

Package Characteristics and Mechanical Drawings

Package Thermal Characteristics

Package Type	Pin Count	θ_{jc}	θ_{ja} Still Air	θ_{ja} 300 ft/min	Unit	
Ceramic Pin Grid Array (CPGA)	84	6	33	20	°C/W	
	100	5.20	27	17	°C/W	
	132	4.80	25	15	°C/W	
	133	4.80	25	15	°C/W	
	175	4.60	23	12	°C/W	
	176	4.60	23	12	°C/W	
	207	3.50	21	10	°C/W	
	257	2.80	15	8	°C/W	
Ceramic Quad Flat Pack (CQFP)	84	7.80	40	30	°C/W	
	– cavity up	132	7.20	35	°C/W	
	172	6.80	28	20	°C/W	
	196	6.40	23	15	°C/W	
	208	6.30	22	14	°C/W	
	256	6.20	20	10	°C/W	
	– cavity up w/ heat sink	208	6.30	21	13	°C/W
	256	6.20	19	9	°C/W	
Plastic Leaded Chip Carrier (PLCC)	44	16	43	31	°C/W	
	68	13	36	25	°C/W	
	84	12	32	22	°C/W	
Plastic Quad Flat Pack (PQFP)	100	12	34	31	°C/W	
	144	10	33	26	°C/W	
	160	10	32	24	°C/W	
	208	8	30	23	°C/W	
	240	8	23	19	°C/W	
Plastic Quad Flat Pack (PQFP) with Embedded Heat Spreader	208	3.80	20	17	°C/W	
	240	3.50	19	16	°C/W	
Thin (1.4mm) Quad Flat Pack (TQFP)	64	14	51.2	35	°C/W	
	100	12	37.5	30	°C/W	
	144	11	32	24	°C/W	
	176	11	28	21	°C/W	
Very Thin (1.0mm) Quad Flat Pack (VQFP)	80	12	39	33	°C/W	
	100	10	38	32	°C/W	
Plastic Power Quad Flat Pack (RQFP)	208	0.40	17	13	°C/W	
	240	0.30	16	11	°C/W	

Package Type	Pin Count	θ_{jc}	θ_{ja}	θ_{ja}	Unit	
			Still Air	300 ft/min		
Plastic Ball Grid Array (PBGA)	272	3	20	16.50	°C/W	
	313	3	23	17	°C/W	
	329	3	18	13.50	°C/W	
	456	3	15.60	12	°C/W	
	729	2.2	13.50	10.24	°C/W	
Fine Pitch Ball Grid Array (FBGA)	144	3.80	38.80	26.70	°C/W	
	256	3.80	25	22	°C/W	
	– Depopulated Array	484	3.20	20	15	°C/W
	– Full Array	484	3.20	20.50	16.60	°C/W
	676	3.20	16.40	11.50	°C/W	
	896	2.40	13.60	10.30	°C/W	
	1152	1.80	120	8.90	°C/W	
Chip Scale Package	49		70.20	55.80	°C/W	
	128		54.10	47.80	°C/W	
	180		57.80	51	°C/W	

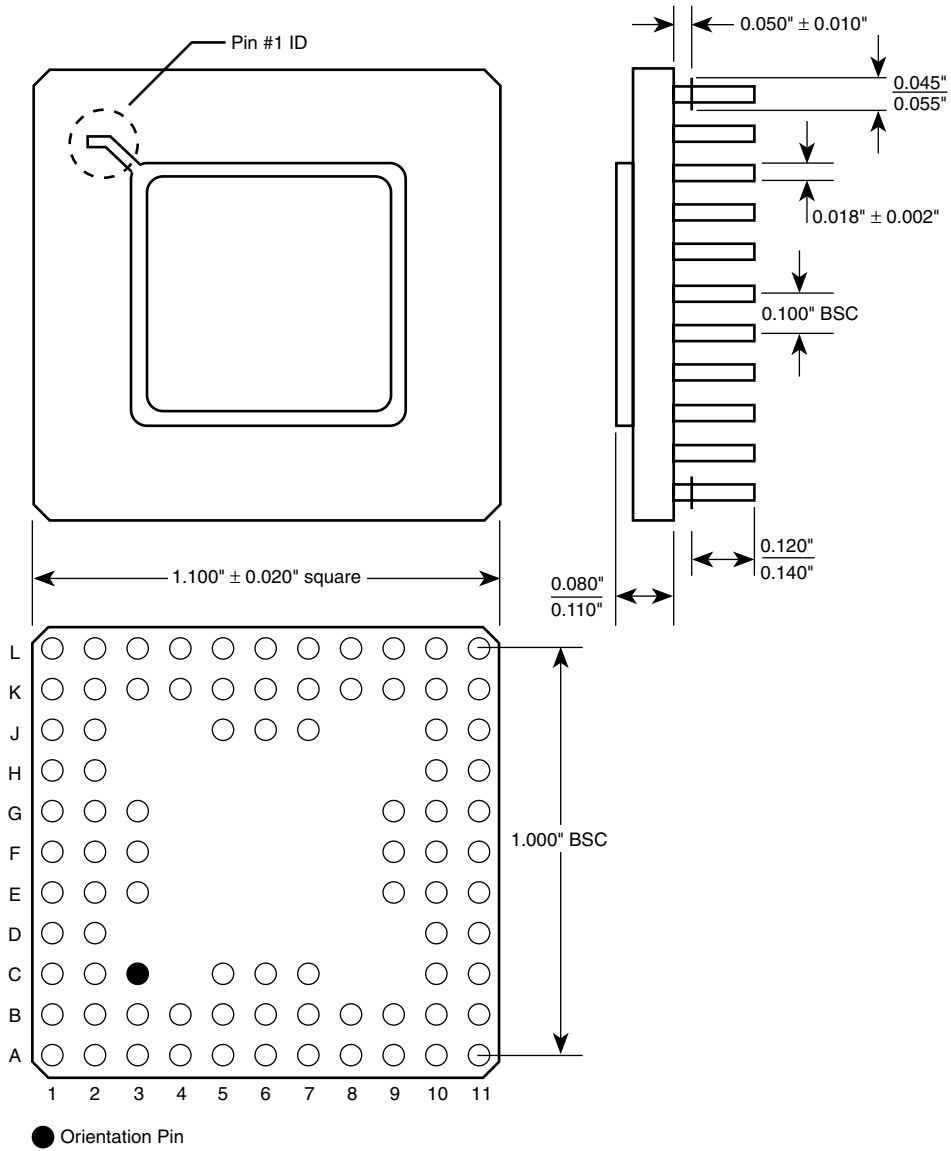
Package Weights

Table 1 gives approximate weights for Actel packages. Actel recommends that you weigh the parts yourself for more accurate values. Package weights may vary from lot to lot.

Table 1 • Package Weights

Package	Weight (grams)
84 CPGA	8.0
132 CPGA	11.0
133 CPGA	11.0
175 CPGA	19.0
176 CPGA	19.0
207 CPGA	24.5
257 CPGA	27.3
84 CQFP	2.2
132 CQFP	5.8
172 CQFP	8.8
196 CQFP	11.1
208 CQFP	8.8
208 CQFP DX	18.5
256 CQFP	13.0
256 CQFP DX	20.2 (with heat sink)
44 PLCC	2.4
68 PLCC	4.6
84 PLCC	6.8
100 PQFP	1.6
144 PQFP	5.2
160 PQFP	5.3
208 PQFP	5.2
208 PQFP DX	6.4
240 PQFP	7.0
240 PQFP DX	8.4
64 TQFP	0.3
100 TQFP	0.4
144 TQFP	1.3
176 TQFP	1.8
80 VQFP	0.5
100 VQFP	0.5
208 RQFP	10.0
240 RQFP	13.0
272 PBGA	2.8
313 PBGA	3.7
329 PBGA	3.4
456 PBGA	4.6
729 PBGA	4.86
144 FBGA	0.3
256 FBGA	0.9
484 FBGA	2.7
676 FBGA	3.0
896 FBGA	3.8
1152 FBGA	4.8
49 CSP	0.1
128 CSP	0.3
180 CSP	0.4

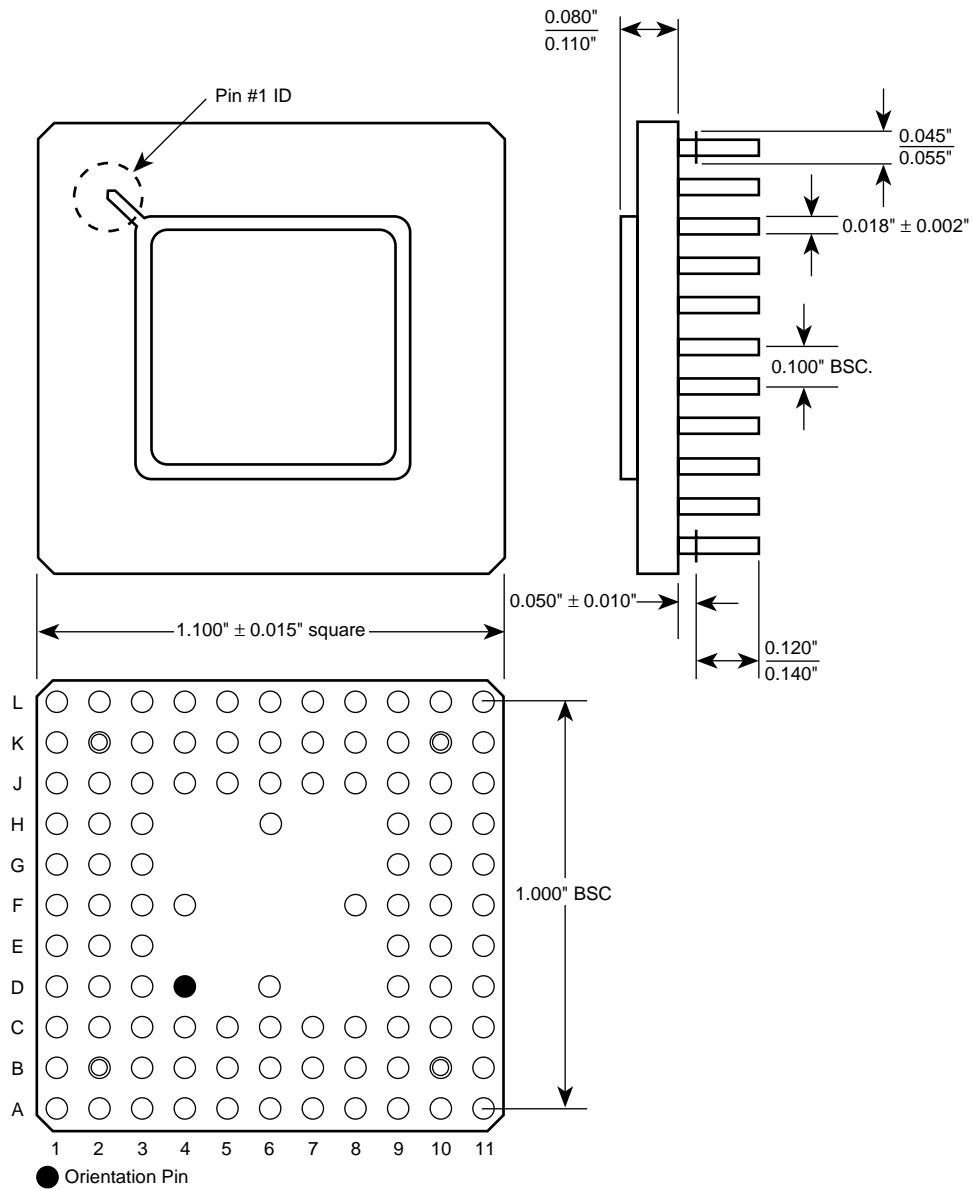
Ceramic Pin Grid Array
84-Pin CPGA



Notes:

1. All dimensions are in inches unless otherwise stated.
2. BSC—Basic Spacing between Centers.

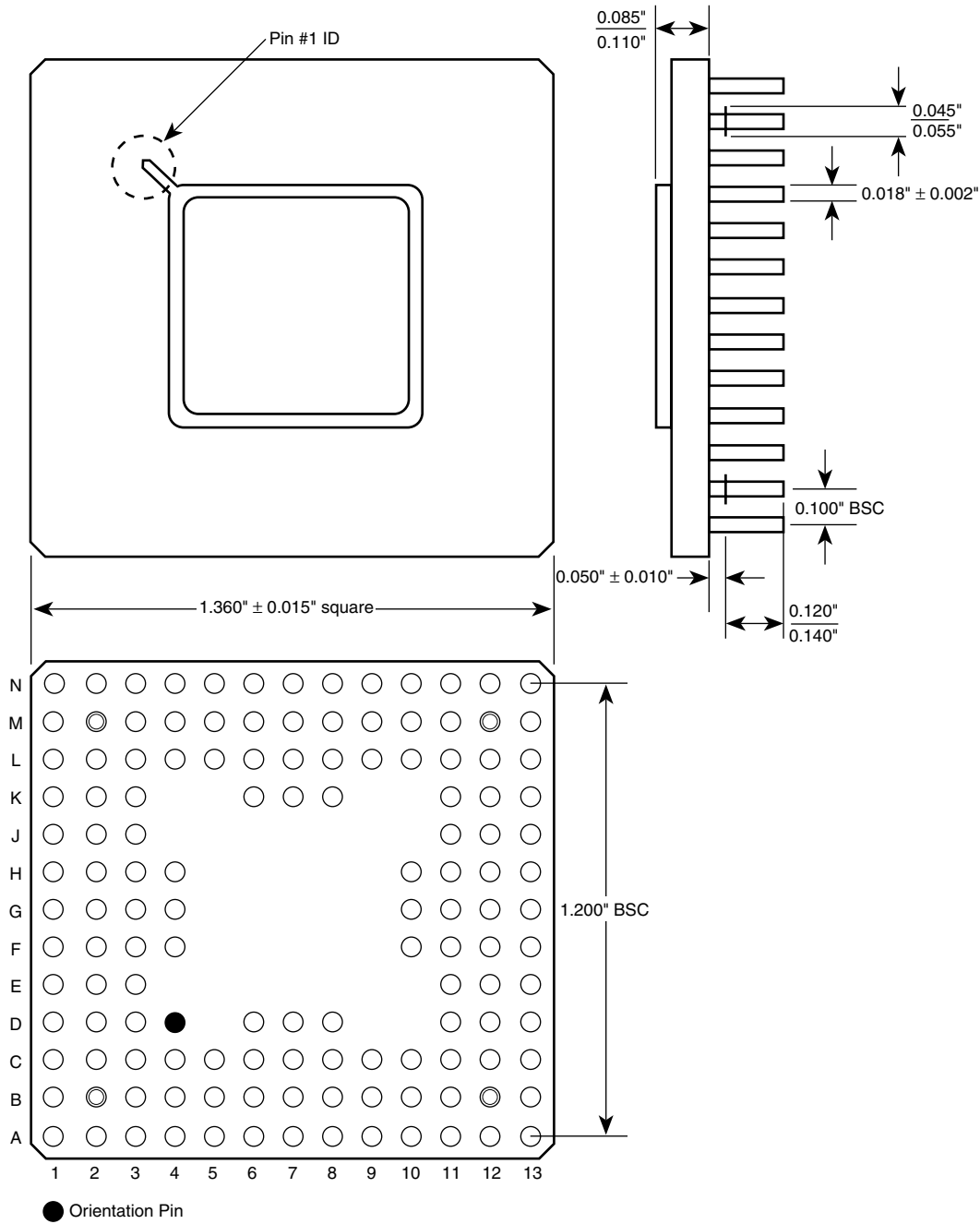
Ceramic Pin Grid Array (continued)
100-Pin CPGA



Notes:

1. All dimensions are in inches unless otherwise stated.
2. BSC—Basic Spacing between Centers.

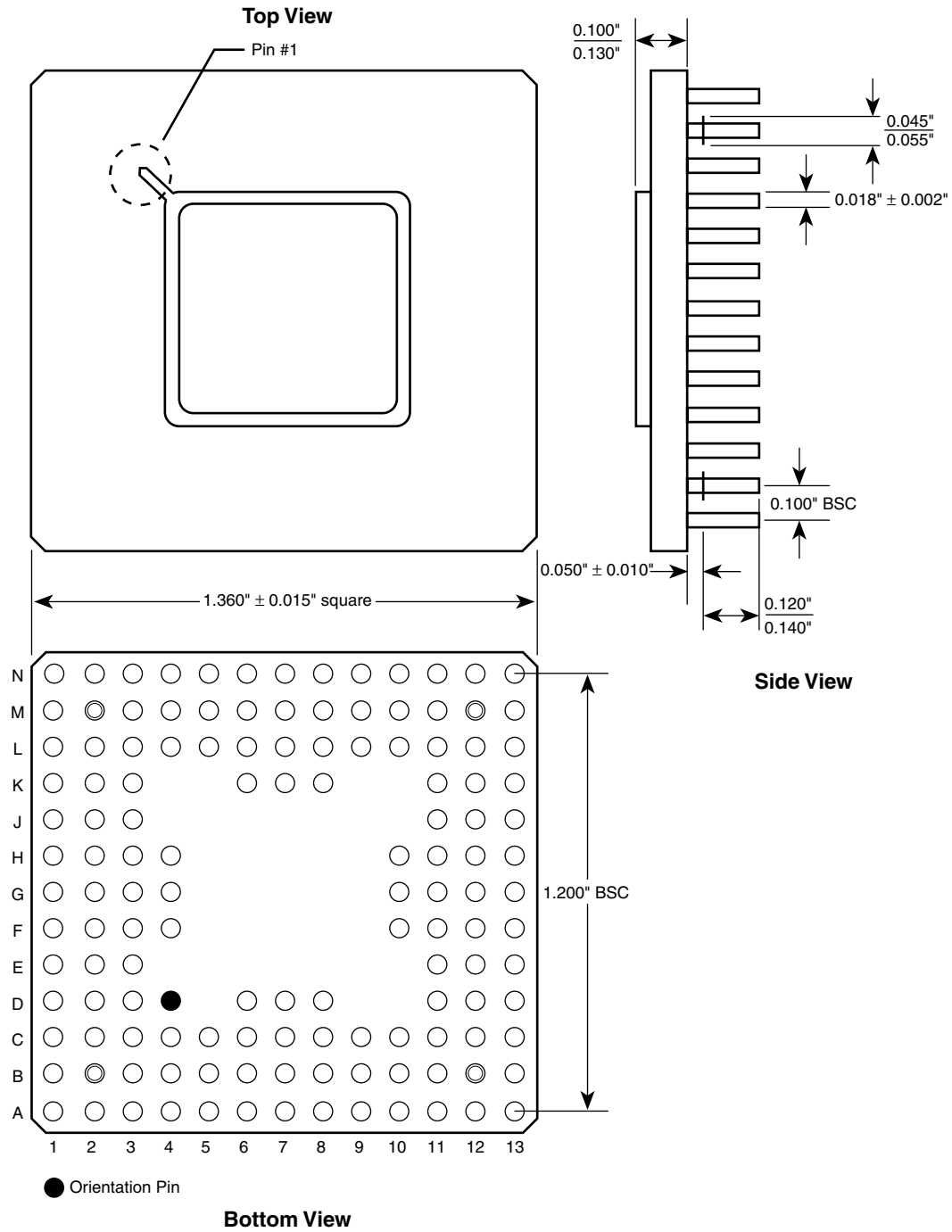
Ceramic Pin Grid Array (continued)
132-Pin CPGA



