PD3068
Datasheet
Package Mechanical Drawings

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Contents

Figures

Tables

1 Revision History

The revision history describes the changes that were implemented in the document. The changes are listed by revision, starting with the most current publication.

1.1 Revision 60.0

The following is a summary of the changes in revision 60.0 of this document.

- Updated CG1657, page 36 by removing C1 pin (SAR 78574)
- Updated FG896—Larger Mold Cap Size, page 73 image (SAR 49423)
- Updated Fine Pitch Plastic Ball Grid Array Dimensions, page 75 table for D2 and E2 options (SAR 49423)
- Updated Fine Pitch Plastic Ball Grid Array Dimensions, page 75 table for in correct decimal values for A1 FG484 (SAR 51031)
- Removed Note in Fine Pitch Plastic Ball Grid Array Dimensions, page 75 (SAR 58283)
- Updated CS325 to FCS325 and CS536 to FCS536 throughout the document (SAR 62909)
- Added CQ352 MO-134 VAR AE in CQFP without Heat Sink Dimensions, page 24 (SAR 82812)
- Added note for CQFP without Heat Sink Dimensions, page 24 (SAR 82812)

1.2 Revision 59.0

Updated the FG676 (Option 2), page 69 bottom view diagram for the corner pin balls (SAR 76003).

1.3 Revision 58.0

Updated the M2S060 and M2GL060 device details in the FG676 (Option 2), page 69, FG484—Fully Populated MS-034 VAR AAJ-1, Larger Mold Cap Size, page 71, FCS325 – (Option 1), page 89, and VF400, page 98 (SAR 69566).

1.4 Revision 57.0

The following is a summary of the changes in revision 57.0 of this document.

- Updated VF256, page 97 mechanical drawing (SAR 66875).
- Updated Dimensions of VF400, page 99 (SAR 66875).
- Updated "FG484 (page 63) (23x23 Fully Populated) MS-034 VAR AAJ-1 with Larger Mold Cap" Package Mechanical Drawing Dimensions (SAR 64737).
- Removed RTAX4000D from CG1272, page 35 support devices (SAR 66765).
- Added CG1657, page 36 package and LG1657, page 29 (SAR 66765).

1.5 Revision 56.0

Updated FG676 (Option 2), page 69 mechanical drawing (SAR 62340).

1.6 Revision 55.0

Added the mechanical drawing of the Plastic Quad Flat Pack Rectangular Package (TQ144), page 49 package. Removed the mechanical drawing of the VQ144 package and VQ144 Package Mechanical Drawing Dimensions. (SAR 61533).

1.7 Revision 54.0

Added the mechanical drawing of the FCV484, page 78 package and FCV484 Package Mechanical Drawing Dimensions, page 79 (SAR 54037).

1.8 Revision 53.0

Added the mechanical drawing of the FCS536, page 93 package and "FCS536" Package Mechanical Drawing Dimensions (SAR 60514).

1.9 Revision 52.0

Updated the mechanical drawing of the FCS325 – (Option 2), page 90 package and FCS325 (Option 2) Package Mechanical Drawing Dimensions (SAR 58504).

1.10 Revision 51.0

Corrected the reference device support for "VQ144" (SAR 58334).

1.11 Revision 50.0

Corrected the pitch (e) on the VQ144 from 0.05 BSC to 0.50 BSC in "Plastic Quad Flat Pack Rectangular Package (VQ144) Dimensions" section (SAR 57666).

1.12 Revision 49.0

The following is a summary of the changes in revision 49.0 of this document.

- Updated Note 2 and Note 3 for CG1152, page 34 package outline drawing (SAR 55805).
- Updated Note 2 and Note 3 for Ceramic Column Grid Array (CCGA), page 30 package outline drawing (SAR 55805).
- Added note QN180 Bottom View, page 46, "QN132 Bottom View" and "QN180 Bottom View" packages in the document (SAR 56846).
- Added "Plastic Quad Flat Pack Rectangular Package (VQ144)" package outline drawings and supported devices.Added "Plastic Quad Flat Pack Rectangular Package (VQ144) Dimensions" (SAR 53464).
- Renamed FG676 (Option 1), page 68 and FG676 (Option 2), page 69 (SAR 54063).
- Updated FG676 (Option 2), page 69 package outline drawing (SAR 55191).
- Updated the mechanical drawing of the FCS325 – (Option 1), page 89 package and "FCS325 (Option 1)" Package Mechanical Drawing Dimensions (SAR 53464).
- Added Chip Scale Package (UC/CS/VF), page 80 package outline drawing and added "FCS325 (Option 2)" Package Mechanical Drawing Dimensions (SAR 53464).
- Added VF256, page 97 package outline drawing and also added Dimensions of VF400, page 99 (SAR 53464).

1.13 Revision 48.0

Updated the mechanical drawing of FG896—Larger Mold Cap Size, page 73 package (SAR 49607).

1.14 Revision 47.0

Added FG676 (Option 2), page 69, FC1152, page 77, and FCS325 – (Option 1), page 89 package outline drawings and supported devices (SAR 51485).

1.15 Revision 46.0

Updated the mechanical 3awing of the VF400, page 98 package (SAR 49374).

1.16 Revision 45.0

Updated the Supported Devices details for FG484—Fully Populated MS-034 VAR AAJ-1, Larger Mold Cap Size, page 71, FG896—Larger Mold Cap Size, page 73, and VF400, page 98 (SAR 48235).

1.17 Revision 44.0

The following is a summary of the changes in revision 44.0 of this document.

- Table 2.1, page 7 was updated to include the VFPBA package.
- The cross-reference to the CQFP with Heat Sink Dimensions, page 25 dimensions table was corrected in the table notes for the CQ208 and CQ256—Cavity Up with Heat Sink, page 20 section (SAR 44419).
- AGL250 was added as a supported device in the CS81, page 83 section (SAVF256_Package_Outline_Drawing R 43697).

- The VF400, page 98 is new (47028).

1.18 Revision 43.0

The following is a summary of the changes in revision 43.0 of this document.

- A2F060 was added as a supported device for "TQ144" (SAR 43622).
- The FG484—Fully Populated MS-034 VAR AAJ-1, Larger Mold Cap Size, page 71 and FG896—Larger Mold Cap Size, page 73 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).

1.19 Revision 42.0

Added new note in Fine Pitch Plastic Ball Grid Array Dimensions, page 75 (SAR 35957).

1.20 Revsion 41.0

Removed “RTSX72SU” from "CQ208" and "CQ256" columns in Table 12, page 19 (SAR 32881).

1.21 Revsion 40.0

The following is a summary of the changes in revision 40.0 of this document.

- Table 2.1, page 7 was added. References to packages throughout the document were changed in conformance with the conventions (SAR 27395).
- The supported devices listings for the following packages were updated and corrected (SAR 27395):
  - PG100, page 9 – Obsolete for 1415A
  - PG175, page 11 – Obsolete for A1440A
  - CQ84, page 15 – 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, page 31 – Supported for RTAX250S
  - CG1152, page 34 – Supported for RTAX2000S, not RTAX4000S
  - Ceramic Column Grid Array (CCGA), page 30 – 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, page 67 – 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
- The lid size table for the CQ84, page 15 package was updated to add dimensions for RT1020 (SAR 27395).
- The CQ84 Side and Bottom View, page 16 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).
- Corrected the CG484, page 30 diagram by removing the pin in the A1 position (SAR 30549).
- The CG896, page 32 package drawing was corrected to show the chamfered corner is at A1 (SAR 30227).
- The CG1152, page 34 and Ceramic Column Grid Array (CCGA), page 30 package drawings were revised to add the CLGA side view (SARs 29751, 30553).
- The FG896, page 72 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).
- The FG1152, page 74 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).

- In the Fine Pitch Plastic Ball Grid Array Dimensions, page 75 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).
- A second FG896 package was added to the Fine Pitch Plastic Ball Grid Array Dimensions, page 75 table. It differs from the first FG896 package only in the D2 and E2 dimensions.
- The VF289 package name was changed back to CS289, page 94 (SAR 27395).

1.22 Revision 39.0

The following is a summary of the changes in revision 39.0 of this document.

- The versioning system has been changed. This document is assigned a revision number that increments each time the document is updated.
- SmartFusion devices A2F060, A2F200, and A2F500 were added to the supported devices table for the FG256 MO-192 VAR DAF1, page 63 and Fine Pitch Plastic Ball Grid Array (FBGA), page 62 (SAR 25571).
- SmartFusion devices A2F200 and A2F500 were added to the supported devices table for the FG484—Fully Populated MS-034 VAR AAJ-1, page 67 Fine Pitch Plastic Ball Grid Array (FBGA), page 62 (SAR 25571).
- The following package names were changed:
  - 36-Pin CSP was changed to UC36, page 80
  - 289-Pin CSP was changed to CS289, page 94
- The side views in the following Chip Scale Package (UC/CS/VF), page 80 drawings were corrected to show half sphere bumps instead of solder balls (SAR 26665):
  - UC36, page 80
  - UC81, page 82
  - CS81, page 83
- The CS288, page 92 Chip Scale Package (UC/CS/VF), page 80 section is new (SAR 27106).
- The A1 dimension values were changed to 0.07 REF in the Table 2.14.16, page 95 for UC36, page 80, UC81, page 82, and CS81, page 83 (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, page 83 package were revised.

1.23 Revsion v11.4

The "CCGA Dimensions" table was updated. The D1 and E1 dimensions for CG484 were changed from 22.00 to 21 (SAR 22814).

1.24 Revision v11.3

Updated dimension for FBGA 144 package in the Fine Pitch Plastic Ball Grid Array Dimensions, page 75 table.

1.25 Revision v11.2

A54SX16 was removed from the CQ256—Cavity Down with Heat Sink, page 23.

1.26 Revision v11.1

The following is a summary of the changes in revision v11.1 of this document.

- The ccc specification was changed from 0.10 to 0.08 in the Plastic Quad Flat Pack (RQFP/PQFP) Dimensions, page 54 table.
- The ccc specification was changed from 0.10 to 0.08 for the TQFP 167 in theThin Quad Flat Pack (TQFP) Dimensions, page 55 table.
- The ccc specification was changed from 0.10 to 0.08 for the CSP 289 in theChip Scale Package Dimensions, page 95 table.
- In the Fine Pitch Plastic Ball Grid Array Dimensions, page 75 table, the following specs were updated for the FG256 MO-192 VAR DAF1, page 63:A, A1, and c.

1.27 Revision v11.0

The following is a summary of the changes in revision v11.0 of this document.

- The document has been updated to include IGLOO nano packages.
- The "QN48" section is new.
- The UC36, page 80 section is new.

1.28 Revision v10.9

The AGL400 device is new and has been added to FG144, page 62, FG256 MO-192 VAR DAF1, page 63, FG484—Fully Populated MS-034 VAR AAJ-1, page 67, and CS196, page 87.

1.29 Revision v10.8

The following is a summary of the changes in revision v10.8 of this document.

- The CG484, page 30 section is new.
- The CG896, page 32 is new.
- Data for the 484 and 896 CCGA/LGA packages was added to the Table 2.5.4, page 33.
- In the Table 2.7.9, page 47, “d” was deleted.

1.30 Revision v10.7

The following is a summary of the changes in revision v10.7 of this document.

- "VQ128" and "VQ176" were added to the VQFP "Supported Devices" table.
- "VQ128 MS-026 VAR AEE3" and "VQ176 MS-026 VAR BFC" dimension data are new.

1.31 Revision v10.6

The following is a summary of the changes in revision v10.6 of this document.

- A3PE600L was added to the supported devices table of the FG484—Fully Populated MS-034 VAR AAJ-1, page 67 package.
- The following specifications have been updated for the FG256 MO-192 VAR DAF1, page 63:
  - DimensionNew Data
  - A1.80
  - A10.35 and 0.45
  - c0.35 and 0.60

1.32 Revision v10.5

The following is a summary of the changes in revision v10.5 of this document.

- bbb has been removed from all chip scale package drawings.
- The Detail A circle on the side view was added to the CS288, page 92 package drawing.
- The CS289, page 94 information is new.

1.33 Revision v10.4

Note 2 under the Quad Flat No Lead (QFN), page 39 package drawing is new and bottom view has been removed from the heading.

1.34 Revision v10.3

The following is a summary of the changes in revision v10.3 of this document.

- The note under the QN108 Bottom View, page 44 package drawing is new.
- The note under the QN132 Bottom View, page 45 package drawing is new. The figure was also updated to include D1 to D4.
- The note under the QN180 Bottom View, page 46 package drawing is new. The figure was also updated to include D1 to D4.

1.35 Revision v10.2

M1A3P250L was deleted; it is no longer supported.

1.36 Revision 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 in.

1.37 Revision v10.0

The following is a summary of the changes in revision v10.0 of this document.

- In the CC256, page 26 figure, one of the side view dimensions was updated from 0.45±0.05 to 0.254±0.025.
- The CS201, page 88 section is new.
- In the CS288, page 92 supported devices, the AGLP125 was added to the table.
- In the Chip Scale Package Dimensions, page 95 table, several CS package dimensions were updated and the CS201 information is new. Please review carefully.

1.38 Revision v9.9

The Ø symbol was missing from all CCGA, PBGA, FBGA, and CSP figures. It has been added back into the document.

1.39 Revision v9.8

The Quad Flat No Lead (QFN), page 39 section, which includes the mechanical drawings and dimension measurements, is new.

2 Package Mechanical Drawings

2.1 Naming Conventions

This document lists all the package types used for Microsemi FPGAs and provides detailed drawings and dimensions. The following table 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)[1]	CSP	CS49
	Micro Chip Scale Package	UCS	UC36
	Very Fine Ball Pitch Grid Array	VFPBA	VF400

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

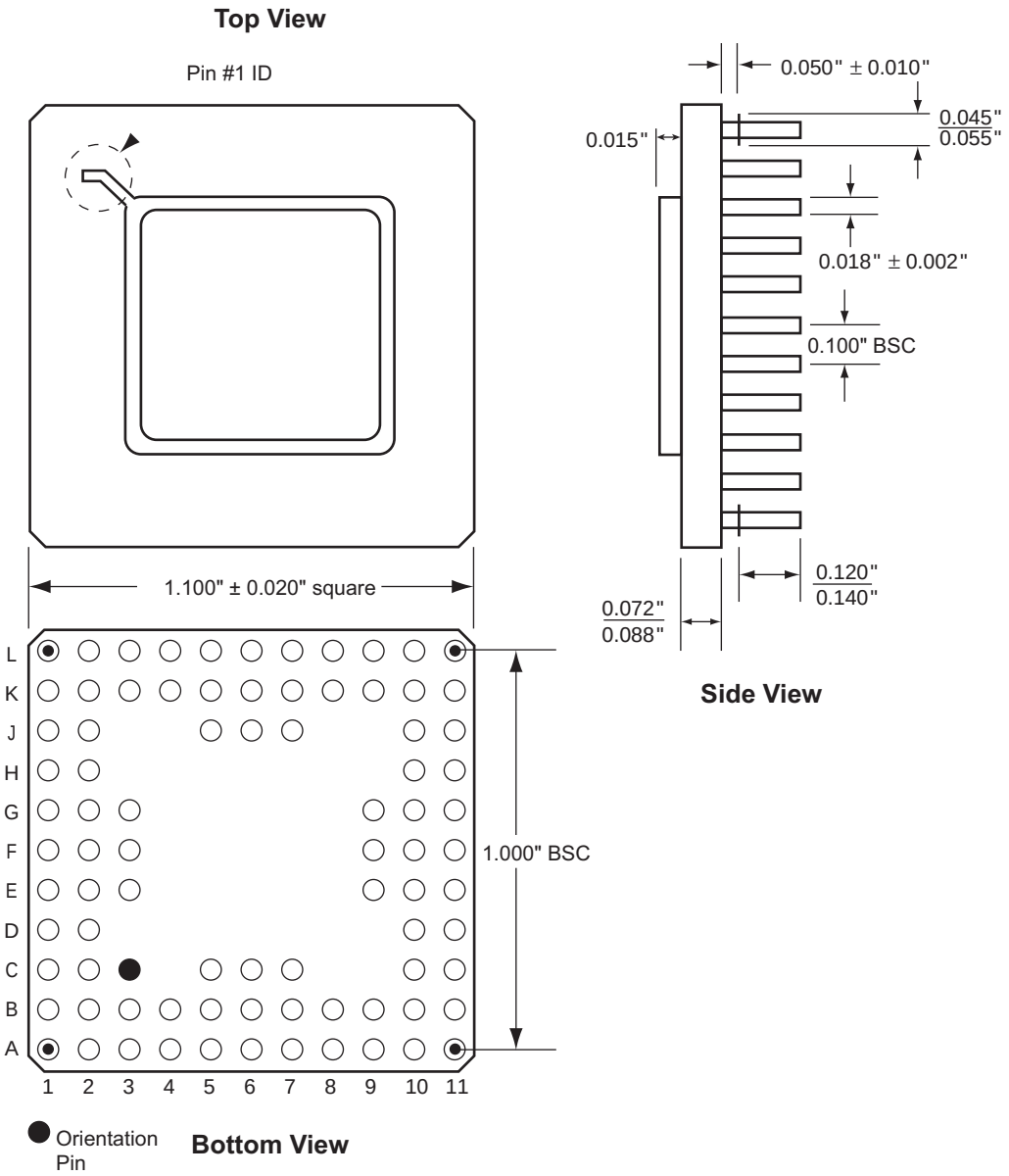
2.2 Ceramic Pin Grid Array (CPGA)

The following figures show package outlines for various packages under CPGA.

2.2.1 PG84

The following figure shows the package outline of PG84.

Figure 1 • **Package Outline of PG84**



Note: All dimensions are in inches unless otherwise stated.

Note: BSC = Basic spacing between centers.

The following table shows the supported devices for PG84.

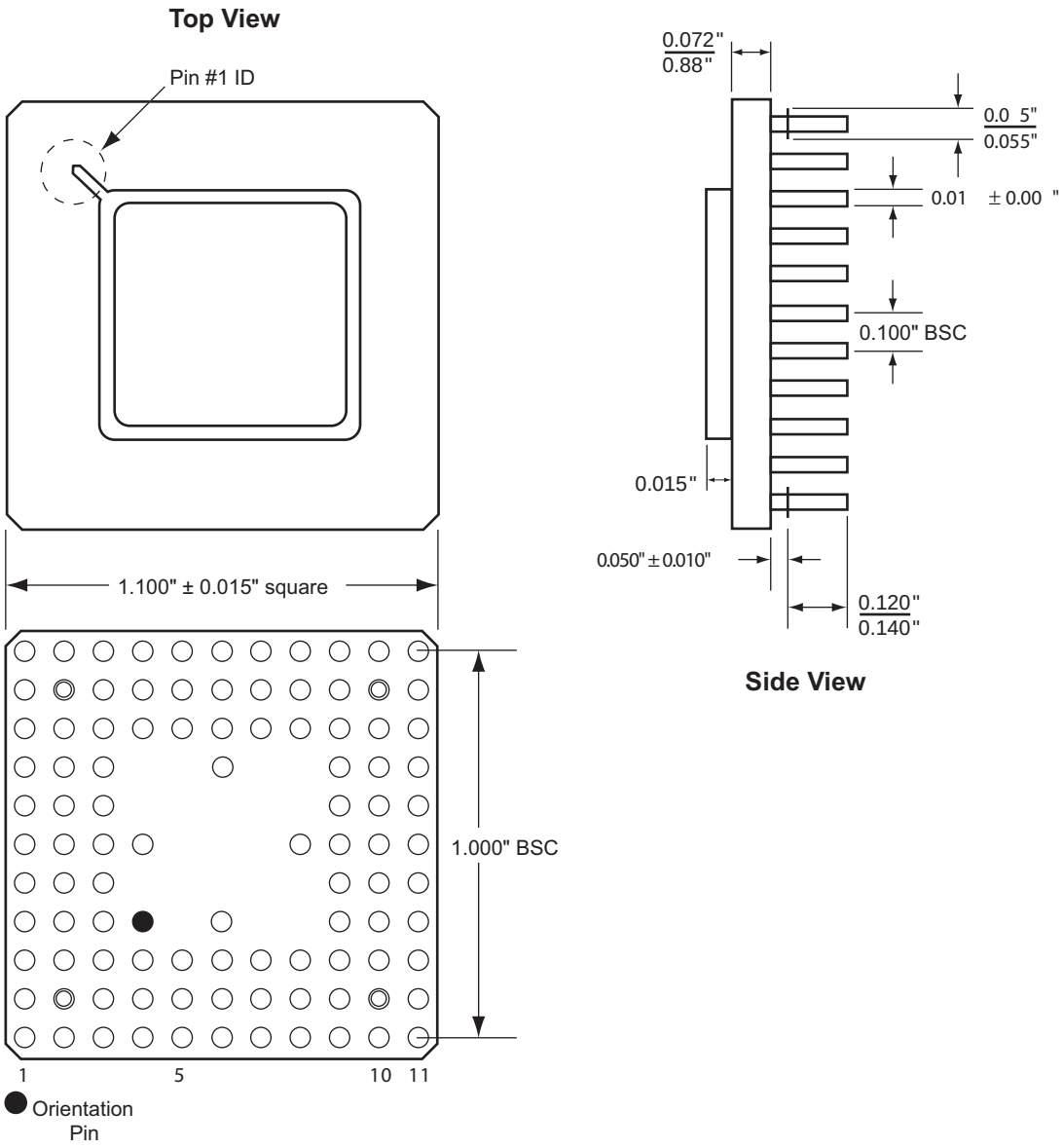
Table 2 • **Supported Devices for PG84**

Supported Devices	
A1010B	A1020B

2.2.2 PG100

The following figure shows the package outline of PG100.

Figure 2 • **Package Outline of PG100**



Note: All dimensions are in inches unless otherwise stated.

Note: BSC = Basic spacing between centers.

The following table lists the supported device for PG100.

Table 3 • **Supported Devices for PG100**

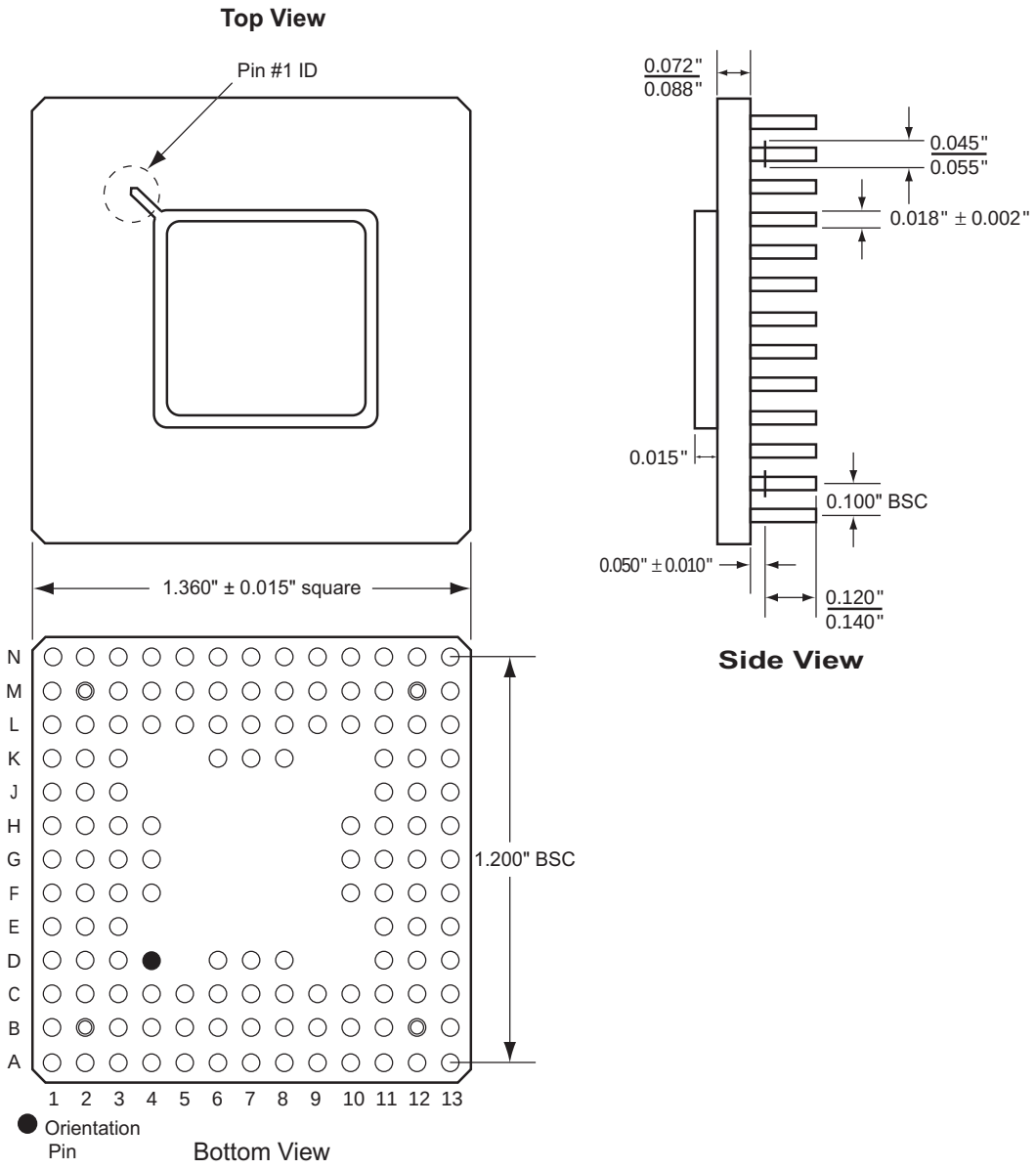
Supported Devices	
A1225XL[1]	A1415A[1]

1. This product is obsolete.

2.2.3 PG132

The following figure shows the package outline of PG132.

Figure 3 • **Package Outline of PG132**



Note: All dimensions are in inches unless otherwise stated.

Note: BSC = Basic spacing between centers.

The following table lists the supported device for PG132.

Table 4 • **Supported Devices for PG132**

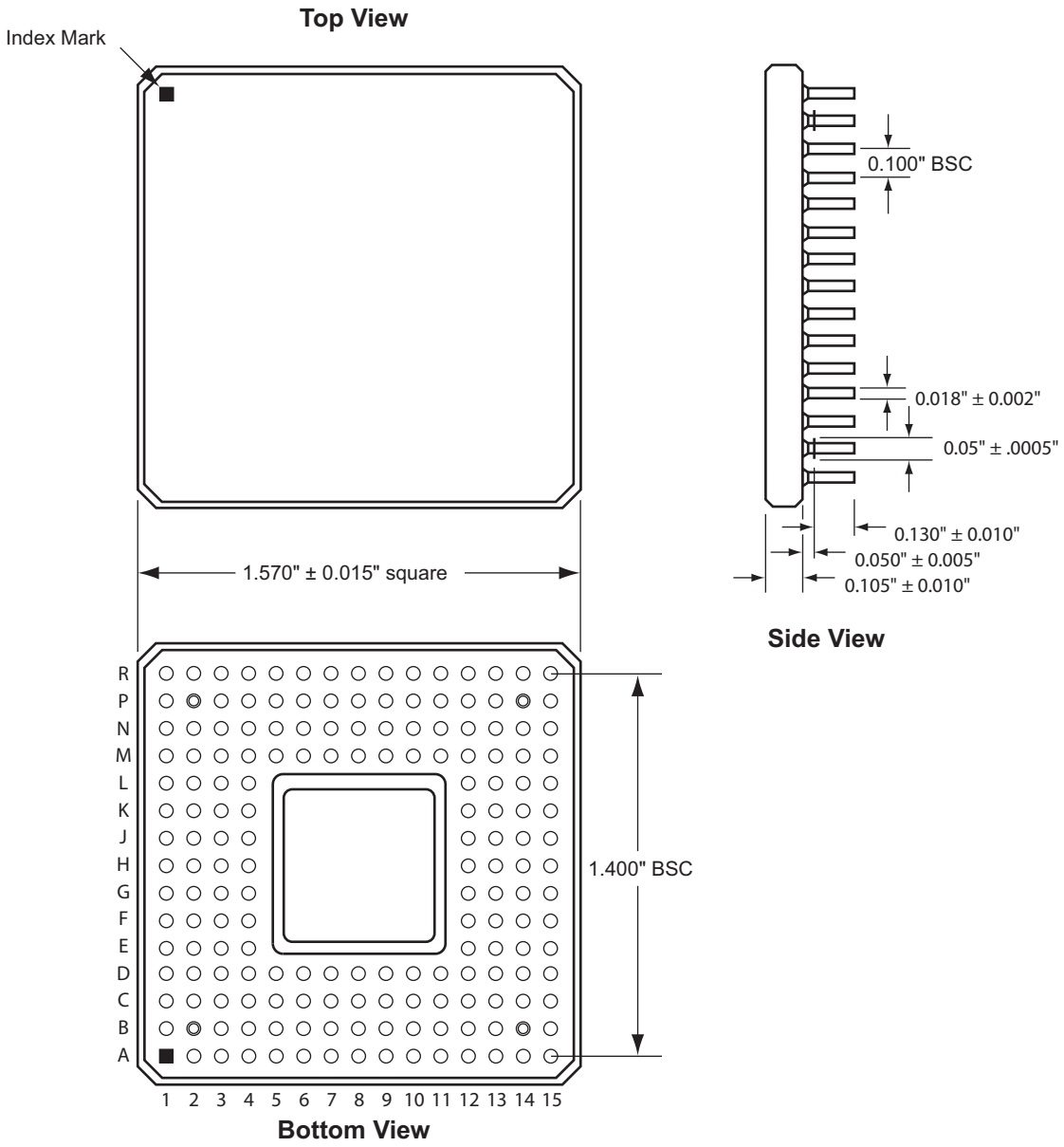
Supported Devices	
A1240A	A1240XL[1]

1. This product is obsolete.

2.2.4 PG175

The following figure shows the package outline of PG175.

Figure 4 • **Package Outline of PG175**



Note: All dimensions are in inches unless otherwise stated.

Note: BSC = Basic spacing between centers.

The following table shows the supported device for PG175.

Table 5 • **Supported Devices for PG175**

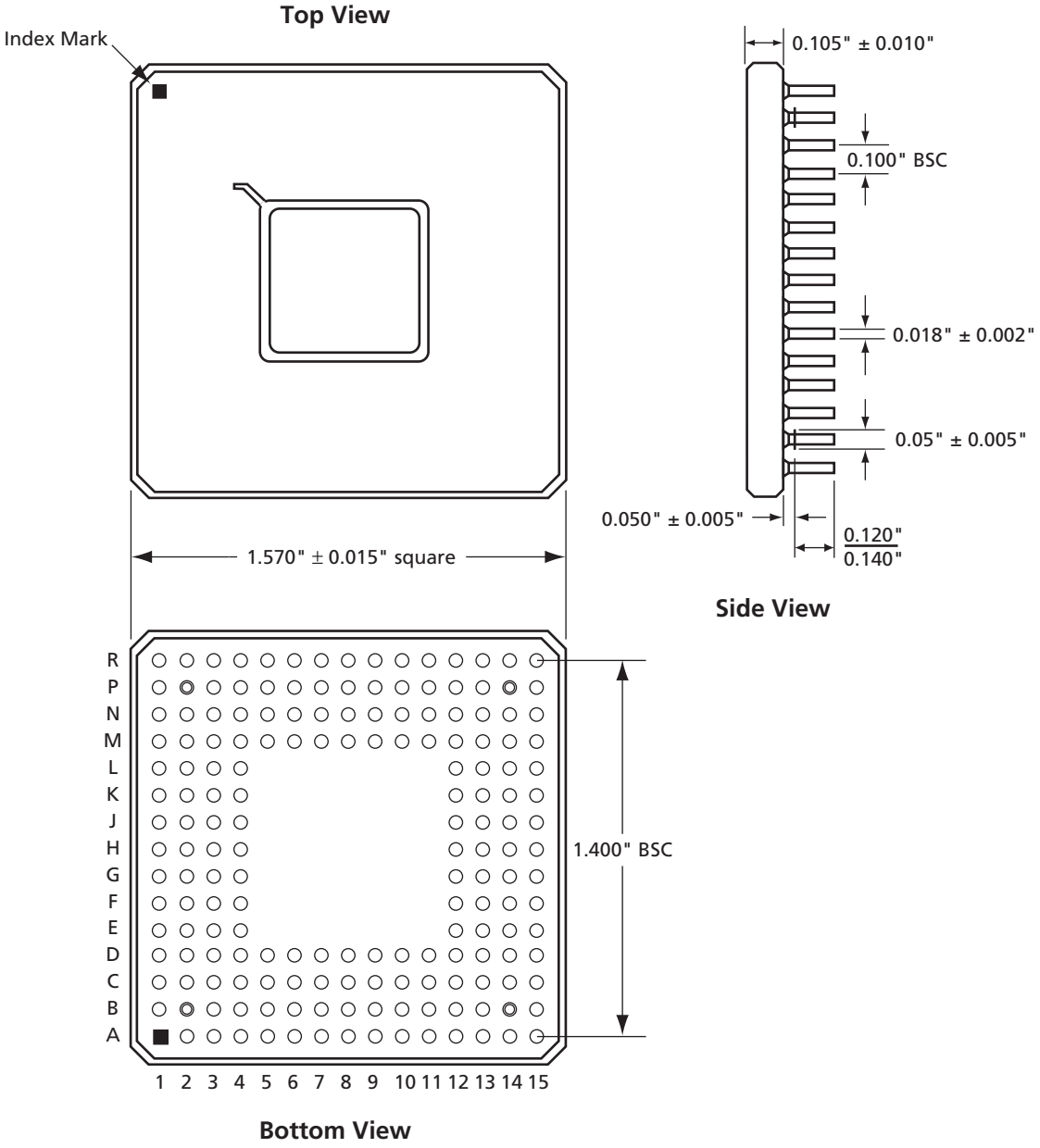
Supported Devices
A1440A[1]

1. This product is obsolete.

2.2.5 PG176

The following figure shows the package outline of PG176.

Figure 5 • **Package Outline of PG176**



Note: All dimensions are in inches unless otherwise stated.

Note: BSC = Basic spacing between centers.

The following table lists the supported devices for PG176.

Table 6 • **Supported Devices for PG176**

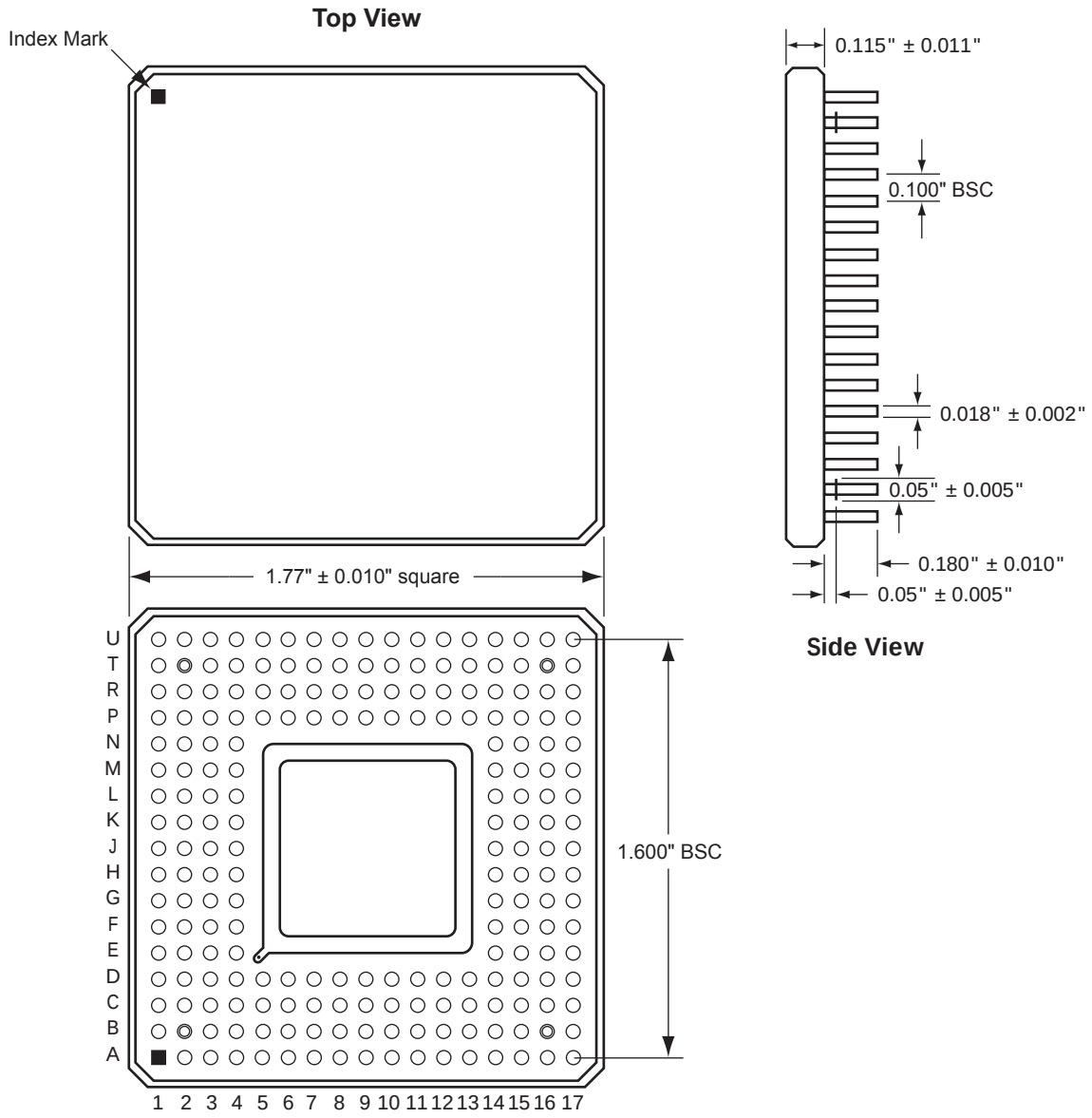
Supported Devices	
A1280A	A1280XL[1]

1. This product is obsolete.

2.2.6 PG207

The following figure shows the package outline of PG207.

Figure 6 • **Package Outline of PG207**



Note: All dimensions are in inches unless otherwise stated.

Note: BSC = Basic Spacing between Center.

The following table shows the supported device for PG207.

