Package Mechanical Drawings

Naming Conventions

This document lists all package types used for Microsemi FPGAs and provides detailed drawings and dimensions. Table 1 lists the package types, their acronyms, and the naming convention used when referring to a package of that type with a particular pin count.

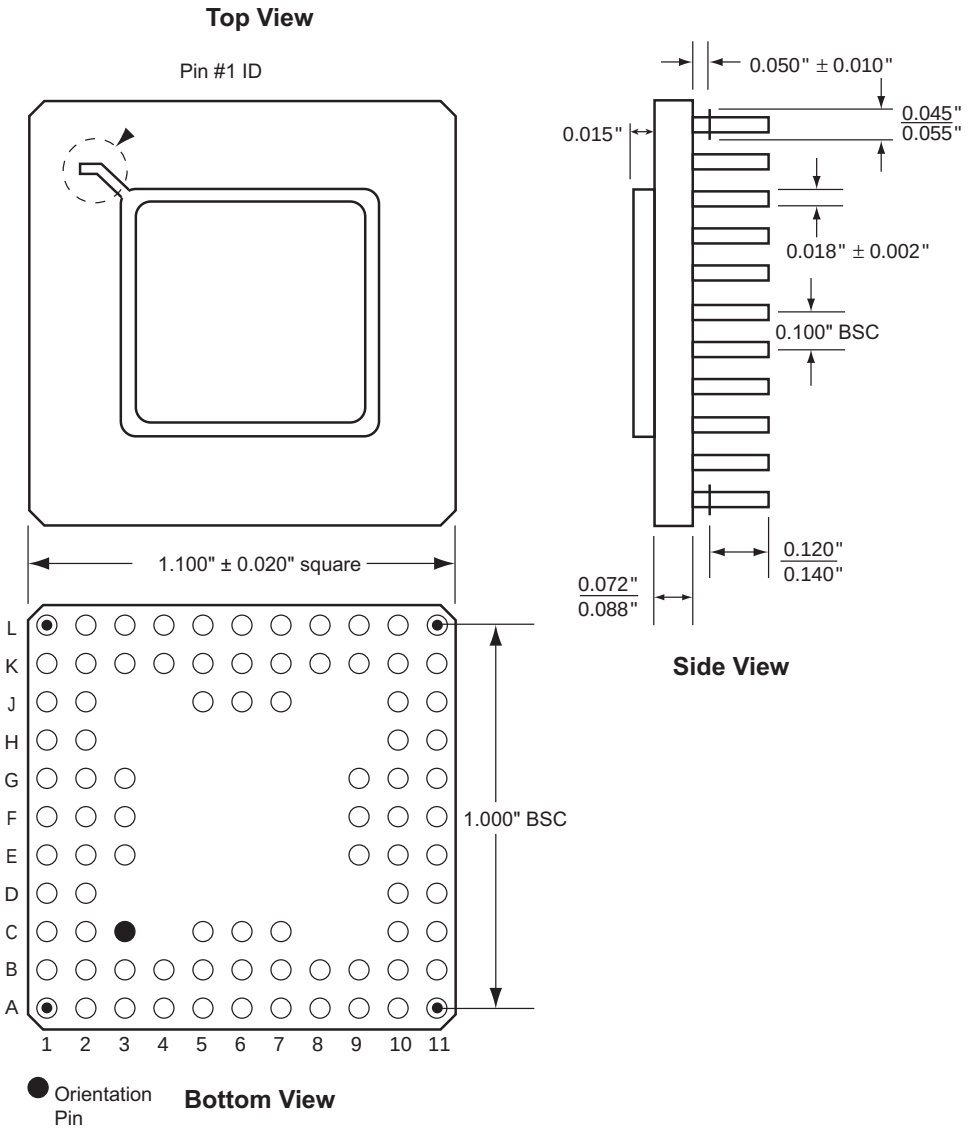
Table 1 • Package Naming Conventions

Package Type	Package Name	Acronym	Package/Pin Naming Convention (example)
Ceramic Packages	Ceramic Pin Grid Array	CPGA	PG84
	Ceramic Quad Flat Pack	CQFP	CQ208
	Ceramic Chip Carrier Land Grid Substrate	CCLG	CC256
	Ceramic Column Grid Array	CCGA	CG484
	Ceramic Land Grid Array	CLGA	LG484
Plastic Packages (leadframe-based, peripheral leads)	Quad Flat No Lead	QFN	QN48
	Plastic Quad Flat Pack	PQFP	PQ208
	Thin Quad Flat Pack	TQFP	TQ144
	Very Thin Quad Flat Pack	VQFP	VQ176
	Plastic Quad Flat Pack (exposed heatsink)	RQFP	RQ208
	Plastic Leaded Chip Carrier	PLCC	PL44
Plastic Packages (substrate-based, area array pins)	Plastic Ball Grid Array (1.27 mm pitch)	PBGA	BG272
	Fine Pitch Plastic Ball Grid Array (1.00 mm pitch)	FBGA	FG144
	Chip Scale Package (0.50 mm pitch)	CSP	CS81
	Chip Scale Package (0.80 mm pitch)*	CSP	CS49
	Micro Chip Scale Package	UCS	UC36
	Very Fine Ball Pitch Grid Array	VFPBA	VF400

*Note: *Currently the CS49, CS128, CS180, and CS289 packages are 0.80 mm pitch rather than 0.50 mm pitch.*

Ceramic Pin Grid Array (CPGA)

PG84



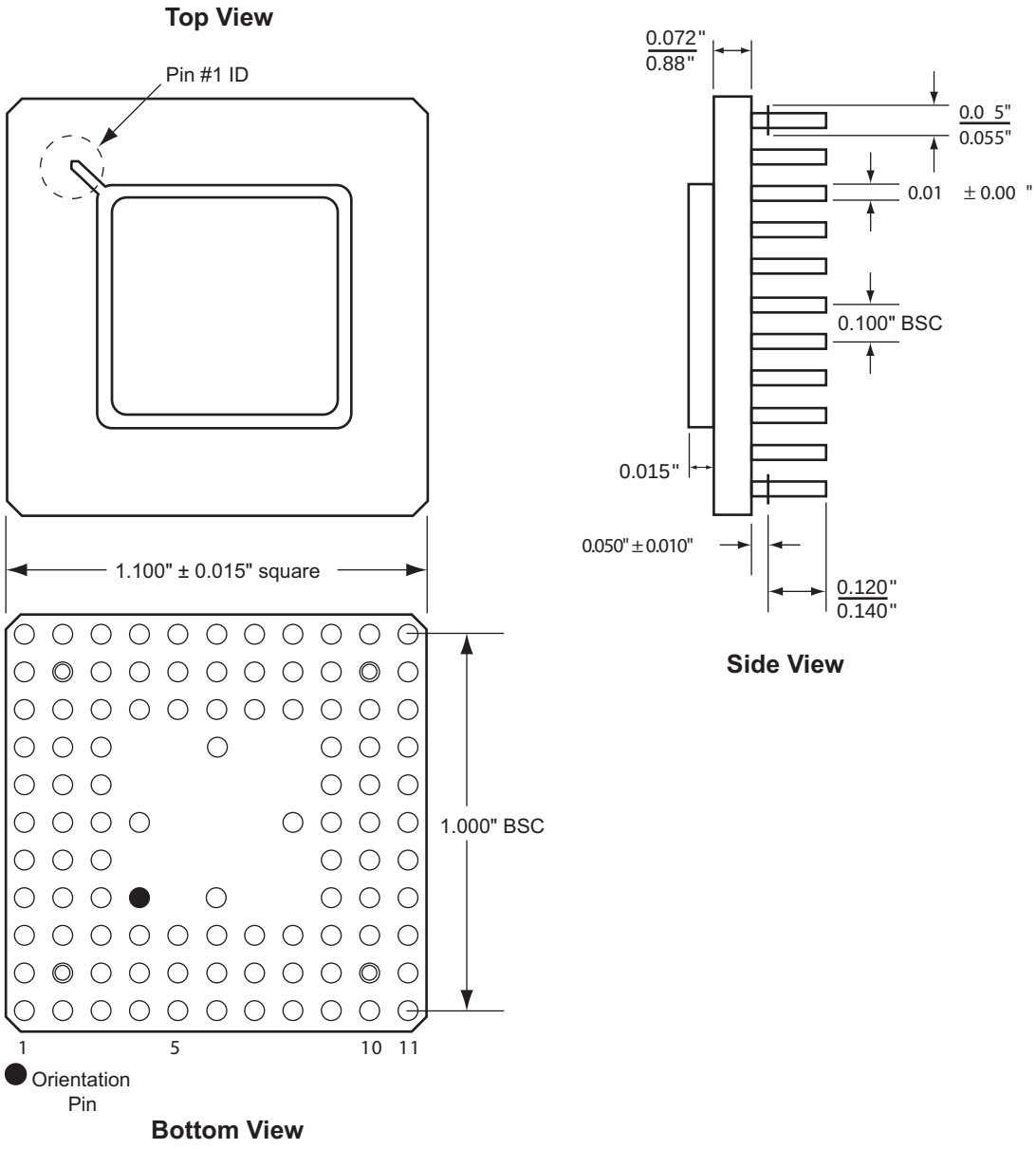
Notes:

1. *All dimensions are in inches unless otherwise stated.*
2. *BSC = Basic spacing between centers.*

Supported Devices	
A1010B	A1020B

Ceramic Pin Grid Array

PG100



Notes:

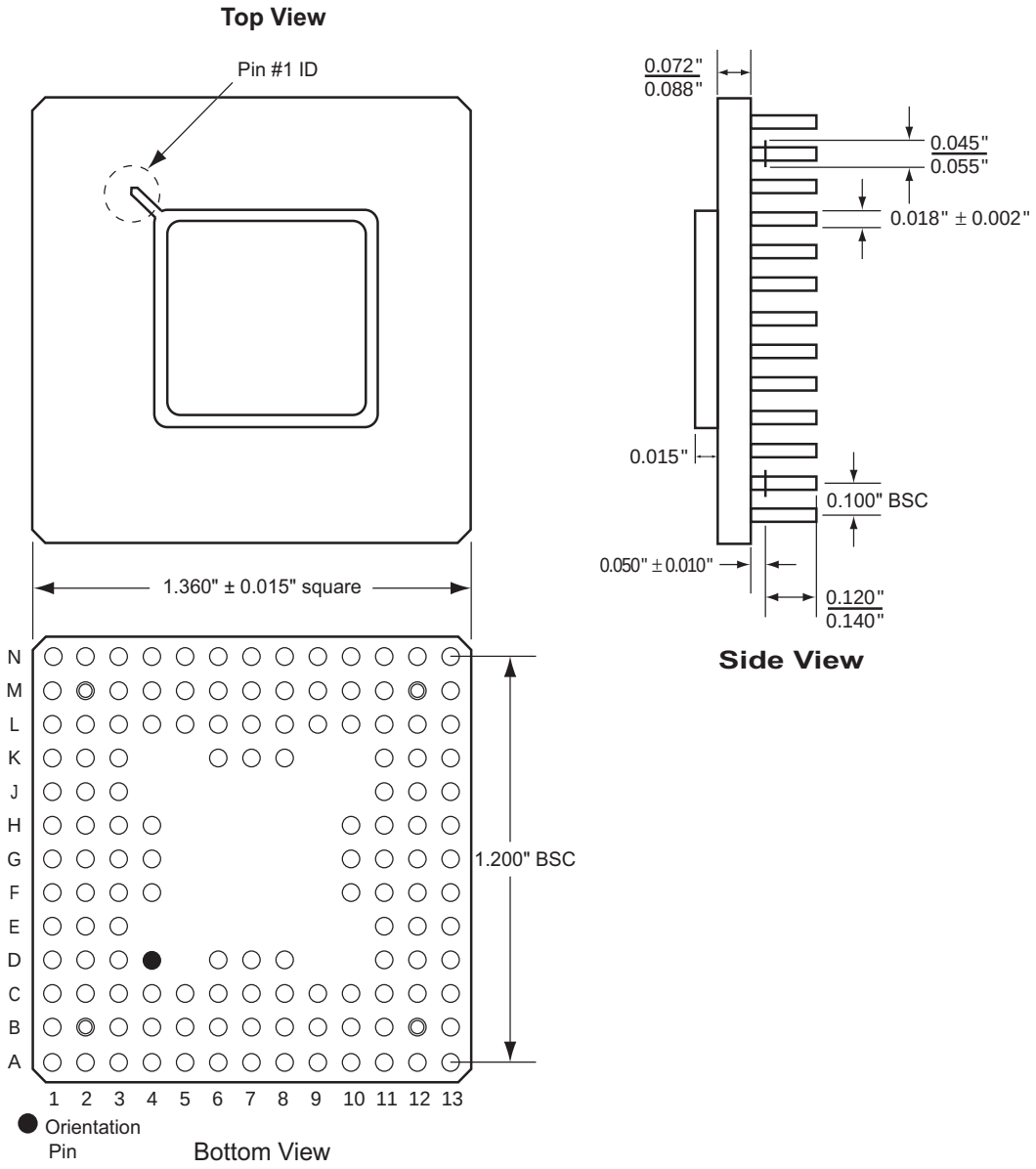
1. *All dimensions are in inches unless otherwise stated.*
2. *BSC = Basic spacing between centers.*

Supported Devices	
A1225XL*	A1415A*

*Note: *This product is obsolete.*

Ceramic Pin Grid Array

PG132



Notes:

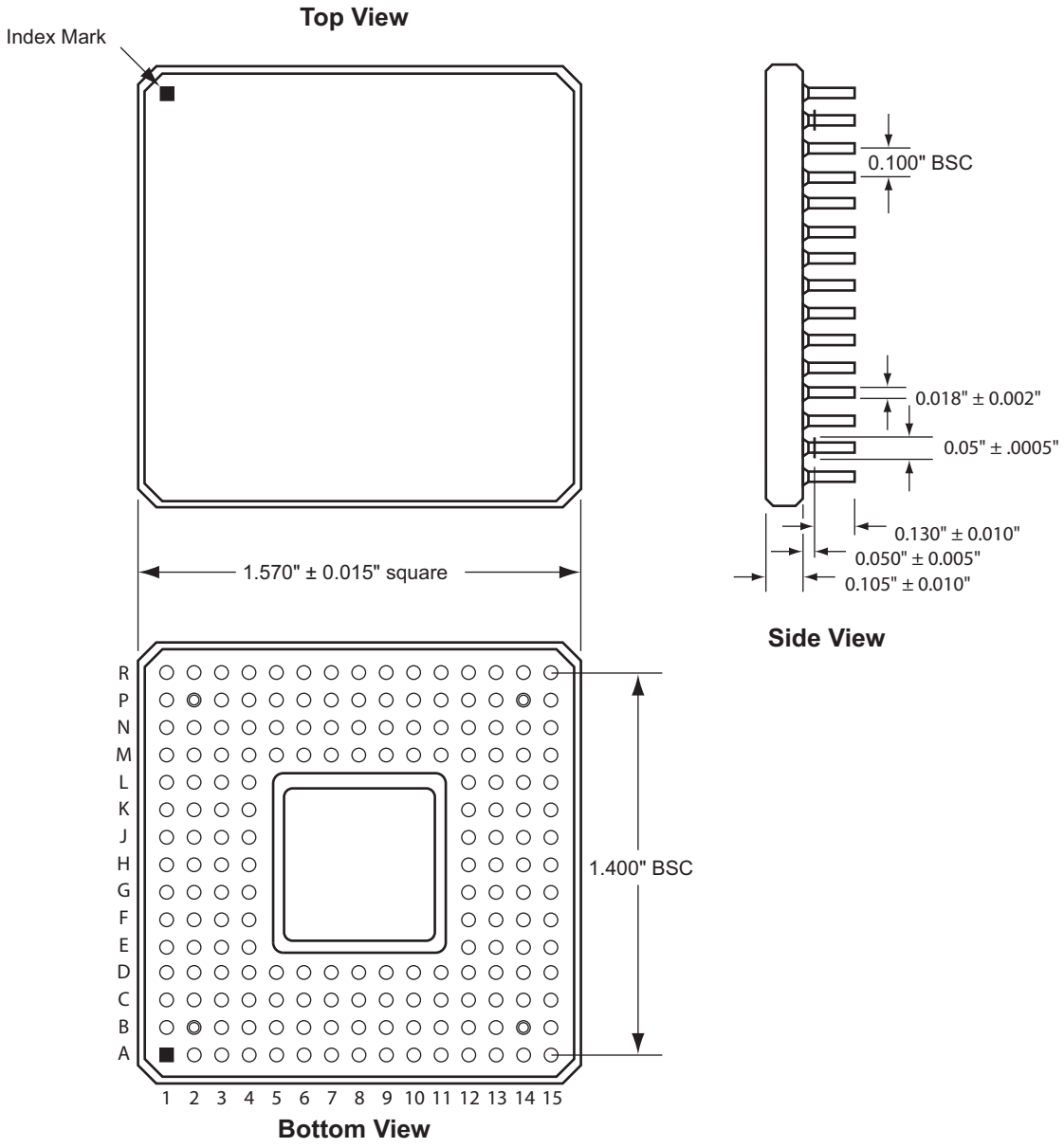
1. *All dimensions are in inches unless otherwise stated.*
2. *BSC = Basic spacing between centers.*

Supported Devices	
A1240A	A1240XL*

*Note: *This product is obsolete.*

Ceramic Pin Grid Array

PG175



Notes:

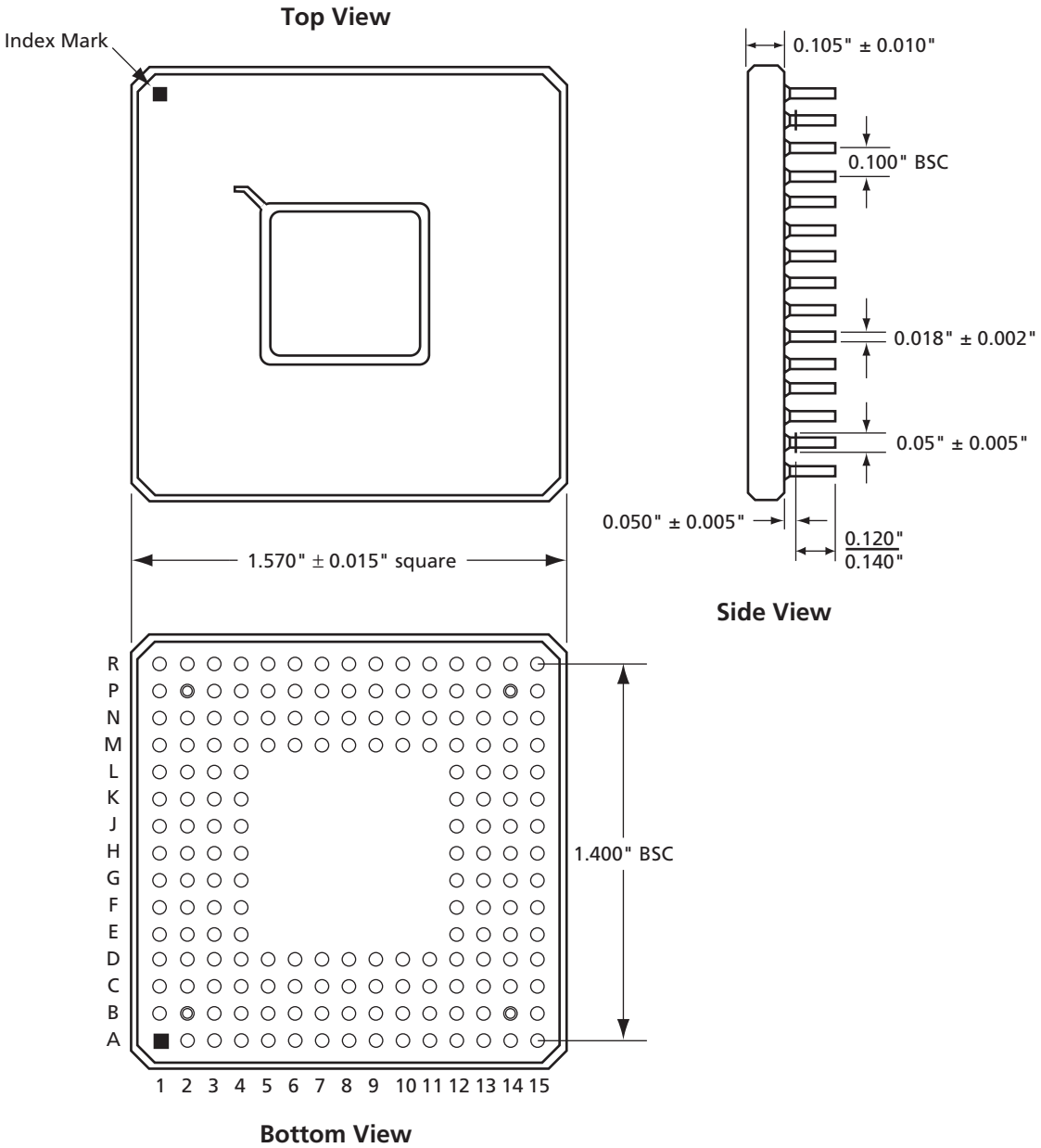
1. *All dimensions are in inches unless otherwise stated.*
2. *BSC = Basic spacing between centers.*

Supported Devices
A1440A*

*Note: *This product is obsolete.*

Ceramic Pin Grid Array

PG176



Notes:

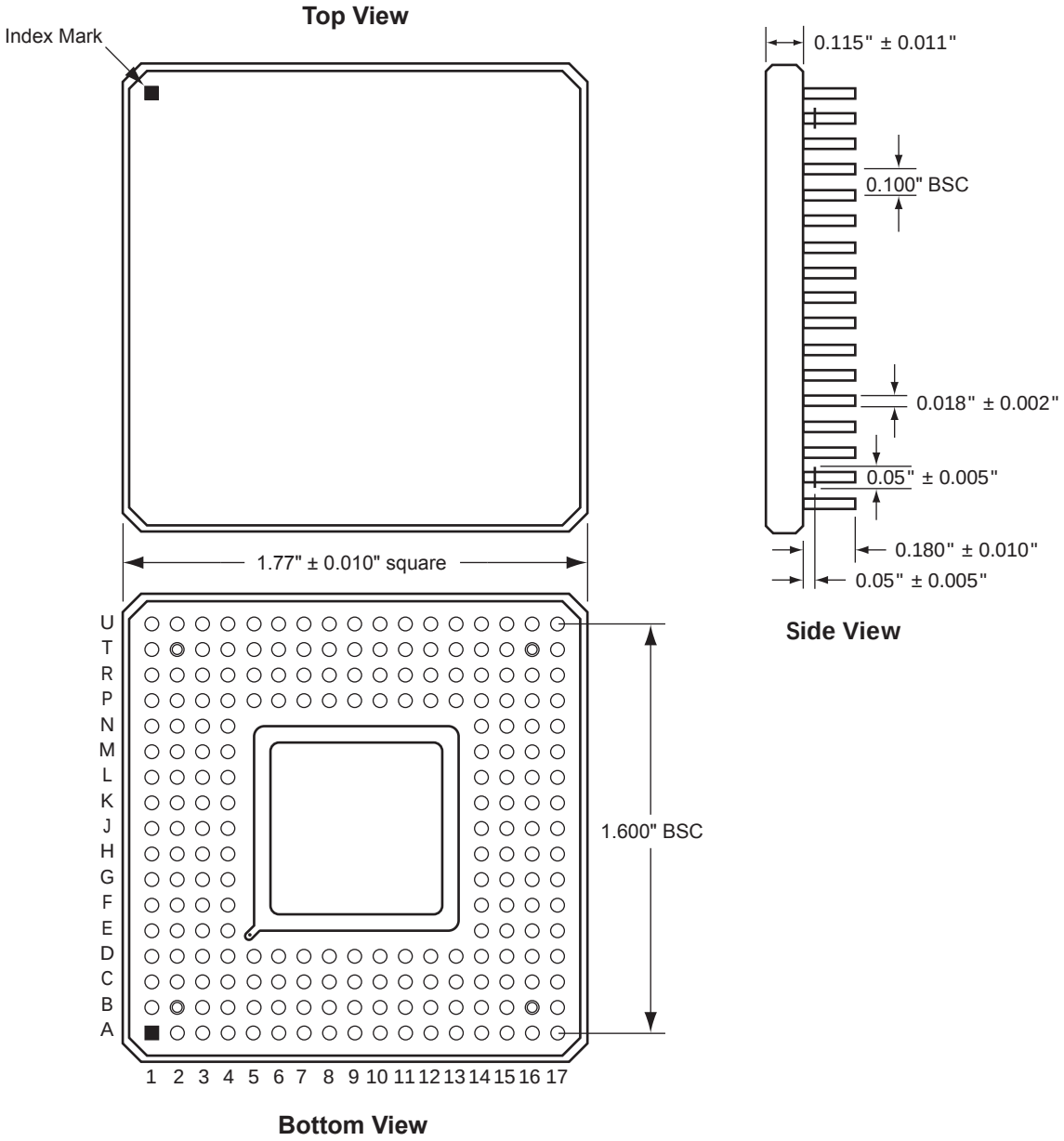
1. *All dimensions are in inches unless otherwise stated.*
2. *BSC = Basic spacing between centers.*

Supported Devices	
A1280A	A1280XL*

*Note: *This product is obsolete.*

Ceramic Pin Grid Array

PG207



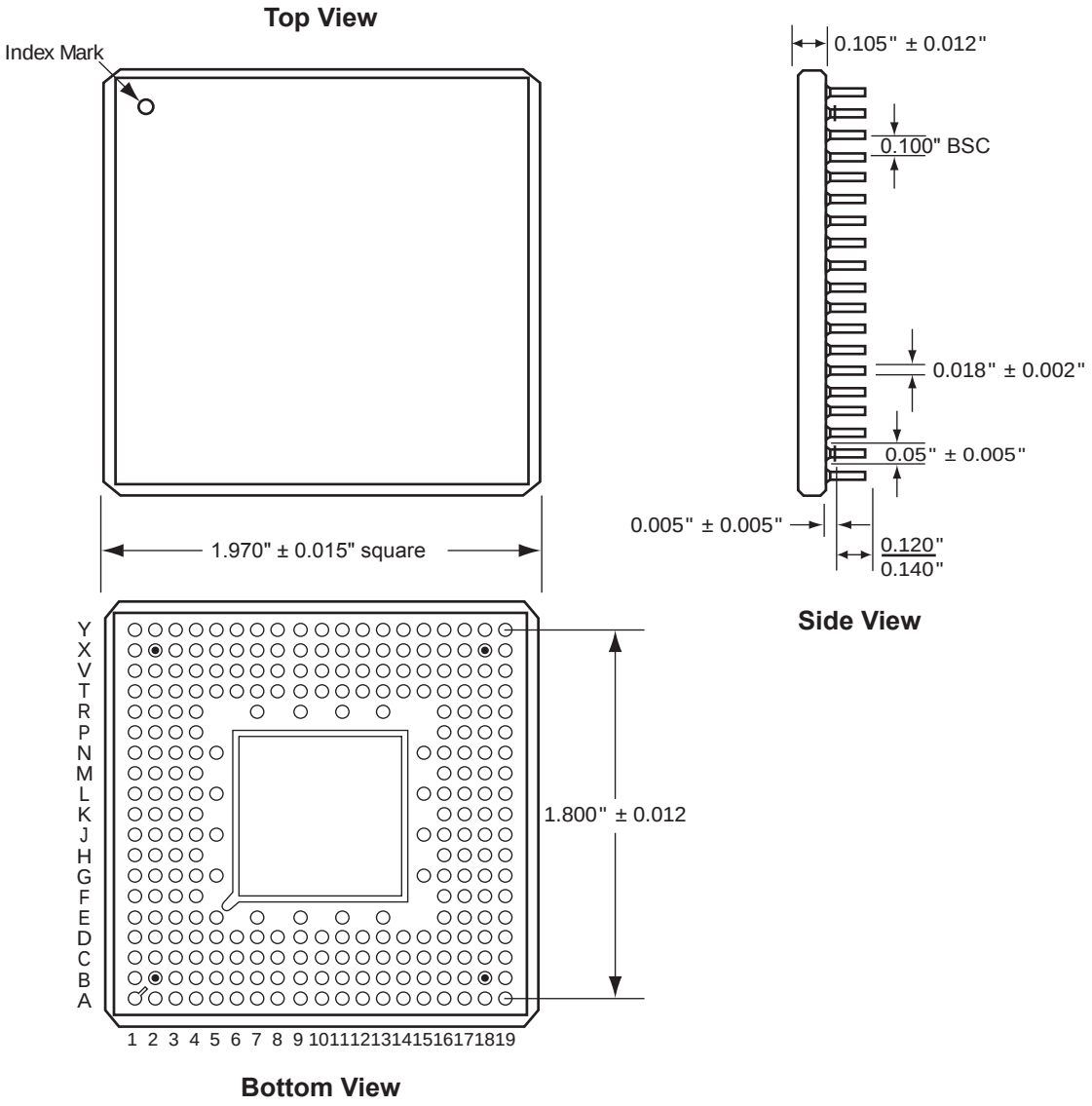
Notes:

1. *All dimensions are in inches unless otherwise stated.*
2. *BSC = Basic Spacing between Center.*

Supported Devices
A1460A

Ceramic Pin Grid Array

PG257



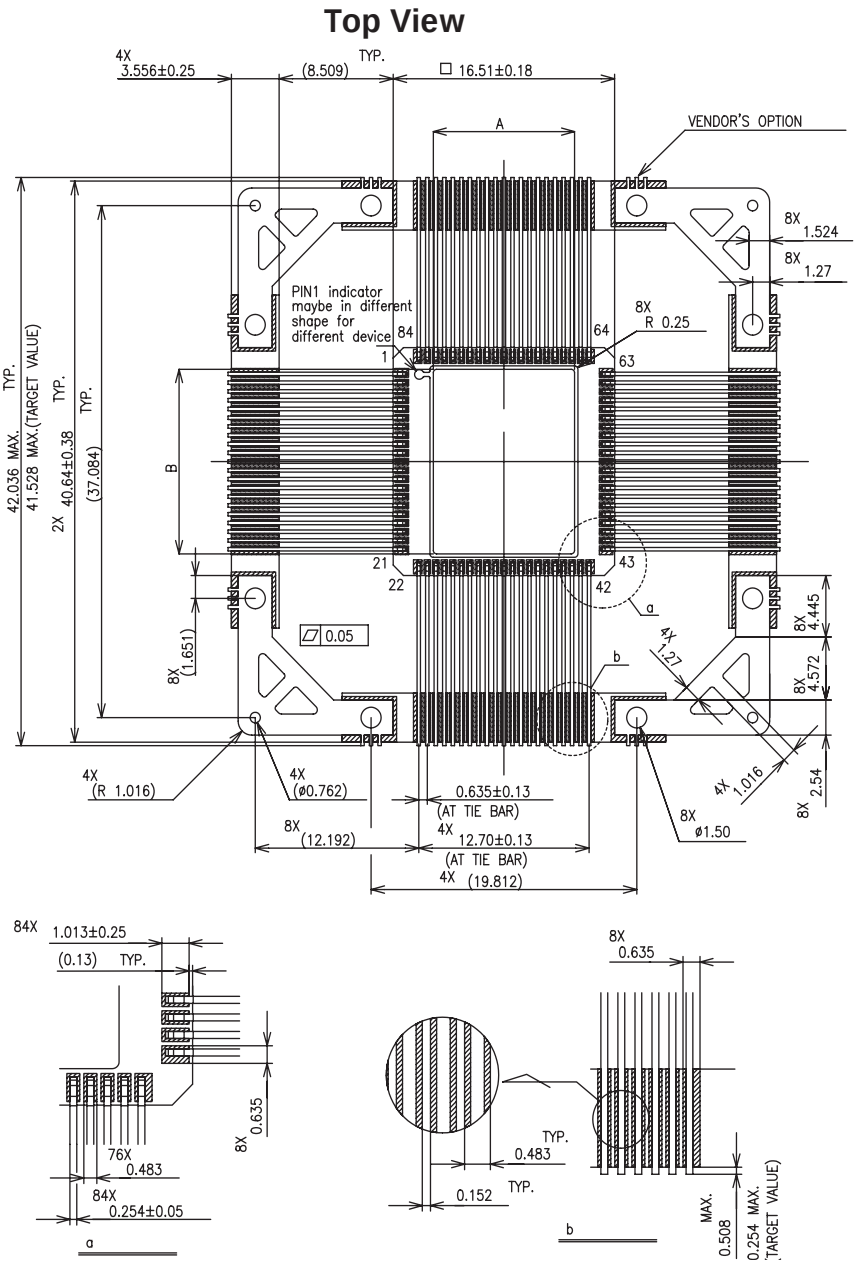
Notes:

1. *All dimensions are in inches unless otherwise stated.*
2. *BSC = Basic spacing between centers.*

Supported Devices
A14100A

Ceramic Quad Flat Pack (CQFP)

CQ84

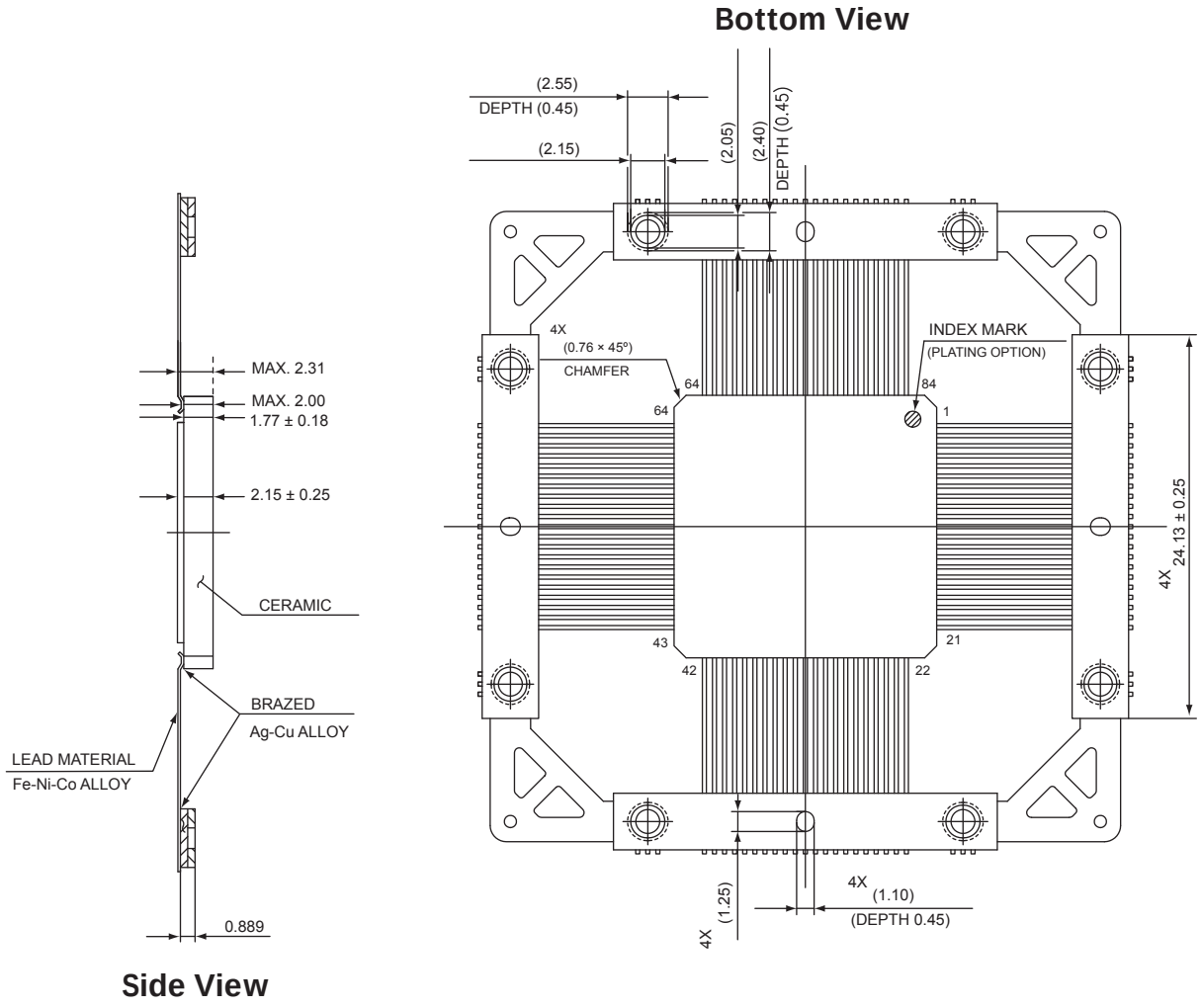


Notes:

1. *Units are mm.*
2. *LID should be connected to GND.*
3. *Die attach area should be connected to GND.*

Ceramic Quad Flat Pack

CQ84 Side View and Bottom View



Notes:

1. *Units are mm.*
2. *LID should be connected to GND.*
3. *Die attach area should be connected to GND.*

Supported Devices	
A1020B	RT1020*
A32100DX*	RH1020*
A54SX32A	RT54SX32S*, RTSX32SU

*Note: *This product is obsolete.*

Plate Thickness	
Ni Plating	2.03~8.89 micron
Au Plating	2.54 micron min.

