

AMD Flash Memory Quick Reference Guide

February 2003 Edition



July 2003

The following document refers to Spansion memory products that are now offered by both Advanced Micro Devices and Fujitsu. Although the document is marked with the name of the company that originally developed the specification, these products will be offered to customers of both AMD and Fujitsu.

Continuity of Specifications

There is no change to this document as a result of offering the device as a Spansion product. Any changes that have been made are the result of normal documentation improvements and are noted in the document revision summary, where supported. Future routine revisions will occur when appropriate, and changes will be noted in a revision summary.

Continuity of Ordering Part Numbers

AMD and Fujitsu continue to support existing part numbers beginning with "Am" and "MBM". To order these products, please use only the Ordering Part Numbers listed in this document.

For More Information

Please contact your local AMD or Fujitsu sales office for additional information about Spansion memory solutions.

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Succeed with

Flash Technology Leadership



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AMD Flash Memory Web Site Contents

Go to <http://www.amd.com/flash>.

The AMD web site contains a wealth of information relating to AMD Flash memory. The Flash memory portion of the site is divided into three subsections: Product Information, Flash Applications, and Technical Resources, and can be accessed from the tabs on the main horizontal menu. Each subsection has its own hub page and menu from which information is easily found. The *Product Information* section allows navigation to individual products by choosing an operating voltage, architecture, or density. The individual product pages have direct links to application notes, and software simulation models. The *Flash Applications* section leads to information on four market segments that have a significant number of Flash memory applications. A link to reference designs that feature AMD Flash is also provided. The *Technical Resources* section contains data sheets, application notes, white papers, Flash memory-specific software, and information on AMD programming services. Supporting documentation on packaging and Known Good Die (KGD) products are also available. Information on obsolete products such as EPROMs and 12 V Flash is archived within this section.

The following table highlights some of the web site features that are currently available.

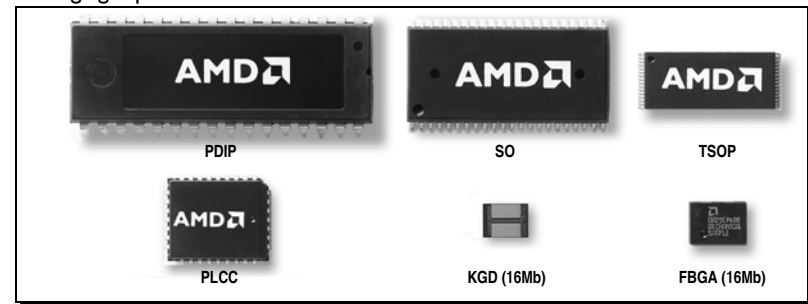
Subject	Description	Link from Flash Memory Home Page Go to http://www.amd.com/flash
MirrorBit	An entire section devoted to MirrorBit products and technology: data sheets, white paper, multimedia demo, application notes, and software simulation models.	http://www.amd.com/flash/mirrorbit
FusionFlash Catalog	A collection of web pages describing companies that work with AMD to support AMD Flash memory products. Some areas of support include sockets, programming equipment, and software.	Click on "Third Party Support." Then click on the desired topic link.
Technical Documentation	A list of online publications in PDF format that includes data sheets, application notes, technical backgrounds, and other general information pieces. Viewing and printing PDFs require Adobe Acrobat Reader.	http://www.amd.com/flash/docs
Data Sheet Programmer Supplements	Documents in PDF format that describe, for Flash devices that lack in-system sector protection and unprotection capability, the algorithms that must be performed using external programming equipment.	Requires contacting AMD or an AMD representative for access.
Applications-focused Web Pages	Web pages designed to explain the features and benefits of AMD Flash memory that are ideal for a specific market segment. Examples of segments include portable, networking/telecommunications, and automotive applications.	http://www.amd.com/flash/applications
Flash Memory Device Drivers	Source code for integration into customer code that handles the operation of the Flash device. Two types of drivers are available: a basic version that controls the operation of the Flash—read, erase, program; the other version controls the Flash device and additionally queries CFI-capable (Common Flash Interface) Flash for device information	http://www.amd.com/flash/drivers
CAD Models	Files that include parameters and specifications describing AMD Flash memory. Files are intended for use with circuit design simulation software.	http://www.amd.com/flash/models