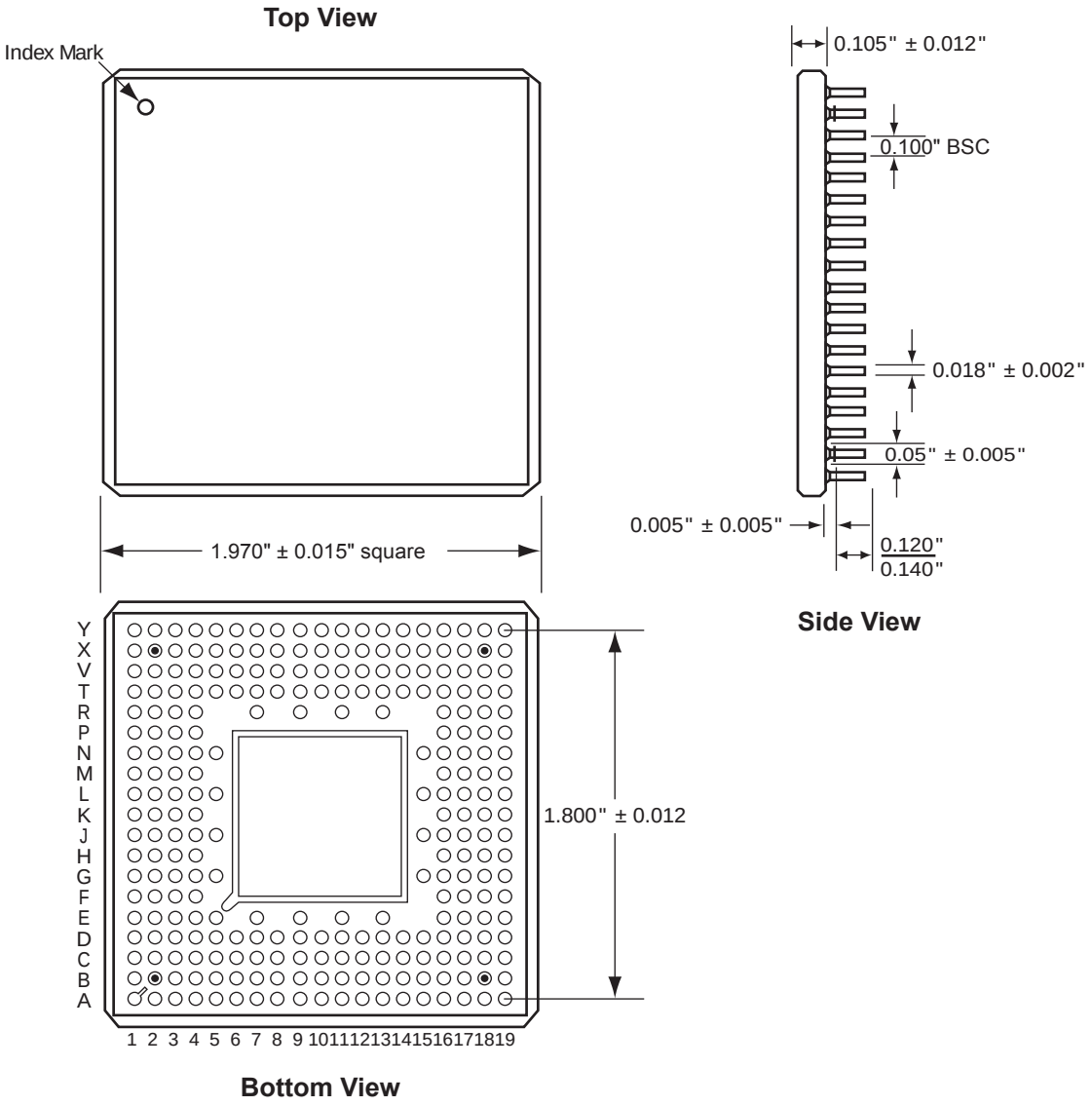
Table 7 • **Supported Devices for PG207**

Supported Devices
A1460A

2.2.7 PG257

The following figure shows the package outline of PG257.

Figure 7 • **Package Outline of PG257**



Note: All dimensions are in inches unless otherwise stated.

Note: BSC = Basic spacing between centers.

The following table shows the package outline of PG257.

Table 8 • **Supported Devices for PG257**

Supported Devices
A14100A

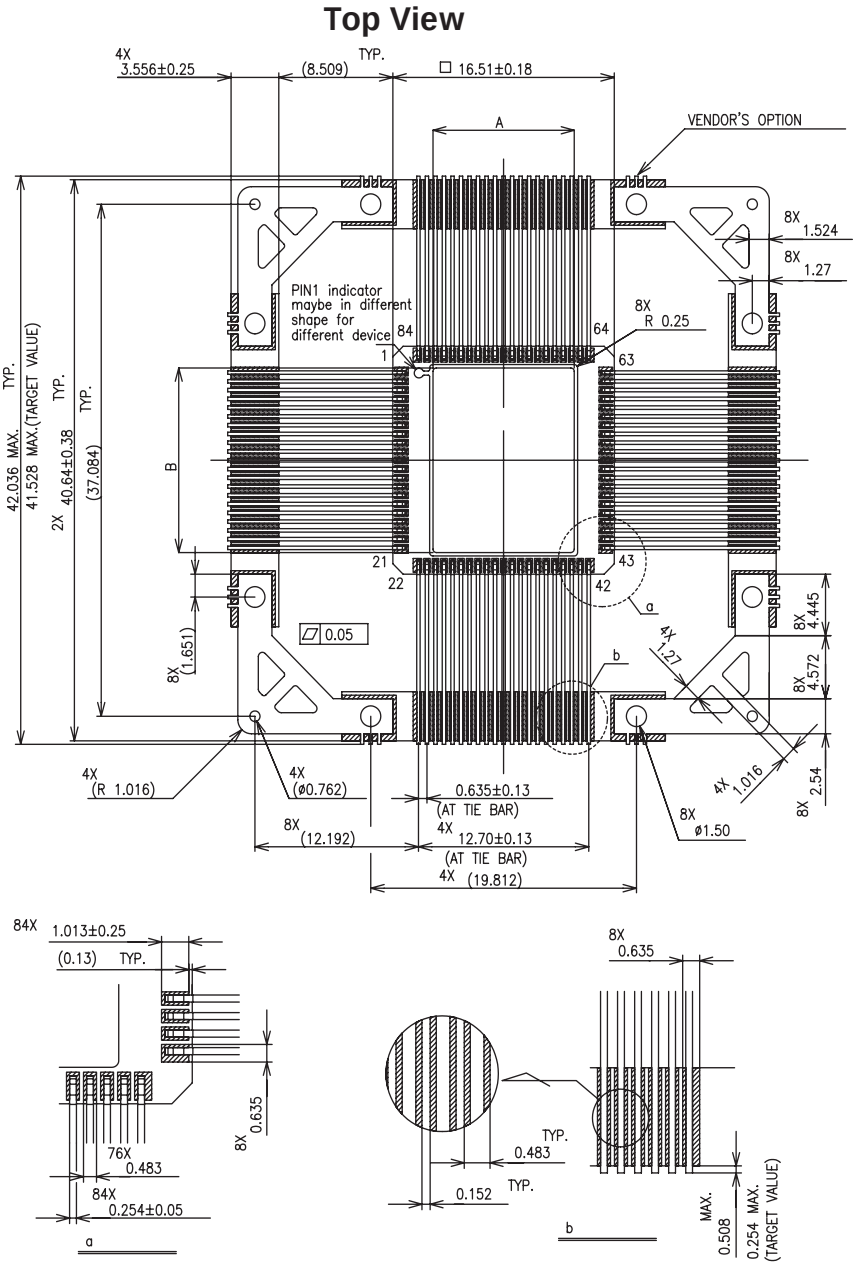
2.3 Ceramic Quad Flat Pack (CQFP)

The following figures show package outlines for various packages under CQFP.

2.3.1 CQ84

The following figure shows the package top view of CQ84.

Figure 8 • **Package Top View of CQ84**



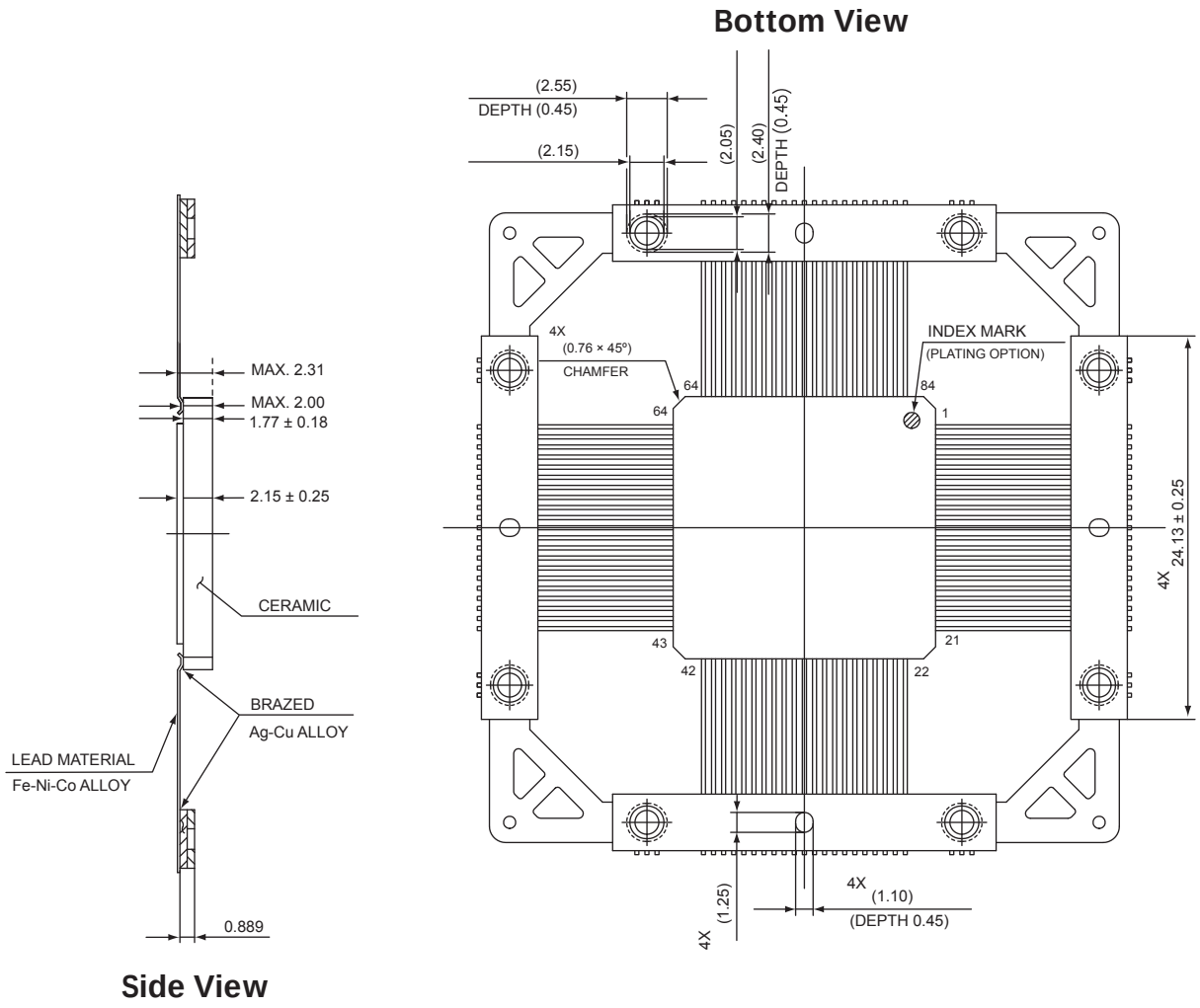
Note: Units are in mm.

Note: LID and die attach area must be connected to ground (GND).

2.3.2 CQ84 Side and Bottom View

The following figure shows the package side and bottom view of CQ84.

Figure 9 • **Bottom and Side Views of CQ84**



Note: Units are in mm.

Note: LID and die attach area must be connected to ground (GND).

The following table shows the supported devices for CQ84.

Table 9 • **Supported Devices for CQ84**

Supported Devices	
A1020B	RT1020[1]
A32100DX[1]	RH1020[1]
A54SX32A	RT54SX32S[1], RTSX32SU

1. This product is obsolete.

Table 10 • **Plate Thickness for CQ84**

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

Table 11 • **Lid Size for CQ84**

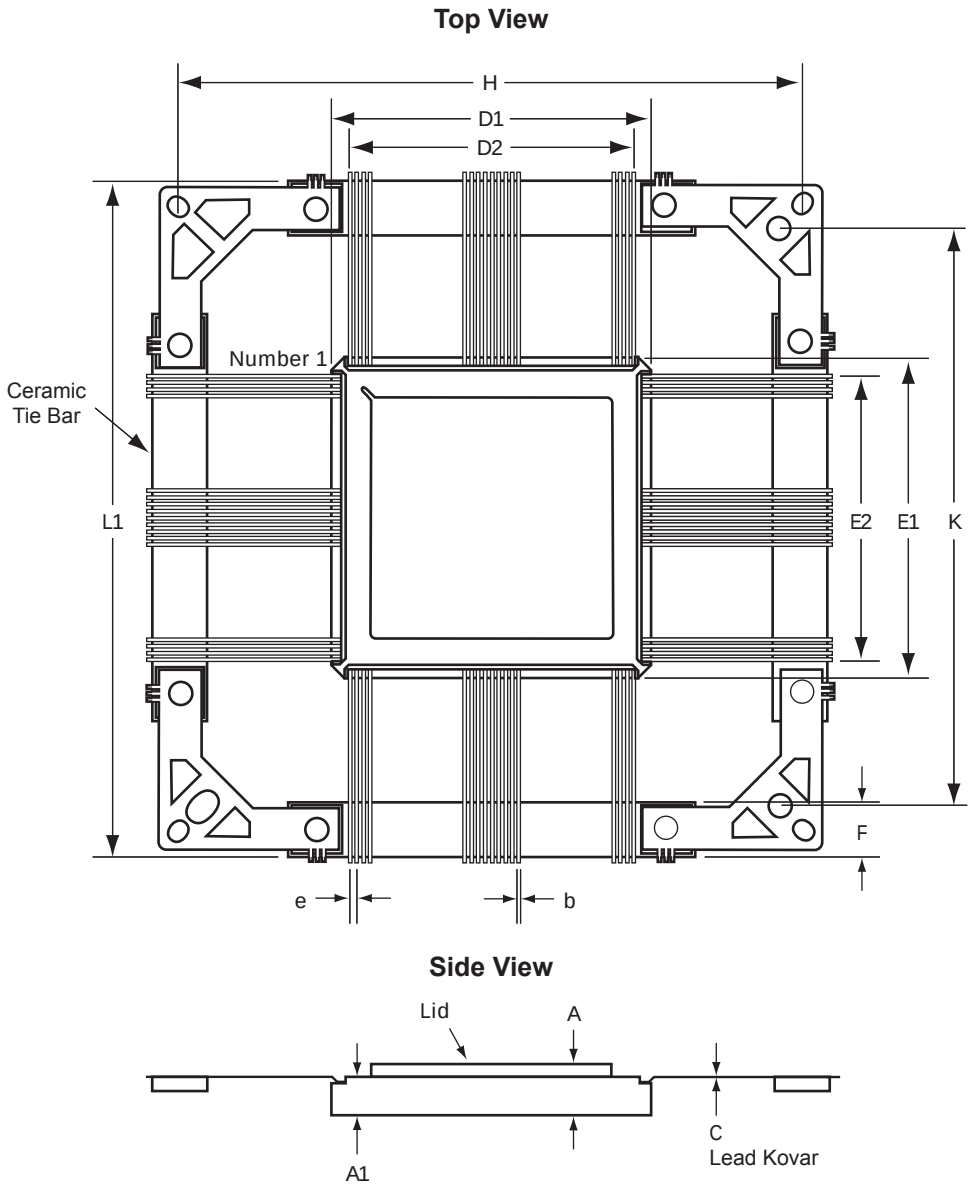
Lid Size	**A**	**B**
A1020B	13.21	13.21
A32100DX[1]	13.97	13.97
A54SX32A	13.21	13.21
RH1020[1]	13.21	13.21
RT1020[1]	13.21	13.21
RT54SX32S[1], RTSX32SU	10.54	13.61

1. This product is obsolete.

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

The following figure shows the dimensions, top view and side view of CQ132, CQ172, CQ196, CQ208, CQ256 and CQ352—Cavity Up devices without Heat Sink.

Figure 10 • **CQ132, CQ172, CQ196, CQ208, CQ256 and CQ352—Cavity Up without Heat Sink**



Note: All dimensions are in inches except for CQ208, CQ256, and CQ352, which are in millimeters. For more information on dimensions, see CQFP without Heat Sink Dimensions, page 24.

Note: Outside lead frame holes (from dimension H) are circular for the CQ208, CQ256, and CQ352.

Note: Seal ring and lid are connected to Ground.

Note: Packages are shipped with the uniform ceramic tie bar in a test carrier.

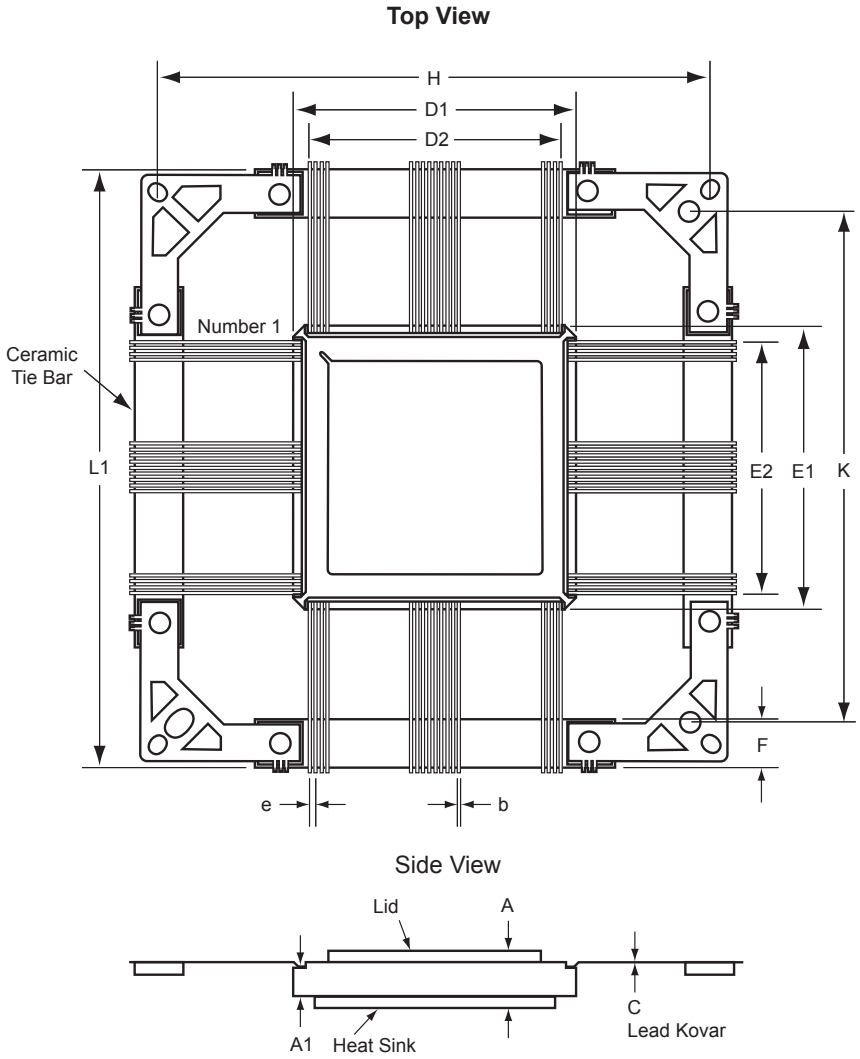
Table 12 • **Supported Devices for CQ132, CQ172, CQ196, CQ208, CQ256, and CQ352**

Supported Devices					
CQ132	**CQ172**	**CQ196**	**CQ208**	**CQ256**	**CQ352**
A1425A	A1280A	A1460A	A42MX36	A14100A	AX250
RT1425A	RH1280[1]	RT1460A	AX250	AX2000	AX500
	RT1280A		AX500	A54SX32A	AX1000
			A54SX16	A54SX72A	AX2000
			A54SX32	RT14100A	APA300
			A54SX32A	RT54SX32S[1]	APA600
			A54SX72A	RTSX32SU	APA1000
			APA300	RTAX2000S	RTAX250S
			APA600	RT3PE600L	RTAX1000S
			APA1000	RT3PE3000L	RTAX2000S
			RT54SX32S[1]		RTAX4000S
			RTSX32SU		RTAX2000D
			RTAX250S		RTAX4000D

1. This product is obsolete.

2.3.4 CQ208 and CQ256—Cavity Up with Heat Sink

Figure 11 • **CQ208 and CQ256—Cavity Up with Heat Sink**



Note: All dimensions are in inches except for CQ208, CQ256, and CQ352, which are in millimeters. For more information on dimensions, see CQFP with Heat Sink Dimensions, page 25.

Note: Outside lead frame holes (from dimension H) are circular for the CQ208, CQ256, and CQ352 devices.

Note: Seal ring and lid are connected to the Ground.

Note: Lead material is Kovar with minimum of 60 microinches gold over nickel.

Note: Packages are shipped with the uniform ceramic tie bar.

The following table lists the supported devices for CQ208 and CQ256.

Table 13 • **Supported Devices for CQ208 and CQ256**

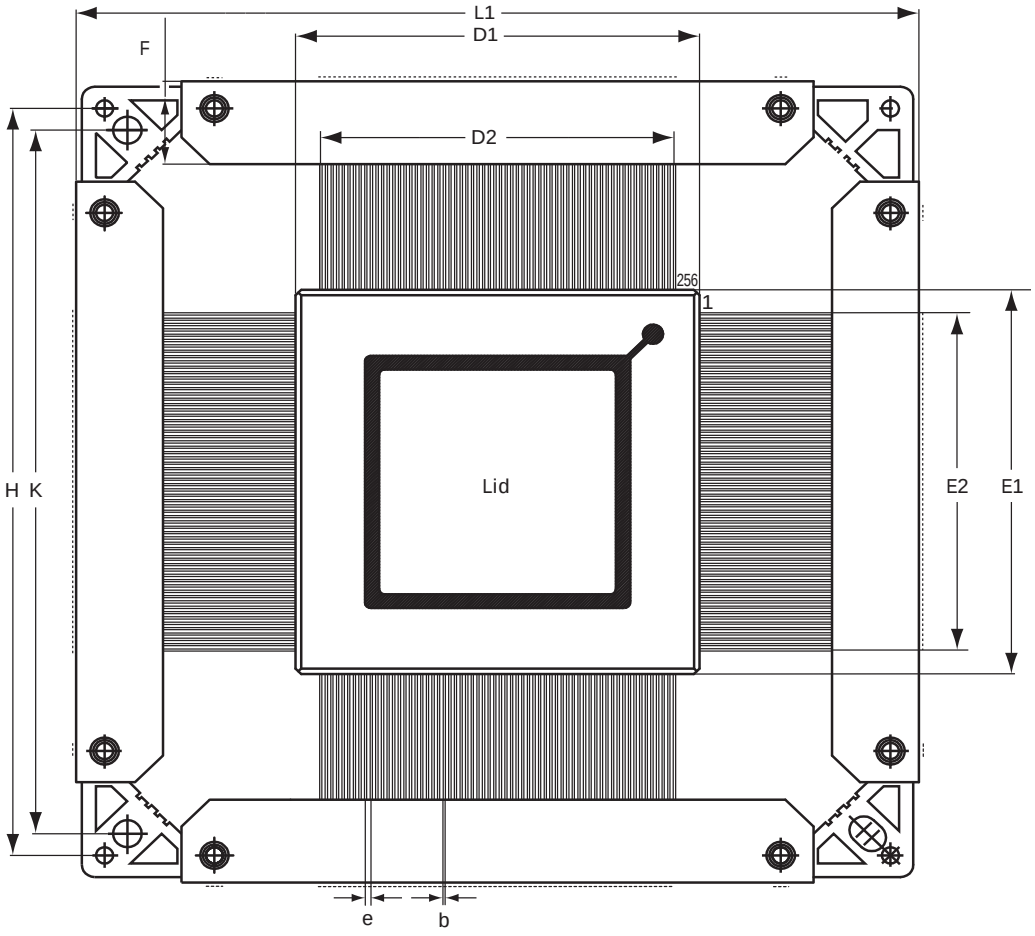
Supported Devices	
CQ208	**CQ256**
A32200DX[1] RT54SX72S[1] RTSX72SU	A54SX16 A54SX32 RT54SX72S[1] RTSX72SU

1. This product is obsolete.

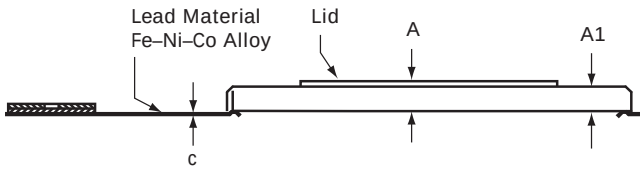
2.3.5 CQ256—Cavity Down without Heat Sink

Figure 12 • **CQ256—Cavity Down without Heat Sink**

Top View



Side View



Note: Dimensions are in millimeters. For more information on dimensions, see CQFP with Heat Sink Dimensions, page 25.

Note: Seal ring and lid are connected to Ground.

Note: Lead material is Kovar with gold plate over nickel.

Note: Packages are shipped with the uniform with the ceramic tie bar.

Note: 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.

The following table lists the supported device for CQ256.

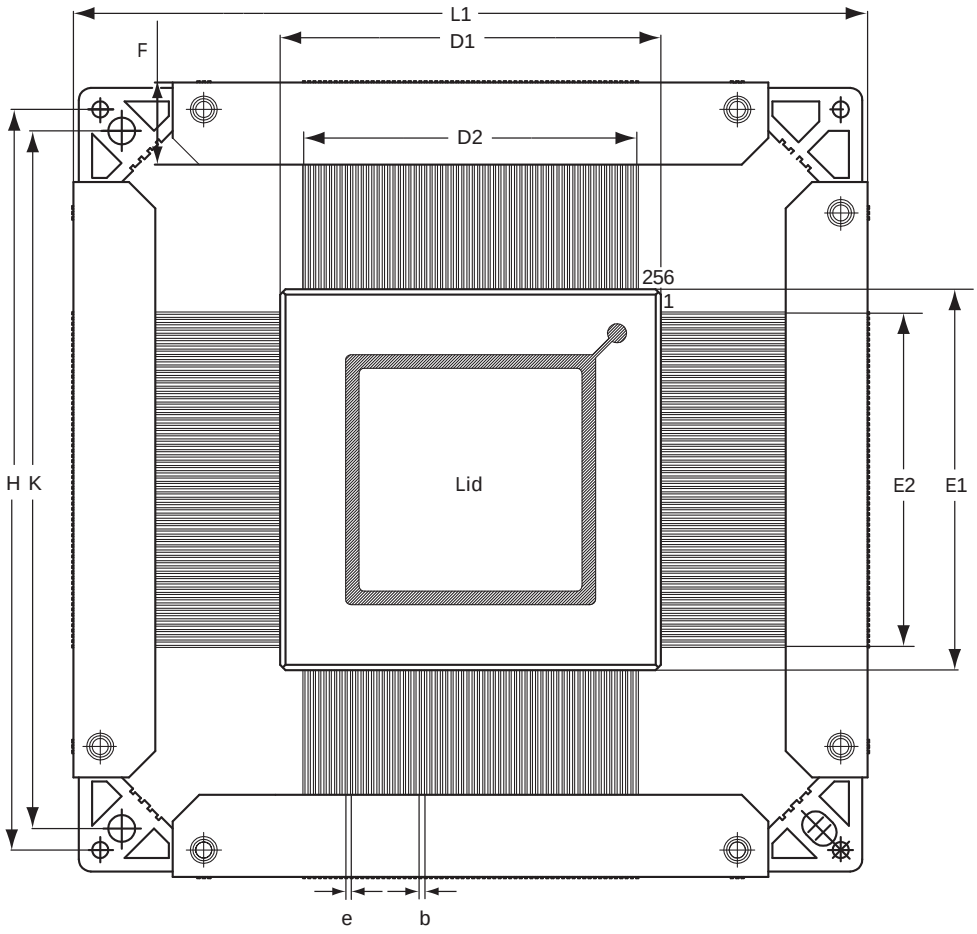
Table 14 • **Supported Devices for CQ256**

Supported Devices
A42MX36

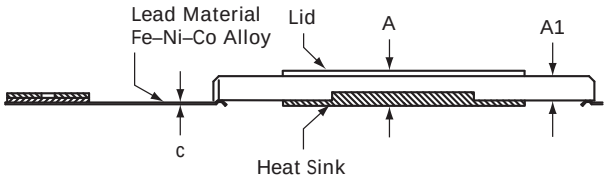
2.3.6 CQ256—Cavity Down with Heat Sink

Figure 13 • **CQ256—Cavity Down with Heat Sink**

Top View



Side View



Note: Packages are shipped with the uniform ceramic tie bar in a test carrier.

Note: Dimensions are in millimeters. For more information on dimensions, see CQFP with Heat Sink Dimensions, page 25.

Table 15 • **Supported Devices for CQ256**

Supported Devices
A32200DX[1]

1. This product is obsolete.

2.3.7 CQFP without Heat Sink Dimensions

The following table lists the dimensions for CQFP without heat sink.

Table 16 • **Dimensions for CQFP without Heat Sink**

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			CQ352[1] MO-134 VAR AE		
Symbol	**Min.**	**Nom.**	**Max.**	**Min.**	**Nom.**	**Max.**	**Min.**	**Nom.**	**Max.**
A	2.30	2.80	3.30	2.43	2.66	3.11	2.96	3.32	3.69
A1	2.00	2.30	2.80	2.05	2.29	2.51	2.5	2.79	3.08
b	0.18	0.20	0.22	0.18	0.2	0.22	0.18	0.2	0.22
c	0.11	0.15	0.18	0.1	0.15	0.2	0.1	0.15	0.2
D1/E1	35.64	36.00	36.64	47.75	48.00	48.25	47.75	48.00	48.25
D2/E2	31.5 BSC			43.51 BSC			43.5 BSC		
e	0.50 BSC			0.50 BSC			0.50 BSC		
F	7.05	7.75	8.45		5.00			5.00	
H	70.00 BSC			70.00 BSC			70.00 BSC		
K	65.90 BSC			65.90 BSC			65.9 BSC		
L1	74.60	75.00	75.40	74.60	75.00	75.40	74.60	75.00	75.40

1. For device RTAX2000D-CQ352 and RTAX4000D-CQ352 only.

Note: All dimensions are in inches except for CQ208, CQ256, and CQ352, which are in millimeters.

Note: BSC = Basic spacing between centers. This is a theoretical true position dimension and so has no tolerance.

2.3.8 CQFP with Heat Sink Dimensions

The following table lists the dimensions for CQFP with Heat Sink.

Table 17 • **Dimensions for CQFP with Heat Sink**

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

Note: All dimensions are in inches except for CQ208, CQ256 and CQ352, which are in millimeters.

Note: 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 the specified device.

For heat sink information, see the *Hermetic Package Mechanical Configuration document (Cavity, weight, lid size and heat sink size)* located at: http://www.microsemi.com/document-portal/doc_view/131087-hermetic-package-mechanical-configuration

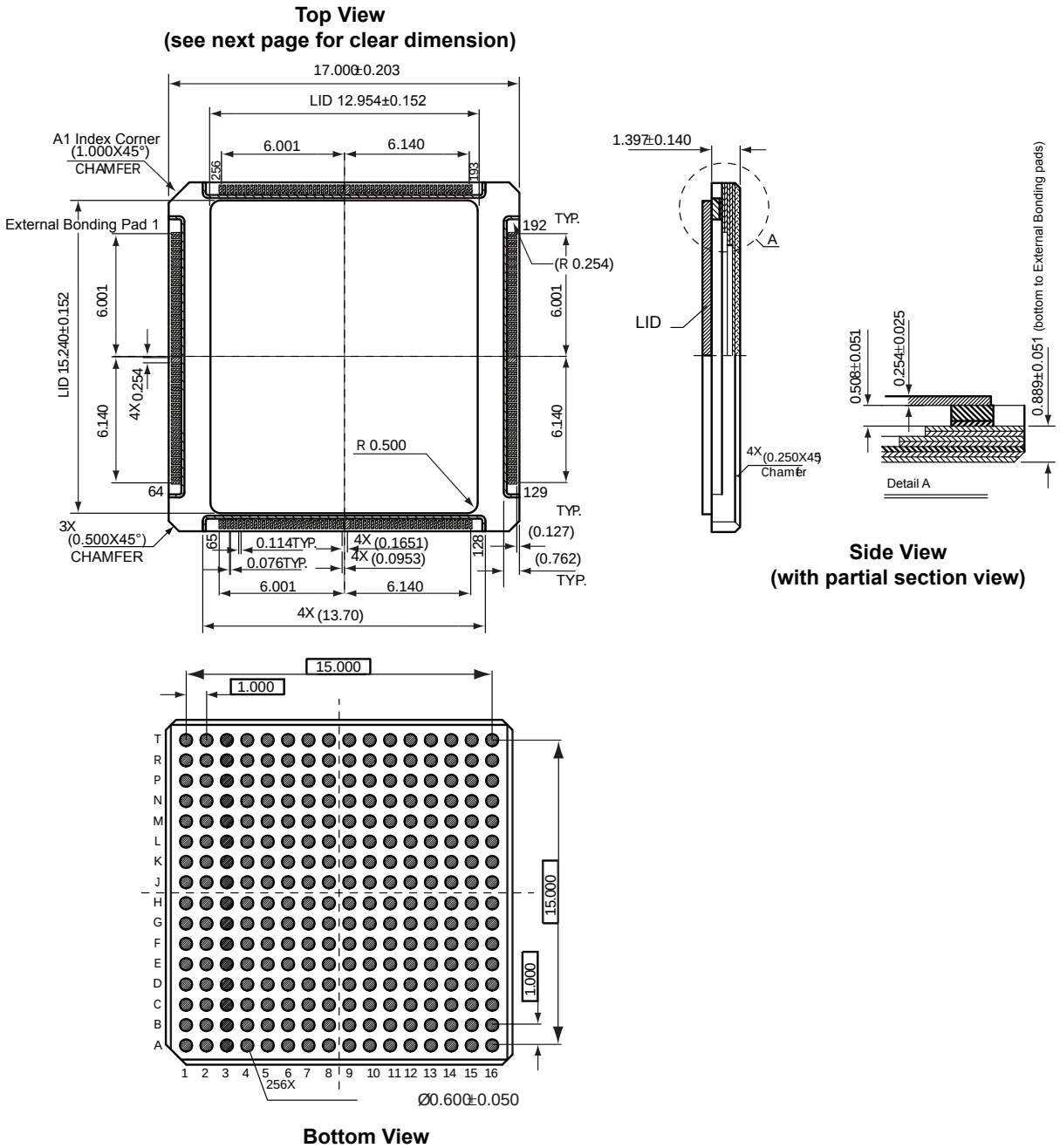
2.4 Ceramic Chip Carrier Land Grid Substrate (CCLG)

The following figures show package outlines for various packages under CCLG.

2.4.1 CC256

The following figure shows the package outline of CC256.

Figure 14 • **Package Outline of CC256**



Note: Units are in mm.

The following table shows the supported devices for CC256.

Table 18 • **Supported Devices for CC256**

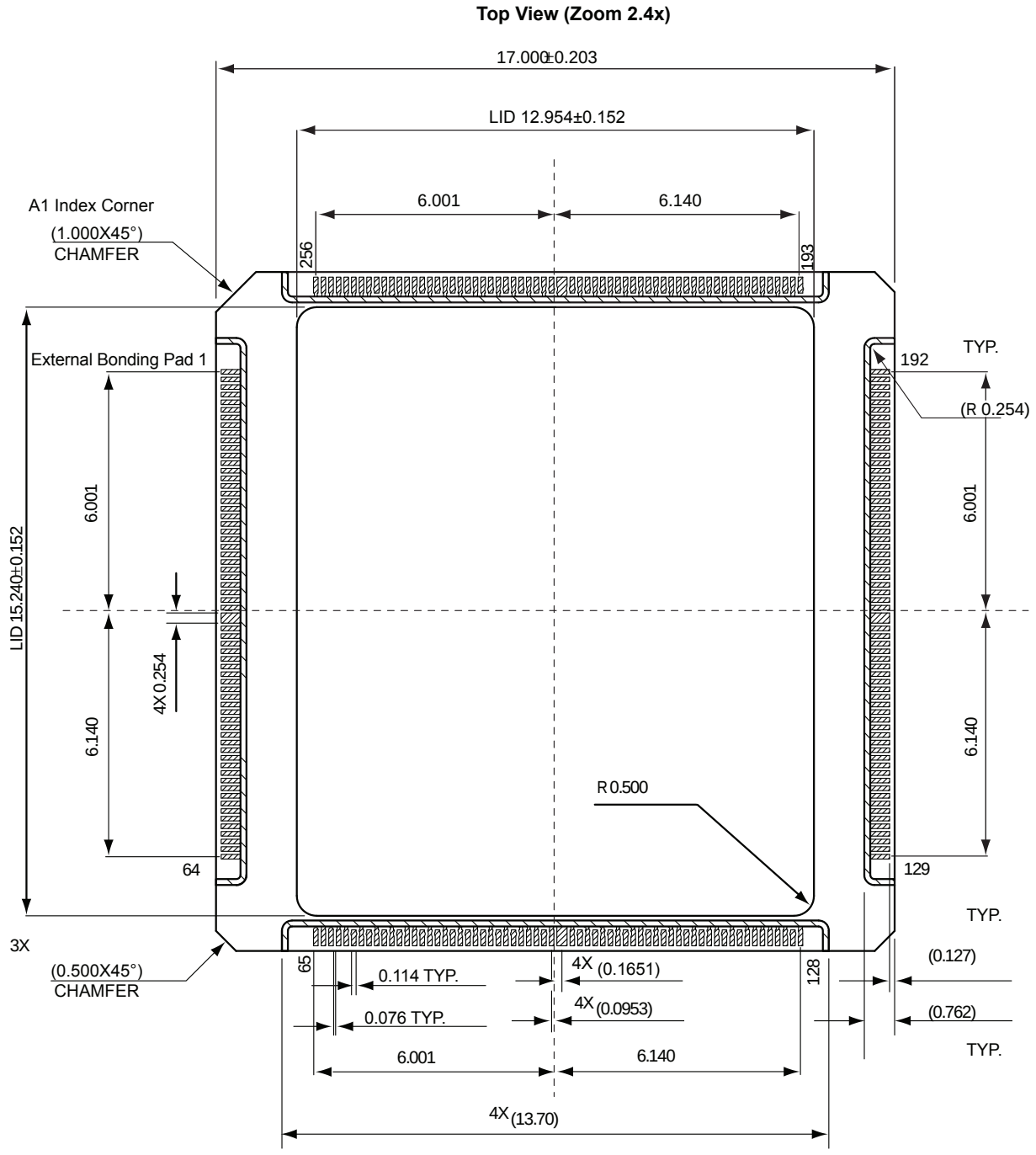
Supported Devices
RT54SX32S[1]
RTSX32SU

1. This product is obsolete.

2.4.2 CCLG Substrate Dimensions

The following figure shows the dimensions of CCLG substrate.