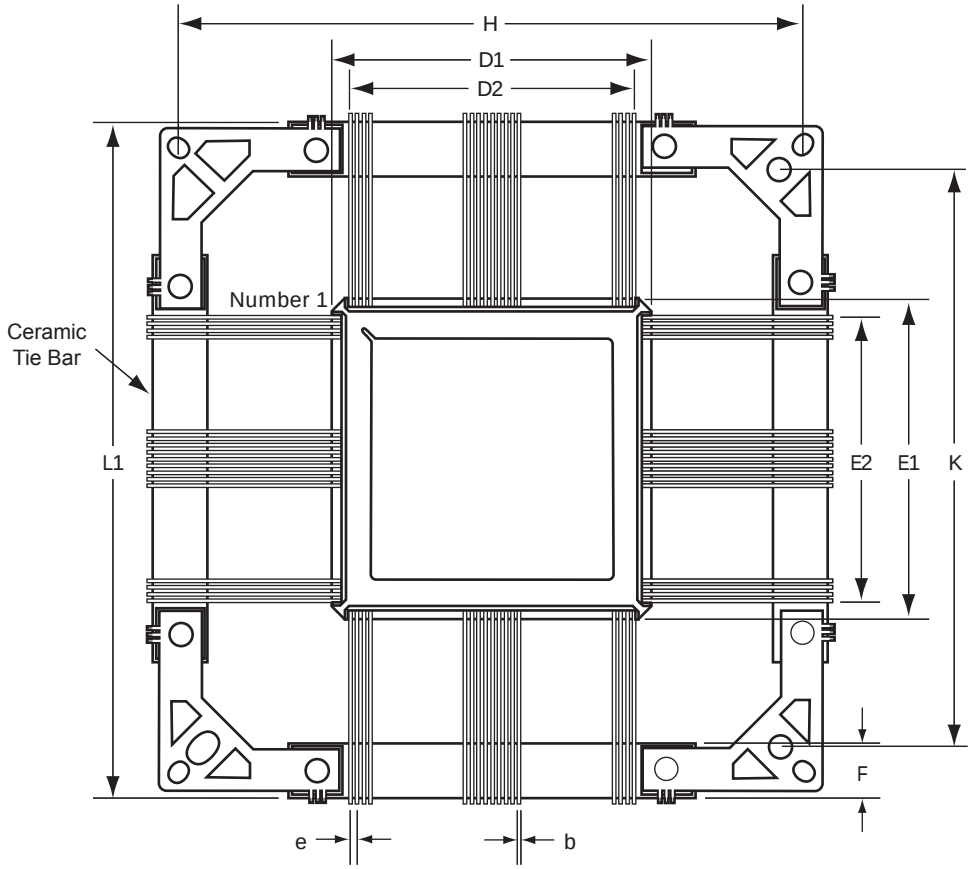
Lid Size	A	B
A1020B	13.21	13.21
A32100DX*	13.97	13.97
A54SX32A	13.21	13.21
RH1020*	13.21	13.21
RT1020*	13.21	13.21
RT54SX32S*, RTSX32SU	10.54	13.61

*Note: *This product is obsolete.*

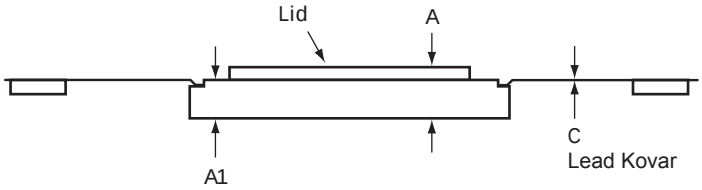
Ceramic Quad Flat Pack

CQ132, CQ172, CQ196, CQ208, CQ256 and CQ352—Cavity Up without Heat Sink

Top View



Side View



Notes:

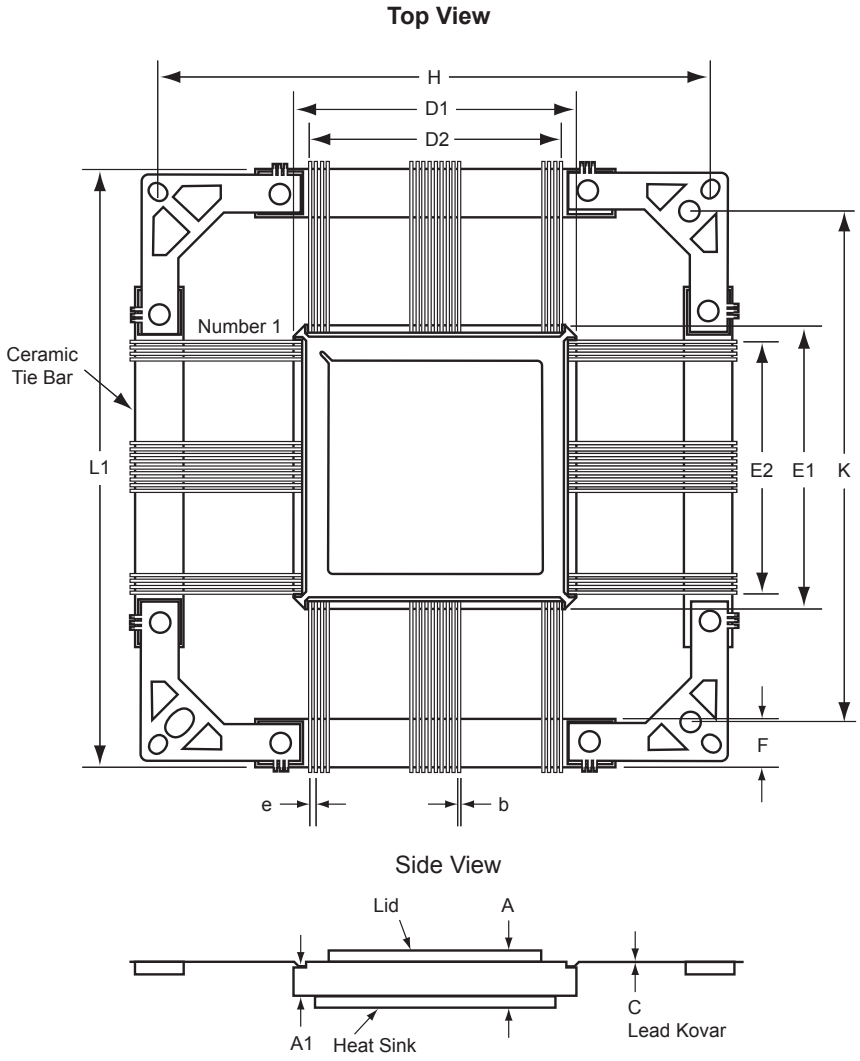
1. *All dimensions are in inches except CQ208, CQ256, and CQ352, which are in millimeters. Refer to the "CQFP without Heat Sink Dimensions" section on page 18 for the dimensions.*
2. *Outside lead frame holes (from dimension H) are circular for the CQ208, CQ256, and CQ352.*
3. *Seal ring and lid are connected to Ground.*
4. *Packages are shipped unformed with the ceramic tie bar in a test carrier.*

Supported Devices					
CQ132	**CQ172**	**CQ196**	**CQ208**	**CQ256**	**CQ352**
A1425A RT1425A	A1280A RH1280* RT1280A	A1460A RT1460A	A42MX36 AX250 AX500 A54SX16 A54SX32 A54SX32A A54SX72A APA300 APA600 APA1000 RT54SX32S* RTSX32SU RTAX250S	A14100A AX2000 A54SX32A A54SX72A RT14100A RT54SX32S* RTSX32SU RTAX2000S RT3PE600L RT3PE3000L	AX250 AX500 AX1000 AX2000 APA300 APA600 APA1000 RTAX250S RTAX1000S RTAX2000S RTAX4000S RTAX2000D RTAX4000D

*Note: *This product is obsolete.*

Ceramic Quad Flat Pack

CQ208 and CQ256—Cavity Up with Heat Sink



Notes:

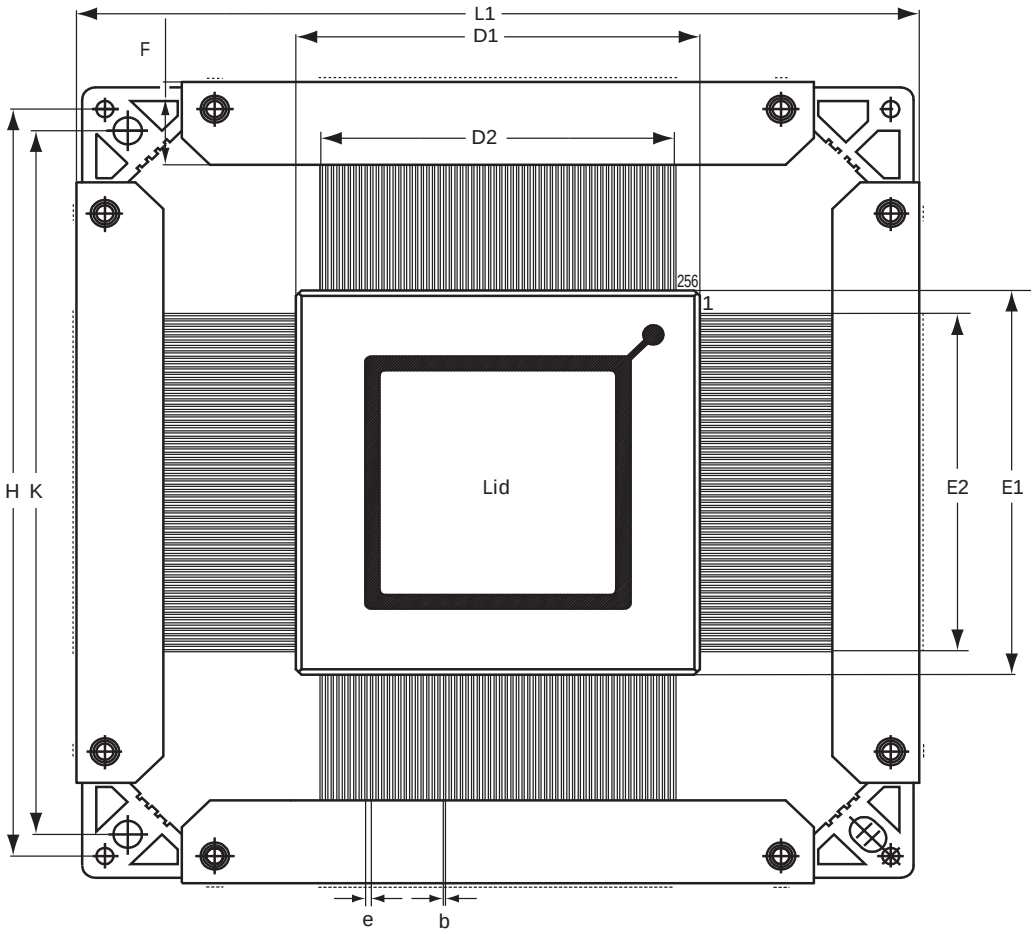
1. *All dimensions are in inches except CQ208, CQ256, and CQ352, which are in millimeters. Refer to the "CQFP with Heat Sink Dimensions" section on page 19 for the dimensions.*
2. *Outside lead frame holes (from dimension H) are circular for the CQ208, CQ256, and CQ352.*
3. *Seal ring and lid are connected to Ground.*
4. *Lead material is Kovar with minimum 60 microinches gold over nickel.*
5. *Packages are shipped unformed with the ceramic tie bar.*

Supported Devices	
CQ208	**CQ256**
A32200DX* RT54SX72S* RTSX72SU	A54SX16 A54SX32 RT54SX72S* RTSX72SU

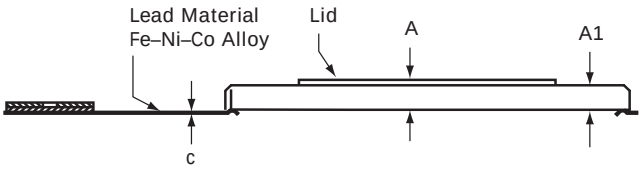
*Note: *This product is obsolete.*

CQ256—Cavity Down without Heat Sink

Top View



Side View



Notes:

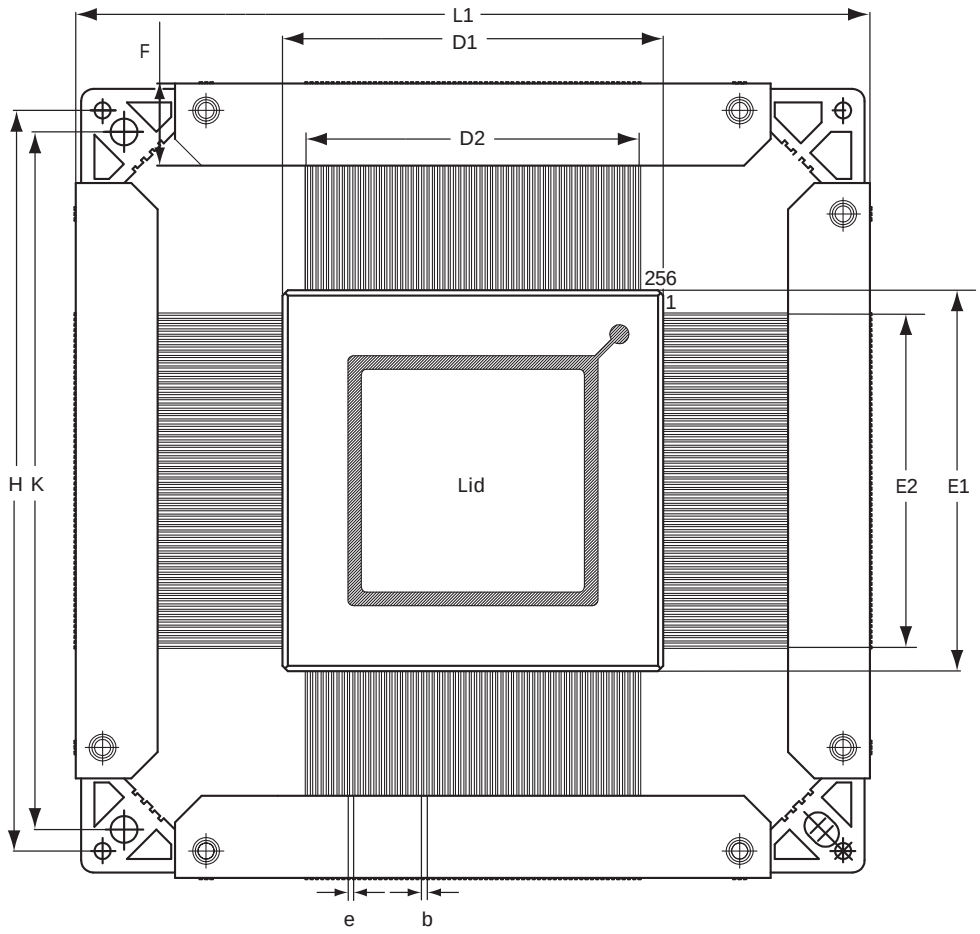
1. *Dimensions are in millimeters. Refer to the "CQFP with Heat Sink Dimensions" section on page 19 for the dimensions.*
2. *Seal ring and lid are connected to Ground.*
3. *Lead material is Kovar with gold plate over nickel.*
4. *Packages are shipped unformed with the ceramic tie bar.*
5. *Package is 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.*

Supported Devices
A42MX36

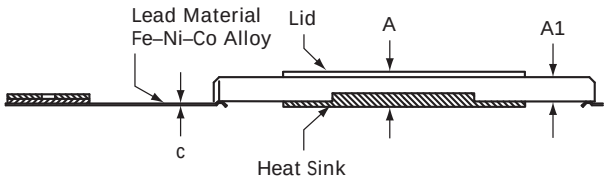
Ceramic Quad Flat Pack

CQ256—Cavity Down with Heat Sink

Top View



Side View



Notes:

1. *Packages are shipped unformed with the ceramic tie bar in a test carrier.*
2. *Dimensions are in millimeters. Refer to the "CQFP with Heat Sink Dimensions" section on page 19 for the dimensions.*

Supported Devices
A32200DX*

*Note: *This product is obsolete.*

CQFP without Heat Sink Dimensions

JEDEC Equivalent	CQ132 MO-113 VAR AC			CQ172 MO-113 VAR AE			CQ196 MO-113 VAR AB			CQ208		
Symbol	**Min.**	**Nom.**	**Max.**	**Min.**	**Nom.**	**Max.**	**Min.**	**Nom.**	**Max.**	**Min.**	**Nom.**	**Max.**
A	0.094	0.105	0.116	0.094	0.105	0.116	0.094	0.105	0.116	2.30	2.80	3.30
A1	0.080	0.090	0.100	0.080	0.090	0.100	0.080	0.090	0.100	2.00	2.30	2.80
b	0.007	0.008	0.010	0.007	0.008	0.010	0.007	0.008	0.010	0.17	0.20	0.22
c	0.004	0.006	0.008	0.004	0.006	0.008	0.004	0.006	0.008	0.11	0.15	0.18
D1/E1	0.940	0.950	0.960	1.168	1.180	1.192	1.336	1.350	1.364	28.96	29.21	29.46
D2/E2	0.800 BSC			1.050 BSC			1.200 BSC			25.5 BSC		
e	0.025 BSC			0.025 BSC			0.025 BSC			0.50 BSC		
F	0.325	0.350	0.375	0.175	0.200	0.225	0.175	0.200	0.225	7.05	7.75	8.45
H	2.320 BSC			2.320 BSC			2.320 BSC			70.00 BSC		
K	2.140 BSC			2.140 BSC			2.140 BSC			65.90 BSC		
L1	2.485	2.500	2.505	2.485	2.495	2.505	2.485	2.495	2.505	74.60	75.00	75.40

JEDEC Equivalent	CQ256 MO-134 VAR AB			CQ352 MO-134 VAR AE		
Symbol	**Min.**	**Nom.**	**Max.**	**Min.**	**Nom.**	**Max.**
A	2.30	2.80	3.30	2.43	2.66	2.89
A1	2.00	2.30	2.80	2.05	2.28	2.51
b	0.18	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	35.64	36.00	36.64	47.75	48.00	48.25
D2/E2	31.5 BSC			43.51 BSC		
e	0.50 BSC			0.50 BSC		
F	7.05	7.75	8.45		5.00	
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, CQ256, and CQ352, which are in millimeters.*
2. *BSC = Basic spacing between centers. This is a theoretical true position dimension and so has no tolerance.*

CQFP with Heat Sink Dimensions

JEDEC Equivalent	CQ208			CQ256 MO-134 VAR AB		
Symbol	**Min.**	**Nom.**	**Max.**	**Min.**	**Nom.**	**Max.**
A	2.79	3.30	3.90	2.79	3.30	3.90
A1	2.00	2.30	2.80	2.00	2.30	2.80
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, CQ256 and CQ352, which is in millimeters.*
2. *BSC = Basic spacing between centers. This is a theoretical true position dimension and so has no tolerance.*

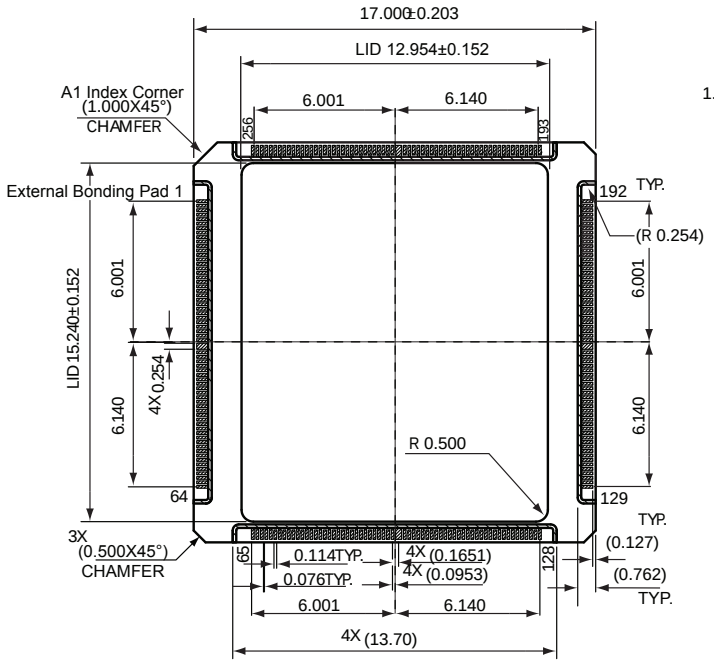
The dimensions above are for reference only. For more accurate dimensions, use the dimensions in the SMD drawings for a specified device.

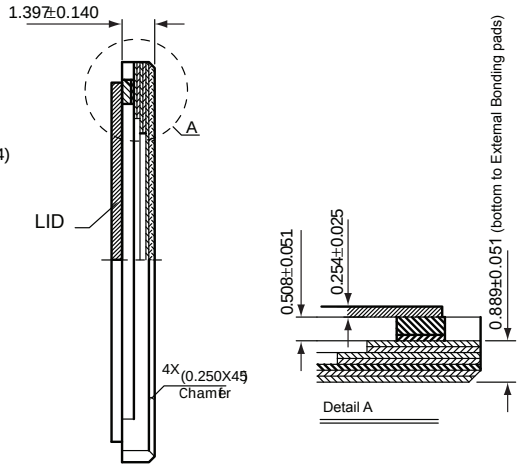
For heat sink information, refer to the *Hermetic Package Mechanical Configuration document (Cavity, weight, lid size and heat sink size)* located at: *www.actel.com/documents/HermeticPckg.pdf*

Ceramic Chip Carrier Land Grid Substrate (CCLG)

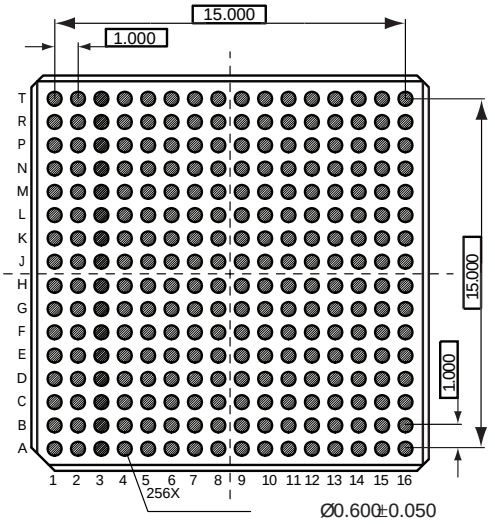
CC256

Top View
(see next page for clear dimension)





Side View
(with partial section view)



Bottom View

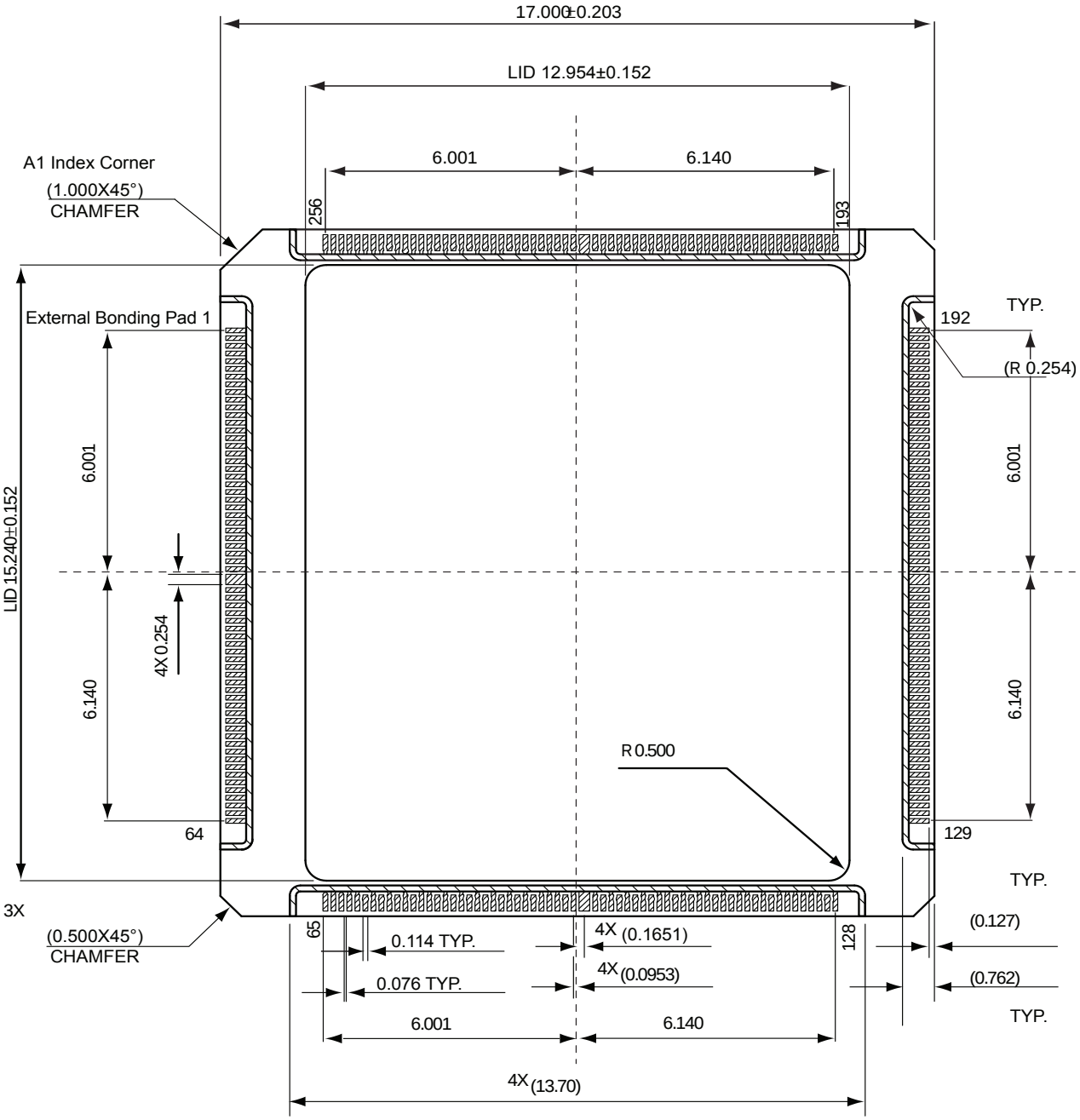
Note: Units are mm.