Chip Scale Packaging Options

Package	Features	Benefits
KGD (Known Good Die) http://www.amd.com/flash/kgd	Existing AMD Flash fully tested at temperature and speed. Same quality and reliability as packaged devices. Both 5.0 Volt-only and 3.0 Volt-only products in x8 or x8/x16 configuration.	A small form factor ideal for use in multi-chip modules or hybrids. Fits small form-factor applications.
Fine-Pitch Ball Grid Array Fortified Ball Grid Array http://www.amd.com/flash/bga	Chip-scale packages. Fine pitch BGA has 0.8 mm pitch; Fortified BGA has 1.0 mm pitch Same input/output ball footprint for a variety of densities, regardless of package size.* No manufacturing or handling equipment changes required if the die size is changed.	FBGA chip-scale packaging requires only about 1/3 the board space of the TSOP package for densities up to 16 Mb. No board layout changes required to migrate to a higher or lower density memory.* Lowest cost chip-scale package.

* Densities greater than 32 Mb may use additional balls for stability.

Packaging Options



Socket Vendors

For more information on sockets, contact the following vendors:

Yamaichi Electronics
2235 Zanker Road
San Jose, CA 95131
(408) 456-0797 Fax (408) 456-0799

Wells Electronics, Inc.
226 Airport Parkway, Suite 300
San Jose, CA 95110
(408) 452-4290 Fax (408) 452-4291

Loranger Intl. Corp.
3000 Scott Boulevard, Suite 201
San Clara, CA 95054
(408) 727-4234 Fax (408) 727-5842
email: loranger@inow.com

3.0 Volt-only MirrorBit™ Flash Memory

Density	Ordering Part Number ¹					Voltage Range		Page Mode	Byte/Word Count x Bus Width	Additional Features, Sector Size/Count ⁵
	Device Number	Sector ²	Access Times (ns) ³	Package (Pin/Ball Count) ⁴	Temp. Range	V _{CC}	V _{IO}			
16 Mbit	Am29LV017M	Uniform	70R, 90R, 120R 70, 90, 120	E (40), F (40), WC (48)	C, I	3.0–3.6 2.7–3.6	NA	N	2 M x 8	CFI. Sector size (KB): (32)64
16 Mbit	Am29LV116M	T, B	70R, 90R, 120R 70, 90, 120	E (40), F (40)	C, I	3.0–3.6 2.7–3.6	NA	N	2 M x 8	CFI. Sector sizes (KB): 16,(2)8,32,(15)64
16 Mbit	Am29LV160M	T, B	70R, 90R, 120R 70, 90, 120	E (48), F (48), WA (48), PC (64)	C, I, E	3.0–3.6 2.7–3.6	NA	N	1 M x 16, 2 M x 8	CFI. Sector sizes (KB): 16,(2)8,32,(15)64
32 Mbit	Am29LV033M	U	90R	E (40), F (40), WC (48)	I	3.0–3.6	3.0–3.6	Y	4 M x 8	CFI. Sector size (KB): (64)64
			101R				2.7–3.6			
			112R, 120R				1.65–3.6			
			101			2.7–3.6	2.7–3.6			
			112, 120				1.65–3.6			
32 Mbit	Am29LV320M	H, L	90R	E (56), F (56), PC (64)	I	3.0–3.6	3.0–3.6	Y	2 M x 16, 4 M x 8	SecSi Sector, WP#/ACC, CFI. Sector size (KB): (64)64
			101R				2.7–3.6			
			112R, 120R				1.65–3.6			
			101			2.7–3.6	2.7–3.6			
			112, 120				1.65–3.6			
		T, B	90R, 100R, 110R, 120R	E (48), WC (48), PC (64)	I	3.0–3.6	NA			SecSi Sector, WP#/ACC, CFI. Sector sizes (KB): (8)8,(63)64
			100, 110, 120			2.7–3.6				
64 Mbit	Am29LV065M	U	90R ⁵	E (48), F (48), WH (63)	I	3.0–3.6	3.0–3.6	Y	8 M x 8	SecSi sector, ACC, CFI. Sector size (KB): (128)64
			101R				2.7–3.6			
			112R, 120R				1.65–3.6			
			101			2.7–3.6	2.7–3.6			
			112, 120				1.65–3.6			
64 Mbit	Am29LV640M	U	90R ⁵	WH (63), PC (64)	I	3.0–3.6	3.0–3.6	Y	4 M x 16	SecSi sector, ACC, CFI. Sector size (Kw): (128)32
			101R				2.7–3.6			
			112R, 120R				1.65–3.6			
			101			2.7–3.6	2.7–3.6			
			112, 120				1.65–3.6			
		H, L	90R ⁶	E (56), F (56), PC (64)	I	3.0–3.6	3.0–3.6	Y	4 M x 16, 8 M x 8	SecSi sector, WP#/ACC, CFI. Sector size (KB): (128)64
			101R				2.7–3.6			
			112R, 120R				1.65–3.6			
			101			2.7–3.6	2.7–3.6			
			112, 120				1.65–3.6			
		T, B	90R ⁶ , 100R, 110R, 120R	E (48), WH (63), PC (64)	I	3.0–3.6	NA	Y	4 M x 16, 8 M x 8	SecSi sector, WP#/ACC, CFI. Sector sizes (KB): (8)8,(127)64
			100, 110, 120			2.7–3.6				
64 Mbit	Am29LV641M	H, L	90R ⁶	E (48), F (48)	I	3.0–3.6	3.0–3.6	Y	4 M x 16	SecSi sector, WP#, ACC, CFI. Sector size (Kw): (128)32
			101R				2.7–3.6			
			112R, 120R				1.65–3.6			
			101			2.7–3.6	2.7–3.6			
			112, 120				1.65–3.6			

