



µBGA* Package Mechanical and Shipping Media Specifications

March 2000



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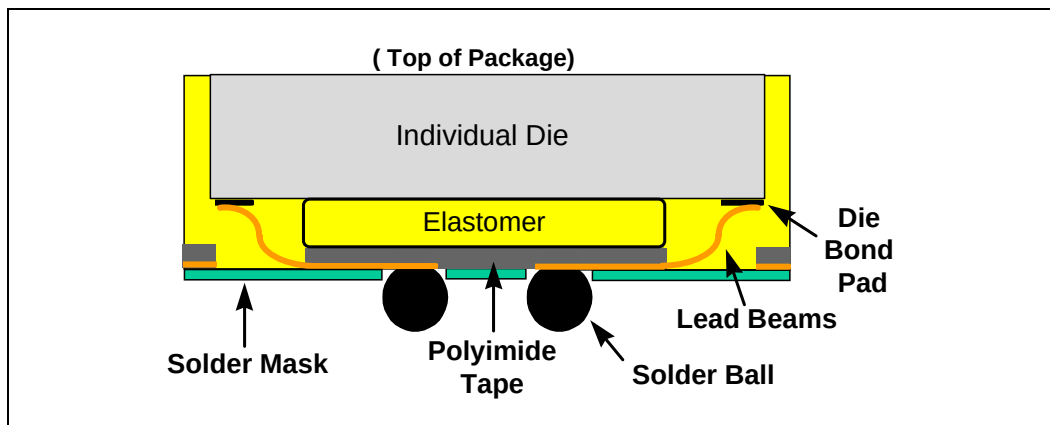
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Revision History

Date of Revision	Version	Description
10/29/97	3.4	First external release
11/20/97	3.5	Deleted Intel's word-wide FlashFile™ memory components
12/04/97	3.6	Added package media information
05/12/98	3.7	Added 28F800B3, 28F160B3, 28F008B3, 28F016B3, 28F016B3_A / 28F160B3_A /28F032B3_A /28F320B3_A, and 28F016C3_A /28F160C3_A / 28F032C3_A /28F320C3_A device information
05/26/98	3.8	Changed name of document from <i>Micro Ball Grid Array Package Mechanical Specifications and Media Information</i> to <i>μBGA* Package Mechanical and Shipping Media Specifications</i> Converted tape daisy chain to silicon daisy chain Discontinued 40-ball tape daisy chain
06/18/98	3.9	Changed 56-Ball array μBGA package SDC and 28F640/320J5 product pinouts to reflect removal of balls I2 and I7.
07/29/98	3.10	Added Fast Boot Block and Advanced+ Boot Block information; deleted ball count references.
08/18/98	3.11	Updated specifications in Table 4.3, <i>μBGA* Package Dimensions for Boot Block Memory Components</i> .
11/11/98	3.12	Corrected pinout layout for 28F320B3_A/28F320C3_A, Section 4.10.
02/16/99	3.13	Added μBGA* Package Silicon Daisy Chain Schematics for G28FSDCCR and μBGA* Package Drawing and Dimensions for Silicon Daisy Chain Devices for G28FSDCCR
03/08/99	3.14	Removed all references to 28F0xxC3 and 28F032B3 (x8).
03/17/99	3.15	Added 28F160C18 information (Section 4.11)
06/07/99	3.1.6	Provided additional media and socket ordering information (Section 7.4.1)
10/06/99	3.1.7	Added 1.8 Volt Dual-Plane Flash Memory Section (Section 7.0) Removed 28F160C18 information Removed all references to 28F008B3_A and 28F008C3_A Corrected _A designation on C3 products
03/01/00	3.1.8	Removed 28FSDC56 SDC's

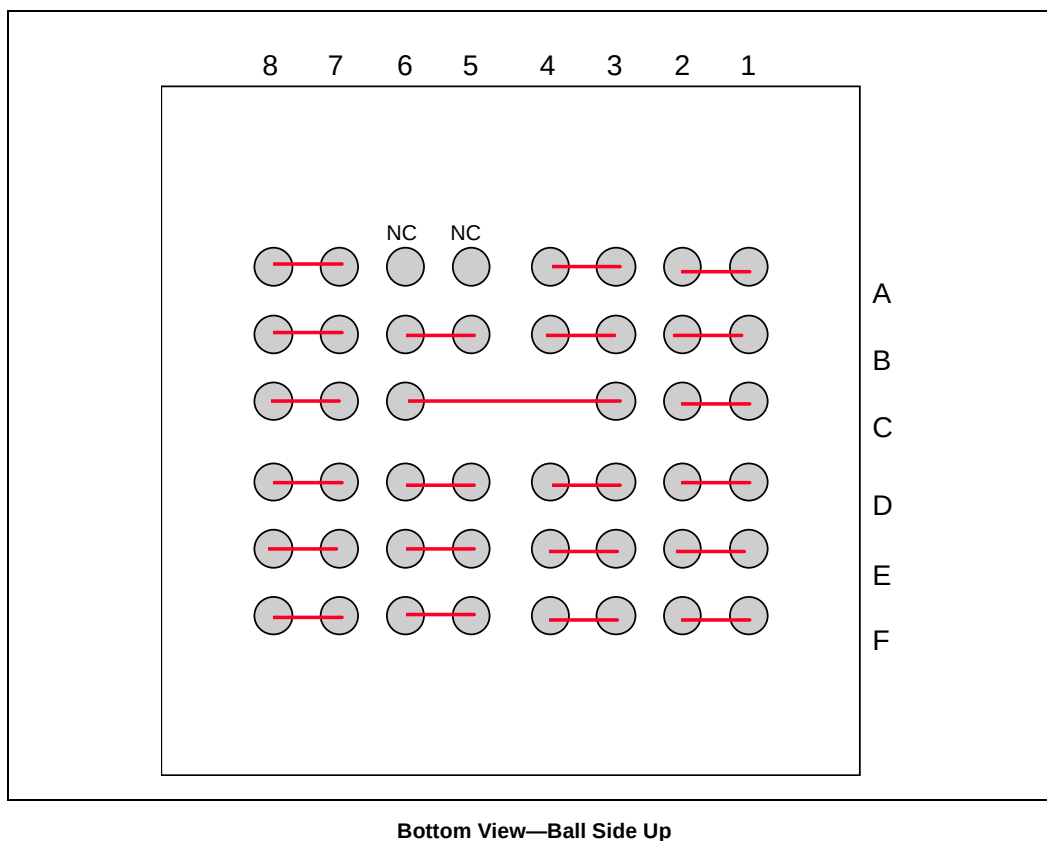
1.0 μ BGA* Package Construction

The following figure illustrates the typical cross section and construction of a μ BGA* package.



2.0 μ BGA* Package Silicon Daisy Chain Evaluation Units

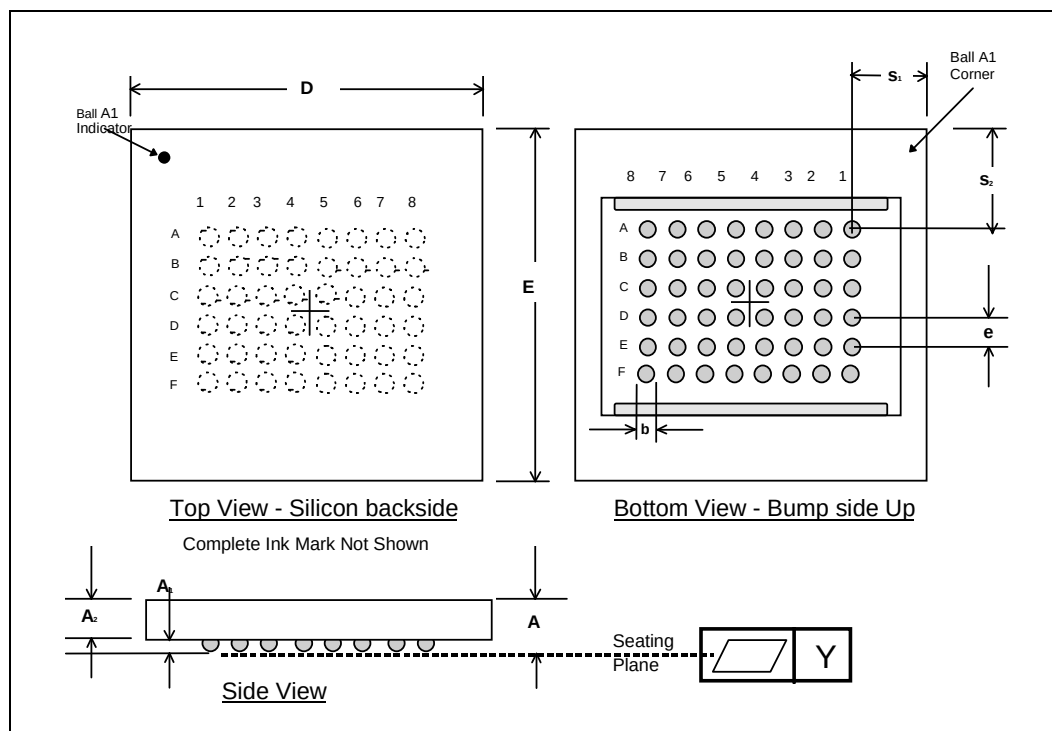
2.1 μ BGA* Package Silicon Daisy Chain Schematics for G28FSDC48



Package Connections:

Ball Number	Ball Number	Ball Number	Ball Number
A1 – A2	B5 – B6	D1 – D2	E5 – E6
A3 – A4	B7 – B8	D3 – D4	E7 – E8
	C1 – C2	D5 – D6	F1 – F2
A7 – A8	C3 – C6	D7 – D8	F3 – F4
B1 – B2		E1 – E2	F5 – F6
B3 – B4	C7 – C8	E3 – E4	F7 – F8

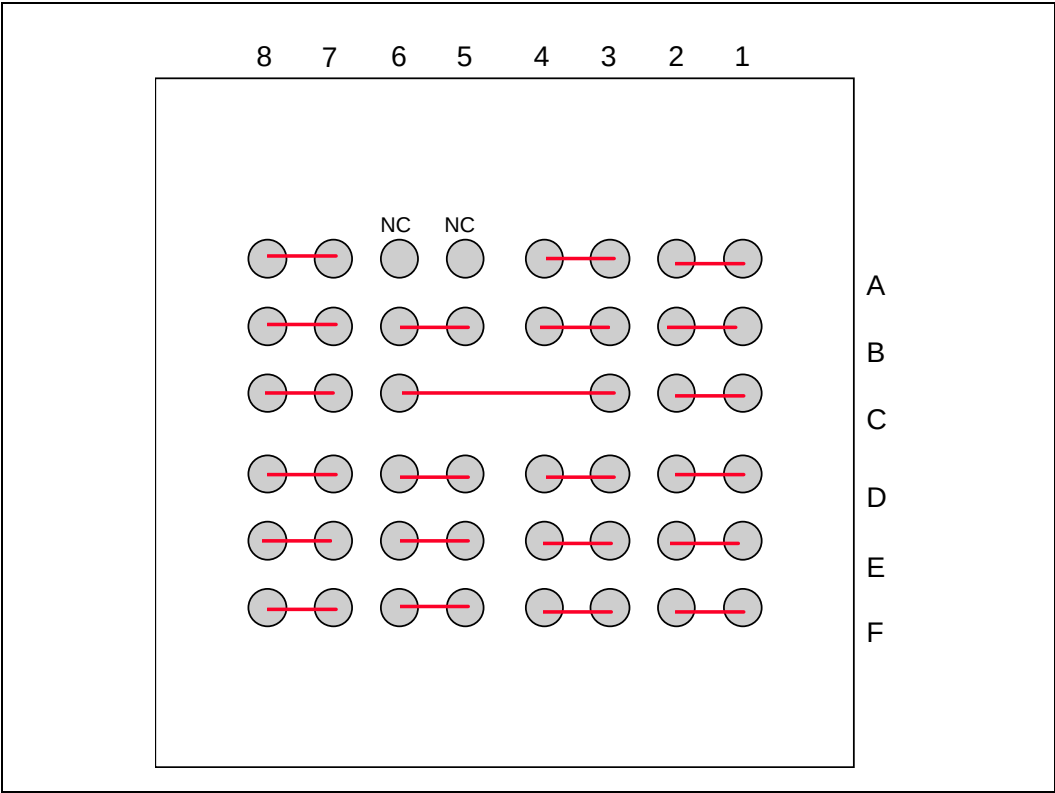
2.2 μ BGA* Package Drawing and Dimensions for Silicon Daisy Chain Devices for G28FSDC48



	Sym	Millimeters				Inches		
		Min	Nom	Max	Notes	Min	Nom	Max
Package Height	A	0.850		1.000		0.0335		0.0394
Ball Height	A ₁	0.150				0.0059		
Package Body Thickness	A ₂	0.600	0.700	0.800		0.0236	0.0276	0.0315
Ball (Lead) Width	b	0.300	0.350	0.400		0.0118	0.0138	0.0157
Package Body Width	D	7.810	7.910	8.010		0.3075	0.3114	0.3154
Package Body Length	E	6.400	6.500	6.600		0.2520	0.2559	0.2598
Pitch	[e]		0.750				0.0295	
Ball (Lead) Count	N		46				46	
Seating Plane Coplanarity	Y			0.100				0.0039
Corner to Ball A1 Distance Along D	S ₁	1.23	1.330	1.43		0.0484	0.0524	0.0563
Corner to Ball A1 Distance Along E	S ₂	1.275	1.375	1.48		0.0502	0.0541	0.0581