Supported Devices
RT54SX32S* RTSX32SU

*Note: *This product is obsolete.*

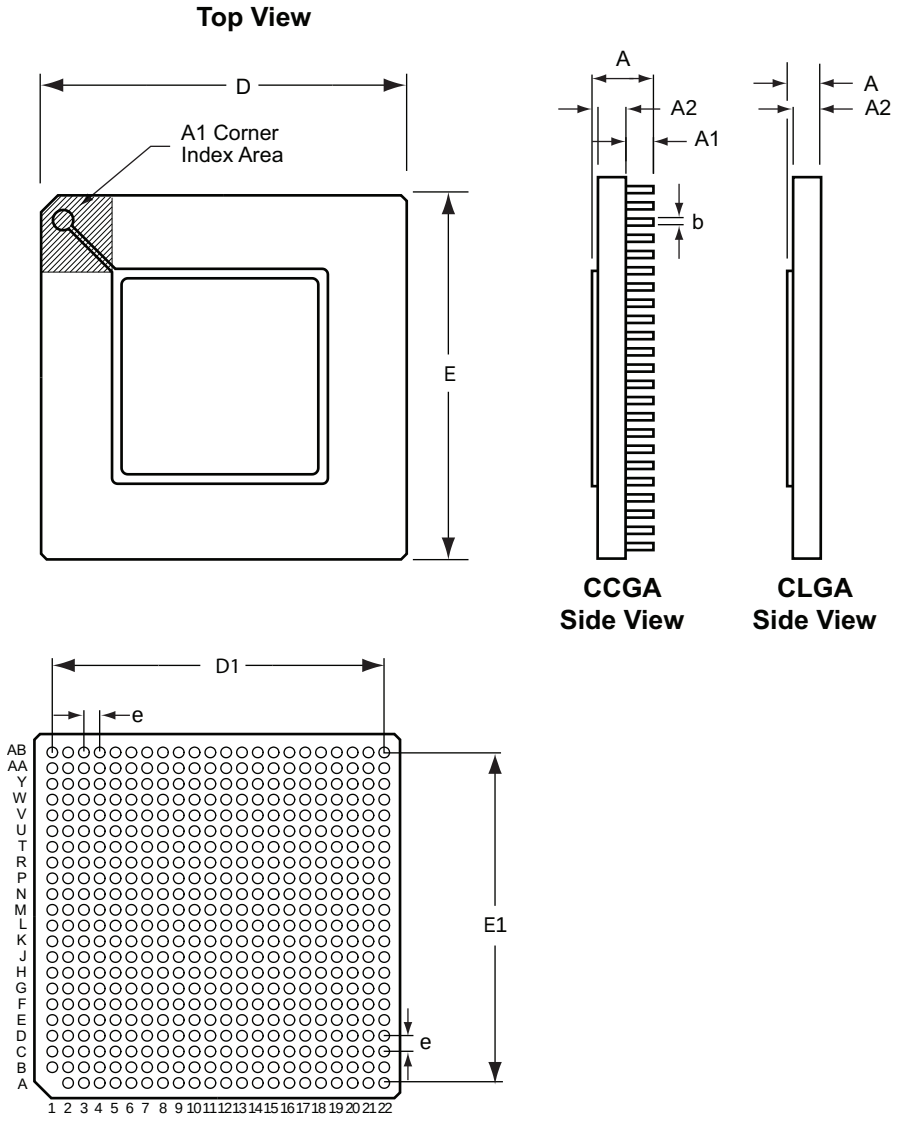
CCLG Substrate Dimensions

Top View (Zoom 2.4x)



Ceramic Column Grid Array (CCGA)

CG484

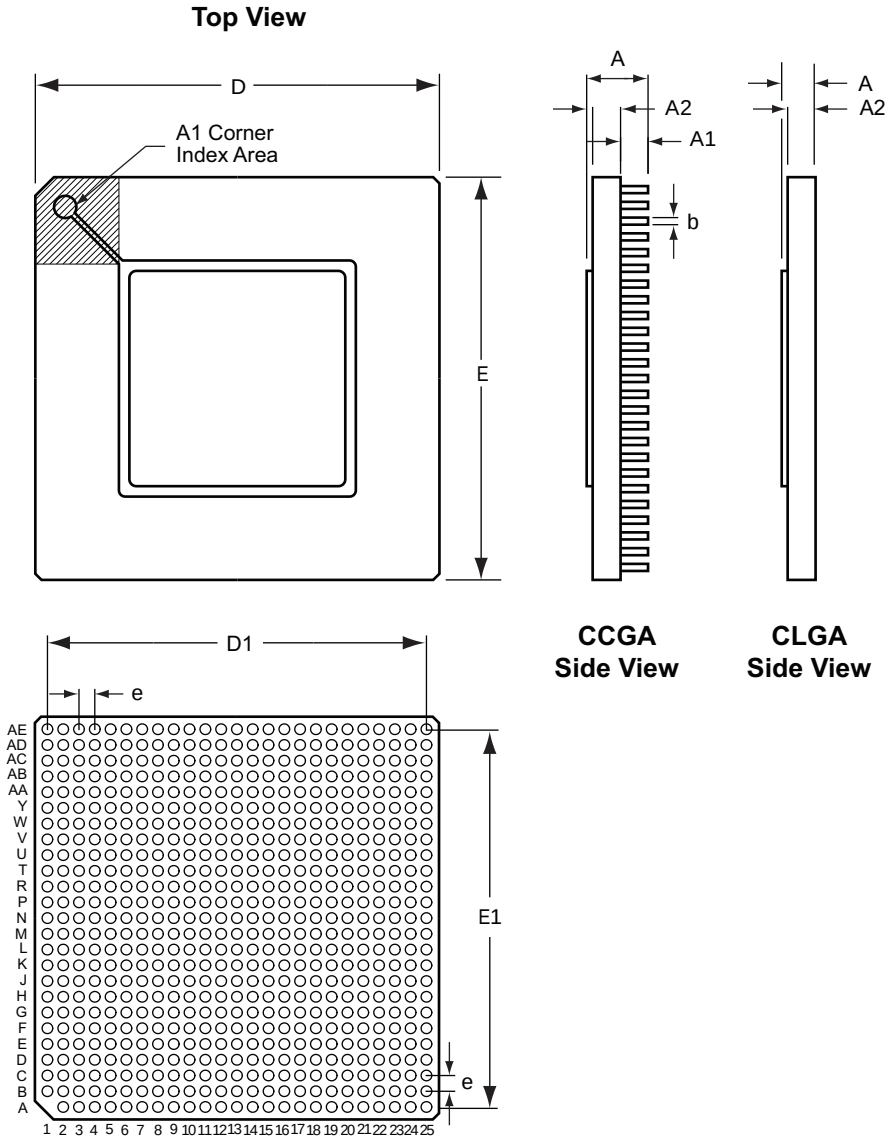


Note: The top and side views will be completed in the future.

Supported Devices
RT3PE600L RT3PE3000L

Ceramic Column Grid Array

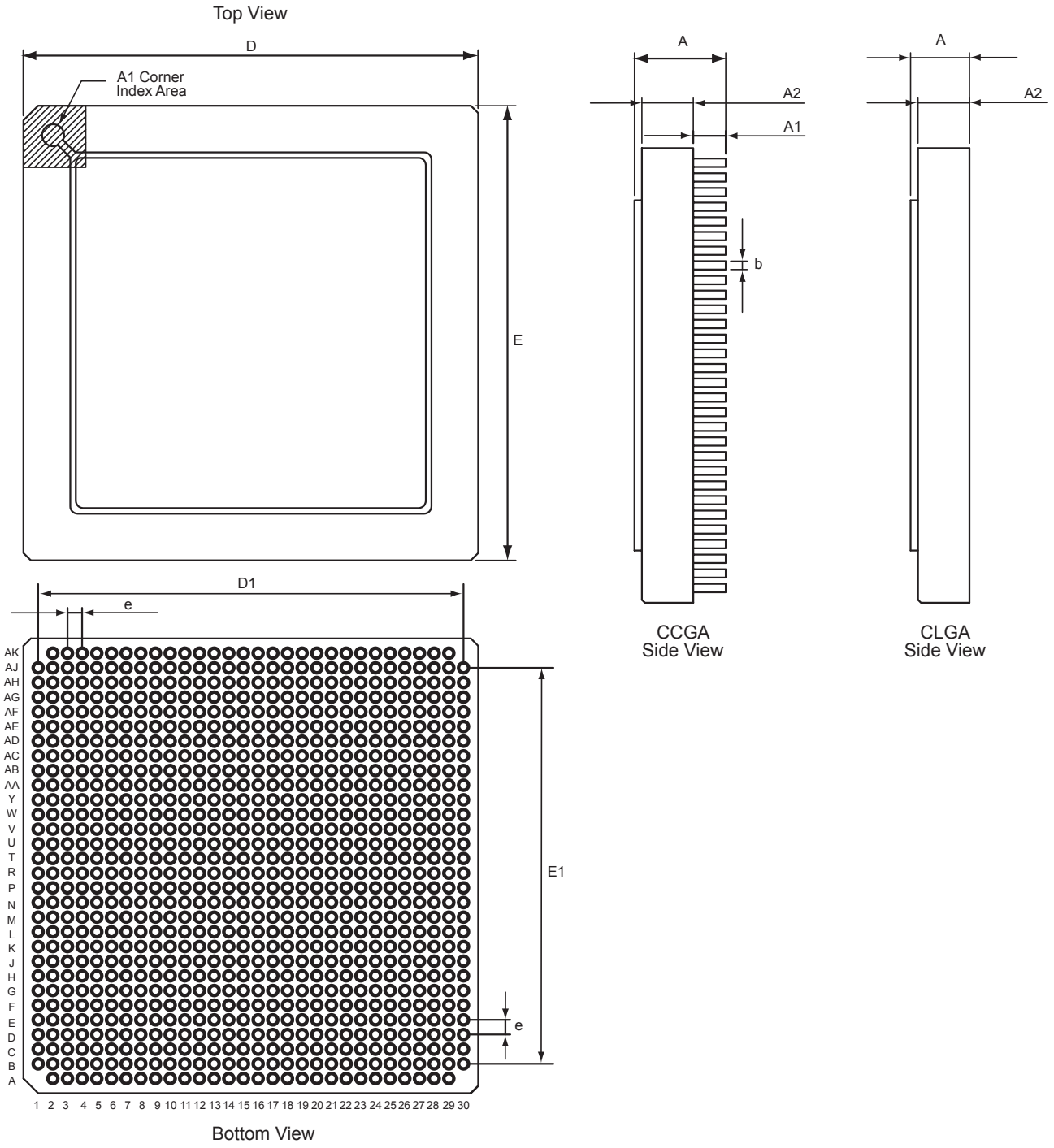
CG624



Supported Devices			
AX1000 AX2000	RTAX1000S RTAX2000S RTAX250S	APA600 APA1000	RTSX72SU

Ceramic Column Grid Array

CG896



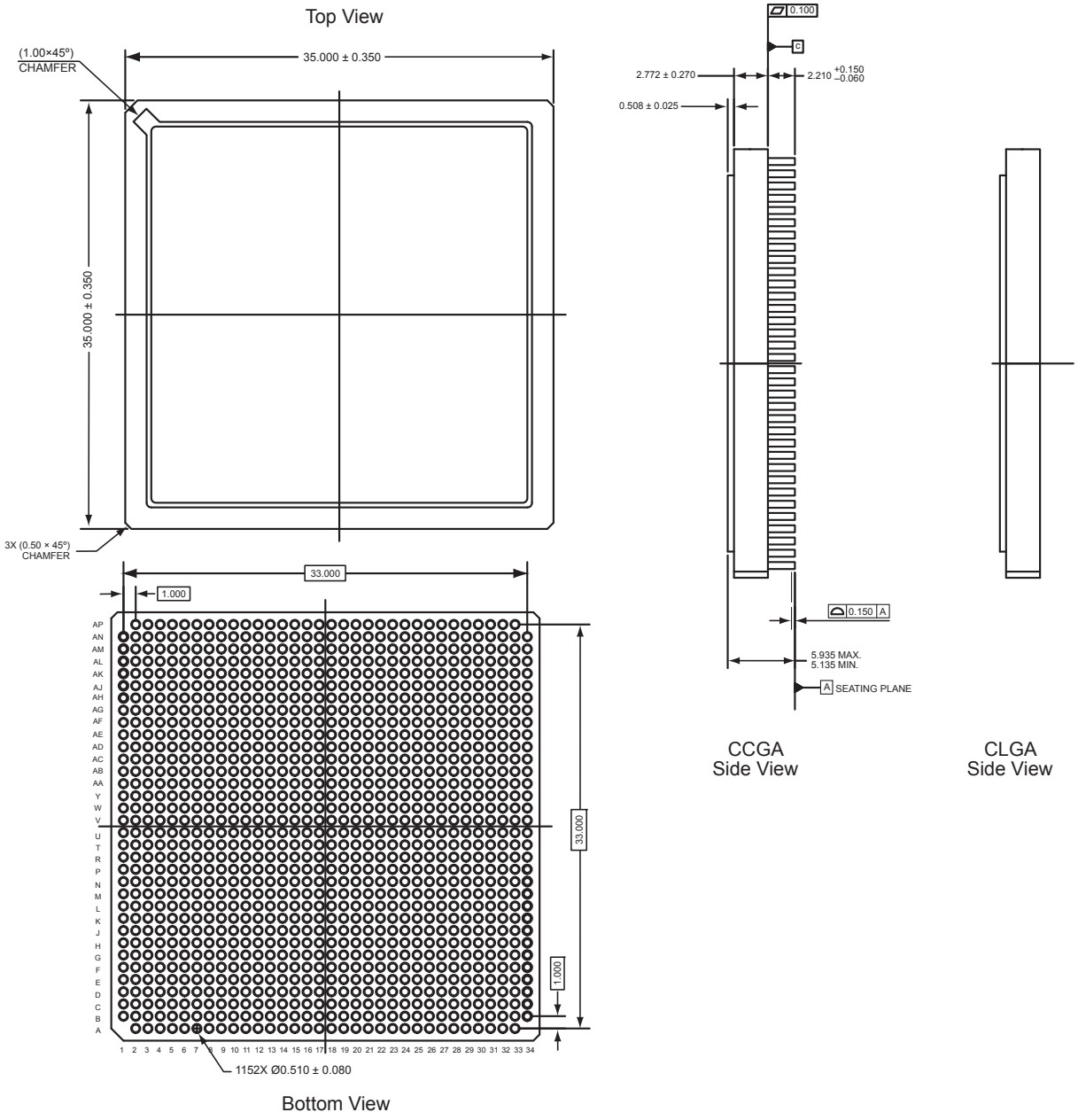
Supported Devices
RT3PE3000L

CCGA Dimensions

Dimension	CG484			CG624			CG896		
	Min.	Nom.	Max.	Min.	Nom.	Max.	Min.	Nom.	Max.
CCGA - A	5.19	5.72	6.19	4.54	4.88	5.41	5.65	6.23	6.75
CLGA - A	3.06	3.51	3.83	2.41	2.67	3.05	3.16	3.51	3.86
A1	2.15	2.21	2.36	2.15	2.21	2.36	2.15	2.21	2.36
A2	2.70	3.00	3.30	2.06	2.29	2.52	3.16	3.51	3.86
b	0.43	0.51	0.59	0.43	0.51	0.59	0.43	0.51	0.59
D	22.77	23.00	23.23	32.17	32.50	32.83	30.69	31.00	31.31
D1	21.00 BSC			30.48 BSC			29.00 BSC		
E	22.77	23.00	23.23	32.17	32.50	32.83	30.69	31.00	31.31
E1	21.00 BSC			30.48 BSC			29.00 BSC		
e	1.00 BSC			1.27 BSC			1.00 BSC		

Ceramic Column Grid Array

CG1152

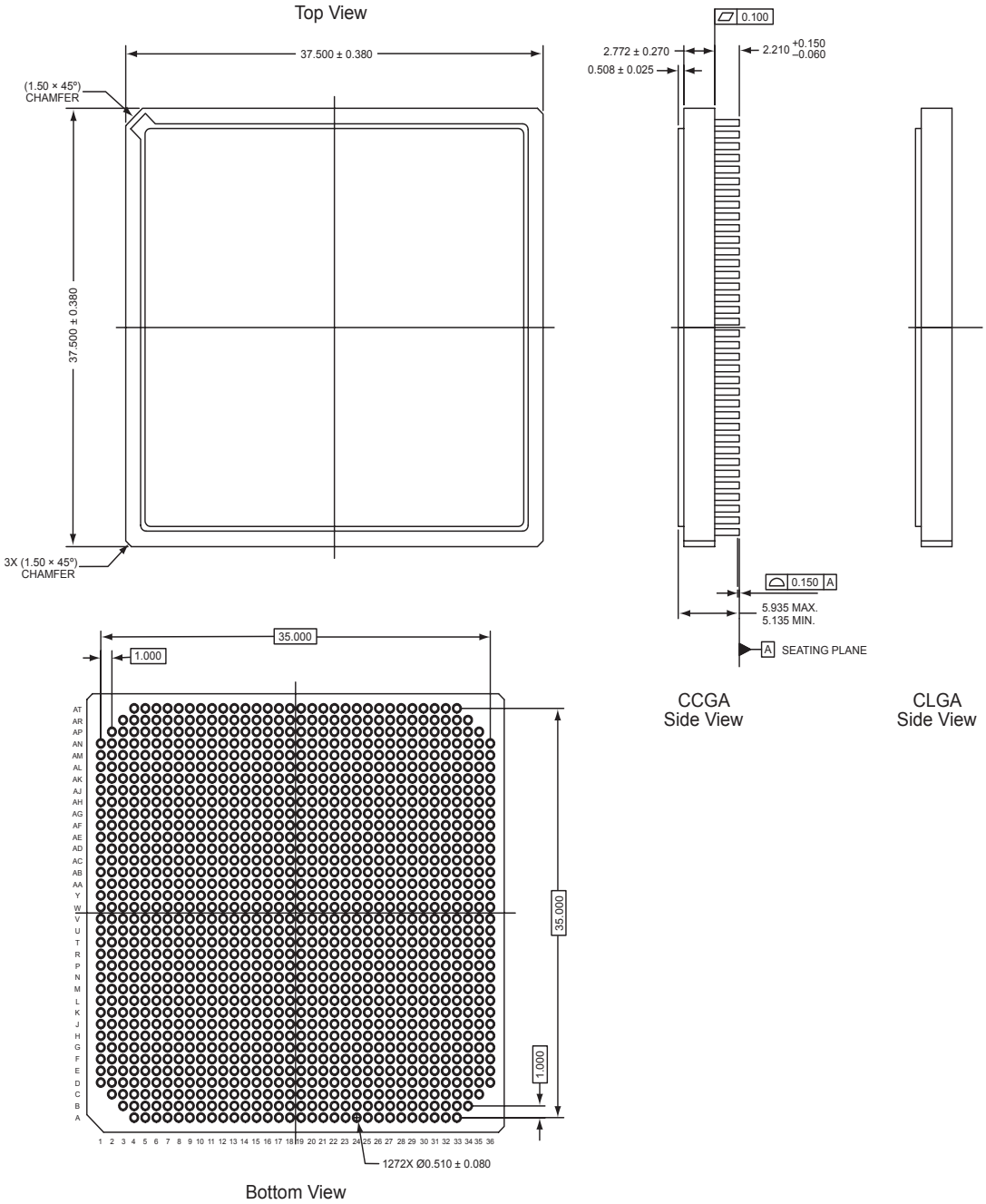


Notes:

1. *The units are in mm.*
2. *The seal ring area must be connected to GND.*
3. *Die attach area must be connected to GND.*

Supported Devices
RTAX2000S

CG1272

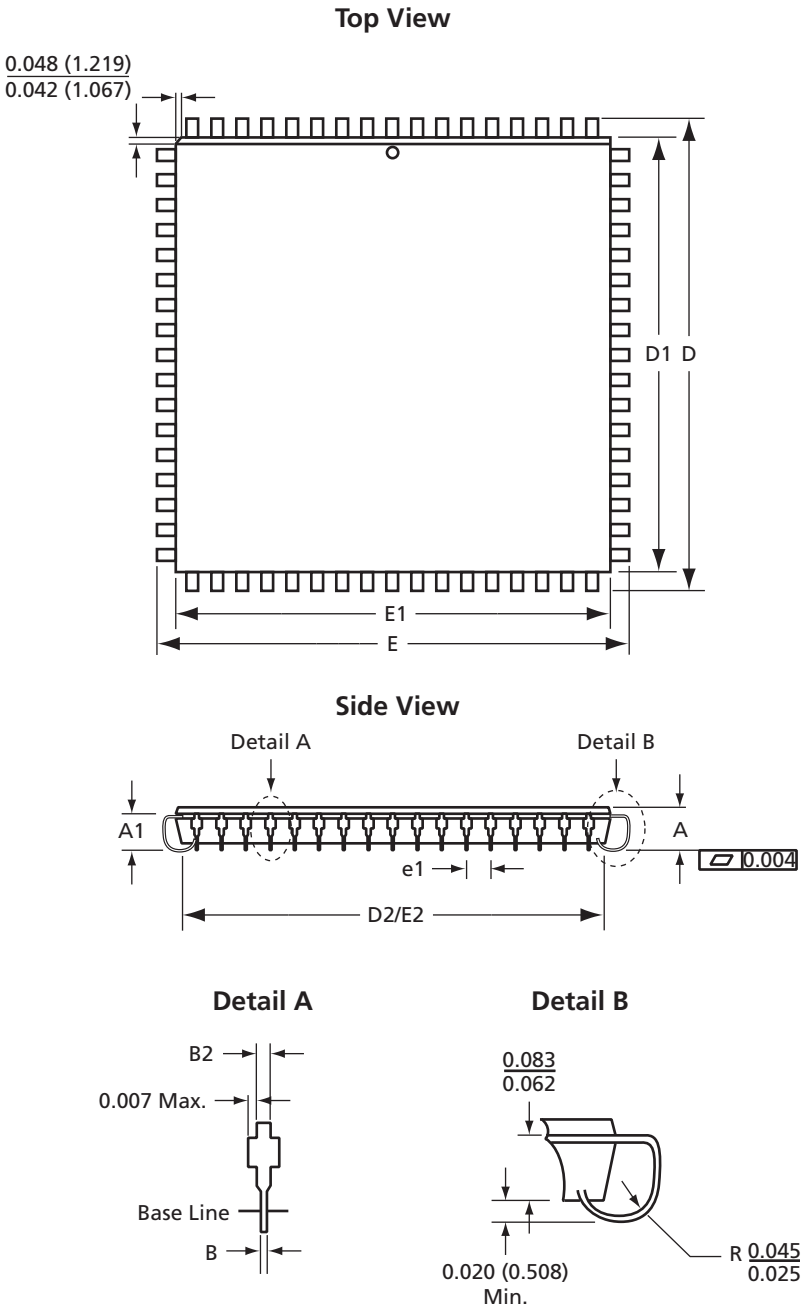


Notes:

1. *The units are in mm.*
2. *The seal ring area must be connected to GND.*
3. *Die attach area must be connected to GND.*

Supported Devices
RTAX4000S RTAX2000D RTAX4000D

Plastic Leaded Chip Carrier (PLCC)



Note: Dimensions are in millimeters. Refer to the "Plastic Leaded Chip Carrier Dimensions" section on page 29 for the dimensions.

Supported Devices				
PL44	**PL68**	**PL84**		
A1010B	A1010B	A10V20B	A1020B	A3265A*
A1020B	A1020B	A1225XLV*	A1225A	A54SX08
A40MX02	A10V10B	A1280XLV*	A1240A	A32100DX*
A40MX04	A10V20B	A1240XLV*	A1280A	A32140DX*
	A40MX02	A14V15A	A1225XL*	A40MX04
	A40MX04	A14V25A	A1240XL*	A42MX09
		A14V40A	A1280XL*	A42MX16
		A3265DXV*	A1415A	A42MX24
		A32100DXV*	A1425A	
		A32140DXV*	A1440A	

*Note: *This product is obsolete.*

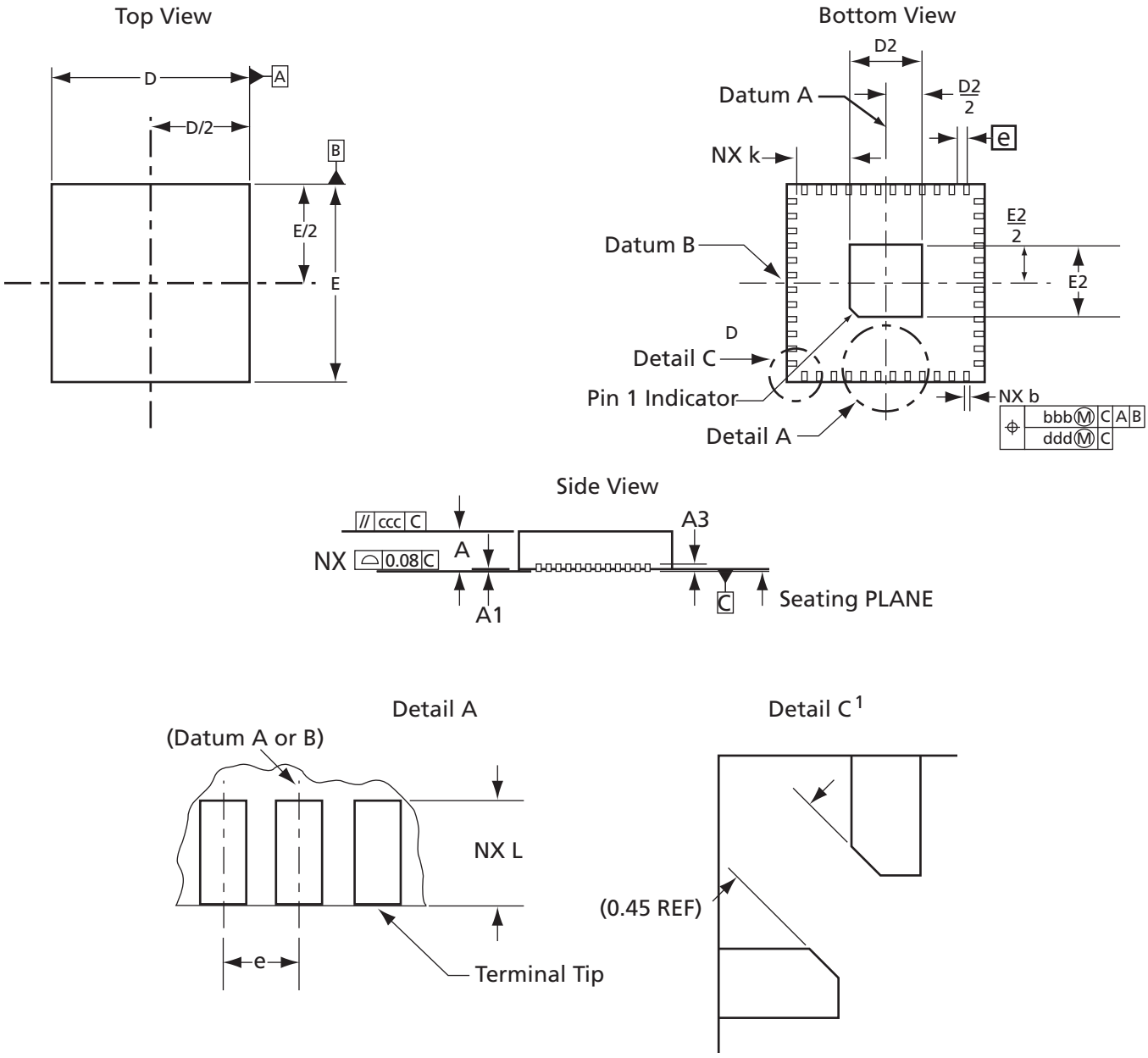
Plastic Leaded Chip Carrier Dimensions

JEDEC Equivalent	PL44 MS-018 VAR AC			PL68 MS-018 VAR AE			PL84 MS-018 VAR AF		
Dimension	**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.*

Quad Flat No Lead (QFN)

QN48

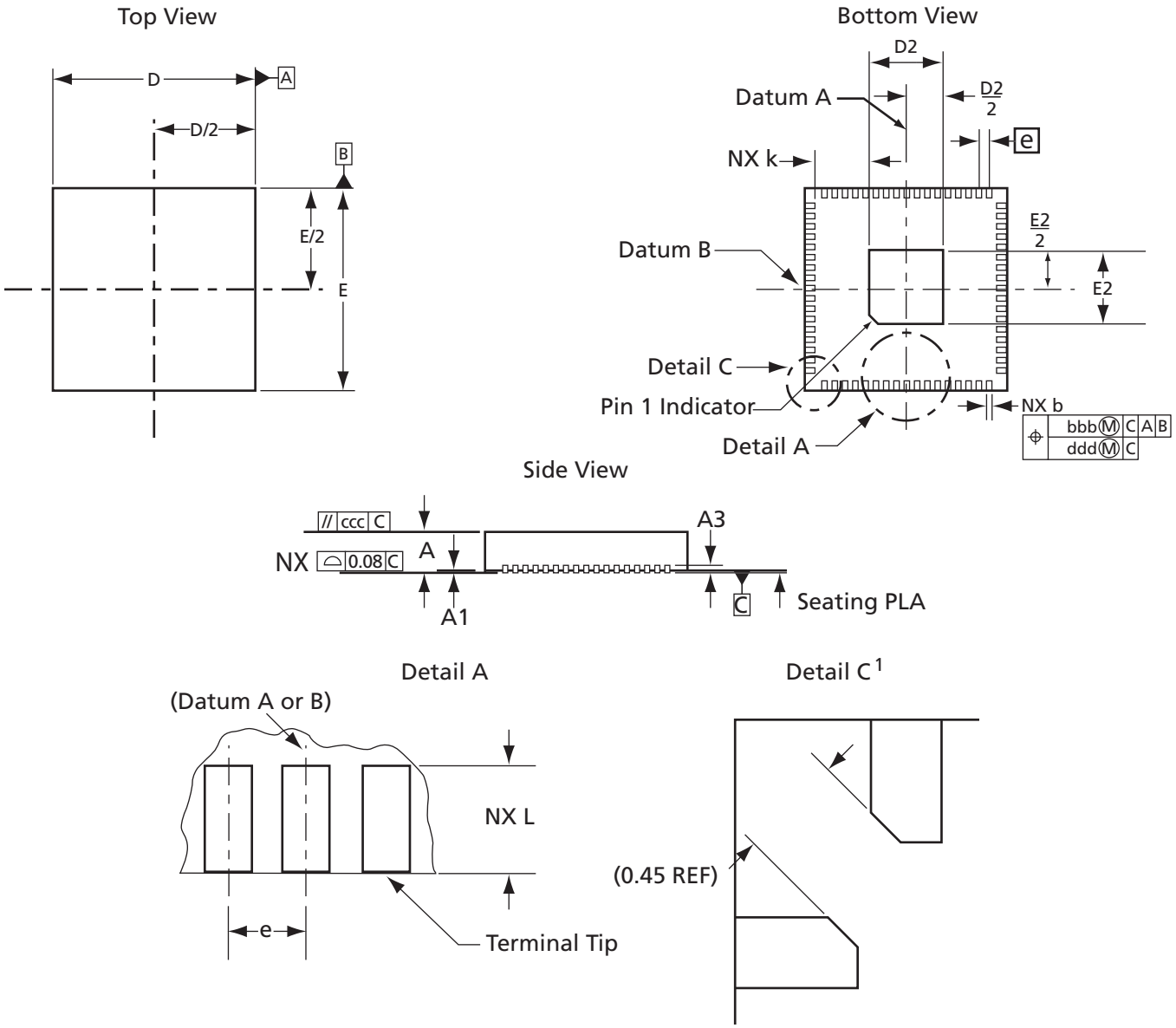


Notes:

1. *Corner chamfer leads are applied to maintain minimum spacing between corner leads; otherwise, keep normal lead shape.*
2. *Die attach paddle center of package is tided to ground (GND).*

Supported Devices	
A3PN010 A3P030/A3PN030	AGN010 AGL030/AGLN030

QN68



Notes:

1. *Corner chamfer leads are applied to maintain minimum spacing between corner leads; otherwise, keep normal lead shape.*
2. *Die attach paddle center of package is tided to ground (GND).*

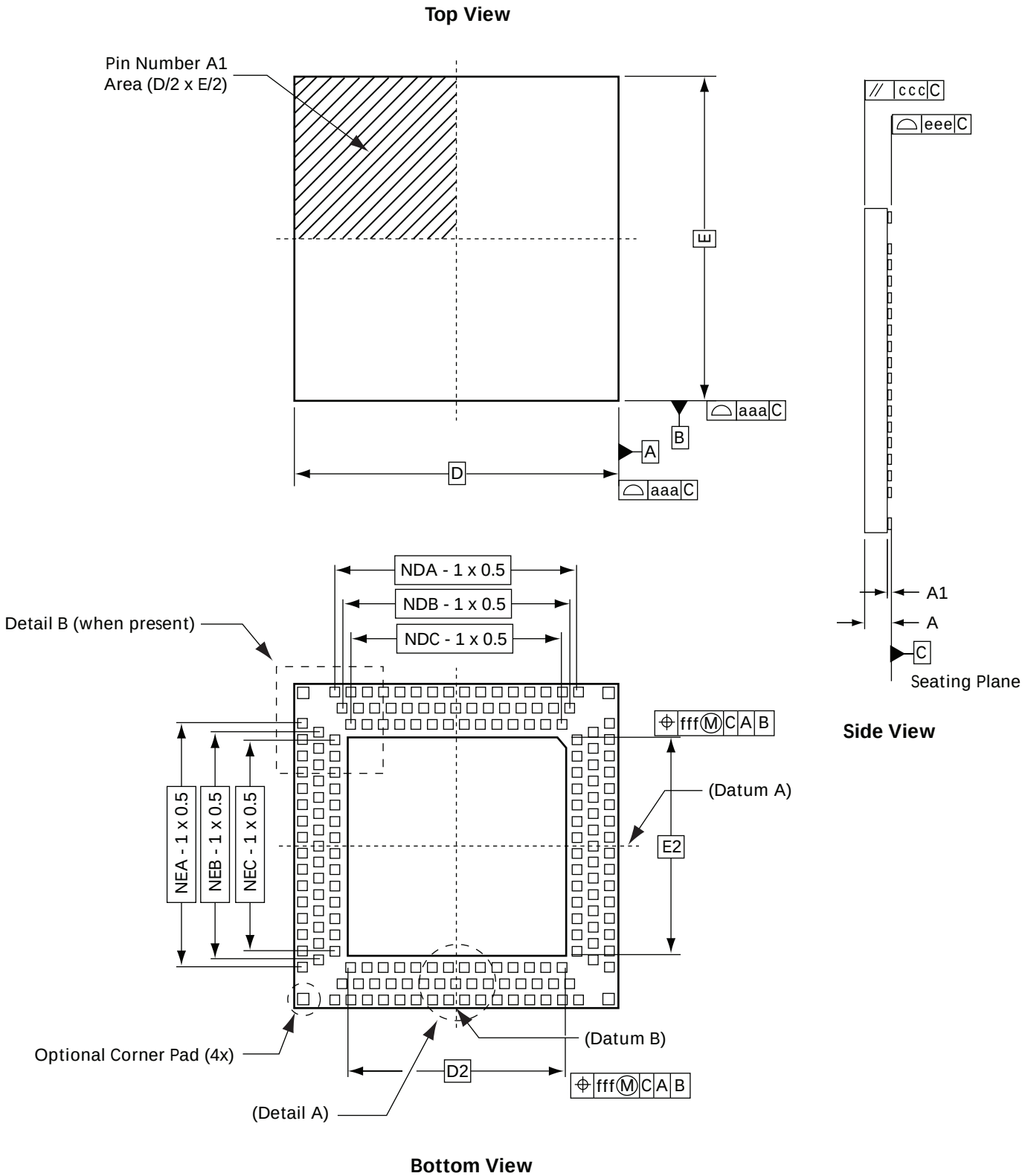
Supported Devices			
AGL015	AGLN015	A3P015	A3PN015
AGL030	AGLN020	A3P030	A3PN020
	AGLN030		A3PN030

QN48 and QN68 Quad Flat No Leads Single Row Dimension Table

Dimension	QN48 (page 30) MO-220, Variation VLLE-1			QN68 (page 31) MO-220, Variation VLLE-1		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	0.80	0.90	1.00	0.80	0.90	1.00
A1	0	.02	0.05	0.00	0.02	0.05
A3	0.20 REF			0.20 REF		
b	0.15	0.20	0.25	0.15	0.20	0.25
D/E	5.90	6.00	6.1	7.90	8.00	8.10
D2/E2	4.50	4.65	4.8	2.77	2.92	3.07
e	0.40 BSC			0.40 BSC		
k	0.20	–	–	0.20	–	–
L	0.30	0.40	0.5	0.35	0.40	0.45
N	48			68		
bbb	0.07			0.07		
ccc	0.10			0.10		
ddd	0.05			0.05		

Note: All dimensions are in millimeters.