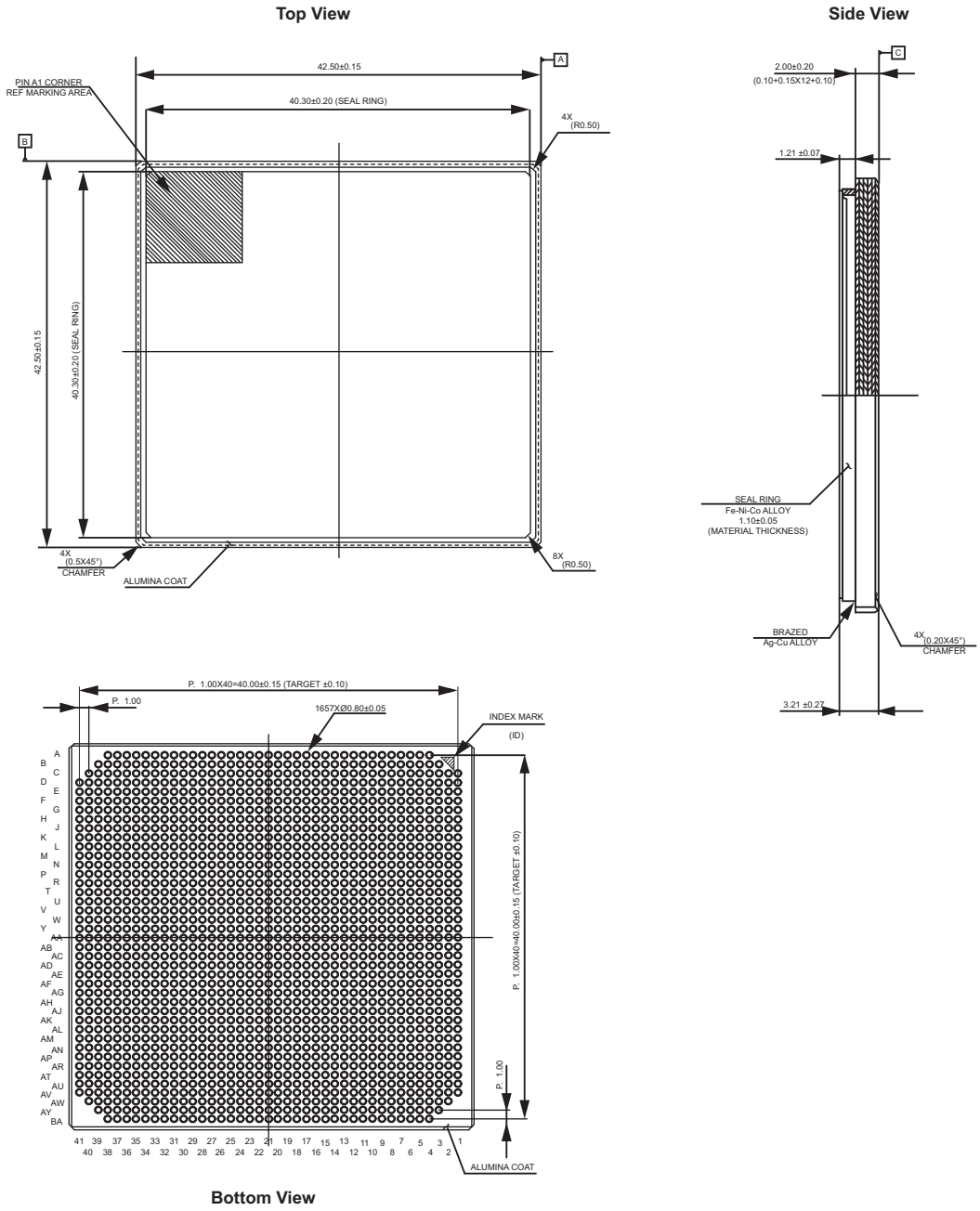
Figure 15 • **CCLG Substrate Dimensions**



2.4.3 LG1657

The following figure shows the package outline of LG1657.

Figure 16 • **Package Outline of LG1657**



Note: The units are in mm.

Note: Seal ring is connected to the ground (GND).

The following table shows the supported devices for LG1657.

Table 19 • **Supported Devices for LG1657**

Supported Devices
RT4G150

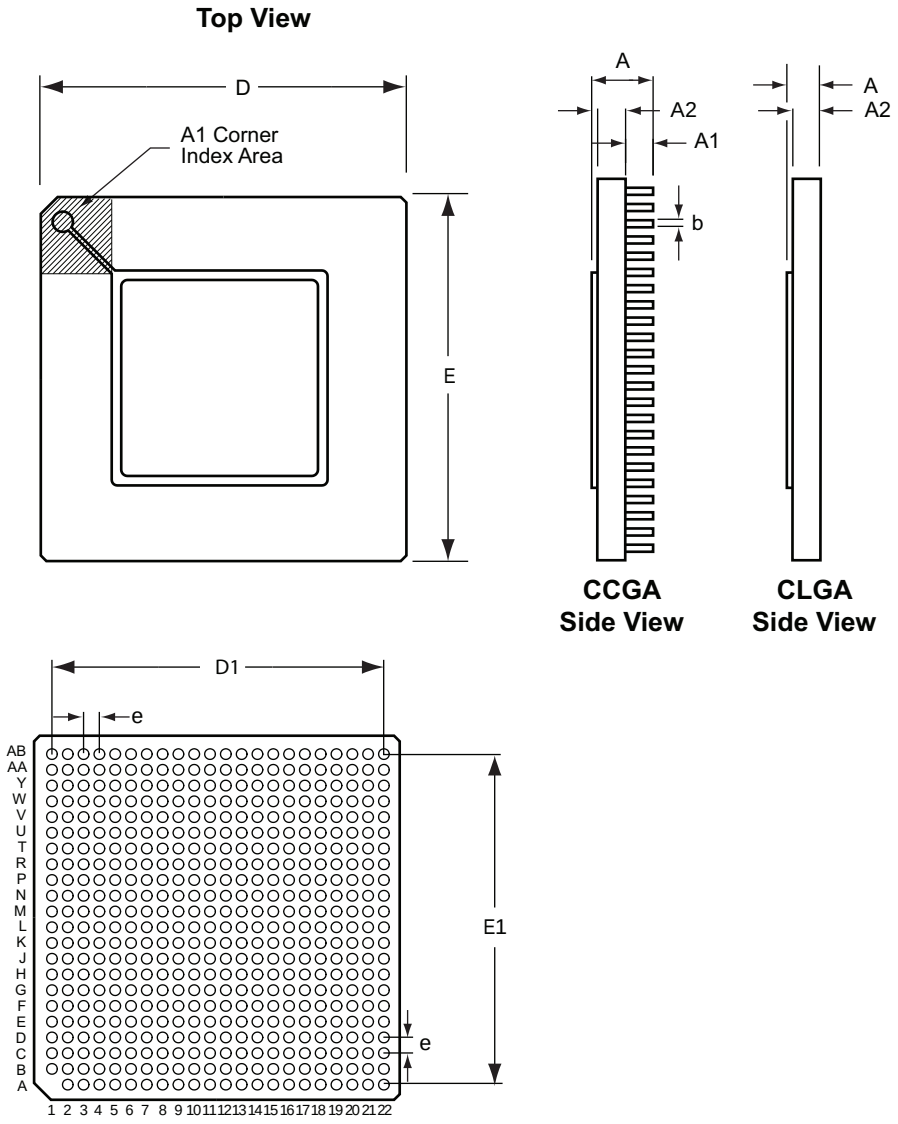
2.5 Ceramic Column Grid Array (CCGA)

The following figures show package outlines for various packages under CCGA.

2.5.1 CG484

The following figure shows the package outline of CG484.

Figure 17 • **Package Outline of CG484**



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

The following table shows the supported devices for CG484.

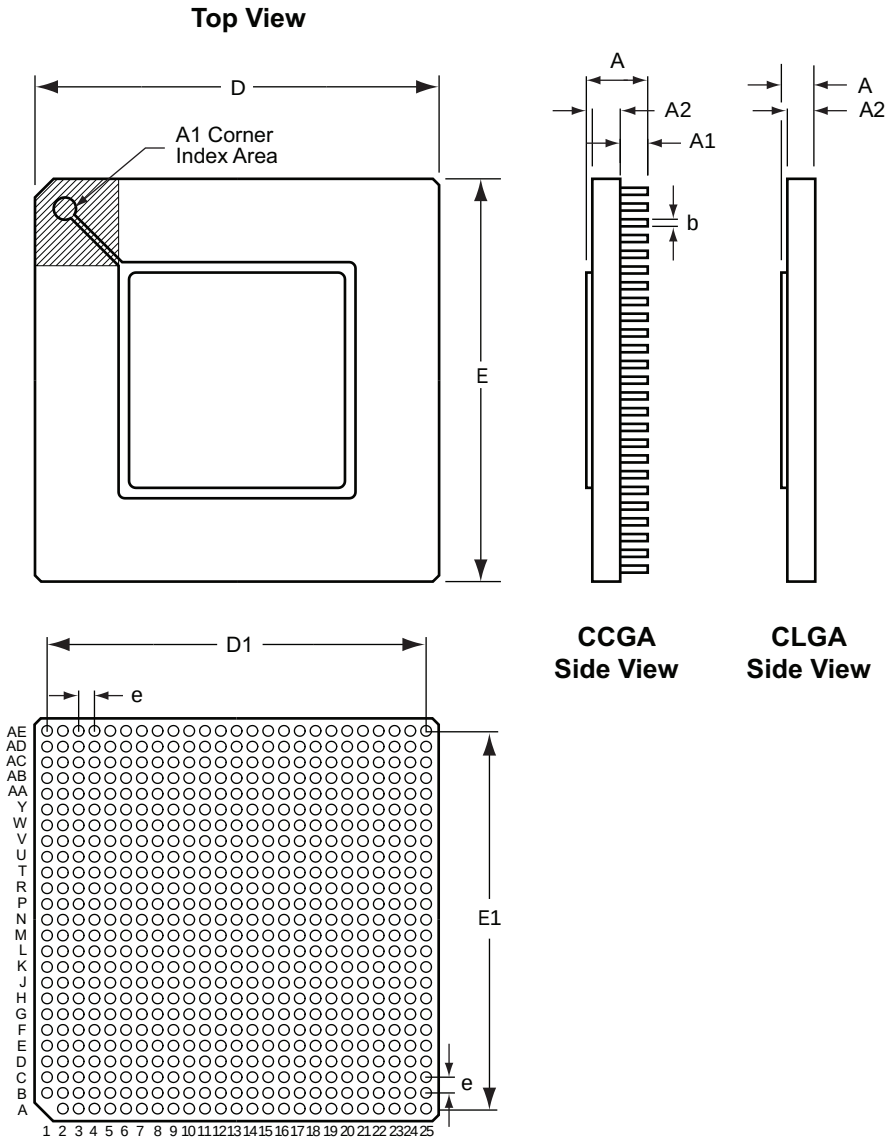
Table 20 • **Supported Devices for CG484**

Supported Devices
RT3PE600L
RT3PE3000L

2.5.2 CG624

The following figure shows the package outline of CG624.

Figure 18 • **Package Outline of CG624**



The following table shows the supported devices for CG624.

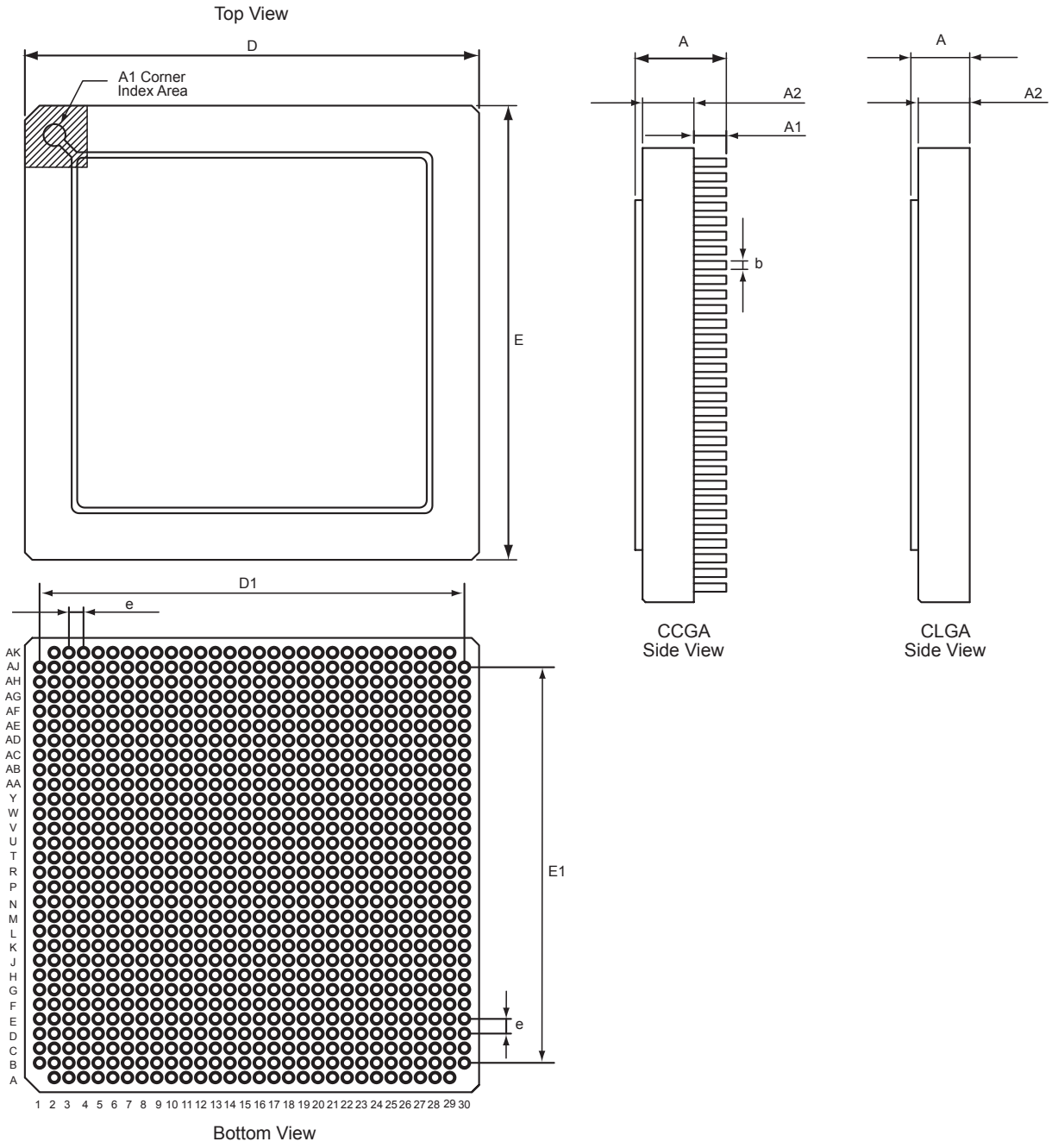
Table 21 • **Supported Devices for CG624**

Supported Devices			
AX1000	RTAX1000S	APA600	RTSX72SU
AX2000	RTAX2000S	APA1000	
	RTAX250S		

2.5.3 CG896

The following figure shows the package outline of CG896.

Figure 19 • **Package Outline of CG896**



The following table shows the supported devices for CG896.

Table 22 • **Supported Devices for CG896**

Supported Devices
RT3PE3000L

2.5.4 CCGA Dimensions

The following table lists the dimensions of CCGA.

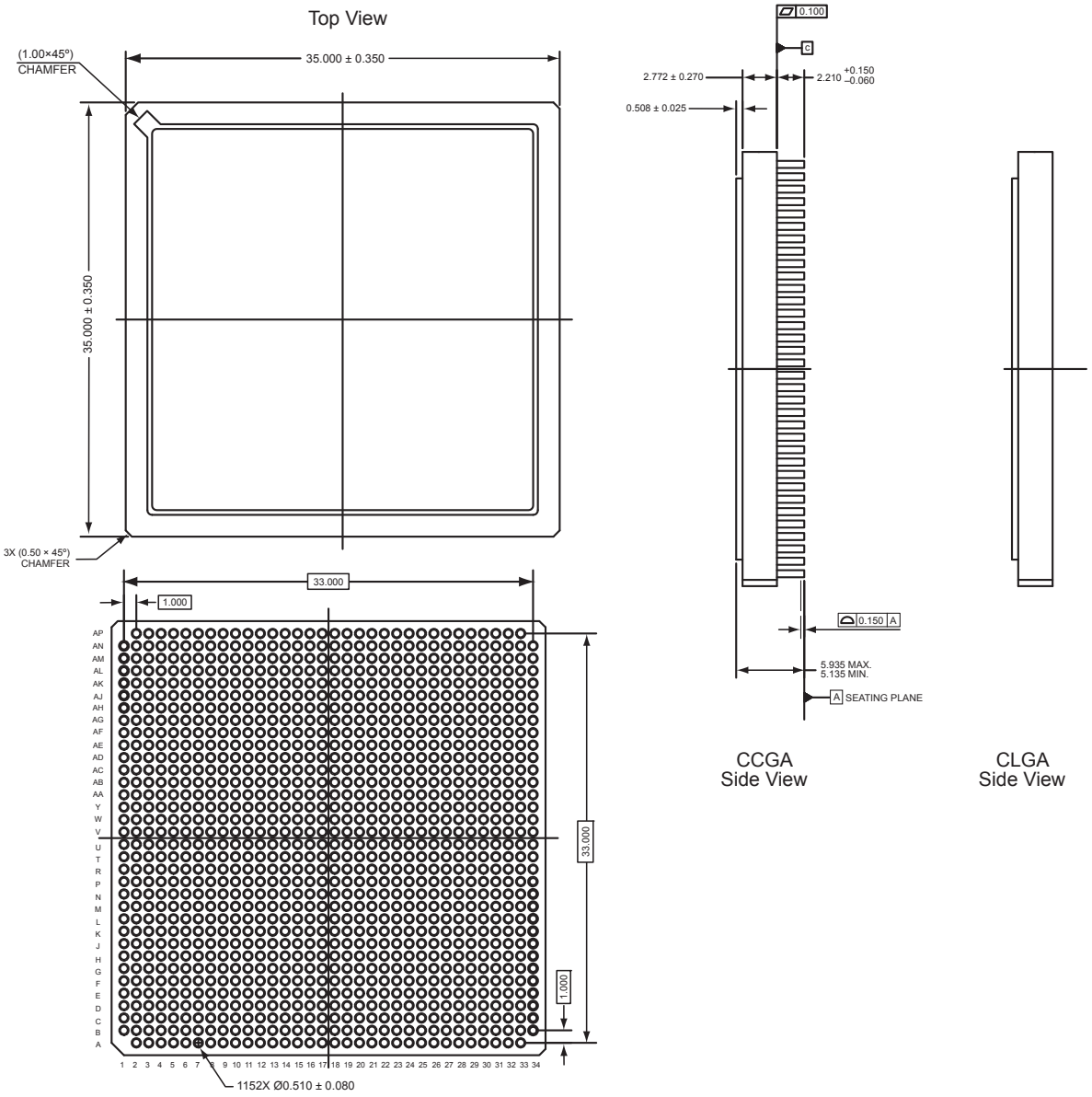
Table 23 • **Dimensions of CCGA**

	CG484			CG624			CG896		
Dimension	**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		

2.5.5 CG1152

The following figure shows the package outline of CG1152.

Figure 20 • **Package Outline of CG1152**



Note: The units are in mm.

Note: Seal ring and die attach are connected to the ground (GND).

The following table shows the supported devices for CG1152.

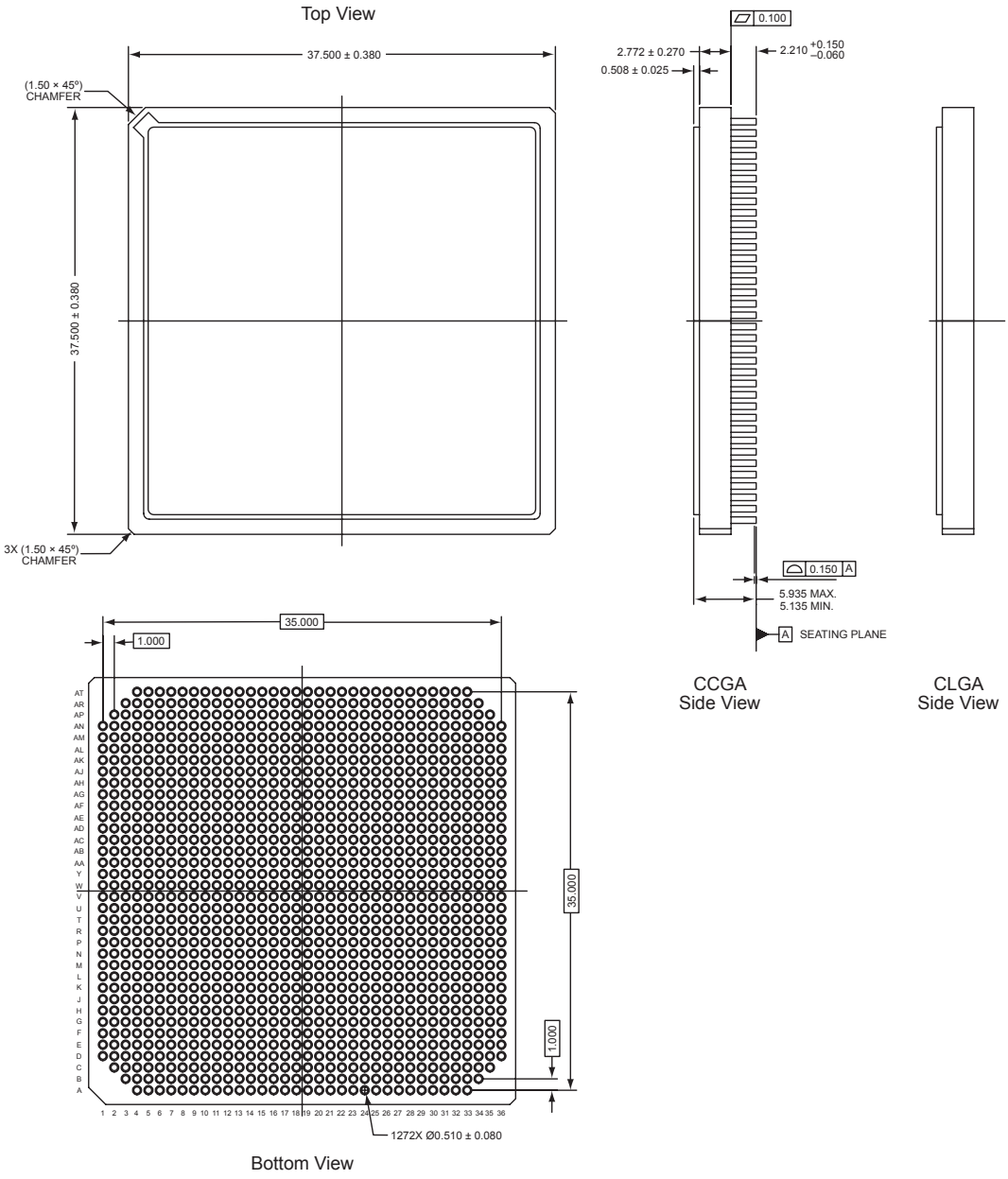
Table 24 • **Supported Devices for CG1152**

Supported Devices
RTAX2000S

2.5.6 CG1272

The following figure shows the package outline of CG1272.

Figure 21 • Package Outline of **CG1272**



Note: The units are in mm.

Note: Seal ring and die attach paddle are connected to the ground (GND).

The following table shows the supported devices for CG1272.

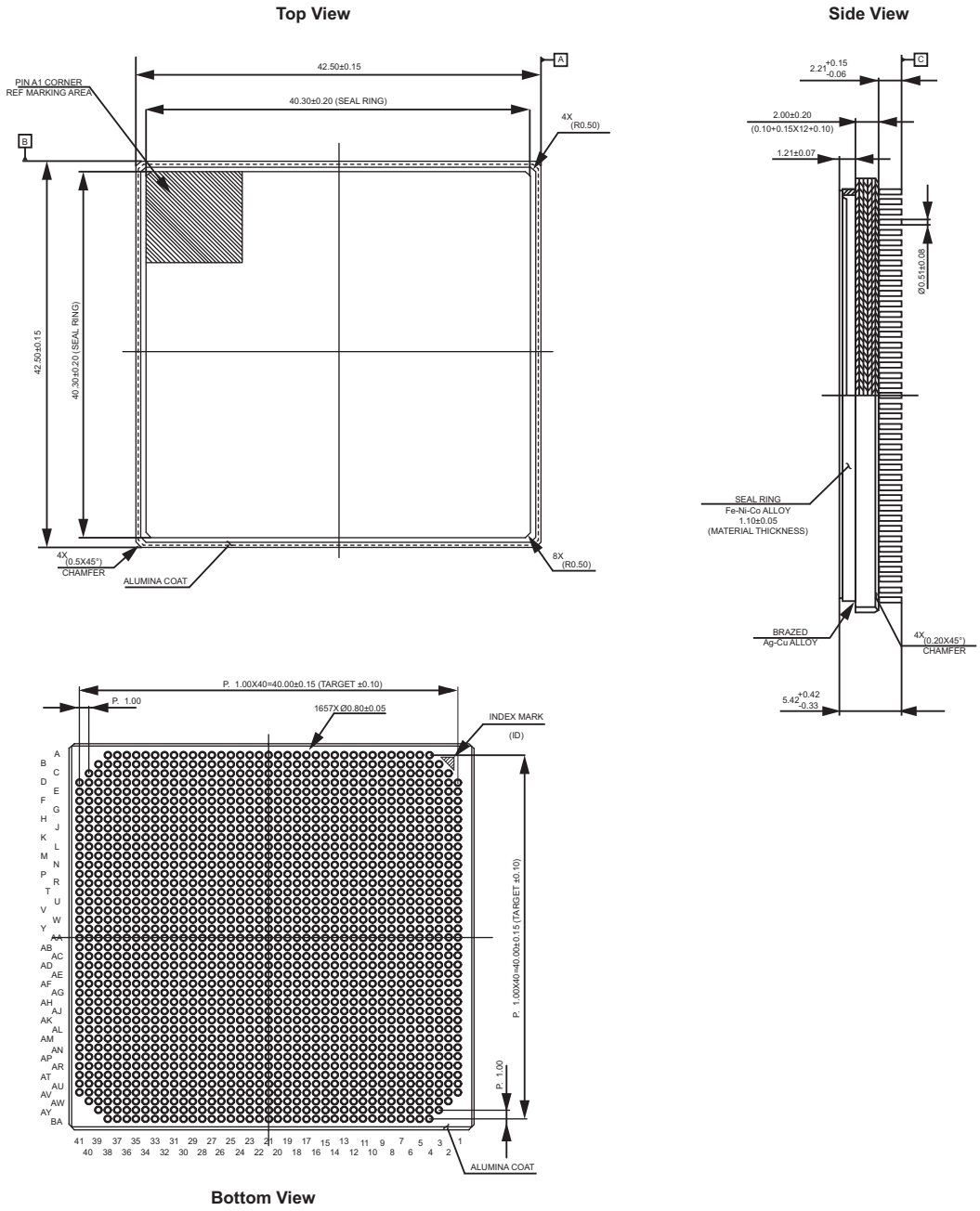
Table 25 • **Supported Devices for CG1272**

Supported Devices
RTAX4000S RTAX2000D

2.5.7 CG1657

The following figure shows the package outline of CG1657.

Figure 22 • **Package Outline of CG1657**



Note: The units are in mm.

Note: Seal ring is connected to the ground (GND).

The following table shows the supported devices for CG1657.

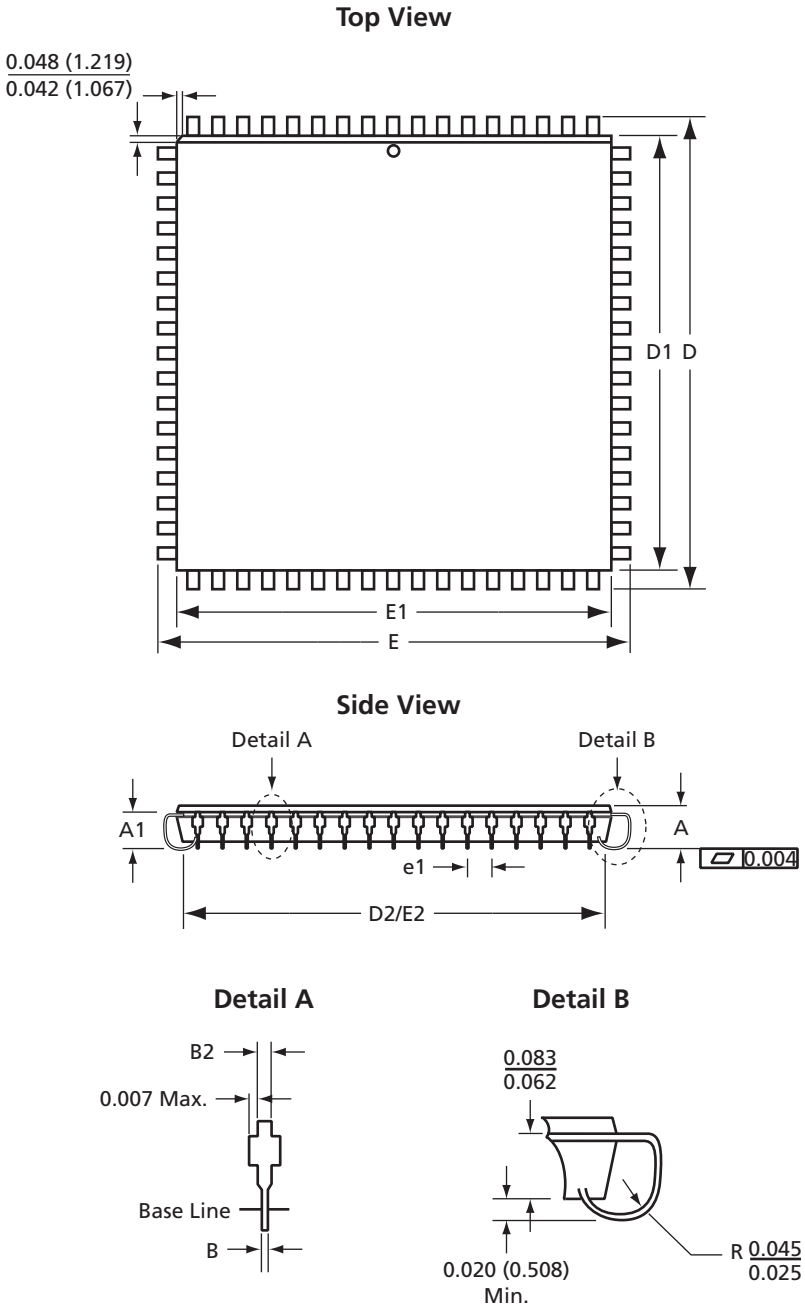
Table 26 • **Supported Devices for CG1657**

Supported Devices
RT4G150

2.6 Plastic Leaded Chip Carrier (PLCC)

The following figure shows the dimensions and details of Plastic Leaded Chip carrier.

Figure 23 • **Plastic Leaded Chip Carrier (PLCC)**



Note: Dimensions are in millimeters. For more information on dimensions, see Plastic Leaded Chip Carrier Dimensions, page 38.

The following table lists the supported device for PL44, PL68, and PL84.

Table 27 • **Supported Devices for PL44, PL68, and PL84**

Supported Devices				
PL44	**PL68**	**PL84**		
A1010B	A1010B	A10V20B	A1020B	A3265A[1]
A1020B	A1020B	A1225XLV[1]	A1225A	A54SX08
A40MX02	A10V10B	A1280XLV[1]	A1240A	A32100DX[1]
A40MX04	A10V20B	A1240XLV[1]	A1280A	A32140DX[1]
	A40MX02	A14V15A	A1225XL[1]	A40MX04
	A40MX04	A14V25A	A1240XL[1]	A42MX09
		A14V40A	A1280XL[1]	A42MX16
		A3265DXV[1]	A1415A	A42MX24
		A32100DXV[1]	A1425A	
		A32140DXV[1]	A1440A	

1. This product is obsolete.

2.6.1 Plastic Leaded Chip Carrier Dimensions

The following table lists the dimensions of Plastic Leaded Chip Carrier.

Table 28 • **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		

Note: All dimensions are in inches.

Note: BSC = Basic spacing between centers.

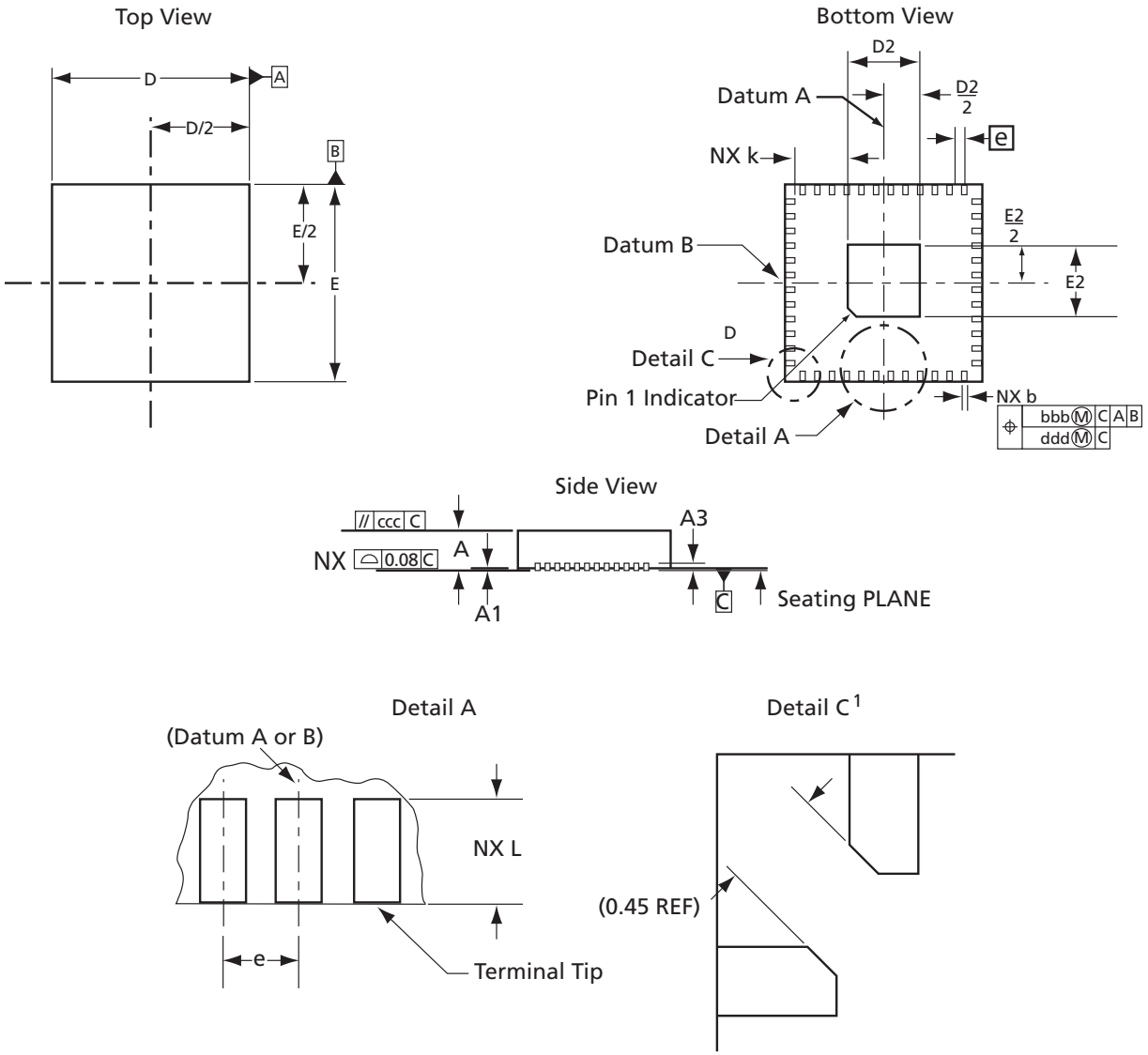
2.7 Quad Flat No Lead (QFN)

The following figures show package outlines for various packages under QFN.

2.7.1 QN48

The following figure shows the package outline of QN48.

Figure 24 • **Package Outline of QN48**



Note: Corner chamfer leads are applied to maintain minimum spacing between corner leads; otherwise, keep normal lead shape.

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

The following table shows the supported devices for QN48.