Notes:

- Contact an AMD representative for availability. See Ordering Part Number Designators table for additional package and product details. Some features on MirrorBit products may be pending, and specifications may be subject to change.
- Sector architecture: U = Uniform, T = Top boot, B = Bottom boot, H = WP# protects highest addressed sector, L = WP# protects lowest addressed sector. LV017M sector designator not included in part number.
- Special access time designators are as follows: 90 = 90 ns; 101 = 100 ns; 112 = 110 ns; 120 = 120 ns. All other access times are as stated in part number. An "R" indicates regulated V_{CC} voltage range.
- Pin/ball count provided in parenthesis is for information only, and is not included in the actual ordering part number.
- Features:** WP# = Write protect input. ACC = Programming acceleration input. SecSi Sector = Secured Silicon (unique/random ID). CFI = Common Flash Interface. **Sector Size/Count:** Sector counts are given in parentheses. Kw = kilowords, KB = kilobytes.
- Volume production of this speed option may not be immediately available. Contact AMD for further information.

3.0 Volt-only MirrorBit™ Flash Memory (Continued)

Density	Ordering Part Number ¹					Voltage Range		Page Mode	Byte/Word Count x Bus Width	Additional Features, Sector Size/Count ⁵
	Device Number	Sector ²	Access Times (ns) ³	Package (Pin/Ball Count) ⁴	Temp. Range	V _{CC}	V _{IO}			
128 Mbit	Am29LV6402M	H, L	100R	PH (80)	I	3.0–3.6	2.7–3.6	Y	4 M x 32, 8 M x 16	Two Am29LV640M devices in a single package. SecSi Sector, ACC, CFI, VersatileIO. Sector size (Kw): (128)64
			110R				1.65–3.6			
128 Mbit	Am29LV128M	H, L	103R ⁶	E (56), F (56), PC (64)	I	3.0–3.6	2.7–3.6	Y	8 M x 16, 16 M x 8	SecSi Sector, WP#/ACC, CFI. Sector size (Kw): (256)32
			113R, 123R				1.65–3.6			
			103			2.7–3.6	2.7–3.6			
			113, 123				1.65–3.6			
256 Mbit	Am29LV1282M	H, L	110R	PH (80)	I	3.0–3.6	2.7–3.6	Y	8 M x 32, 16 M x 16	Two Am29LV128M devices in a single package. SecSi Sector, ACC, CFI, VersatileIO. Sector size (KB): (256)64
			120R				1.65–3.6			
256 Mbit	Am29LV256M	H, L	103R ⁶	E (56), F (56), PG (64)	I	3.0–3.6	2.7–3.6	Y	16 M x 16, 32 M x 8	WP#/ACC, CFI. Sector size (Kw): (512)32
			113R, 123R				1.65–3.6			
			103 ⁶			2.7–3.6	2.7–3.6			
			113, 123				1.65–3.6			
512 Mbit	Am29LV2562M	H, L	120R	PI (80)	I	2.7–3.6	1.65–3.6	Y	16 M x 32, 32 M x 16	Two Am29LV256M devices in a single package. SecSi Sector, ACC, CFI, VersatileIO. Sector size (Kw): (512)64
512 Mbit	Am29LV512N	H, L	80, 90	E (56), F (56), PG (64)	I	2.7–3.6	2.7–3.6	Y	32 M x 16, 64 M x 8	WP#/ACC, CFI. Sector size (Kw): (512)64
			85, 95				1.65–1.95			