2.3 **µBGA* Package Silicon Daisy Chain Schematics for G28FSDCCR**

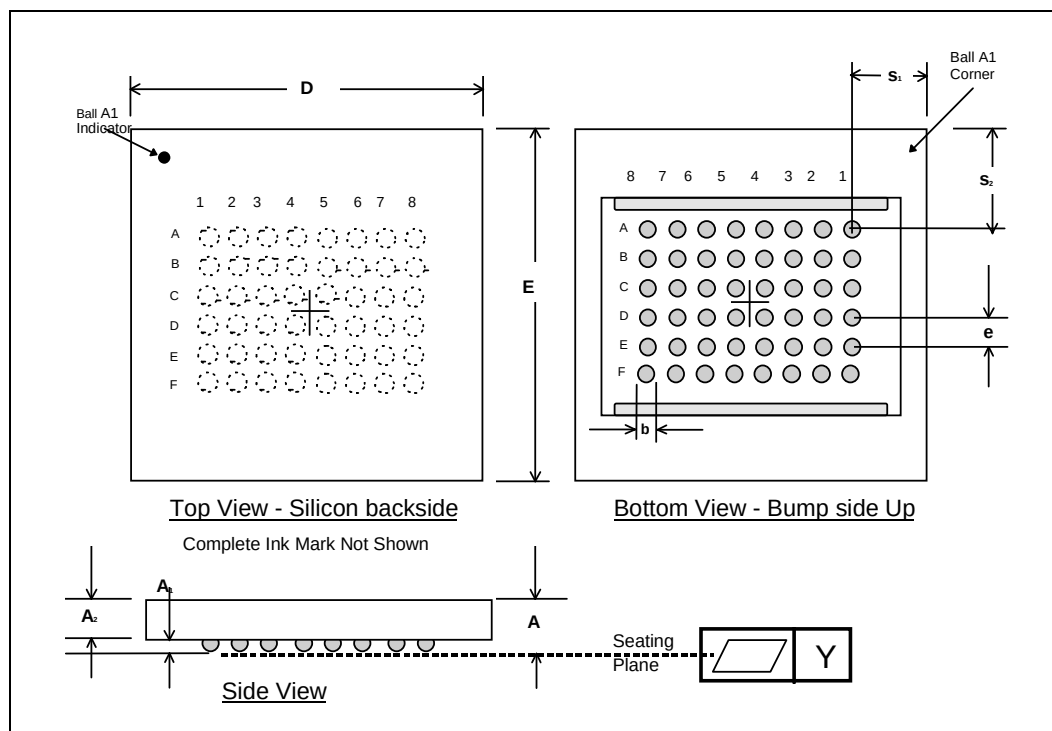


Bottom View—Ball Side Up

Package Connections:

Ball Number	Ball Number	Ball Number	Ball Number
A1– A2	B5 – B6	D1 – D2	E5 – E6
A3 – A4	B7 – B8	D3 – D4	E7 – E8
	C1 – C2	D5 – D6	F1 – F2
A7 – A8	C3 – C6	D7 – D8	F3 – F4
B1 – B2		E1 – E2	F5 – F6
B3 – B4	C7 – C8	E3 – E4	F7 – F8

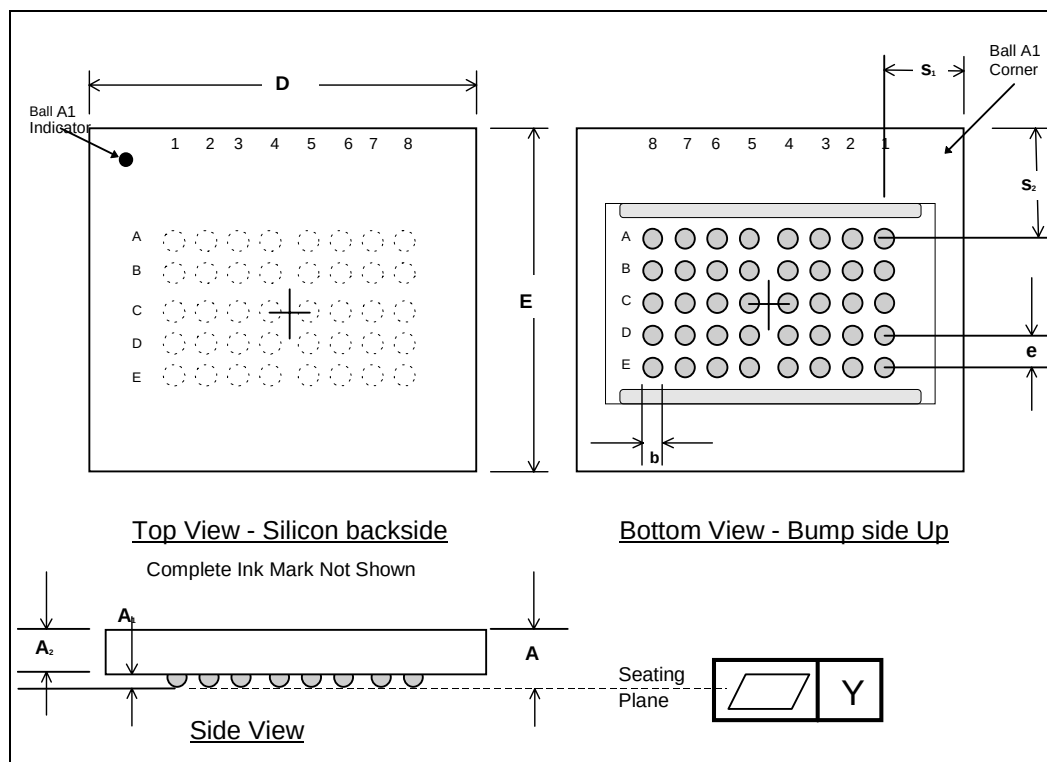
2.4 μ BGA* Package Drawing and Dimensions for Silicon Daisy Chain Devices for G28FSDCCR



	Sym	Millimeters				Inches		
		Min	Nom	Max	Notes	Min	Nom	Max
Package Height	A	0.850		1.000		0.0335		0.0394
Ball Height	A ₁	0.150				0.0059		
Package Body Thickness	A ₂	0.600	0.700	0.800		0.0236	0.0276	0.0315
Ball (Lead) Width	b	0.300	0.350	0.400		0.0118	0.0138	0.0157
Package Body Width	D	7.186	7.286	7.386		0.2829	0.2868	0.2908
Package Body Length	E	6.864	6.964	7.064		0.2702	0.2742	0.2781
Pitch	[e]		0.750				0.0295	
Ball (Lead) Count	N		46				46	
Seating Plane Coplanarity	Y			0.100				0.0039
Corner to Ball A1 Distance Along D	S ₁	0.98	1.018	1.118		0.0361	0.0400	0.0440
Corner to Ball A1 Distance Along E	S ₂	1.507	1.607	1.707		0.0593	0.0633	0.0672

3.0 FlashFile™ Memory Components

3.1 µBGA* Package Drawing and Dimensions



40-Ball µBGA* Package Specifications for 28F008S3/28F016S3

Remarks: 40-ball package consists of 8 x 5 solder ball matrix - 8 columns and 5 rows. Each row is identified by a letter and the column by a number. Each ball location, thus, is designated by row and column combination. Example, ball B4 indicates 2nd row and 4th column.

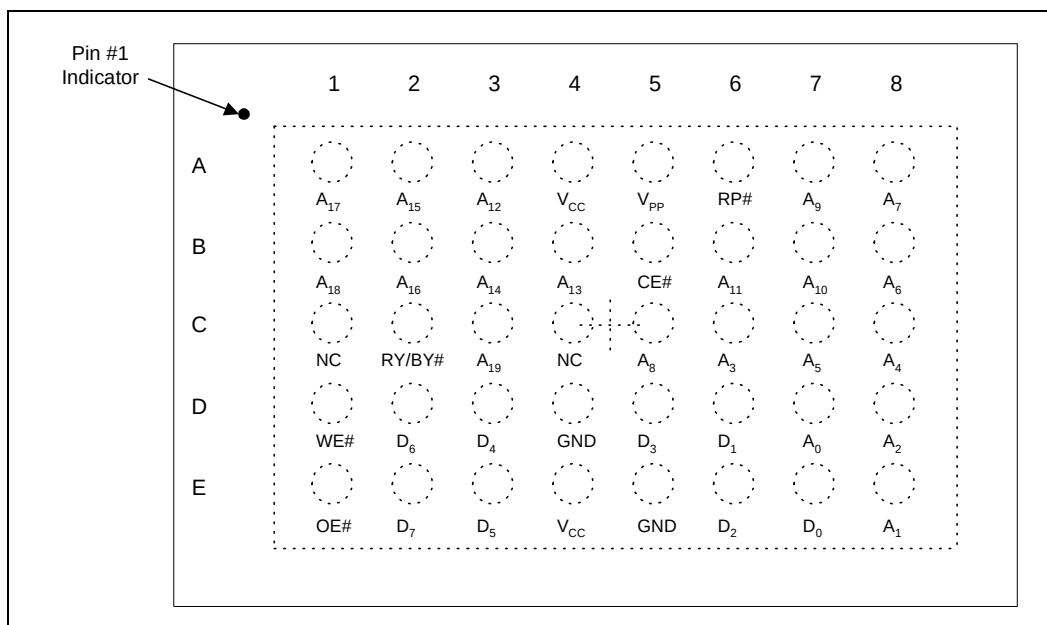
3.2 μ BGA* Package Dimensions for FlashFile™ Memory Architecture Devices

	Sym	Millimeters				Inches		
		Min	Nom	Max	Notes	Min	Nom	Max
Package Height	A	0.850		1.000		0.0335		0.0394
Ball Height	A ₁	0.150				0.0059		
Package Body Thickness	A ₂	0.600	0.700	0.800		0.0236	0.0276	0.0315
Ball (Lead) Width	b	0.300	0.350	0.400		0.0118	0.0138	0.0157
Package Body Width (8 Mb)	D	7.330	7.430	7.530		0.2886	0.2925	0.2965
Package Body Width (16 Mb)	D	7.528	7.628	7.728	1	0.2964	0.3003	0.3043
Package Body Length (8 Mb)	E	5.590	5.690	5.790		0.2201	0.2240	0.2280
Package Body Length (16 Mb)	E	9.128	9.228	9.328	1	0.3594	0.3633	0.3672
Pitch	[e]		0.750				0.0295	
Ball (Lead) Count	N		40				40	
Seating Plane Coplanarity	Y			0.100				0.0039
Corner to Ball A1 Distance Along D (8 Mb)	S ₁	0.99	1.090	1.19		0.0390	0.0429	0.0469
Corner to Ball A1 Distance Along D (16 Mb)	S ₁	1.089	1.189	1.29	1	0.0429	0.0468	0.0507
Corner to Ball A1 Distance Along E (8 Mb)	S ₂	1.245	1.345	1.45		0.0490	0.0530	0.0569
Corner to Ball A1 Distance Along E (16 Mb)	S ₂	3.014	3.114	3.21	1	0.1187	0.1226	0.1265

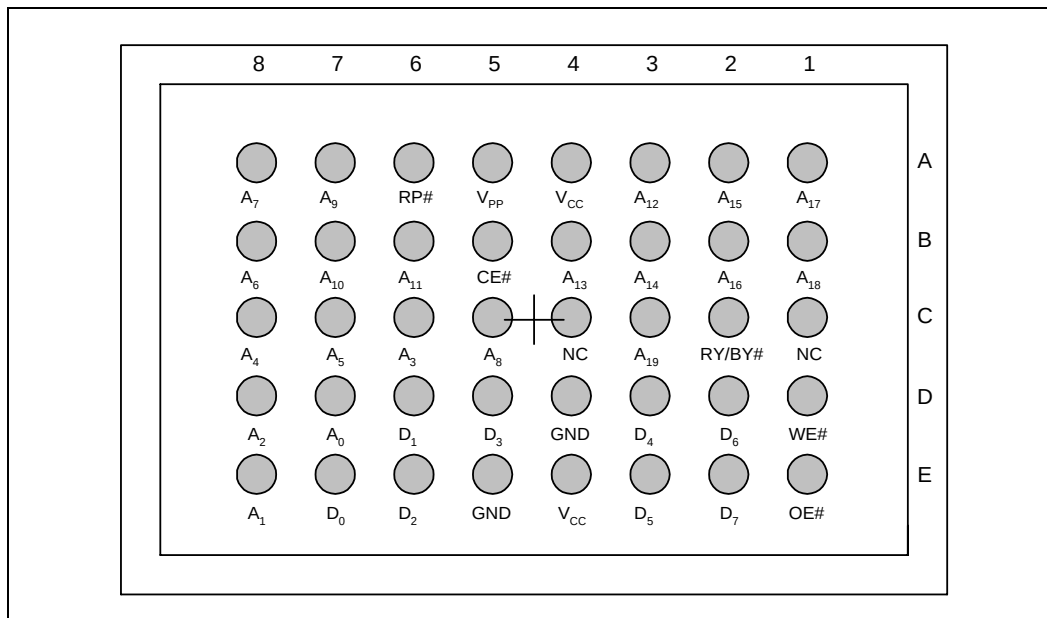
NOTE:

- Package dimensions are for reference only. These dimensions are estimates based on projected die size, and are subject to change.