Notes:

1. All dimensions are in inches unless otherwise stated.
2. BSC—Basic Spacing between Centers.

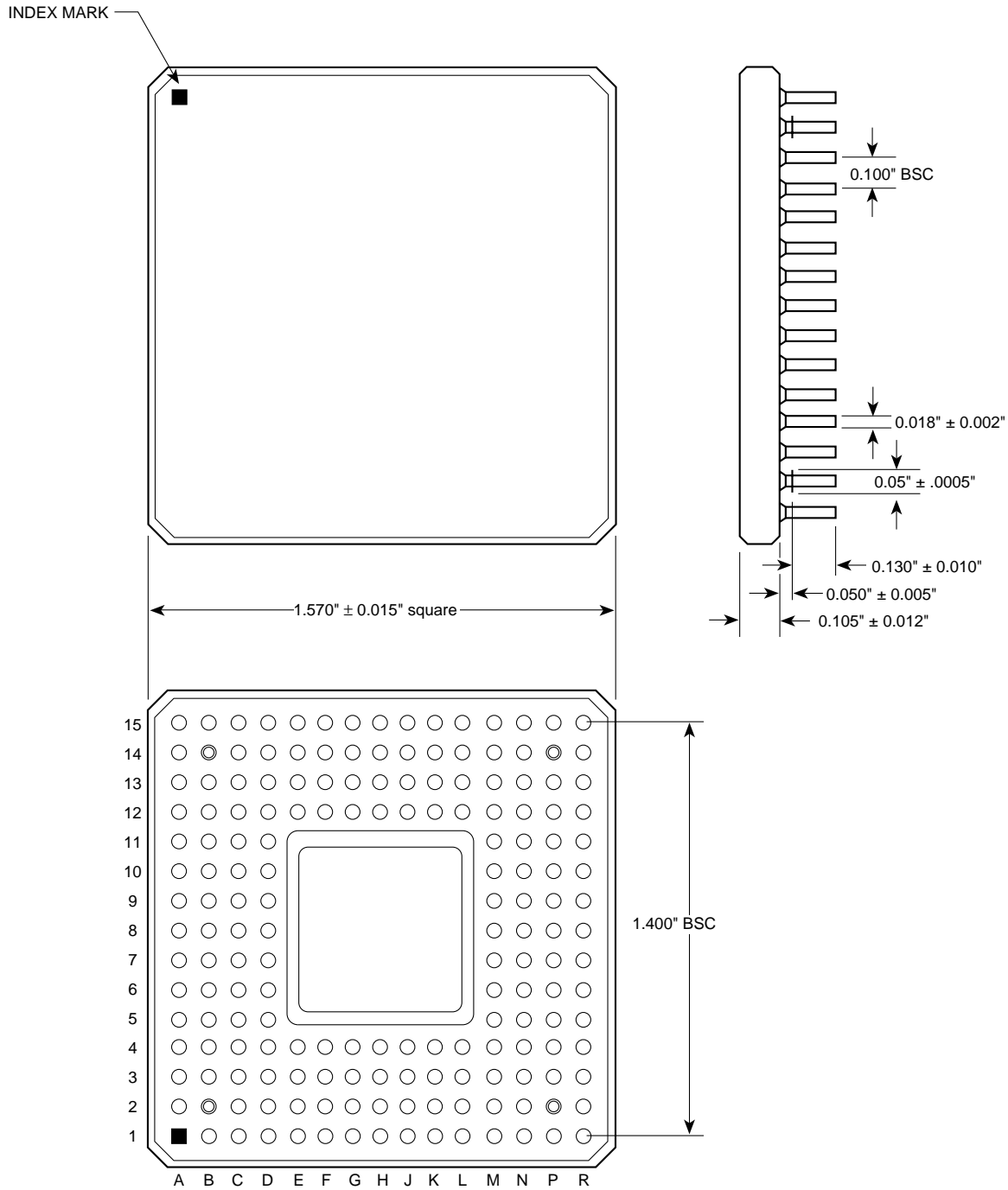
Ceramic Pin Grid Array (continued)
133-Pin CPGA



Notes:

1. All dimensions are in inches unless otherwise stated.
2. BSC—Basic Spacing between Centers.

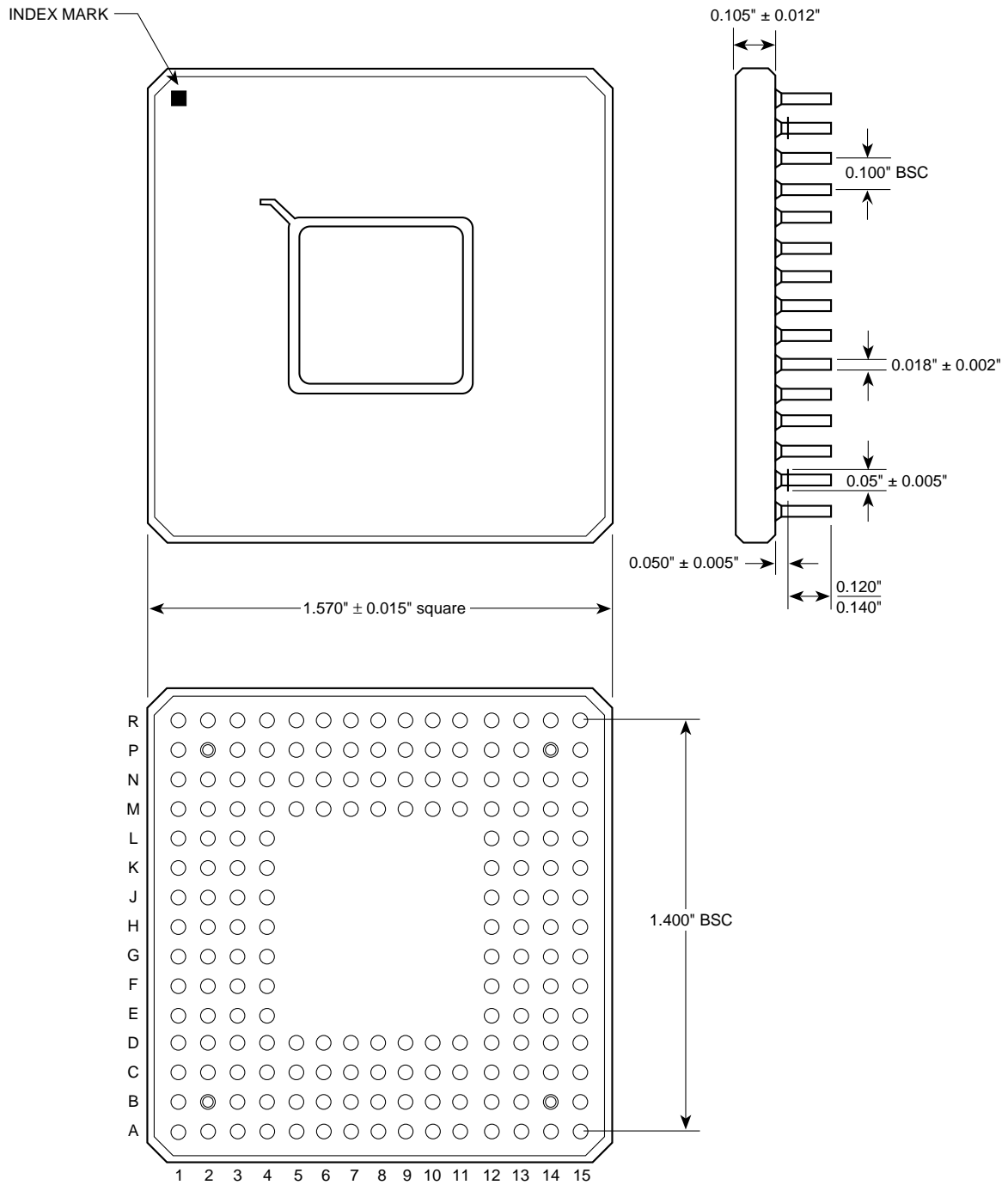
Ceramic Pin Grid Array (continued)
175-Pin CPGA



Notes:

1. All dimensions are in inches unless otherwise stated.
2. BSC—Basic Spacing between Centers.

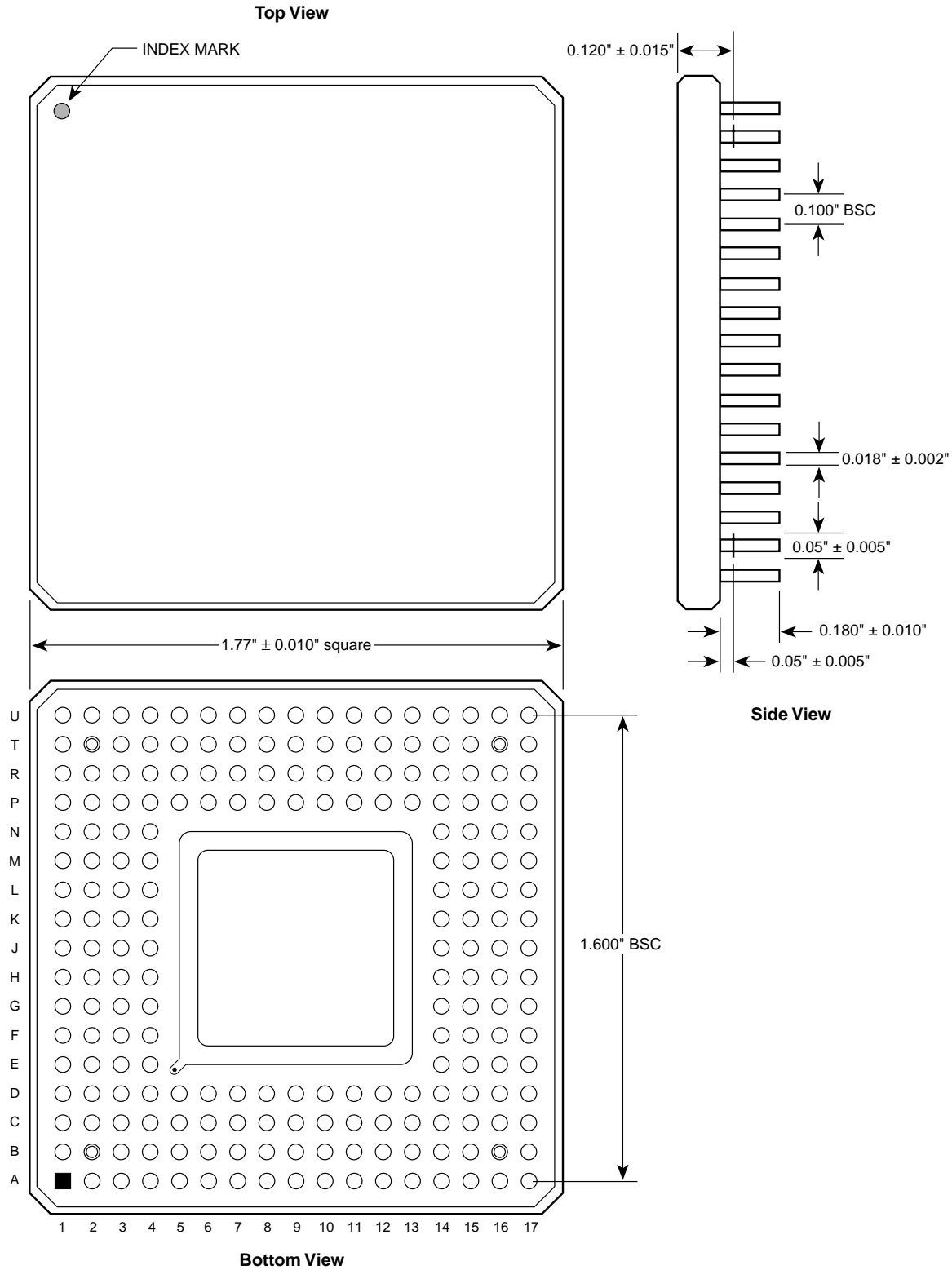
Ceramic Pin Grid Array (continued)
176-Pin CPGA



Notes:

1. All dimensions are in inches unless otherwise stated.
2. BSC—Basic Spacing between Centers.

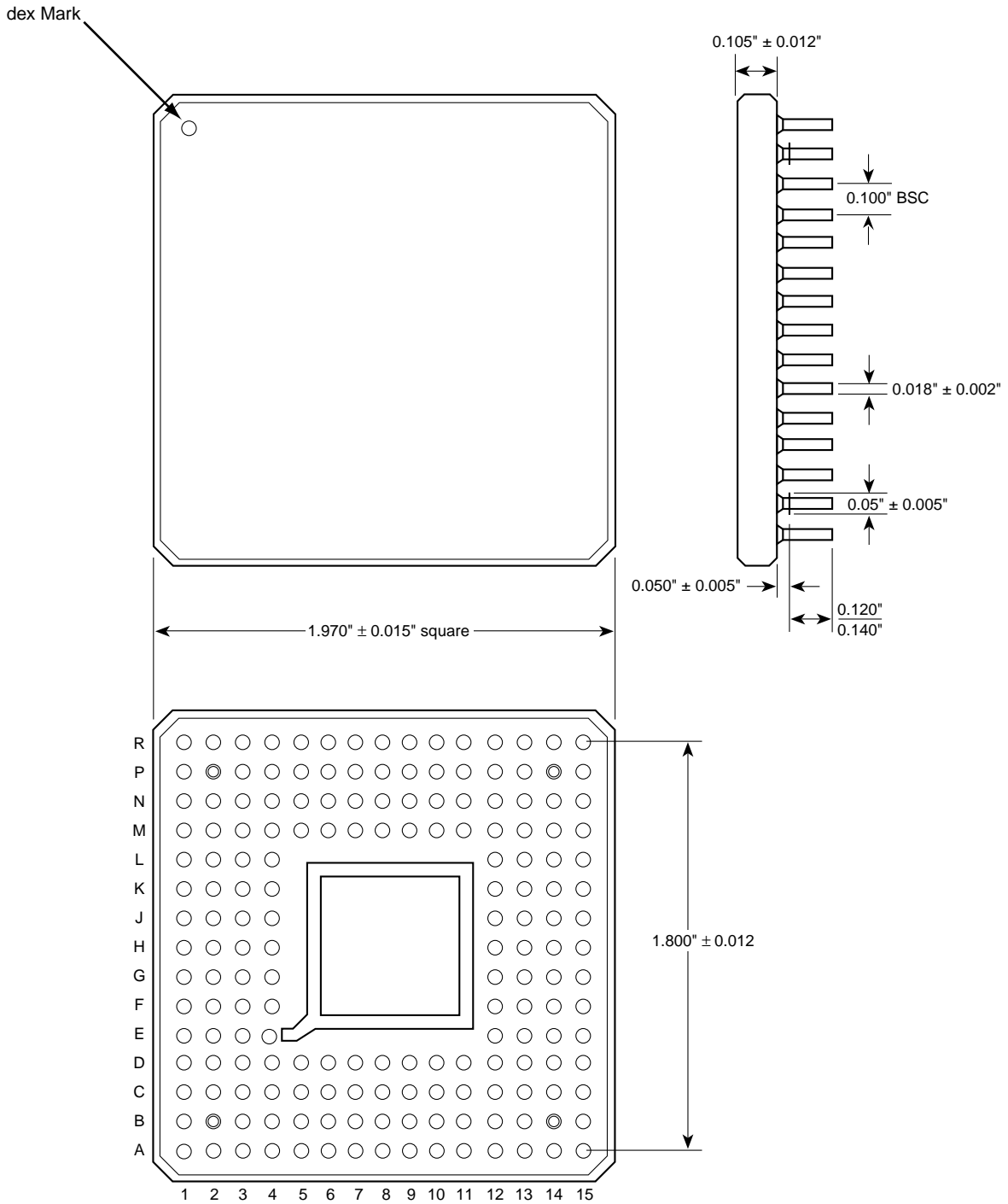
Ceramic Pin Grid Array (continued)
207-Pin CPGA



Notes:

1. All dimensions are in inches unless otherwise stated.
2. BSC—Basic Spacing between Centers.

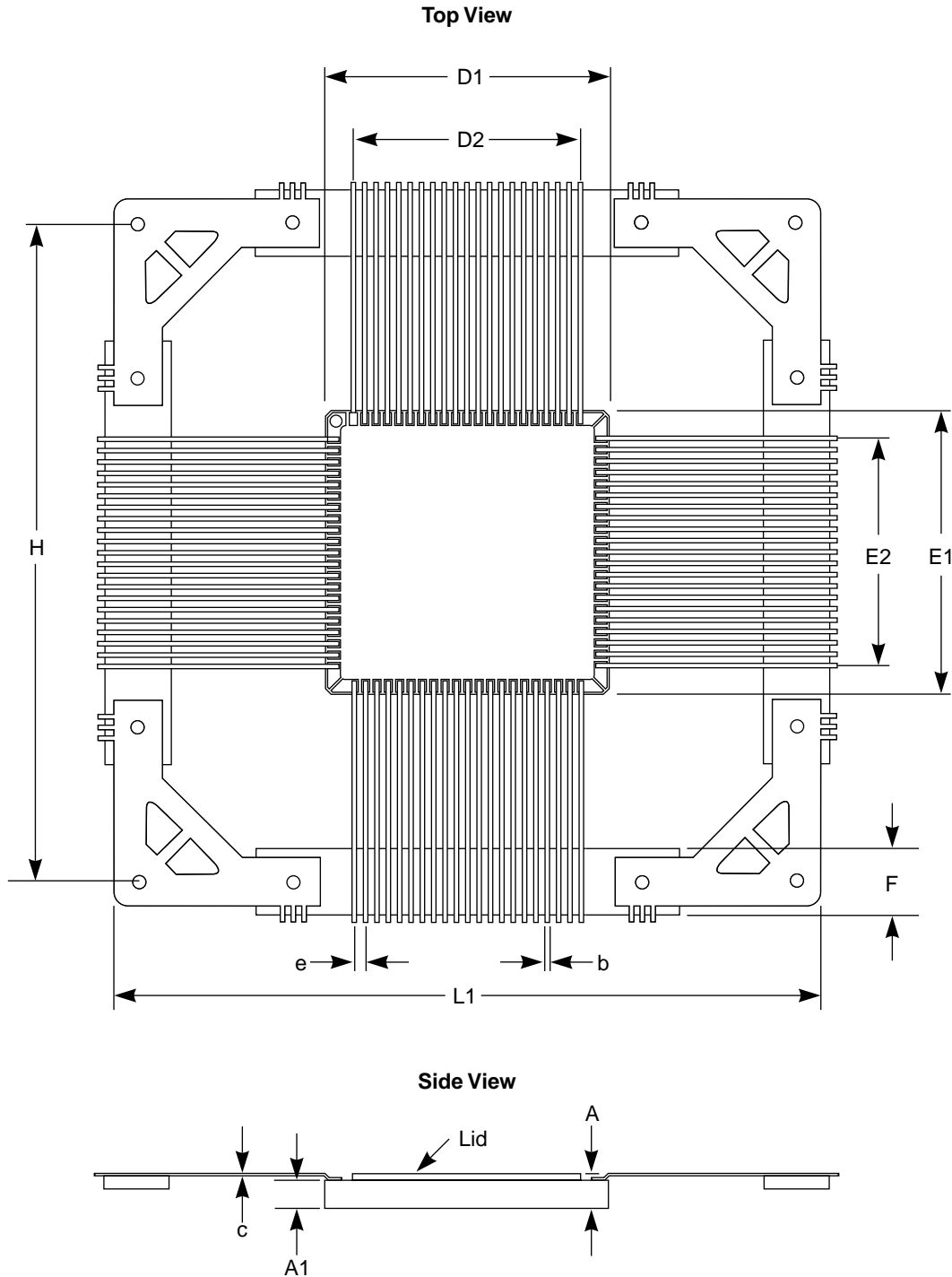
Ceramic Pin Grid Array (continued)
257-Pin CPGA