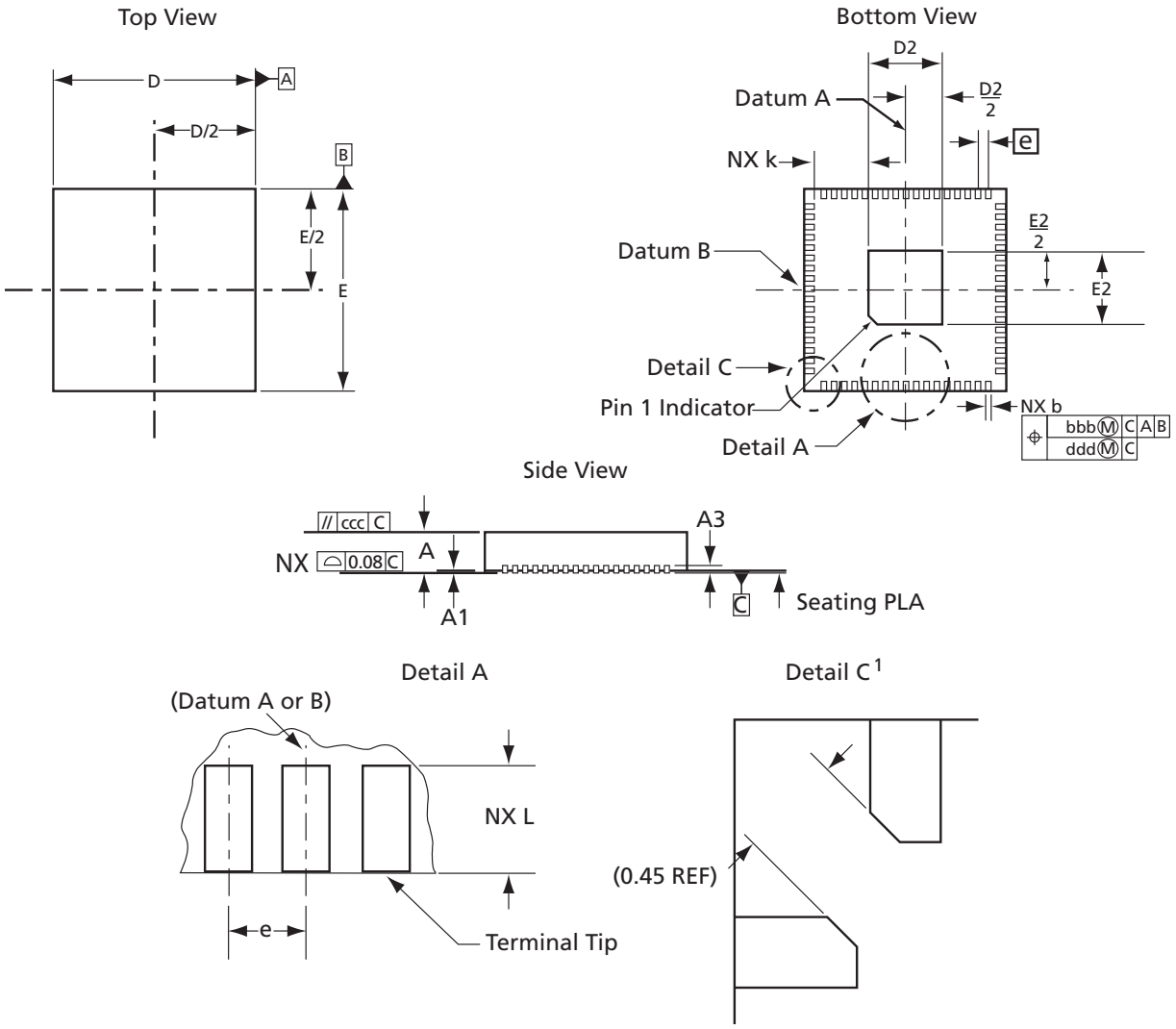
Table 29 • **Supported Devices for QN48**

Supported Devices	
A3PN010	AGN010
A3P030/A3PN030	AGL030/AGLN030

2.7.2 QN68

The following figure shows the package outline of QN68.

Figure 25 • **Package Outline of QN68**



Note: Corner chamfer leads are applied to maintain minimum spacing between corner leads; otherwise, keep normal lead shape.

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

The following table shows the supported devices for QN68.

Table 30 • **Supported Devices for QN68**

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

2.7.3 QN48 and QN68 Quad Flat No Leads Single Row Dimensions

Table 31 • **QN48 and QN68 Quad Flat No Leads Single Row Dimensions**

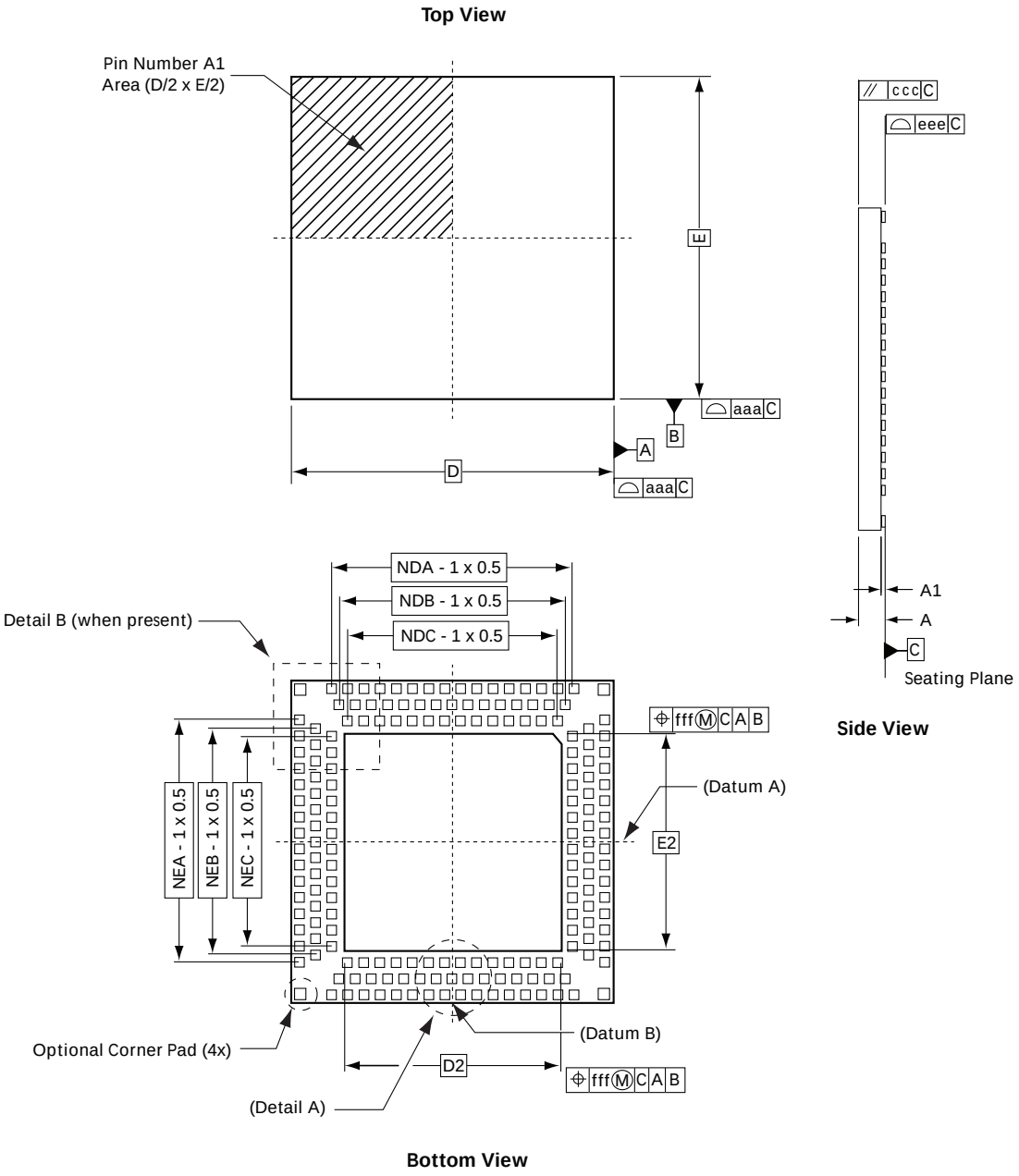
	QN48, page 39 MO-220, Variation VLLE-1			**QN68, page 40 MO-220, Variation VLLE-1**		
Dimension	**Min.**	**Nom.**	**Max.**	**Min.**	**Nom.**	**Max.**
A	0.80	0.90	1.00	0.80	0.90	1.00
A1	0	.02	0.05	0.00	0.02	0.05
A3	0.20 REF			0.20 REF		
b	0.15	0.20	0.25	0.15	0.20	0.25
D/E	5.90	6.00	6.1	7.90	8.00	8.10
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.

2.7.4 Quad Flat No Lead

The following figure shows the dimensions of quad flat no lead.

Figure 26 • **Quad Flat No Lead**

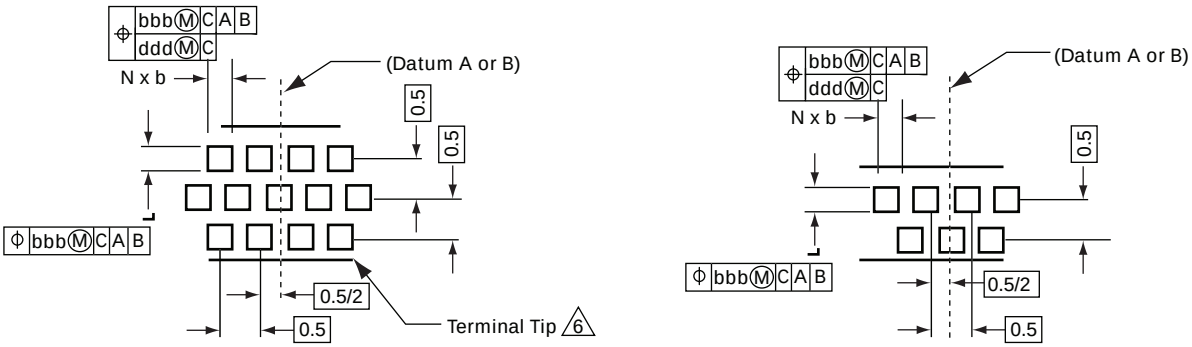


2.7.5 Quad Flat No Lead Details

The following figure shows the details of quad flat no lead.

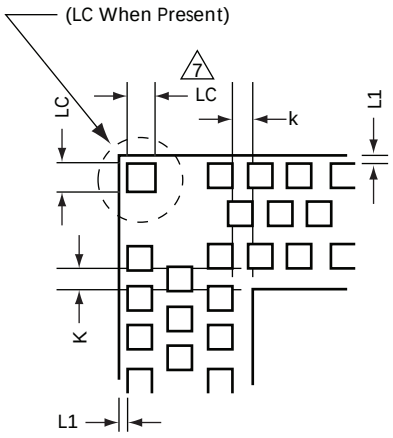
Figure 27 • **Quad Flat No Lead Details**

Detail A



QN180/QN132 **QN108**

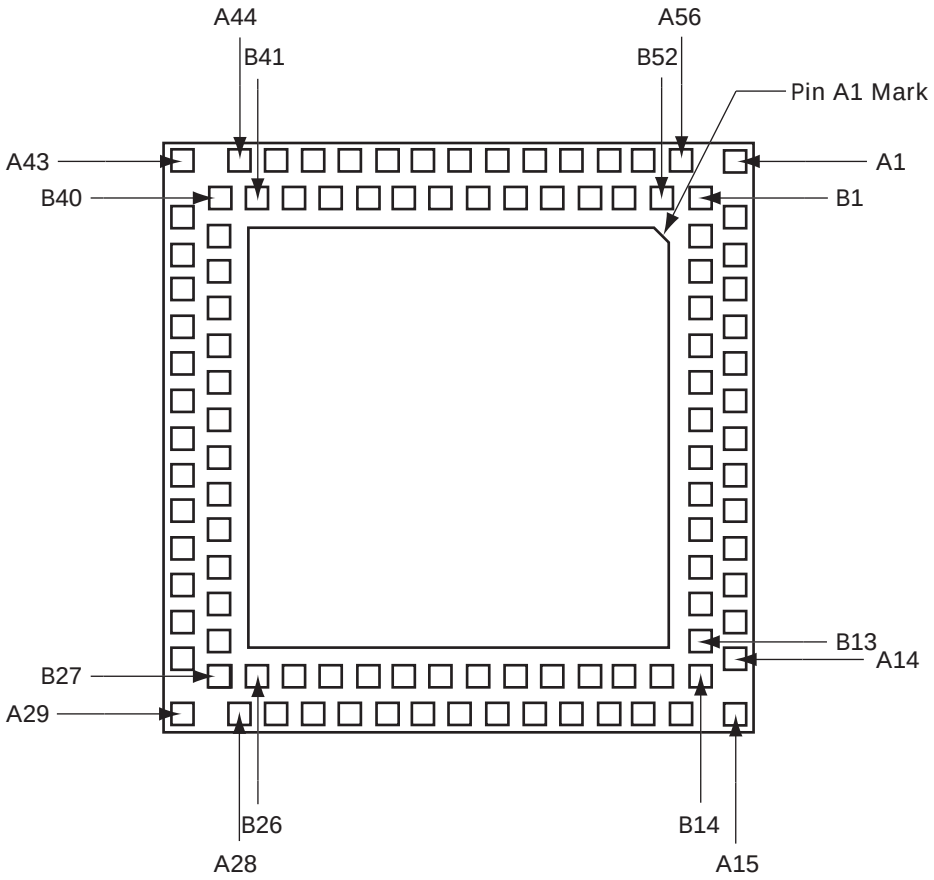
Detail B



2.7.6 QN108 Bottom View

The following figure shows the package bottom view of QN108.

Figure 28 • **Bottom View of QN108**



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

Note: Package is discontinued and not available.

The following table shows the supported devices for QN108.

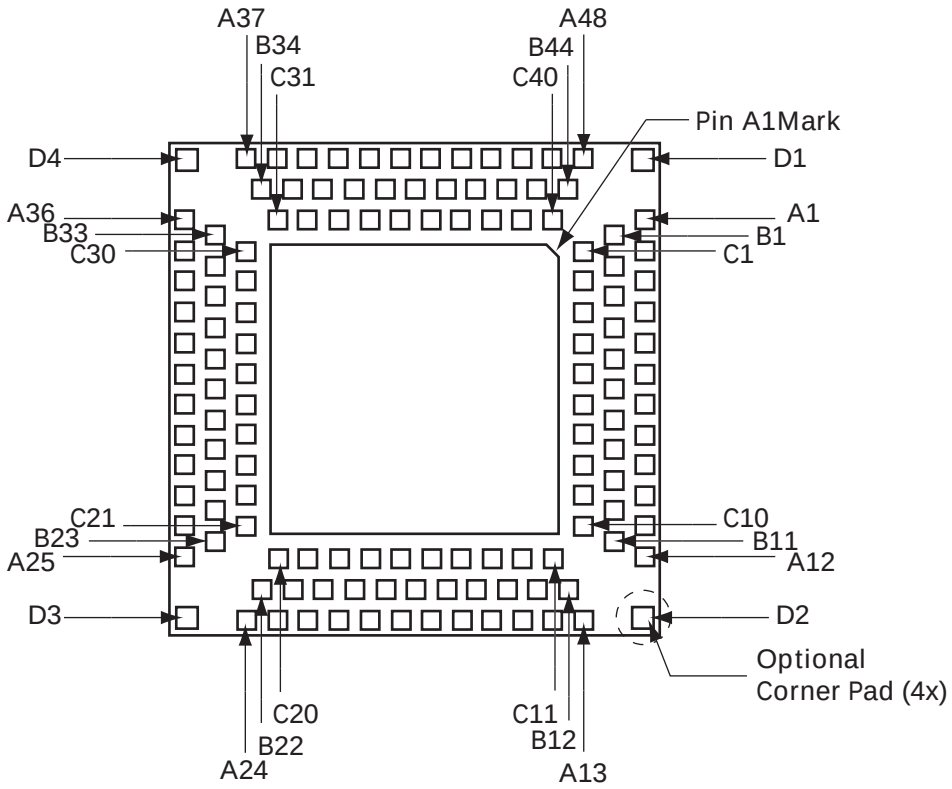
Table 32 • **Supported Devices for QN108**

Supported Devices
AFS090

2.7.7 QN132 Bottom View

The following figure shows the package bottom view of QN132.

Figure 29 • **QN132 Bottom View**



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

Note: Package is discontinued and not available.

The following table lists the supported devices for QN132.

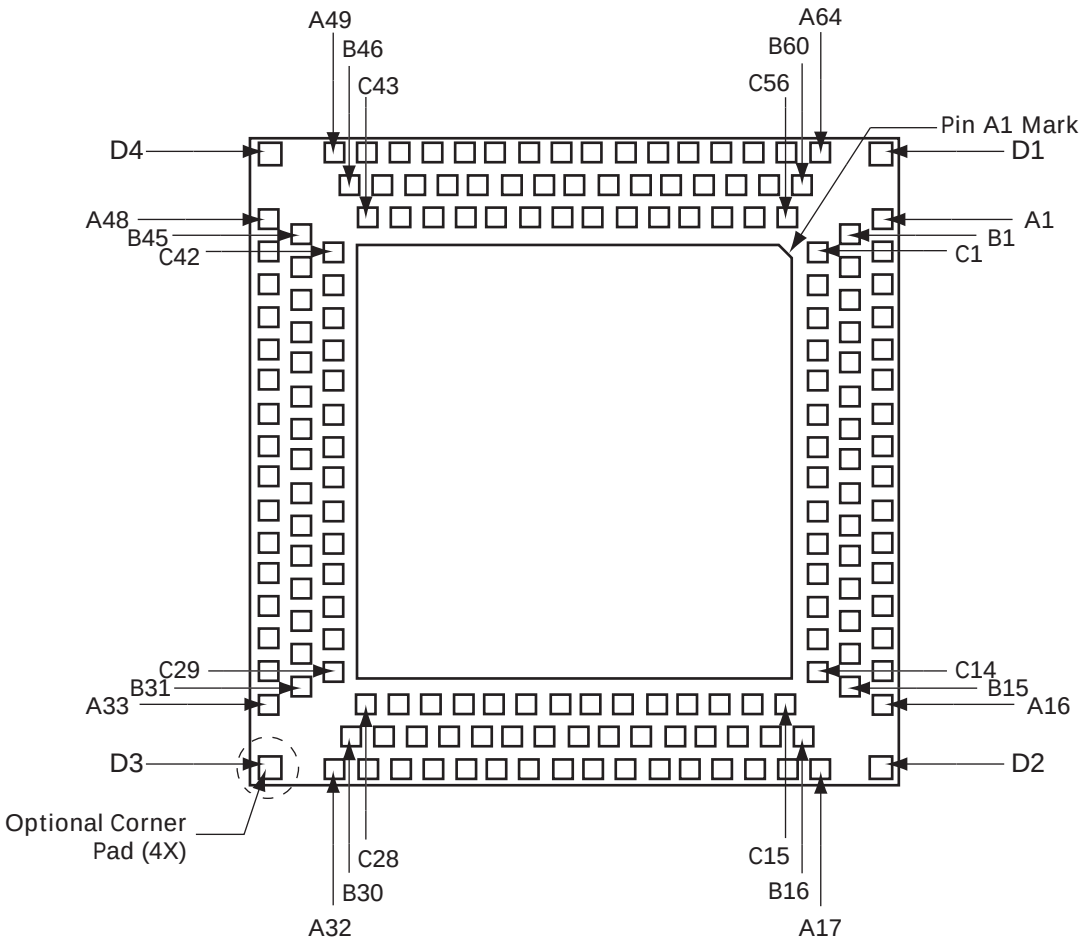
Table 33 • **Supported Devices for QN132**

Supported Devices	
AGL030	A3P030
AGL060	A3P060
AGL125	A3P125
AGL250	A3P250

2.7.8 QN180 Bottom View

The following figure shows the package bottom view of QN180.

Figure 30 • **Bottom View of QN180**



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

Note: Package is discontinued and not available.

Table 34 • **Supported Devices for QN180**

Supported Devices
AFS090
AFS250
M1AFS250

2.7.9 Quad Flat No Leads Dimensions

The following table lists the dimensions of the quad flat no leads.

Table 35 • **Dimensions of Quad Flat No Leads**

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		

Note: All dimensions are in millimeters.

Note: BSC = Basic spacing between centers.

The following table lists the dimensions of QN108, QN132, and QN180 packages.

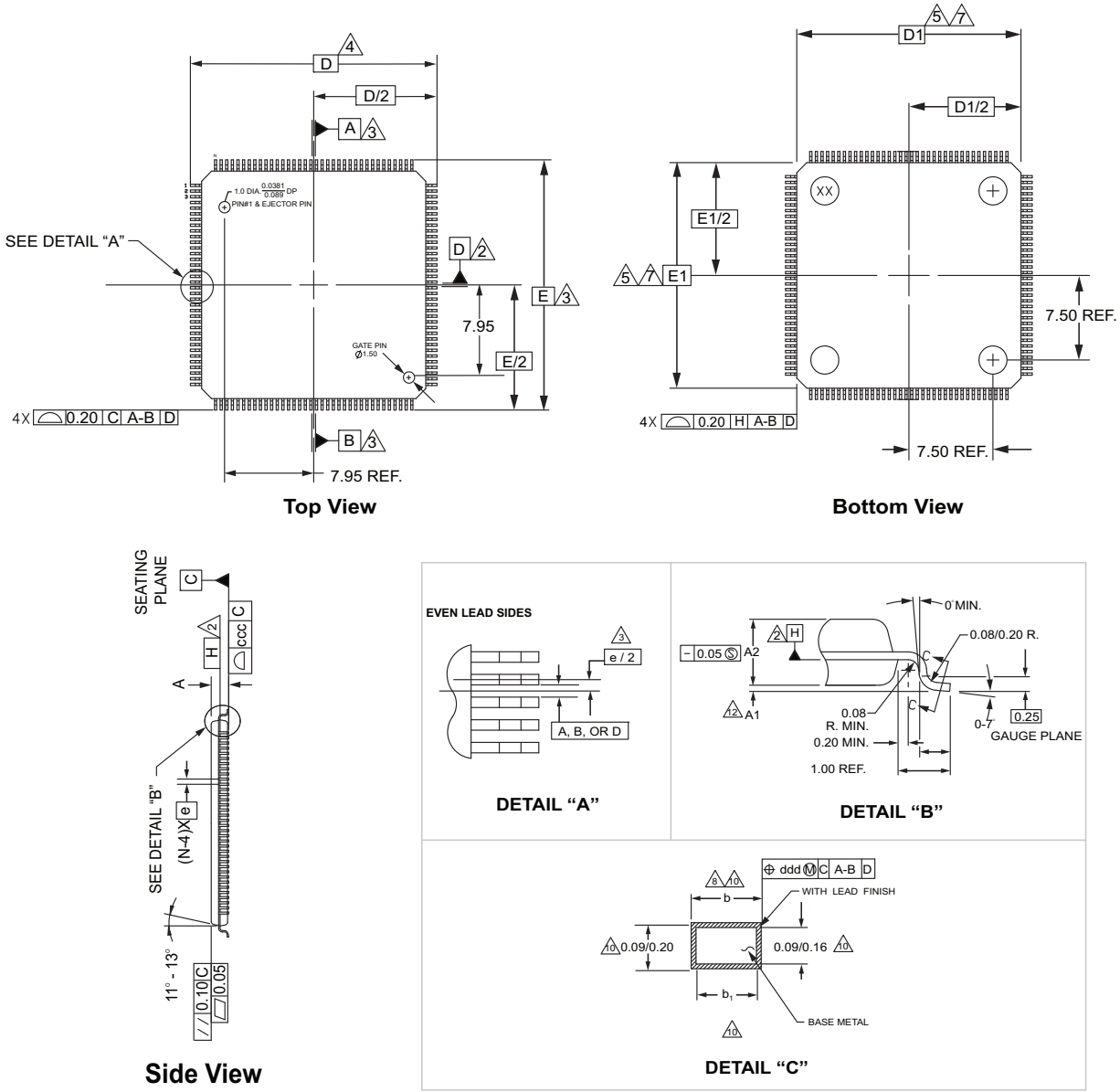
Table 36 • **Dimensions for QN108, QN132, and QN180**

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

2.8 Plastic Quad Flat Pack Rectangular Package (TQ144)

The following figure shows the details and dimensions of Plastic Quad Flat Pack Rectangular.

Figure 31 • **Plastic Quad Flat Pack Rectangular Package (TQ144)**



NOTES: UNLESS OTHERWISE SPECIFIED

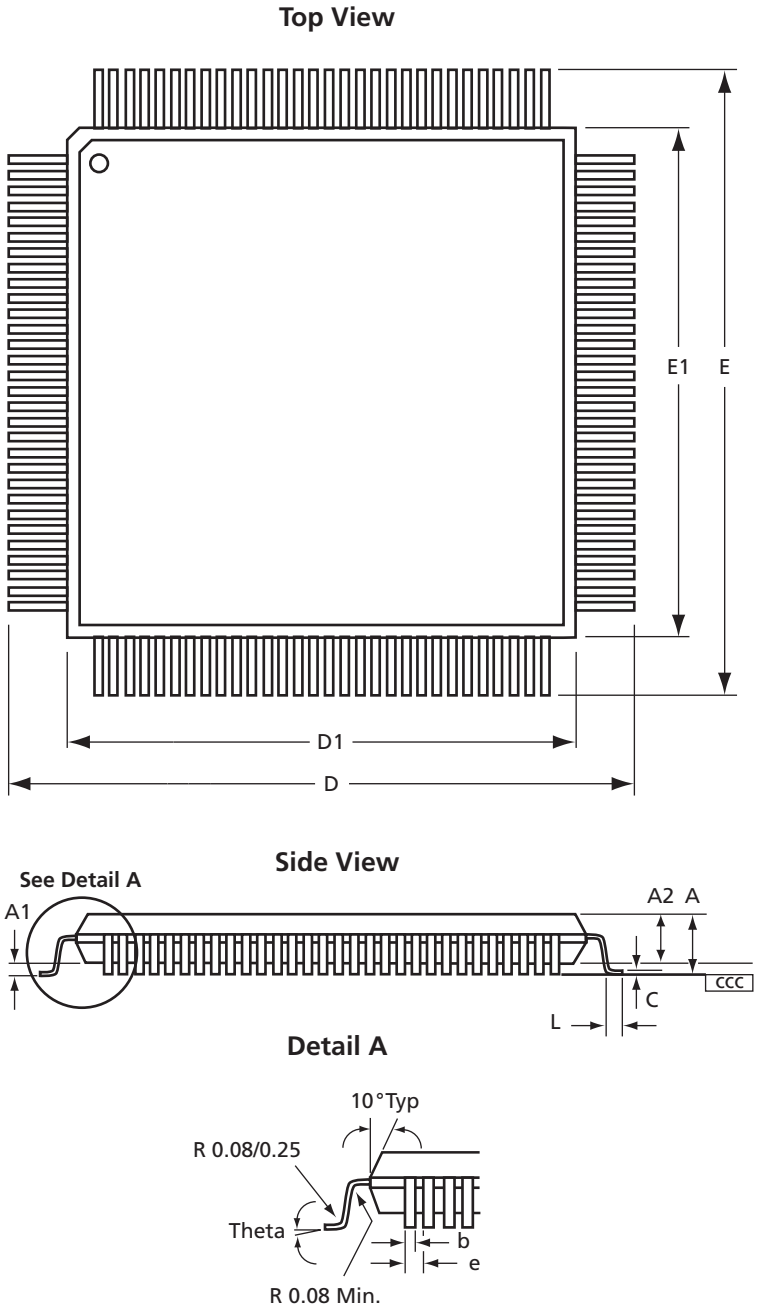
1. *All dimensioning and tolerances confirm to ASME Y14.5-1994.*
2. *Datum plane **H** located at mold parting line and coincident with lead, where lead exits plastic body at bottom of parting line.*
3. *Datums **A-B** and **D** to be determined at centerline between leads where leads exit plastic body at datum plane **H**.*
4. *To be determined at seating plane **C**.*
5. *Dimensions **D1** and **E1** do not include mold protrusion. Allowable mold protrusion is 0.254 mm per side. Dimension **D1** and **E1** include mold mismatch and are determined at datum plane **H**.*
6. *N is number of terminals.*
7. *Package top dimensions are smaller than bottom dimensions by 0.10 millimeters and top of package will not overhang bottom of package.*
8. *Dimension **b** does not include damber protrusion. Allowable damber protrusion shall be not cause the lead width to exceed the maximum b dimension by more than 0.08 mm. Damber can not be located on the lower radius or the foot.*
9. *All dimensions are in millimeters.*
10. *These dimensions apply to the flat section of the lead between 0.10 mm and 0.25 mm from the lead tip.*
11. *This drawing conforms to JEDEC registered outline m2s-026-c, variation BFB.*
12. *A1 is defined as the distance from the seating plane to the lowest point of the package body.*

Note: Dimensions are in millimeters. For more information on TQ144 dimensions, see Thin Quad Flat Pack (TQFP) Dimensions, page 55.

2.9 Plastic Quad Flat Pack (PQFP, TQFP, VQFP)

The following figure shows the details and dimensions of Plastic Quad Flat Pack.

Figure 32 • **Plastic Quad Flat Pack (PQFP, TQFP, VQFP)**

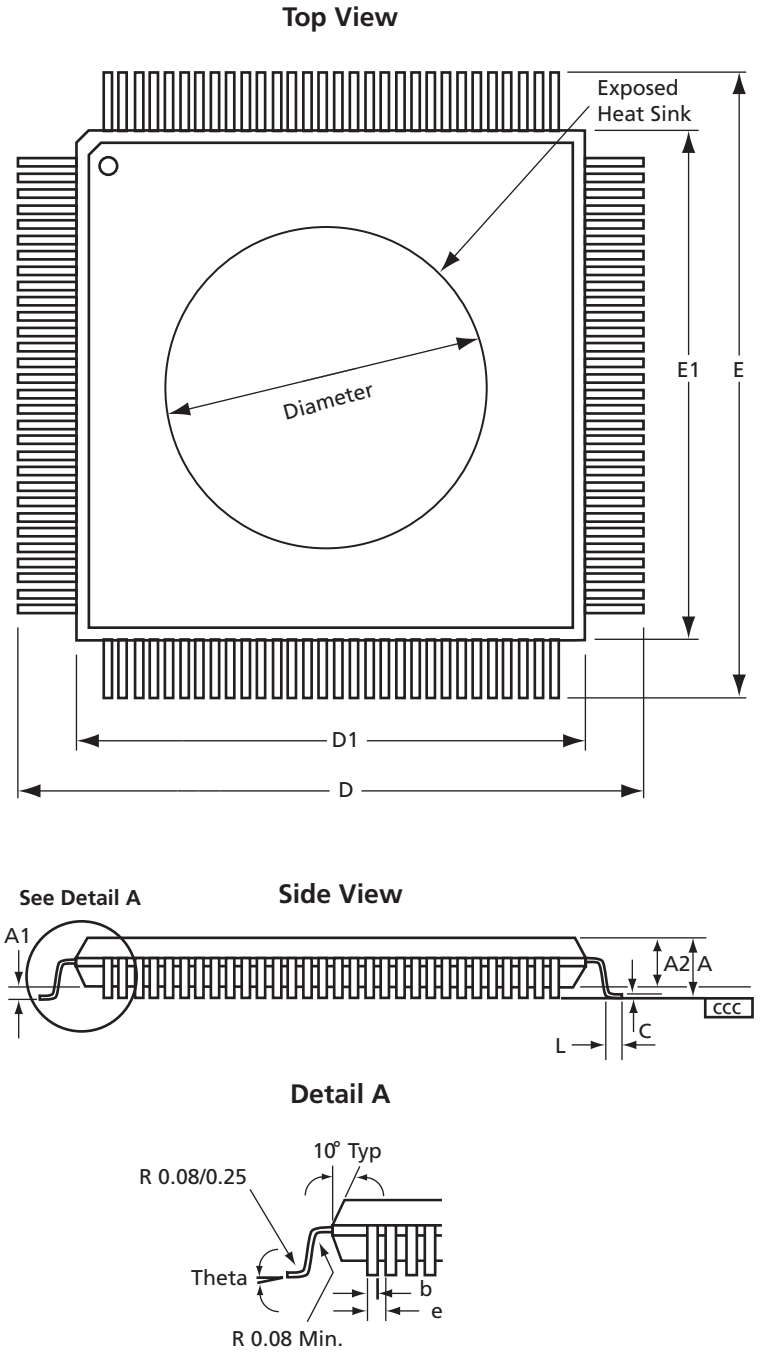


Note: Dimensions are in millimeters. For more information on dimensions, see Plastic Quad Flat Pack (PQFP) Dimensions, page 53 and Very Thin Quad Flat Pack (VQFP) Dimensions, page 55.

2.10 Plastic Quad Flat Pack—Exposed Heatsink (RQFP)

The following figure shows the details and dimensions of Plastic Quad Flat Pack Exposed Heatsink.

Figure 33 • **Plastic Quad Flat Pack—Exposed Heatsink (RQFP)**

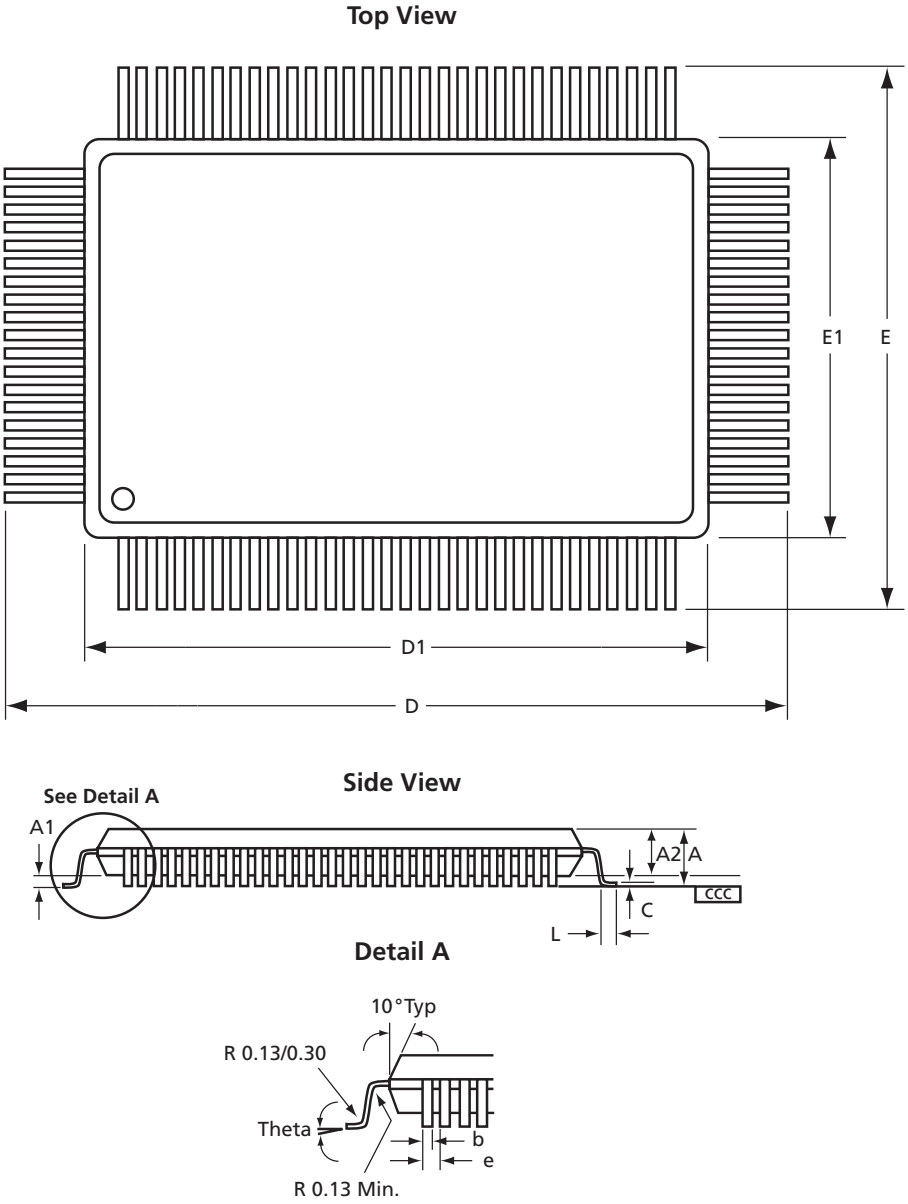


Note: Dimensions are in millimeters. For more information on dimensions, see Plastic Quad Flat Pack (RQFP/PQFP) Dimensions, page 54.

2.11 Plastic Quad Flat Pack Rectangular Package (PQ100)

The following figure shows the details and dimensions of Plastic Quad Flat Pack Rectangular Package.

Figure 34 • **Plastic Quad Flat Pack Rectangular Package (PQ100)**



Note: Dimensions are in millimeters. For more information on dimensions, see Plastic Quad Flat Pack (RQFP/PQFP) Dimensions, page 54.

The following figure shows the supported devices for or Plastic Quad Flat Pack Rectangular Package.

Table 37 • **Supported Devices for Plastic Quad Flat Pack Rectangular Package**

Supported Devices								
RQ208	**PQ100**	**PQ144**	**PQ160**	**PQ208**			**RQ240**	**PQ240**
A14V100A	A1010B	A1240A	A1280A	A1280XL[1]	AX250	A3PE600	A32200DX[1]	A42MX36
A14100A	A1020B	A1240XL[1]	A1280XL[1]	A14V60A	AX500	A3PE1500	A32200DXV[1]	
A32200DX[1]	A1225A		A14V25A	A1460A	APA075	A3PE3000		
A32300DX[1]	A1225XL[1]		A1425A	A32100DX[1]	APA150	M1A3PE1500		
A32300DXV[1]	A1240XL[1]		A14V40A	A32140DX[1]	APA300	M1A3PE3000		
	A1415A		A1440A	A32200DX[1]	APA450	A3P250L		
	A1425A		A14V60A	A32200DXV[1]	APA600	A3P1000L		
	A3265DX[1]		A1460A	A42MX16	APA750	M1A3P600L		
	A40MX02		A3265DX[1]	A42MX24	APA1000	M1A3P1000L		
	A40MX04		A32100DX[1]	A42MX36	A3P125	A3PE3000L		
	A42MX09		A32140DX[1]	A500K050[1]	A3P250	M1A3PE3000L		
	A42MX16		A42MX09	A500K130[1]	A3P400	AFS250		
			A42MX16	A500K180[1]	A3P600	AFS600		
			A42MX24	A500K270[1]	A3P1000	M1AFS250		
				A54SX08	M1A3P250	M1AFS600		
				A54SX16	M1A3P400	M7AFS600		
				A54SX16P	M1A3P600	A2F200		
				A54SX32	M1A3P1000	A2F500		
				A54SX08A	M7A3P1000			
				A54SX16A				
				A54SX32A				
				A54SX72A				

1. This product is obsolete.

2.11.1 Plastic Quad Flat Pack (PQFP) Dimensions

The following figure shows the details and dimensions of Plastic Quad Flat Pack.