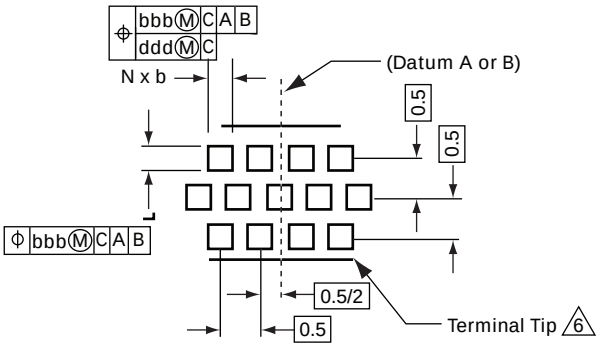
Quad Flat No Lead



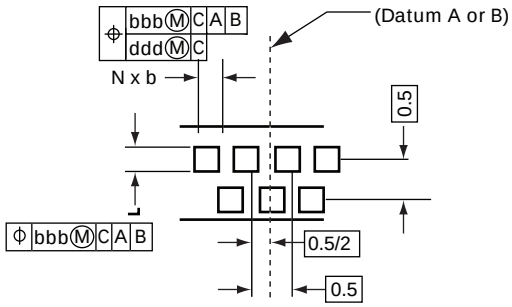
Quad Flat No Lead

Quad Flat No Lead Details

Detail A

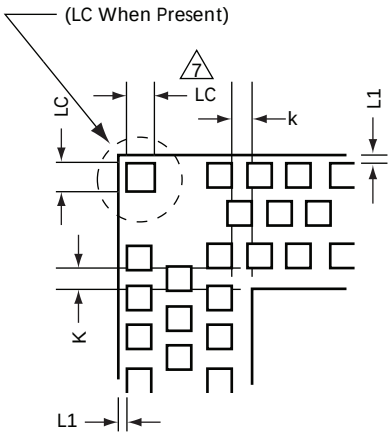


QN180/QN132



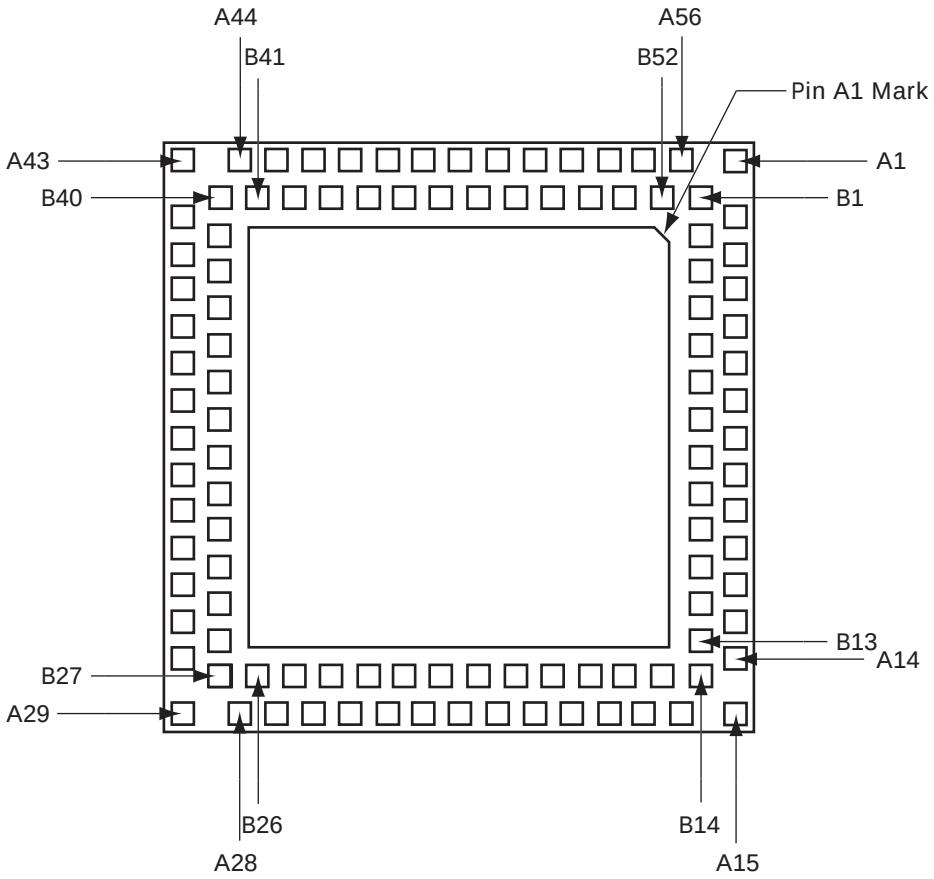
QN108

Detail B



Quad Flat No Lead

QN108 Bottom View

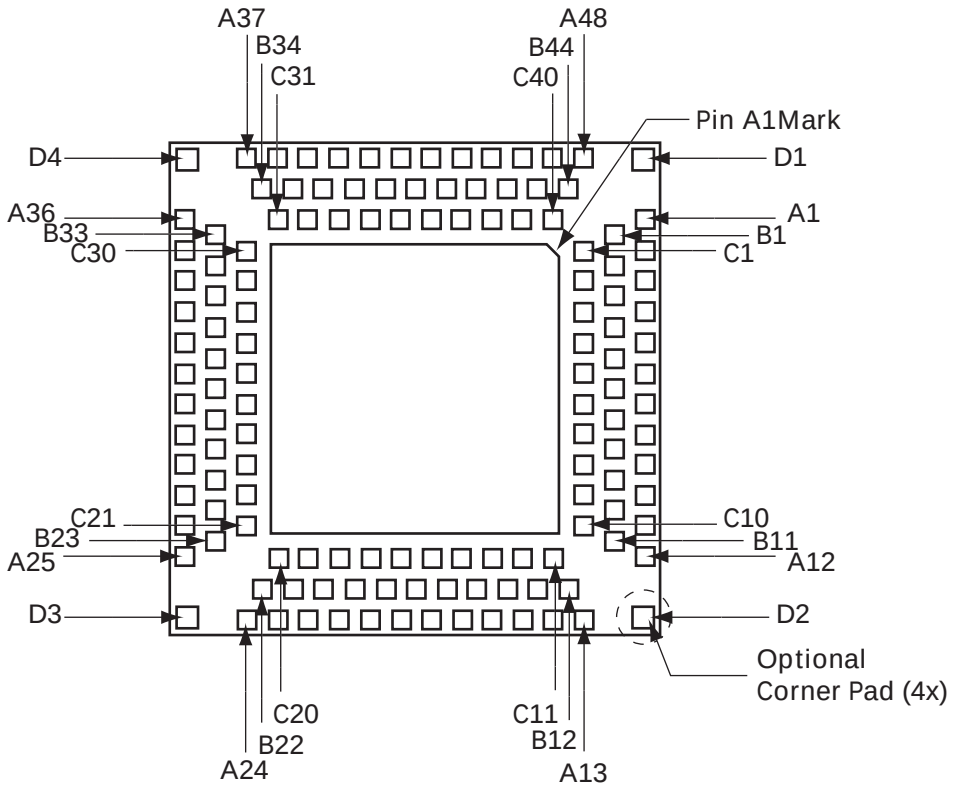


Note: Die attach paddle center of package is tied to ground (GND).

Supported Devices
AFS090

Quad Flat No Lead

QN132 Bottom View

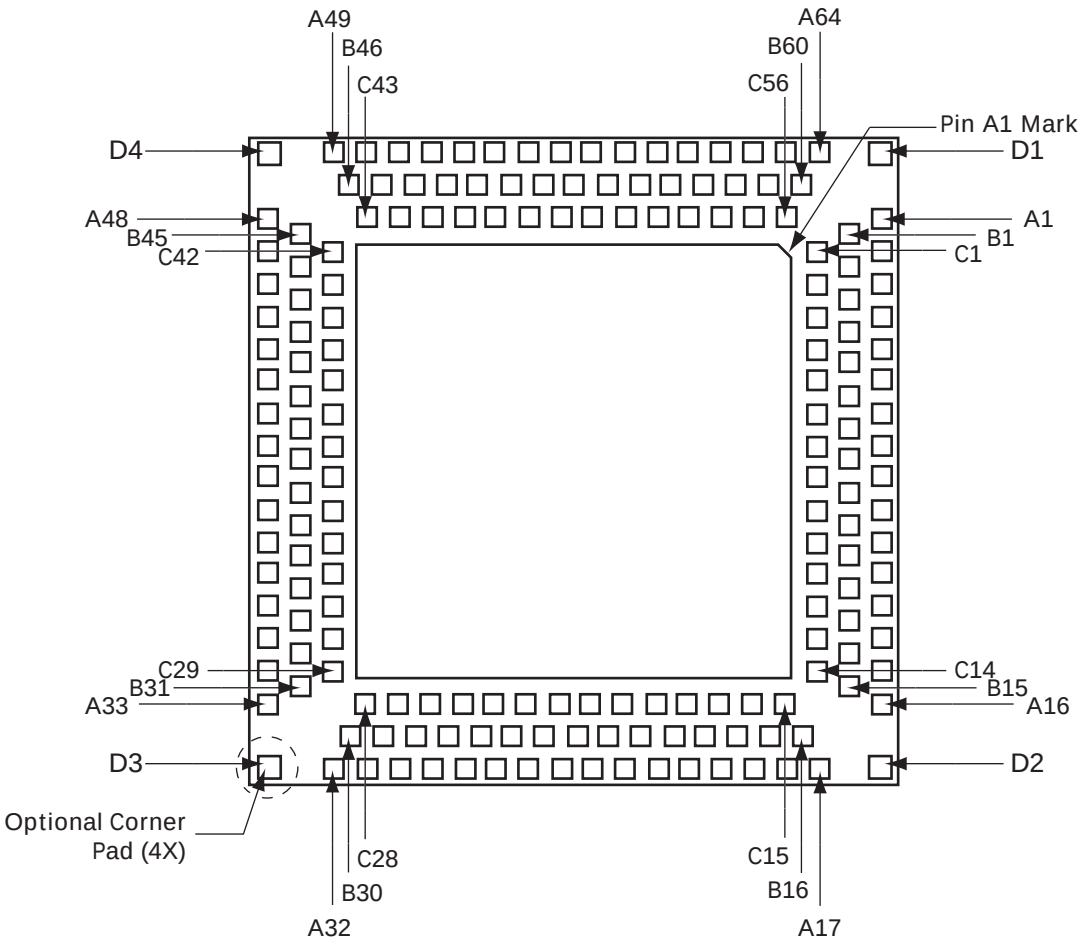


Note: Die attach paddle center of package is tied to ground (GND).

Supported Devices	
AGL030	A3P030
AGL060	A3P060
AGL125	A3P125
AGL250	A3P250

Quad Flat No Lead

QN180 Bottom View



Note: Die attach paddle center of package is tided to ground (GND).

Supported Devices
AFS090
AFS250
M1AFS250

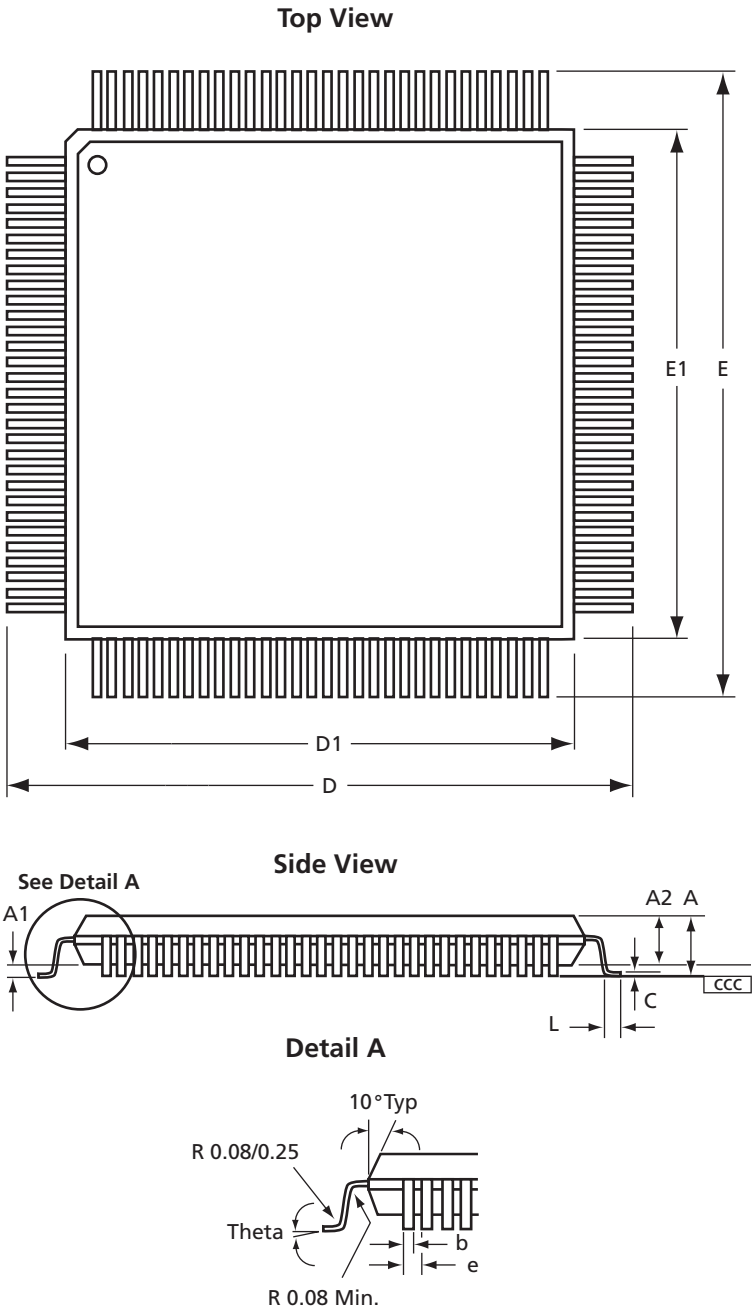
Quad Flat No Leads Dimensions

Symbol	Min.	Nom.	Max.
A	0.70	0.75	0.80
A1	0.00	–	0.05
b	0.25	–	0.35
k	0.20	–	–
L	0.25	–	0.35
L1	0.05	–	0.15
Tolerance of Form and Position			
aaa	0.15		
bbb	0.10		
ccc	0.10		
ddd	0.05		
eee	0.08		
fff	0.10		

Notes:
1. *All dimensions are in millimeters.*
2. *BSC = Basic spacing between centers.*

Variation / Symbol		QN108	QN132	QN180
D BSC.		8.00	8.00	10.00
E BSC.		8.00	8.00	10.00
D2	Min.	5.65	4.65	6.65
	Nom.	5.70	4.70	6.70
	Max.	5.75	4.75	6.75
E2	Min.	5.65	4.65	6.65
	Nom.	5.70	4.70	6.70
	Max.	5.75	4.75	6.75
LC	Min.	–	0.30	0.30
	Nom.	–	–	–
	Max.	–	0.40	0.40
N		108	132	180
NDA		12	12	16
NDB		11	11	15
NDC		–	10	14
NEA		12	12	16
NEB		11	11	15
NEC		–	10	14

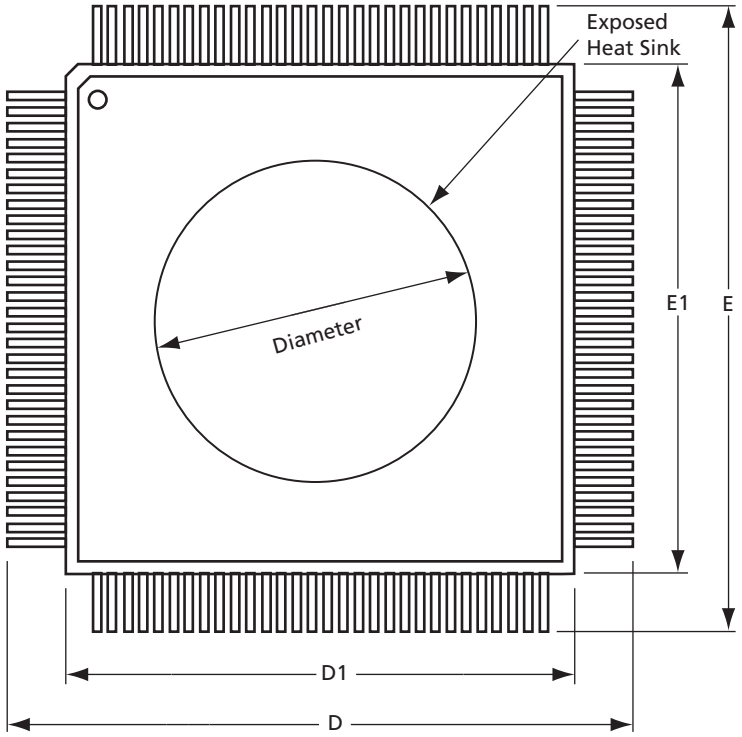
Plastic Quad Flat Pack (PQFP, TQFP, VQFP)



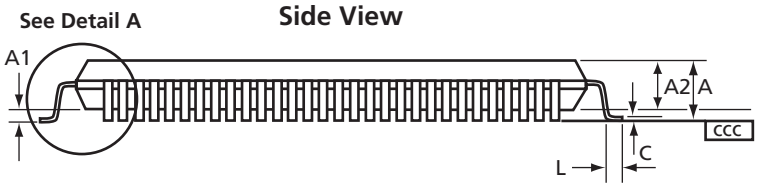
Note: Dimensions are in millimeters.Refer to the "Plastic Quad Flat Pack (PQFP) Dimensions" section on page 43,"Thin Quad Flat Pack (TQFP) Dimensions" section on page 45, and "Very Thin Quad Flat Pack (VQFP) Dimensions" section on page 45 for the dimensions.

Plastic Quad Flat Pack—Exposed Heatsink (RQFP)

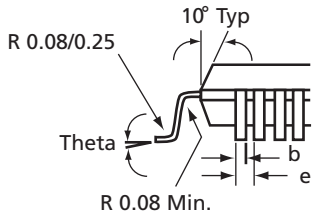
Top View



Side View



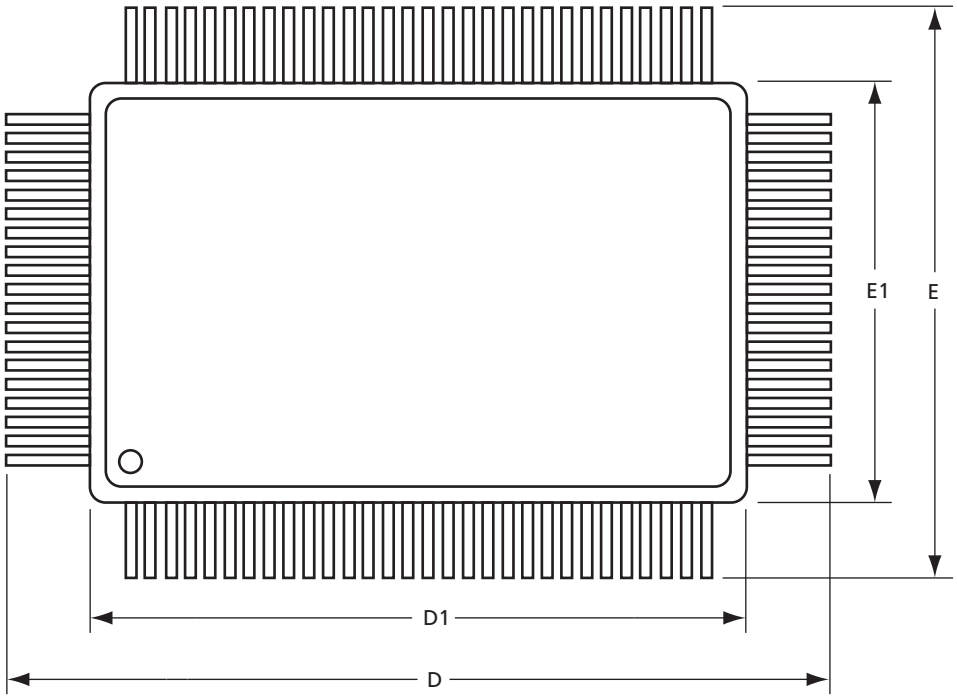
Detail A



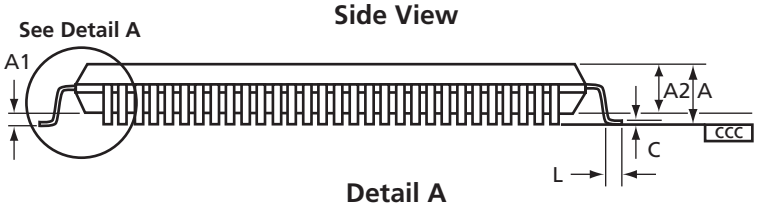
Note: Dimensions are in millimeters. Refer to the "Plastic Quad Flat Pack (RQFP/PQFP) Dimensions" section on page 43 for the dimensions.

Plastic Quad Flat Pack Rectangular Package (PQ100)

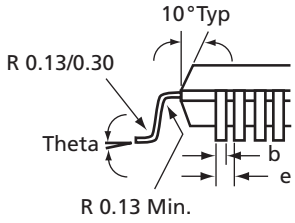
Top View



Side View



Detail A



Note: Dimensions are in millimeters. Refer to the "Plastic Quad Flat Pack (PQFP) Dimensions" section on page 43 for the dimensions.

Supported Devices								
RQ208	**PQ100**	**PQ144**	**PQ160**	**PQ208**			**RQ240**	**PQ240**
A14V100A A14100A A32200DX* A32300DX* A32300DXV*	A1010B A1020B A1225A A1225XL* A1240XL* A1415A A1425A A3265DX* A40MX02 A40MX04 A42MX09 A42MX16	A1240A A1240XL*	A1280A A1280XL* A14V25A A1425A A14V40A A1440A A14V60A A1460A A3265DX* A32100DX* A32140DX* A42MX09 A42MX16 A42MX24	A1280XL* A14V60A A1460A A32100DX* A32140DX* A32200DX* A32200DXV* A42MX16 A42MX24 A42MX36 A500K050* A500K130* A500K180* A500K270* A54SX08 A54SX16 A54SX16P A54SX32 A54SX08A A54SX16A A54SX32A A54SX72A	AX250 AX500 APA075 APA150 APA300 APA450 APA600 APA750 APA1000 A3P125 A3P250 A3P400 A3P600 A3P1000 M1A3P250 M1A3P400 M1A3P600 M1A3P1000 M7A3P1000	A3PE600 A3PE1500 A3PE3000 M1A3PE1500 M1A3PE3000 A3P250L A3P1000L M1A3P600L M1A3P1000L A3PE3000L M1A3PE3000L AFS250 AFS600 M1AFS250 M1AFS600 M7AFS600 A2F200 A2F500	A32200DX* A32200DXV*	A42MX36

*Note: *This product is obsolete.*

Plastic Quad Flat Pack (PQFP) Dimensions

JEDEC Equivalent	PQ100 MS-022 VAR GC-1			PQ144 MS-022 VAR DC-1			PQ160 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	–	0.40	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 Pack (RQFP/PQFP) Dimensions

JEDEC Equivalent	RQ208/PQ208 MS-029 VAR FA-1			RQ240/PQ240 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	0.08			0.08		
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:

1. *All dimensions are in millimeters.*
2. *BSC = Basic spacing between centers.*

Supported Devices									
TQ64	**TQ100**	**TQ144**	**TQ176**		**VQ80**	**VQ100**		**VQ128**	**VQ176**
eX64 eX128	APA075 APA150 A54SX08A A54SX16A A54SX32A eX64 eX128 eX256	A54SX08 A54SX16P A54SX32 A54SX08A A54SX16A A54SX32A APA075 A3P060 A3P125 A2F060	A1240A A1440A A1460A A14V40A A14V60A A1240XL* A1280XL* A1280XLV* A1240XLV* A3265DX* A32140DX*	A3265DXV* A32140DXV* A42MX09 A42MX16 A42MX24 A54SX08 A54SX16 A54SX16P A54SX32 A54SX32A	A1010B A10V10B A1020B A10V20B A40MX02 A40MX04	A1225XL* A1415A A1425A A1440A A14V15A A14V25A A14V40A A42MX09 A42MX16 A54SX16	A54SX16P A54SX08 AGL030 AGL060 AGL125 AGL250 AGLN030 AGLN060 AGLN125 AGLN250 A3P030 A3P060 A3P125 A3P250 M1A3P250 A3P250L A3PN030 A3PN060 A3PN125 A3PN250	AGLP030	AGLP060

*Note: *This product is obsolete.*

Thin Quad Flat Pack (TQFP) Dimensions

JEDEC Equivalent	TQ64 MS-026 VAR BCD			TQ100 MS-026 VAR BED			TQ144 MS-026 VAR BFB			TQ176 MS-026 VAR BCA		
Dimension	**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			0.10		
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.*

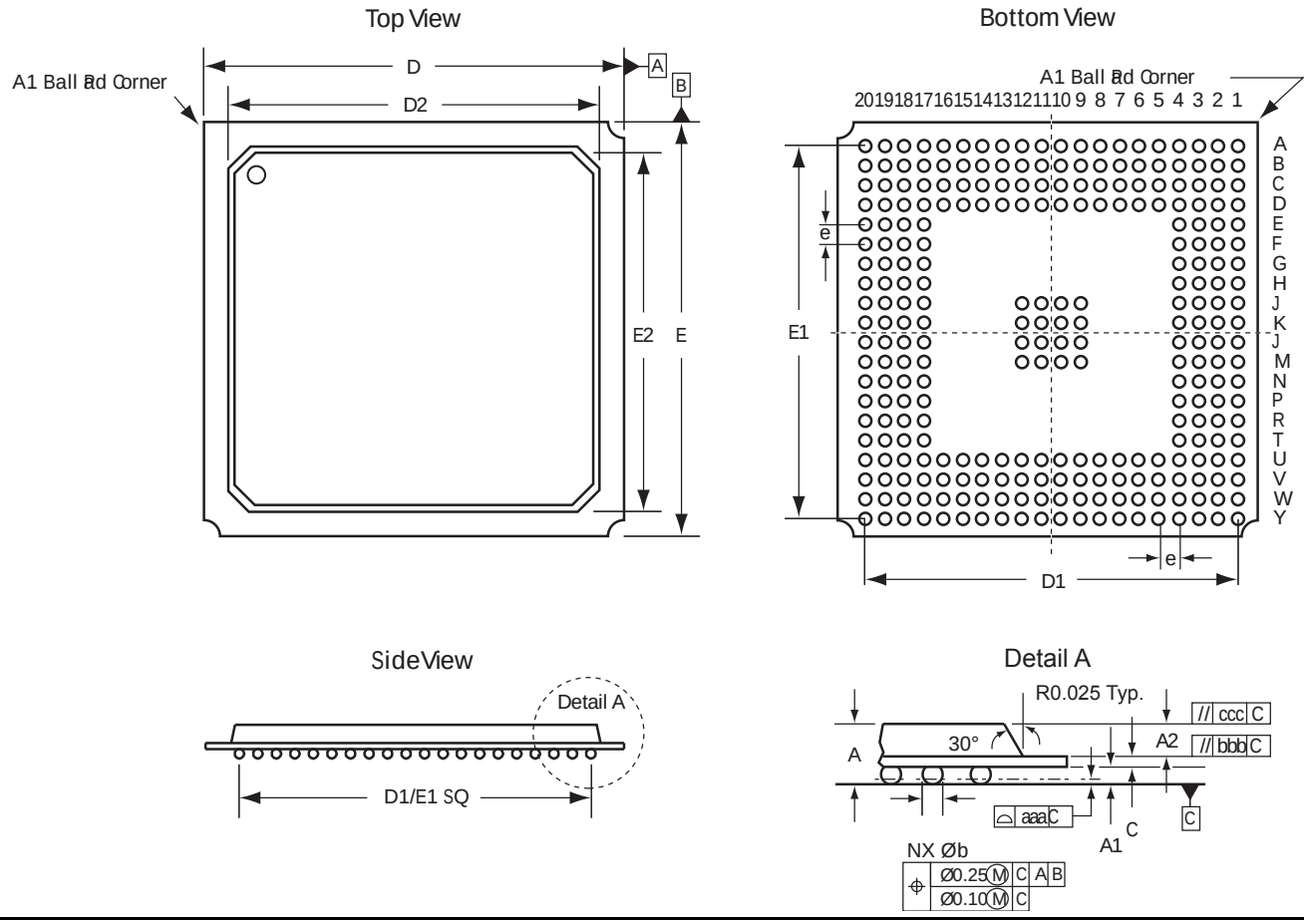
Very Thin Quad Flat Pack (VQFP) Dimensions

JEDEC Equivalent	VQ80 MS-026 VAR AEC			VQ100 MS-026 VAR AED			VQ128 MS-026 VAR AEE[3]			VQ176 MS-026 VAR BFC		
Dimension	**Min.**	**Nom.**	**Max.**	**Min.**	**Nom.**	**Max.**	**Min.**	**Nom.**	**Max.**	**Min.**	**Nom.**	**Max.**
A	–	–	1.20		–	1.20		–	1.20		–	1.20
A1	0.05	–	0.15	0.05	–	0.15	0.05	0.10	0.15	0.05	0.10	0.15
A2	0.95	1.00	1.05	0.95	1.00	1.05	0.95	1.00	1.05	0.95	1.00	1.05
b	0.22	0.32	0.38	0.17	0.22	0.27	0.13	0.18	0.23	0.13	0.18	0.23
c	0.09	–	0.20	0.09	–	0.20	0.09	–	0.20	0.09	–	0.20
D/E	16.00 BSC			16.00 BSC			16.00 BSC			22.00 BSC		
D1/E1	14.00 BSC			14.00 BSC			14.00 BSC			20.00 BSC		
e	0.65 BSC			0.50 BSC			0.40 BSC			0.40 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	0.10			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.*
3. *Variation AEE plus 8 leads.*

Plastic Ball Grid Array (PBGA)