Notes:

1. All dimensions are in inches unless otherwise stated.
2. BSC—Basic Spacing between Centers.

Ceramic Quad Flat Pack (CQFP)
84-Pin CQFP

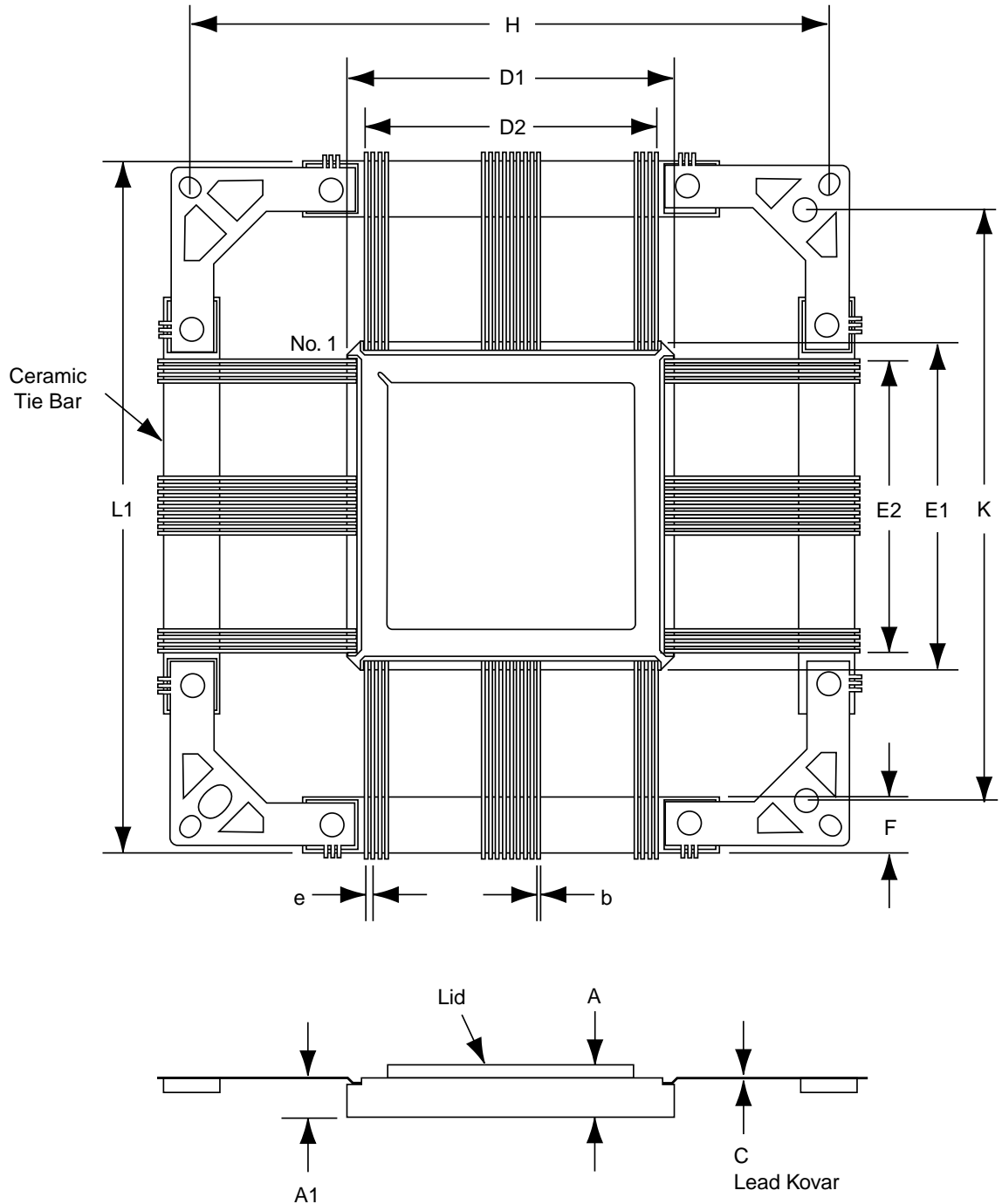


Notes:

1. Dimensions are in inches. Please see the "Ceramic Quad Flat Pack (CQFP) without Heat Sink" table on page 17 for the dimensions.
2. Seal Ring and Lid are connected to Ground.
3. Lead material is Kovar with gold plate over nickel.
4. Packages are shipped unformed with the ceramic tie bar in a test carrier.

Ceramic Quad Flat Pack (CQFP) (continued)

132-Pin, 172-Pin, 196-Pin, 208-Pin, and 256-Pin CQFP—Cavity Up without Heat Sink

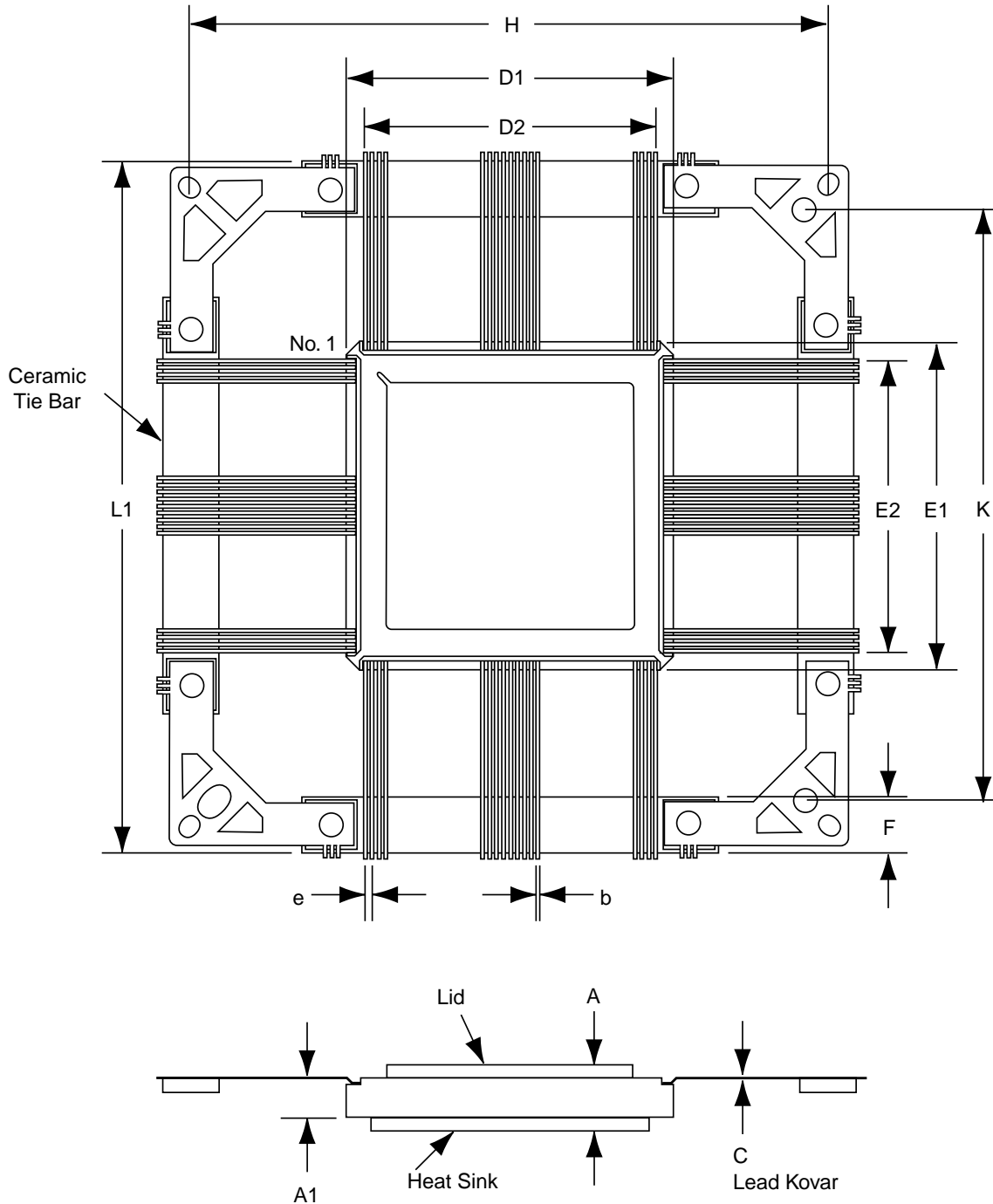


Notes:

1. All dimensions are in inches except CQ208 and CQ256 which are in millimeters. Please see the "Ceramic Quad Flat Pack (CQFP) without Heat Sink" table on page 17 for the dimensions.
2. Outside leadframe holes (from dimension H) are circular for the CQ208 and CQ256.
3. Seal ring and lid are connected to Ground.
4. Lead material is Kovar with minimum 60 microinches gold over nickel.
5. Packages are shipped unformed with the ceramic tie bar.

Ceramic Quad Flat Pack (CQFP) (continued)

208-Pin, and 256-Pin CQFP With Heat Sink—Cavity Up with Heat Sink

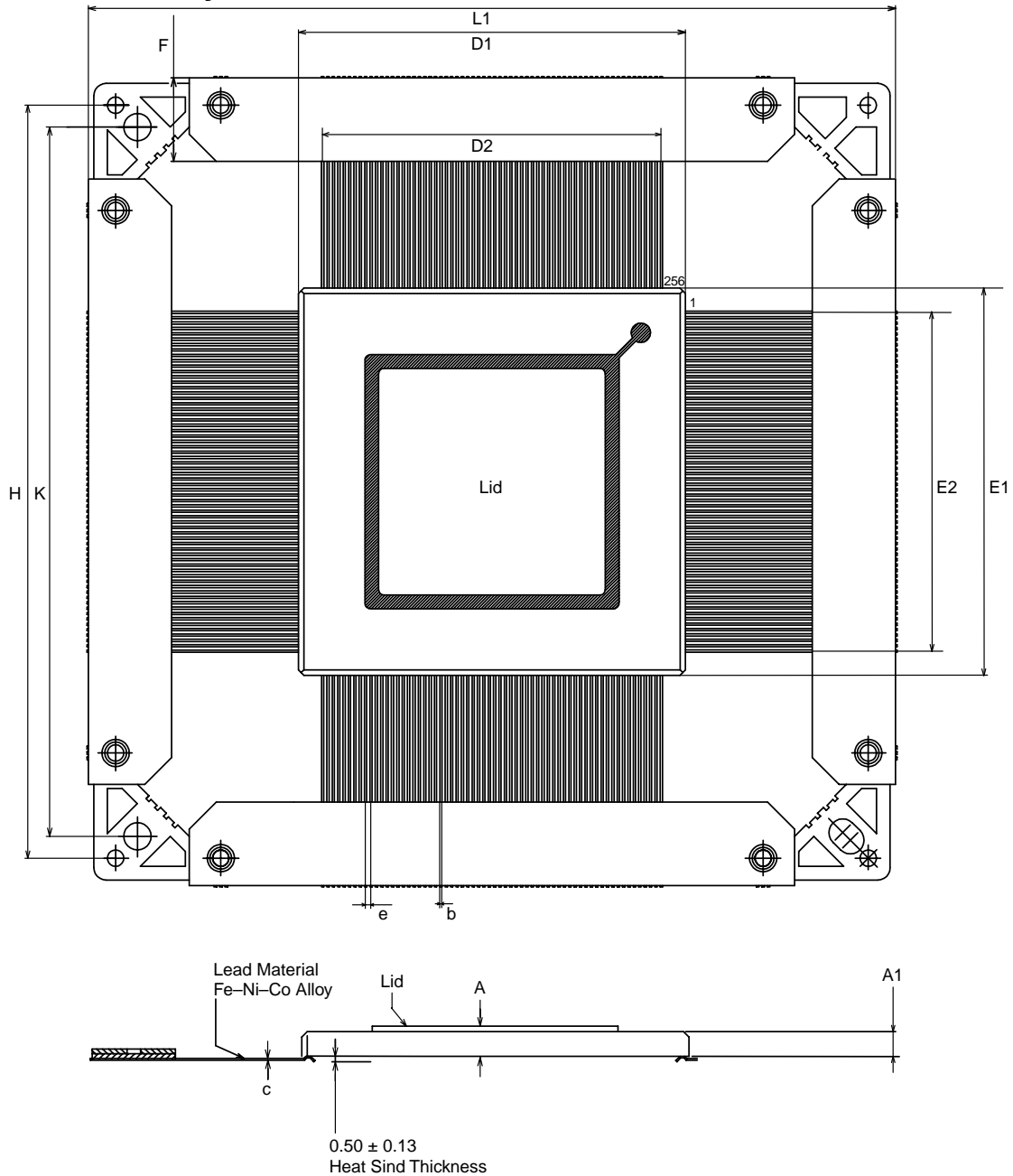


Notes:

1. All dimensions are in inches except CQ208 and CQ256 which are in millimeters. Please see the "Ceramic Quad Flat Pack (CQFP) with Heat Sink" table on page 18 for the dimensions.
2. Outside leadframe holes (from dimension H) are circular for the CQ208 and CQ256.
3. Seal ring and lid are connected to Ground.
4. Lead material is Kovar with minimum 60 microinches gold over nickel.
5. Packages are shipped unformed with the ceramic tie bar.

Ceramic Quad Flat Pack (CQFP) (continued)

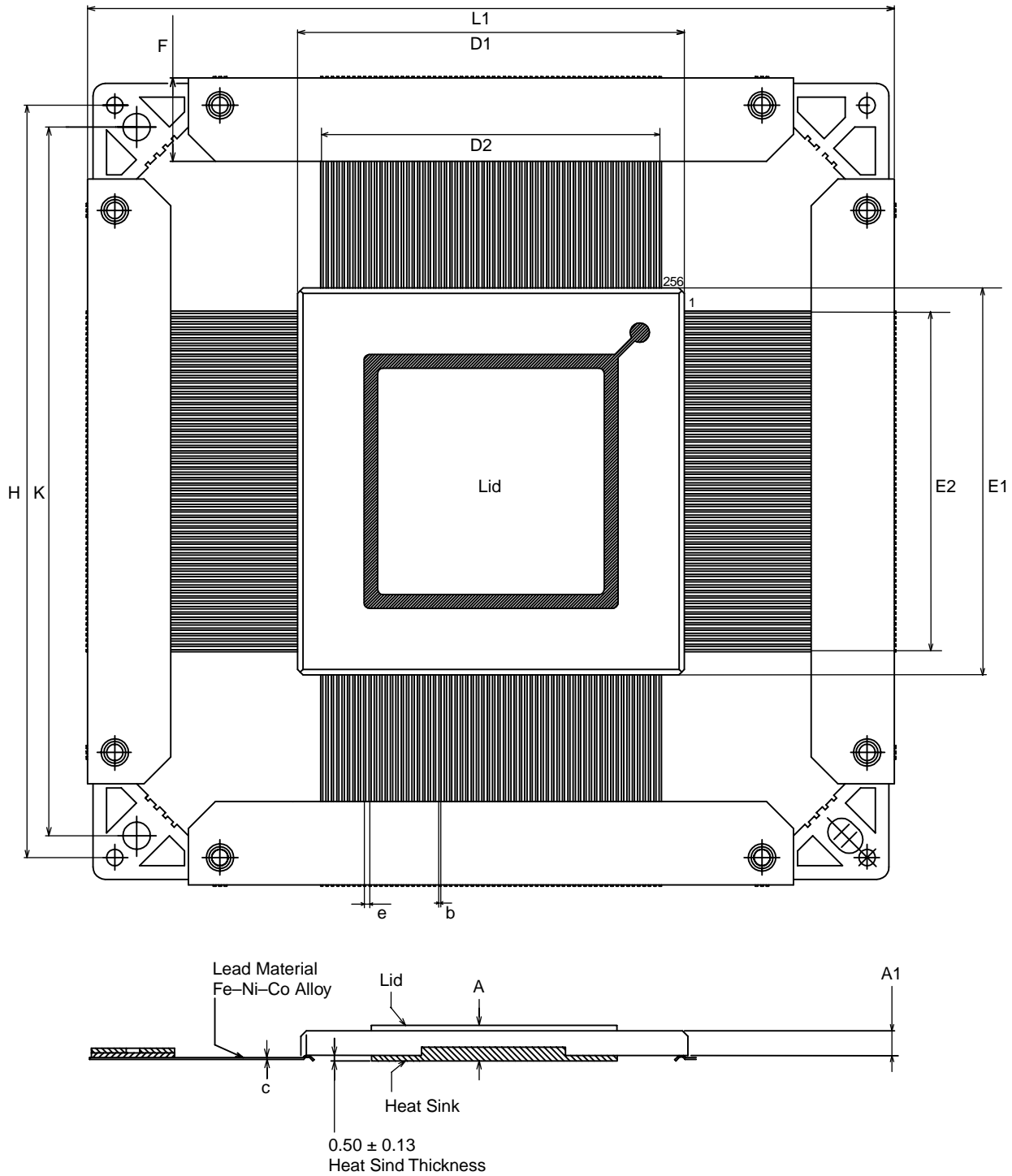
256-Pin CQFP — Cavity Down without Heat Sink



Notes:

1. Dimensions are in millimeters. Please see the "Ceramic Quad Flat Pack (CQFP) without Heat Sink" table on page 17 for the dimensions.
2. Seal Ring and Lid are connected to Ground.
3. Lead material is Kovar with gold plate over nickel.
4. Packages are shipped unformed with the ceramic tie bar.
5. Package is cavity down, with the lid facing the bottom of the package. However the leads can be formed on either side if the application requires the lid to be facing the top.