Table 38 • **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

2.11.2 Plastic Quad Flat Pack (RQFP/PQFP) Dimensions

The following figure shows the details and dimensions of Plastic Quad Flat Pack.

Table 39 • **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

Note: All dimensions are in millimeters.

Note: BSC = Basic spacing between centers.

The following table lists the supported devices for Quad.

Table 40 • **Supported Devices for Quad Slat (TQ/VQ)**

Supported Devices									
TQ64	**TQ100**	**TQ144**	**TQ176**		**VQ80**	**VQ100**		**VQ128**	**VQ176**
eX64	APA075	A54SX08	A1240A	A3265DXV[1]	A1010B	A1225XL[1]	A54SX16P	AGLP030	AGLP060
eX128	APA150	A54SX16P	A1440A	A32140DXV[1]	A10V10B	A1415A	A54SX08		
	A54SX08A	A54SX32	A1460A	A42MX09	A1020B	A1425A	AGL030		
	A54SX16A	A54SX08A	A14V40A	A42MX16	A10V20B	A1440A	AGL060		
	A54SX32A	A54SX16A	A14V60A	A42MX24	A40MX02	A14V15A	AGL125		
	eX64	A54SX32A	A1240XL[1]	A54SX08	A40MX04	A14V25A	AGL250		
	eX128	APA075	A1280XL[1]	A54SX16		A14V40A	AGLN030		
	eX256	A3P060	A1280XLV[1]	A54SX16P		A42MX09	AGLN060		
		A3P125	A1240XLV[1]	A54SX32		A42MX16	AGLN125		
		A2F060	A3265DX[1]	A54SX32A		A54SX16	AGLN250		
		M2S005	A32140DX[1]				A3P030		
		M2GL005					A3P060		
		M2S010					A3P125		
		M2GL010					A3P250		
							M1A3P250		
							A3P250L		
							A3PN030		
							A3PN060		
							A3PN125		
							A3PN250		

1. This product is obsolete.

2.11.3 Thin Quad Flat Pack (TQFP) Dimensions

The following table lists the dimensions of thin quad flat pack.

Table 41 • **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

Note: All dimensions are in millimeters.

Note: BSC = Basic spacing between centers.

2.11.4 Very Thin Quad Flat Pack (VQFP) Dimensions

The following table lists the dimensions of very thin quad flat pack.

Table 42 • **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

Note: All dimensions are in millimeters.

Note: BSC = Basic spacing between centers.

Note: Variation AEE plus 8 leads.

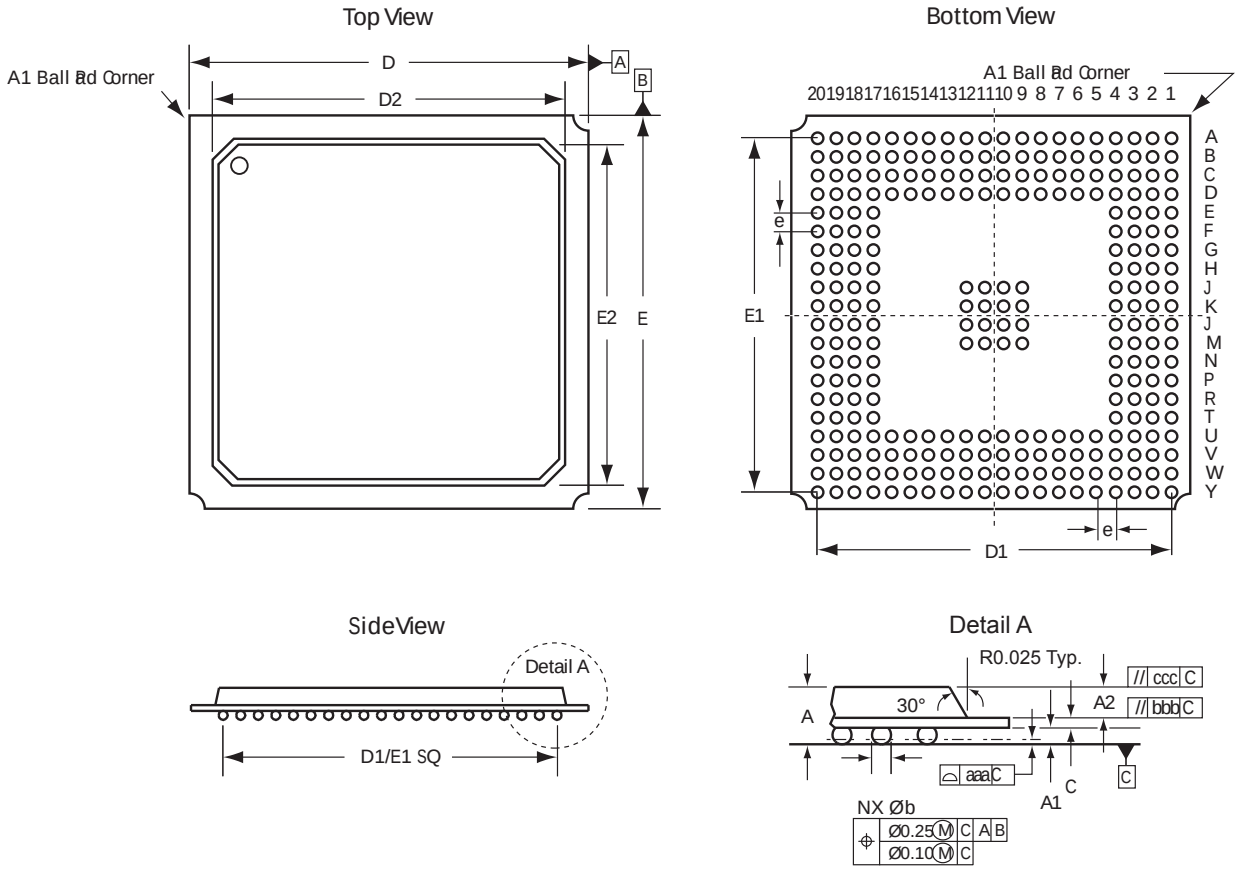
2.12 Plastic Ball Grid Array (PBGA)

The following figures show package outlines for various packages under PBGA.

2.12.1 BG272

The following figure shows the package outline of BG272.

Figure 35 • **Package Outline of BG272**



The following table shows the supported devices for BG272.

Table 43 • **Supported Devices for BG272**

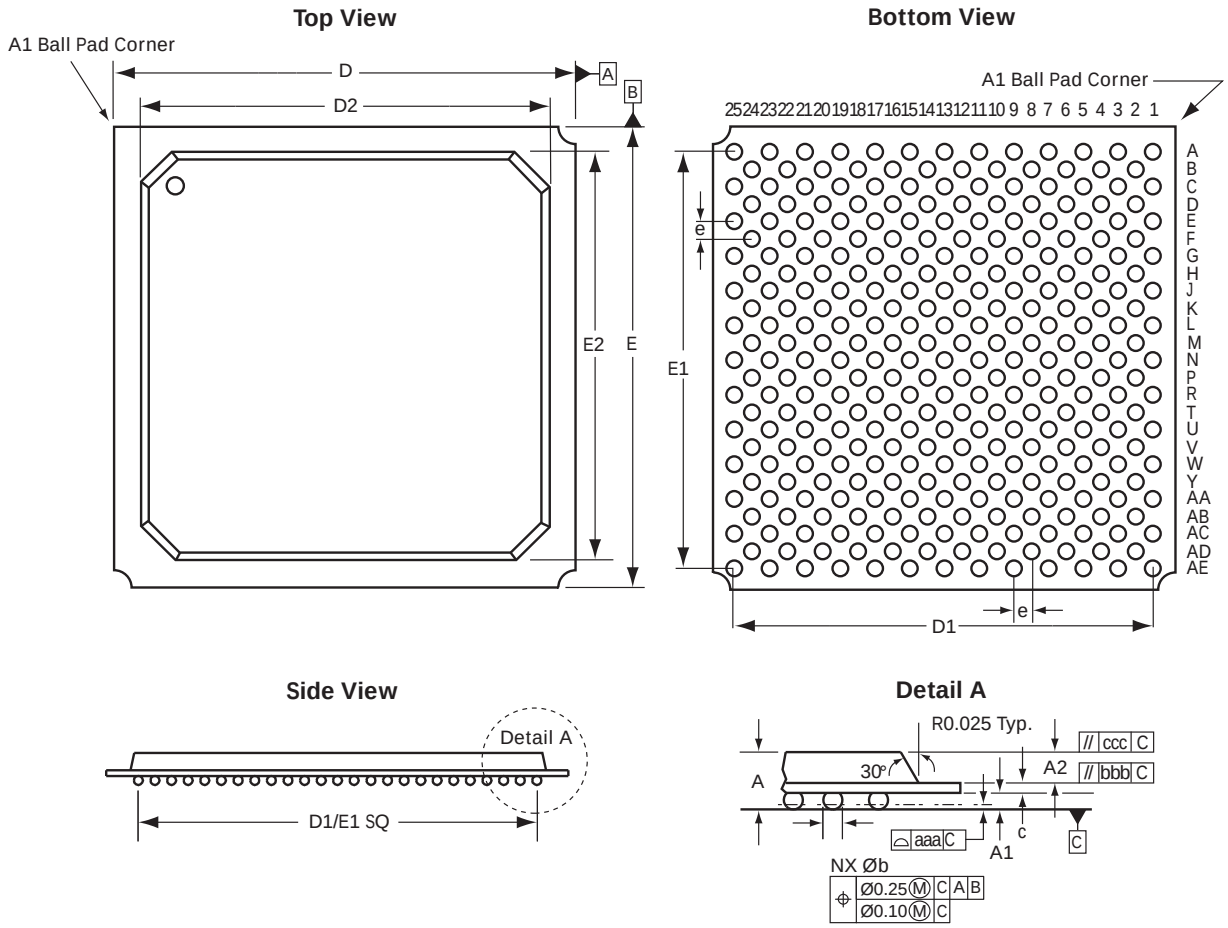
Supported Devices	
A42MX36	A500K050[1] A500K130[1]

1. This product is obsolete.

2.12.2 BG313

The following figure shows the package outline of BG313.

Figure 36 • **Package Outline of BG313**



Note: Dimensions are in millimeters. For more information on dimensions, see Plastic Ball Grid Array Dimensions, page 61.

The following table shows the supported devices for BG313.

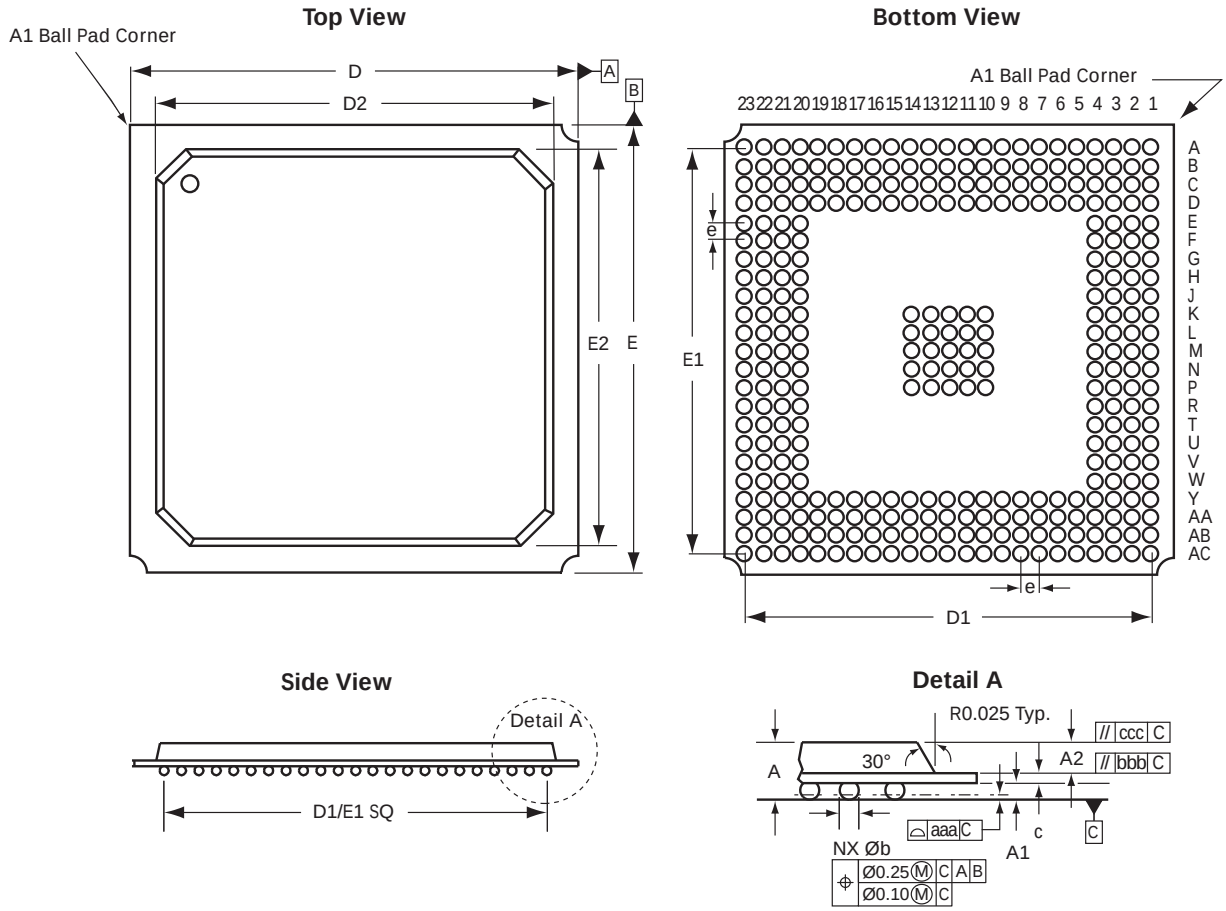
Table 44 • **Supported Devices for BG313**

Supported Devices	
A14100A	A54SX32
A14V100A	

2.12.3 BG329

The following figure shows the package outline of BG329.

Figure 37 • **Package Outline of BG329**



Note: Dimensions are in millimeters.

For more information on dimensions, see Plastic Ball Grid Array Dimensions, page 61.

The following table lists the supported devices for BG329.

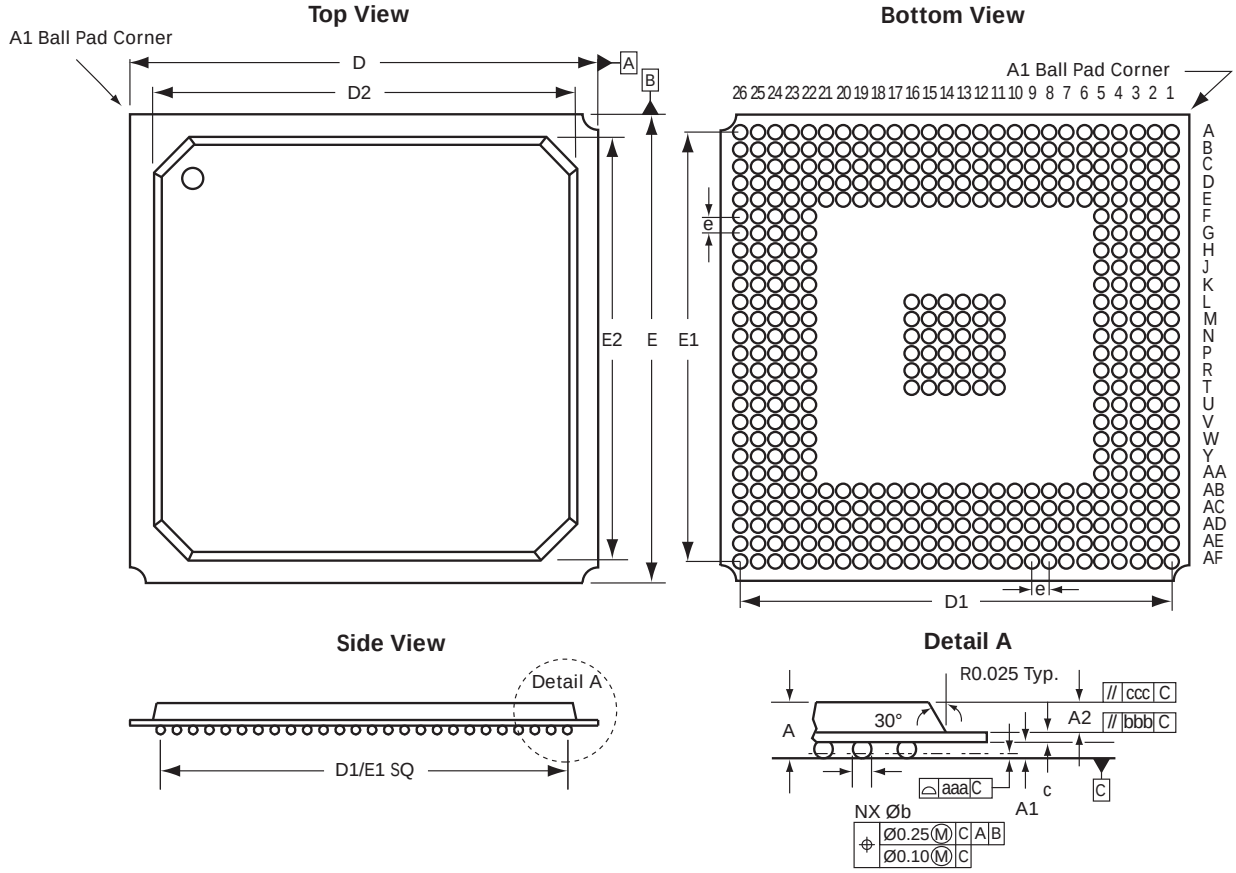
Table 45 • **Supported Devices for BG329**

Supported Devices	
A54SX32	A53SX32A

2.12.4 BG456

The following figure shows the package outline of BG456.

Figure 38 • **Package Outline of BG456**



Note: Dimensions are in millimeters. For more information on dimensions, see Plastic Ball Grid Array Dimensions, page 61.

The following table shows the supported devices for BG456.

Table 46 • **Supported Devices for BG456**

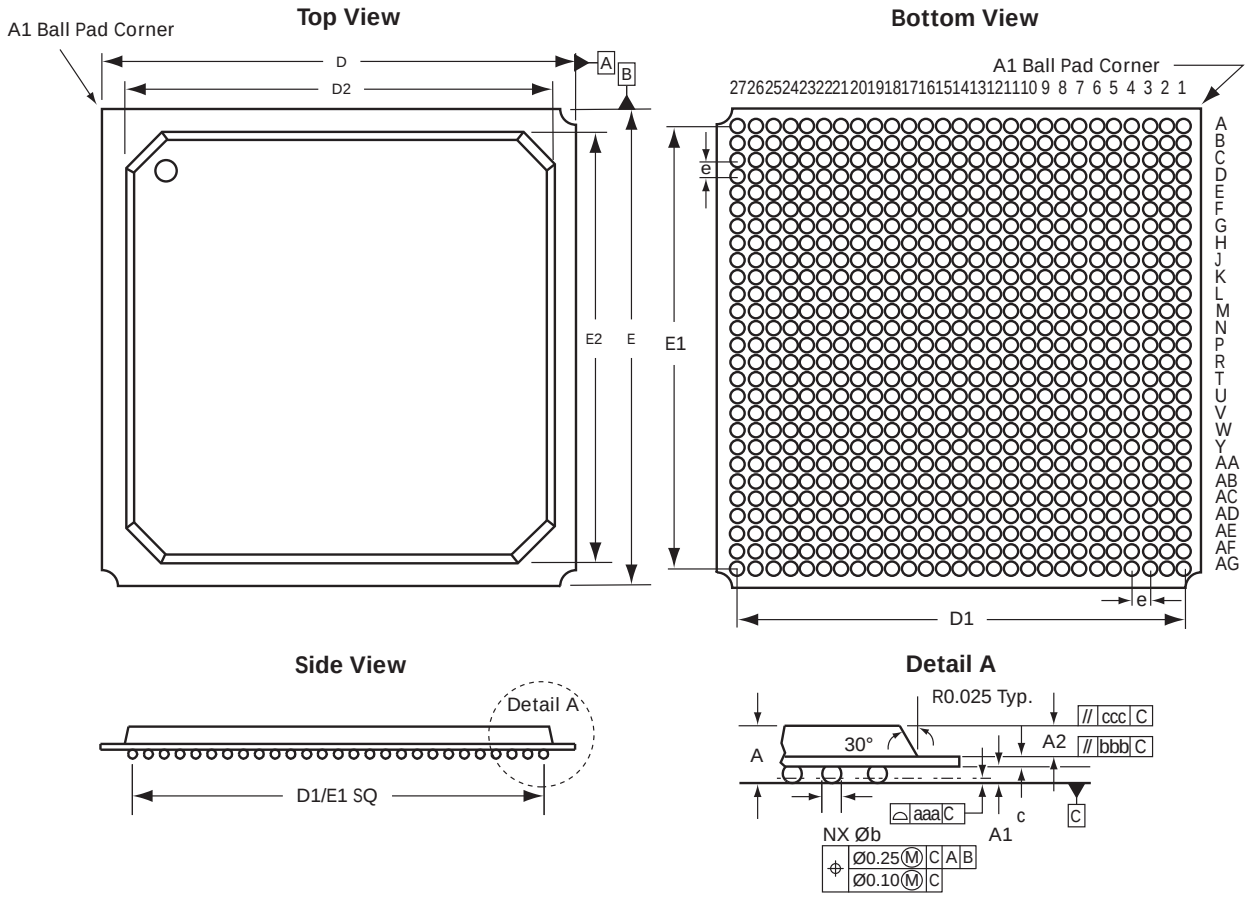
Supported Devices	
A500K130[1]	APA150
A500K180[1]	APA300
A500K270[1]	APA450
	APA600
	APA750
	APA1000

1. This product is obsolete.

2.12.5 BG729

The following figure shows the package outline of BG729.

Figure 39 • **Package Outline of BG729**



Note: Dimensions are in millimeters. For more information on dimensions, see Plastic Ball Grid Array Dimensions, page 61.

The following table shows the supported devices for BG729.

Table 47 • **Supported Devices for BG729**

Supported Devices
AX1000

2.12.6 Plastic Ball Grid Array Dimensions

The following table lists the dimensions of Plastic Ball Grid Array.

Table 48 • **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.		

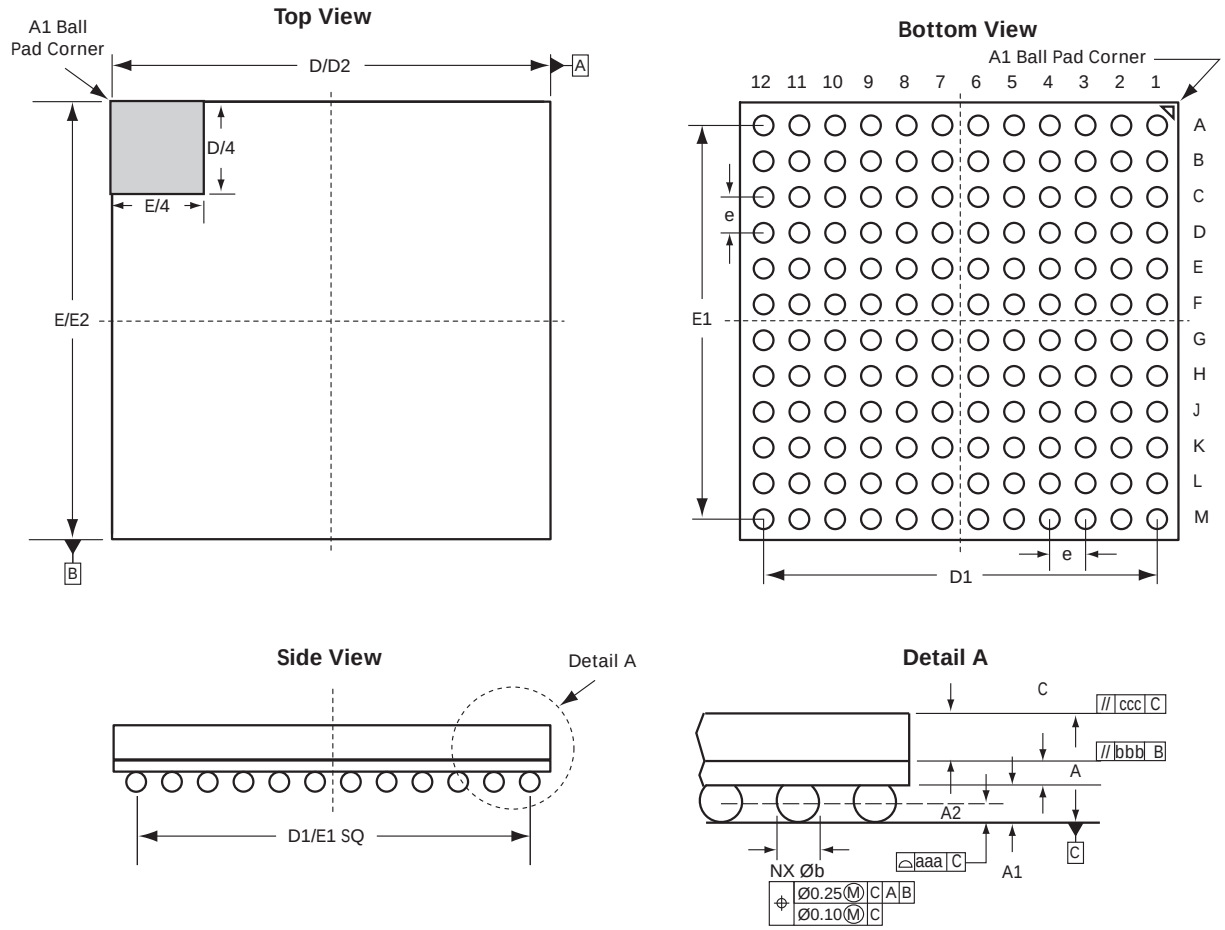
2.13 Fine Pitch Plastic Ball Grid Array (FBGA)

The following figures show package outlines for various packages under Fine Pitch Plastic Ball Grid Array.

2.13.1 FG144

The following figure shows the package outline of FG144.

Figure 40 • **Package Outline of FG144**



Note: Dimensions are in millimeters. For more information on dimensions, see Fine Pitch Plastic Ball Grid Array Dimensions, page 75.

The following table lists the supported devices for FG144.

Table 49 • **Supported Devices for FG144**

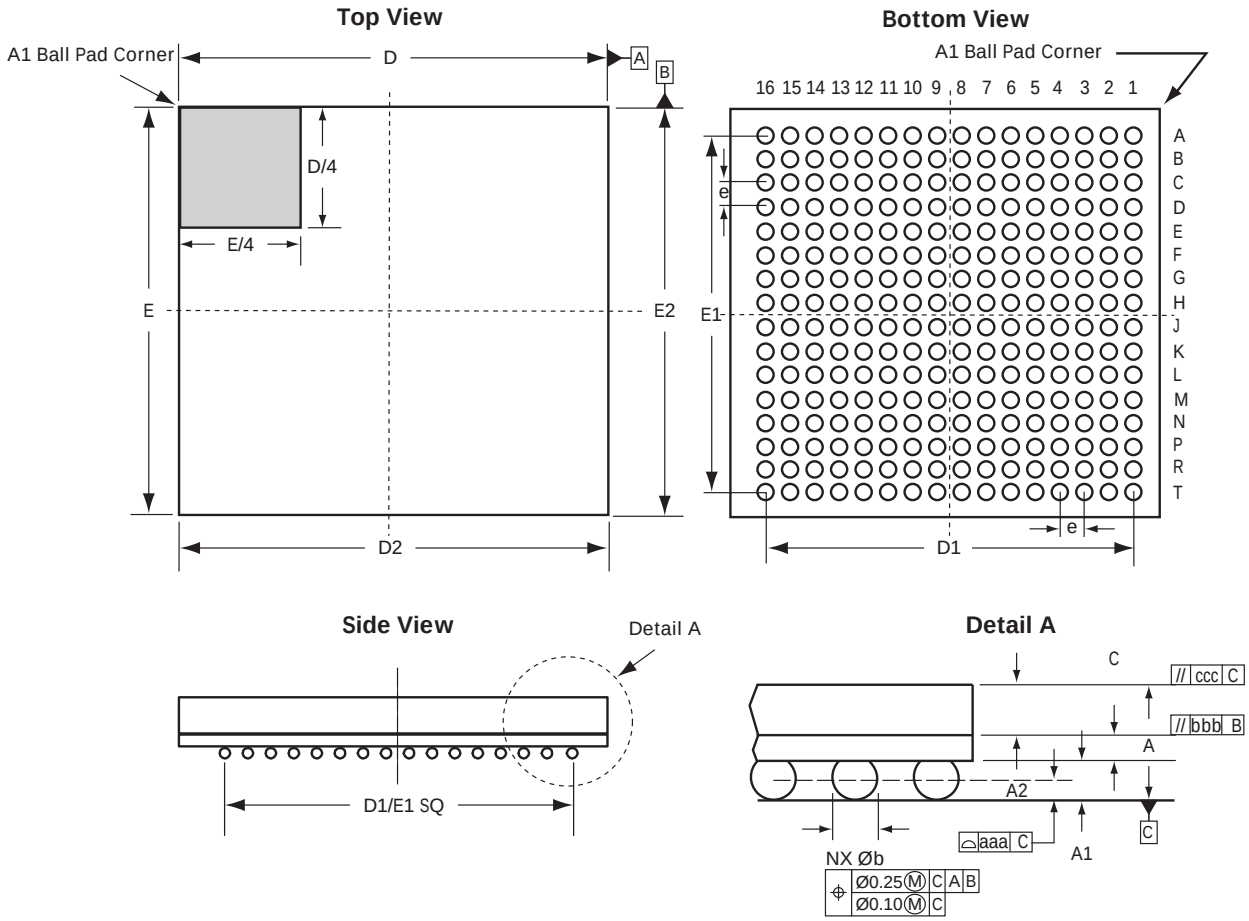
Supported Devices						
A54SX08	A500K050[1] A500K130[1]	APA075 APA150 APA300 APA450	A54SX08A A54SX16A A54SX32A	AGL060 AGL125 AGL250 AGL400 AGL600 AGL1000 M1AGL250 M1AGL600 M1AGL1000	A3P060 A3P125 A3P250 A3P400 A3P600 A3P1000 M1A3P250 M1A3P400 M1A3P600 M1A3P1000 M7A3P1000	A3P250L A3P600L A3P1000L M1A3P600L/ M1A3P1000L

1. This product is obsolete.

2.13.2 FG256 MO-192 VAR DAF1

The following figure shows the package outline of FG256 MO-192 VAR DAF1.

Figure 41 • **Package Outline of FG256 MO-192 VAR DAF1**



Note: Dimensions are in millimeters. For more information on dimensions, see Fine Pitch Plastic Ball Grid Array Dimensions, page 75.

The following table lists the supported devices for FG256 MO-192 VAR DAF1.

Table 50 • **Supported Devices for FG256 MO-192 VAR DAF1**

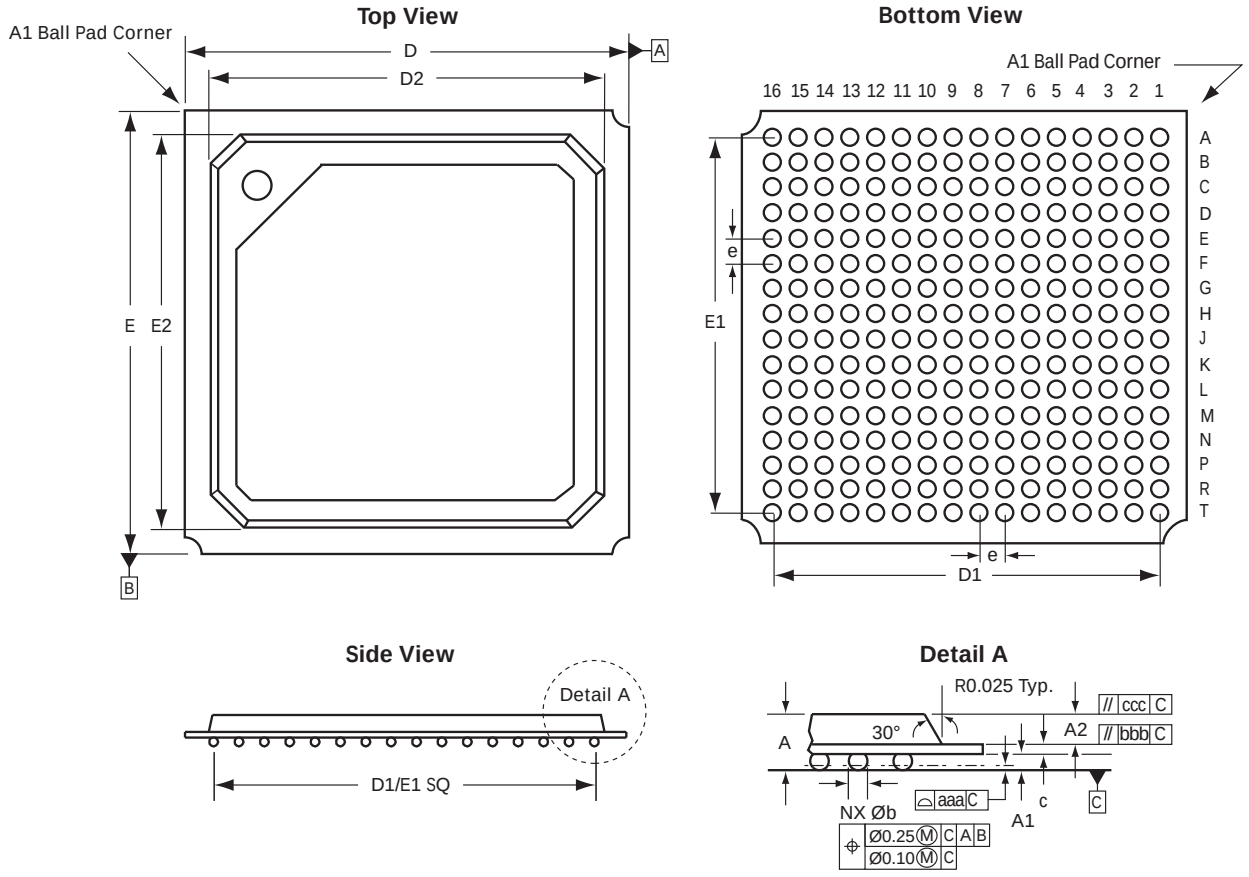
Supported Devices								
A500K130[1]	APA150	A54SX16A	AX125	AGL400	A3P250	A3P250L	AFS090	A2F060
A500K180[1]	APA300		AX250	AGL600	A3P400	A3P600L	AFS250	A2F200
A500K270[1]	APA450			AGL1000	A3P600	A3P1000L	AFS600	A2F500
	APA600			M1AGL600	A3P1000	M1A3P600L	AFS1500	
				M1AGL1000	M1A3P400	M1A3P1000L	M1AFS250	
				AGLE600	M1A3P600		M1AFS600	
					M1A3P1000		M1AFS1500	
					M7A3P1000		M7AFS600	
					A3PE600			

1. This product is obsolete.

2.13.3 FG256 MS-034 VAR AAF-1

The following figure shows the package outline of FG256 MS-034 VAR AAF-1.

Figure 42 • **Package Outline of FG256 MS-034 VAR AAF-1**



Note: Dimensions are in millimeters. For more information on dimensions, see Fine Pitch Plastic Ball Grid Array Dimensions, page 75.

The following table lists the supported devices for FG256 MS-034 VAR AAF-1.

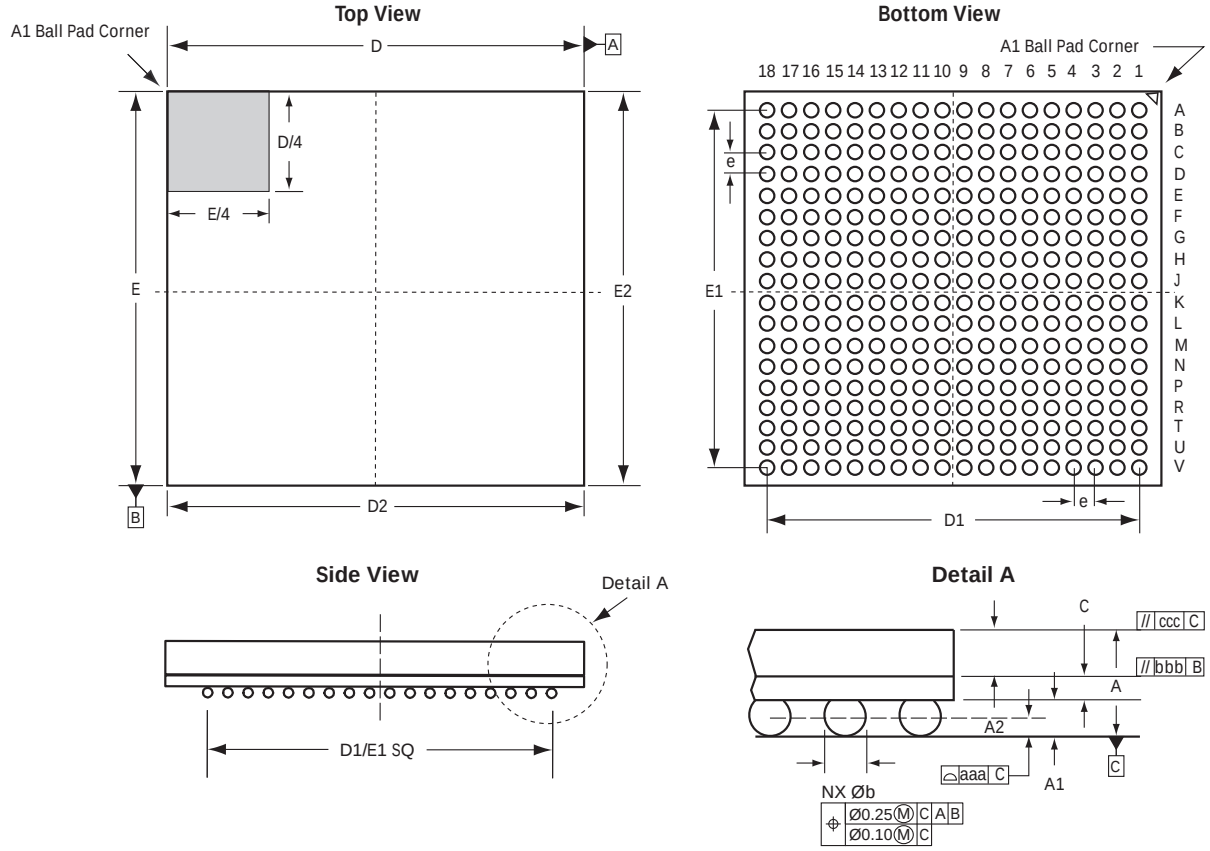
Table 51 • **Supported Devices for FG256 MS-034 VAR AAF-1**

Supported Devices
A54SX32A
A54SX72A

2.13.4 FG324

The following figure shows the package outline of FG324.