3.3 μ BGA* Package Schematics for 28F008S3

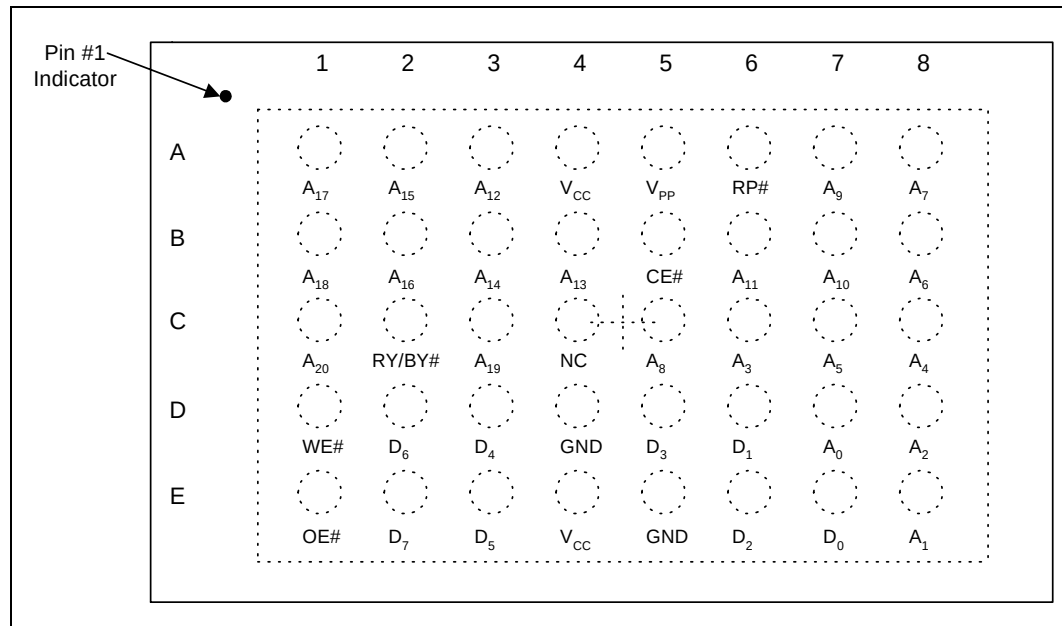


Top View - Ball Side Down: 40-Ball μ BGA* Package Pinout "Board" Layout

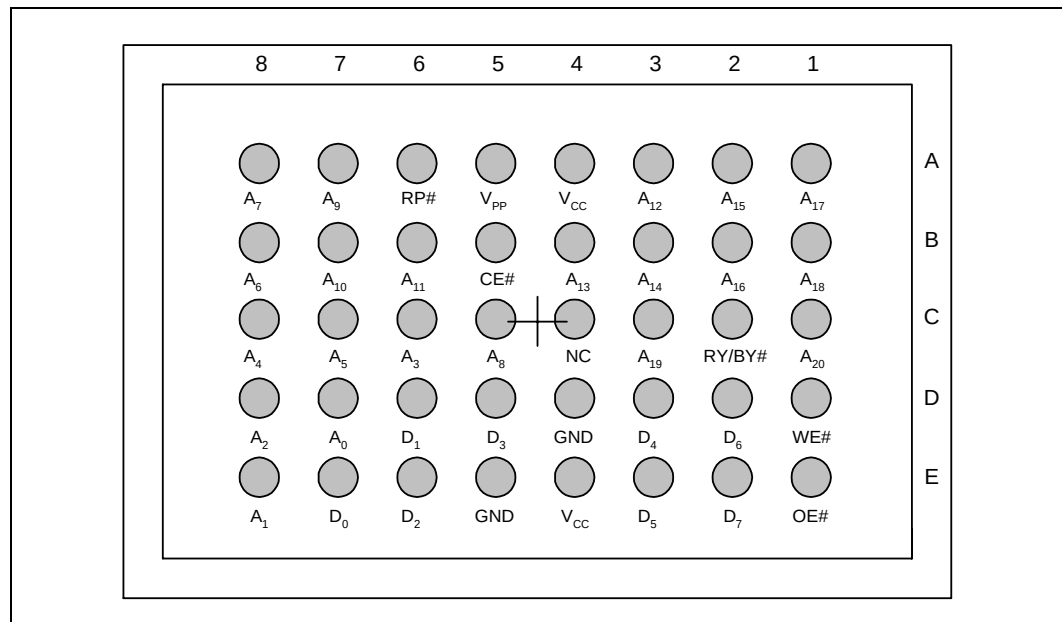


Bottom View - Ball Side Up: 40-Ball μ BGA* Package Pinout

3.4 μ BGA* Package Schematics for 28F016S3



Top View - Ball Side Down: 40-Ball μ BGA* Package Pinout "Board" Layout



Bottom View - Ball Side Up: 40-Ball μ BGA* Package Pinout

3.5 Table for Signal to Ball Assignment for 28F008S3 and 28F016S3

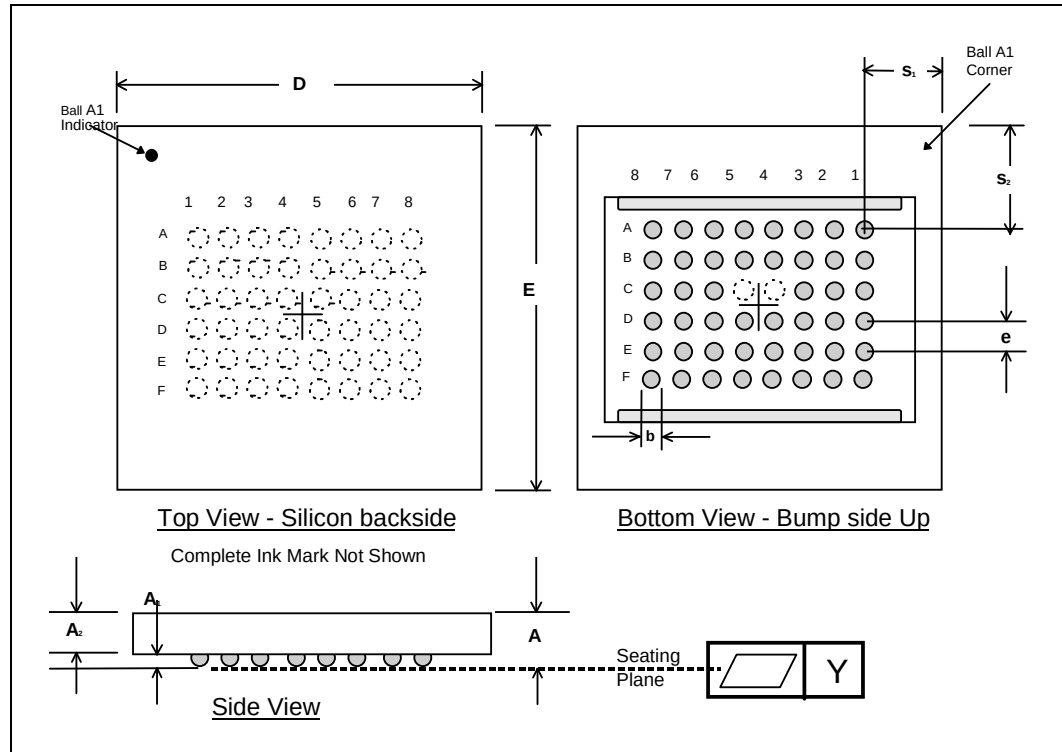
	28F008S3	28F016S3
Ball #		
A1	A ₁₇	A ₁₇
A2	A ₁₅	A ₁₅
A3	A ₁₂	A ₁₂
A4	V _{CC}	V _{CC}
A5	V _{PP}	V _{PP}
A6	RP#	RP#
A7	A ₉	A ₉
A8	A ₇	A ₇
B1	A ₁₈	A ₁₈
B2	A ₁₆	A ₁₆
B3	A ₁₄	A ₁₄
B4	A ₁₃	A ₁₃
B5	CE#	CE#
B6	A ₁₁	A ₁₁
B7	A ₁₀	A ₁₀
B8	A ₆	A ₆
C1	NC	A ₂₀
C2	RY/BY#	RY/BY#
C3	A ₁₉	A ₁₉
C4	NC	NC

	28F008S3	28F016S3
Ball #		
C5	A ₈	A ₈
C6	A ₃	A ₃
C7	A ₅	A ₅
C8	A ₄	A ₄
D1	WE#	WE#
D2	D ₆	D ₆
D3	D ₄	D ₄
D4	GND	GND
D5	D ₃	D ₃
D6	D ₁	D ₁
D7	A ₀	A ₀
D8	A ₂	A ₂
E1	OE#	OE#
E2	D ₇	D ₇
E3	D ₅	D ₅
E4	V _{CC}	V _{CC}
E5	GND	GND
E6	D ₂	D ₂
E7	D ₀	D ₀
E8	A ₁	A ₁

NOTE: Ball locations may be used for density upgrades.

4.0 Boot Block Flash Memory Components

4.1 μ BGA* Package Drawing and Dimensions



**μ BGA* Package Specifications for 28F800B3/28F160B3/28F008B3/28F016B3
28F016B3_A/28F160B3_A/28F320B3_A and 28F160C3_A/28F320C3_A**

Remarks: This package consists of 8 x 6 solder ball matrix - 8 columns and 6 rows. Each row is identified by a letter and the column by a number. Each ball location, thus, is designated by row and column combination. Example, ball B4 indicates 2nd row and 4th column. **Some ball locations may not be populated on some products. See the specific product signal list for complete details.** The underscore is a placeholder for the boot configuration (top[T], bottom[B]).

4.2 μ BGA* Package Dimensions for Boot Block Memory Components 28F800B3, 28F160B3, 28F008B3, 28F016B3 Devices Only

	Sym	Millimeters				Inches		
		Min	Nom	Max	Notes	Min	Nom	Max
Package Height	A	0.850		1.000		0.0335		0.0394
Ball Height	A ₁	0.150				0.0059		
Package Body Thickness	A ₂	0.600	0.700	0.800		0.0236	0.0276	0.0315
Ball (Lead) Width	b	0.300	0.350	0.400		0.0118	0.0138	0.0157
Package Body Width (8 Mb)	D	7.810	7.910	8.010		0.3075	0.3114	0.3154
Package Body Width (16 Mb)	D	7.480	7.580	7.680		0.2945	0.2984	0.3024
Package Body Length (8 Mb)	E	6.400	6.500	6.600		0.2520	0.2559	0.2598
Package Body Length (16 Mb)	E	9.710	9.810	9.910		0.3823	0.3862	0.3902
Pitch	[e]		0.750				0.0295	
Ball (Lead) Count	N		48		1		48	
Seating Plane Coplanarity	Y			0.100				0.0039
Corner to Ball A1 Distance Along D (8 Mb)	S ₁	1.23	1.330	1.43		0.0484	0.0524	0.0563
Corner to Ball A1 Distance Along D (16 Mb)	S ₁	1.065	1.165	1.27		0.0419	0.0459	0.0498
Corner to Ball A1 Distance Along E (8 Mb)	S ₂	1.275	1.375	1.48		0.0502	0.0541	0.0581
Corner to Ball A1 Distance Along E (16 Mb)	S ₂	2.93	3.030	3.13		0.1154	0.1193	0.1232

NOTE:

1. Some ball locations may not be populated on some products. See the specific product signal list for complete details.

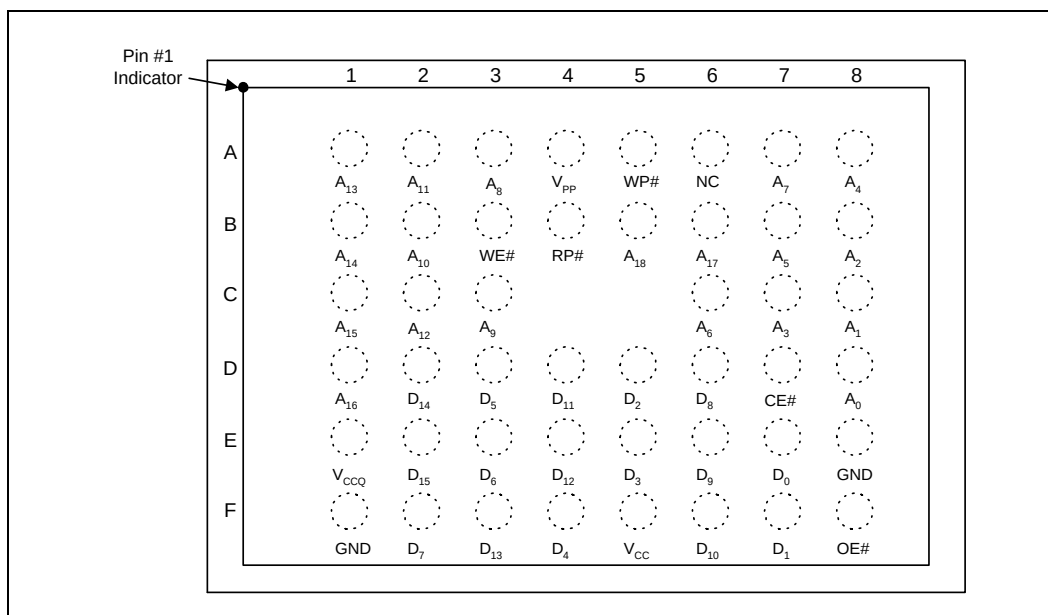
4.3 μ BGA* Package Dimensions for Boot Block Memory Components 28F016B3_A/28F160B3_A /28F320B3_A and 28F160C3_A /28F320C3_A Devices Only

	Sym	Millimeters				Inches		
		Min	Nom	Max	Notes	Min	Nom	Max
Package Height	A	0.850		1.000		0.0335		0.0394
Ball Height	A ₁	0.150				0.0059		
Package Body Thickness	A ₂	0.600	0.700	0.800		0.0236	0.0276	0.0315
Ball (Lead) Width	b	0.300	0.350	0.400		0.0118	0.0138	0.0157
Package Body Width (16 Mb)	D	7.186	7.286	7.386		0.2829	0.2868	0.2908
Package Body Width (32 Mb)	D	7.186	7.286	7.386		0.2829	0.2868	0.2908
Package Body Length (16 Mb)	E	6.864	6.964	7.064		0.2702	0.2742	0.2781
Package Body Length (32 Mb)	E	10.75	10.85	10.95		0.4232	0.4272	0.4311
Pitch	[e]		0.750				0.0295	
Ball (Lead) Count	N		48		1		48	
Seating Plane Coplanarity	Y			0.100				0.0039
Corner to Ball A1 Distance Along D (16 Mb)	S ₁	0.918	1.018	1.118		0.0361	0.0400	0.0440
Corner to Ball A1 Distance Along D (32 Mb)	S ₁	0.918	1.018	1.118		0.0361	0.0400	0.0440
Corner to Ball A1 Distance Along E (16 Mb)	S ₂	1.507	1.607	1.707		0.0593	0.0633	0.0672
Corner to Ball A1 Distance Along E (32 Mb)	S ₂	3.45	3.55	3.65		0.1358	0.1398	0.1437