BG272

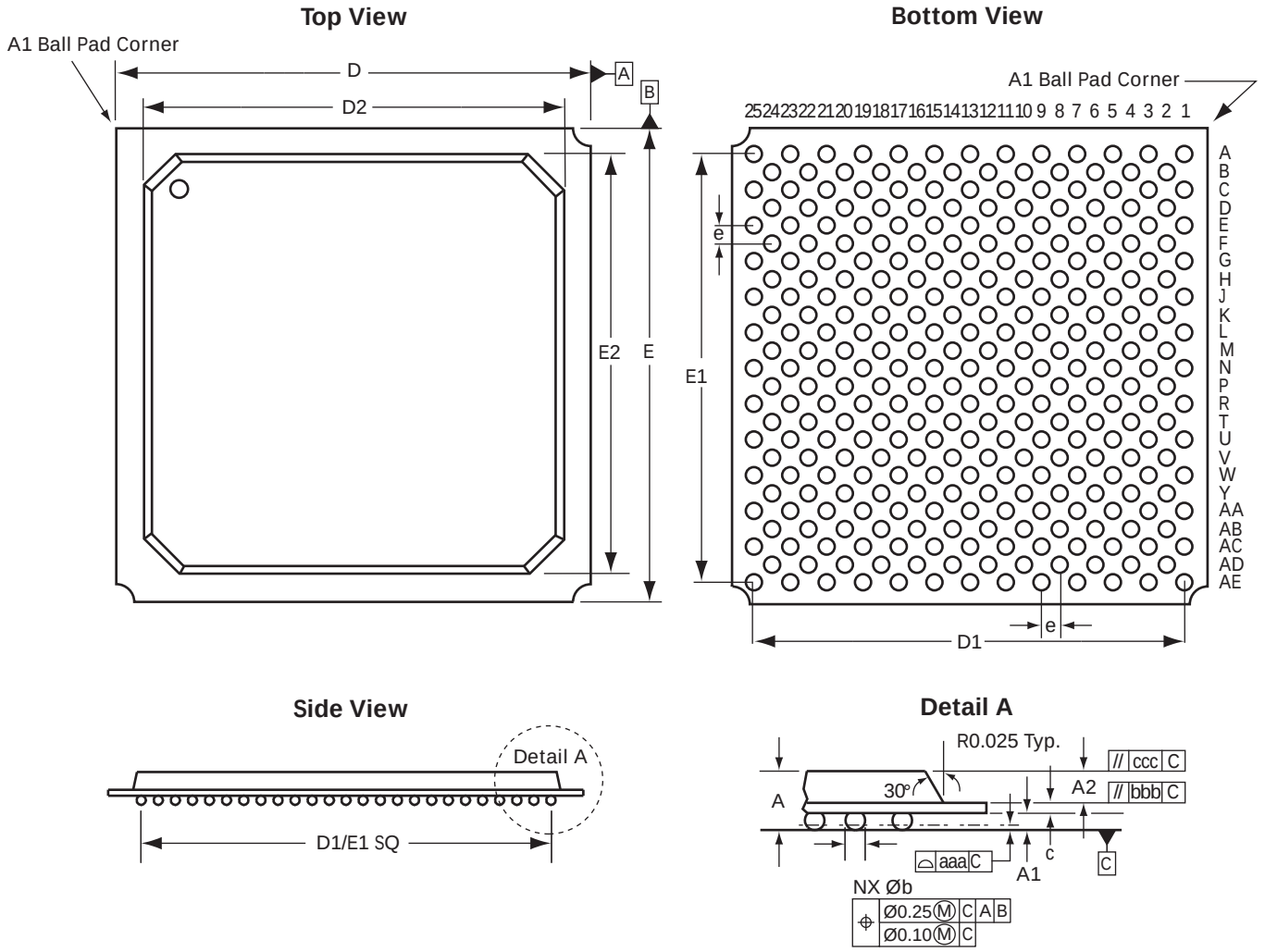


Supported Devices	
A42MX36	A500K050* A500K130*

Note: **This product is obsolete.*

Plastic Ball Grid Array

BG313

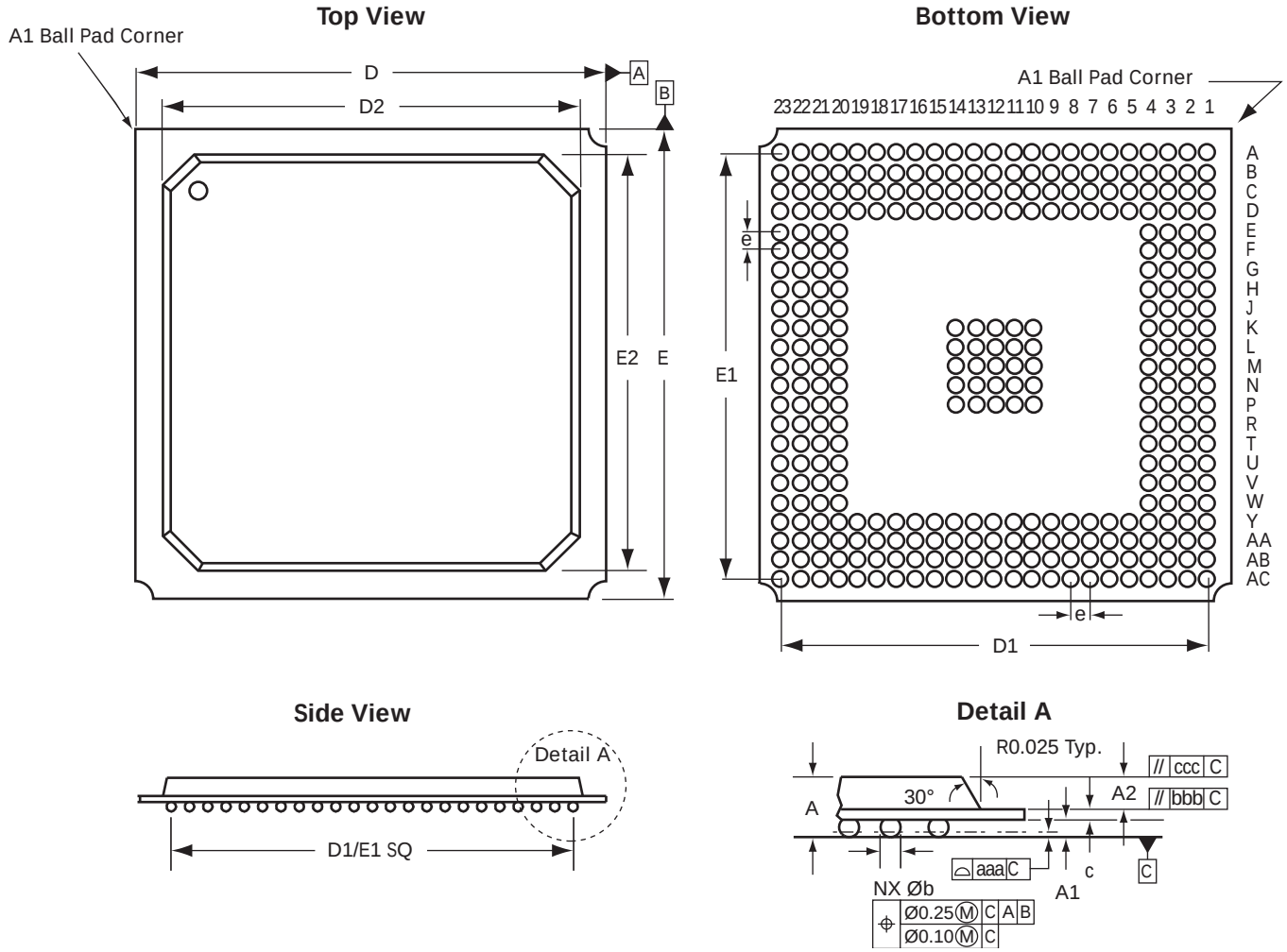


Note: Dimensions are in millimeters. Refer to the "Plastic Ball Grid Array Dimensions" section on page 51 for the dimensions.

Supported Devices	
A14100A A14V100A	A54SX32

Plastic Ball Grid Array

BG329

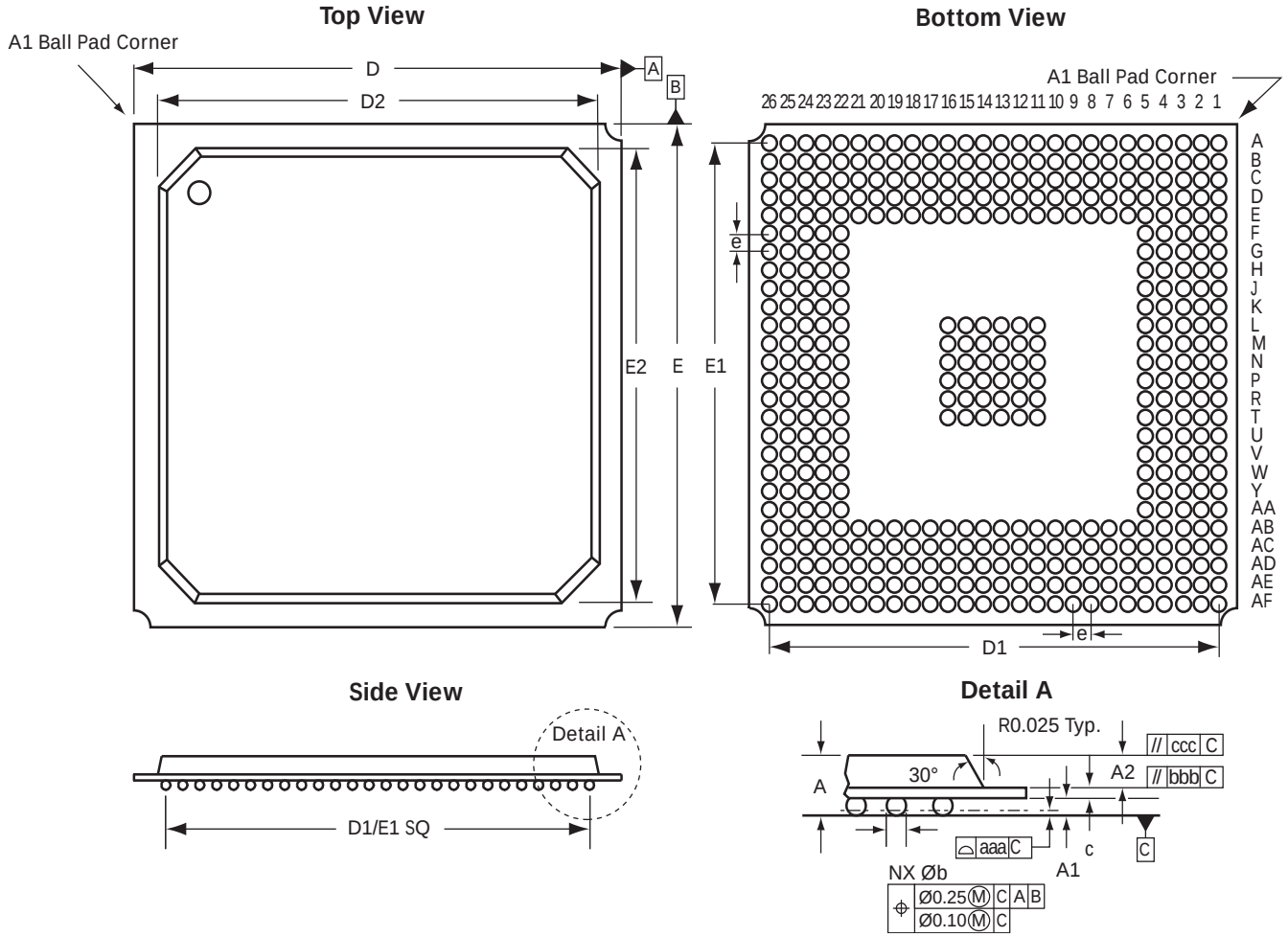


Note: Dimensions are in millimeters. Refer to the "Plastic Ball Grid Array Dimensions" section on page 51 for the dimensions.

Supported Devices	
A54SX32	A53SX32A

Plastic Ball Grid Array

BG456



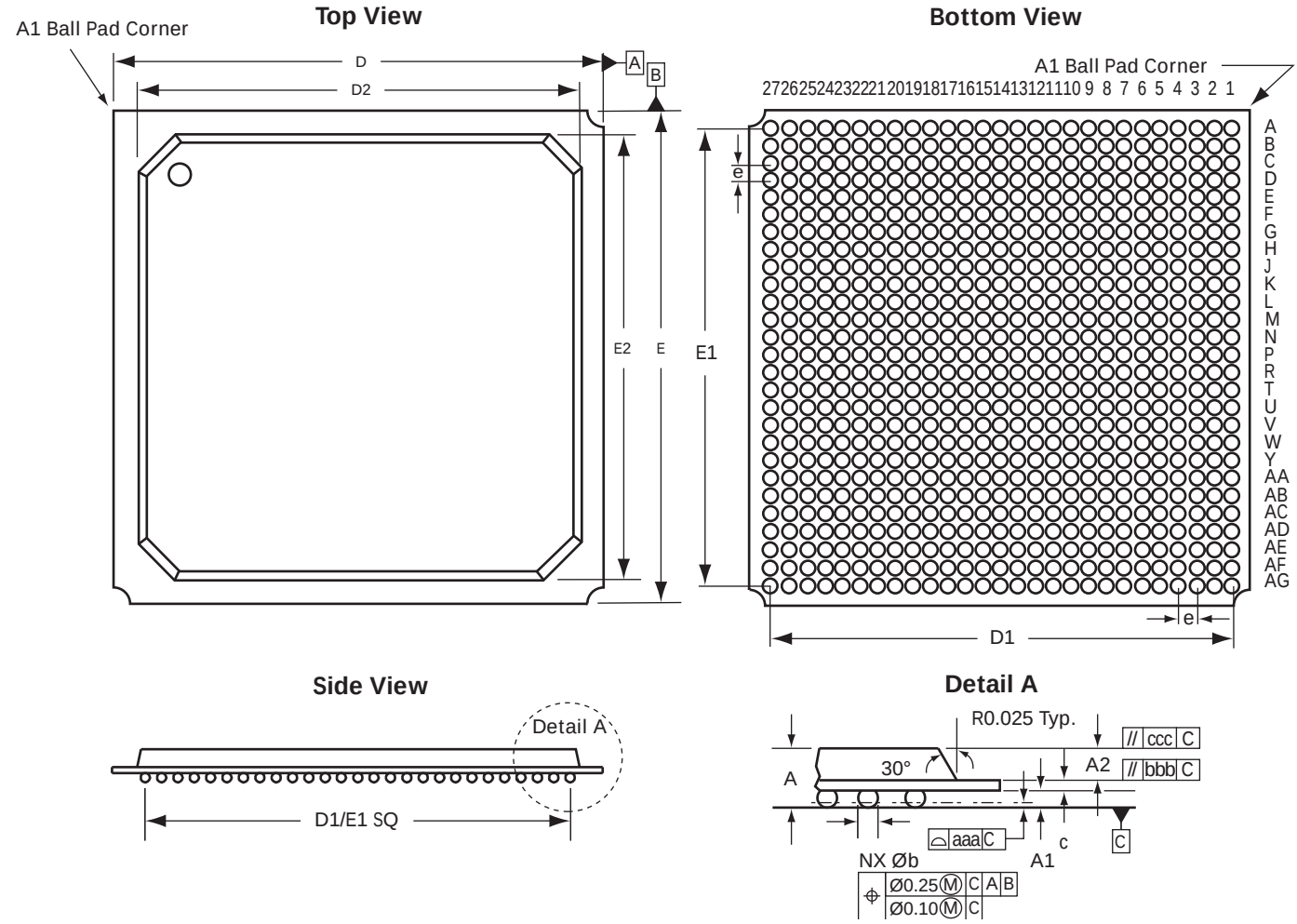
Note: Dimensions are in millimeters. Refer to the"Plastic Ball Grid Array Dimensions" section on page 51 for the dimensions.

Supported Devices	
A500K130*	APA150
A500K180*	APA300
A500K270*	APA450
	APA600
	APA750
	APA1000

*Note: *This product is obsolete.*

Plastic Ball Grid Array

BG729



Note: Dimensions are in millimeters. Refer to the "Plastic Ball Grid Array Dimensions" section on page 51 for the dimensions.

Supported Devices
AX1000

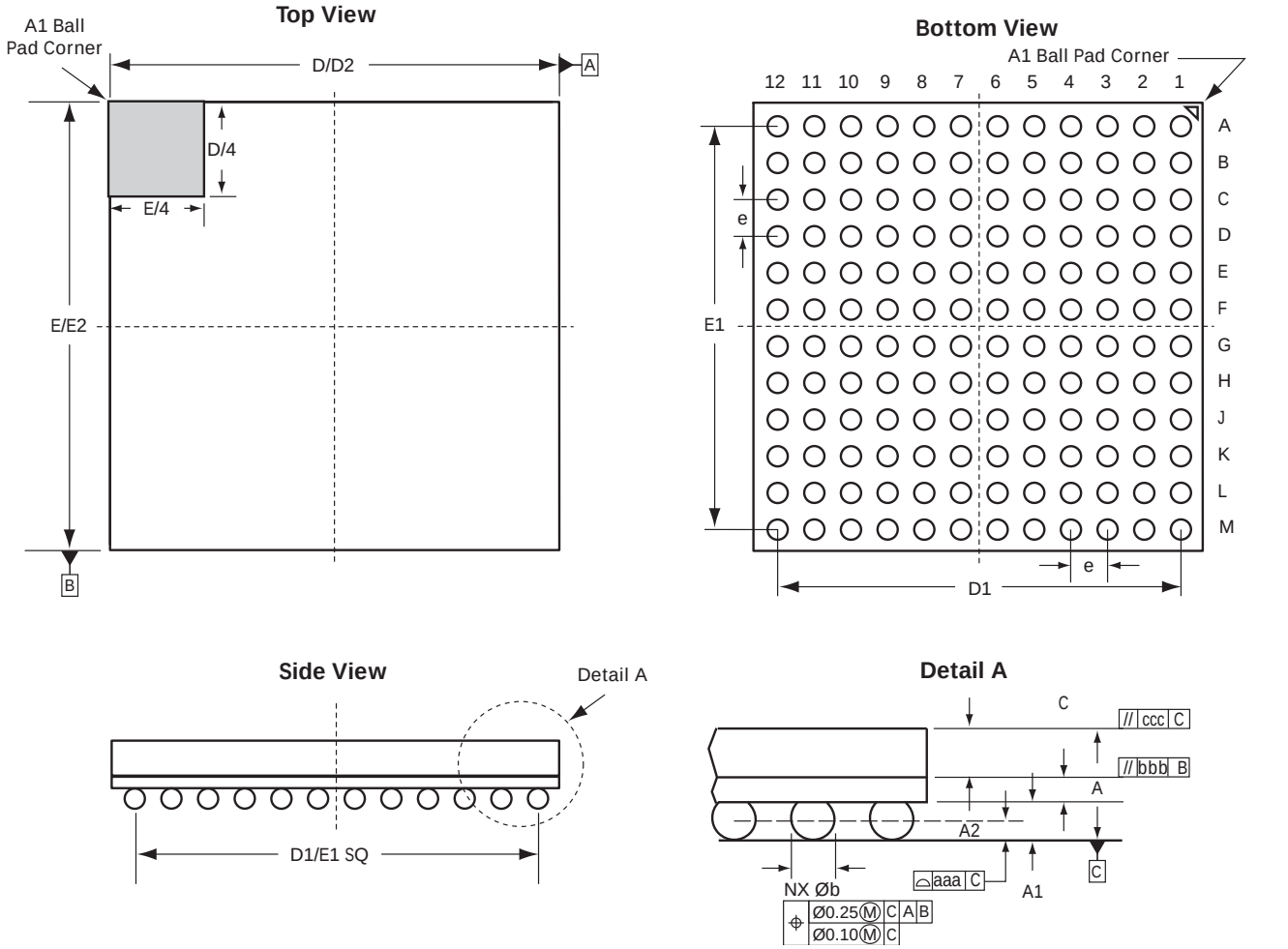
Plastic Ball Grid Array Dimensions

JEDEC Equivalent	BG272 MS-034 VAR BAL-2			BG313 MS-034			BG329 MS-034 VAR BAN-2			BG456 MS-034 VAR BAR-2		
Dimension	**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	BG729 MS-034 VAR BAR-1		
Dimensions	**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 (FBGA)

FG144



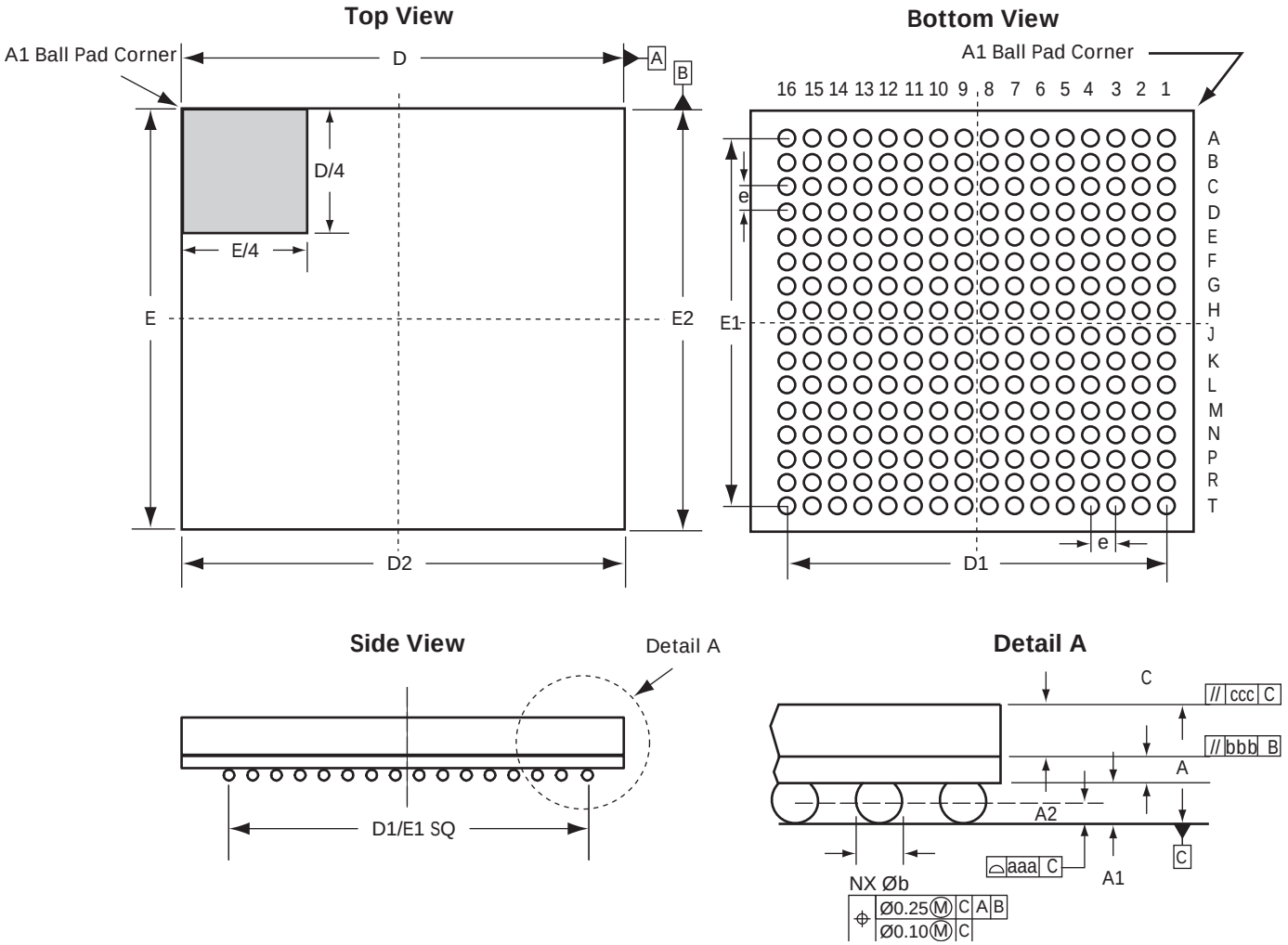
Note: Dimensions are in millimeters. Refer to the "Fine Pitch Plastic Ball Grid Array Dimensions" section on page 63 for the dimensions.

Supported Devices						
A54SX08	A500K050* A500K130*	APA075 APA150 APA300 APA450	A54SX08A A54SX16A A54SX32A	AGL060 AGL125 AGL250 AGL400 AGL600 AGL1000 M1AGL250 M1AGL600 M1AGL1000	A3P060 A3P125 A3P250 A3P400 A3P600 A3P1000 M1A3P250 M1A3P400 M1A3P600 M1A3P1000 M7A3P1000	A3P250L A3P600L A3P1000L M1A3P600L/ M1A3P1000L

*Note: *This product is obsolete.*

Fine Pitch Plastic Ball Grid Array

FG256 MO-192 VAR DAF1



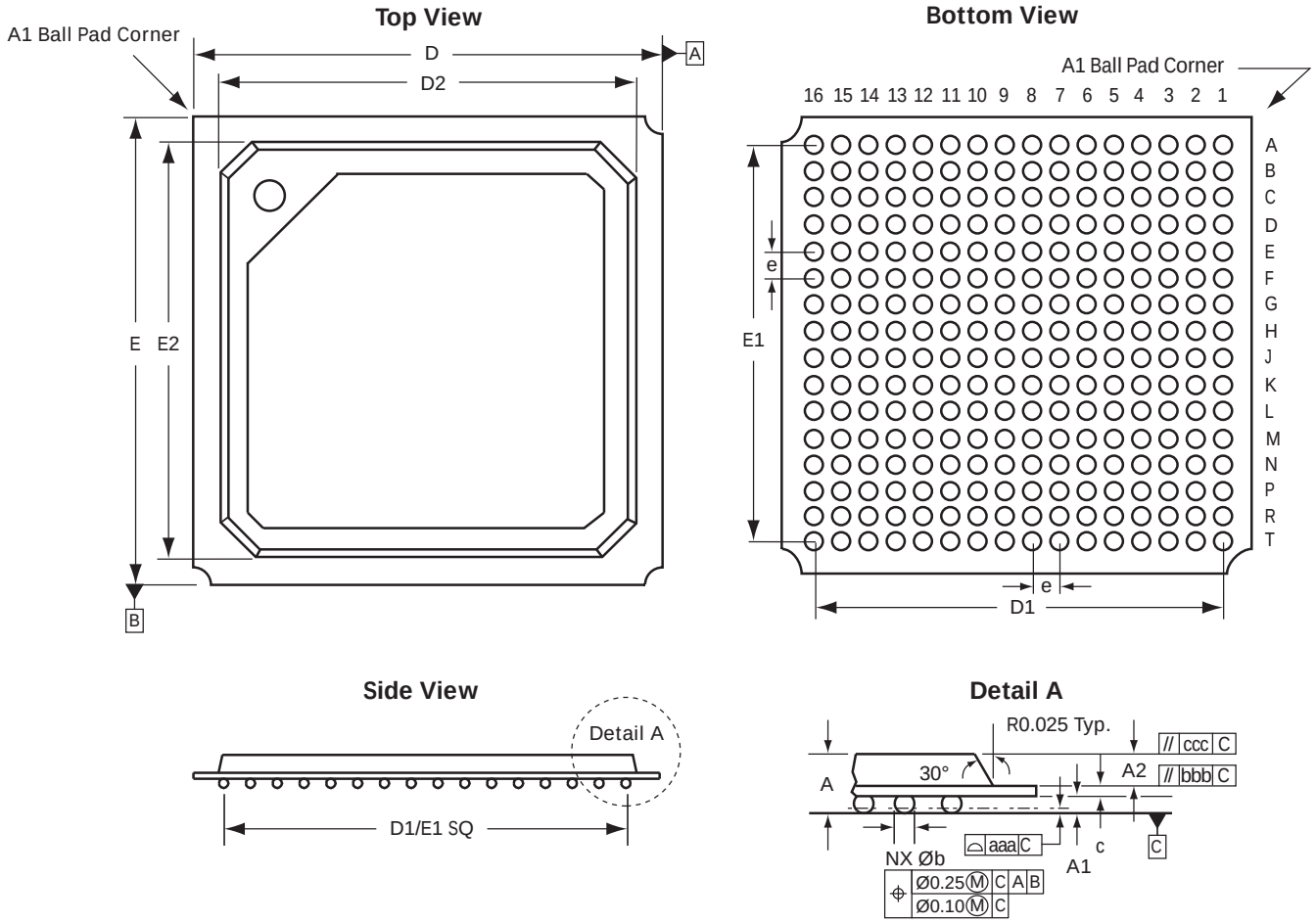
Note: Dimensions are in millimeters. Refer to the "Fine Pitch Plastic Ball Grid Array Dimensions" section on page 63 for the dimensions.

Supported Devices								
A500K130* A500K180* A500K270*	APA150 APA300 APA450 APA600	A54SX16A	AX125 AX250	AGL400 AGL600 AGL1000 M1AGL600 M1AGL1000 AGLE600	A3P250 A3P400 A3P600 A3P1000 M1A3P400 M1A3P600 M1A3P1000 M7A3P1000 A3PE600	A3P250L A3P600L A3P1000L M1A3P600L M1A3P1000L	AFS090 AFS250 AFS600 AFS1500 M1AFS250 M1AFS600 M1AFS1500 M7AFS600	A2F060 A2F200 A2F500

*Note: *This product is obsolete.*

Fine Pitch Plastic Ball Grid Array

FG256 MS-034 VAR AAF-1

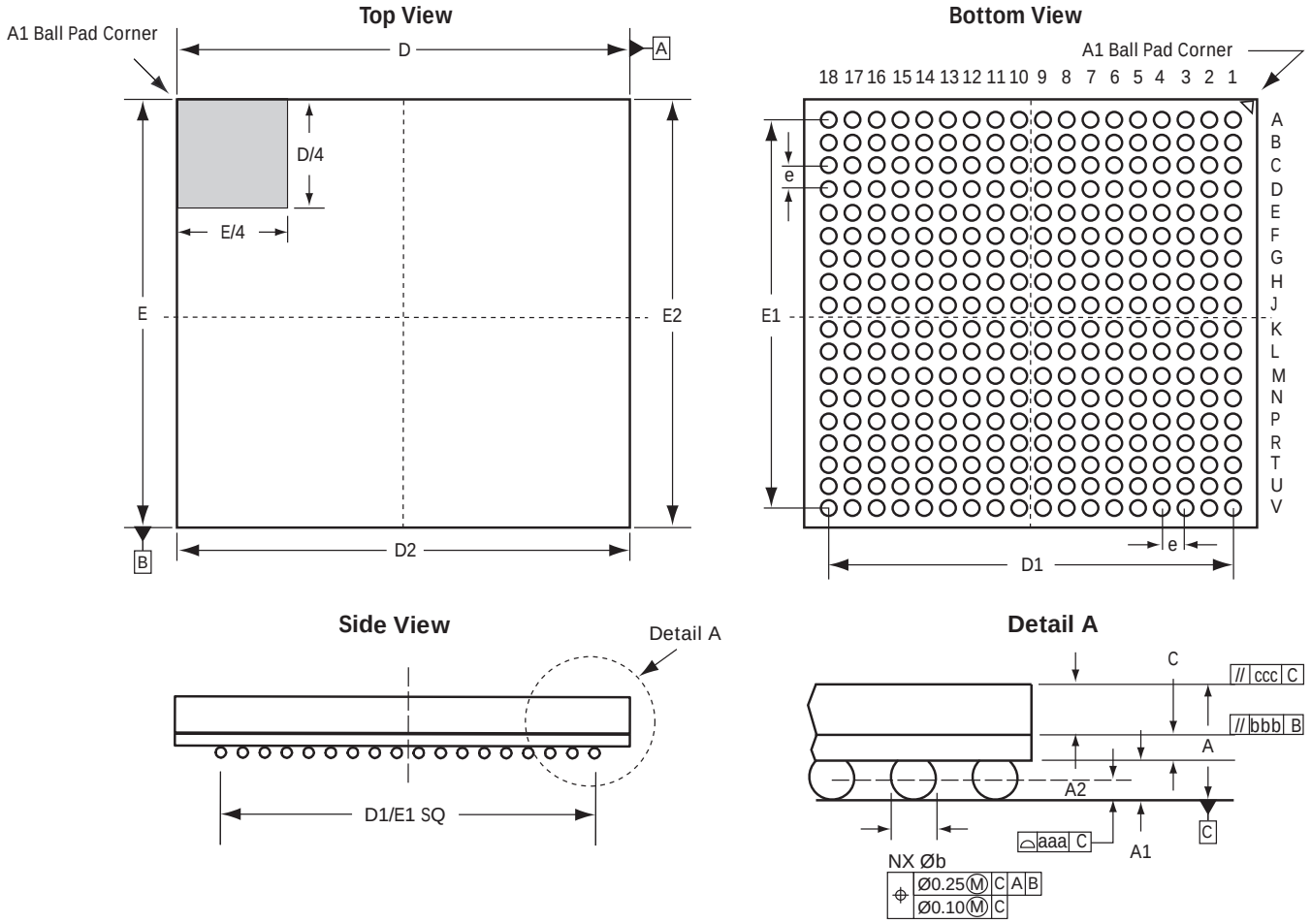


Note: Dimensions are in millimeters. Refer to the "Fine Pitch Plastic Ball Grid Array Dimensions" section on page 63 for the dimensions.