Figure 43 • **Package Outline of FG324**



Note: Dimensions are in millimeters. For more information on dimensions, see Fine Pitch Plastic Ball Grid Array Dimensions, page 75.

The following table lists the supported devices for FG324.

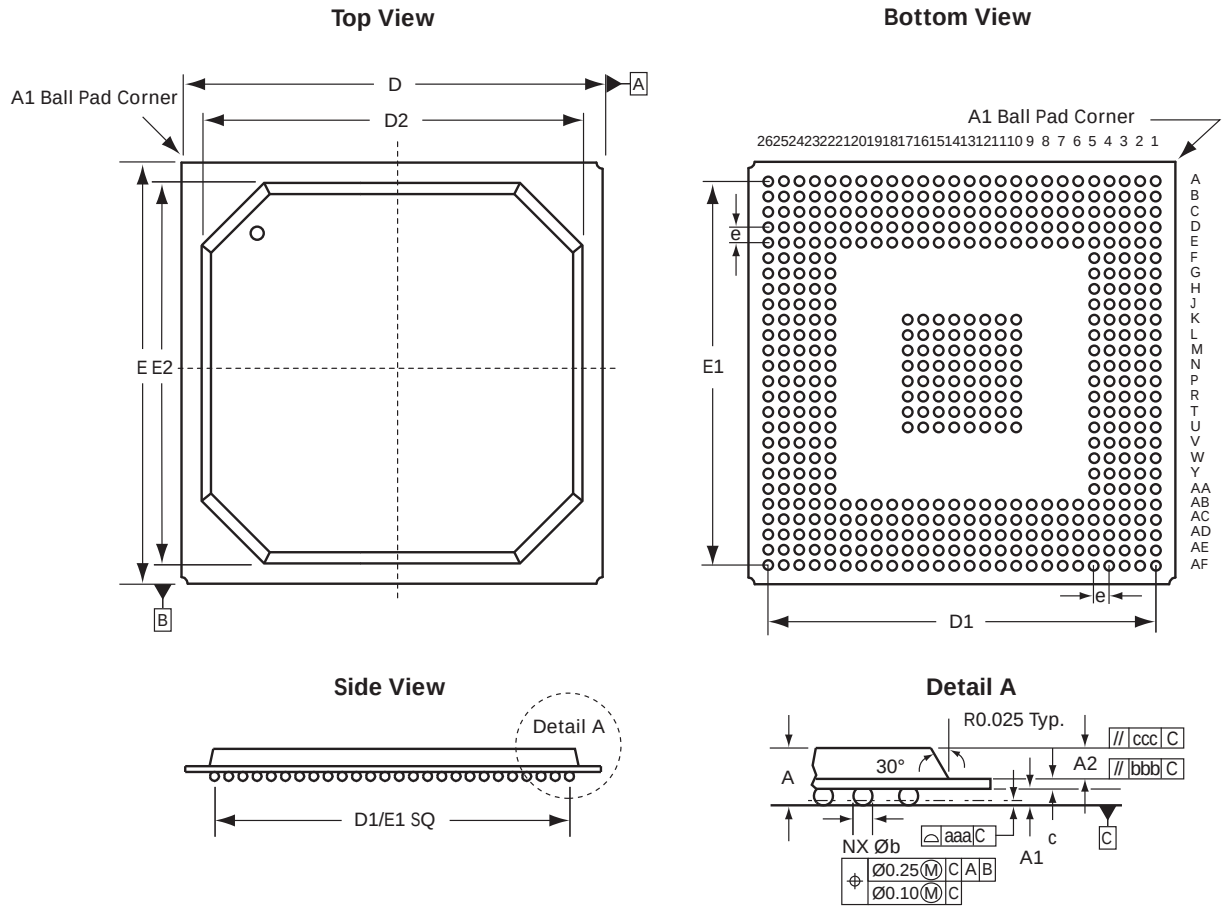
Table 52 • **Supported Devices for FG324**

Supported Devices		
AX125	A3PE3000 M1A3PE3000	A3PE3000L M1A3PE3000L

2.13.5 FG484 MS-034 VAR AAL-1

The following figure shows the package outline of FG484 MS-034 VAR AAL-1.

Figure 44 • **Package Outline of FG484 MS-034 VAR AAL-1**



Note: Dimensions are in millimeters. For more information on dimensions, see Fine Pitch Plastic Ball Grid Array Dimensions, page 75.

The following table lists the supported devices for FG484 MS-034 VAR AAL-1.

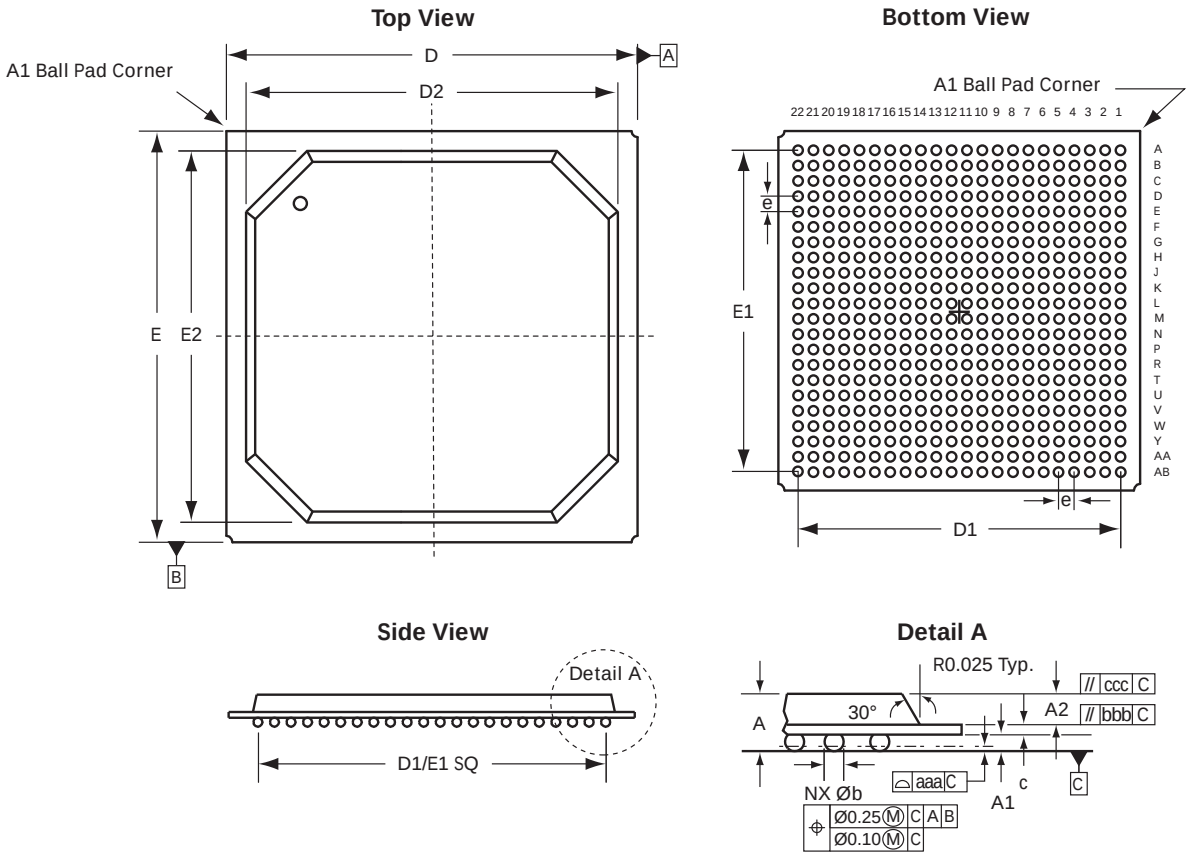
Table 53 • **Supported Devices for FG484 MS-034 VAR AAL-1**

Supported Devices
A54SX32A
A54SX72A

2.13.6 FG484—Fully Populated MS-034 VAR AAJ-1

The following figure shows the package outline of FG484 Fully Populated MS-034 VAR AAJ-1.

Figure 45 • **FG484—Fully Populated MS-034 VAR AAJ-1**



Note: Dimensions are in millimeters. For more information on dimensions, see Fine Pitch Plastic Ball Grid Array Dimensions, page 75.

The following figure lists the supported devices for FG484 Fully Populated MS-034 VAR AAJ-1.

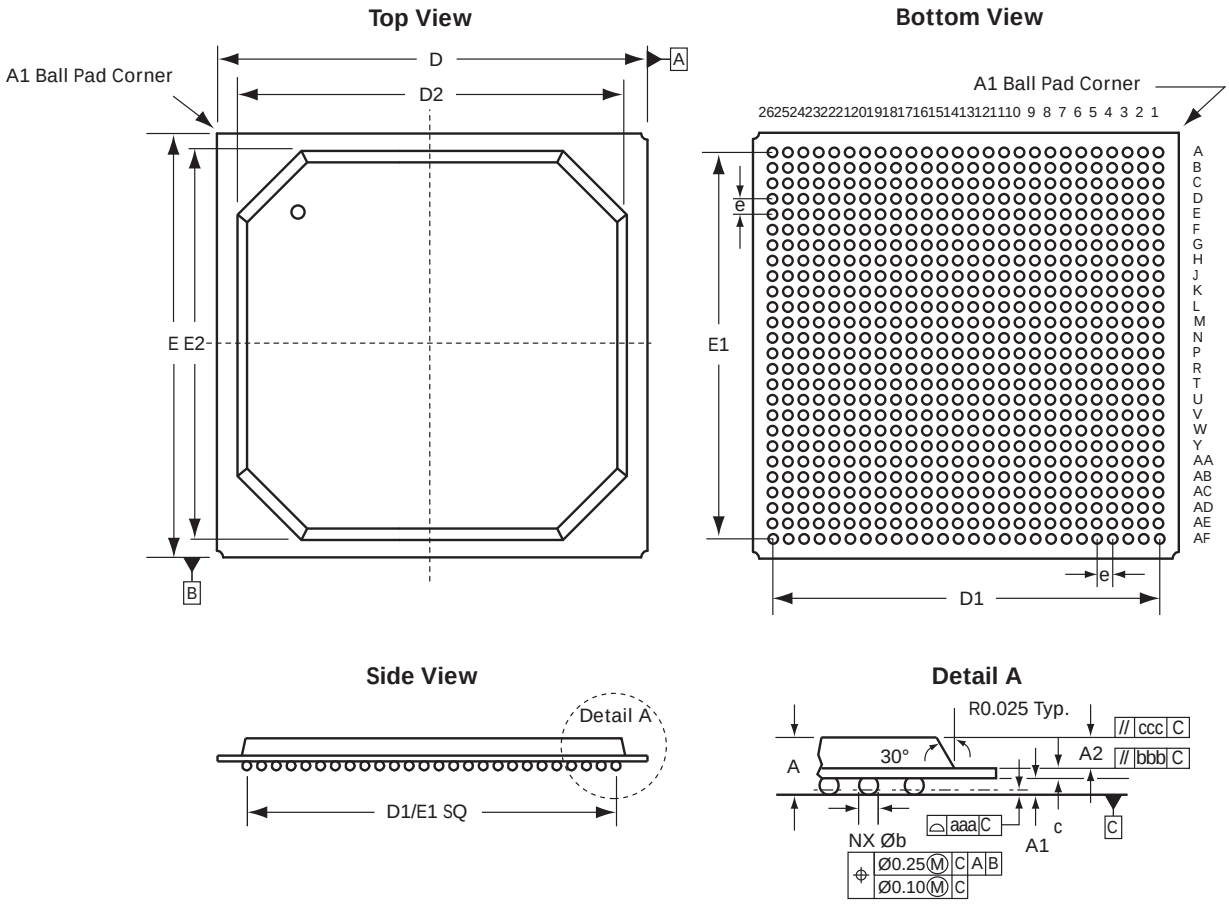
Table 54 • **Supported Devices for FG484 Fully Populated MS-034 VAR AAJ-1**

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

2.13.7 FG676 (Option 1)

The following figure shows the package outline of FG676 (Option 1).

Figure 46 • **Package Outline of FG676 (Option 1)**



Note: Dimensions are in millimeters. For more information on dimensions, see FG676 (Option 1 and 2) Package Mechanical Drawing Dimensions, page 70.

The following table lists the supported device for FG676 (Option 1).

Table 55 • **Supported Devices for FG676 (Option 1)**

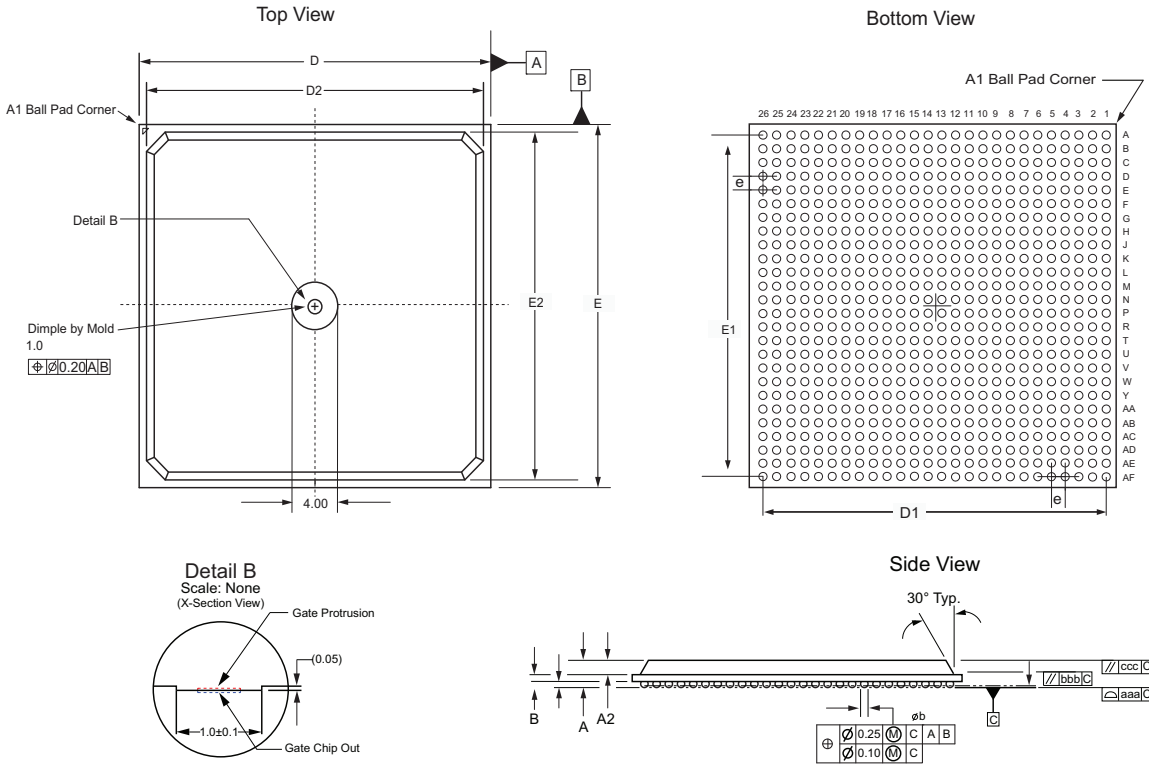
Supported Devices				
A500K270[1]	APA600 APA750	AX500 AX1000	A3PE1500 M1A3PE1500	AFS1500 M1AFS1500

1. This product is obsolete.

2.13.8 FG676 (Option 2)

The following figure shows the package outline of FG676 (Option 2).

Figure 47 • **Package Outline of FG676 (Option 2)**



Note: Dimensions are in millimeters. For more information on dimensions, see FG676 (Option 1 and 2) Package Mechanical Drawing Dimensions, page 70.

The following table lists the supported devices for FG676 (Option 2).

Table 56 • **Supported Devices for FG676 (Option 2)**

Supported Devices	
SmartFusion®2 (M2S090, M2S060)	IGLOO®2 (M2GL090, M2GL060)

2.13.9 FG676 (Option 1 and 2) Package Mechanical Drawing Dimensions

The following table lists the dimensions of FG676 (Option 1 and 2) Package Mechanical Drawing.

Table 57 • **Dimensions of FG676 (Option 1 and 2) Package Mechanical Drawing**

JEDEC Equivalent	FG676 (Option 1), page 68 27mm X 27mm, 1.0mm Pitch, 676 Solder Balls, PBGA			FG676 (Option 2), page 69 27mm X 27mm, 1.0mm Pitch, 676 Solder Balls, PBGA		
Dimension	**Min.**	**Nom.**	**Max.**	**Min.**	**Nom.**	**Max.**
A	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
A2	1.12	1.17	1.22	1.12	1.17	1.22
aaa	0.20			0.15		
b	0.50	0.63	0.70	0.50	0.61	0.70
bbb	0.25			0.25		
c	0.50	0.56	0.62	0.50	0.56	0.62
ccc	0.35			0.35		
D	26.80	27.00	27.20	26.80	27.00	27.20
D1	25.00 BSC			25.00 BSC		
D2	23.95	24.00	24.70	25.65	25.70	26.05
E	26.80	27.00	27.20	26.80	27.00	27.20
E1	25.00 BSC			25.00 BSC		
E2	23.95	24.00	24.70	25.65	25.70	26.05
e	1.00 typ.			1.00 TYP		

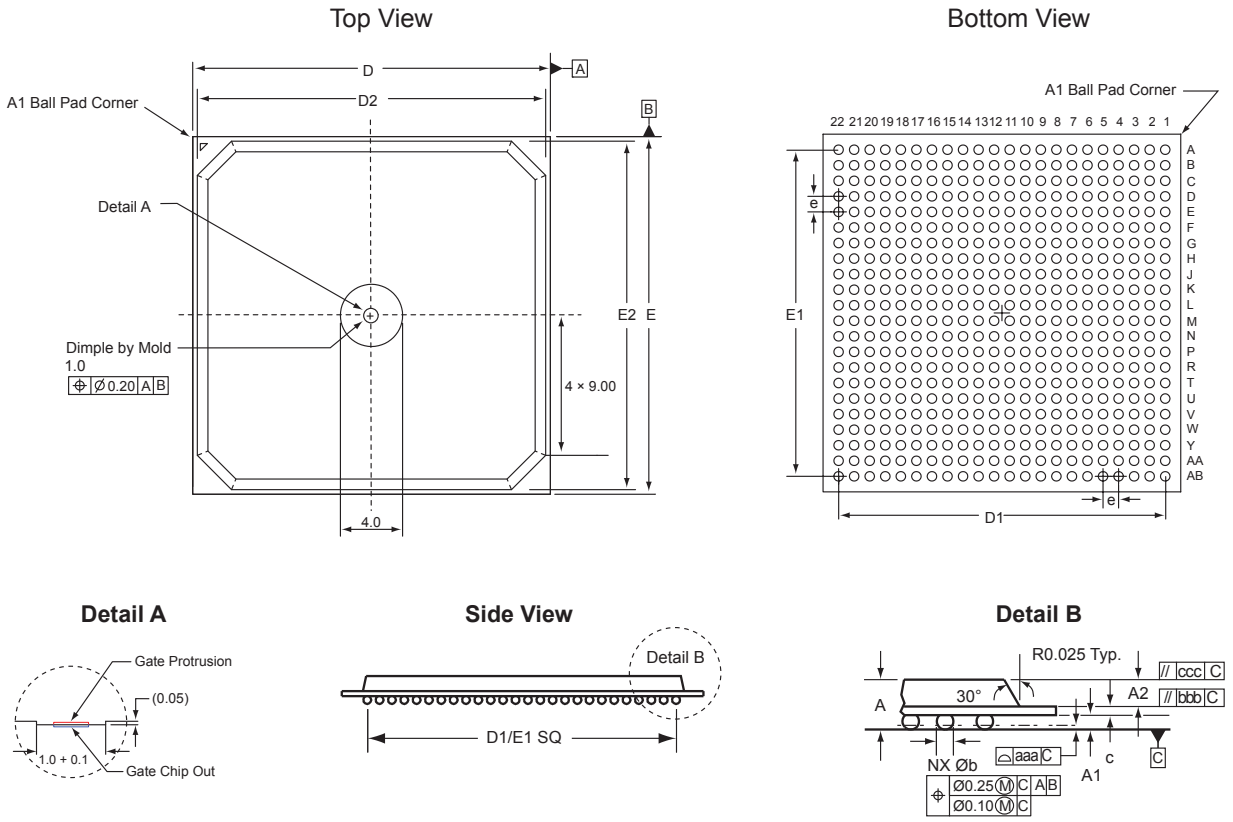
Note: All dimensions are in millimeters.

Note: BSC = Basic spacing between centers.

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

The following figure shows package outlines of FG484 Fully Populated MS-034 VAR AAJ-1, Larger Mold Cap Size.

Figure 48 • **Package Outline of FG484 MS-034 VAR AAJ-1**



The following table lists the supported devices for FG484 MS-034 VAR AAJ-1.

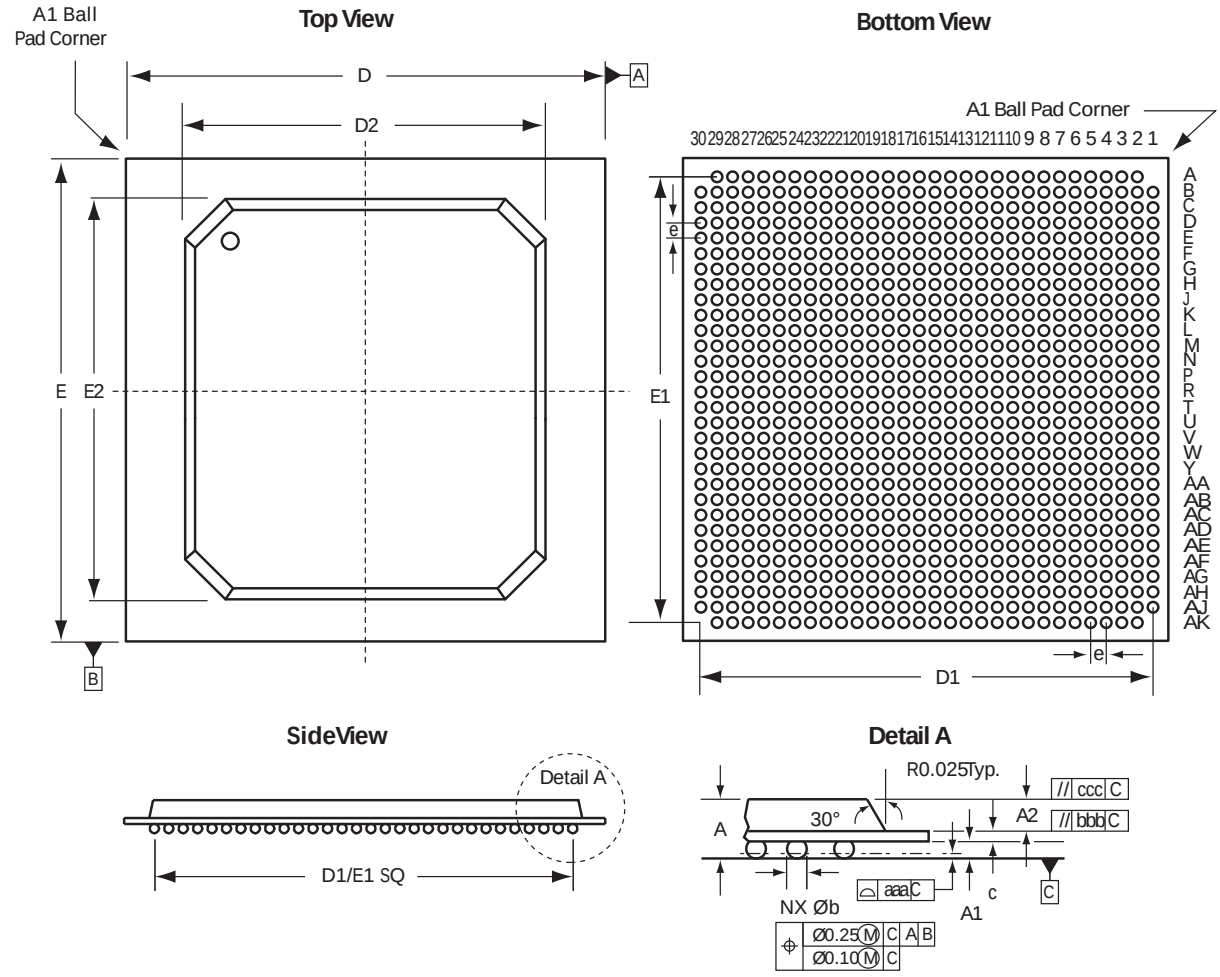
Table 58 • **Supported Devices for FG484 MS-034 VAR AAJ-1**

Supported Devices	
M2S005, M2S005S	M2GL005, M2GL005S
M2S010, M2S010T, M2S010TS	M2GL010, M2GL010T, M2GL010TS
M2S025, M2S025T, M2S025TS	M2GL025, M2GL025T, M2GL025TS
M2S050, M2S050T, M2S050TS	M2GL050, M2GL050T, M2GL050TS
M2S090, M2S090T, M2S090TS	M2GL090, M2GL090T, M2GL090TS
M2S060, M2S060T, M2S060TS	M2GL060, M2GL060T, M2GL060TS

2.13.11 FG896

The following figure shows the package outline of FG896.

Figure 49 • **Package Outline of FG896**



The following table lists the supported devices for FG896.

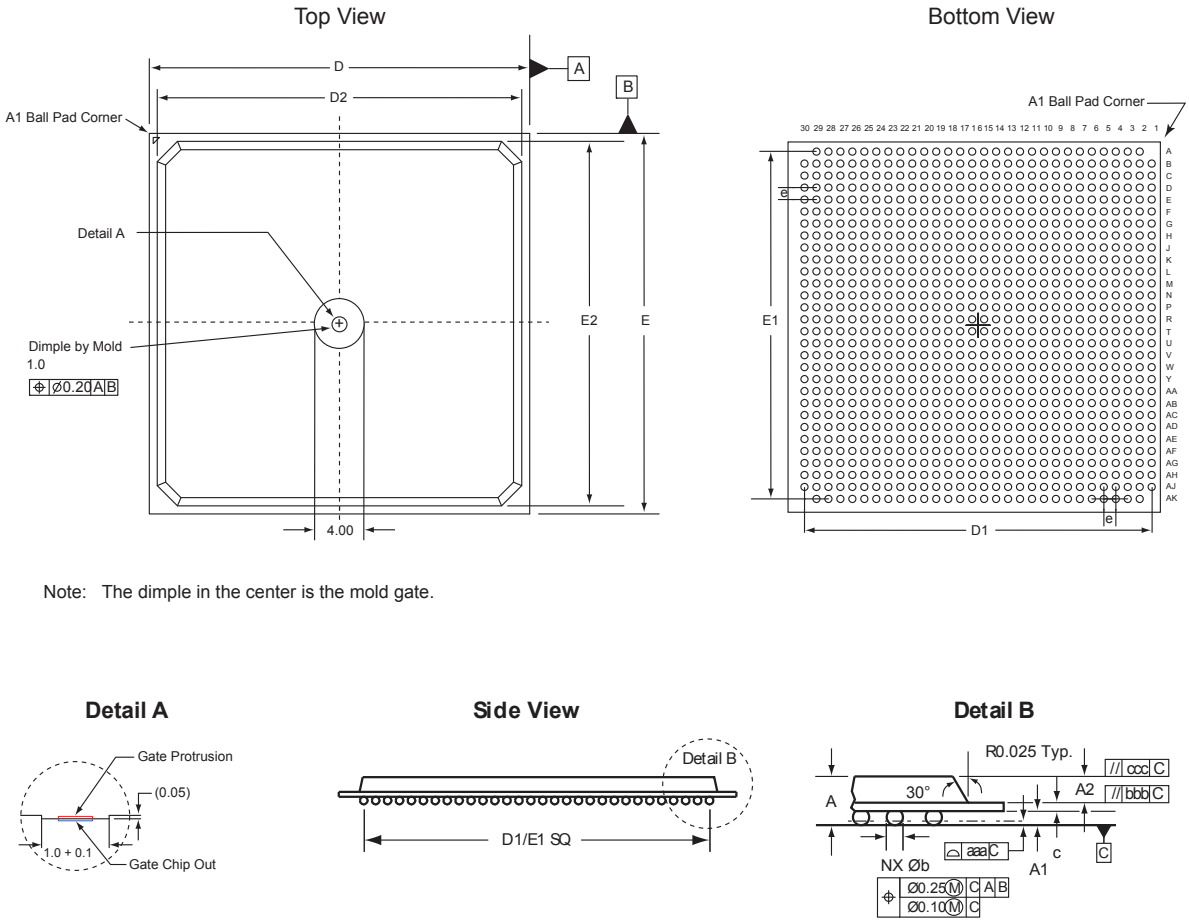
Table 59 • **Supported Devices for FG896**

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

2.13.12 FG896—Larger Mold Cap Size

The following figure shows the package outline of Larger Mold Cap Size for FG896.

Figure 50 • **FG896 Larger Mold Cap Size**



Note: The dimple in the center is the mold gate.

The following table lists the Supported Devices for FG896 Larger Mold Cap Size.

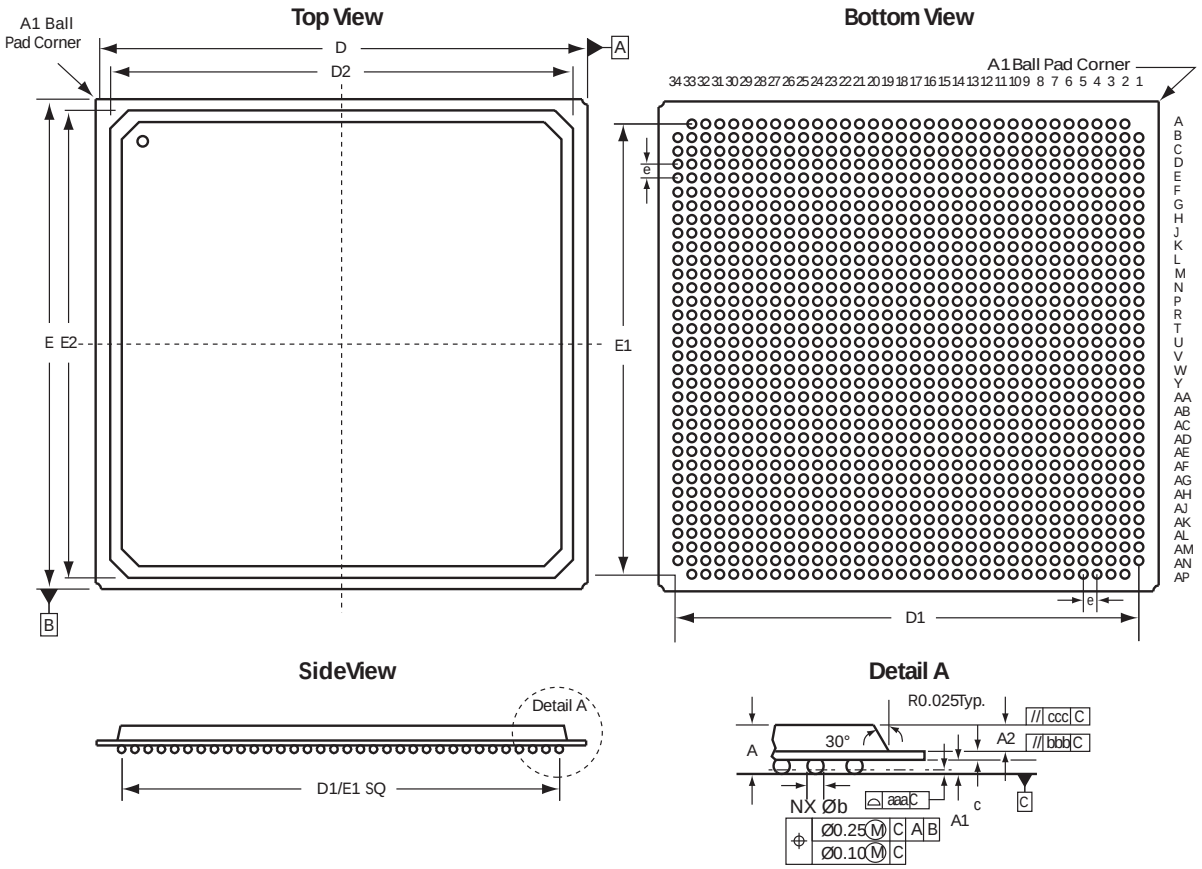
Table 60 • **Supported Devices for FG896 Larger Mold Cap Size**

Supported Devices	
M2S050, M2S050S, M2S050TS	M2GL050, M2GL050S, M2GL050TS

2.13.13 FG1152

The following figure shows the package outline of FG1152.

Figure 51 • **Package Outline of FG1152**



Note: Dimensions are in millimeters. For more information on dimensions, see Fine Pitch Plastic Ball Grid Array Dimensions, page 75.

The following table lists the supported devices for FG1152

Table 61 • **Supported Devices for FG1152**

Supported Devices	
APA1000	AX2000

2.13.14 Fine Pitch Plastic Ball Grid Array Dimensions

The following table lists the details and dimensions for FG144, FG256, and FG324.

Table 62 • **Fine Pitch Plastic Ball Grid Array Dimensions for FG144, FG256, and FG324**

JEDEC Equivalent	FG144, page 62 MO-192 VAR DAD-1			FG256 MO-192 VAR DAF1, page 63			FG256 MS-034 VAR AAF-1, page 64			FG324, page 65 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.	

Note: All dimensions are in millimeters.

Note: BSC = Basic spacing between centers.

The following table lists the details and dimensions for FG484.

Table 63 • **Fine Pitch Plastic Ball Grid Array Dimensions for FG484**

JEDEC Equivalent	FG484 MS-034 VAR AAL-1, page 66			FG484—Fully Populated MS-034 VAR AAJ-1, page 67			FG484—Fully Populated MS-034 VAR AAJ-1, Larger Mold Cap Size, page 71		
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			0.20			0.15		
b	0.50	0.63	0.70	0.50	0.63	0.70	0.50	0.61	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	26.80	27.00	27.20	22.80	23.00	23.20	22.80	23.00	23.20
D1	25.00 BSC			21.00 BSC			21.00 BSC		

Table 63 • **Fine Pitch Plastic Ball Grid Array Dimensions for FG484**

D2	23.80	24.00	24.20	19.45	19.50	20.20	22.35	22.40	22.75
E	26.80	27.00	27.20	22.80	23.00	23.20	22.80	23.00	23.20
E1	25.00 BSC			21.00 BSC			21.00 BSC		
E2	23.80	24.00	24.20	19.45	19.50	20.20	22.35	22.40	22.75
e	1.00 typ.			1.00 typ.			1.00 typ.		

Note: All dimensions are in millimeters.

Note: BSC = Basic spacing between centers.

The following table lists the details and dimensions for FG896 and FG1152.

Table 64 • **Fine Pitch Plastic Ball Grid Array Dimensions for FG896 and FG1152**

JEDEC Equivalent	**FG896, page 72 MS-034 VAR AAN-1**			**FG896—Larger Mold Cap Size, page 73 MS-034 VAR AAN-1**			**FG1152, page 74 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)[1]	25.95	26.00	26.70				33.65	33.70	34.20
D2 (option 2)[1]				29.65	29.70	30.05			
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)[1]	25.95	26.00	26.70				33.65	33.70	34.20
E2 (option 2)[1]				29.65	29.70	30.05			
e	1.00 typ.			1.00 typ.			1.00 typ.		

1. As per JEDEC specification MS-034, a different lid size is allowed (D2/E2) for FG896.

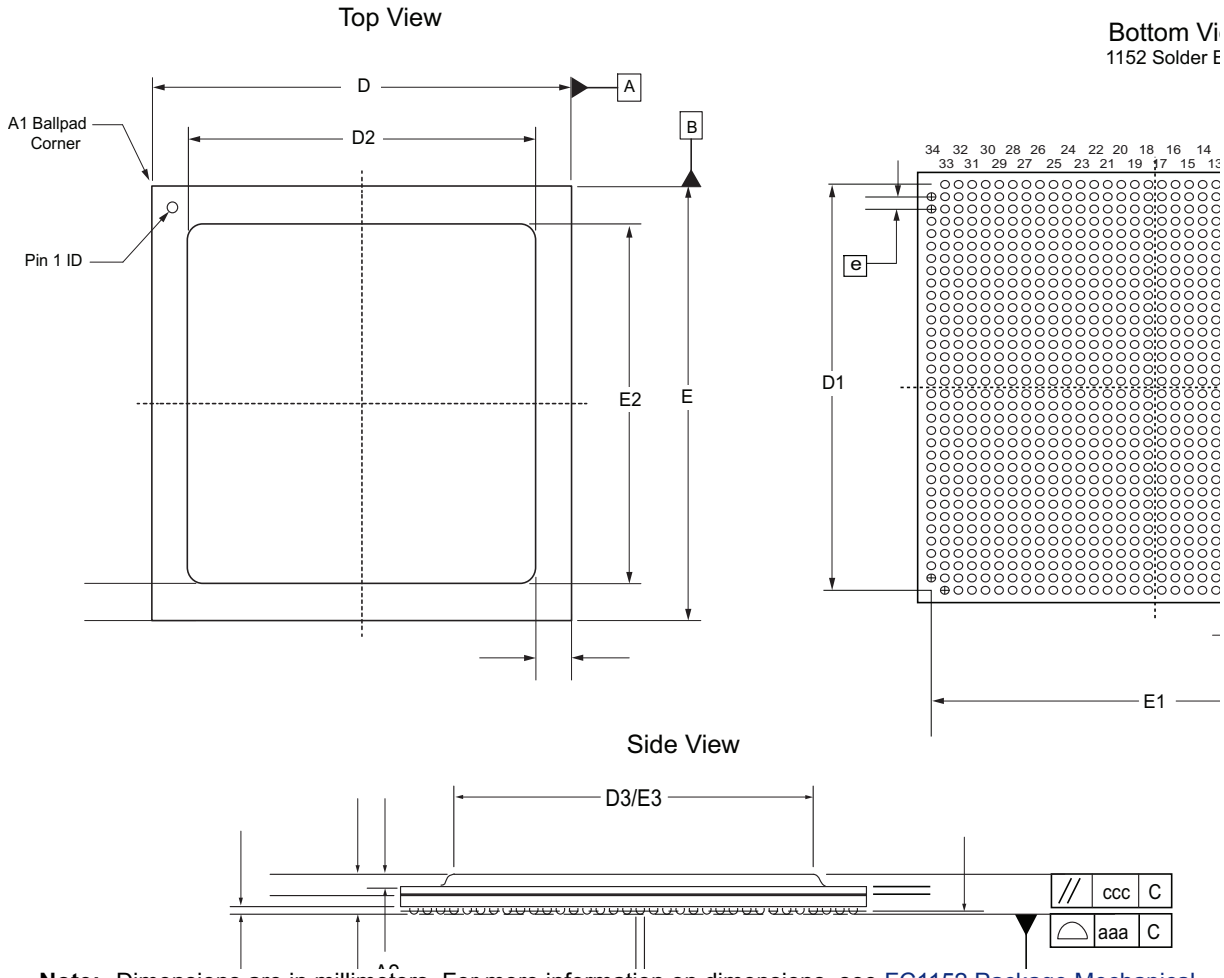
Note: All dimensions are in millimeters.