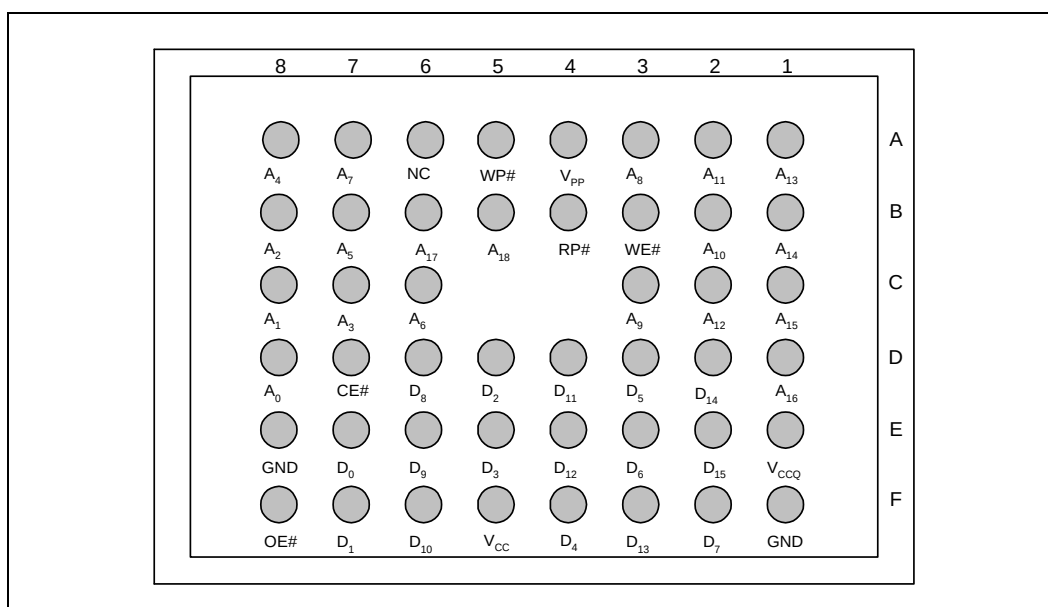
NOTE:

1. Some ball locations may not be populated on some products. See the specific product signal list for complete details.

4.4 μ BGA* Package Schematics for 28F800B3 (x16)



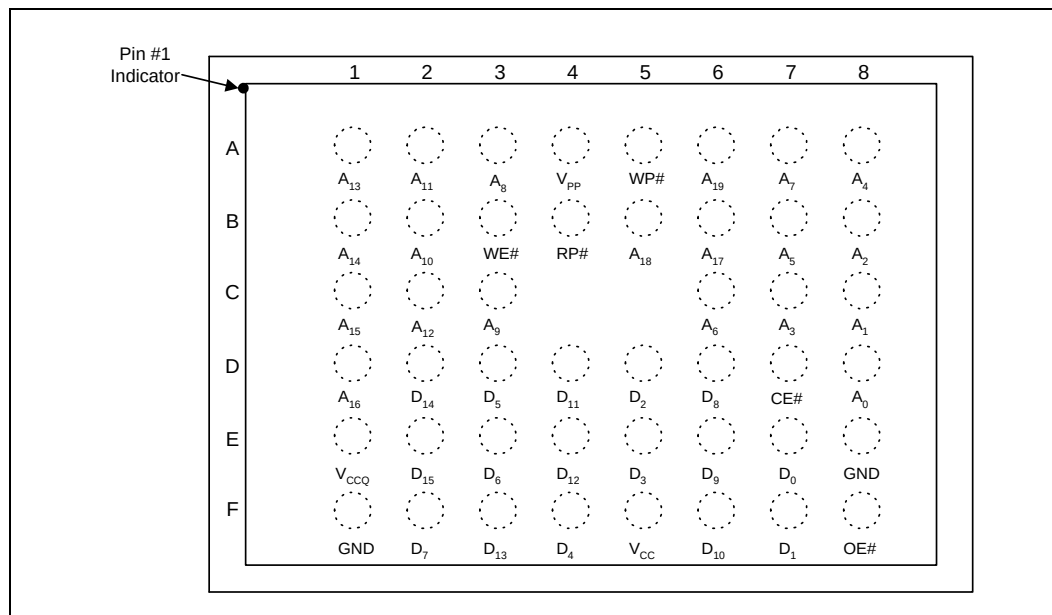
Top View - Ball Side Down: 46- μ BGA* Package Pinout "Board" Layout



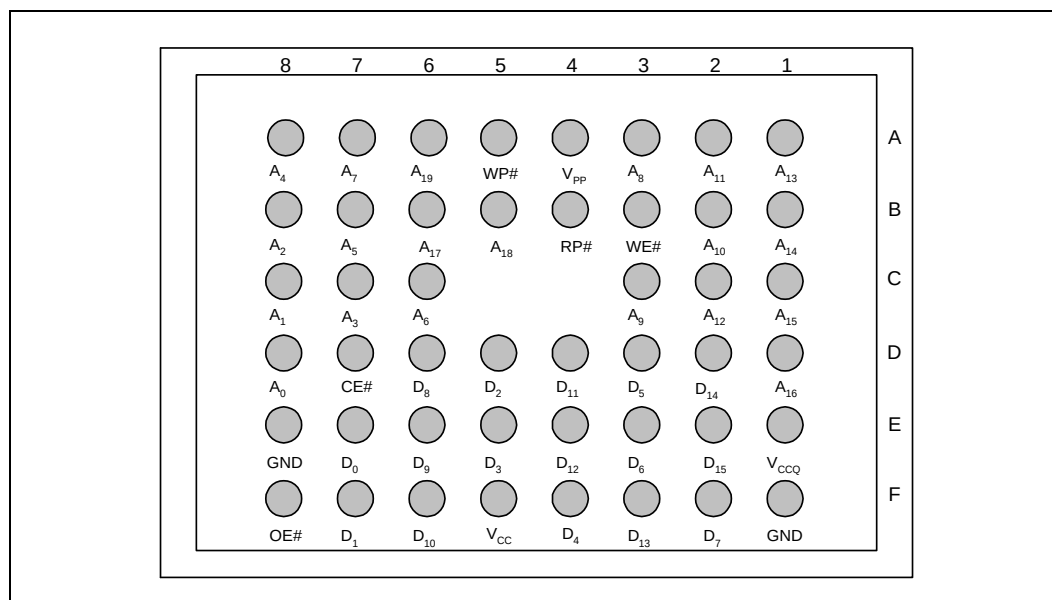
Bottom View - Ball Side Up: 46-Ball μ BGA* Package Pinout

NOTE: Some ball locations may not be populated on some products.

4.5 μ BGA* Package Schematics for 28F160B3/28F160B3_A/ 28F160C3_A(x16)



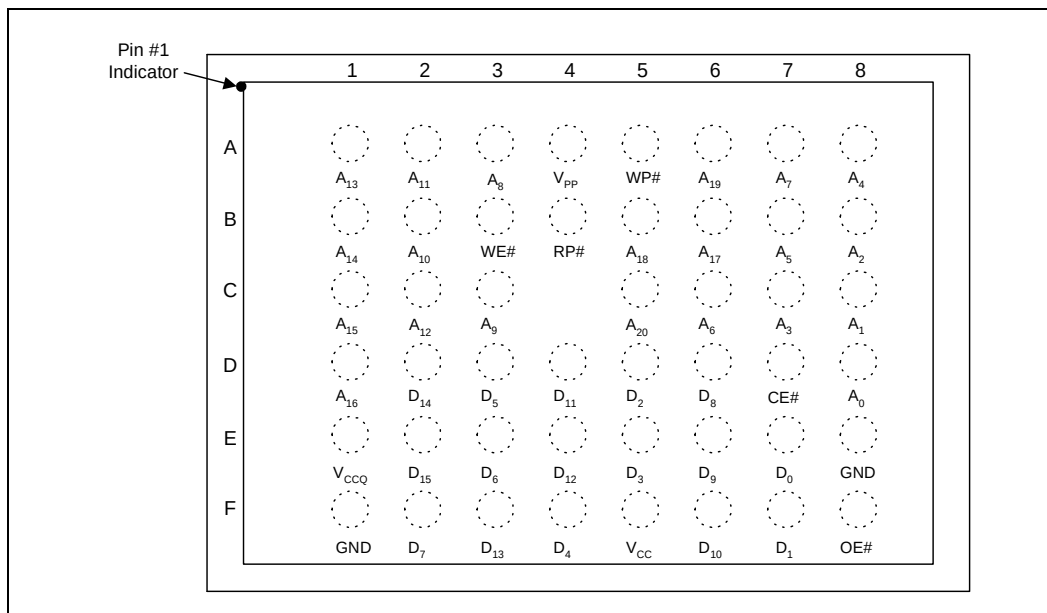
Top View - Ball Side Down: 46-Ball μ BGA* Package Pinout "Board" Layout



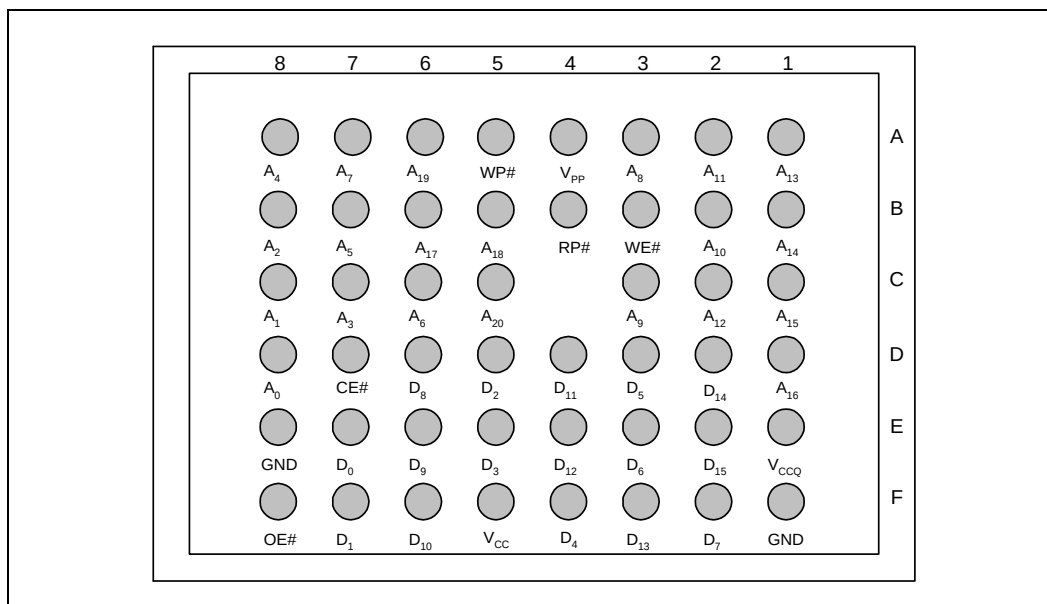
Bottom View - Ball Side Up: 46-Ball μ BGA* Package Pinout

NOTE: Some ball locations may not be populated on some products.

4.6 μ BGA* Package Schematics: 28F320B3_A/28F320C3_A (x16)



Top View - Ball Side Down: 47-Ball μ BGA* Package Pinout "Board" Layout



Bottom View - Ball Side Up: 47-Ball μ BGA* Package Pinout

NOTE: Some ball locations may not be populated on some products.