Ceramic Quad Flat Pack (CQFP) (continued)
256-Pin CQFP— Cavity Down with Heat Sink



Note: Dimensions are in millimeters. Please see the "Ceramic Quad Flat Pack (CQFP) without Heat Sink" table on page 17 for the dimensions.

Ceramic Quad Flat Pack (CQFP) without Heat Sink

	CQ84			CQ132			CQ172			CQ196		
Symbol	Min	Nom.	Max	Min	Nom.	Max	Min	Nom.	Max	Min	Nom.	Max
A	0.070	0.090	0.100	0.094	0.105	0.116	0.094	0.105	0.116	0.094	0.105	0.116
A1	0.060	0.075	0.080	0.080	0.090	0.100	0.080	0.090	0.100	0.080	0.090	0.100
b	0.008	0.010	0.012	0.007	0.008	0.010	0.007	0.008	0.010	0.007	0.008	0.010
c	0.004	0.006	0.008	0.004	0.006	0.008	0.004	0.006	0.008	0.004	0.006	0.008
D1/E1	0.640	0.650	0.660	0.940	0.950	0.960	1.168	1.180	1.192	1.336	1.350	1.364
D2/E2	0.500 BSC			0.800 BSC			1.050 BSC			1.200 BSC		
e	0.025 BSC			0.025 BSC			0.025 BSC			0.025 BSC		
F	0.130	0.140	0.150	0.325	0.350	0.375	0.175	0.200	0.225	0.175	0.200	0.225
H	1.460 BSC			2.320 BSC			2.320 BSC			2.320 BSC		
K	—			2.140 BSC			2.140 BSC			2.140 BSC		
L1	1.595	1.600	1.615	2.485	2.500	2.505	2.485	2.495	2.505	2.485	2.495	2.505

Notes:

1. All dimensions are in inches except CQ208 and CQ256, which are in millimeters.
2. BSC equals Basic Spacing between Centers. This is a theoretical true position dimension and so has no tolerance.

Ceramic Quad Flat Pack (CQFP) without Heat Sink (continued)

	CQ208			CQ256		
Symbol	Min	Nom.	Max	Min	Nom.	Max
A	2.28	2.67	3.06	2.28	2.67	3.06
A1	2.43	2.79	3.15	1.93	2.29	3.15
b	0.17	0.20	0.22	0.18	0.20	0.22
c	0.11	0.15	0.18	0.11	0.15	0.18
D1/E1	28.96	29.21	29.46	35.64	36.00	36.64
D2/E2	25.5 BSC			31.5 BSC		
e	0.50 BSC			0.50 BSC		
F	7.05	7.75	8.45	7.05	7.75	8.45
H	70.00 BSC			70.00 BSC		
K	65.90 BSC			65.90 BSC		
L1	74.60	75.00	75.40	74.60	75.00	75.40

Notes:

1. All dimensions are in inches except CQ208 and CQ256, which are in millimeters.
2. BSC equals Basic Spacing between Centers. This is a theoretical true position dimension and so has no tolerance.

Ceramic Quad Flat Pack (CQFP) with Heat Sink

	CQ208			CQ256		
Symbol	Min	Nom.	Max	Min	Nom.	Max
A	2.78	3.17	3.56	2.78	3.17	3.56
A1	2.43	2.79	3.15	1.93	2.29	3.15
b	0.18	0.20	0.22	0.18	0.20	0.22
c	0.11	0.15	0.17	0.11	0.15	0.18
D1/E1	28.96	29.21	29.46	35.64	36.00	36.66
D2/E2	25.5 BSC			31.5 BSC		
e	0.50 BSC			0.50 BSC		
F	7.05	7.75	8.45	7.05	7.75	8.45
H	70.00 BSC			70.00 BSC		
K	65.90 BSC			65.90 BSC		
L1	74.60	75.00	75.40	74.60	75.00	75.40

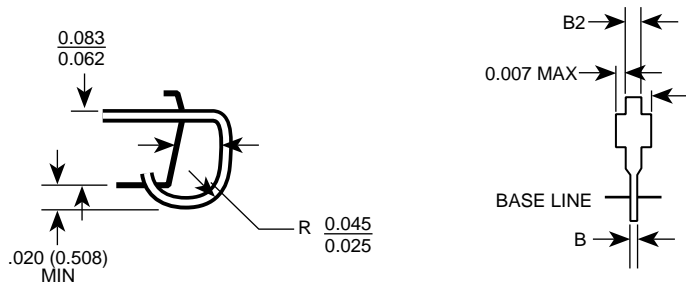
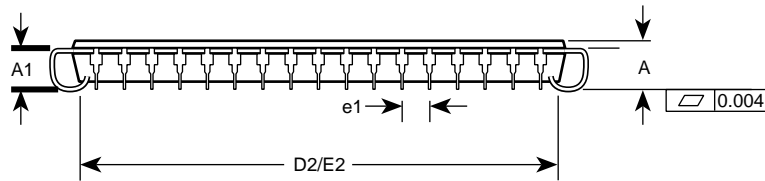
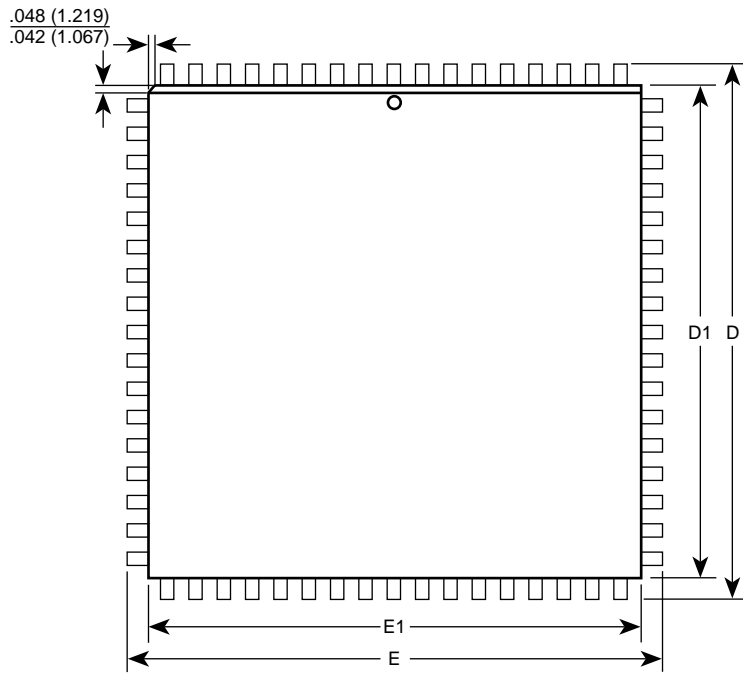
Notes:

1. All dimensions are in inches except CQ208 and CQ256, which is in millimeters.
2. BSC equals Basic Spacing between Centers. This is a theoretical true position dimension and so has no tolerance.

CQFP with Heat Sink Package:

A32200DX CQ208
A32200DX CQ256
RT54SX16 CQ256
RT54SX32 CQ256
A54SX16 CQ256
A54SX32 CQ256
RT54SX72S CQ256

Plastic Leaded Chip Carrier (PLCC)



Note: Dimensions are in millimeters. Please see the "Plastic Leaded Chip Carrier Packages (PLCC)" table on page 20 for the dimensions.

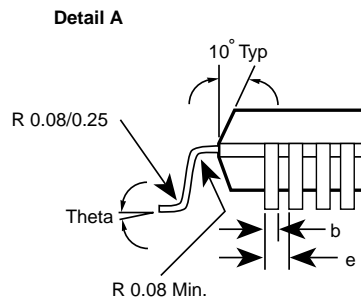
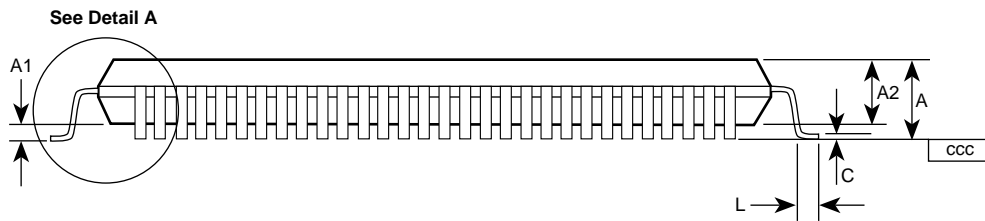
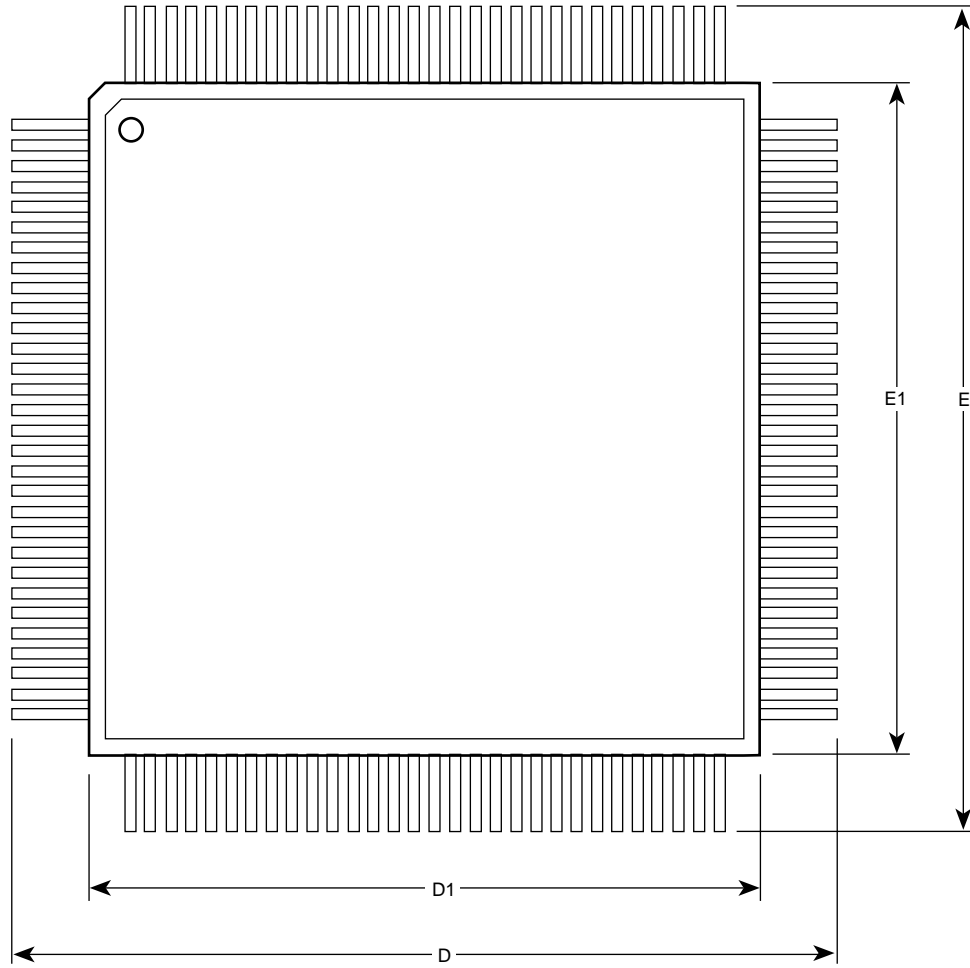
Plastic Leaded Chip Carrier Packages (PLCC)

Jedec Equiv	PLCC 44 MS-018 VAR AC			PLCC 68 MS-018 VAR AE			PLCC 84 MS-018 VAR AF		
	Min	Nom.	Max	Min	Nom.	Max	Min	Nom.	Max
A	0.165	0.172	0.180	0.165	0.172	0.180	0.165	0.172	0.180
A1	0.090	0.105	0.120	0.090	0.105	0.120	0.090	0.105	0.120
B	0.013	–	0.021	0.013	–	0.021	0.013	–	0.021
B2	0.026	–	0.032	0.026	–	0.032	0.026	–	0.032
D/E	0.685	0.690	0.695	0.985	0.990	0.995	1.185	1.190	1.195
D1/E1	0.650	0.653	0.656	0.950	0.954	0.958	1.150	1.154	1.158
D2/E2	0.590	0.610	0.630	0.890	0.910	0.930	1.090	1.110	1.130
e1	0.050 BSC			0.050 BSC			0.050 BSC		

Notes:

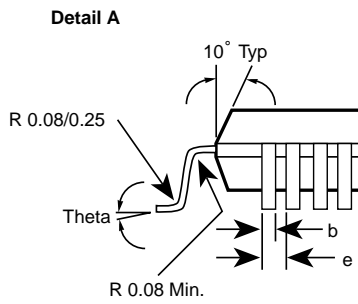
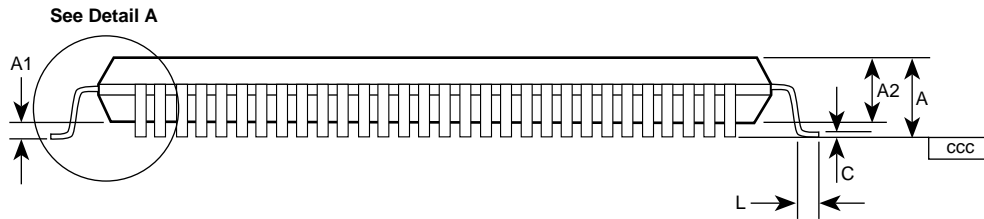
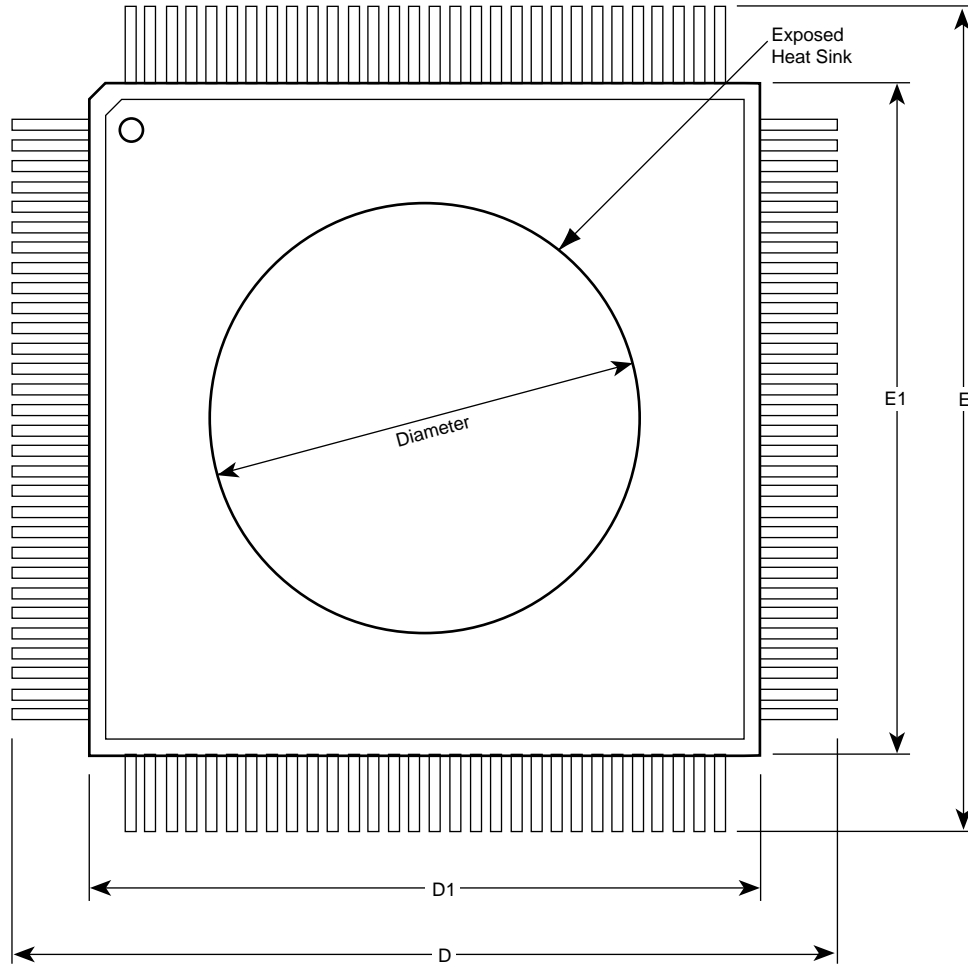
1. All dimensions are in inches.
2. BSC—Basic Spacing between Centers.

Plastic Quad Flat Pack (PQFP, TQFP, VQFP)



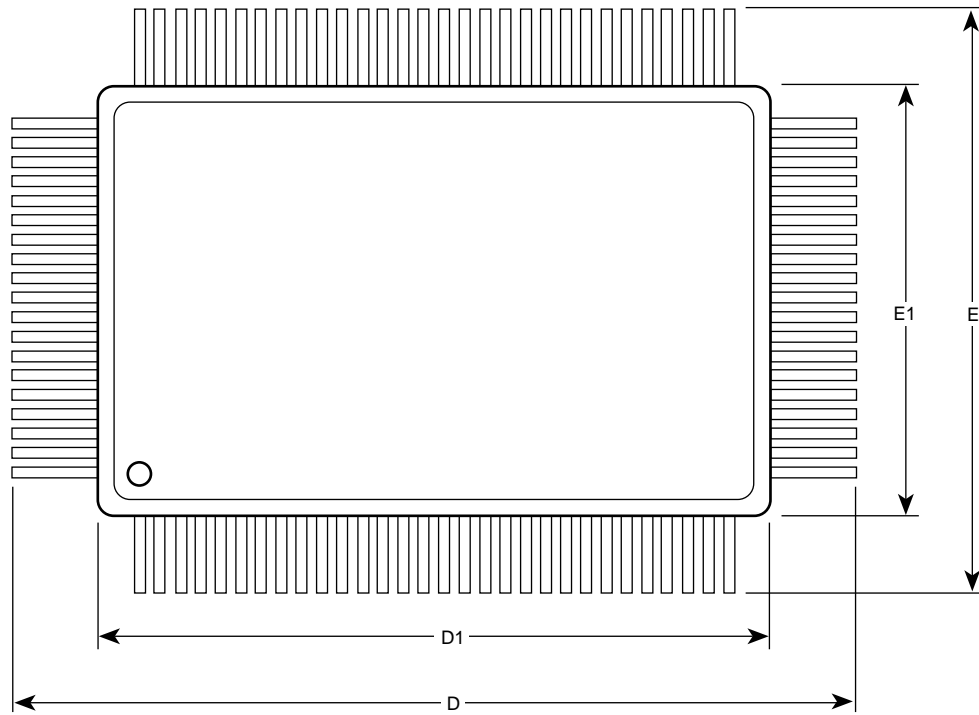
Note: Dimensions are in millimeters. Please see the "Plastic Quad Flat Packages (PQFP)" table on page 24, "Thin Quad Flat Pack (TQFP)" table on page 25, and "Very Thin Quad Flat Pack (VQFP)" table on page 25 for the dimensions.