Note: BSC = Basic spacing between centers.

2.13.15 FC1152

The following figure shows the package outline of FC1152.

Figure 52 • **Package Outline of FC1152**



Note: Dimensions are in millimeters. For more information on dimensions, see FC1152 Package Mechanical Drawing Dimensions, page 79.

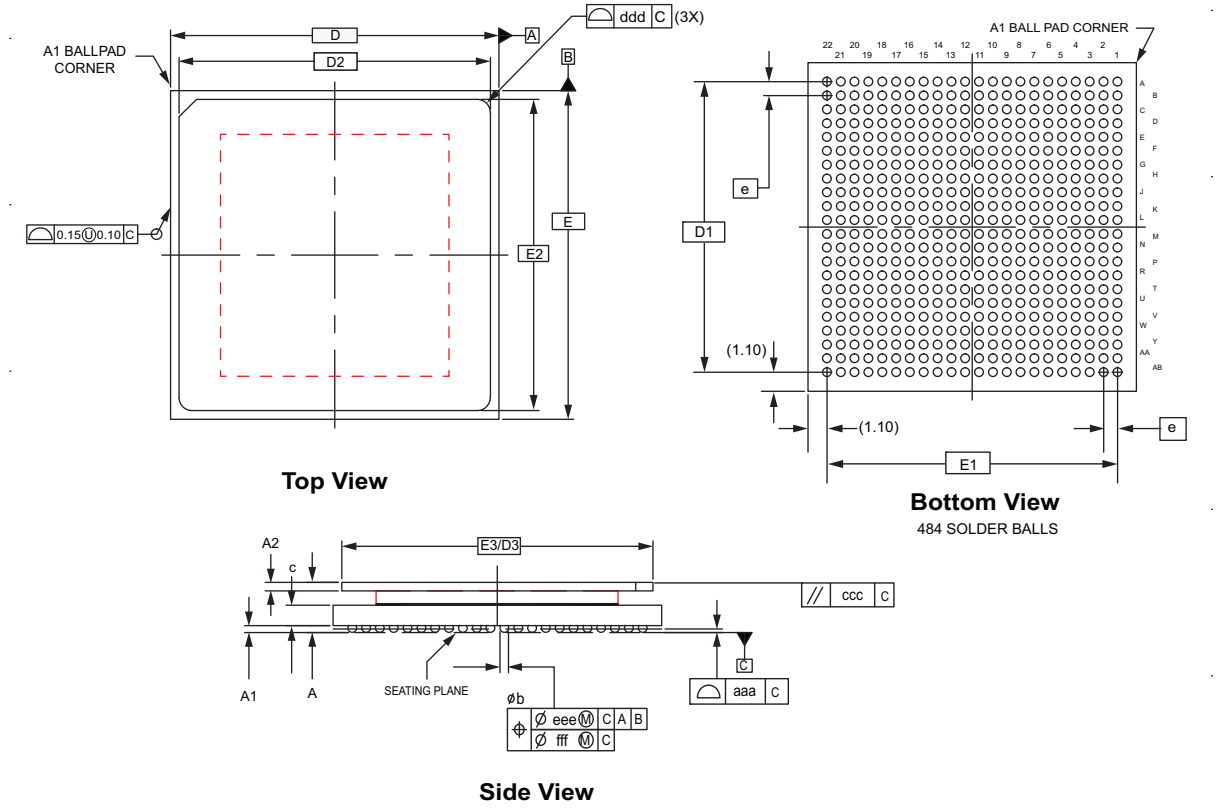
Table 65 • **Supported Devices for FC1152**

Supported Devices	
SmartFusion2 (M2S150)	IGLOO2 (M2GL150)

2.13.16 FCV484

The following figure shows the package outline of FCV484.

Figure 53 • **Package Outline of FCV484**



Note: Dimensions are in millimeters. For more information on dimensions, see FCV484 Package Mechanical Drawing Dimensions, page 79.

Table 66 • **Supported Devices for FCV484**

Supported Devices	
SmartFusion2 (M2S150)	IGLOO2 (M2GL150)

2.13.17 FCV484 Package Mechanical Drawing Dimensions

The following figure shows the details and dimensions of FCV484 Package Mechanical Drawing.

Table 67 • **FCV484 Package Mechanical Drawing Dimensions**

JEDEC Equivalent	FCV484, page 78		
Dimension	**Min.**	**Nom.**	**Max.**
A	2.85	3.00	3.15
A1	0.30	0.40	0.50
A2	0.50		
aaa	0.20		
b	0.45	0.50	0.55
ccc	0.25		
D	19.00		
D1	16.80 BSC		
D2	18.00 REF		
D3	18.00 REF		
E	19.00		
E1	16.80 BSC		
E2	18.00 REF		
E3	18.00 REF		
e	0.80 BSC		
eee	0.15		
fff	0.08		

Note: All dimensions are in millimeters.

Note: BSC = Basic spacing between centers.

2.13.18 FC1152 Package Mechanical Drawing Dimensions

The following figure shows the dimensions of FC1152

Table 68 • **Dimensions of FC1152**

JEDEC Equivalent	FC1152, page 77		
Dimension	**Min.**	**Nom.**	**Max.**
A	2.34	2.62	2.90
A1	0.40	0.50	0.60
A2	0.8		
aaa	0.20		
b	0.50	0.64	0.70
ccc	0.25		
D	34.85	35.00	35.15
D1	33.00 BSC		

Table 68 • **Dimensions of FC1152**

D2	29.00 REF		
D3	27.00 REF		
E	34.85	35.00	35.15
E1	33.00 BSC		
E2	29.00 REF		
E3	27.00 REF		
e	1.00 BSC		
eee	0.25		
fff	0.10		

Note: All dimensions are in millimeters.

Note: BSC = Basic spacing between centers.

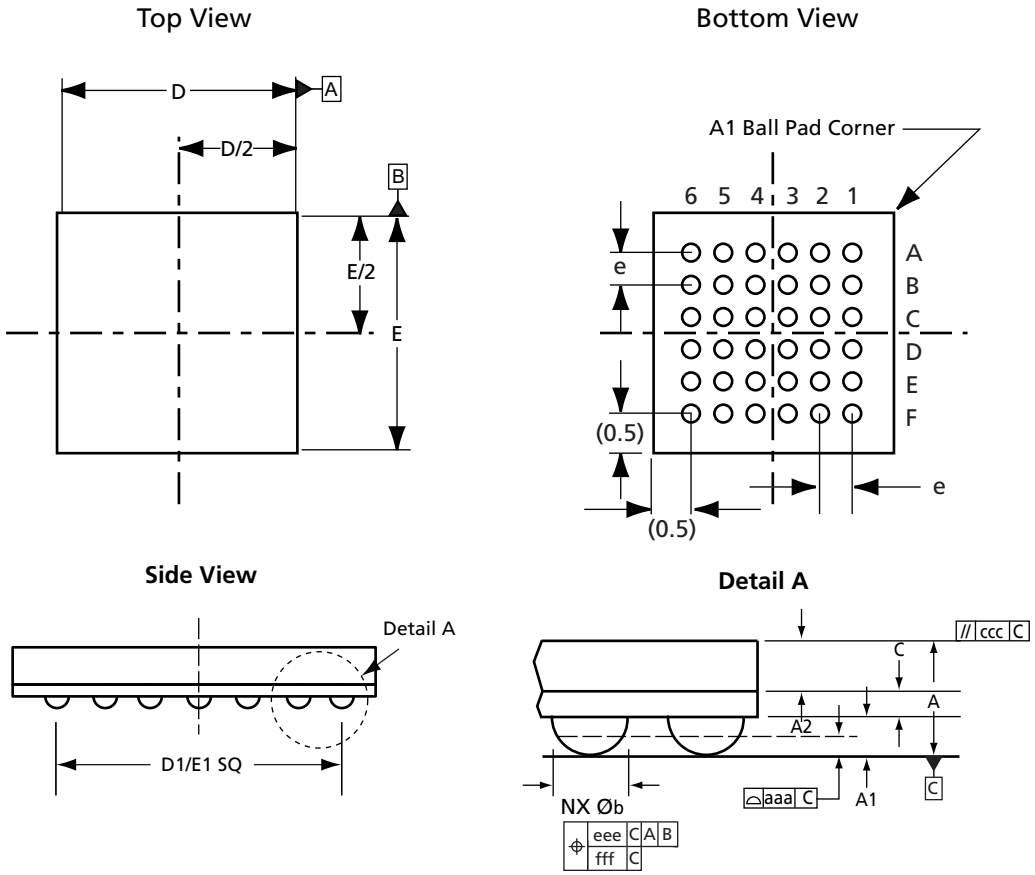
2.14 Chip Scale Package (UC/CS/VF)

The following figures show package outlines for various packages under chip scale package.

2.14.1 UC36

The following figure shows the package outline of UC36.

Figure 54 • **Package Outline of UC36**



Note: Dimensions are in millimeters. For more information on dimensions, see Chip Scale Package Dimensions, page 95.

The following table shows the supported devices for UC36.

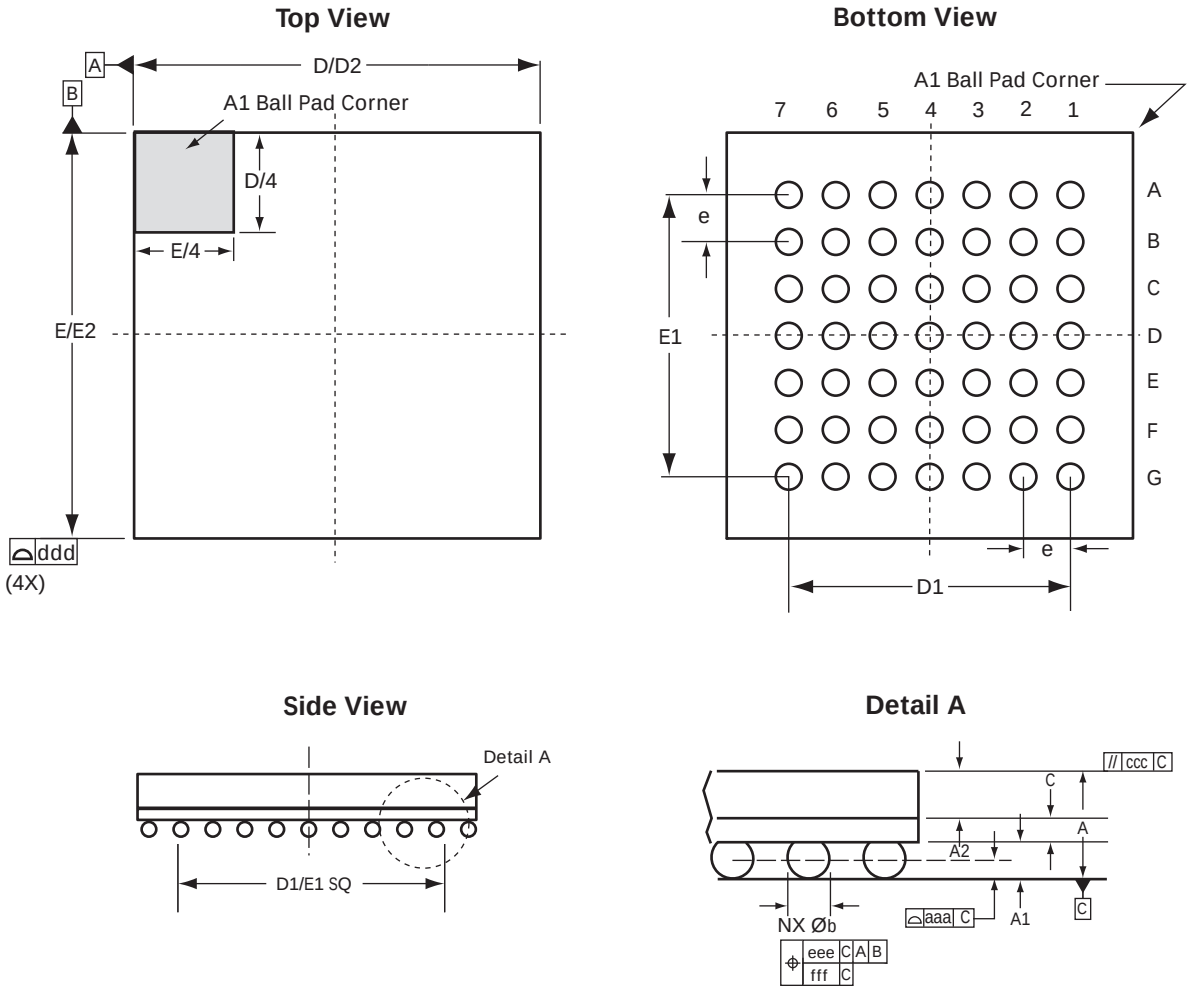
Table 69 • **Supported Devices for UC36**

Supported Devices
AGLN010

2.14.2 CS49

The following figure shows the package outline of CS49.

Figure 55 • **Package Outline of CS49**



Note: Dimensions are in millimeters. For more information on dimensions, see Chip Scale Package Dimensions, page 95.

The following table shows the supported devices for CS49.

Table 70 • **Supported Devices for CS49**

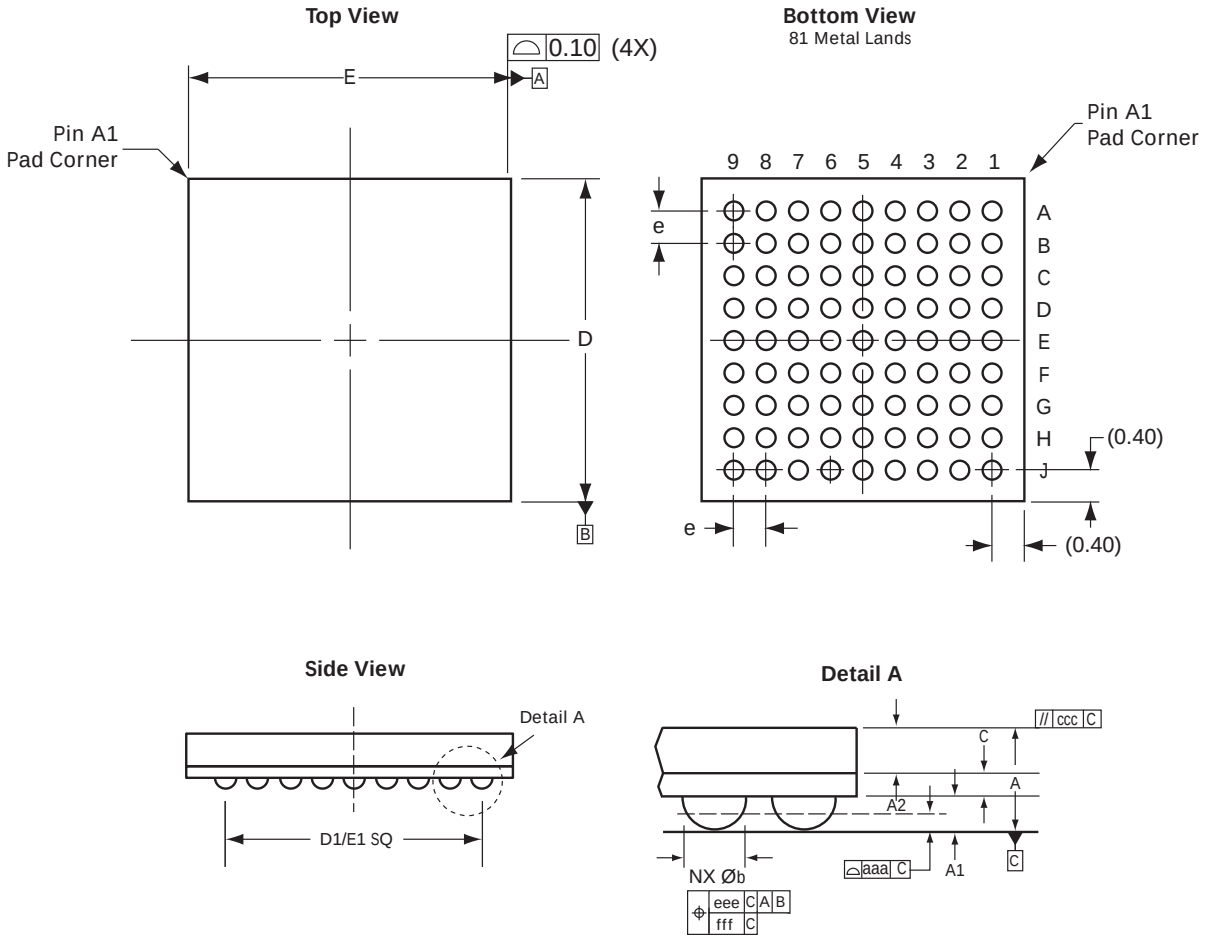
Supported Devices
eX64[1]
eX128[1]

1. This product is obsolete.

2.14.3 UC81

The following figure shows the package outline of UC81.

Figure 56 • **Package Outline of UC81**



Note: Dimensions are in millimeters. For more information on dimensions, see Chip Scale Package Dimensions, page 95.

The following table lists the supported devices for UC81.

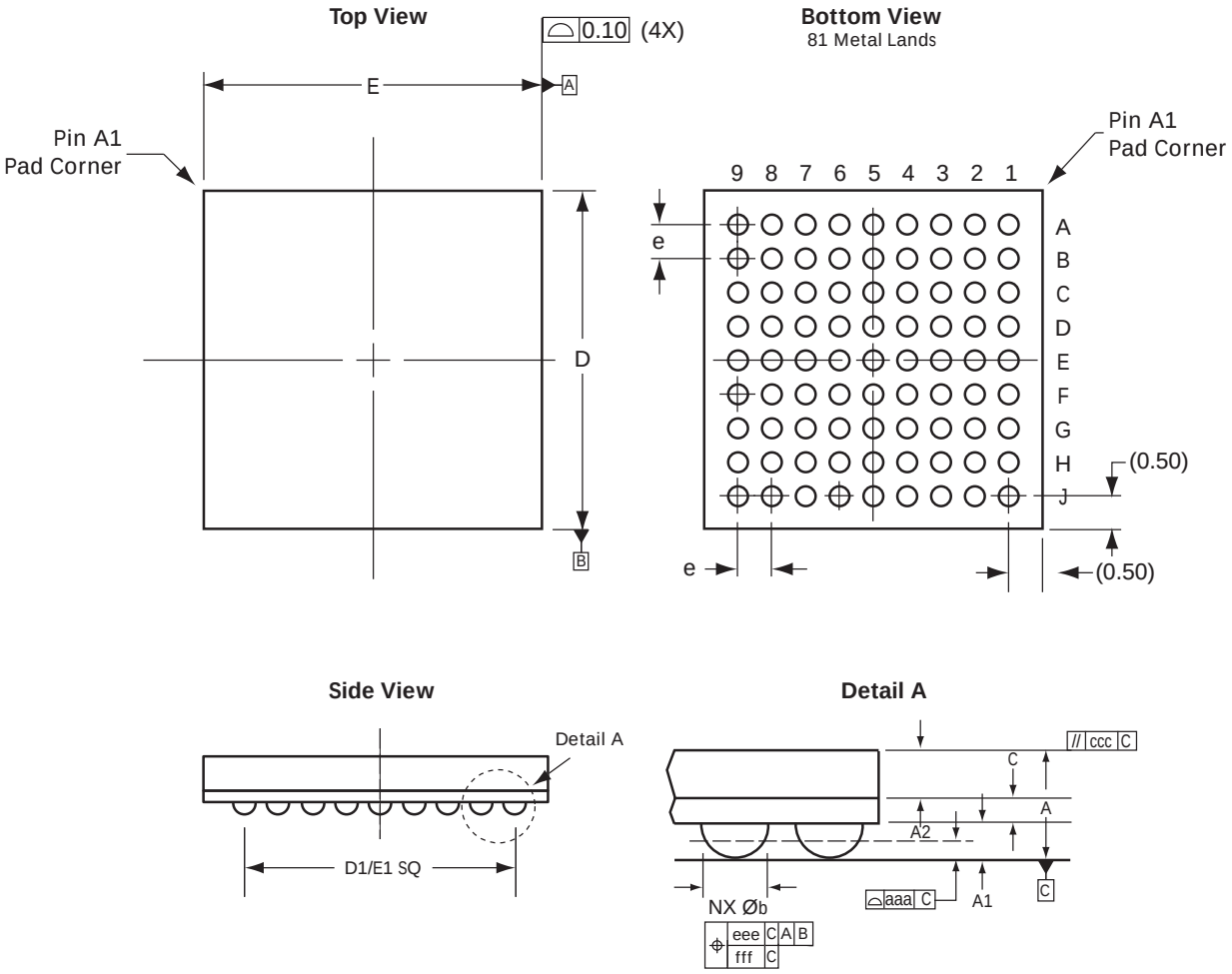
Table 71 • **Supported Devices for UC81**

Supported Devices	
AGL030	AGLN020 AGLN030

2.14.4 CS81

The following figure shows the package outline of CS81.

Figure 57 • **Package Outline of CS81**



Note: Dimensions are in millimeters. For more information on dimensions, see Chip Scale Package Dimensions, page 95.

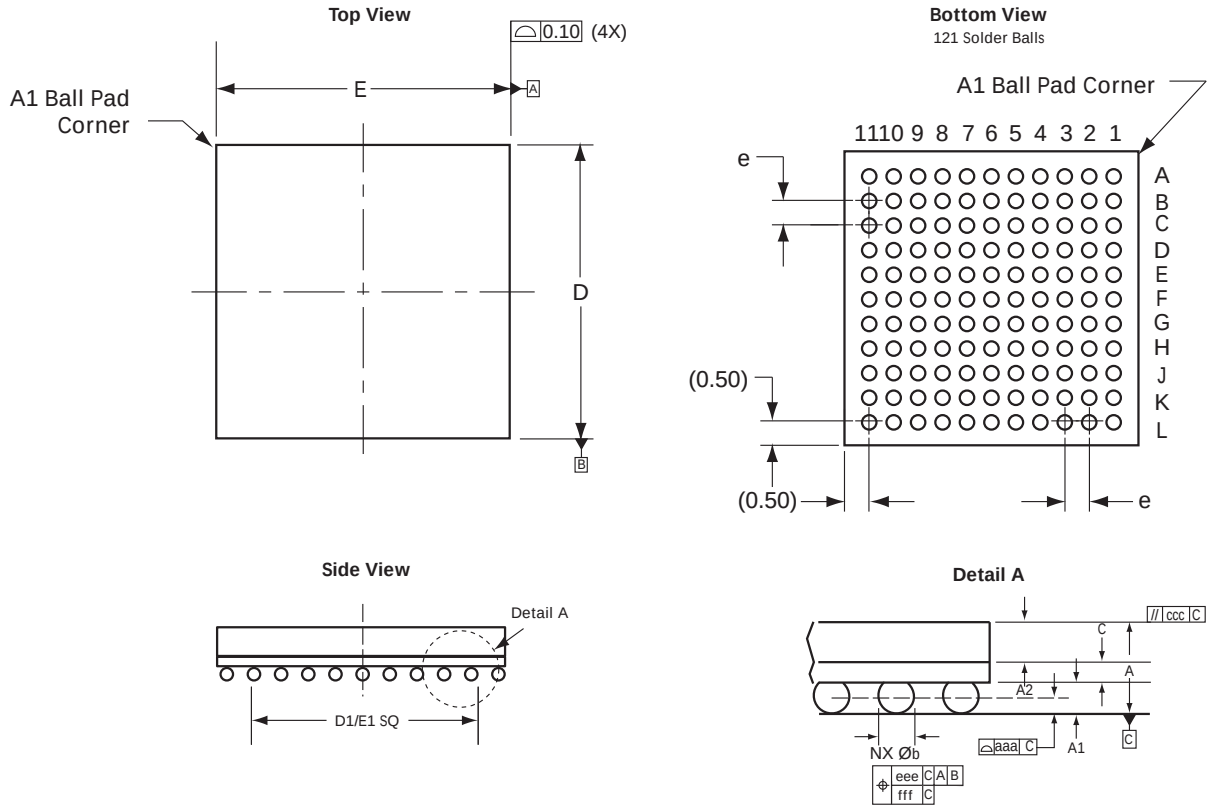
Table 72 • **Supported Devices for CS81**

Supported Devices	
AGL030	AGLN020
AGL250	AGLN030
	AGLN060
	AGLN125
	AGLN250

2.14.5 CS121

The following figure shows the package outline of CS121.

Figure 58 • **Package Outline of CS121**



Note: Dimensions are in millimeters. For more information on dimensions, see Chip Scale Package Dimensions, page 95.

The following table lists the supported devices for CS121.

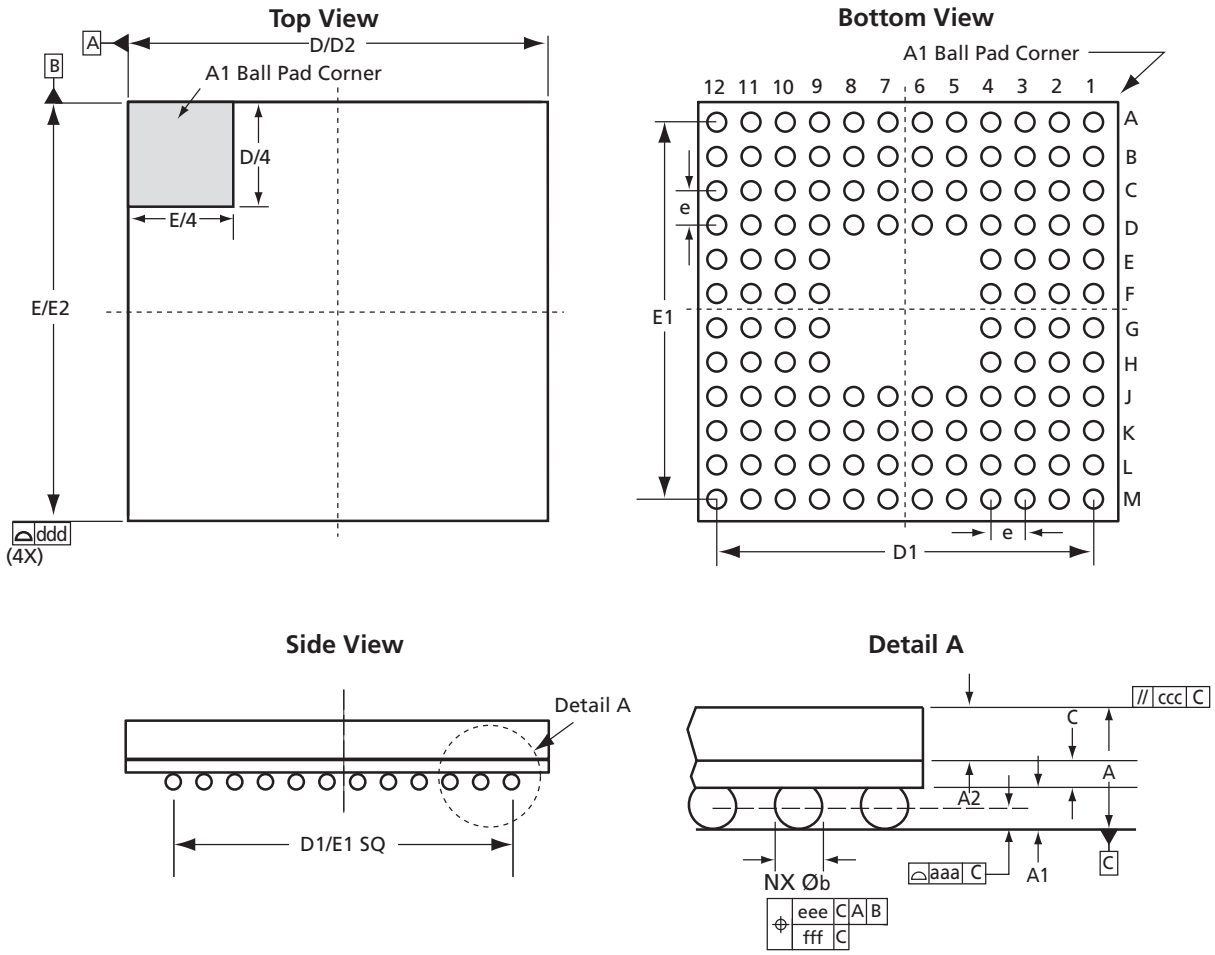
Table 73 • **Supported Devices for CS121**

Supported Devices
AGL060

2.14.6 CS128

The following figure shows the package outline of CS128.

Figure 59 • **Package Outline of CS128**



Note: Dimensions are in millimeters. For more information on dimensions, see Chip Scale Package Dimensions, page 95.

Table 74 • **Supported Devices for CS128**

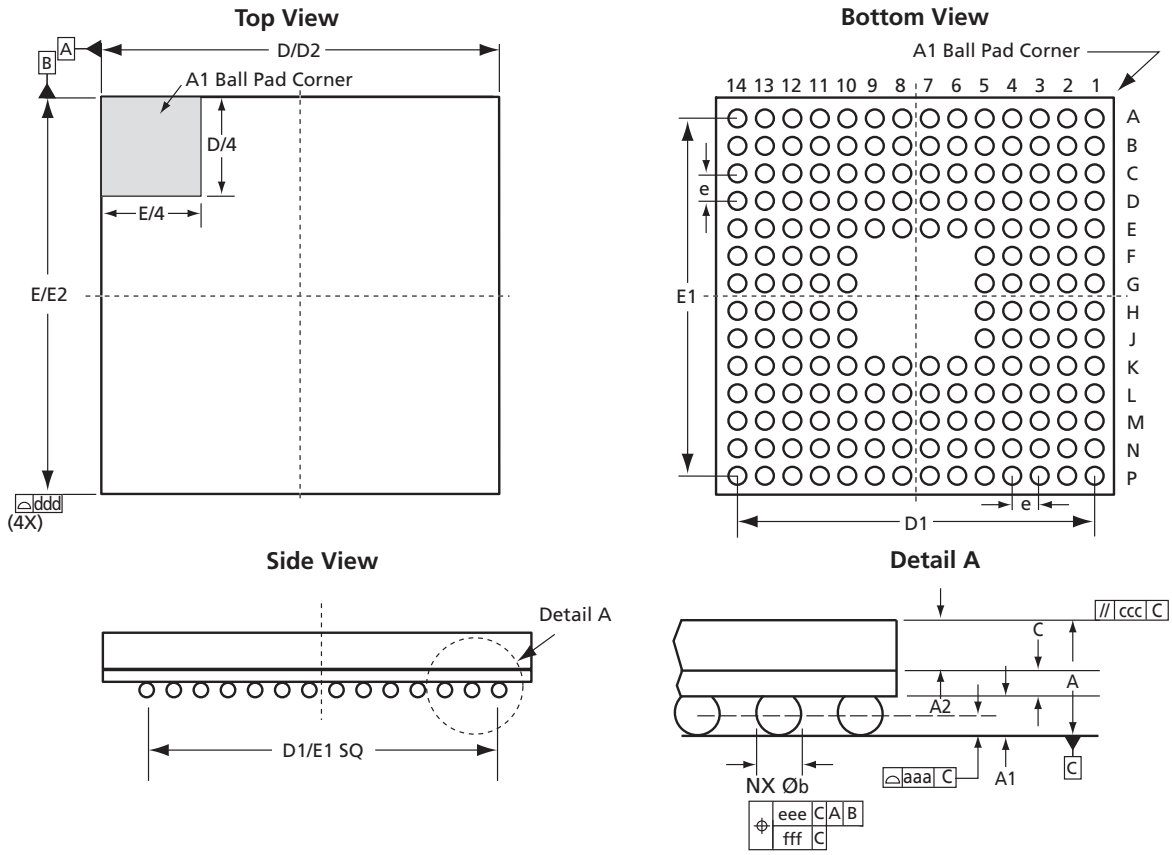
Supported Devices
eX64[1]
eX128[1]
eX256[1]

1. This product is obsolete.

2.14.7 CS180

The following figure shows the package outline of CS180.

Figure 60 • **Package Outline of CS180**



Note: Dimensions are in millimeters. For more information on dimensions, see Chip Scale Package Dimensions, page 95.

The following table shows the supported devices for CS180.

Table 75 • **Supported Devices for CS180**

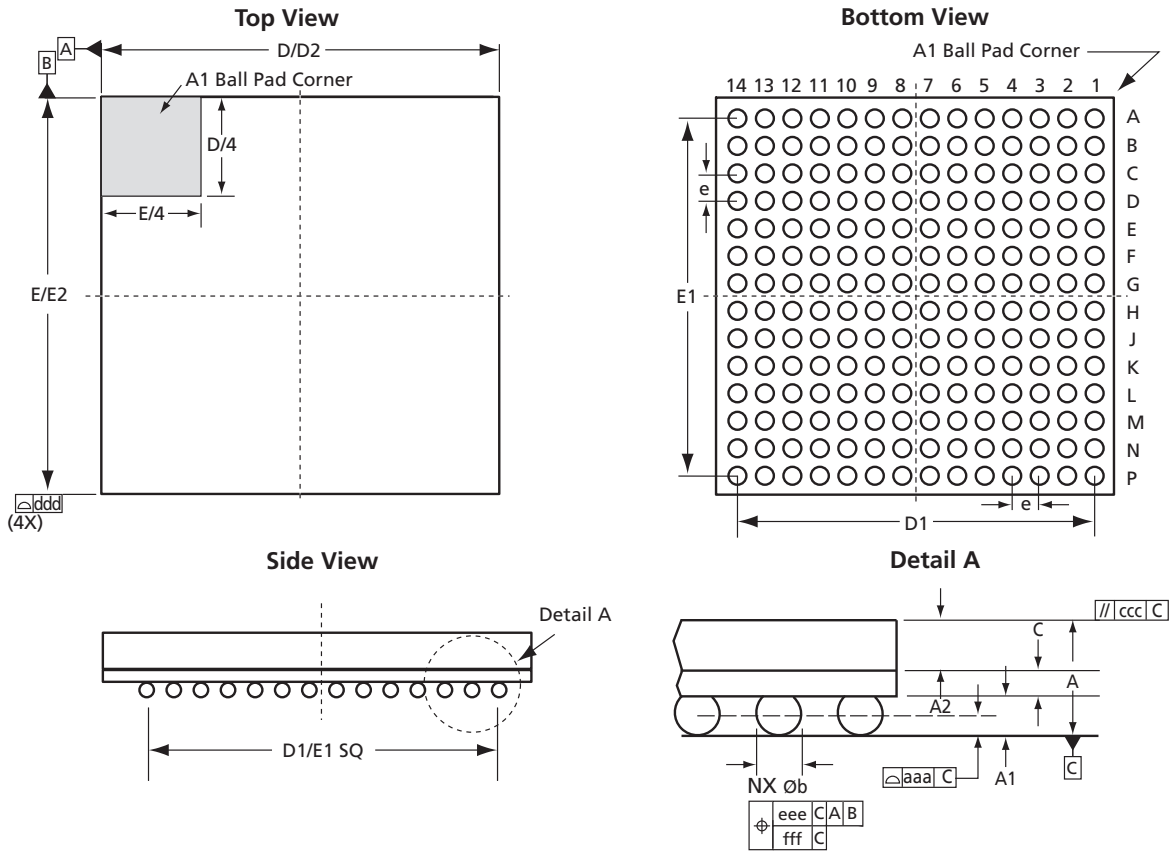
Supported Devices	
eX256[1]	AX125[1]

1. This product is obsolete.

2.14.8 CS196

The following figure shows the package outline of CS196.

Figure 61 • **Package Outline of CS196**



Note: Dimensions are in millimeters. For more information on dimensions, see Chip Scale Package Dimensions, page 95.

The following table lists the supported device for CS196.