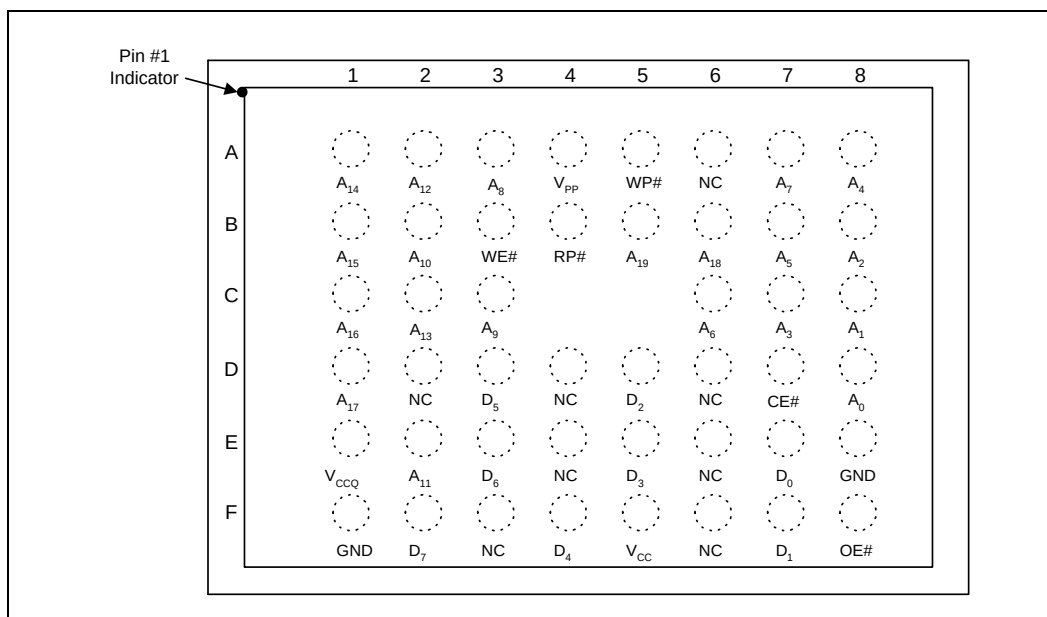
4.7 Table for Signal to Ball Assignment for 28Fxx0B3/ 8Fxx0B3_A/28Fxx0C3_A (x16)

	28F800B3	28F160B3 28F160C3_A	28F320B3_A 28F320C3_A		28F800B3	28F160B3 28F160B3_A 28F160C3_A	28F320B3_A 28F320C3_A
Ball #				Ball #			
A1	A ₁₃	A ₁₃	A ₁₃	D1	A ₁₆	A ₁₆	A ₁₆
A2	A ₁₁	A ₁₁	A ₁₁	D2	D ₁₄	D ₁₄	D ₁₄
A3	A ₈	A ₈	A ₈	D3	D ₅	D ₅	D ₅
A4	V _{PP}	V _{PP}	V _{PP}	D4	D ₁₁	D ₁₁	D ₁₁
A5	WP#	WP#	WP#	D5	D ₂	D ₂	D ₂
A6	N/C*	A ₁₉	A ₁₉	D6	D ₈	D ₈	D ₈
A7	A ₇	A ₇	A ₇	D7	CE#	CE#	CE#
A8	A ₄	A ₄	A ₄	D8	A ₀	A ₀	A ₀
B1	A ₁₄	A ₁₄	A ₁₄	E1	V _{CCQ}	V _{CCQ}	V _{CCQ}
B2	A ₁₀	A ₁₀	A ₁₀	E2	D ₁₅	D ₁₅	D ₁₅
B3	WE#	WE#	WE#	E3	D ₆	D ₆	D ₆
B4	RP#	RP#	RP#	E4	D ₁₂	D ₁₂	D ₁₂
B5	A ₁₈	A ₁₈	A ₁₈	E5	D ₃	D ₃	D ₃
B6	A ₁₇	A ₁₇	A ₁₇	E6	D ₉	D ₉	D ₉
B7	A ₅	A ₅	A ₅	E7	D ₀	D ₀	D ₀
B8	A ₂	A ₂	A ₂	E8	GND	GND	GND
C1	A ₁₅	A ₁₅	A ₁₅	F1	GND	GND	GND
C2	A ₁₂	A ₁₂	A ₁₂	F2	D ₇	D ₇	D ₇
C3	A ₉	A ₉	A ₉	F3	D ₁₃	D ₁₃	D ₁₃
C4	No Ball ⁽¹⁾	No Ball ⁽¹⁾	No Ball ⁽¹⁾	F4	D ₄	D ₄	D ₄
C5	No Ball ⁽¹⁾	No Ball ⁽¹⁾	A ₂₀	F5	V _{CC}	V _{CC}	V _{CC}
C6	A ₆	A ₆	A ₆	F6	D ₁₀	D ₁₀	D ₁₀
C7	A ₃	A ₃	A ₃	F7	D ₁	D ₁	D ₁
C8	A ₁	A ₁	A ₁	F8	OE#	OE#	OE#

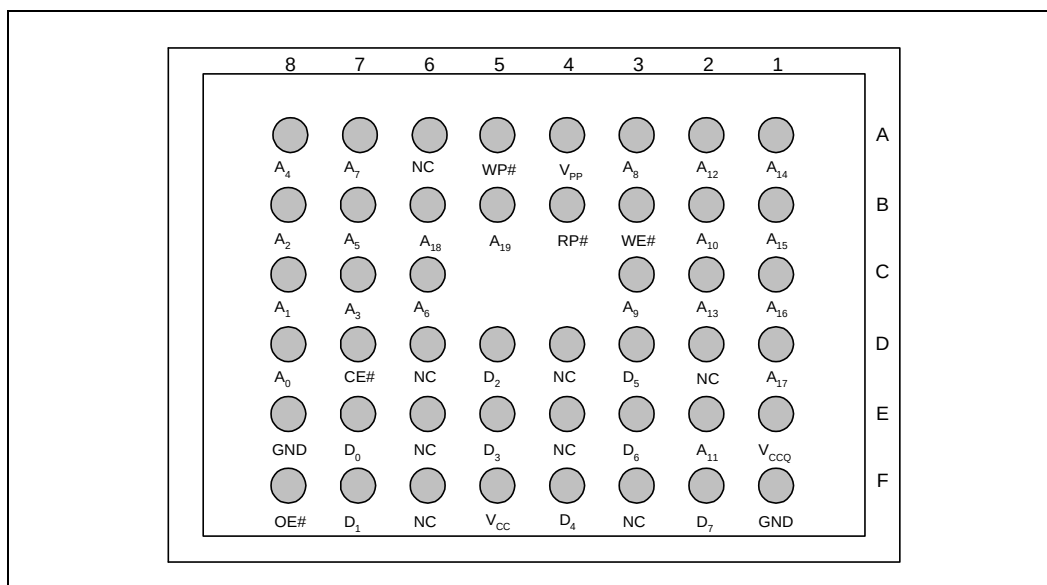
NOTE:

1. Ball locations may be used for density upgrades.

4.8 μ BGA* Package Schematics for 28F008B3/28F008B3_A (x8)



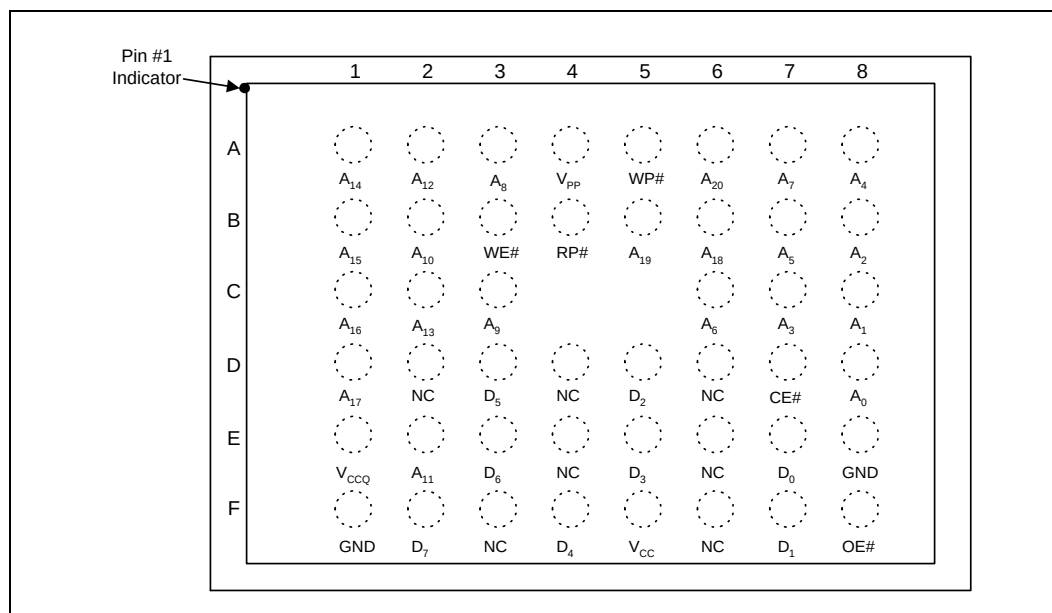
Top View - Ball Side Down: 46-Ball μ BGA* Package Pinout "Board" Layout



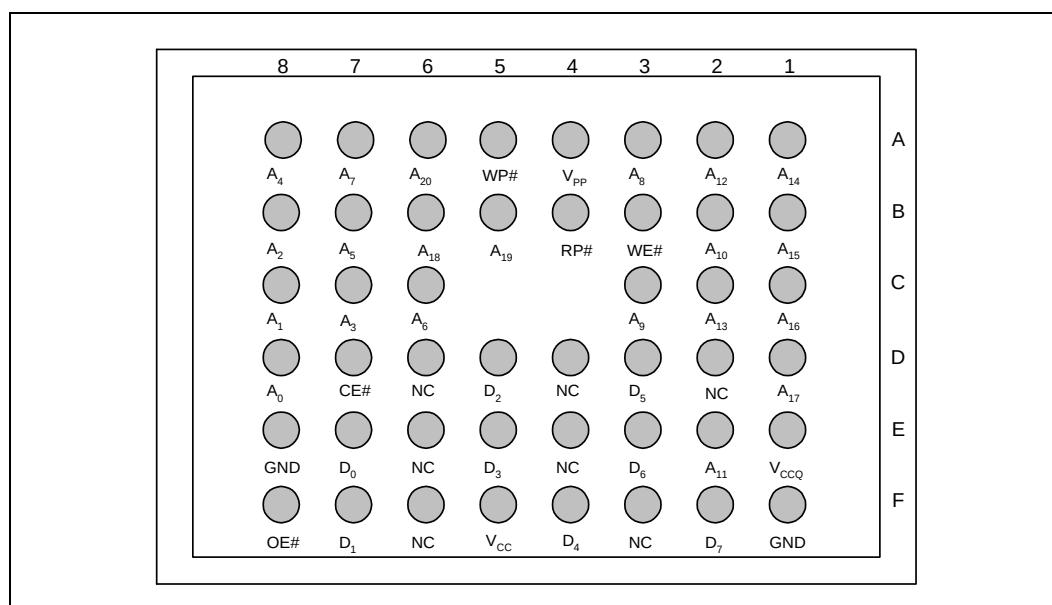
Bottom View - Ball Side Up: 46-Ball μ BGA* Package Pinout

NOTE: Some ball locations may not be populated on some products.

4.9 μ BGA* Package Schematics for 28F016B3/28F016B3_A (x8)



Top View - Ball Side Down: 46-Ball μ BGA* Package Pinout "Board" Layout



Bottom View - Ball Side Up: 46-Ball μ BGA* Package Pinout

NOTE: Some ball locations may not be populated on some products.

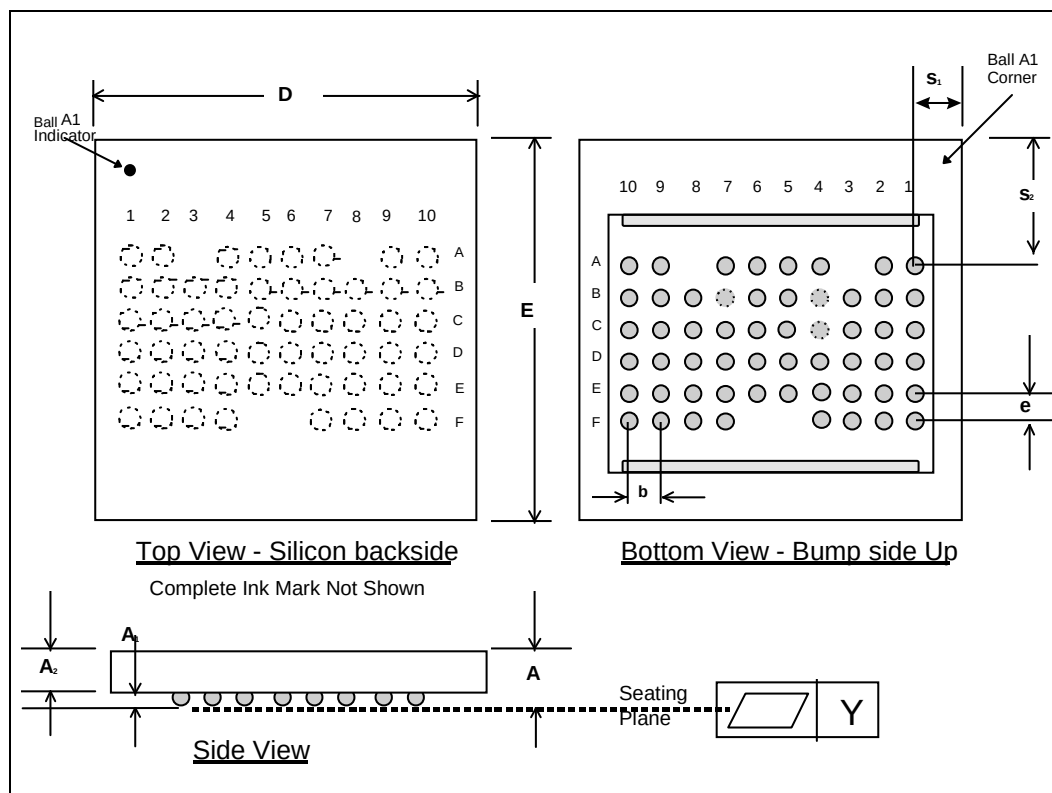
4.10 Table for Signal to Ball Assignment for 28F0xxB3/ 28F0xxB3_A (x8)

	28F008B3	28F016B3 28F016B3_A		28F008B3	28F016B3 28F016B3_A
Ball #			Ball#		
A1	A ₁₄	A ₁₄	D1	A ₁₇	A ₁₇
A2	A ₁₂	A ₁₂	D2	NC	NC
A3	A ₈	A ₈	D3	D ₅	D ₅
A4	V _{PP}	V _{PP}	D4	NC	NC
A5	WP#	WP#	D5	D ₂	D ₂
A6	N/C*	A ₂₀	D6	NC	NC
A7	A ₇	A ₇	D7	CE#	CE#
A8	A ₄	A ₄	D8	A ₀	A ₀
B1	A ₁₅	A ₁₅	E1	V _{CCQ}	V _{CCQ}
B2	A ₁₀	A ₁₀	E2	A ₁₁	A ₁₁
B3	WE#	WE#	E3	D ₆	D ₆
B4	RP#	RP#	E4	NC	NC
B5	A ₁₉	A ₁₉	E5	D ₃	D ₃
B6	A ₁₈	A ₁₈	E6	NC	NC
B7	A ₅	A ₅	E7	D ₀	D ₀
B8	A ₂	A ₂	E8	GND	GND
C1	A ₁₆	A ₁₆	F1	GND	GND
C2	A ₁₃	A ₁₃	F2	D ₇	D ₇
C3	A ₉	A ₉	F3	NC	NC
C4	No Ball ⁽¹⁾	No Ball ⁽¹⁾	F4	D ₄	D ₄
C5	No Ball ⁽¹⁾	No Ball ⁽¹⁾	F5	V _{CC}	V _{CC}
C6	A ₆	A ₆	F6	NC	NC
C7	A ₃	A ₃	F7	D ₁	D ₁
C8	A ₁	A ₁	F8	OE#	OE#

NOTE: 1. Ball locations may be used for density upgrades.