Notes:

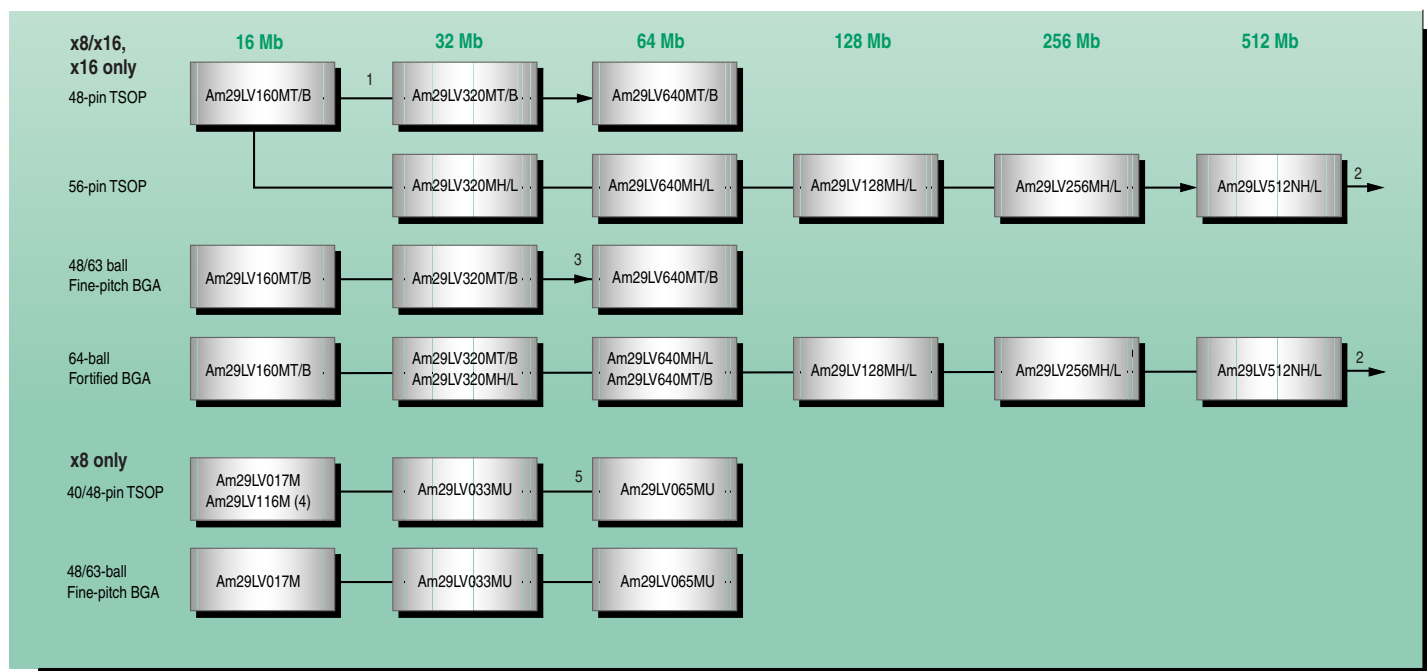
- Contact an AMD representative for availability. See Ordering Part Number Designators table and individual data sheets for details. Some features on MirrorBit products may be pending, and specifications may be subject to change. Products listed in italics have not yet been introduced.
- Sector architecture: U = Uniform, T = Top boot, B = Bottom boot, H = WP# protects highest addressed sector, L = WP# protects lowest addressed sector.
- Special access time designators are as follows: 90, 93 = 90 ns; 101, 103 = 100 ns; 112, 113 = 110 ns; 120, 123 = 120 ns. All other access times are as stated in part number. An "R" indicates regulated V_{CC} voltage range. Designators ending in "3" indicate 3 V V_{IO}. Designators ending in "5" indicate 1.65–1.95 V V_{IO}.
- Pin/ball count provided in parenthesis is for information only, and is not included in the actual ordering part number.
- Features:** WP# = Write protect input. ACC = Programming acceleration input. SecSi Sector = Secured Silicon (unique/random ID). CFI = Common Flash Interface. **Sector Size/Count:** Sector counts are given in parentheses. Kw = kilowords, KB = kilobytes.
- Volume production of this speed option may not be immediately available. Contact AMD for further information.