Plastic Quad Flat Pack (RQFP)

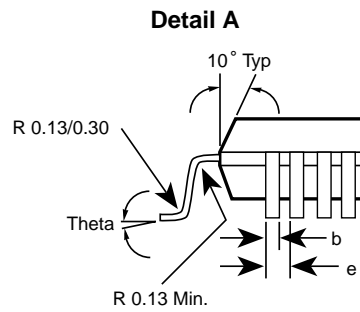
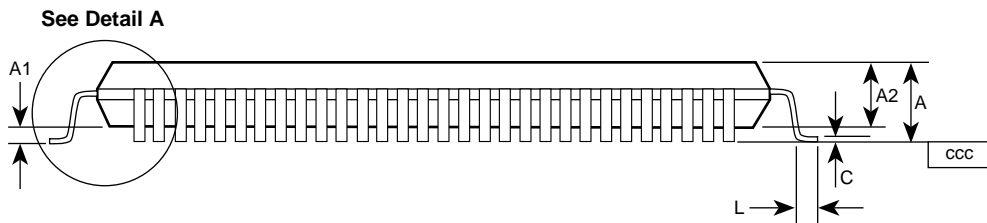


Note: Dimensions are in millimeters. Please see the "Plastic Quad Flat Packages (RQFP/PQFP)" table on page 24 for the dimensions.

**Plastic Quad Flat Pack
Rectangular Package (PQ100)**



Side View



Note: Dimensions are in millimeters. Please see the "Plastic Quad Flat Packages (PQFP)" table on page 24 for the dimensions.

Plastic Quad Flat Packages (PQFP)

Jedec Equiv	PQFP 100 MS-022 VAR GC-1			PQFP 144 MS-022 VAR DC-1			PQFP 160 MS-022 VAR DD-1		
Dimension	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max
A			3.40			4.10			4.10
A1	0.25		0.5	0.25		0.50	0.25	0.33	0.50
A2	2.50	2.70	2.9	3.20	3.40	3.60	3.20	3.40	3.60
b	0.22		0.04	0.22		0.40	0.22		0.40
c	0.11		0.23	0.11		0.23	0.11		0.23
D		23.20 BSC			31.20 BSC			31.20 BSC	
D1		20.00 BSC			28.00 BSC			28.00 BSC	
E		17.20 BSC			31.20 BSC			31.20 BSC	
E1		14.00 BSC			28.00 BSC			28.00 BSC	
e	0.65 BSC			0.65 BSC			0.65 BSC		
L	0.73	0.88	1.03	0.73	0.88	1.03	0.73	0.88	1.03
ccc	0.10			0.10			0.10		
Theta	0		7 deg	0		7 deg	0		7 deg

Plastic Quad Flat Packages (RQFP/PQFP)

Jedec Equiv	RQFP 208/PQFP 208 MS-029 VAR FA-1			RQFP 240/PQFP 240 MS-029 VAR GA		
Dimension	Min	Nom	Max	Min	Nom	Max
A			4.10			4.10
A1	0.25		0.50	0.25		0.50
A2	3.20	3.40	3.60	3.20	3.40	3.60
b	0.17		0.27	0.17		0.27
c	0.09		0.20	0.09		0.20
D/E		30.60 BSC			34.60 BSC	
D1/E1		28.00 BSC			32.10 BSC	
e	0.50 BSC			0.50 BSC		
L	0.45	0.60	0.75	0.50	0.60	0.75
ccc	0.10			0.10		
Theta	0	3.50	8 deg	0	3.50	8 deg
Diameter	19.82	20.32	20.82	23.63	24.13	24.63

Notes:

- All dimensions are in millimeters.
- BSC—Basic Spacing between Centers.

Thin Quad Flat Pack (TQFP)

JEDEC Equivalent	TQFP 64 MS-026 VAR BCD			TQFP 100 MS-026 VAR BED			TQFP 144 MS-026 VAR BFB			TQFP 176 MS-026 VAR BCA		
	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max
A			1.60			1.60			1.60			1.60
A1	0.05		0.15	0.05		0.15	0.05		0.15	0.05		0.15
A2	1.35	1.40	1.45	1.35	1.40	1.45	1.35	1.40	1.45	1.35	1.40	1.45
b	0.17	0.22	0.27	0.17	0.22	0.27	0.17	0.22	0.27	0.17	0.22	0.27
c	0.09		0.20	0.09		0.20	0.09		0.20	0.09		0.20
D/E		12.00 BSC			16.00 BSC			22.00 BSC			26.00 BSC	
D1/E1		10.00 BSC			14.00 BSC			20.00 BSC			24.00 BSC	
e	0.50 BSC			0.50 BSC			0.50 BSC			0.50 BSC		
L	0.45	0.60	0.75	0.45	0.60	0.75	0.45	0.60	0.75	0.45	0.60	0.75
ccc	0.08			0.08			0.08			0.08		
Theta	0	3.50 deg	7 deg	0	3.50 deg	7 deg	0	3.50 deg	7 deg	0	3.50 deg	7 deg

Notes:

1. All dimensions are in millimeters.
2. BSC—Basic Spacing between Centers.

Very Thin Quad Flat Pack (VQFP)

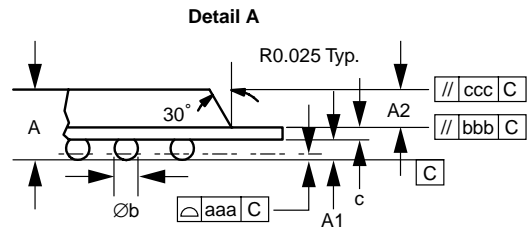
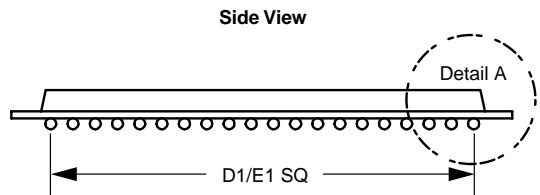
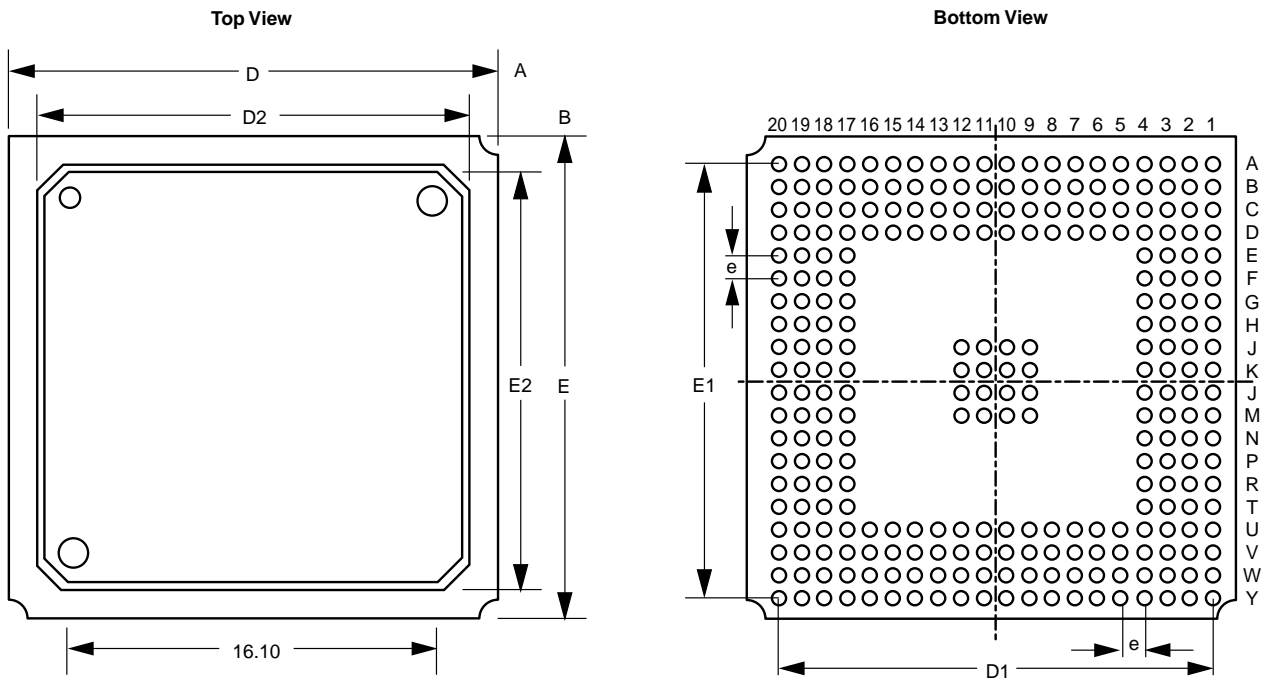
Jedec Equivalent	VQFP 80 MS-026 VAR AEC			VQFP 100 MS-036 VAR AED		
	Min	Nom	Max	Min	Nom	Max
A			1.20			1.20
A1	0.05		0.15	0.05		0.15
A2	0.95	1.00	1.05	0.95	1.00	1.05
b	0.22	0.32	0.38	0.17	0.32	0.27
c	0.09		0.20	0.09		0.20
D/E		16.00 BSC			16.00 BSC	
D1/E1		14.00 BSC			14.00 BSC	
e	0.65 BSC			0.50 BSC		
L	0.45	0.60	0.75	0.45	0.60	0.75
ccc	0.10			0.08		
Theta	0	3.50 deg	7 deg	0	3.50 deg	7 deg

Notes:

1. All dimensions are in millimeters.
2. BSC—Basic Spacing between Centers.

Plastic Ball Grid Array

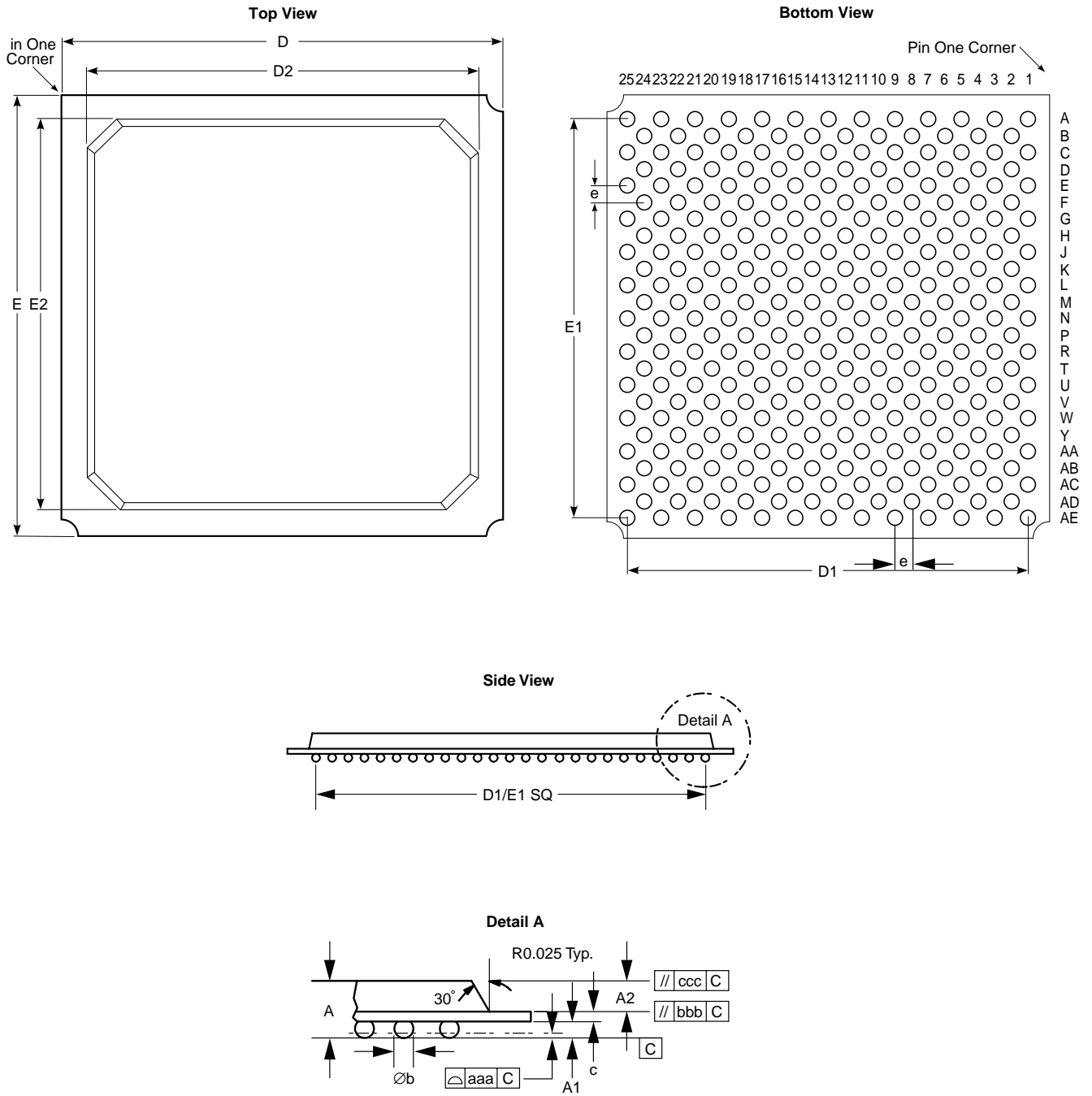
272-pin PBGA



Note: Dimensions are in millimeters. Please see the "Plastic Ball Grid Array (PBGA)" table on page 31 for the dimensions.

Plastic Ball Grid Array (continued)

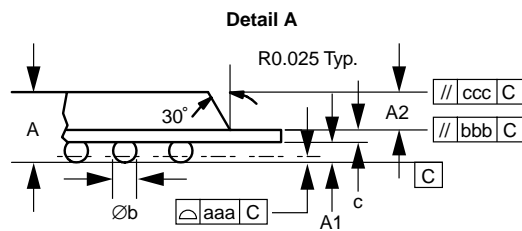
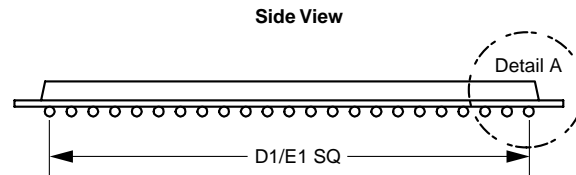
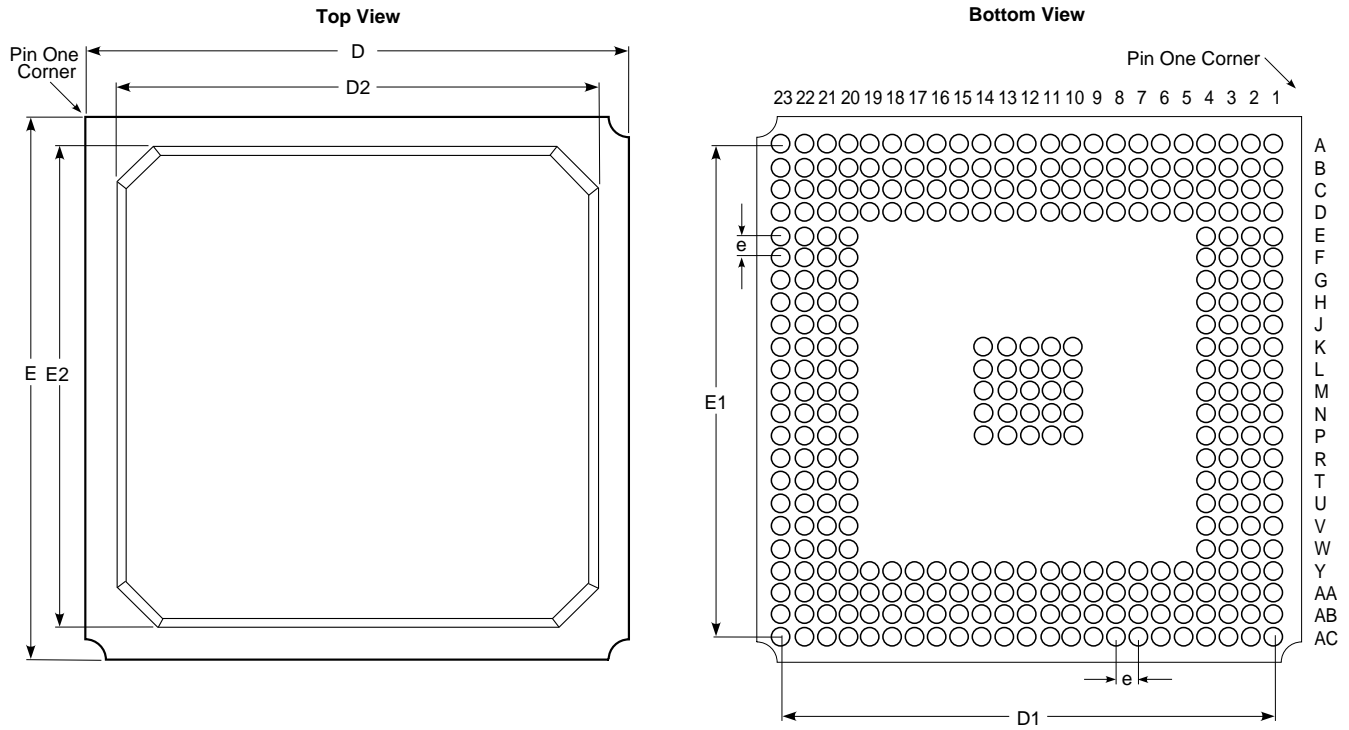
313-pin PBGA



Note: Dimensions are in millimeters. Please see the "Plastic Ball Grid Array (PBGA)" table on page 31 for the dimensions.