5.0 Fast Boot Block Memory Components

5.1 μ BGA* Package Drawing and Dimensions



Remarks: This package consists of partially depopulated solder ball matrix to allow for easy PCB escape routing. Each row is identified by a letter and the column by a number. Each ball location, thus, is designated by row and column combination. Example, ball B4 indicates 2nd row and 4th column. **Some ball locations may not be populated on some products. See the specific product signal list for complete details.**

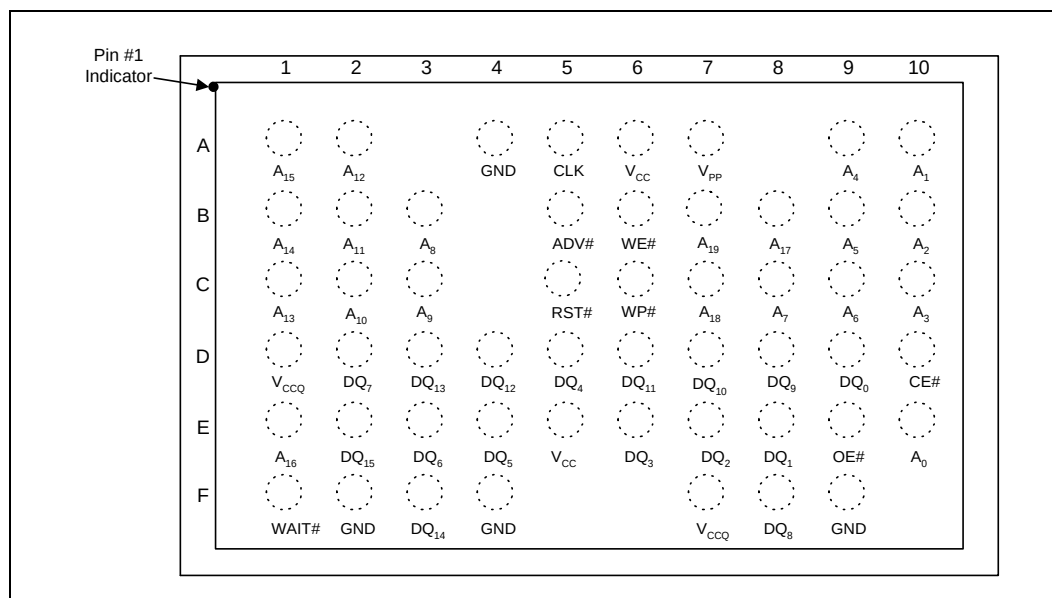
5.2 μ BGA* Package Dimensions for Fast Boot Block Memory Component Devices

		Millimeters				Inches		
		Min	Nom	Max	Notes	Min	Nom	Max
	Sym							
Package Height	A	0.850		1.000		0.0335		0.0394
Ball Height	A ₁	0.150				0.0059		
Package Body Thickness	A ₂	0.600	0.700	0.800		0.0236	0.0276	0.0315
Ball (Lead) Width	b	0.300	0.350	0.400		0.0118	0.0138	0.0157
Package Body Width (16 Mb)	D	7.9	8.0	8.1	1	0.311	0.315	0.3189
Package Body Length (16 Mb)	E	10.14	10.24	10.34	1	0.399	0.4031	0.4071
Pitch	[e]		0.750				0.0295	
Ball (Lead) Count	N		56		2		56	
Seating Plane Coplanarity	Y			0.100				0.0039
Corner First Ball Distance Along D (8 Mb)	S ₁	1.258	1.358	1.458	1	0.0495	0.0535	0.0574
Corner First Ball Distance Along D (16 Mb)	S ₁	0.525	0.625	0.725		0.021	0.0246	0.0285
Corner First Ball Distance Along E (8 Mb)	S ₂	0.612	0.712	0.812	1	0.0241	0.0280	0.0320
Corner First Ball Distance Along E (16 Mb)	S ₂	3.145	3.245	3.345		0.1238	0.1277	0.1317

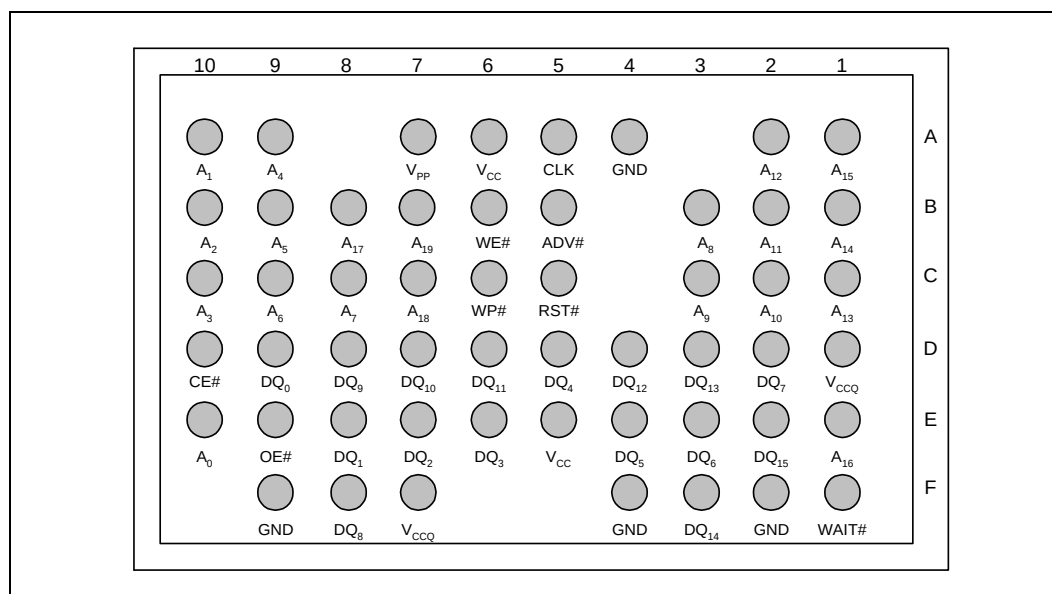
NOTES:

1. The tolerances above indicate projected production accuracy. This product is in the design phase. The minimal, nominal, and maximum package body width and length are subject to change dependent on final die size.
2. Some ball locations may not be populated on some products. See the specific product signal list for complete details.

5.3 μ BGA* Package Schematics for 28F160F3



Top View - Ball Side Down: 53-Ball μ BGA* Package Pinout "Board" Layout



Bottom View - Ball Side Up: 53-Ball μ BGA* Package Pinout "Board" Layout

NOTE: Some ball locations may not be populated on some products.

5.4 Table for Signal to Ball Assignment for 28F800F3/28F160F3

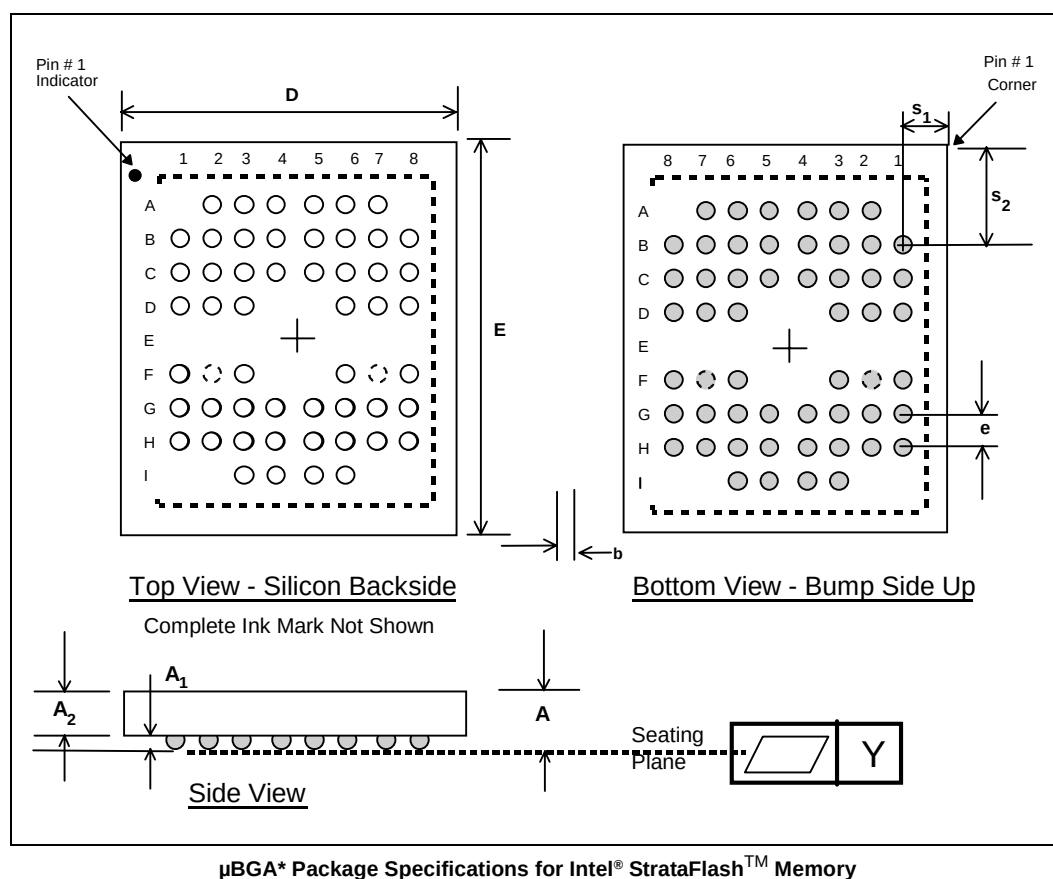
	28F800F3	28F160F3			28F800F3	28F160F3
Ball #				Ball#		
A1	A ₁₅	A ₁₅		D1	V _{CCQ}	V _{CCQ}
A2	A ₁₂	A ₁₂		D2	DQ ₇	DQ ₇
A3	No Ball ⁽¹⁾	No Ball ⁽¹⁾		D3	DQ ₁₃	DQ ₁₃
A4	GND	GND		D4	DQ ₁₂	DQ ₁₂
A5	CLK	CLK		D5	DQ ₄	DQ ₄
A6	V _{CC}	V _{CC}		D6	DQ ₁₁	DQ ₁₁
A7	V _{PP}	V _{PP}		D7	DQ ₁₀	DQ ₁₀
A8	No Ball ⁽¹⁾	No Ball ⁽¹⁾		D8	DQ ₉	DQ ₉
A9	A ₄	A ₄		D9	DQ ₀	DQ ₀
A10	A ₁	A ₁		D10	CE#	CE#
B1	A ₁₄	A ₁₄		E1	A ₁₆	A ₁₆
B2	A ₁₁	A ₁₁		E2	DQ ₁₅	DQ ₁₅
B3	A ₈	A ₈		E3	DQ ₆	DQ ₆
B4	No Ball ⁽¹⁾	No Ball ⁽¹⁾		E4	DQ ₅	DQ ₅
B5	ADV#	ADV#		E5	V _{CC}	V _{CC}
B6	WE#	WE#		E6	DQ ₃	DQ ₃
B7	No Ball ⁽¹⁾	A ₁₉		E7	DQ ₂	DQ ₂
B8	A ₁₇	A ₁₇		E8	DQ ₁	DQ ₁
B9	A ₅	A ₅		E9	OE#	OE#
B10	A ₂	A ₂		E10	A ₀	A ₀
C1	A ₁₃	A ₁₃		F1	WAIT#	WAIT#
C2	A ₁₀	A ₁₀		F2	GND	GND
C3	A ₉	A ₉		F3	DQ ₁₄	DQ ₁₄
C4	A ₂₁	A ₂₁		F4	GND	GND
C5	RST#	RST#		F5	No Ball ⁽¹⁾	No Ball ⁽¹⁾
C6	WP#	WP#		F6	No Ball ⁽¹⁾	No Ball ⁽¹⁾
C7	A ₁₈	A ₁₈		F7	V _{CCQ}	V _{CCQ}
C8	A ₇	A ₇		F8	DQ ₈	DQ ₈
C9	A ₆	A ₆		F9	GND	GND
C10	A ₃	A ₃		F10	No Ball ⁽¹⁾	No Ball ⁽¹⁾

NOTE:

1. Ball locations may be used for density upgrades.

6.0 Intel® StrataFlash™ Memory

6.1 µBGA* Package Drawing and Dimensions for Intel® StrataFlash™ Memory



Remarks: This package consists of partially depopulated solder ball matrix to allow for easy PCB escape routing. Each row is identified by a letter and the column by a number. Each ball location, thus, is designated by row and column combination. Example, ball B4 indicates 2nd row and 4th column. **Some ball locations may not be populated on some products. See the specific product signal list for complete details.**