Supported Devices
A54SX32A
A54SX72A

Fine Pitch Plastic Ball Grid Array

FG324

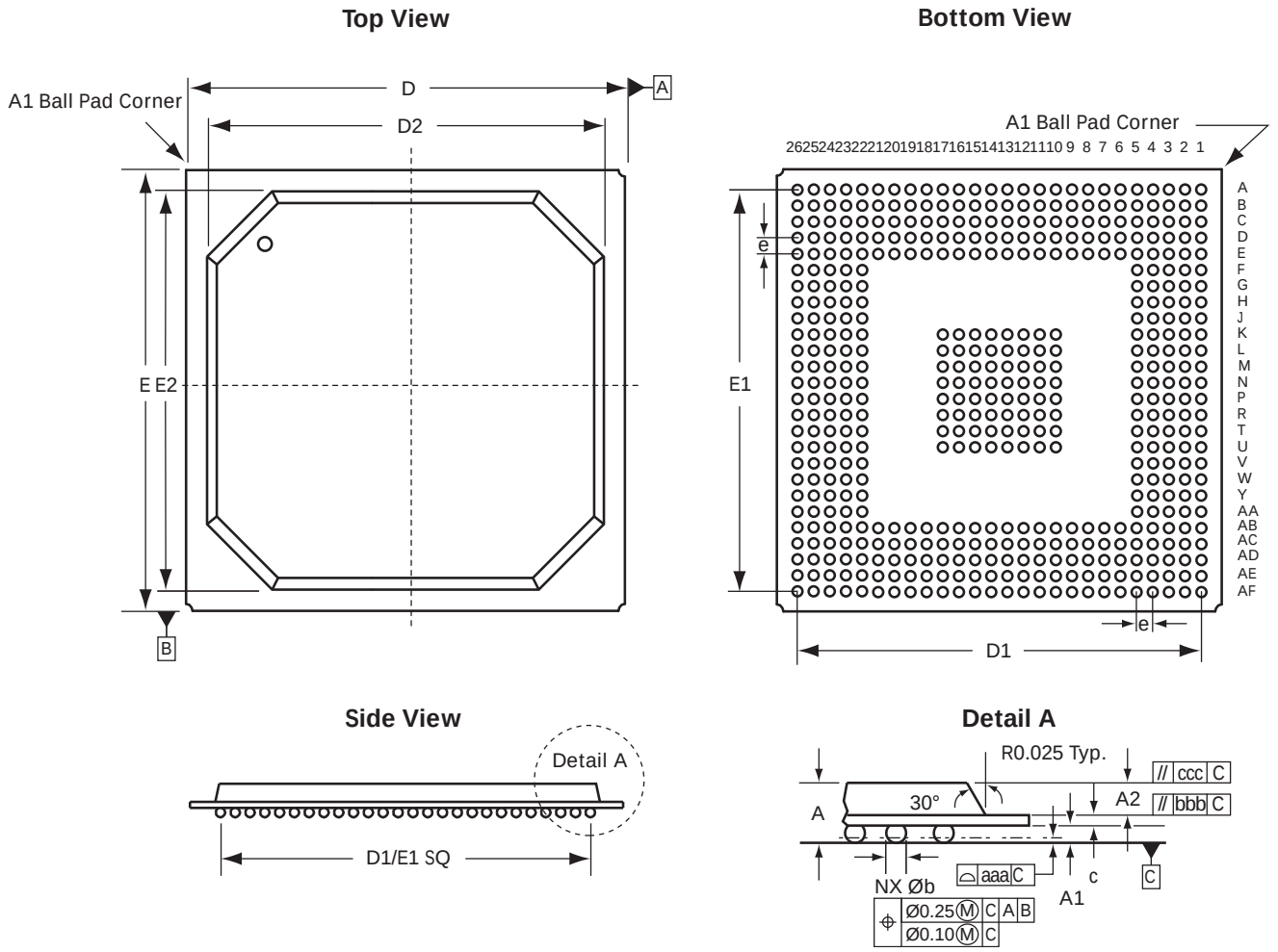


Note: Dimensions are in millimeters. Refer to the "Fine Pitch Plastic Ball Grid Array Dimensions" section on page 63 for the dimensions.

Supported Devices		
AX125	A3PE3000 M1A3PE3000	A3PE3000L M1A3PE3000L

Fine Pitch Plastic Ball Grid Array

FG484 MS-034 VAR AAL-1

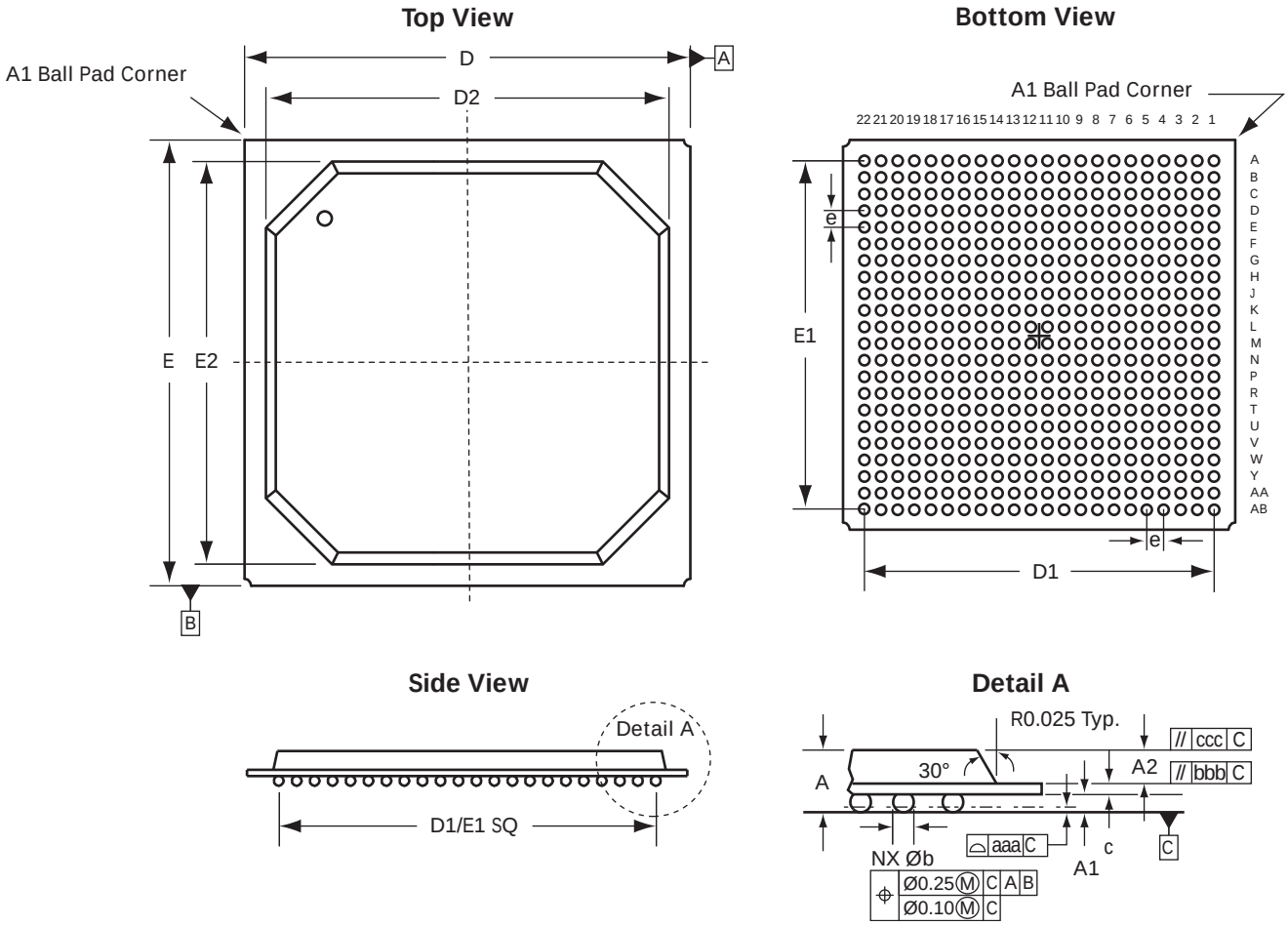


Note: Dimensions are in millimeters. Refer to the "Fine Pitch Plastic Ball Grid Array Dimensions" section on page 63 for the dimensions.

Supported Devices
A54SX32A
A54SX72A

Fine Pitch Plastic Ball Grid Array

FG484—Fully Populated MS-034 VAR AAJ-1

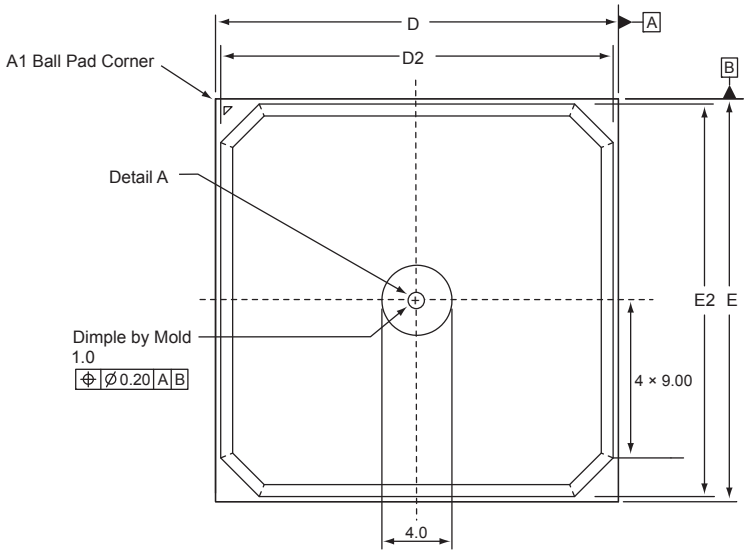


Note: Dimensions are in millimeters. Refer to the "Fine Pitch Plastic Ball Grid Array Dimensions" section on page 63 for the dimensions.

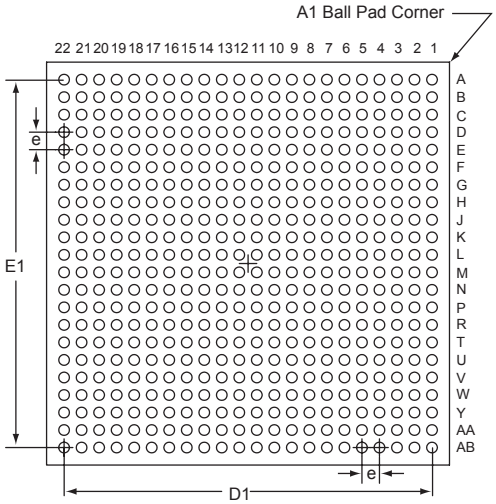
Supported Devices							
APA450 APA600	AX250 AX500 AX1000	AGL400 AGL600 AGL1000 M1AGL600 M1AGL1000 AGLE600 AGLE3000 M1AGLE3000	A3P400 A3P600 A3P1000 M1A3P400 M1A3P600 M1A3P1000 M7A3P1000	A3PE600 A3PE1500 A3PE3000 M1A3PE1500 M1A3PE3000 A3PE600L A3PE3000L M1A3PE3000L	A3P600L A3P1000L M1A3P600L M1A3P1000L	AFS600 AFS1500 M1AFS600 M1AFS1500 M7AFS600	A2F200 A2F500

FG484—Fully Populated MS-034 VAR AAJ-1, Larger Mold Cap Size

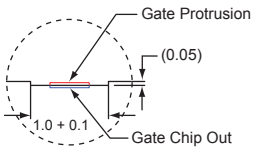
Top View



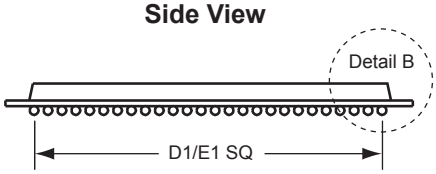
Bottom View



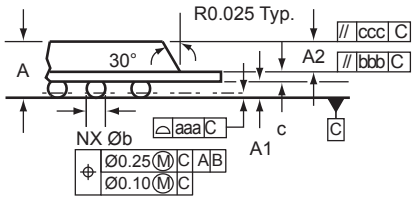
Detail A



Side View



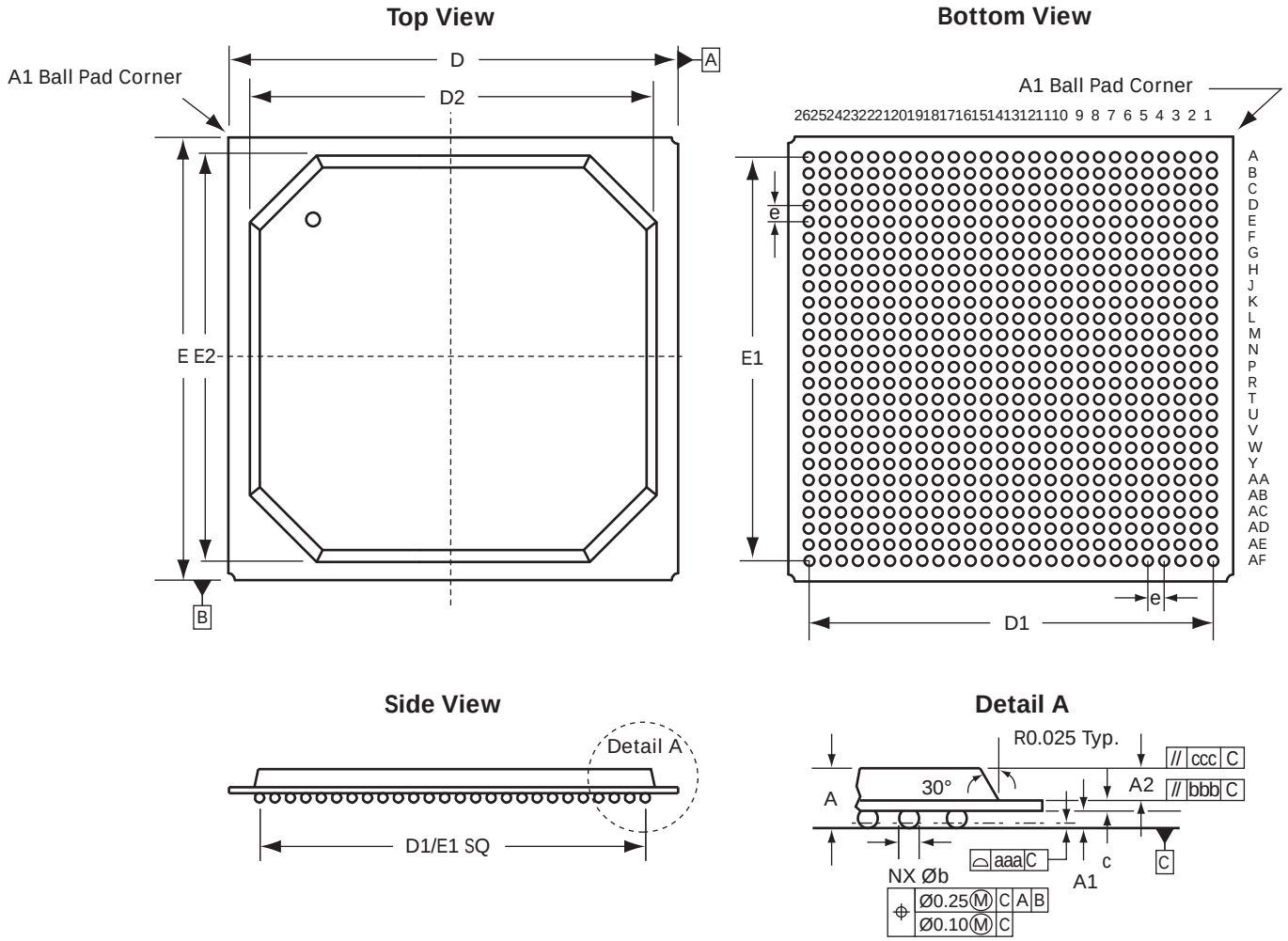
Detail B



Supported Devices
M2S005
M2S010
M2S025
M2S050

Fine Pitch Plastic Ball Grid Array

FG676



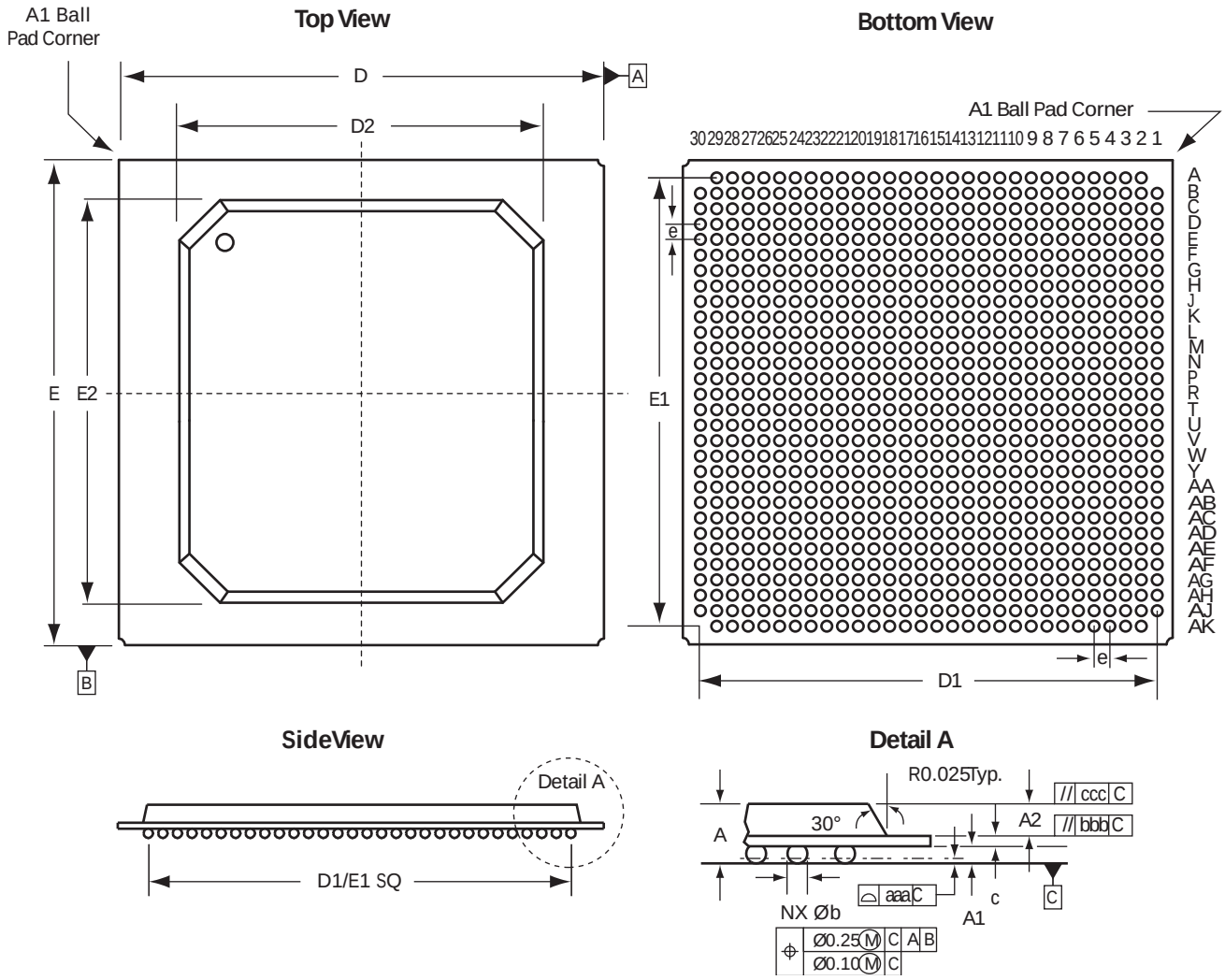
Note: Dimensions are in millimeters. Refer to the "Fine Pitch Plastic Ball Grid Array Dimensions" section on page 63 for the dimensions.

Supported Devices				
A500K270*	APA600 APA750	AX500 AX1000	A3PE1500 M1A3PE1500	AFS1500 M1AFS1500

*Note: *This product is obsolete.*

Fine Pitch Plastic Ball Grid Array

FG896

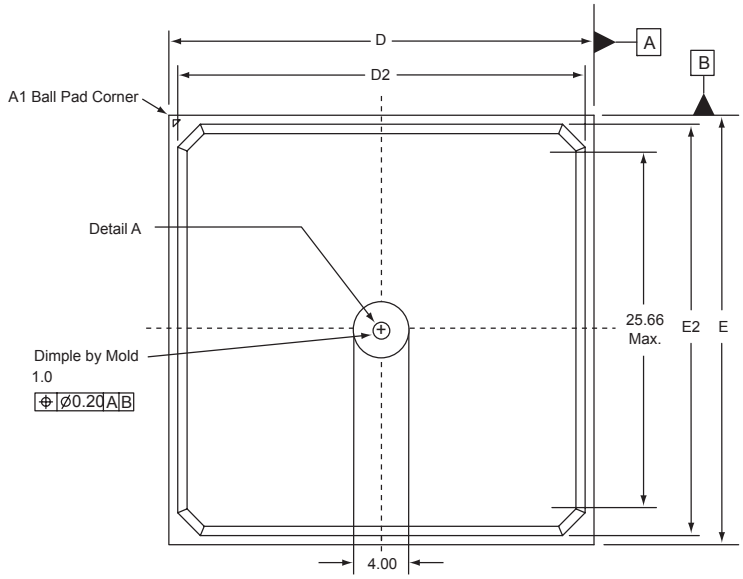


Note: Dimensions are in millimeters. Refer to the "Fine Pitch Plastic Ball Grid Array Dimensions" section on page 63 for the dimensions.

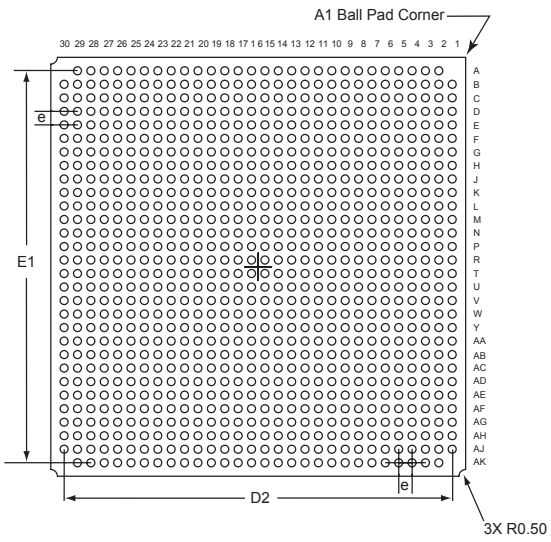
Supported Devices				
APA750 APA1000	AX1000 AX2000	AGLE3000 M1AGLE3000	A3PE3000 M1A3PE3000	A3PE3000L M1A3PE3000L

FG896—Larger Mold Cap Size

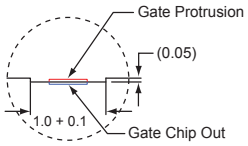
Top View



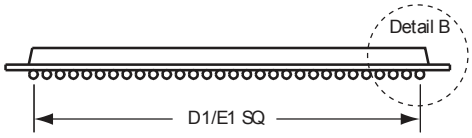
Bottom View



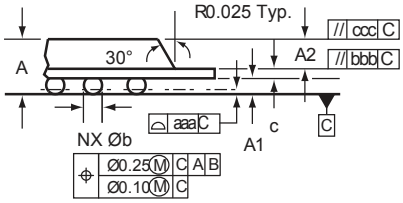
Detail A



Side View



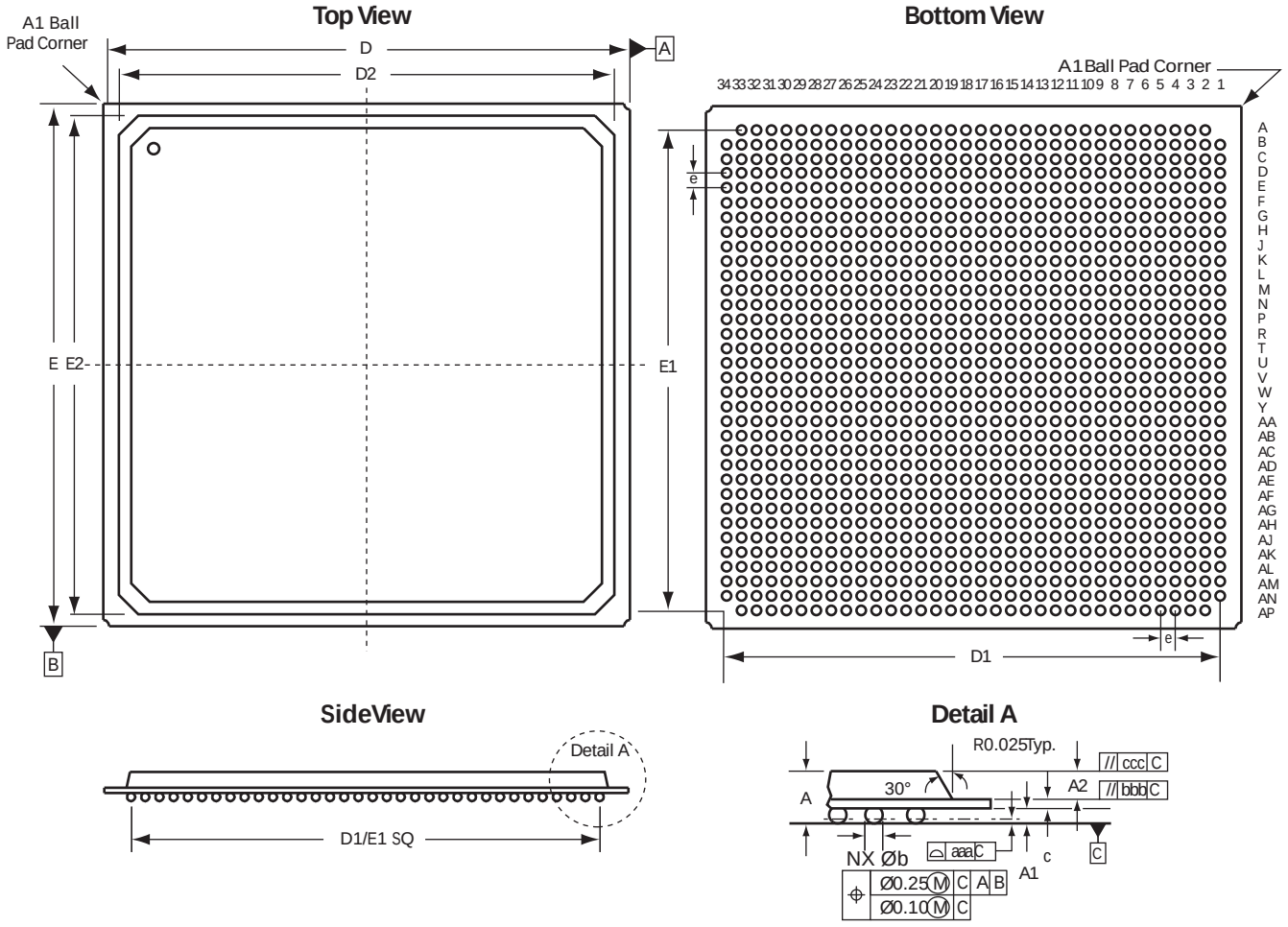
Detail B



Supported Devices
M2S050

Fine Pitch Plastic Ball Grid Array

FG1152



Note: Dimensions are in millimeters. Refer to the "Fine Pitch Plastic Ball Grid Array Dimensions" section on page 63 for the dimensions.

Supported Devices	
APA1000	AX2000

Fine Pitch Plastic Ball Grid Array Dimensions

JEDEC Equivalent	FG144 (page 52) MO-192 VAR DAD-1			FG256 (page 53) MO-192 VAR DAF1			FG256 (page 54) MS-034 VAR AAF-1			FG324 (page 55) MS-034 VAR AAG-1		
Dimension	**Min.**	**Nom.**	**Max.**	**Min.**	**Nom.**	**Max.**	**Min.**	**Nom.**	**Max.**	**Min.**	**Nom.**	**Max.**
A	1.35	1.45	1.55	1.35	1.60	1.70	1.55	1.76	1.97	1.48	1.63	1.78
A1	0.35	0.40	0.45	0.25	0.40	–	0.30	0.40	0.50	0.33	0.38	0.43
A2	0.65	0.70	0.75	0.65	0.70	0.75	0.75	0.80	0.85	0.65	0.70	0.75
aaa	0.10			0.12			0.20			0.20		
b	0.45	0.50	0.55	0.45	0.50	0.55	0.40	0.50	0.60	0.49	0.54	0.59
bbb	0.25			0.25			0.25			0.25		
c	–	0.35	–	0.40	0.50	0.60	0.50	0.56	0.62	0.50	0.55	0.60
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	18.80	19.00	19.20
D1	11.00 BSC			15.00 BSC			15.00 BSC			17.00 BSC		
D2	12.80	13.00	13.20	16.80	17.00	17.20	14.80	15.00	15.20	18.80	19.00	19.20
E	12.80	13.00	13.20	16.80	17.00	17.20	16.80	17.00	17.20	18.80	19.00	19.20
E1	11.00 BSC			15.00 BSC			15.00 BSC			17.00 BSC		
E2	12.80	13.00	13.20	16.80	17.00	17.20	14.80	15.00	15.20	18.80	19.00	19.20
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.*
3. *For FG484 the land pad metal size is 0. 57mm with 0.45 mm land pad open. This is specific only to FG484.*

JEDEC Equivalent	FG484 (page 56) MS-034 VAR AAL-1			FG484 (page 57) (23x23 Fully Populated) MS-034 VAR AAJ-1			FG484 (page 58) (23x23 Fully Populated MS-034 VAR AAJ-1 with Larger Mold Cap			FG676 (page 59) MS-034 VAR AAL-1		
Dimension	**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	.040	.050	.060	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			0.15			0.20		
b	0.50	0.63	0.70	0.50	0.63	0.70	0.50	0.61	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	26.80	27.00	27.20	22.80	23.00	23.20	22.80	23.00	23.20	26.80	27.00	27.20
D1	25.00 BSC			21.00 BSC			21.00 BSC			25.00 BSC		
D2	23.80	24.00	24.20	19.45	19.50	20.20	22.35	22.40	22.75	23.95	24.00	24.70
E	26.80	27.00	27.20	22.80	23.00	23.20	22.80	23.00	23.30	26.80	27.00	27.20
E1	25.00 BSC			21.00 BSC			21.00 BSC			25.00 BSC		
E2	23.80	24.00	24.20	19.45	19.50	20.20	22.35	22.40	22.75	23.95	24.00	24.70
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.*
3. *For FG484 the land pad metal size is 0. 57mm with 0.45 mm land pad open. This is specific only to FG484.*

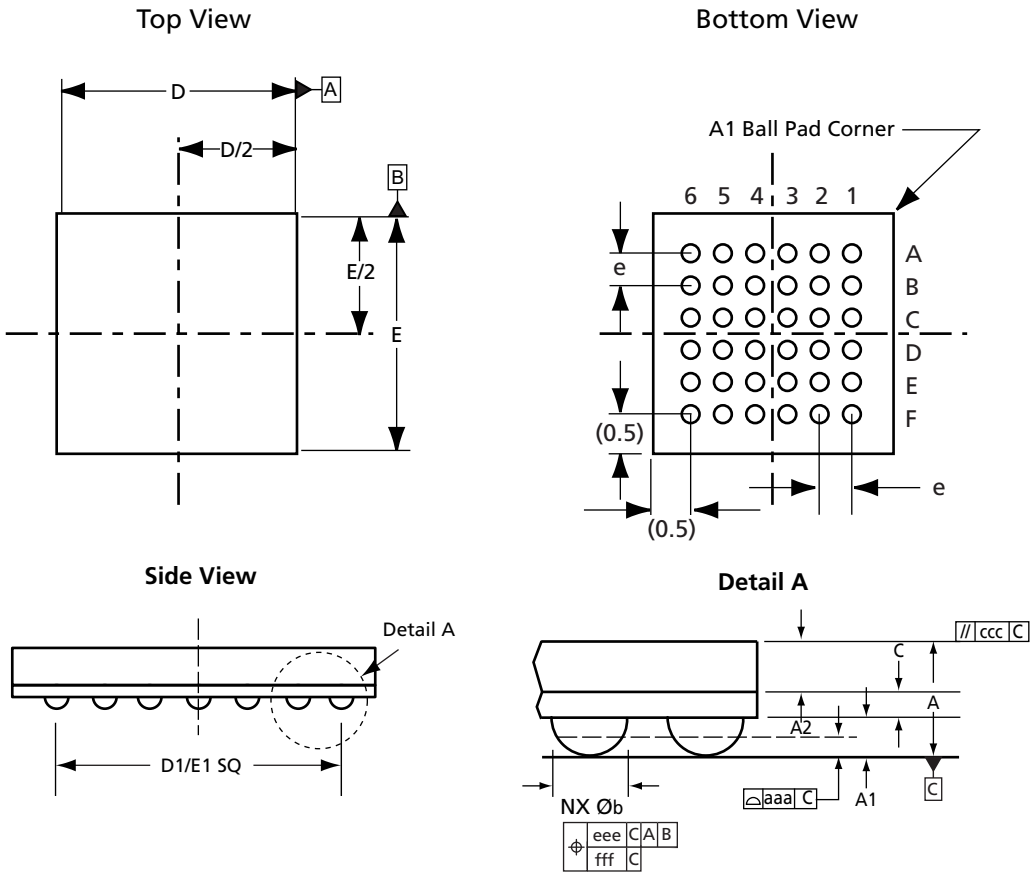
JEDEC Equivalent	FG896 (page 60) MS-034 VAR AAN-1			FG896 (page 61) MS-034 VAR AAN-1 with Larger Mold Cap			FG1152 (page 62) MS-034 VAR AAR-1		
Dimension	**Min.**	**Nom.**	**Max.**	**Min.**	**Nom.**	**Max.**	**Min.**	**Nom.**	**Max.**
A	2.02	2.23	2.44	2.02	2.23	2.44	2.02	2.23	2.44
A1	0.40	0.50	0.60	0.40	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
aaa		0.20			0.15			0.20	
b	0.50	0.63	0.70	0.50	0.61	0.70	0.50	0.63	0.70
bbb		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
ccc		0.35			0.35			0.35	
D	30.80	31.00	31.20	30.80	31.00	31.20	34.80	35.00	35.20
D1		29.00 BSC			29.00 BSC			33.00 BSC	
D2 (option 1)[3]	25.95	26.00	26.70	29.65	29.70	30.05	33.65	33.70	34.20
D2 (option 2)[3]	28.80	29.00	29.20						
E	30.80	31.00	31.20	30.80	31.00	31.20	34.80	35.00	35.20
E1		29.00 BSC			29.00 BSC			33.00 BSC	
E2 (option 1)[3]	25.95	26.00	26.70	29.65	29.70	30.05	33.65	33.70	34.20
E2 (option 2)[3]	28.80	29.00	29.20						
e		1.00 typ.			1.00 typ.			1.00 typ.	