MirrorBit Drop-in Compatibility

Density	MirrorBit Device	TSOP	BGA (Fine-pitch/Fortified)	Conventional Flash Device
16 Mbit	Am29LV160M	E (48), F (48)	WC (48)	Am29LV160D, Am29DL16xD ¹
			PC (64)	Am29DL16xD ¹
	Am29LV017M	E (40), F (40)	WC (48)	Am29LV017D
	Am29LV116M	E (40), F (40)		Am29LV116D
32 Mbit	Am29LV320MT/B	E (48)	WM (48)	Am29LV320D, Am29DL32xD/G
			PC (64)	Am29DL32xD/G
	Am29LV320MH/L	E (56), F (56)		Am29LV320D ¹
			PC (64)	Am29DL323D/G ¹
	Am29LV033M	E (40), F (40)	WC (48)	Am29LV033C
64 Mbit	Am29LV640MU		WH (63), PC (64)	Am29LV640DU
	Am29LV640MT/B	E (48)	WH (63), PC (64)	Am29DL640D/G
	Am29LV640MH/L	E (56), F (56)	PC (64)	Am29DL640G ^{1,2,3} , Am29LV640D/H/L
	Am29LV641MH/L	E (48), F (48)		Am29LV641DH/L
	Am29LV065MU	E (48), F (48)	WH (63)	Am29LV065D
128 Mbit	Am29LV128M		PC (64)	Am29LV642D

Notes: 1. Sector architecture differences. 2. 48-pin to 56-pin TSOP migration. 3. MirrorBit supports V_{IO}; DL640 does not support V_{IO}.

MirrorBit Package Migration



Notes: T/B = Top or bottom boot sector. H/L = Uniform sector with highest or lowest addressed sector WP# protection. U = Uniform sectors without WP# protection.

(1) 48- to 56-pin migration. (2) MirrorBit products in these packages will include 1 Gbit devices. (3) 48- to 63-ball migration. (4) Am29LV116M has boot sectors; all other devices shown have uniform sectors. (5) 40- to 48-pin migration.

1.8 Volt-only Flash Memory

Architecture ²	Density	Ordering Part Number ¹					Voltage Range		Byte/Word Count x Bus Width	Additional Features, Sector Size/Count ⁵
		Device Number	Sector ³	Access Times (ns)	Package (Pin/Ball Count) ⁴	Temp. Range	V _{CC}	V _{IO}		
Sim. R/W + Burst Mode	32 Mbit	Am29BDS320G	T, B	D3, D4, D8, D9 (13.5) ⁷ C8, C9, C3, C4 (20) ⁷	VM (64)	I	1.65–1.95	1.65–1.95 2.7–3.15	4 M x 16	WP#, ACC, CFI. Separate address and data buses. Bank split 4 x 16Mb. Banks A–D (Kw): [(4)8,(15)32] [(16)32] [(15)32,(4)8]
	64 Mbit	Am29BDS640G	T, B	D3, D4, D8, D9 (13.5) ⁷ C8, C9, C3, C4 (20) ⁷	WS (80)	I	1.65–1.95	1.65–1.95 2.7–3.15	4 M x 16	WP#, ACC, CFI. Separate address and data buses. Bank split 4 x 16Mb. Banks A–D (Kw): [(4)8,(31)32] [(32)32] [(32)32] [(4)8,(31)32]
	64 Mbit	Am29BDS643G	T	7G (20), 7M (13.5), 5K (11) ⁸	VA (44)	I	1.7–1.9	1.7–1.9	4 M x 16	WP#. Multiplexed address/data bus. Bank split 4 x 16Mb. Banks A–D (Kw): [(8)4,(31)32] [(32)32] [(32)32] [(8)4,(31)32]
	128 Mbit	Am29BDS128H	T, B	D3, D4, D8, D9 (13.5) ⁷ C8, C9, C3, C4 (20) ⁷	WS (80)	I	1.65–1.95	1.65–1.95 2.7–3.15	4 M x 16	WP#, ACC, CFI, Advanced Sector Protection. Separate address and data buses. Bank split 4 x 16Mb. Banks A–D (Kw): [(4)8,(31)32] [(32)32] [(32)32] [(4)8,(31)32]