Plastic Ball Grid Array (continued)

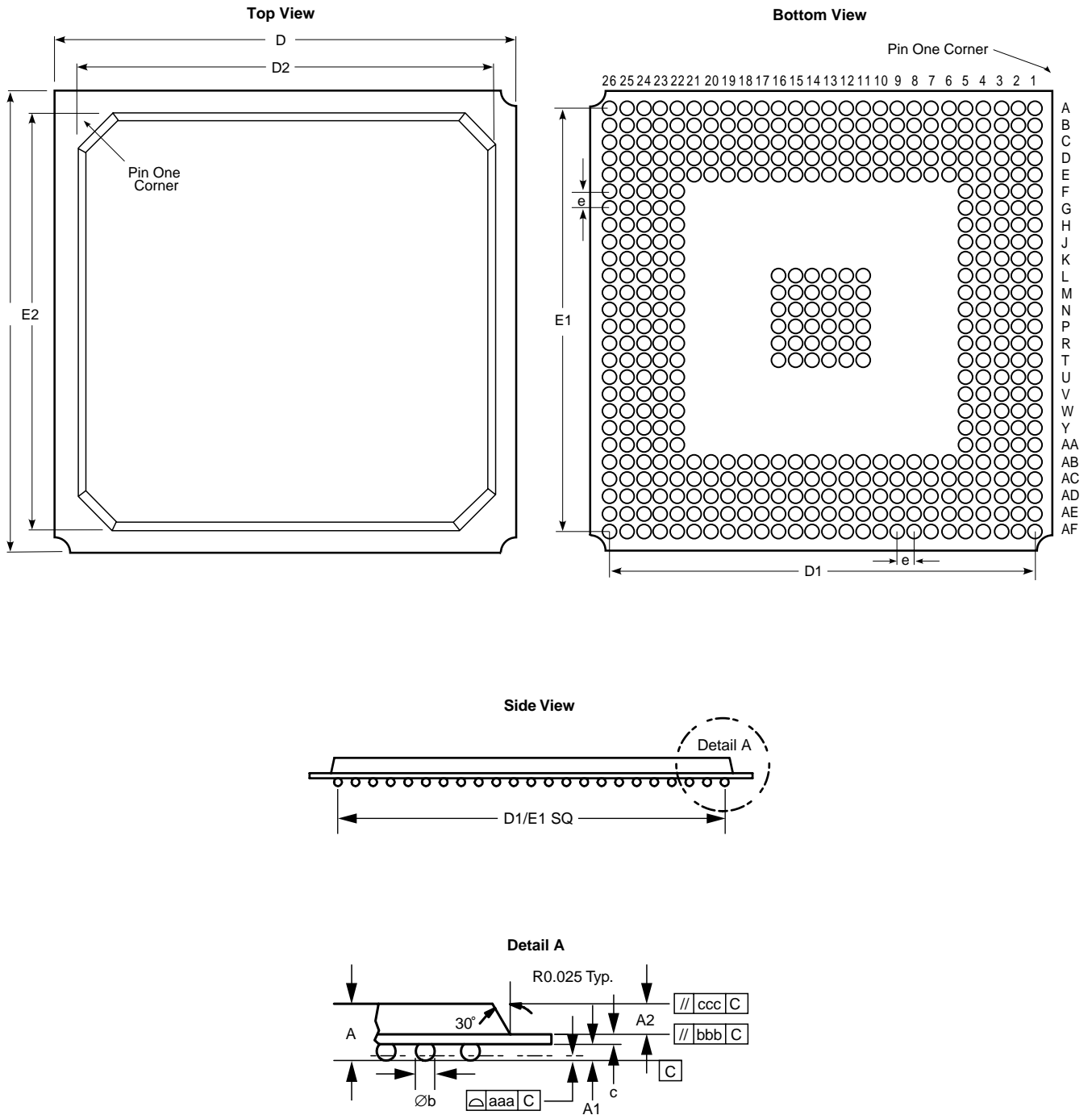
329-pin PBGA



Note: Dimensions are in millimeters. Please see the “Plastic Ball Grid Array (PBGA)” table on page 31 for the dimensions.

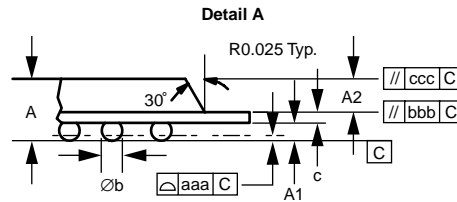
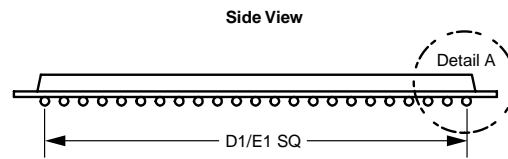
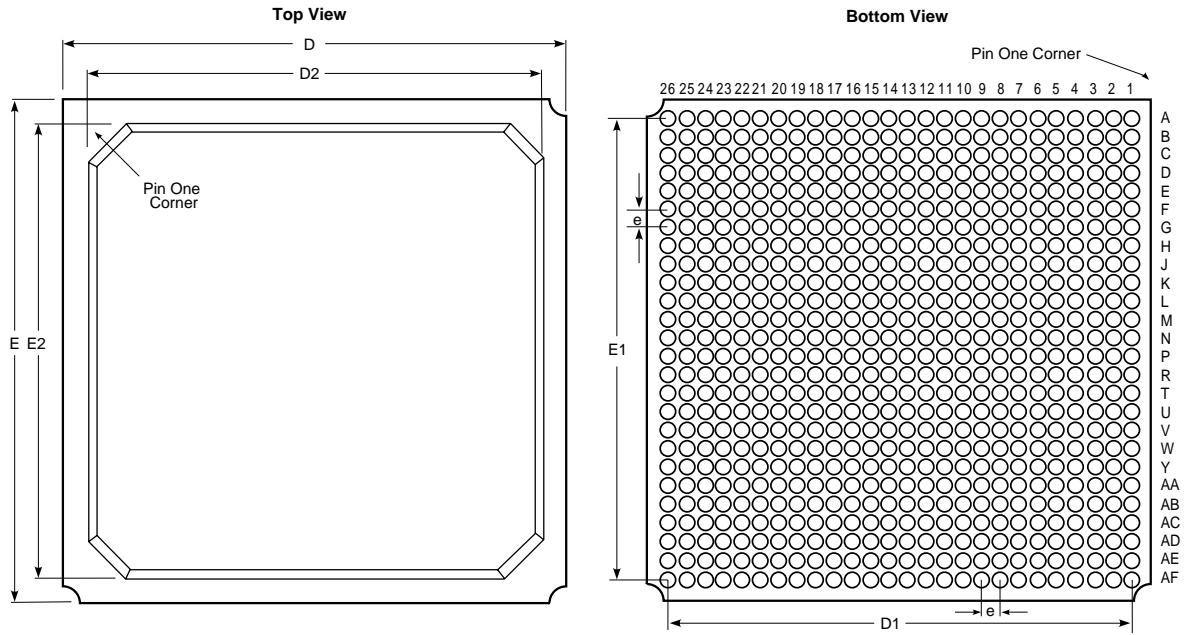
Plastic Ball Grid Array (continued)

456-pin PBGA



Note: Dimensions are in millimeters. Please see the "Plastic Ball Grid Array (PBGA)" table on page 31 for the dimensions.

Plastic Ball Grid Array (continued)
729-pin PBGA



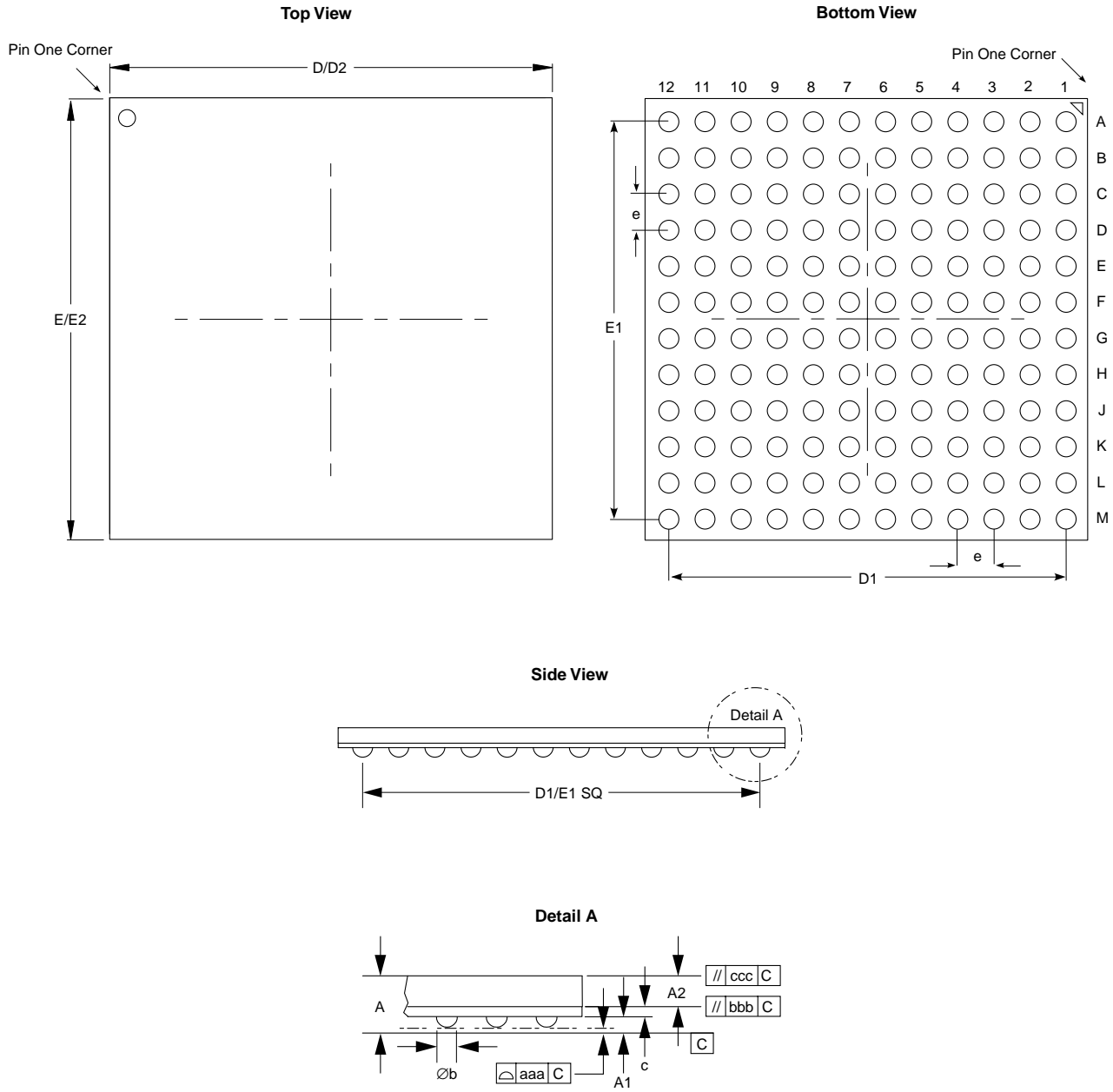
Plastic Ball Grid Array (PBGA)

JEDEC Equivalent	PBGA272 MS-034 VAR BAL-2			PBGA313 MS-034			PBGA329 MS-034 VAR BAN-2			PBGA456 MS-034 VAR BAR-2		
	Min.	Nom.	Max.	Min.	Nom.	Max.	Min.	Nom.	Max.	Min.	Nom.	Max.
A	2.18	2.33	2.50	2.12	2.33	2.52	2.17	2.33	2.70	2.12	2.33	2.54
A1	0.50	0.60	0.70	0.50	0.60	0.70	0.50	0.60	0.70	0.50	0.60	0.70
A2	1.15	1.17	1.19	1.12	1.17	1.22	1.10	1.20	1.30	1.12	1.17	1.19
aaa	0.20			0.20			0.20			0.20		
b	0.60	0.75	0.90	0.60	0.76	0.90	0.60	0.76	0.90	0.60	0.76	0.90
bbb	0.25			0.25			0.25			0.25		
c	0.53	0.56	0.61	0.53	0.56	0.61	0.53	0.60	0.70	0.51	0.56	0.61
ccc	0.35			0.35			0.35			0.35		
D	26.80	27.00	27.20	34.80	35.00	35.20	30.80	31.00	31.20	34.80	35.00	35.20
D1	24.13 BSC			30.48 BSC			27.94 BSC			31.75 BSC		
D2	23.90	24.00	24.10	29.50	30.00	30.70	27.90	28.00	28.10	29.80	30.00	30.20
E	26.80	27.00	27.20	34.80	35.00	35.20	30.80	31.00	31.20	34.80	35.00	35.20
E1	24.13 BSC			30.48 BSC			27.94 BSC			31.75 BSC		
E2	23.90	24.00	24.10	29.50	30.00	30.70	27.90	28.00	28.10	29.80	30.00	30.20
e	1.27 typ.			1.27 typ.			1.27 typ.			1.27 typ.		

JEDEC Equivalent	PBGA729 MS-034 VAR BAR-1		
Dimension	Min.	Nom.	Max.
A	2.12	2.33	2.54
A1	0.50	0.60	0.70
A2	1.12	1.17	1.19
aaa	0.20		
b	0.60	0.76	0.90
bbb	0.25		
c	0.50	0.56	0.62
ccc	0.35		
D	34.80	35.00	35.20
D1	33.02 BSC		
D2	29.95	30.00	30.70
E	34.80	35.00	35.20
E1	33.02 BSC		
E2	29.95	30.00	30.70
e	1.27 typ.		

Fine Pitch Plastic Ball Grid Array

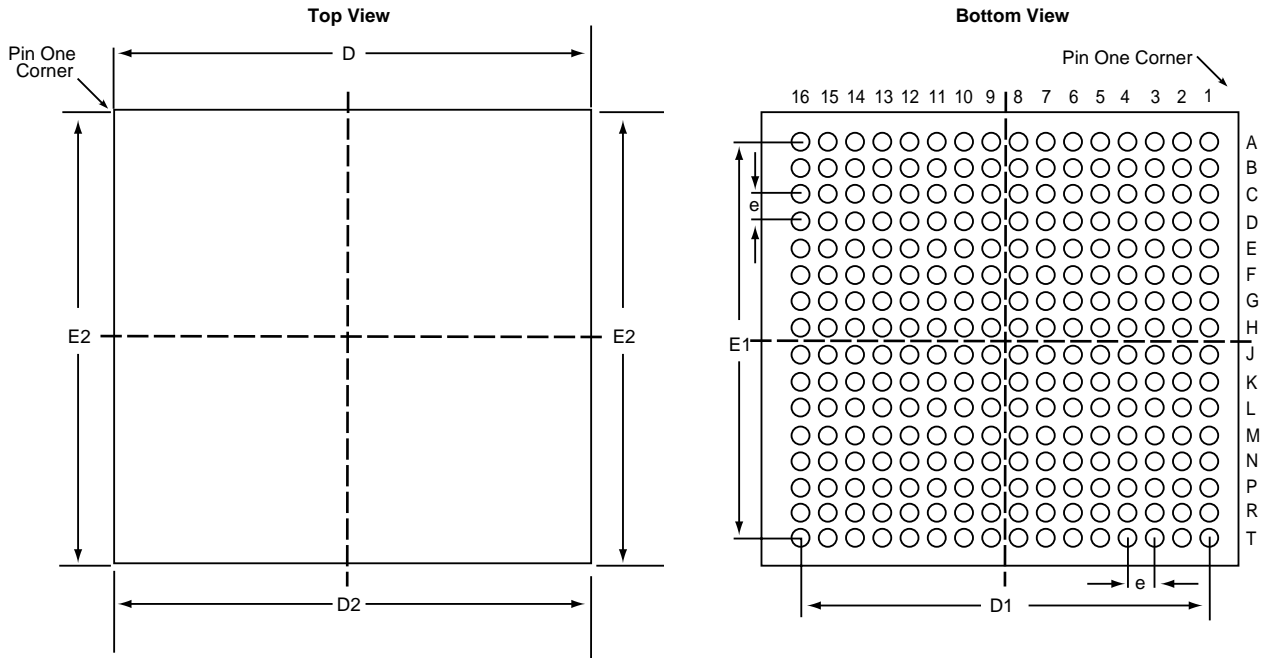
144-pin FG



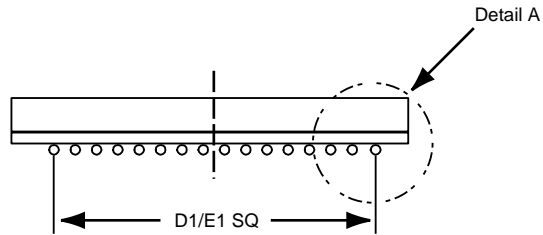
Note: Dimensions are in millimeters. Please see the "Fine Pitch Ball Grid Array (FBGA)" table on page 40 for the dimensions.