Notes:

1. *All dimensions are in millimeters.*
2. *BSC = Basic spacing between centers.*
3. *Per JEDEC specification MS-034, a different lid size is allowed (D2/E2) for FG896.*

Chip Scale Package (UC/CS/VF)

UC36

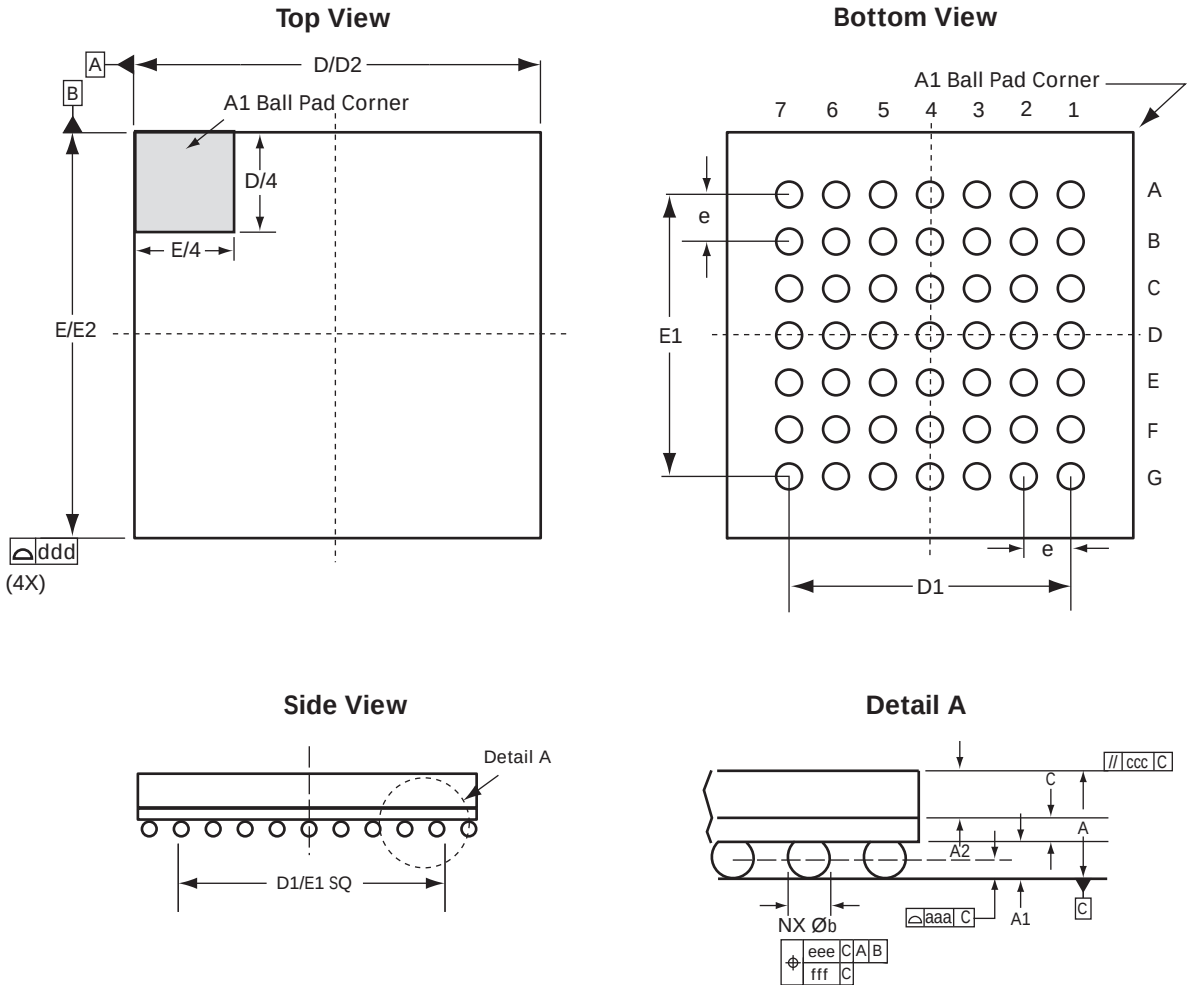


Note: Dimensions are in millimeters. Refer to the "Chip Scale Package Dimensions" section on page 78 for the dimensions.

Supported Devices
AGLN010

Chip Scale Package

CS49



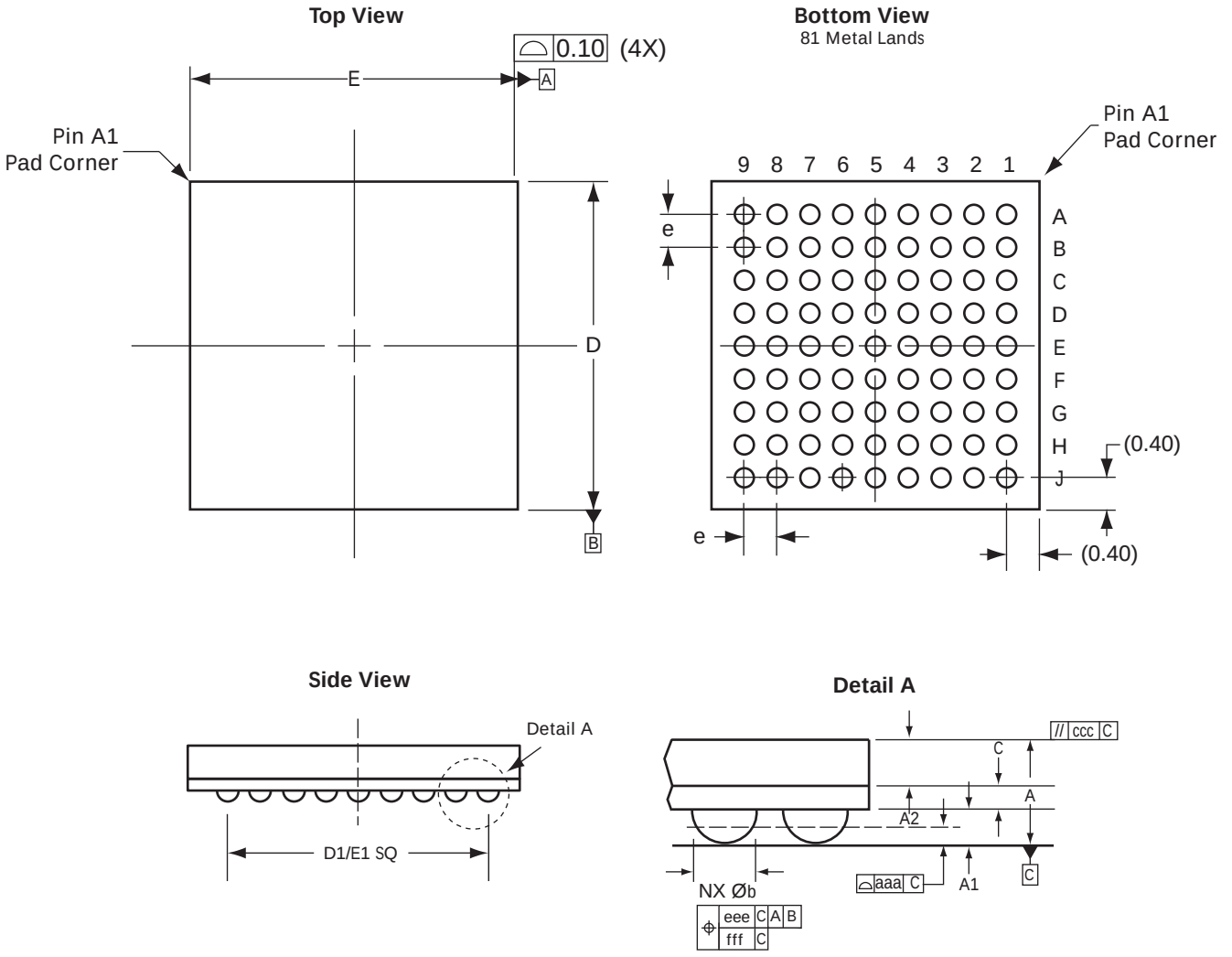
Note: Dimensions are in millimeters. Refer to the "Chip Scale Package Dimensions" section on page 78 for the dimensions.

Supported Devices
eX64* eX128*

*Note: *This product is obsolete*

Chip Scale Package

UC81

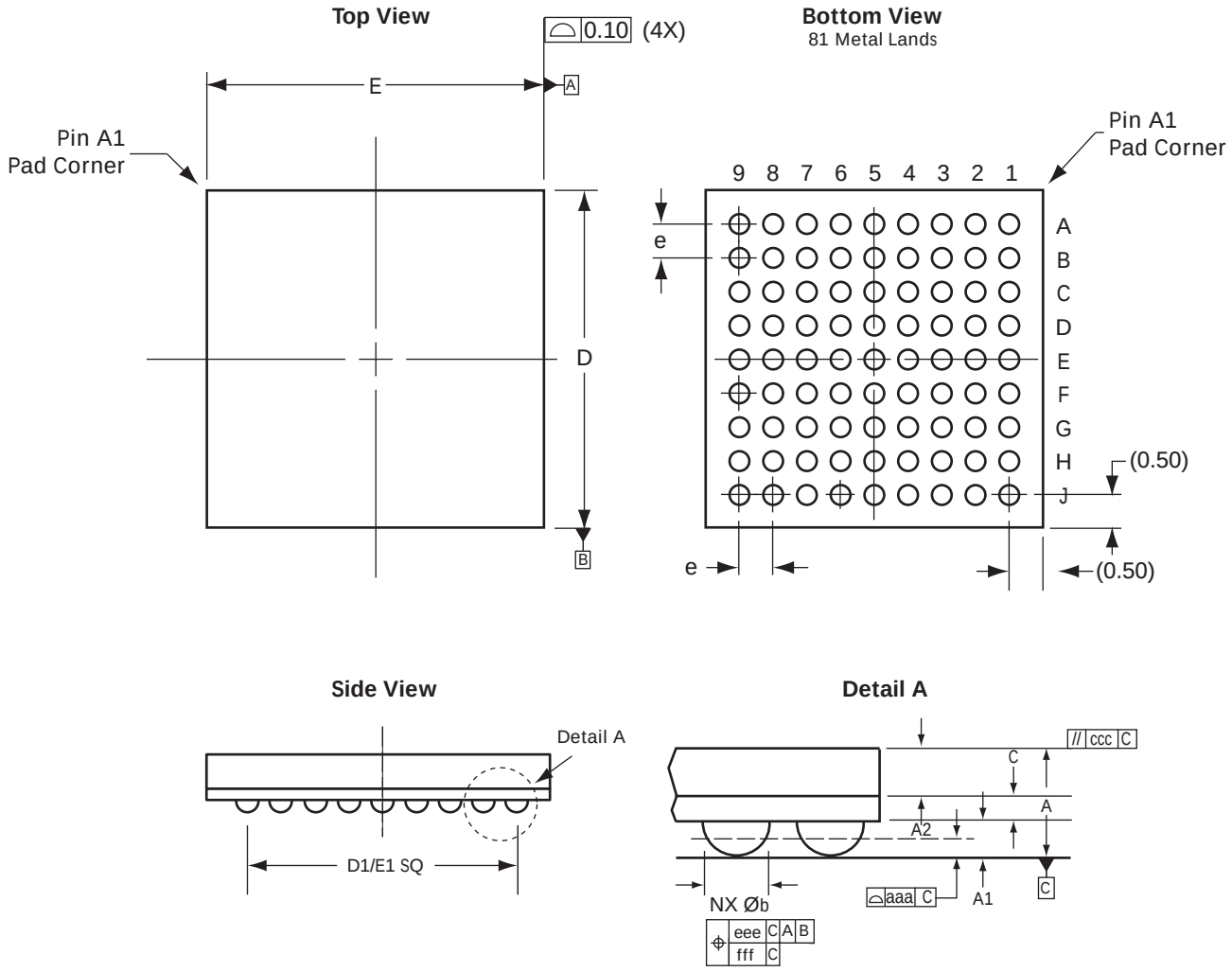


Note: Dimensions are in millimeters. Refer to the "Chip Scale Package Dimensions" section on page 78 for the dimensions.

Supported Devices	
AGL030	AGLN020 AGLN030

Chip Scale Package

CS81

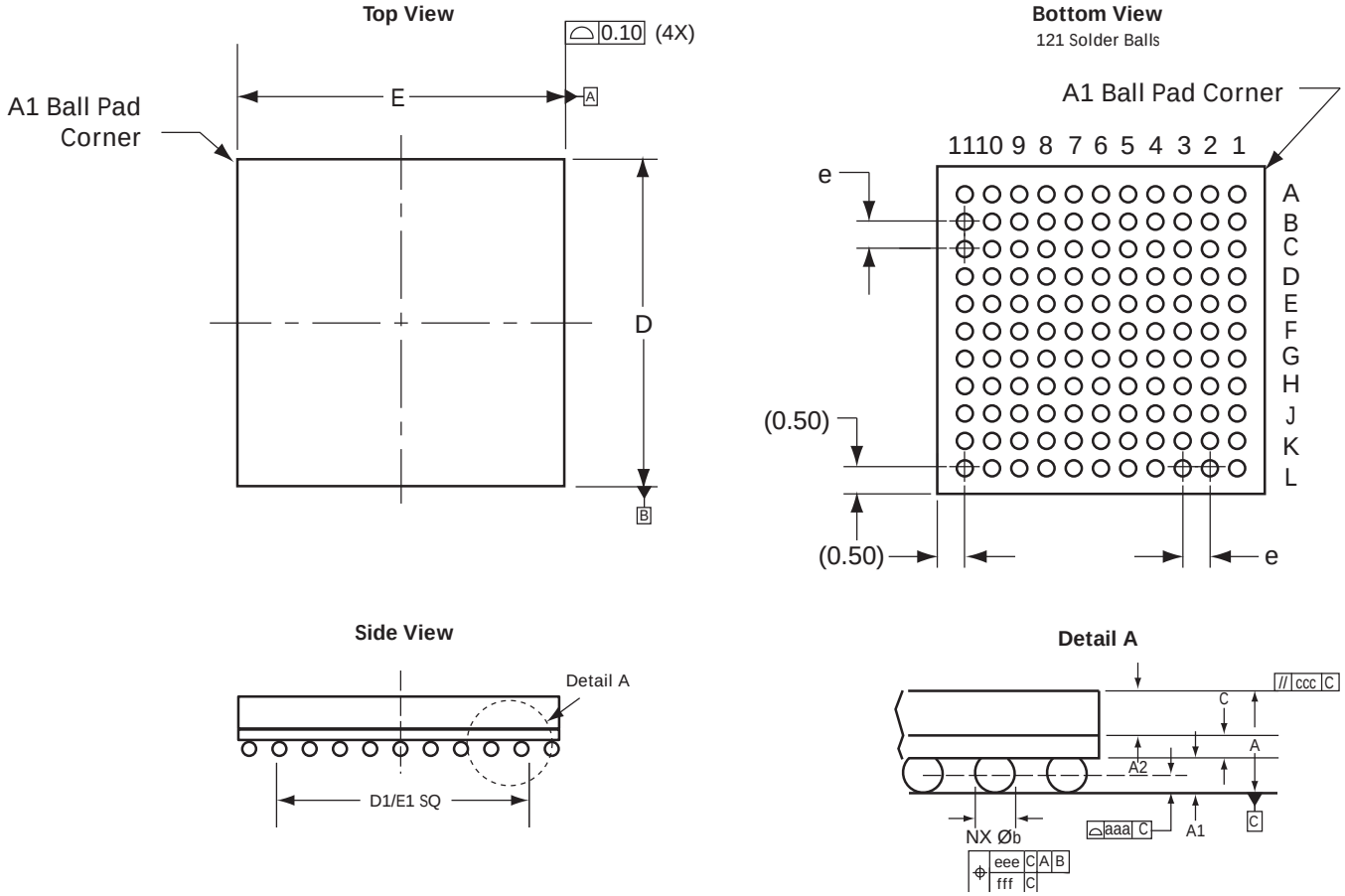


Note: Dimensions are in millimeters. Refer to the "Chip Scale Package Dimensions" section on page 78 for the dimensions.

Supported Devices	
AGL030 AGL250	AGLN020 AGLN030 AGLN060 AGLN125 AGLN250

Chip Scale Package

CS121

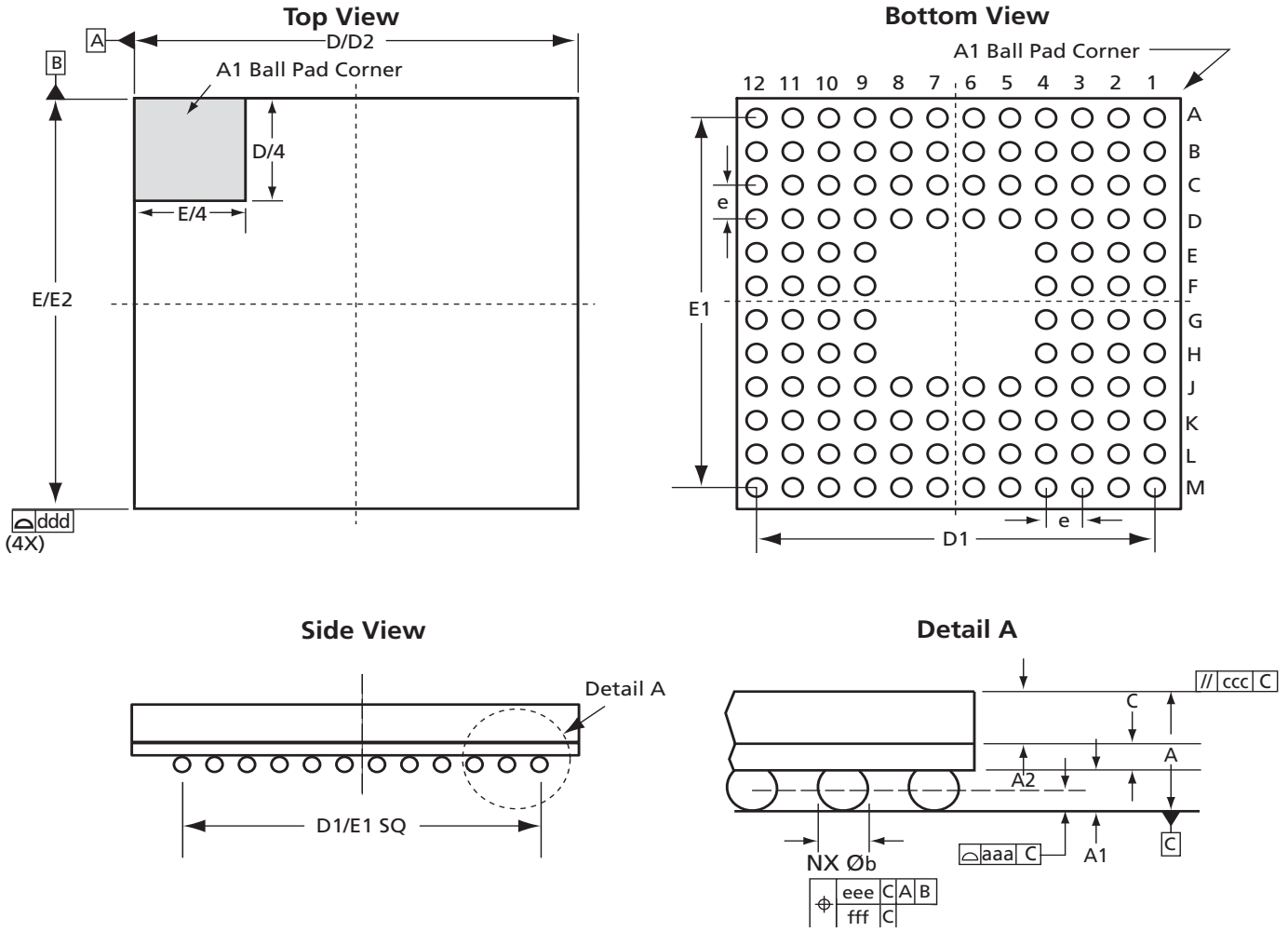


Note: Dimensions are in millimeters. Refer to the "Chip Scale Package Dimensions" section on page 78 for the dimensions.

Supported Devices
AGL060

Chip Scale Package

CS128



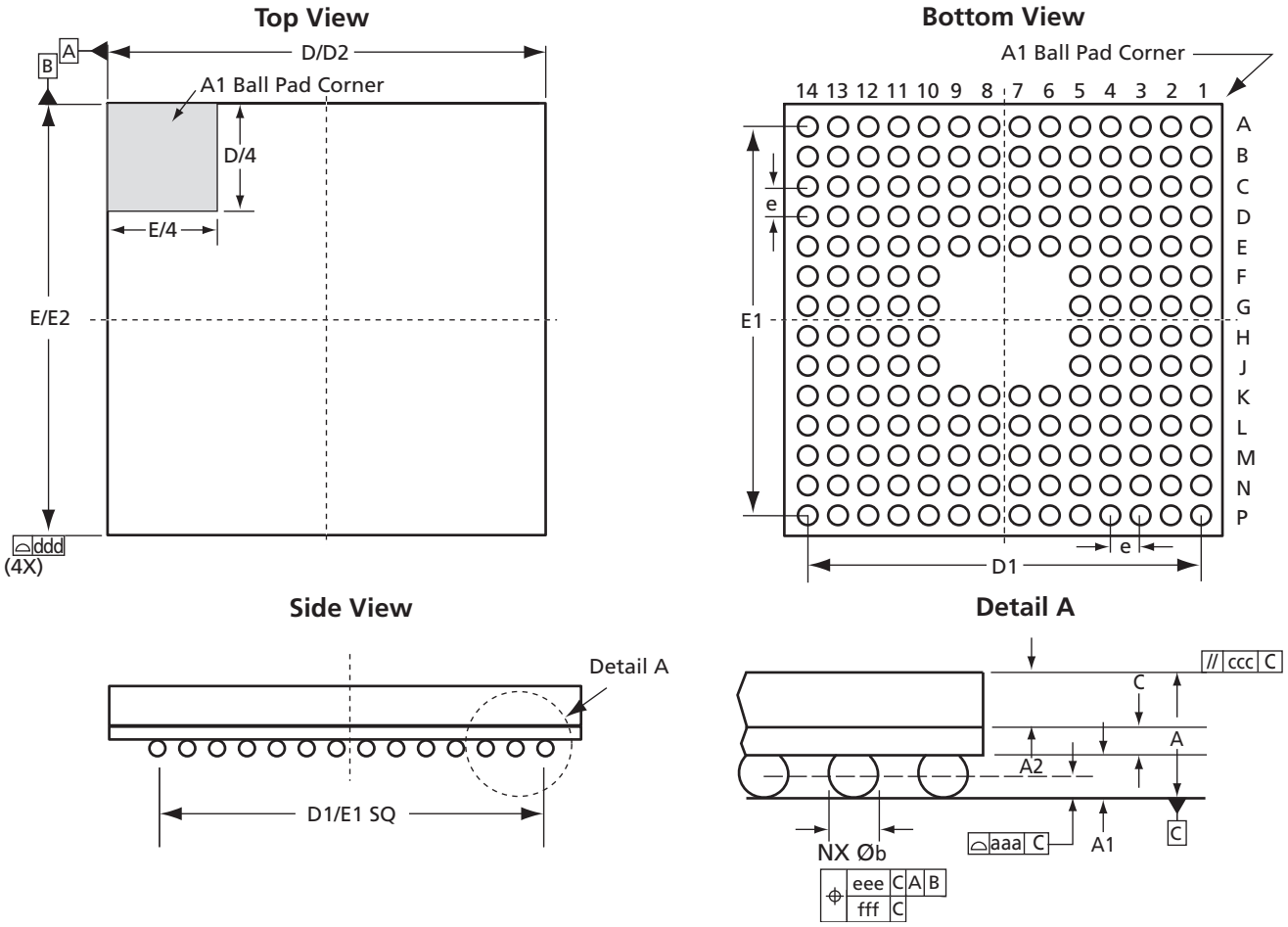
Note: *Dimensions are in millimeters. Refer to the "Chip Scale Package Dimensions" section on page 78 for the dimensions.*

Supported Devices
eX64*
eX128*
eX256*

Note: *This product is obsolete

Chip Scale Package

CS180



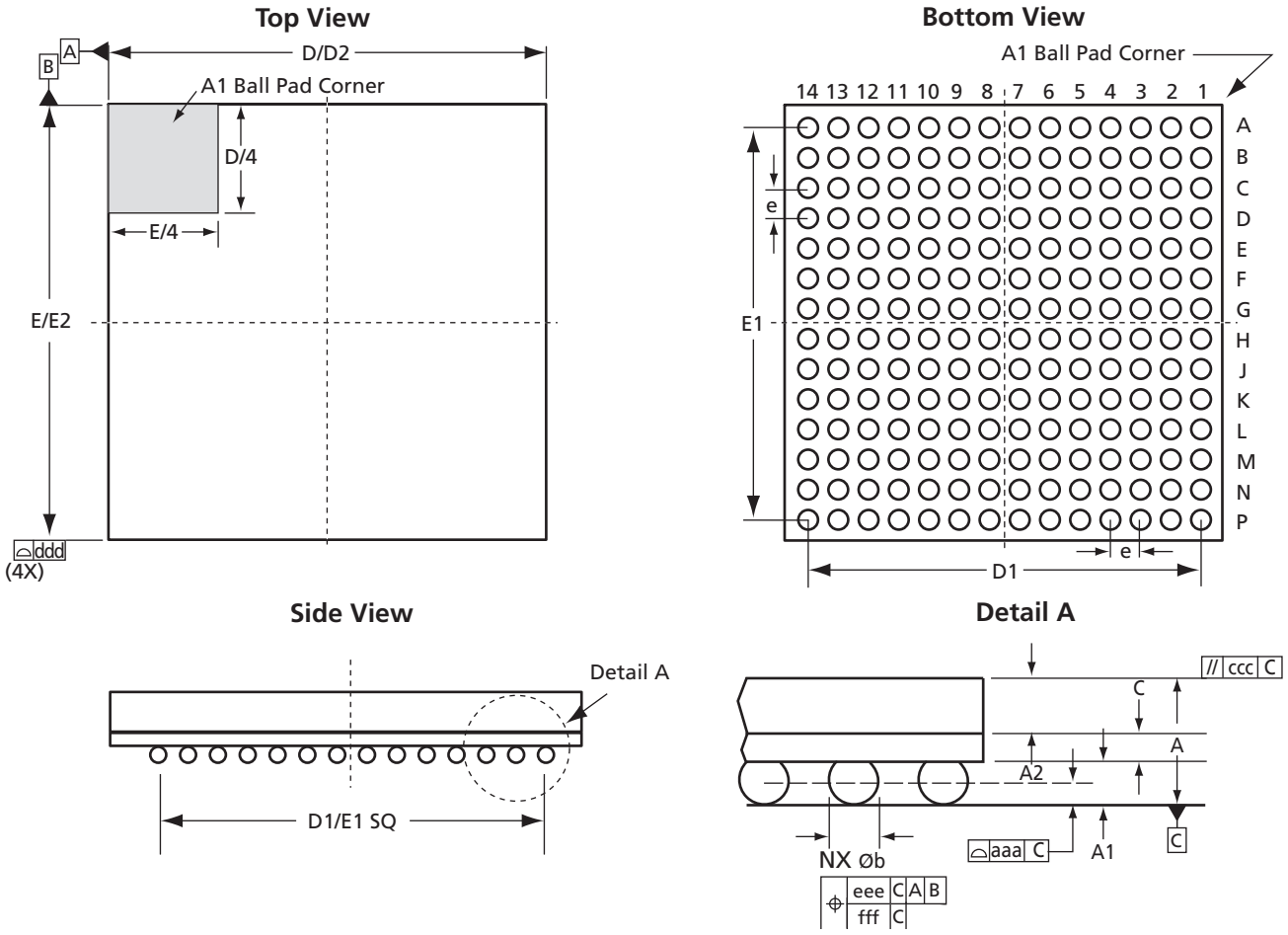
Note: Dimensions are in millimeters. Refer to the "Chip Scale Package Dimensions" section on page 78 for these dimensions.

Supported Devices	
eX256*	AX125*

Note: *This product is obsolete.