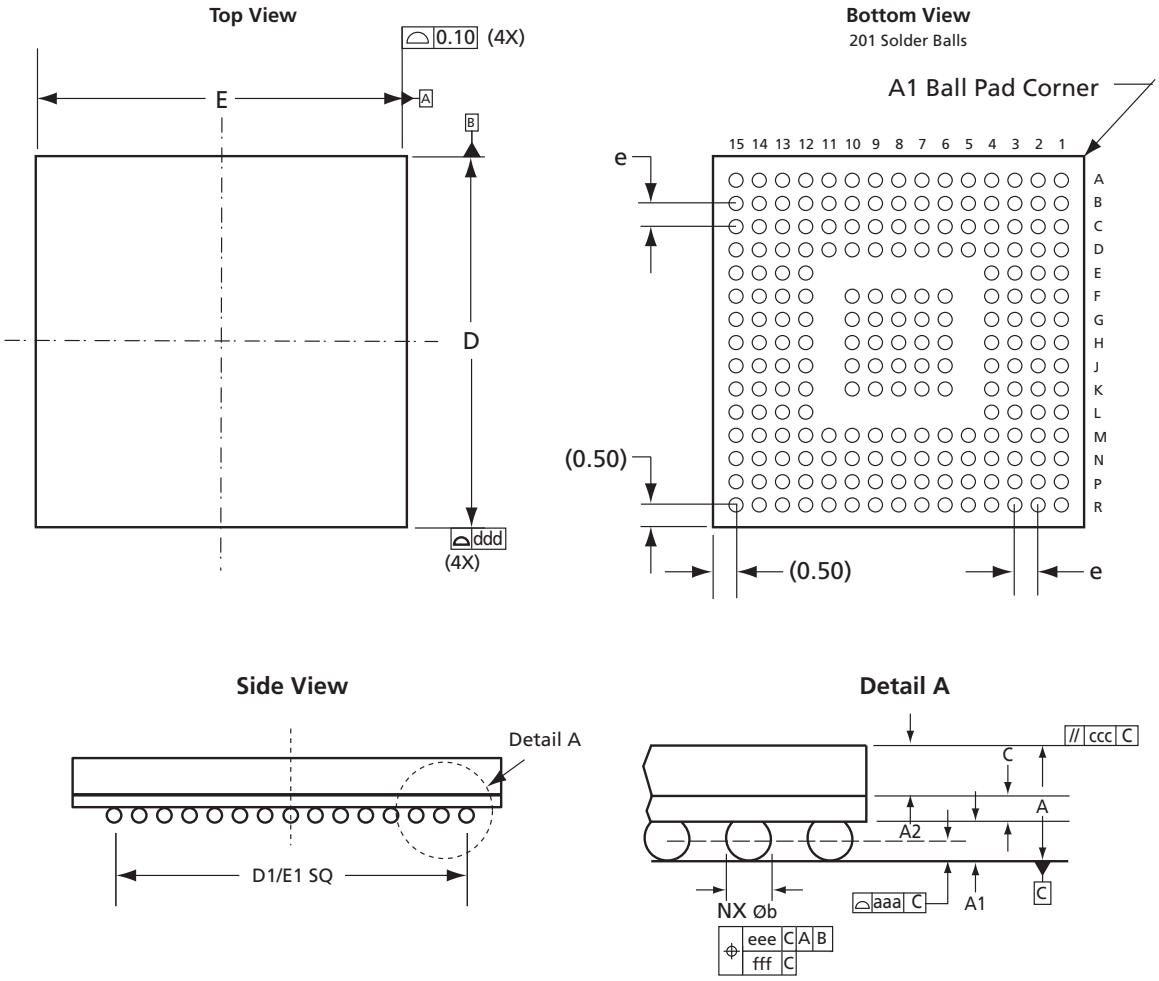
Table 76 • **Supported Devices for CS196**

Supported Devices
AGL125
AGL250
AGL400

2.14.9 CS201

The following figure shows the package outline of CS201.

Figure 62 • **Package Outline of CS201**



Note: Dimensions are in millimeters. For more information on dimensions, see Chip Scale Package Dimensions, page 95.

The following table shows the supported devices for CS201.

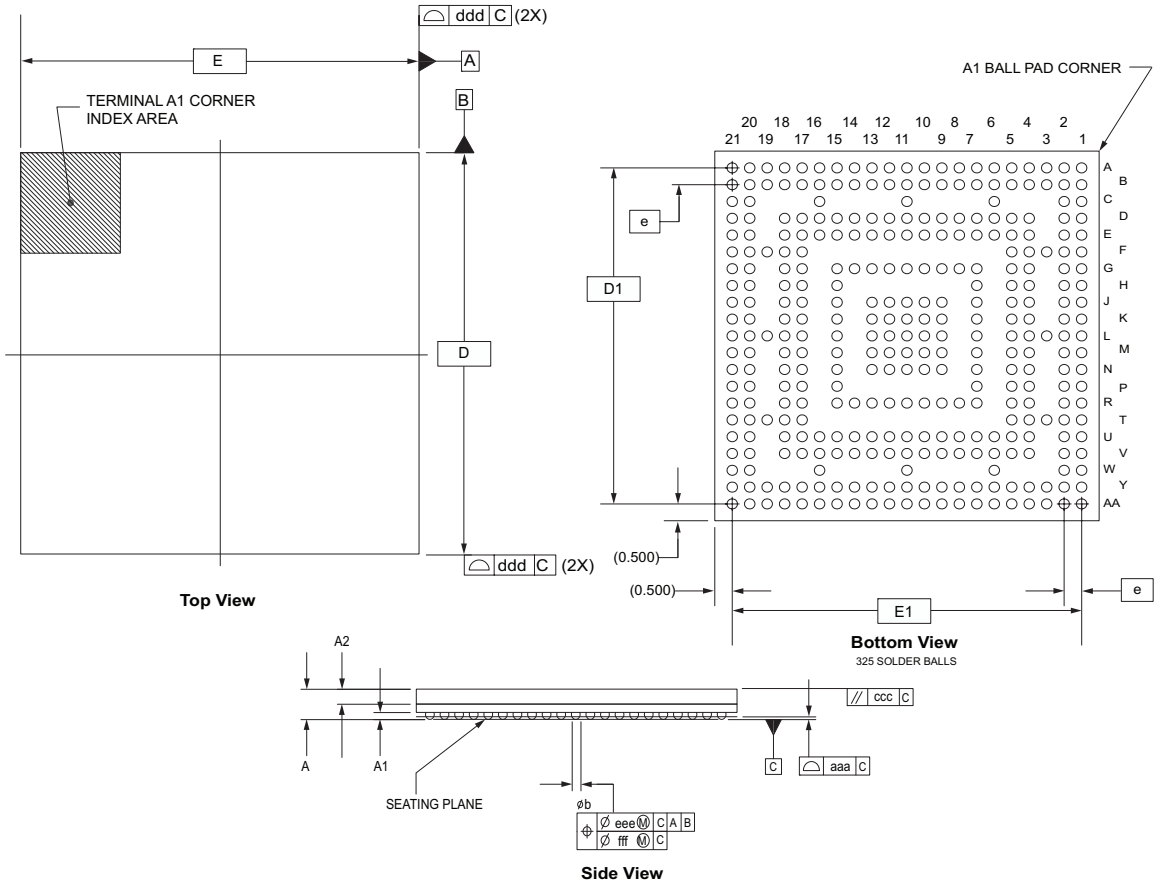
Table 77 • **Supported Devices for CS201**

Supported Devices
AGLP030
AGLP060

2.14.10 FCS325 – (Option 1)

The following figure shows the package outline of FCS325 (Option 1).

Figure 63 • **Package Outline of FCS325 (Option 1)**



Note: Dimensions are in millimeters. For more information on dimensions, see FC325 column under Chip Scale Package Dimensions, page 95.

The following table lists the supported devices for FCS325 (Option 1).

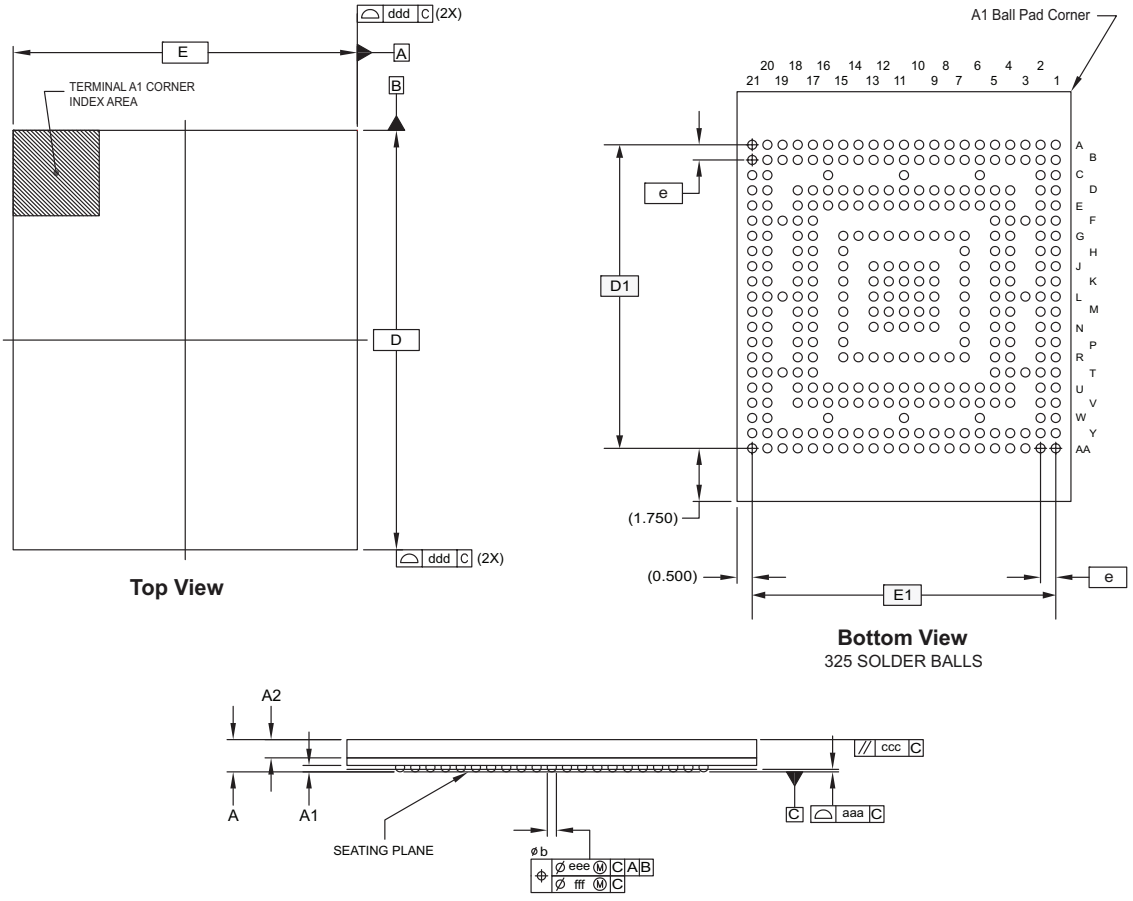
Table 78 • **Supported Devices for FCS325 (Option 1)**

Supported Devices	
SmartFusion2 (M2S050, M2S025, M2S060)	IGLOO2 (M2GL050, M2GL025, M2GL060)

2.14.11 FCS325 – (Option 2)

The following figure shows the package outline of FCS325 (Option 2).

Figure 64 • **Package Outline of FCS325 (Option 2)**



Note: Dimensions are in millimeters. For more information on dimensions, see FCS325 (Option 2) column under Chip Scale Package Dimensions, page 95.

The following table lists the supported devices for FCS325 (Option 2).

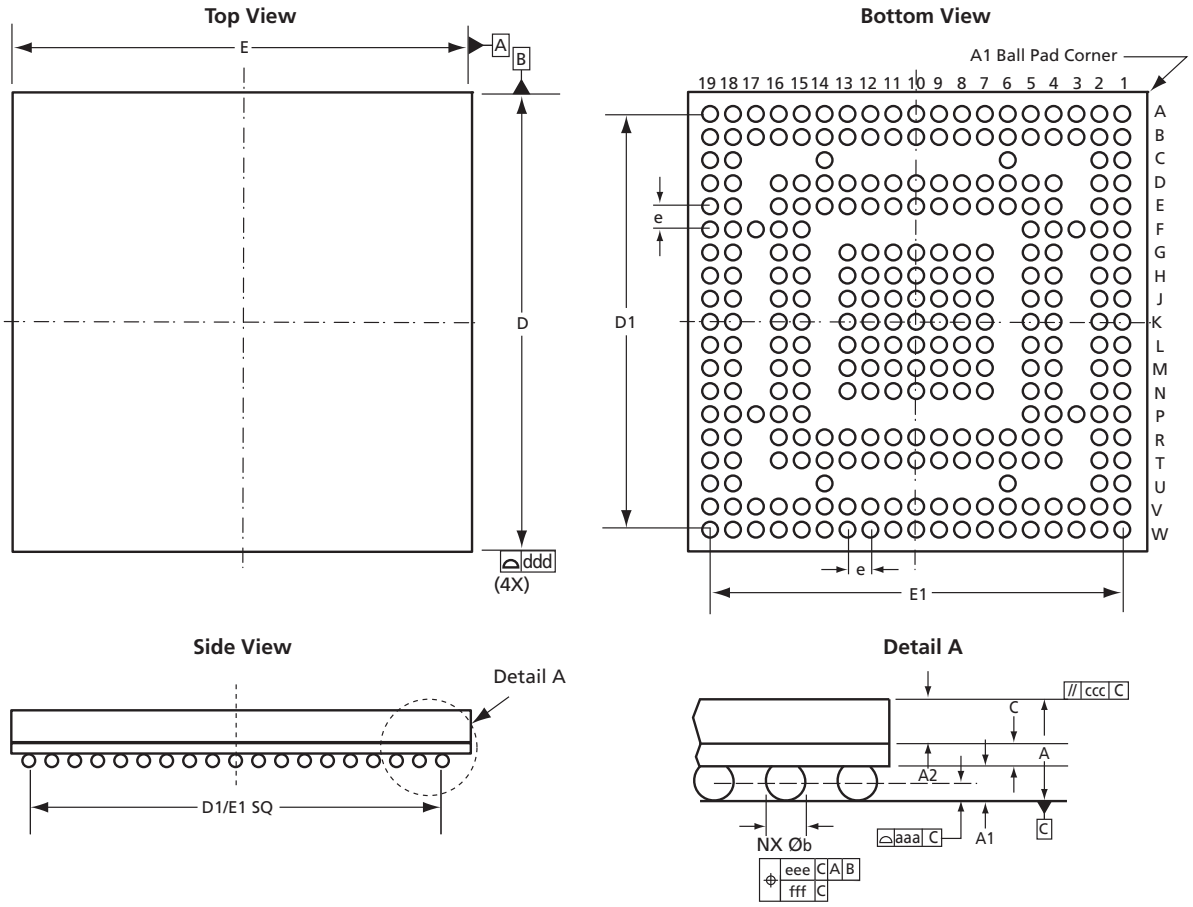
Table 79 • **Supported Devices for FCS325 (Option 2)**

Supported Devices	
SmartFusion2 (M2S090)	IGLOO2 (M2GL090)

2.14.12 CS281

The following figure shows the package outline of CS281.

Figure 65 • **Package Outline of CS281**



Note: Dimensions are in millimeters. For more information on dimensions, see Chip Scale Package Dimensions, page 95.

The following table shows the supported devices for CS281.

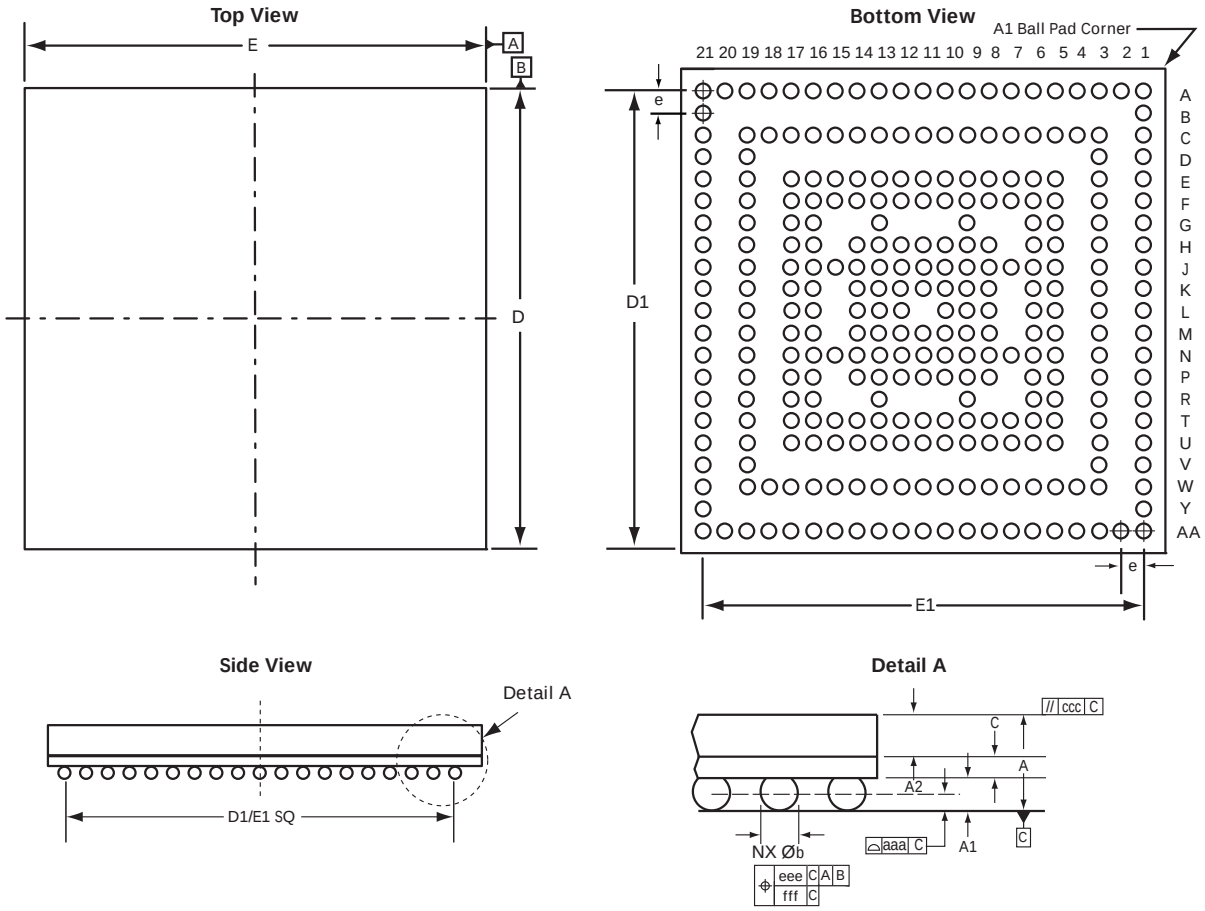
Table 80 • **Supported Devices for CS281**

Supported Devices
AGLP125
AGL600
AGL1000
M1AGL600
M1AGL1000

2.14.13 CS288

The following figure shows the package outline of CS288.

Figure 66 • **Package Outline of CS288**



Note: Dimensions are in millimeters. For more information on dimensions, see Chip Scale Package Dimensions, page 95.

The following table lists the supported devices for CS288.

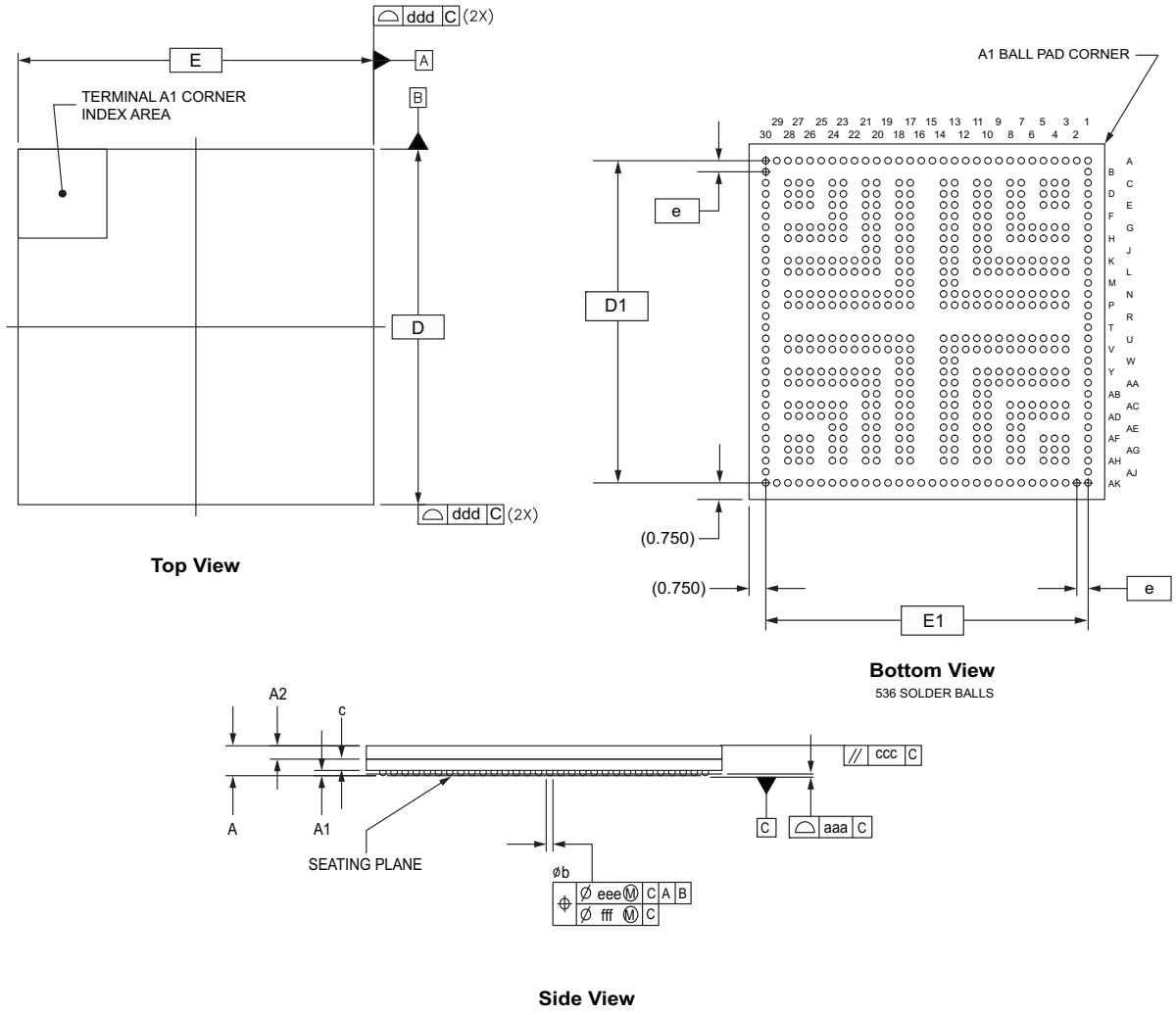
Table 81 • **Supported Devices for CS288**

Supported Devices
A2F060
A2F200
A2F500

2.14.14 FCS536

The following figure shows the package outline of FCS536.

Figure 67 • **Package Outline of FCS536**



Dimensions are in millimeters. For more information on dimensions, see FC536 column under Chip Scale Package Dimensions, page 95.

The following table lists the supported devices for FCS536.

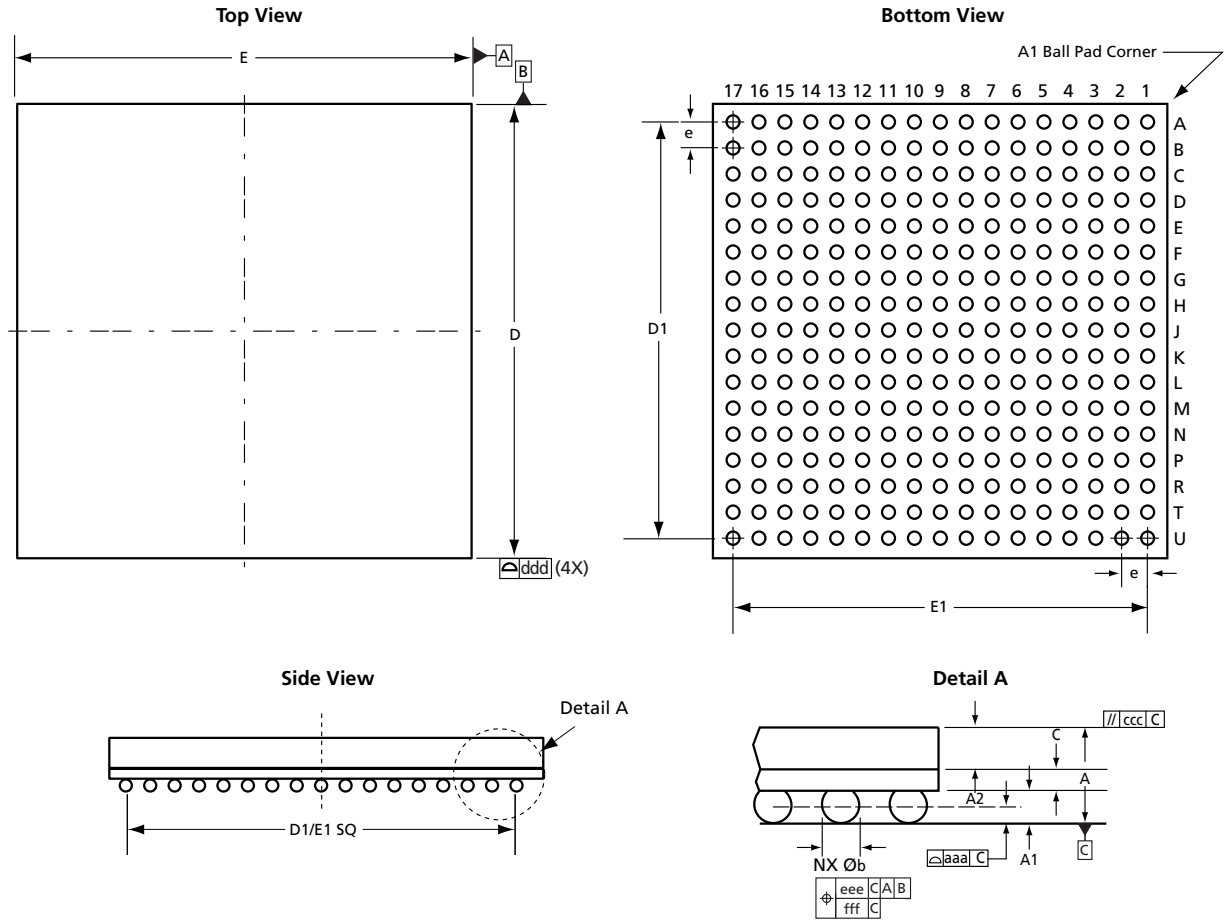
Table 82 • **Supported Devices for FCS536**

Supported Devices
IGLOO2 (M2GL150)

2.14.15 CS289

The following figure shows the package outline of CS289.

Figure 68 • **Package Outline of CS289**



Note: Dimensions are in millimeters. For more information on dimensions, see Chip Scale Package Dimensions, page 95.

The following table lists the supported devices for CS289.

Table 83 • **Supported Devices for CS289**

Supported Devices
AGLP030
AGLP060
AGLP125

2.14.16 Chip Scale Package Dimensions

The following table lists the Chip Scale Package Dimensions for UC36, CS49, UC81, and CS81.

Table 84 • **Chip Scale Package Dimensions for UC36, CS49, UC81, and CS81**

JEDEC Equivalent	UC36, page 80			CS49, page 81 MO-205			UC81, page 82			CS81, page 83		
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		

Note: All dimensions are in millimeters.

Note: Variation AG depopulated.

The following table lists the Chip Scale Package Dimensions for CS121, CS128, CS180, CS196, and CS201.

Table 85 • **Chip Scale Package Dimensions for CS121, CS128, CS180, CS196, and CS201**

JEDEC Equivalent	CS121, page 84 MO-195, Variation AC			CS128, page 85 MO-205, Variation BD			CS180, page 86 MO-205, Variation BF			CS196, page 87 MO-195, Variation BE			CS201, page 88 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		

Note: All dimensions are in millimeters.

Note: Variation AG depopulated.

The following table lists the Chip Scale Package Dimensions for FC325 and FC536.

Table 86 • **Chip Scale Package Dimensions for FC325 and FC536**

JEDEC Equivalent	FCS325 – (Option 1), page 89			FCS325 – (Option 2), page 90			FCS536, page 93		
Dimension	Min.	Nom.	Max.	Min.	Nom.	Max.	Min.	Nom.	Max.
A			1.01			1.16			1.45
A1	0.15	0.21		0.15	0.21		0.15	0.24	
A2	0.40	0.45	0.50	0.55	0.60	0.65	0.55	0.60	0.65
aaa	0.08			0.08			0.08		
b	0.25	0.30	0.35	0.25	0.30	0.35	0.25	0.30	0.35
bbb	N.A.			N.A.			N.A.		
c	0.21	0.25	0.29	0.21	0.25	0.29	0.472	0.512	0.552
ccc	0.10			0.10			0.10		
D	11.00			13.50			16.0		
D1	10.00 BSC			10.00 BSC			14.50 BSC		
E	11.00			11.00			16.0		
ddd	0.15			0.15			0.15		
E1	10.00 BSC			10.00 BSC			14.50 BSC		
e	0.50 TYP			0.50 TYP			0.50 TYP		
eee	0.15			0.15			0.15		

Note: All dimensions are in millimeters.

Note: Variation AG depopulated.

The following table lists the Chip Scale Package Dimensions for CS281, CS288, and CS289.

Table 87 • **Chip Scale Package Dimensions for CS281, CS288, and CS289**

JEDEC Equivalent	CS281, page 91 MO-195, Variation AG[2]			CS288, page 92			CS289, page 94		
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	

Table 87 • **Chip Scale Package Dimensions for CS281, CS288, and CS289**

eee	0.15	0.15	0.15
fff	0.05	0.05	0.08

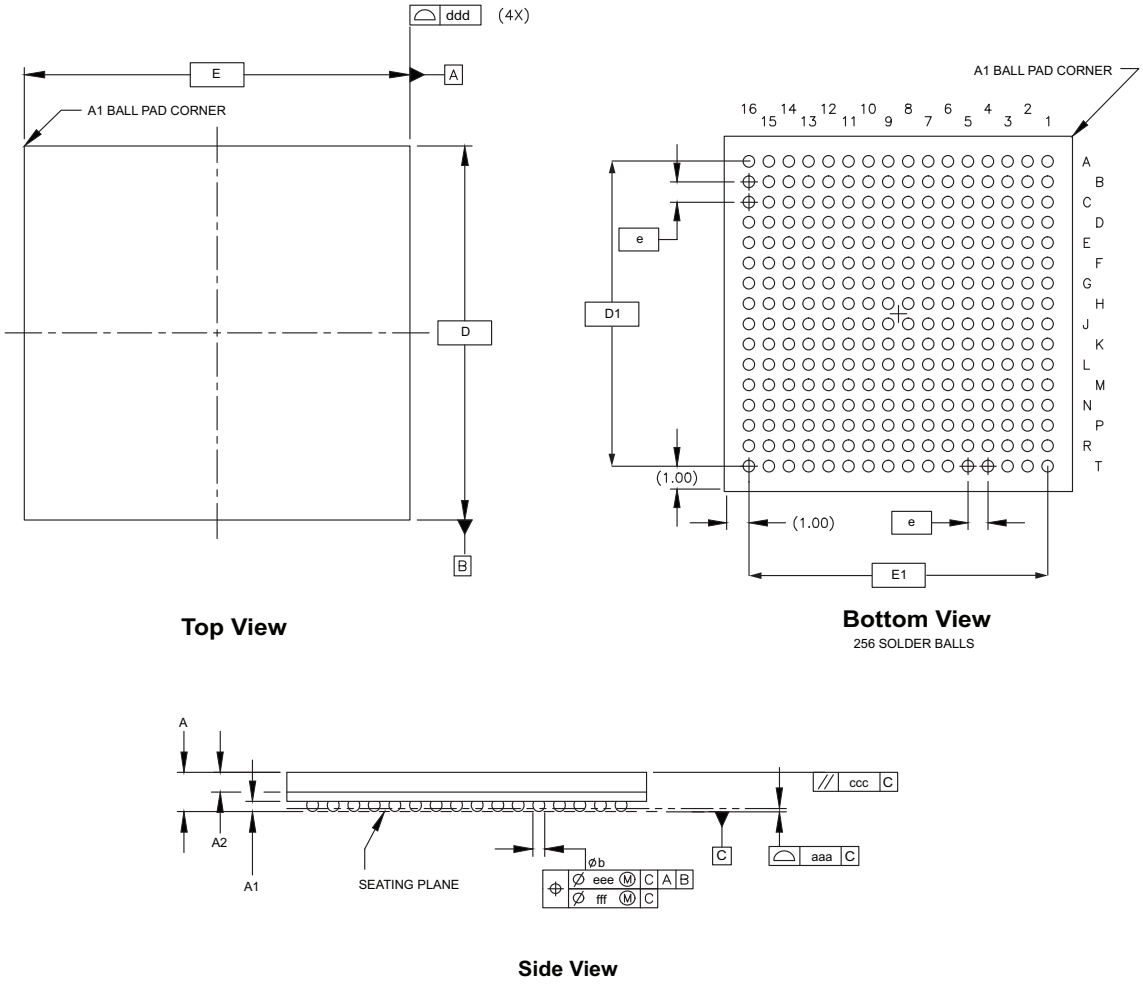
Note: All dimensions are in millimeters.

Note: Variation AG depopulated.

2.14.17 VF256

The following figure shows the package outline of VF256.

Figure 69 • **Package Outline of VF256**



Note: Dimensions are in millimeters. For more information on dimensions, see "Dimensions of VF256" section on page 100.

The following table lists the supported devices for VF256.

Table 88 • Supported Devices for VF256

Supported Devices	
SmartFusion2 M2S025, M2S025T, M2S025TS M2S010, M2S010T, M2S025TS M2S005, M2S005S	IGLOO2 M2GL025, M2GL025T, M2S025TS M2GL010, M2GL010T, M2GL025TS M2GL005, M2GL005S

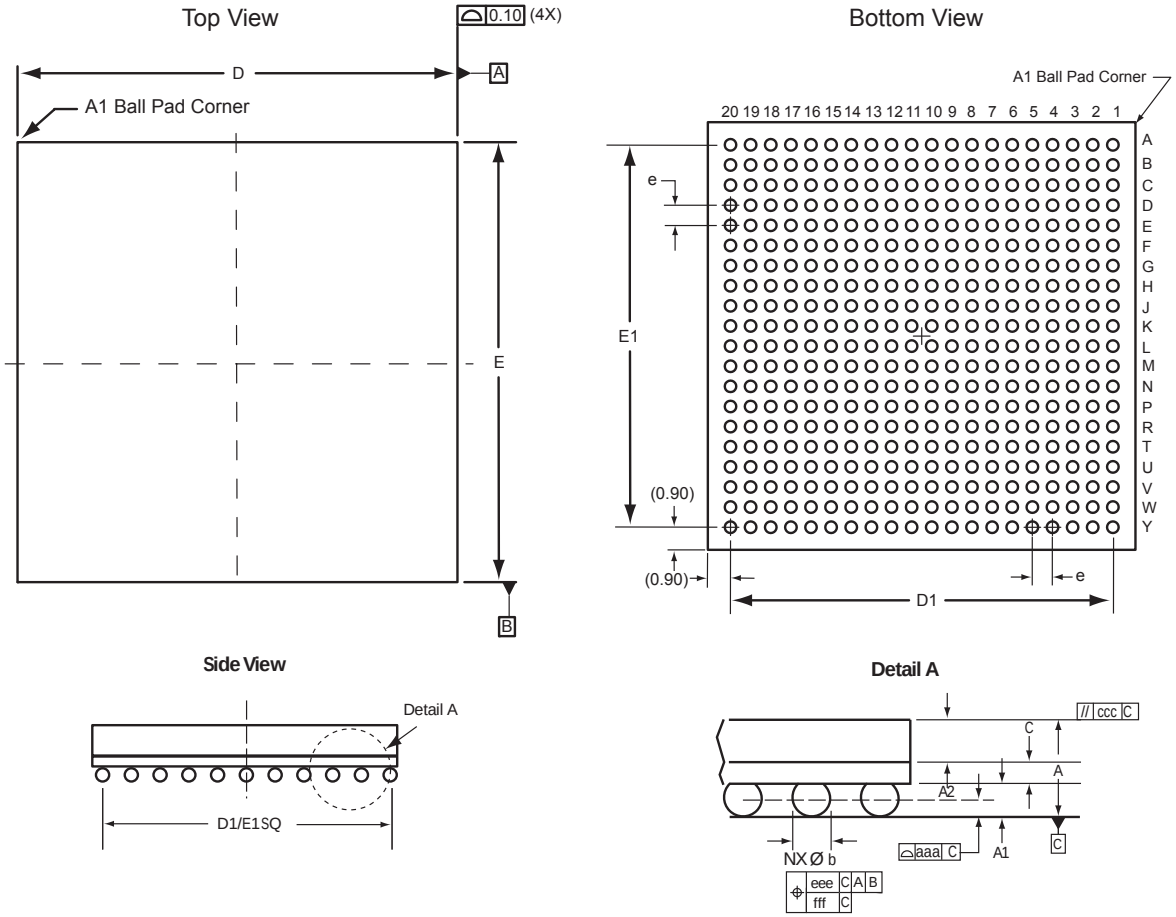
2.15 Very Fine Pitch Ball Grid Array

The following figures show package outlines for various packages under Very Fine Pitch Ball Grid Array.

2.15.1 VF400

The following figure shows the package outline of VF400.

Figure 70 • **Package Outline of VF400**



The following table lists the supported device for VF400.

Table 89 • **Supported Devices for VF400**

Supported Devices	
M2S005, M2S005S	M2GL005, M2GL005S
M2S010, M2S010T, M2S010TS	M2GL010, M2GL010T, M2GL010TS
M2S025, M2S025T, M2S025TS	M2GL025, M2GL025T, M2GL025TS
M2S050, M2S050T, M2S050TS	M2GL050, M2GL050T, M2GL050TS
M2S060, M2S060T, M2S060TS	M2GL060, M2GL060T, M2GL060TS

2.15.2 Dimensions of VF400

The following table lists the dimensions of VF400.

Table 90 • **Dimensions of VF400**

JEDEC Equivalent	**VF400, page 98**		
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		

Note: All dimensions are in millimeters.

2.15.3 Dimensions of VF256

The following table lists the dimensions of VF256.

Table 91 • **Dimensions of VF256**

JEDEC Equivalent	**VF256, page 97**		
Dimension	**Min.**	**Nom.**	**Max.**
A	1.36	1.46	1.56
A1	0.35	0.40	0.45
A2	0.65	0.70	0.75
aaa	0.12		
b	0.45	0.50	0.55
ccc	0.10		
D	14.00		
D1	12.00 BSC		
E	14.00		
E1	12.00 BSC		
ddd	0.10		
fff	0.08		
e	0.80 TYP		
eee	0.15		

Note: All dimensions are in millimeters.

Note: BSC = Basic spacing between centers.