Fine Pitch Plastic Ball Grid Array (continued)

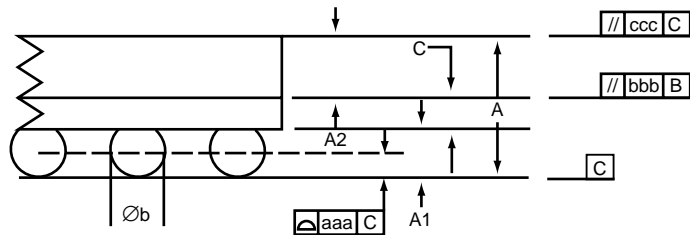
256-pin FG



Side View

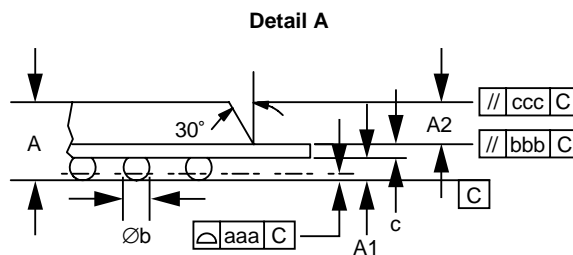
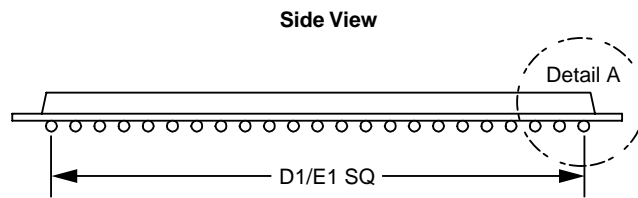
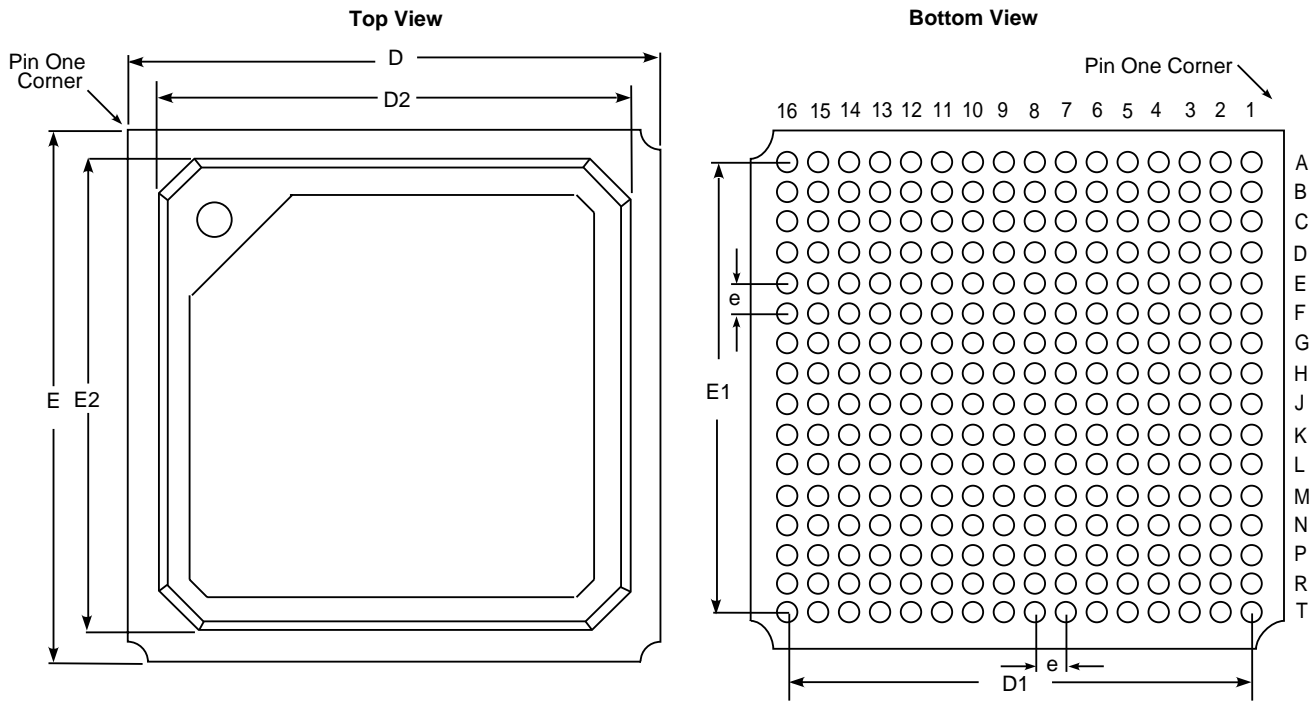


Detail A



Fine Pitch Plastic Ball Grid Array (continued)

256-pin FG

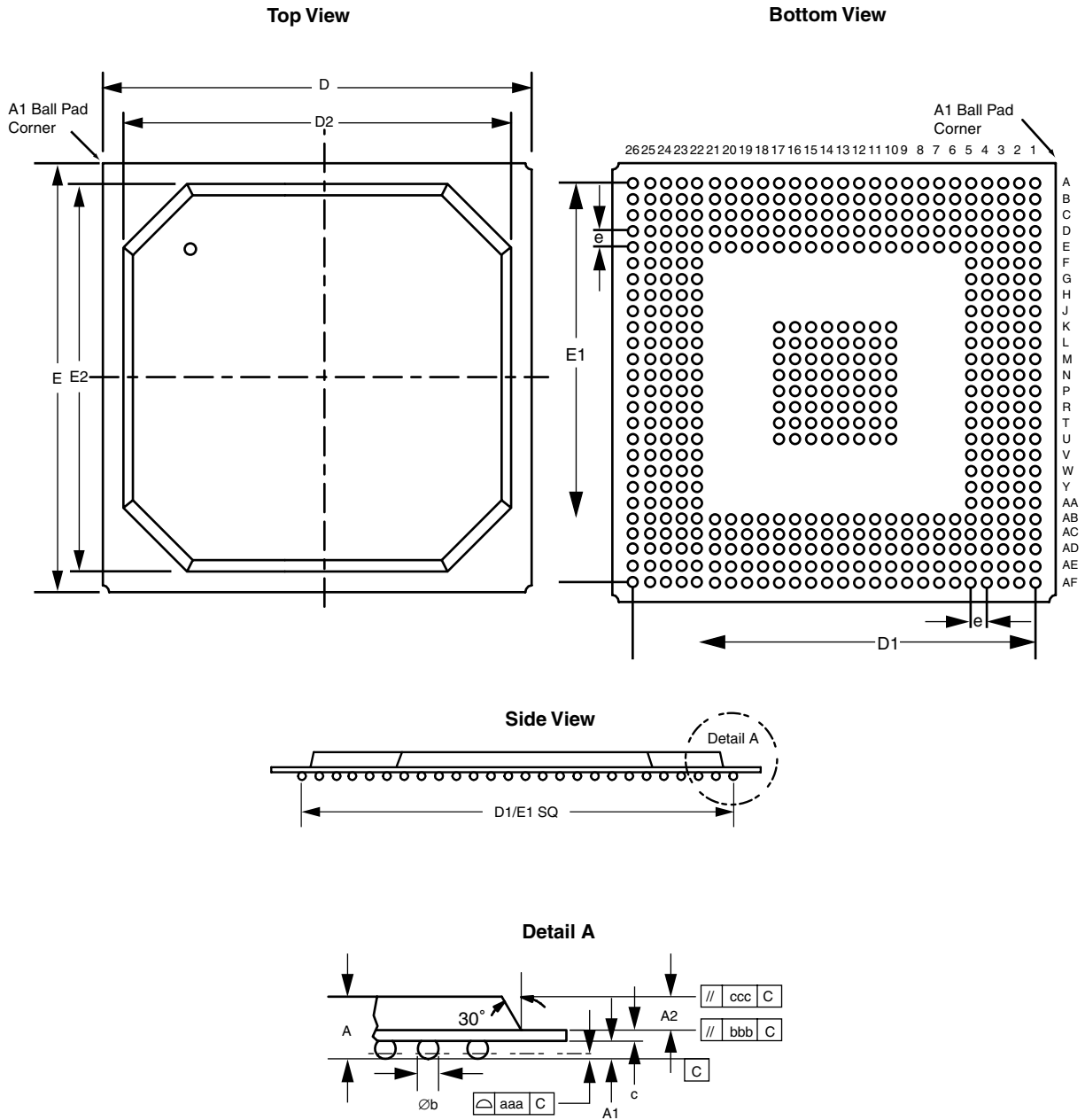


Notes:

1. Dimensions are in millimeters. Please see the "Fine Pitch Ball Grid Array (FBGA)" table on page 40 for the dimensions.
2. Only for A54SX32A and A54SX72A devices, for all other devices refer to "256-pin FG" figure on page 33.

Fine Pitch Plastic Ball Grid Array (continued)

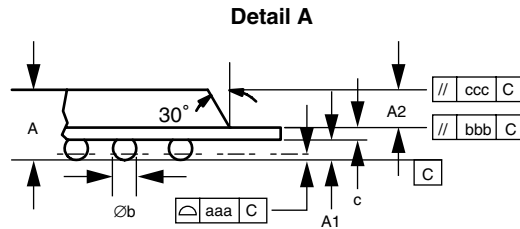
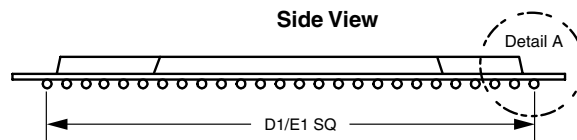
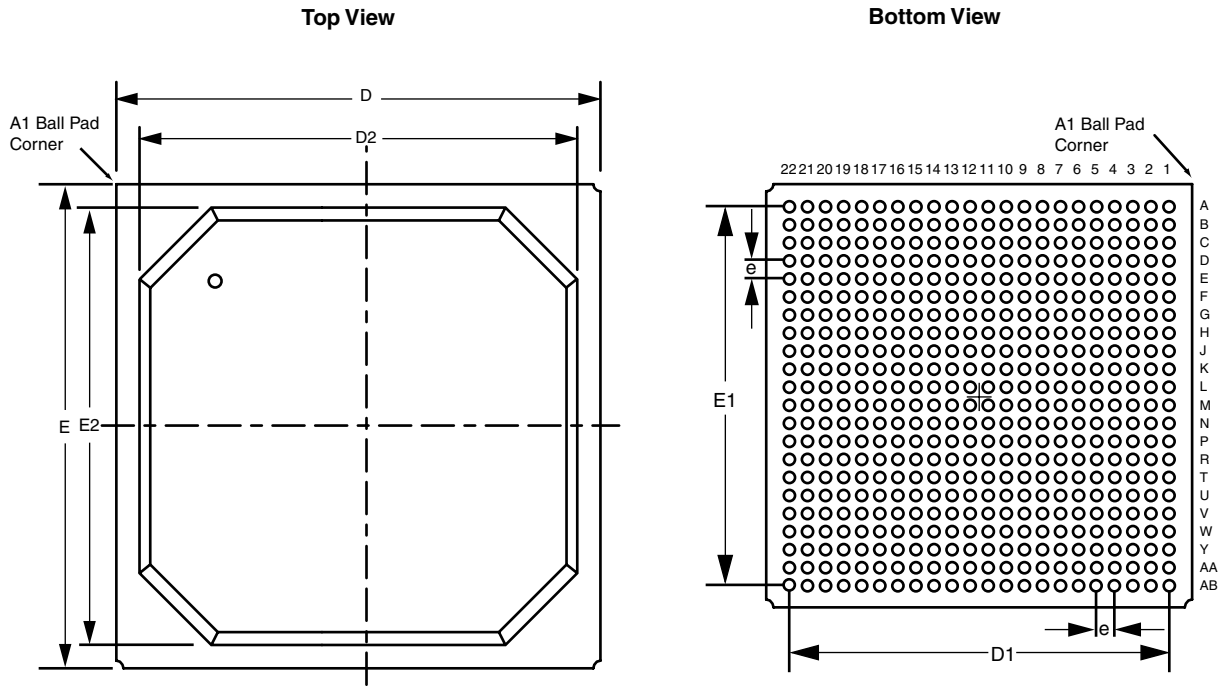
484-pin FG



Note: Dimensions are in millimeters. Please see the "Fine Pitch Ball Grid Array (FBGA)" table on page 40 for the dimensions.

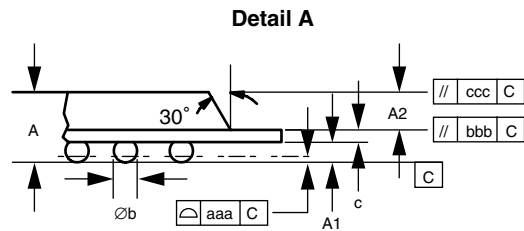
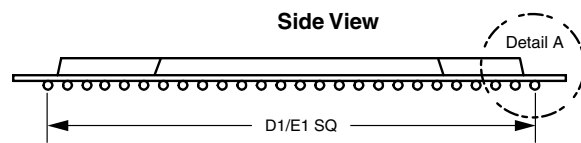
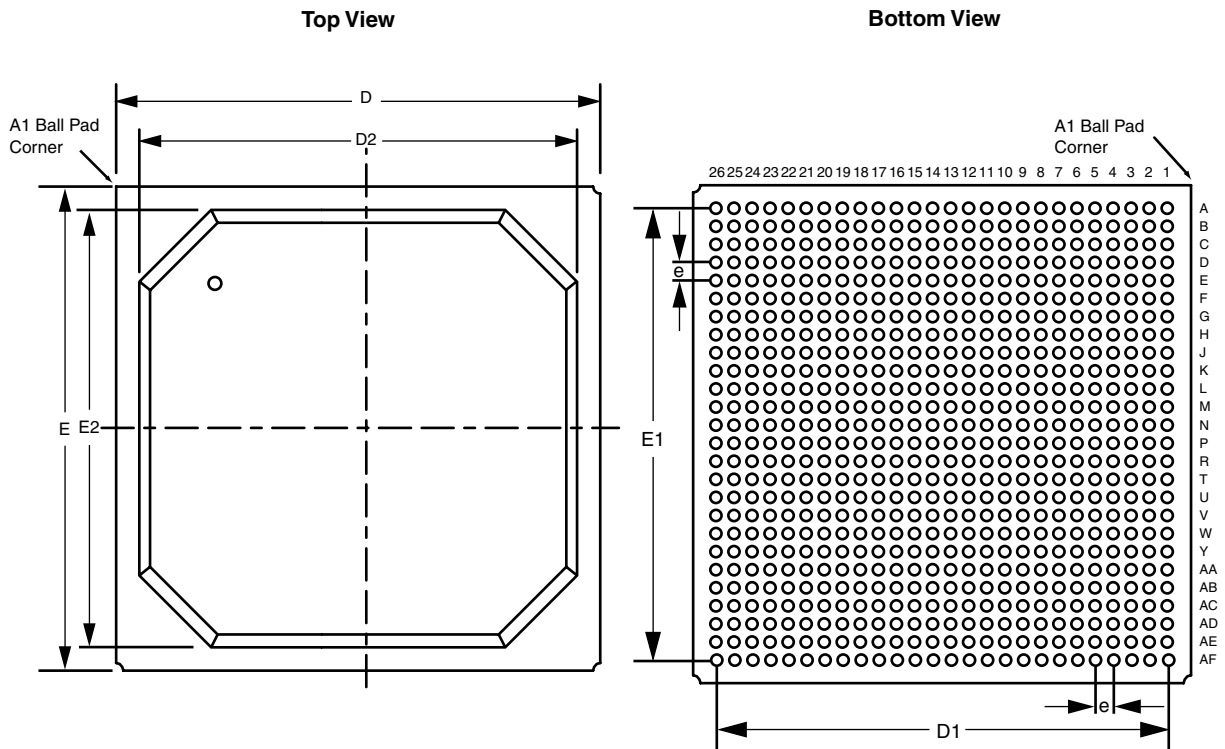
Fine Pitch Plastic Ball Grid Array (continued)

484-pin FG – Fully Populated

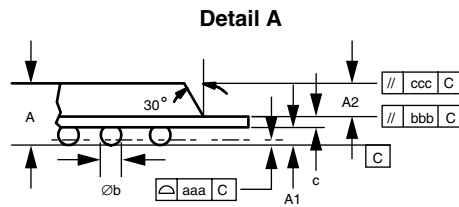
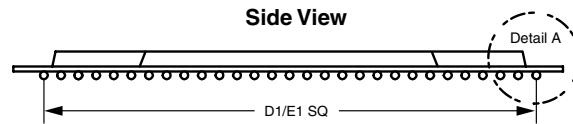
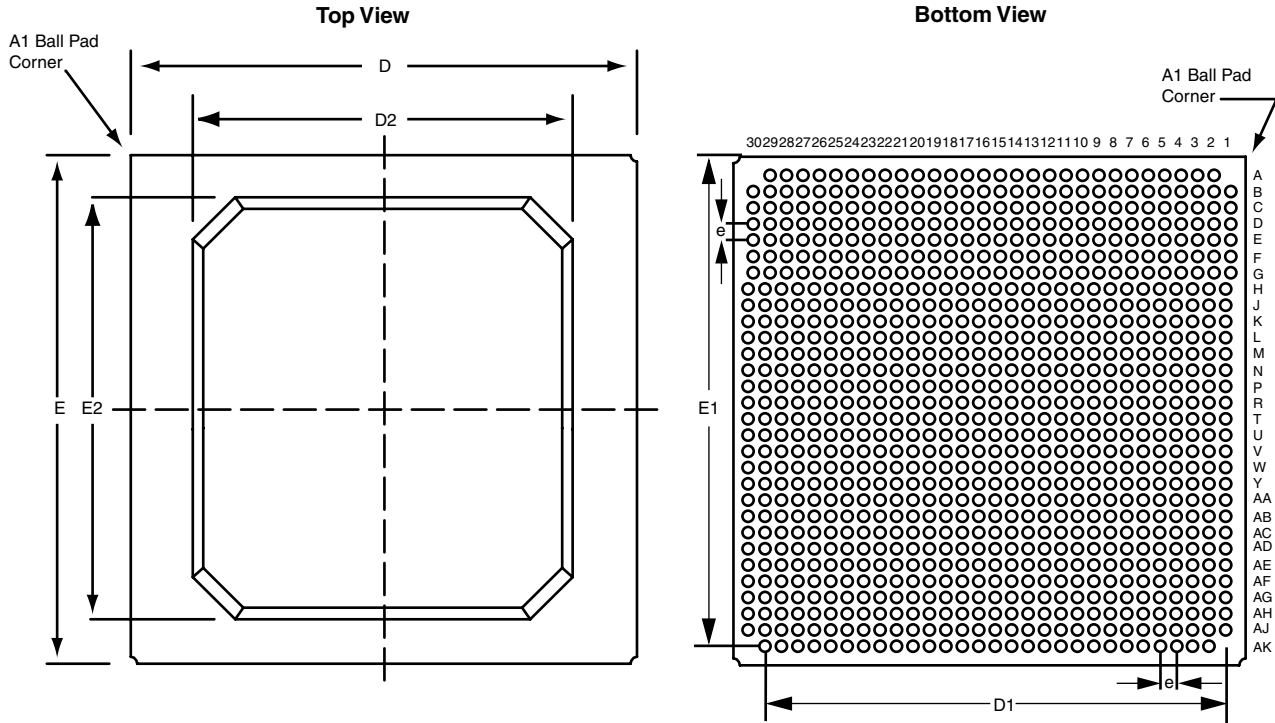


Note: Dimensions are in millimeters. Please see the "Fine Pitch Ball Grid Array (FBGA)" table on page 40 for the dimensions.