Chip Scale Package

CS196

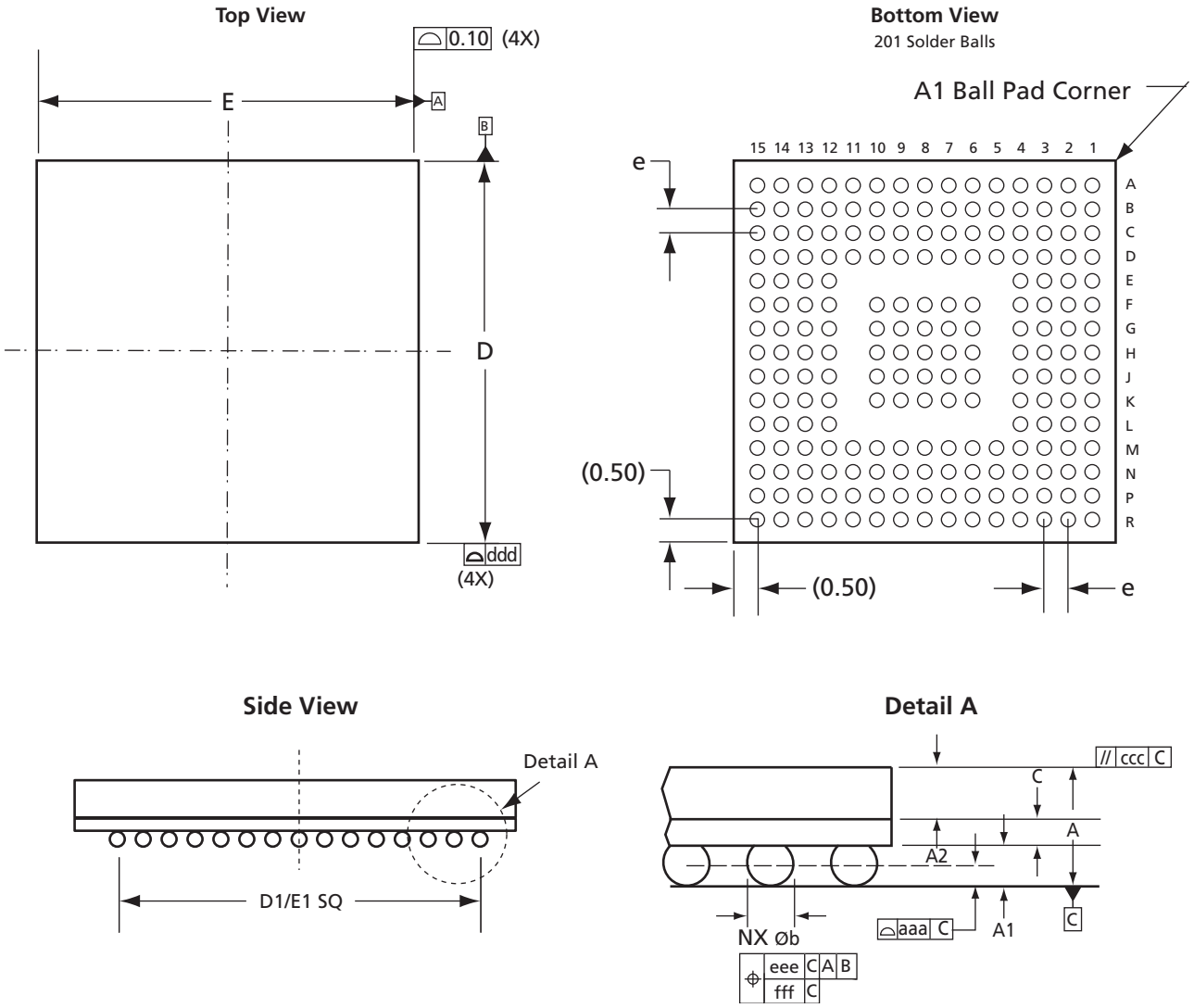


Note: Dimensions are in millimeters. Refer to the "Chip Scale Package Dimensions" section on page 78 for these dimensions.

Supported Devices
AGL125
AGL250
AGL400

Chip Scale Package

CS201

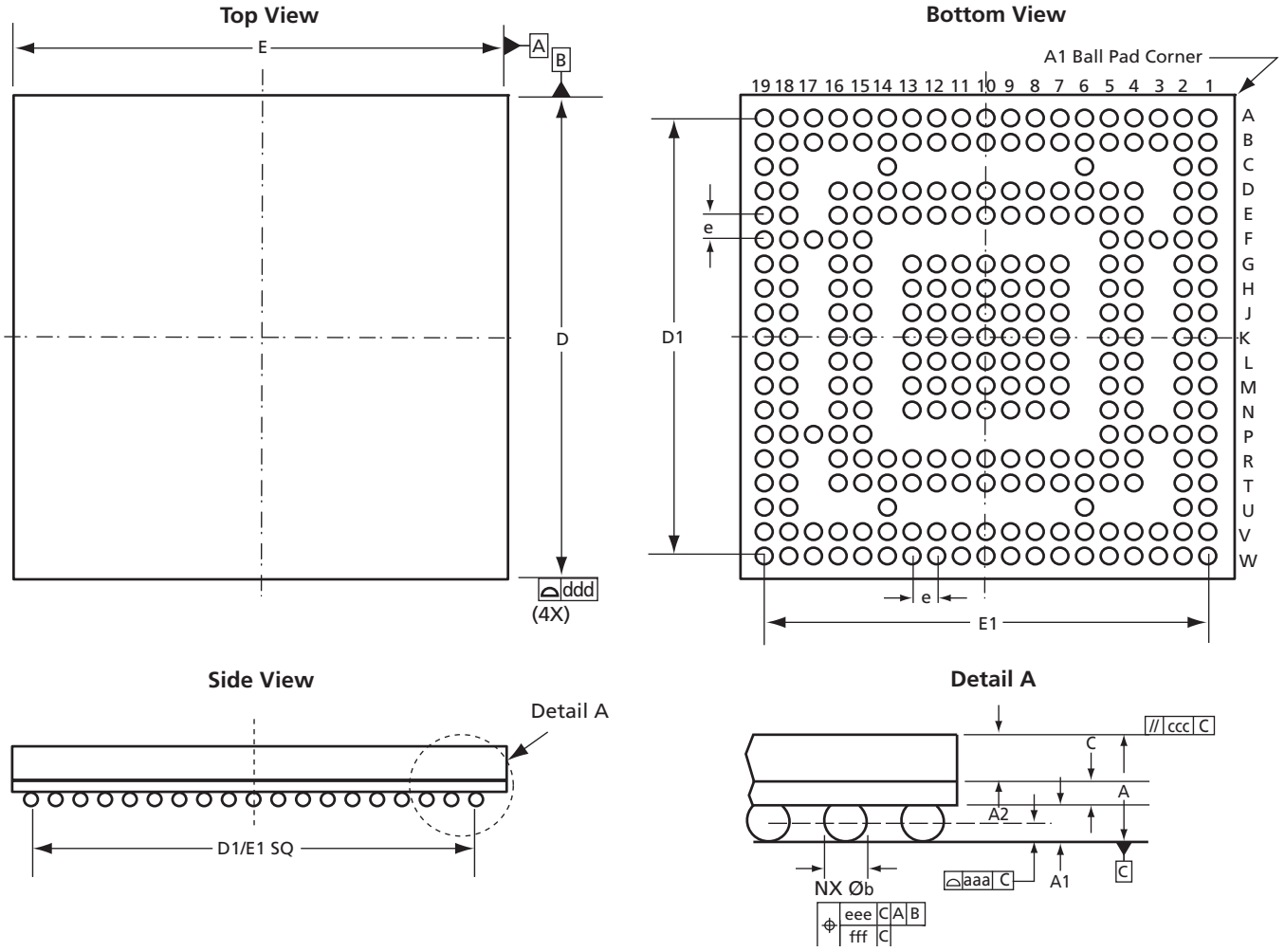


Note: Dimensions are in millimeters. Refer to the "Chip Scale Package Dimensions" section on page 78 for these dimensions.

Supported Devices
AGLP030
AGLP060

Chip Scale Package

CS281

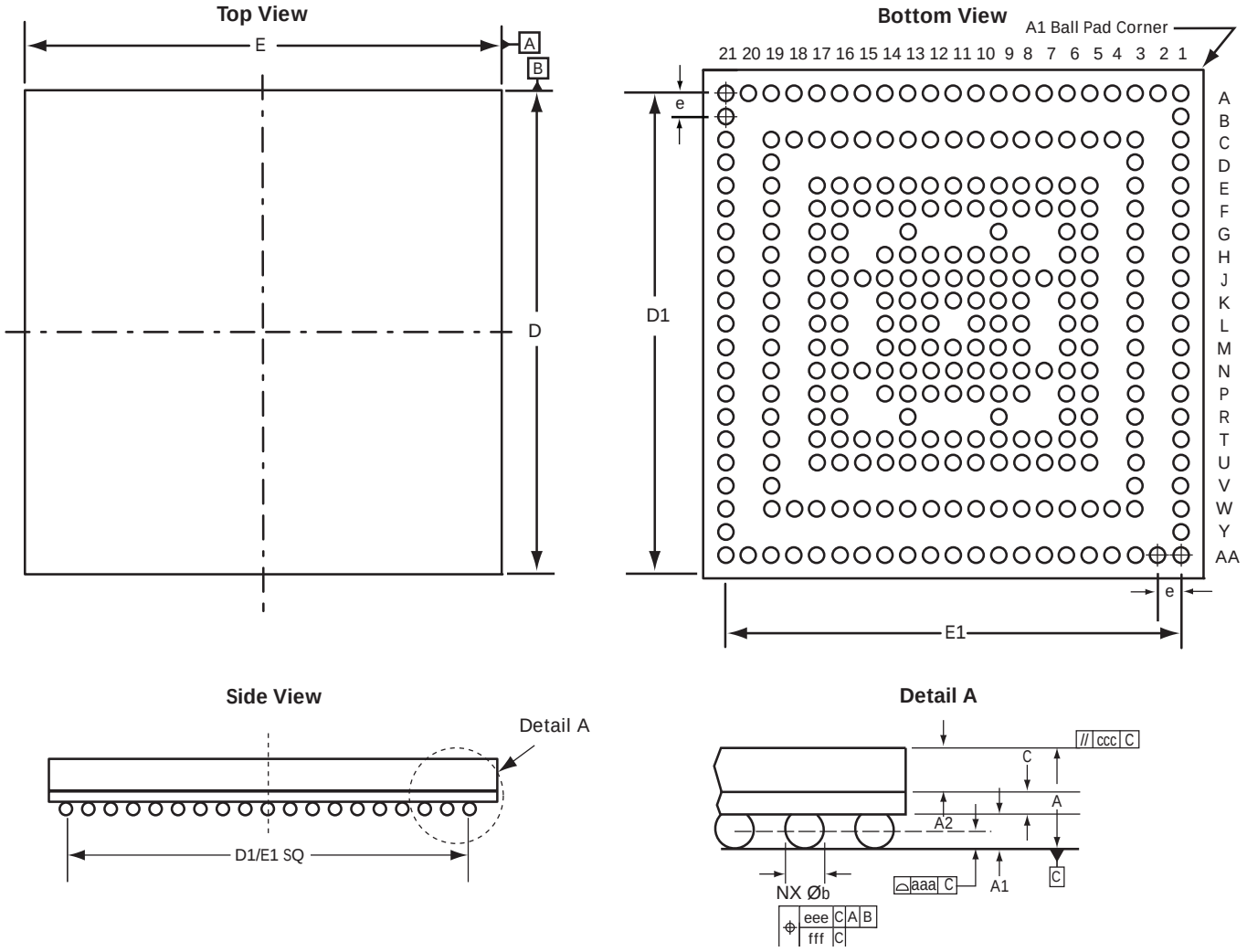


Note: Dimensions are in millimeters. Refer to the "Chip Scale Package Dimensions" section on page 78 for these dimensions.

Supported Devices
AGLP125 AGL600 AGL1000 M1AGL600 M1AGL1000

Chip Scale Package

CS288

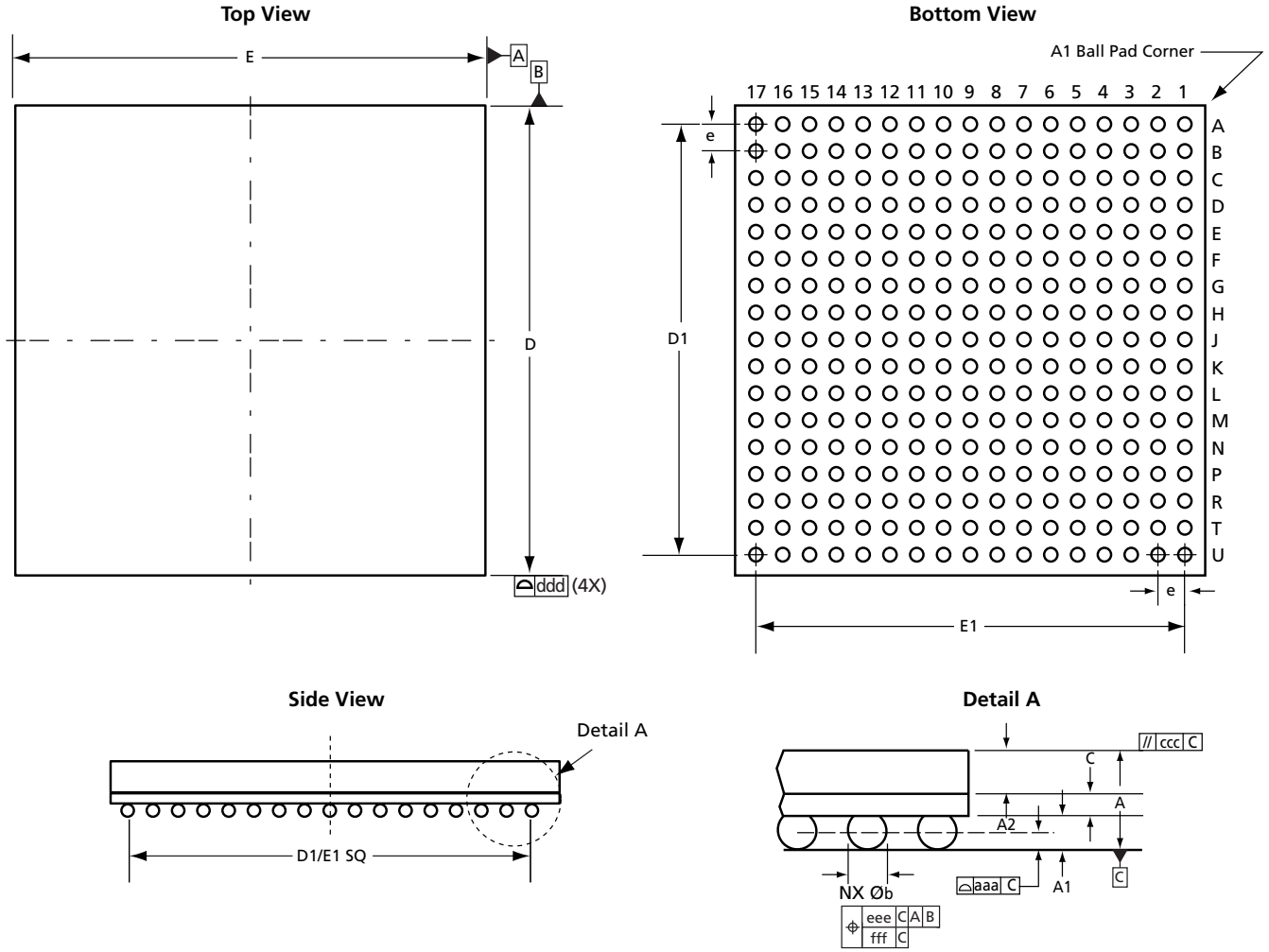


Note: Dimensions are in millimeters.Refer to the "Chip Scale Package Dimensions" section on page 78 for these dimensions.

Supported Devices
A2F060
A2F200
A2F500

Chip Scale Package

CS289



Note: Dimensions are in millimeters. Refer to the "Chip Scale Package Dimensions" section on page 78 for these dimensions.

Supported Devices
AGLP030
AGLP060
AGLP125

Chip Scale Package Dimensions

JEDEC Equivalent	UC36 (page 66)			CS49 (page 67) MO-205			UC81 (page 68)			CS81 (page 69)		
Dimension	**Min.**	**Nom.**	**Max.**	**Min.**	**Nom.**	**Max.**	**Min.**	**Nom.**	**Max.**	**Min.**	**Nom.**	**Max.**
A	0.66	0.73	0.80	–	–	1.50	0.66	0.73	0.80	0.66	0.73	0.80
A1	0.07 REF			0.25	–	–	0.07 REF			0.07 REF		
A2	0.40	0.45	0.50	0.85	–	–	0.42	0.45	0.48	0.42	0.45	0.48
aaa	0.08			0.12			0.08			0.08		
b	0.18	0.23	0.28	0.45	0.50	0.55	0.18	0.23	0.28	0.20	0.25	0.30
c	0.21 REF			–	0.36	–	0.21 REF			0.21 REF		
ccc	0.10			0.10			0.10			0.10		
D/E	3.00 BSC			7.00 BSC			4.00 BSC			5.00 BSC		
D1/E1	2.00			–	4.80	–	–	3.20	–	–	4.00	–
e	0.4 BSC			0.8 BSC			0.4 BSC			0.5 BSC		
eee	0.15			0.15			0.15			0.15		
fff	0.05			0.08			0.05			0.05		

JEDEC Equivalent	CS121 (page 70) MO-195, Variation AC			CS128 (page 71) MO-205, Variation BD			CS180 (page 72) MO-205, Variation BF			CS196 (page 73) MO-195, Variation BE			CS201 (page 74) MO195, Variation AE[2]		
Dimension	**Min.**	**Nom.**	**Max.**	**Min.**	**Nom.**	**Max.**	**Min.**	**Nom.**	**Max.**	**Min.**	**Nom.**	**Max.**	**Min.**	**Nom.**	**Max.**
A	0.79	0.89	0.99	–	–	1.50	–	–	1.50	–	–	1.20	0.79	0.89	0.99
A1	0.18	0.23	0.28	0.25	–	–	0.25	–	-	0.15	–	–	0.18	0.23	0.28
A2	0.40	0.45	0.50	0.85	–	–	0.85	–	-	0.60	–	–	0.40	0.45	0.50
aaa	0.08			0.12			0.12			0.08			0.08		
b	0.25	0.30	0.35	0.45	0.50	0.55	0.45	0.50	0.55	0.25	0.30	0.35	0.25	0.30	0.35
c	0.16	0.21	0.26	–	0.36	–	–	0.36	–	–	0.36	–	0.16	0.21	0.25
ccc	0.10			0.10			0.10			0.10			0.10		
D/E	6.00 BSC			11.00 BSC			13.00 BSC			8.00 BSC			8.00 BSC		
D1/E1	–	5.00	–	–	8.80	–	–	10.40	–	–	6.50	–	–	7.00	–
e	0.5 BSC			0.8 BSC			0.8 BSC			0.5 BSC			0.5 BSC		
eee	0.15			0.15			0.15			0.15			0.15		
fff	0.05			0.08			0.08			0.05			0.05		

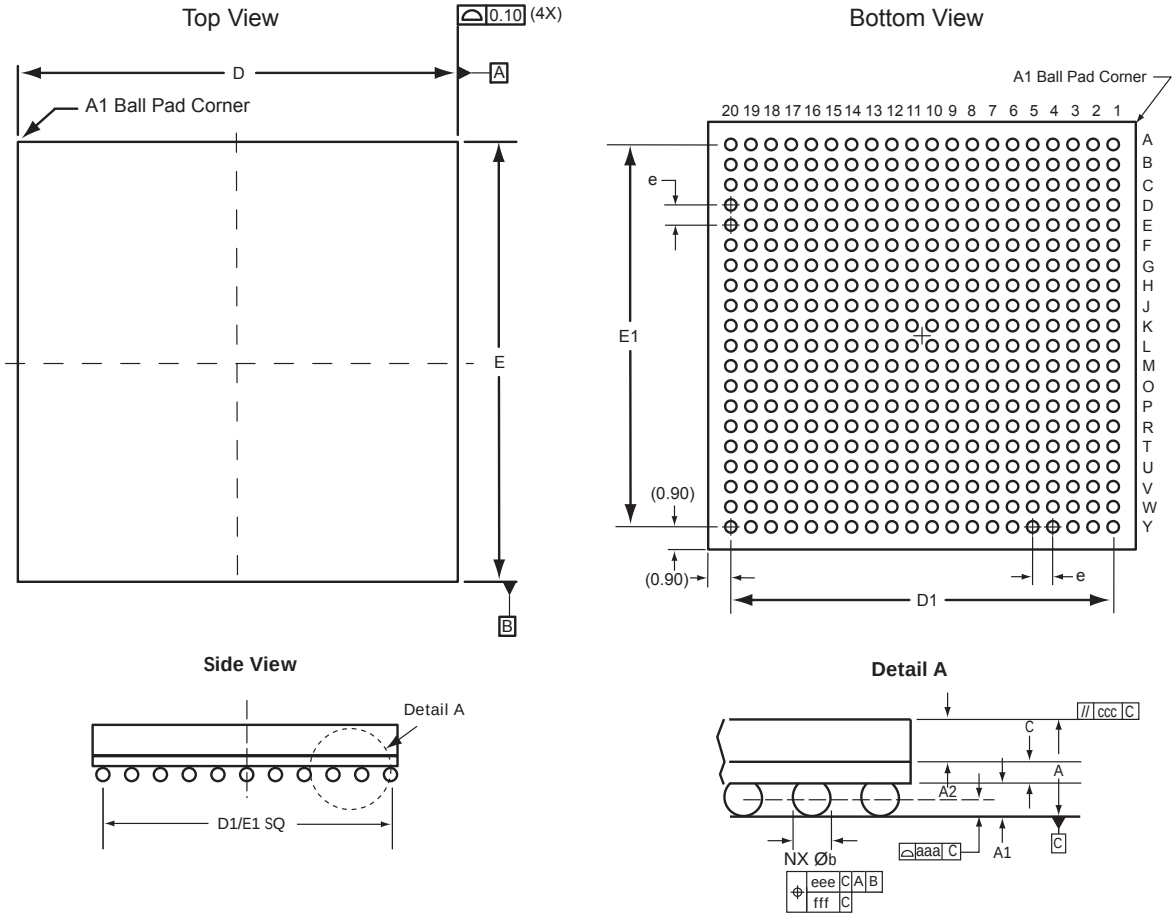
Notes:
1. *All dimensions are in millimeters.*
2. *Variation AG depopulated.*

JEDEC Equivalent	CS281 (page 75) MO-195, Variation AG[2]			CS288 (page 76)			CS289 (page 77)		
Dimension	**Min.**	**Nom.**	**Max.**	**Min.**	**Nom.**	**Max.**	**Min.**	**Nom.**	**Max.**
A	–	–	1.05	–	–	1.05	1.01	1.11	1.20
A1	0.18	0.23	0.28	0.18	0.23	0.28	0.25	0.30	0.35
A2	–	0.45 REF	–	–	0.45 REF	–	0.55	0.60	0.65
aaa	0.08			0.08			0.08		
b	0.26	0.31	0.36	0.26	0.31	0.36	0.35	0.40	0.45
c	–	0.26 REF	–	–	0.26 REF	–	0.17	0.21	0.25
ccc	0.20			0.20			0.10		
D/E	9.85	10.00	10.15	10.85	11.0	11.15	14.00 BSC		
D1/E1	9.00 BSC			10.00 BSC			–	12.80	–
e	0.5 BSC			0.5 BSC			0.8 BSC		
eee	0.15			0.15			0.15		
fff	0.05			0.05			0.08		

Notes:
1. *All dimensions are in millimeters.*
2. *Variation AG depopulated.*

Very Fine Pitch Ball Grid Array

VF400



Supported Devices
M2S005
M2S010
M2S025
M2S050

Very Fine Pitch Ball Grid Array Package Dimensions

JEDEC Equivalent	VF400 (page 80)		
Dimension	**Min.**	**Nom.**	**Max.**
A	1.31	1.41	1.51
A1	0.32	0.37	0.42
A2	0.65	0.70	0.75
aaa		0.12	
b	0.41	0.46	0.51
c	0.29	0.34	0.39
ccc		0.10	
D/E		17.00 BSC	
D1/E1	–	15.20	–
e		0.80 BSC	
eee		0.15	
fff		0.08	

Notes:

1. *All dimensions are in millimeters.*

List of Changes

The following table lists critical changes that were made in each revision of the document.

Revision	Changes	Page
Revision 44 (April 2013)	Table 1 • Package Naming Conventions was updated to include the VFPBA package.	1
	The cross-reference to the "CQFP with Heat Sink Dimensions" dimensions table was corrected in the table notes for the "CQ208 and CQ256—Cavity Up with Heat Sink" section (SAR 44419).	14
	AGL250 was added as a supported device in the "CS81" section (SAR 43697).	69
	The "VF400" section is new (47028).	80
Revision 43 (January 2013)	A2F060 was added as a supported device for "TQ144" (SAR 43622).	44
	The "FG484—Fully Populated MS-034 VAR AAJ-1, Larger Mold Cap Size" section and "FG896—Larger Mold Cap Size" section are new. These packages are new for the SmartFusion2 family and differ from the existing FG484 and FG896 packages due to a larger mold cap and the pin gate feature, which prevents marking in the center of the package (SAR 42898).	58, 61
Revision 42 (April 2012)	Added new note in "Fine Pitch Plastic Ball Grid Array Dimensions" section (SAR 35957).	63
Revision 41 (November 2011)	Removed "RTSX72SU" from "CQ208" and "CQ256" columns in "Supported Devices" table (SAR 32881).	13
Revision 40 (June 2011)	Table 1 • Package Naming Conventions was added. References to packages throughout the document were changed in conformance with the conventions (SAR 27395).	1
	The supported devices listings for the following packages were updated and corrected (SAR 27395): "PG100" – Obsolete for 1415A "PG175" – Obsolete for A1440A "CQ84" – Obsolete for A32100DX "CQ208" – Supported for AX250 and AX500 (SAR 26344) "CQ256" – Supported for AX2000 (SAR 22918), RT3PE600L, and RT3PE3000L "CQ352" – Supported for RTAX4000S (SAR 30672), RTAX2000D, and RTAX4000D "CG624" – Supported for RTAX250S "CG1152" – Supported for RTAX2000S, not RTAX4000S "CG1272" – Supported for RTAX2000D and RTAX4000D "PL84" – Obsolete for A3265A "QN132" – Not supported for M1ASGL250 or M1A3P250 "PQ144" – Obsolete for A1240XL "PQ208" – Not supported for M1A3PE600. Supported for A2F200 and A2F500 (SAR 31179) "BG272" – Obsolete for A500K050 and A500K130 "FG256 MO-192 VAR DAF1" – Supported for M1AGL600 "FG484—Fully Populated MS-034 VAR AAJ-1" – Not supported for M1A3P600 or M1A3PE600 "CS49" – Obsolete for eX64 and eX128 "CS128" – Obsolete for eX64, eX128, and eX256 "CS180" – Obsolete for AX125 and eX256	 3 5 9 13 13 13 23 26 27 29 38 42 42 46 53 57 67 71 72
	The lid size table for the "CQ84" package was updated to add dimensions for RT1020 (SAR 27395).	9
Revision 40 (continued)	The "CQ84 Side View and Bottom View" diagram was revised to add additional dimensions to the side view, noting the maximum distances between the lead and the top of the package (SAR 27406).	10

Revision	Changes	Page
	Corrected the "CG484" diagram by removing the pin in the A1 position (SAR 30549).	22
	The "CG896" package drawing was corrected to show the chamfered corner is at A1 (SAR 30227).	24
	The "CG1152" and "CG1272" package drawings were revised to add the CLGA side view (SARs 29751, 30553).	26, 27
	The "FG896" diagram was corrected to show the D1 dimension extends from pin 1 to pin 30. Previously the diagram showed that D1 extended from pin 1 to pin 29 (SAR 26792).	60
	The "FG1152" diagram was corrected to show the D1 dimension extends from pin 1 to pin 34. Previously the diagram showed that D1 extended from pin 1 to pin 33 (SAR 26792).	62
	In the "Fine Pitch Plastic Ball Grid Array Dimensions" table, dimension c for FG256 MO-192 VAR DAF1 was corrected to 0.4 to 0.6 mm. Previously it was 0.25 to 1.10 mm (SAR 28605).	63
	A second FG896 package was added to the "Fine Pitch Plastic Ball Grid Array Dimensions" table. It differs from the first FG896 package only in the D2 and E2 dimensions.	65
	The VF289 package name was changed back to "CS289" (SAR 27395).	77
Revision 39 (August 2010)	The versioning system has been changed. This document is assigned a revision number that increments each time the document is updated.	N/A
	SmartFusion devices A2F060, A2F200, and A2F500 were added to the supported devices table for the "FG256 MO-192 VAR DAF1" "Fine Pitch Plastic Ball Grid Array" (SAR 25571).	53
	SmartFusion devices A2F200 and A2F500 were added to the supported devices table for the "FG484—Fully Populated MS-034 VAR AAJ-1" "Fine Pitch Plastic Ball Grid Array" (SAR 25571).	56
	The following package names were changed: 36-Pin CSP was changed to "UC36" 289-Pin CSP was changed to "CS289"	66 77
	The side views in the following "Chip Scale Package (UC/CS/VF)" drawings were corrected to show half sphere bumps instead of solder balls (SAR 26665): "UC36" "UC81" "CS81"	67, 68, 69
	The "CS288" "Chip Scale Package" section is new (SAR 27106).	76
	The A1 dimension values were changed to 0.07 REF in the "Chip Scale Package Dimensions" table for "UC36", "UC81", and "CS81" (SAR 26432). The c dimension values were changed to 0.21 REF. The text, "MO-195, Variation AB," was deleted from the heading for these two packages. The b dimension values for the "CS81" package were revised.	78
v11.4 (March 2010)	The "CCGA Dimensions" table was updated. The D1 and E1 dimensions for CG484 were changed from 22.00 to 21 (SAR 22814).	25
v11.3	Updated aaa dimension for FBGA 144 package in the "Fine Pitch Plastic Ball Grid Array Dimensions" table.	63
v11.2	A54SX16 was removed from the "CQ256".	13

Revision	Changes	Page
v11.1	The ccc specification was changed from 0.10 to 0.08 in the "Plastic Quad Flat Pack (RQFP/PQFP) Dimensions" table.	43
	The ccc specification was changed from 0.10 to 0.08 for the TQFP 167 in the "Thin Quad Flat Pack (TQFP) Dimensions" table.	45
	The ccc specification was changed from 0.10 to 0.08 for the CSP 289 in the "Chip Scale Package Dimensions" table.	43
	In the "Fine Pitch Plastic Ball Grid Array Dimensions" table, the following specs were updated for the "FG256 (page 53) MO-192 VAR DAF1":A, A1, and c.	63
v11.0	The document has been updated to include IGLOO nano packages.	
	The "QN48" section is new.	30
	The "UC36" section is new.	66
v10.9	The AGL400 device is new and has been added to "FG144", "FG256 MO-192 VAR DAF1", "FG484—Fully Populated MS-034 VAR AAJ-1", "CS196".	N/A
v 10.8	The "CG484" section is new.	22
	The "CG896" is new.	24
	Data for the 484 and 896 CCGA/LGA packages was added to the "CCGA Dimensions" table.	25
	In the "Quad Flat No Leads Dimensions" table, "d" was deleted.	38
v10.7	"VQ128" and "VQ176" were added to the VQFP "Supported Devices" table.	44
	"VQ128 MS-026 VAR AEE3" and "VQ176 MS-026 VAR BFC" dimension data are new.	45
v10.6	A3PE600L was added to the supported devices table of the "FG484—Fully Populated MS-034 VAR AAJ-1" package.	57
	The following specifications have been updated for the "FG256 (page 53) MO-192 VAR DAF1": DimensionNew Data A1.80 A10.35 and 0.45 c0.35 and 0.60	63
v10.5	bbb has been removed from all chip scale package drawings.	67,77
	The Detail A circle on the side view was added to the "CS288" package drawing.	76
	The "CS289" information is new.	77,79
v10.4	Note 2 under the "QN68" package drawing is new and bottom view has been removed from the heading.	31
v10.3	The note under the "QN108 Bottom View" package drawing is new.	35
	The note under the "QN132 Bottom View" package drawing is new. The figure was also updated to include D1 to D4.	36
	The note under the "QN180 Bottom View" package drawing is new. The figure was also updated to include D1 to D4.	37
v10.2	M1A3P250L was deleted; it is no longer supported.	N/A
v10.1	In Detail A, the A1 top arrow was incorrectly placed. It was originally at the top of the substrate and it has been moved to the bottom of the substrate.	46 to 50
	In Detail A, the A1 top arrow was incorrectly placed. It was originally at the top of the substrate and it has been moved to the bottom of the substrate.	54 to 62

Revision	Changes	Page
v10.0	In the "CC256" figure, one of the side view dimensions was updated from 0.45±0.05 to 0.254±0.025.	20
	The "CS201" section is new.	74
	In the "CS288" supported devices, the AGLP125 was added to the table.	76
	In the "Chip Scale Package Dimensions" table, several CS package dimensions were updated and the CS201 information is new. Please review carefully.	78
v9.9	The Ø symbol was missing from all CCGA, PBGA, FBGA, and CSP figures. It has been added back into the document	N/A
v9.8	The "QN68" section, which includes the mechanical drawings and dimension measurements, is new.	31

Microsemi Corporate Headquarters
One Enterprise, Aliso Viejo CA 92656 USA
Within the USA: +1 (949) 380-6100
Sales: +1 (949) 380-6136
Fax: +1 (949) 215-4996

Microsemi Corporation (NASDAQ: MSCC) offers a comprehensive portfolio of semiconductor solutions for: aerospace, defense and security; enterprise and communications; and industrial and alternative energy markets. Products include high-performance, high-reliability analog and RF devices, mixed signal and RF integrated circuits, customizable SoCs, FPGAs, and complete subsystems. Microsemi is headquartered in Aliso Viejo, Calif. Learn more at **www.microsemi.com**.

5193068-44/4.13