6.2 μ BGA* Package Dimensions for 28F640J5 Intel® StrataFlash™ Memory

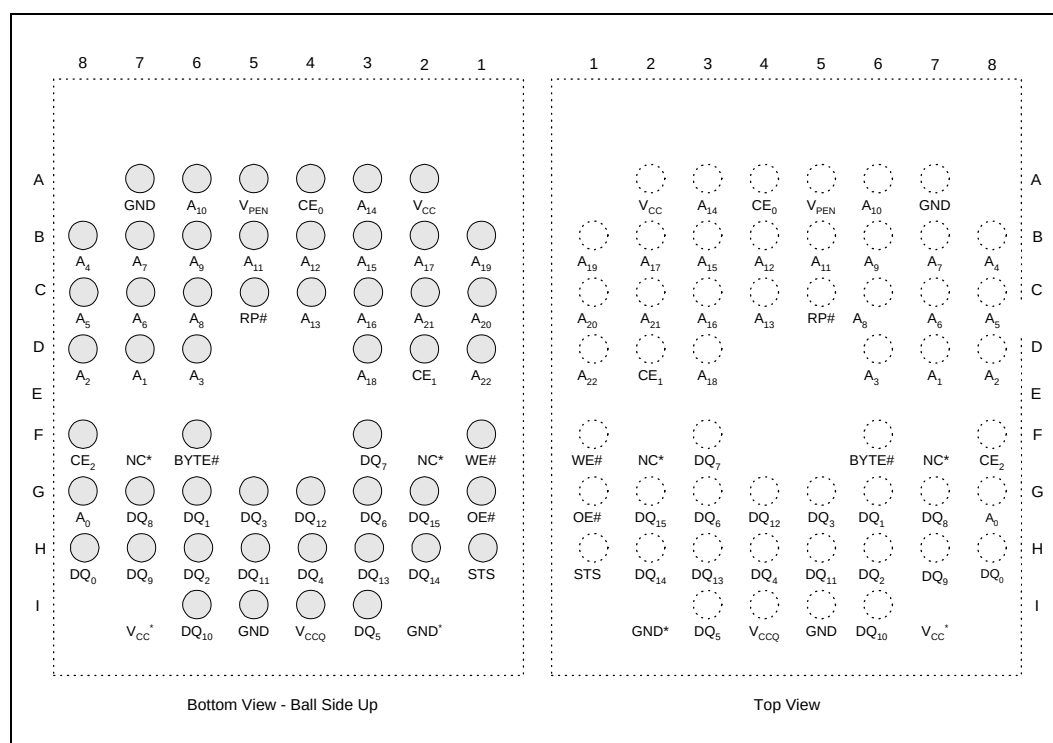
	Sym	Millimeters				Inches		
		Min	Nom	Max	Notes	Min	Nom	Max
Package Height	A	0.850		1.000		0.0335		0.0394
Ball Height	A ₁	0.150				0.0059		
Package Body Thickness	A ₂	0.600	0.700	0.800		0.0236	0.0276	0.0315
Ball (Lead) Width	b	0.300	0.350	0.400		0.0118	0.0138	0.0157
Package Body Width (64 Mb)	D	7.570	7.670	7.770		0.2980	0.3020	0.3059
Package Body Length (64 Mb)	E	16.270	16.370	16.470		0.6406	0.6445	0.6484
Pitch	[e]		0.750				0.0295	
Ball (Lead) Count	N		56		1		56	
Seating Plane Coplanarity	Y			0.100				0.0039
Corner First Ball Distance Along D (64 Mb)	S ₁	1.114	1.214	1.314		0.0439	0.0478	0.0517
Corner First Ball Distance Along E (64 Mb)	S ₂	5.835	5.935	6.035		0.2297	0.2337	0.2376

NOTE:

1. Some ball locations may not be populated on some products. See the specific product signal list for complete details.

6.3 μBGA* Package Schematics for 28F640J5 Intel® StrataFlash™ Memory

Electrical Pinout



64-Mbit Intel® StrataFlash™ Memory: 7.67 mm x 16.37 mm

NOTE: * V_{CC} (Ball I7), GND (Ball I2), and NC (Balls F2 and F7) have been removed. Future generations of Intel StrataFlash memory may make use of these missing ball locations.

Figures are not drawn to scale.

6.4 Table for Signal to Ball Assignment for 28F640J5 Intel® StrataFlash™ Memory

Ball #	28F640J5
A1	No Ball ⁽¹⁾
A2	V _{CC}
A3	A ₁₄
A4	CE ₀
A5	V _{PEN}
A6	A ₁₀
A7	GND
A8	No Ball ⁽¹⁾
B1	A ₁₉
B2	A ₁₇
B3	A ₁₅
B4	A ₁₂
B5	A ₁₁
B6	A ₉
B7	A ₇
B8	A ₄
C1	A ₂₀
C2	A ₂₁
C3	A ₁₆
C4	A ₁₃
C5	RP#
C6	A ₈
C7	A ₆
C8	A ₅
D1	A ₂₂
D2	CE ₁
D3	A ₁₈
D4	No Ball ⁽¹⁾
D5	No Ball ⁽¹⁾
D6	A ₃
D7	A ₁
H7	DQ ₉
H8	DQ ₀
I1	No Ball ⁽¹⁾
I2	No Ball
I3	DQ ₅

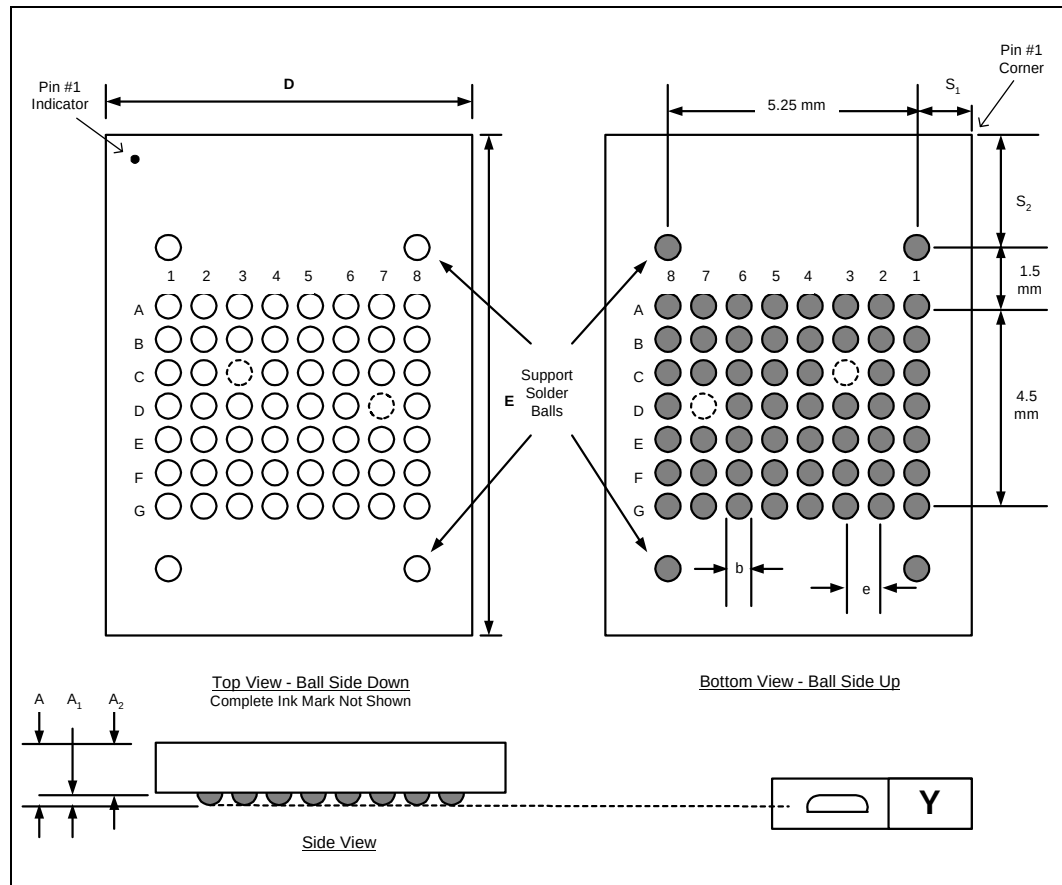
Ball #	28F640J5
D8	A ₂
E1	No Ball ⁽¹⁾
E2	No Ball ⁽¹⁾
E3	No Ball ⁽¹⁾
E4	No Ball ⁽¹⁾
E5	No Ball ⁽¹⁾
E6	No Ball ⁽¹⁾
E7	No Ball ⁽¹⁾
E8	No Ball ⁽¹⁾
F1	WE#
F2	No Ball ⁽¹⁾
F3	DQ ₇
F4	No Ball ⁽¹⁾
F5	No Ball ⁽¹⁾
F6	BYTE#
F7	No Ball ⁽¹⁾
F8	CE ₂
G1	OE#
G2	DQ ₁₅
G3	DQ ₆
G4	DQ ₁₂
G5	DQ ₃
G6	DQ ₁
G7	DQ ₈
G8	A ₀
H1	STS
H2	DQ ₁₄
H3	DQ ₁₃
H4	DQ ₄
H5	DQ ₁₁
H6	DQ ₂
I4	V _{CCQ}
I5	GND
I6	DQ ₁₀
I7	No Ball
I8	No Ball ⁽¹⁾

NOTE:

1. Ball locations may be used for density upgrades.

7.0 Intel® I.8 Volt Dual-Plane Flash Memory

7.1 µBGA* Package Drawing and Dimensions for Intel® 1.8 Volt Dual-Plane Flash Memory



Remarks: This package consists of partially depopulated solder ball matrix to allow for easy PCB escape routing. Each row is identified by a letter and the column by a number. Each ball location, thus, is designated by row and column combination. Example, ball B4 indicates 2nd row and 4th column. **Some ball locations may not be populated on some products. See the specific product signal list for complete details.**

7.2 (0.75 mm/60 ball) μ BGA* Package Dimensions for Intel® 1.8 Volt Dual-Plane Flash Memory

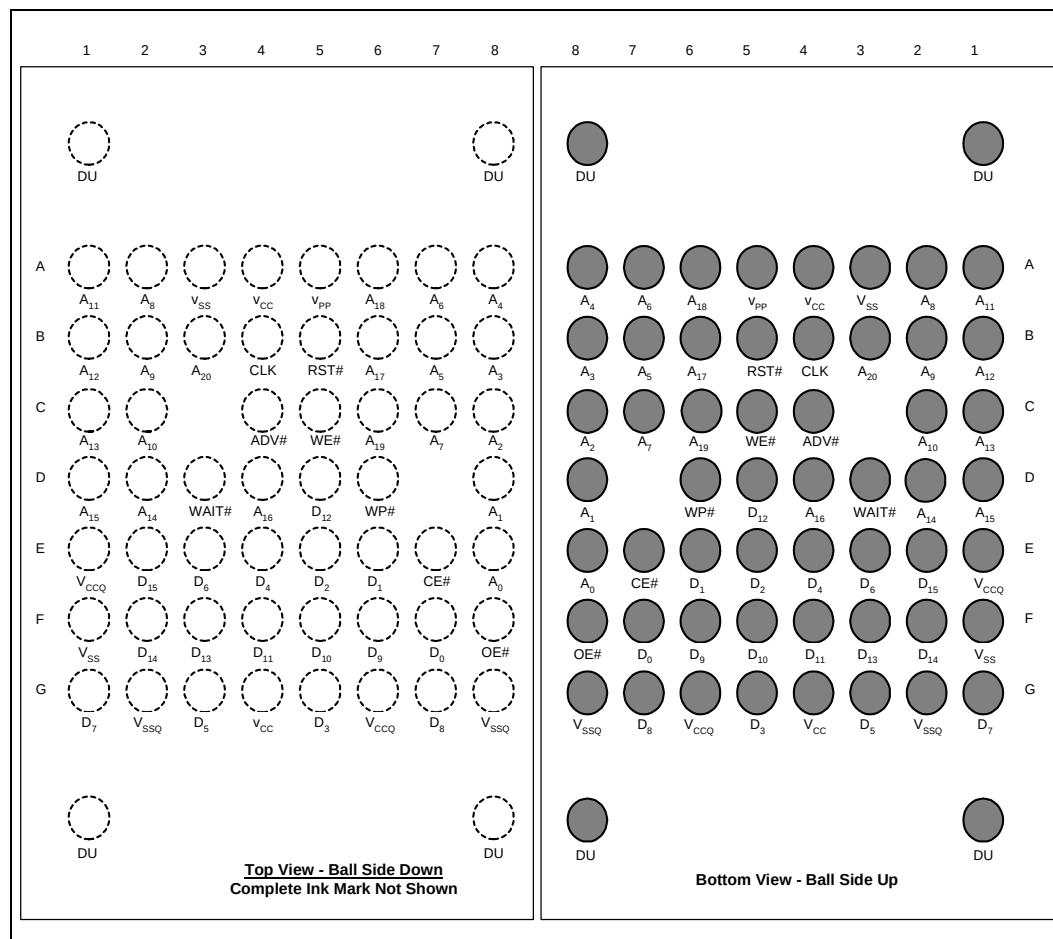
		Millimeters				Inches		
		Min	Nom	Max	Notes	Min	Nom	Max
	Sym							
Package Height	A	0.850		1.000		0.0335		0.0394
Ball Height	A ₁	0.150				0.0059		
Package Body Thickness	A ₂	0.600	0.700	0.800		0.0236	0.0276	0.0315
Ball (Lead) Width	b	0.300	0.350	0.400		0.0118	0.0138	0.0157
Package Body Width (32 Mb)	D	7.420	7.520	7.620		0.2921	0.2961	0.3000
Package Body Length (32 Mb)	E	13.320	13.420	13.520		0.5244	0.5283	0.5323
Pitch	[e]		0.750				0.0295	
Ball (Lead) Count	N		60		1		60	
Seating Plane Coplanarity	Y			0.100				0.0039
Corner First Ball Distance Along D (32 Mb)	S ₁	1.035	1.135	1.235		0.0407	0.0447	0.0486
Corner First Ball Distance Along E (32 Mb)	S ₂	2.860	2.960	3.060		0.1126	0.1165	0.1205