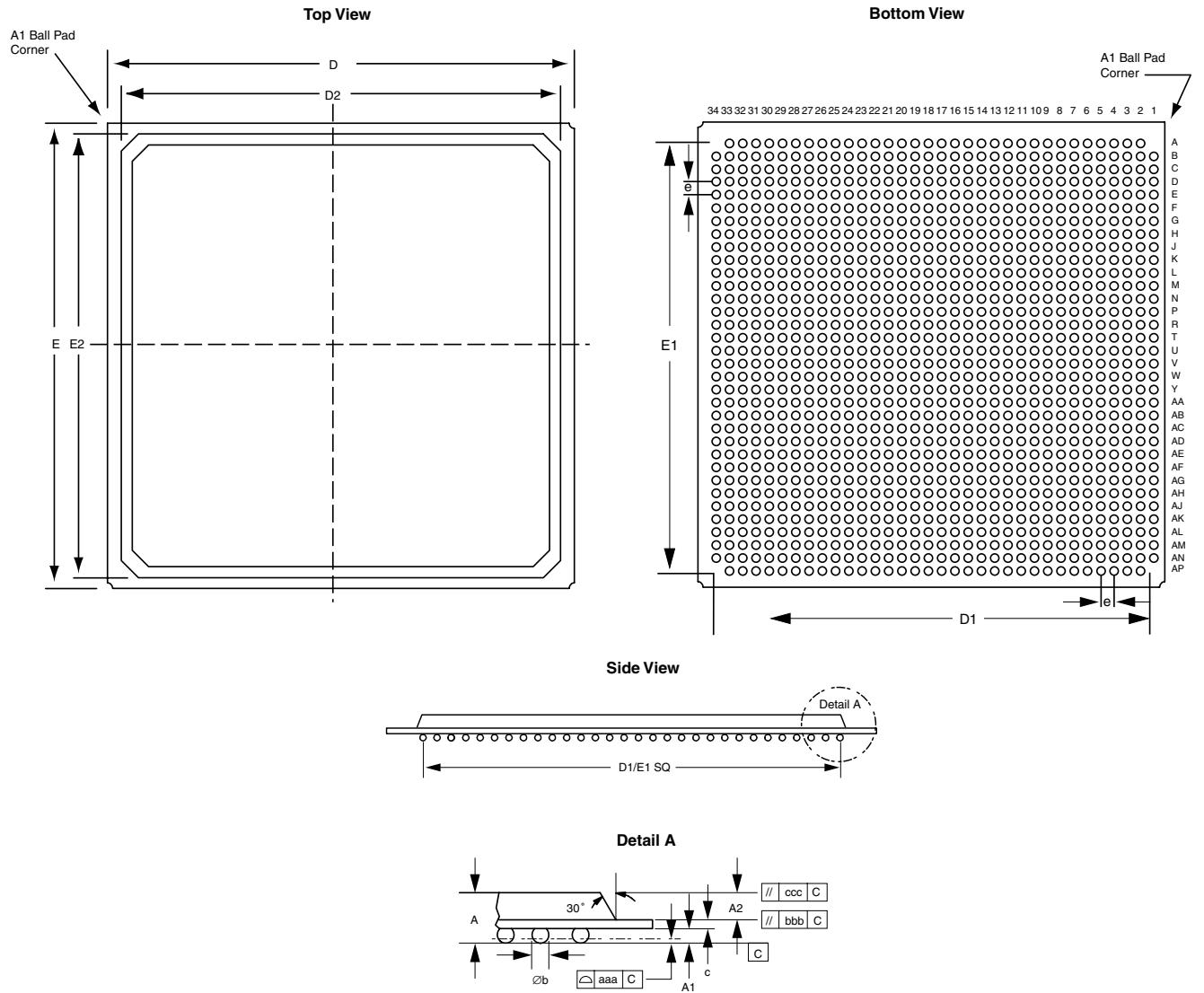
Fine Pitch Plastic Ball Grid Array (continued)
676-pin FG



Fine Pitch Plastic Ball Grid Array (continued)
896-pin FG



Fine Pitch Plastic Ball Grid Array (continued)
1152-pin FG



Fine Pitch Ball Grid Array (FBGA)

Dimension	FBGA 144 MS-034 VAR AAP-1			FBGA 256 (page 33) MS-034 VAR AAF-1			FBGA 256 (page 34) MS-034 VAR AAF-1			FBGA 484 (page 35) MS-034 VAR AAL-1		
	Min.	Nom.	Max.	Min.	Nom.	Max.	Min.	Nom.	Max.	Min.	Nom.	Max.
A	1.35	1.45	1.55	1.38	1.53	1.68	1.55	1.76	1.97	2.02	2.23	2.44
A1	0.35	0.40	0.45	0.33	0.38	0.43	0.30	0.40	0.50	0.40	0.50	0.60
A2	0.65	0.70	0.75	0.65	0.70	0.75	0.75	0.80	0.85	1.12	1.17	1.22
aaa	0.20			0.20			0.20			0.20		
b	0.45	0.50	0.55	0.50	0.55	0.60	0.40	0.50	0.60	0.50	0.63	0.70
bbb	0.25			0.25			0.25			0.25		
c		0.35		0.40	0.45	0.50	0.50	0.56	0.62	0.50	0.56	0.62
ccc	0.35			0.35			0.35			0.35		
D	12.80	13.00	13.20	16.80	17.00	17.20	16.80	17.00	17.20	26.80	27.00	27.20
D1	11.00 BSC			15.00 BSC			15.00 BSC			21.00 BSC		
D2	12.80	13.00	13.20	16.80	17.00	17.20		15.00	15.70	19.45	19.50	20.20
E	12.80	13.00	13.20	16.80	17.00	17.20	16.80	17.00	17.20	26.80	27.00	27.20
E1	11.00 BSC			15.00 BSC			15.00 BSC			21.00 BSC		
E2	12.80	13.00	13.20	16.80	17.00	17.20		15.00	15.70	19.45	19.50	20.20
e	1.00 typ.			1.00 typ.			1.00 typ.			1.00 typ.		

Notes:

1. All dimensions are in millimeters.
2. BSC—Basic Spacing between Centers.

Fine Pitch Ball Grid Array (FBGA)

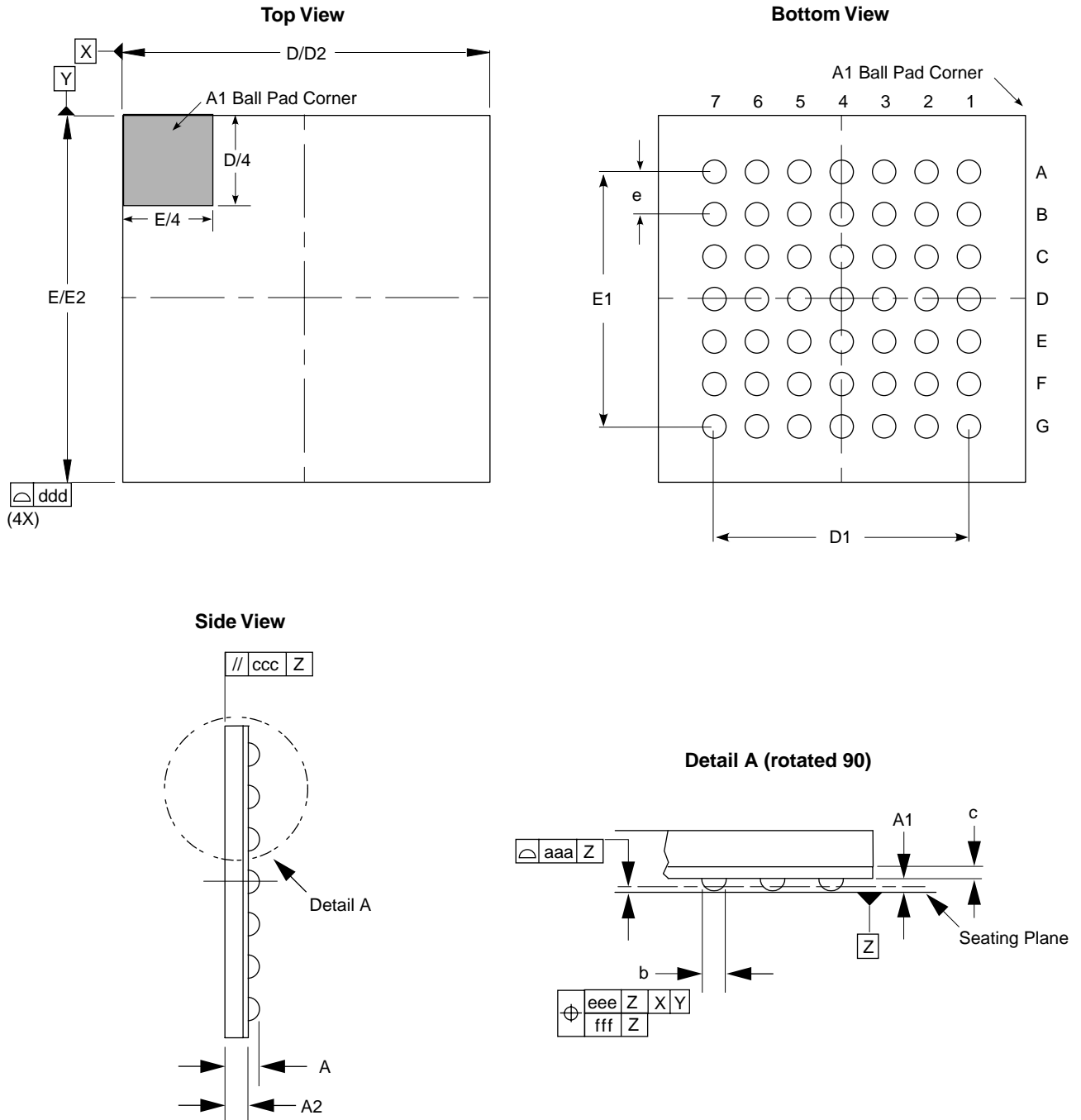
Dimension	FBGA 484 (page 36) (23x23 Fully Populated) MS-034 VAR AAJ-1			FBGA 676 MS-034 VAR AAL-1			FBGA 896 MS-034 VAR AAN-1			FBGA 1152 MS-034 VAR AAR-1		
	Min.	Nom.	Max.	Min.	Nom.	Max.	Min.	Nom.	Max.	Min.	Nom.	Max.
A	2.02	2.23	2.44	2.02	2.23	2.44	2.02	2.23	2.44	2.02	2.23	2.44
A1	0.40	0.50	0.60	0.40	0.50	0.60	0.40	0.50	0.60	0.40	0.50	0.60
A2	1.12	1.17	1.22	1.12	1.17	1.22	1.12	1.17	1.22	1.12	1.17	1.22
aaa	0.20			0.20			0.20			0.20		
b	0.50	0.63	0.70	0.50	0.63	0.70	0.50	0.63	0.70	0.50	0.63	0.70
bbb	0.25			0.25			0.25			0.25		
c	0.50	0.56	0.62	0.50	0.56	0.62	0.50	0.56	0.62	0.50	0.56	0.62
ccc	0.35			0.35			0.35			0.35		
D	22.95	23.00	23.05	26.80	27.00	27.20	30.80	31.00	31.20	34.80	35.00	35.20
D1	21.00 BSC			25.00 BSC			29.00 BSC			33.00 BSC		
D2	19.45	19.50	20.20	23.05	24.00	24.70	25.95	26.00	26.70	33.65	33.70	34.20
E	22.95	23.00	23.05	26.80	27.00	27.20	30.80	31.00	31.20	34.80	35.00	35.20
E1	21.00 BSC			25.00 BSC			29.00 BSC			33.00 BSC		
E2	19.45	19.50	20.20	23.05	24.00	24.07	25.95	26.00	26.70	33.65	33.70	34.20
e	1.00 typ.			1.00 typ.			1.00 typ.			1.00 typ.		

Notes:

1. All dimensions are in millimeters.
2. BSC—Basic Spacing between Centers.

Chip Scale Package

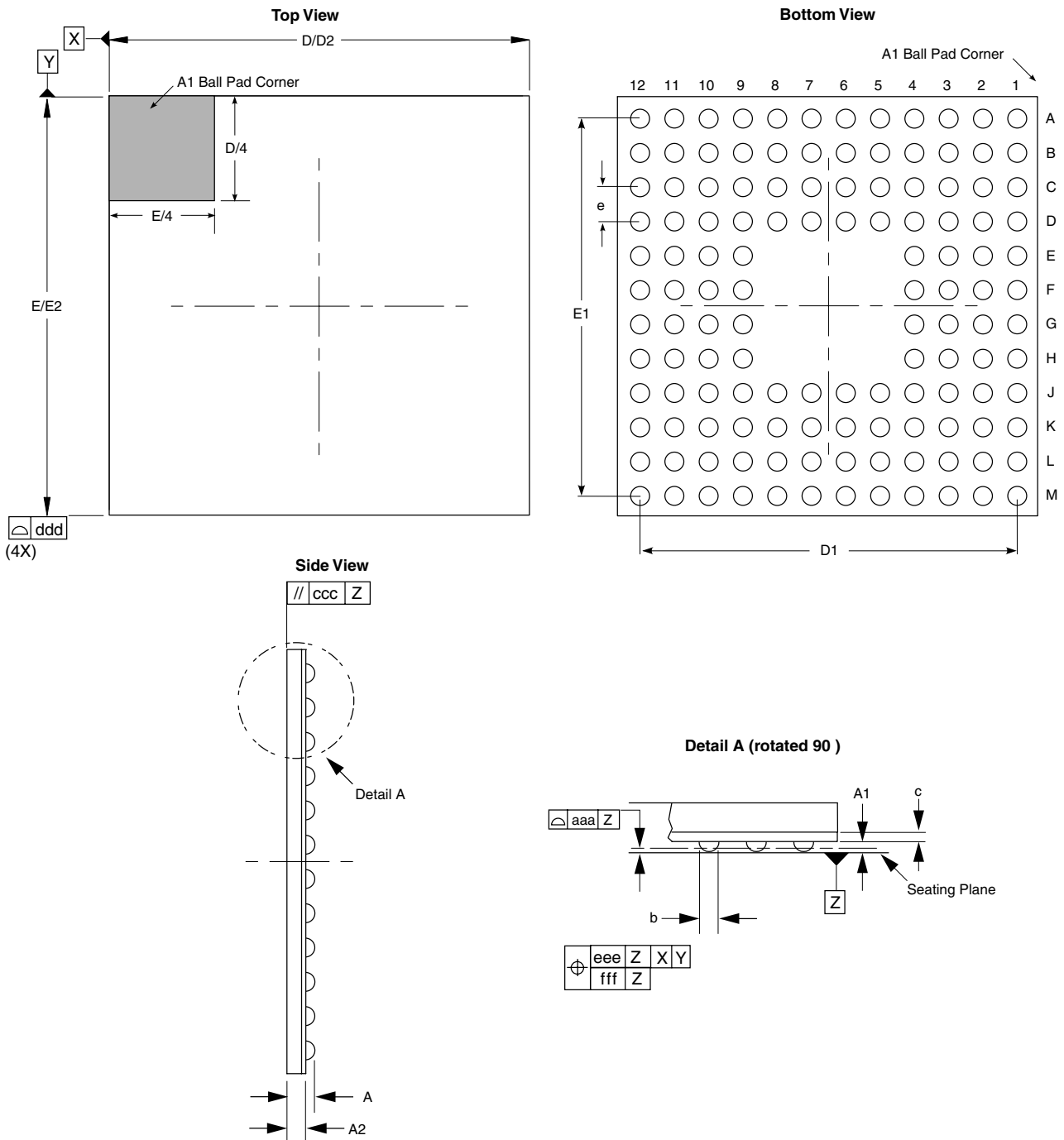
49-pin CSP



Note: Dimensions are in millimeters. Please see the "Chip Scale Package (CSP)" table on page 44 for the dimensions.

Chip Scale Package (continued)

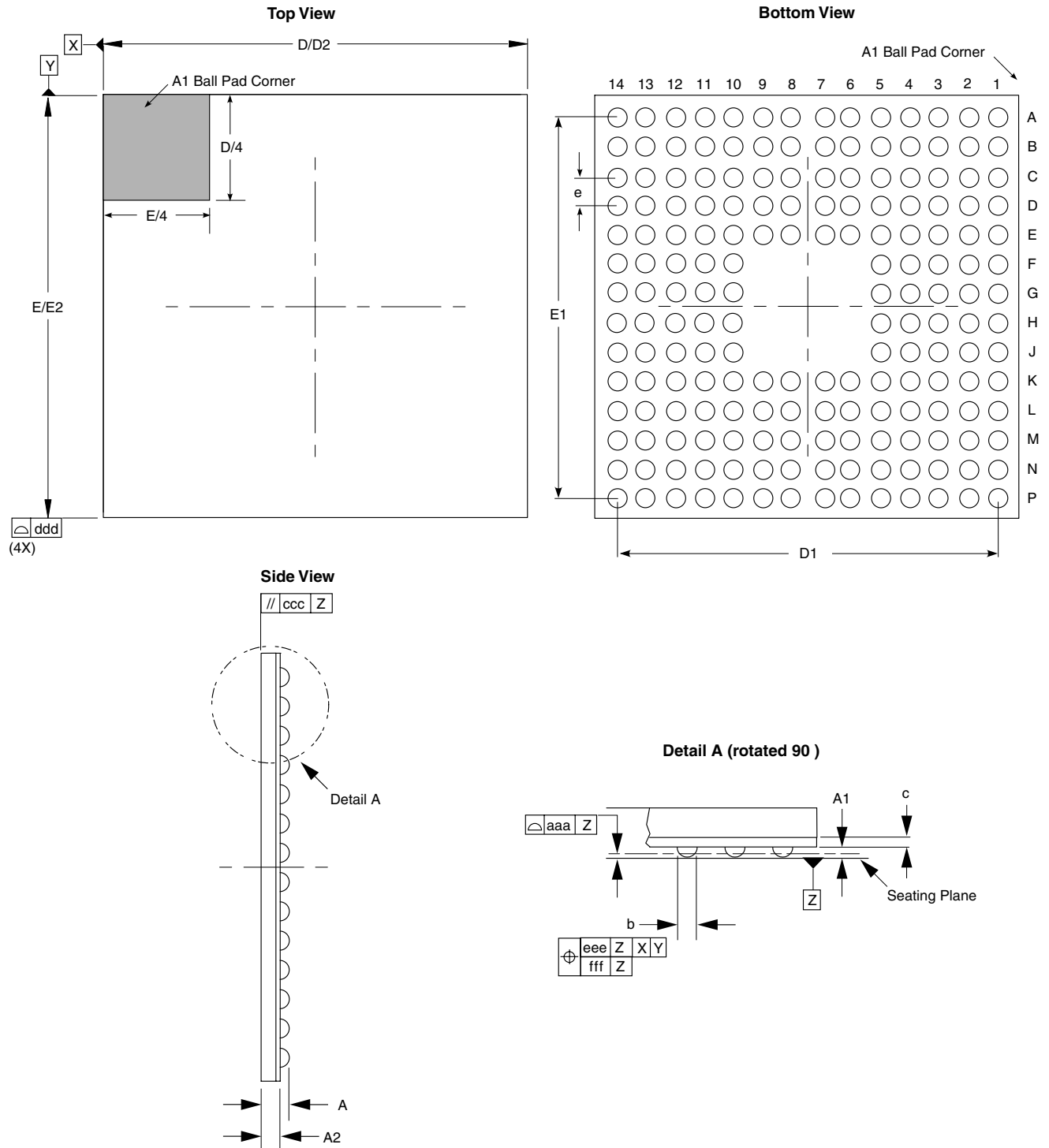
128-pin CSP



Note: Dimensions are in millimeters. Please see the "Chip Scale Package (CSP)" table on page 44 for the dimensions.

Chip Scale Package (continued)

180-pin CSP



Note: Dimensions are in millimeters. Please see the "Chip Scale Package (CSP)" table on page 44 for these dimensions.

Chip Scale Package (CSP)

JEDEC Equivalent	CS49 MO-205			CS128 MO-205, Variation BD			CS180 MO-205, Variation BF		
	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max
A			1.50			1.50			1.50
A1	0.25			0.25			0.25		
A2	0.85			0.85			0.85		
aaa	0.12			0.12			0.12		
b	0.45	0.50	0.55	0.45	0.50	0.55	0.45	0.50	0.55
c		0.36			0.36			0.36	
ccc	0.10			0.10			0.10		
ddd	0.10			0.10			0.10		
D/E		7.00			11.00			13.00	
D1/E1		4.80			8.80			10.40	
e	0.8 typ.			0.8 typ.			0.8 typ.		
eee	0.15			0.15			0.15		
fff	0.08			0.08			0.08		

Note:

1. All dimensions are in millimeters.

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