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats.



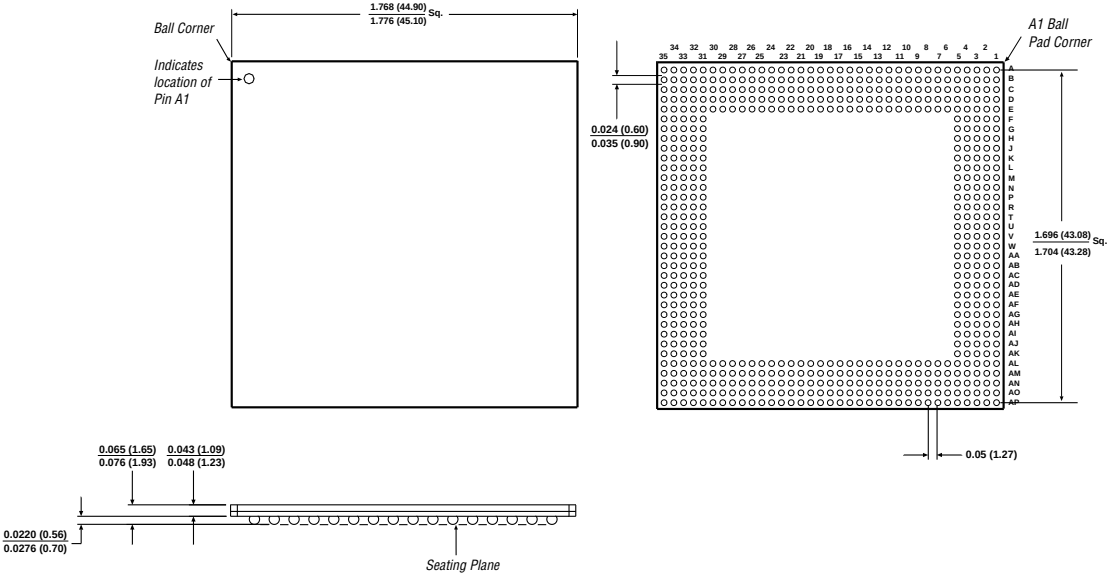
599-Pin Pin-Grid Array (PGA)

Controlling measurement is in inches. Millimeter measurements, shown in parentheses, are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats. Metal heat sink is shown in the side view.



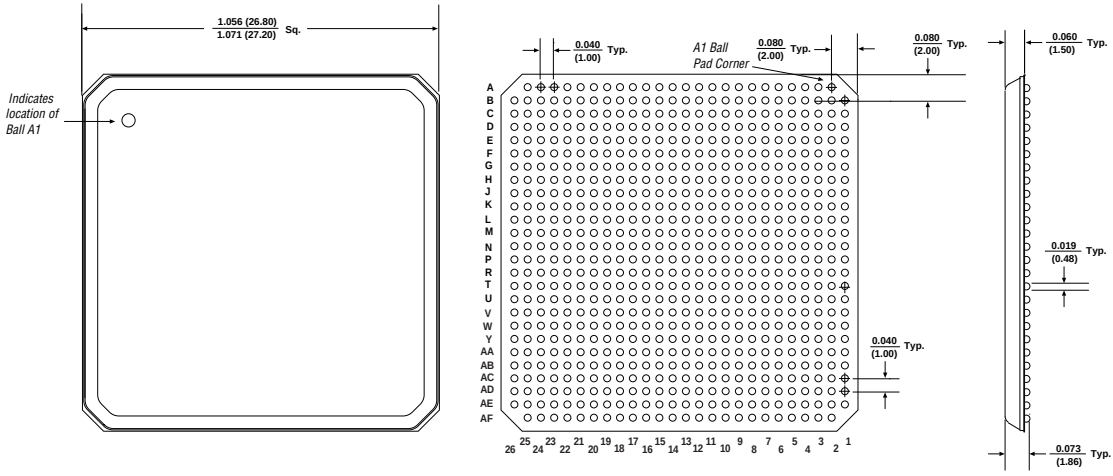
600-Pin Ball-Grid Array (BGA)

Controlling measurement is in millimeters, shown in parentheses. Inch measurements are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats. Metal heat sink is shown in the side view.



672-Pin FineLine Ball-Grid Array (FLBGA)

Controlling measurement is in inches. Millimeter measurements, shown in parentheses, are for reference only. See "Dimension Formats" on page 764 of this data sheet for dimension formats.



Revision History

The information contained in the *Altera Device Package Information Data Sheet* version 7.01 supersedes information published in previous versions. The *Altera Device Package Information Data Sheet* version 7.01 contains the following changes:

- Corrected the placement of pin A1 in the 232-pin PGA package diagram on page 798.
- Corrected the side view dimension in the 240-pin PQFP package diagram on page 799.
- Added 100-pin FLBGA package diagram on page 785.
- Added 256-pin FLBGA package diagram on page 801.
- Added 484-pin FLBGA package diagram on page 807.
- Added 672-pin FLBGA package diagram on page 811.