NOTE:

1. Some ball locations may not be populated on some products. See the specific product signal list for complete details.

7.3 μ BGA* Package Schematics for Intel® 1.8 Volt Dual-Plane Flash Memory

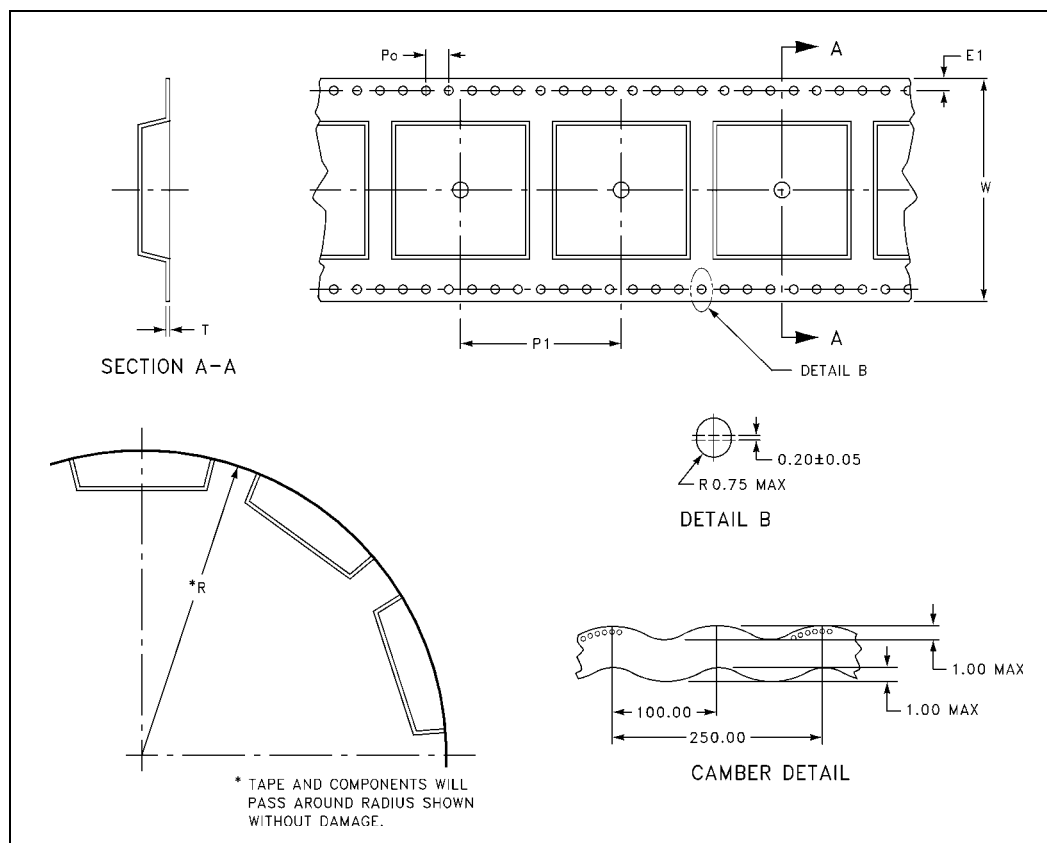
Electrical Pinout



Figures are not drawn to scale

8.0 μ BGA* Package Media Information

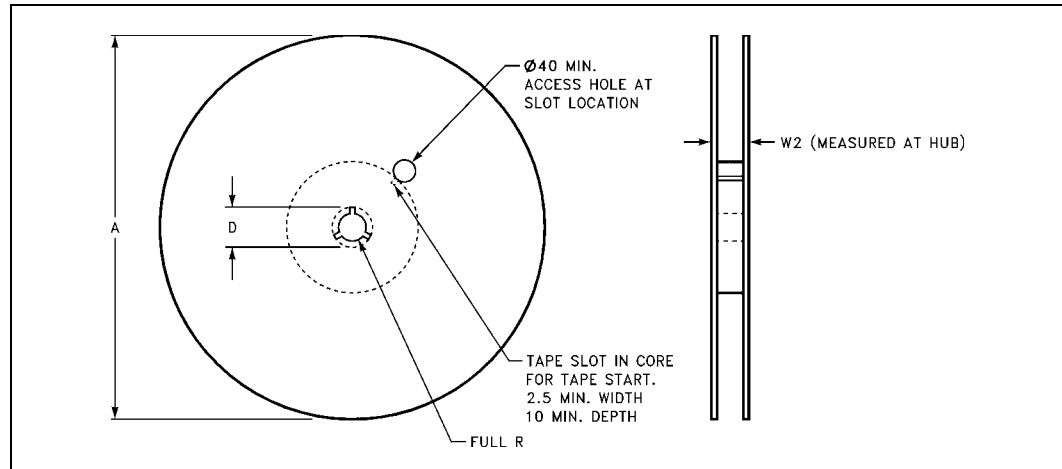
8.1 Carrier Tape Diagram and Dimensions



Pkg. Type	Tape Size	E1	Single/ Double- Sprocket	PO	P1	R	T	W
28F008S3	12 mm	1.65–1.85	Single	3.9–4.1	11.9–12.1	50 Min	0.27–0.29	11.9–12.3
All other μ BGA packages	24 mm	1.65–1.85	Single	3.9–4.1	11.9–12.1	50 Min	0.32–0.34	23.9–24.3

NOTE: Dimensions are in millimeters

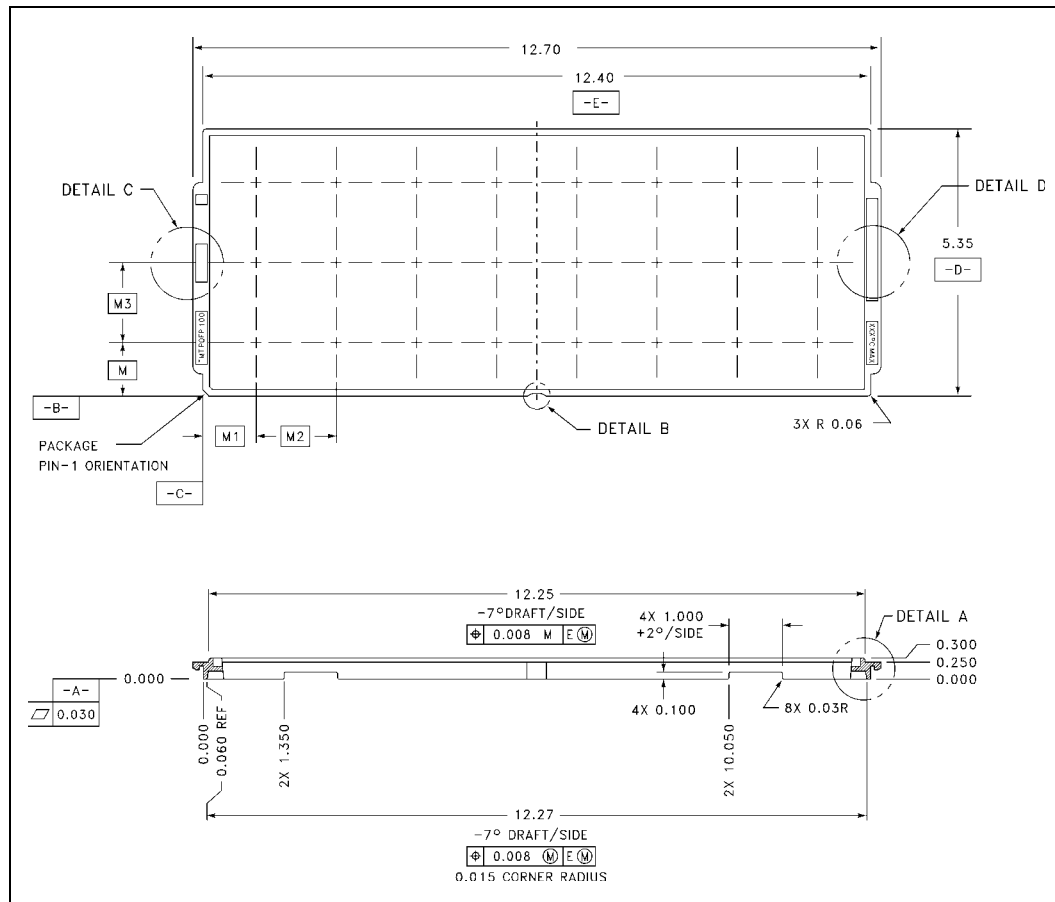
8.2 Carrier Tape and Reel Diagram and Dimensions



Millimeters	12 mm	24 mm	32 mm
A Maximum	330	330	330
D Minimum	20.2	20.2	20.2
W2 Maximum	16.0	30.4	38.4

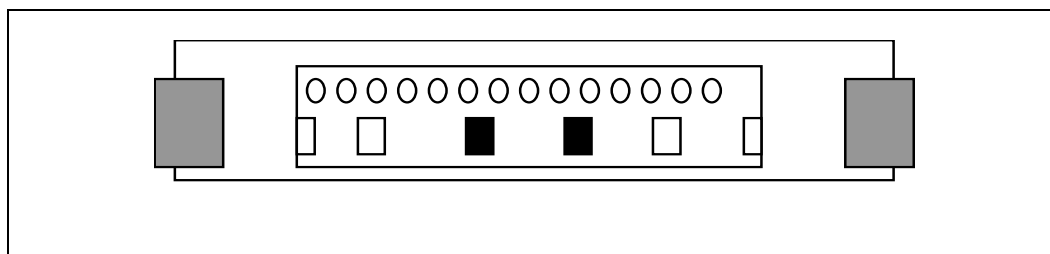
NOTE: Dimensions are in millimeters

8.3 Injection Molded Thin JEDEC Tray Parameters



μBGA* Package Thin Tray Dimensions							
Pkg. Type	M	M1	M2	M3	Columns	Rows	Pockets
28F008S3	17.246	16.129	13.462	9.220	22	12	264
28F016S3	12.052	12.128	19.380	12.420	16	10	160
28F800B3 28F008B3	12.390	11.532	15.367	13.919	20	9	180
28F160B3 28F016B3	13.386	12.522	17.043	13.640	18	9	162
28F160B3_A 28F016B3_A 28F160C3_A	18.9	8.7	12.4	10.9	25	10	250
28F320B3 28F320C3	15.7	8.7	12.4	9.5	25	12	300
28F160F3	18.9	8.7	12.4	10.9	25	10	250
28F640J5	13.386	19.380	25.121	13.640	12	9	108
28F320D18	12.95	12.15	15.30	10.00	20	12	240

NOTE: Dimensions are in millimeters



Two-Piece Sample Tape-in-Tube

8.4 Shipping Media and Socket Ordering Information

8.4.1 ORDERING INFORMATION

Shipping media and off-board programming sockets can be purchased directly from the manufacturers. These materials have been characterized by Intel to ensure the optimal quality and reliability and are the same materials used internally for testing and shipping media.

The following tables list the various materials, manufacturer's part numbers, and U.S. contact information. If outside of U.S., please consult the manufacturer's nearest sales office.

Note: The hardware vendor remains solely responsible for the design, sale and functionality of its product, including any liability arising from product infringement or product warranty.

Carrier Tape	
Vendor: 3M Contact # 1-800-666-8273	
Product	Part Number
28F008S3	US035751
28F800B3	US040001
28F160B3	US038431
28F640J5	US039141
28F160B3_A 28F016B3_A 28F160C3_A	US044581
28F320C3_A	US046761
28F160F3	US045081
28F320D18	3M051581

PSA Cover Tape	
Vendor: 3M Contact # 1-800-666-8273	
Product	Part Number
28F008S3	#2666 Cond. For 12 mm
All other μ BGA* packages	#2666 Cond. For 24 mm

Reels (2 Pc.)	
Vendor: Advantek Contact # 1-612-938-6800	
Product	Part Number
28F008S3	(4 mm) RD33704SW (8 mm) RD33708SW
All other μ BGA* packages	(8 mm) RD33708SW (16 mm) RD33716SW

JEDEC Thin Trays	
Distributor: Alliance Electronics Contact # 1-303-433-1648	
Product	Part Number
28F008S3	21002-370
28F800B3	21002-373
28F160B3	21002-371
28F640J5	21002-372
Vendor: Daiwon Contact # (408) 562-6172 (USA) 82-347-794-2001 (Korea)	
28F160B3_A 28F016B3_A 28F160C3_A	12E-0607-C13
28F320C3_A	12E-0710-C13
28F160F3	12E-0810-C13
28F320D18	12E-0713-C13

Programming Sockets	
Vendor: Yamaichi Contact # 1-408-456-0797	
Product	Part Number
28F008S3	NP291-04002-G4-BF-P
28F800B3	NP291-04812-G4-BF-P
28F160B3	NP291-04808-G4-BF-P
28F640J5	NP291-07210-G4-BF-P
Vendor: Texas Instruments Contact # (508) 236-5216	
28F160B3_A 28F016B3_A 28F160C3_A	CBG048-035C13
28F160F3	CBG060-044A
28F320D18	CBG056-035D

9.0 Additional Information

Order Number	Document/Tool
298161	<i>Intel® Flash Memory Chip Scale Package User's Guide</i>
298000	<i>Intel® Flash Memory Tools Guide</i>

NOTE:

1. Please call the Intel Literature Center at (800) 548-4725 to request Intel documentation. International customers should contact their local Intel or distribution sales office.
2. Visit Intel's World Wide Web tools and software page at <http://developer.intel.com/design/flash/tools> for technical documentation and tools.