Notes:

- Contact AMD or an AMD representative for availability. See Ordering Part Number Designators table for additional package and product details. Products listed in italics are not yet introduced.
- Sim R/W = Simultaneous Read/Write feature: Read from one bank while writing to any other bank.
- Sector architecture: U = Uniform, T = Top boot, B = Bottom boot.
- Pin/ball count provided in parenthesis is for information only, and is not included in the actual ordering part number.
- Features:** WP# = Write protect input. ACC = Programming acceleration input. SecSi Sector = Secured Silicon (unique/random ID). CFI = Common Flash Interface. **Bank & Sector Size/Count:** Bank contents are given in square brackets. Sector counts are given in parentheses. Kw = kilowords, KB = kilobytes, Mb = megabits.
- BDS323D asynchronous access time is given first (11A = 110 ns, 40 MHz clock speed), followed by the burst mode access time in parentheses.
- BDS320G/640G/128H clock rate/asynchronous access: D = 54 MHz/70 ns, C = 40 MHz/90 ns. Voltage/handshaking type: 3 = 3 V V_{IO}, reduced wait state handshaking; 4 = 3 V V_{IO}, standard handshaking; 8 = 1.8 V V_{IO}, reduced wait state handshaking; 9 = 1.8 V V_{IO}, standard handshaking.
- BDS643G clock rate/handshaking enabled: K = 66 MHz/yes; M = 54 MHz/yes; G = 40 MHz/yes. Asynchronous access: 7 = 70 ns; 5 = 55 ns.

1.8 Volt-only Flash Memory (Continued)

Architecture ²	Density	Ordering Part Number ¹					Voltage Range		Byte/Word Count x Bus Width	Additional Features, Sector Size/Count ⁵
		Device Number	Sector ³	Access Times (ns)	Package (Pin/Ball Count) ⁴	Temp. Range	V _{CC}	V _{IO}		
Sim. R/W + Page Mode	32 Mbit	Am29PDS322D	T, B	10 (40), 12 (45) ⁶	WM (48)	I	1.8–2.2	NA	2 M x 16	SecSi Sector, WP#/ACC, CFI. Bank split 4/28Mb. Banks 1–2 (Kw): [(8)4,(7)32] [(56)32]
Sim. R/W	16 Mbit	Am29DS163D	T, B	100, 120	WA (48)	I, E	1.8–2.2	NA	2 M x 8, 1 M x 16	SecSi Sector, WP#/ACC, CFI. Bank split 4/12 Mb. Banks 1–2 (KB): [(8)8,(7)64] [(24)64]
	32 Mbit	Am29DS323D	T, B	110, 120	E (48), WM (48)	I	1.8–2.2	NA	4 M x 8, 2 M x 16	SecSi Sector, WP#/ACC, CFI. Bank split 8/24 Mb. Banks 1–2 (KB): [(8)8,(15)64] [(48)64]
	32 Mbit	Am29DS320G	T, B	70, 90, 120	E (48), WM (48)	I, E	1.8–2.2	NA	4 M x 8, 2 M x 16	SecSi Sector, WP#/ACC, CFI. Four banks, split 4/12/12/4 Mb. Sector sizes (KB): [(8)8,(7)64] [(24)64] [(24)64] [(8)64]
	32 Mbit	Am29DS322G, Am29DS323G, Am29DS324G	T, B	70, 90, 120	E (48), WM (48)	I	1.8–2.2	NA	4 M x 8, 2 M x 16	SecSi Sector, WP#/ACC, CFI. Four banks, split 4/12/12/4 Mb. Sector sizes (KB): [(8)8,(7)64] [(24)64] [(24)64] [(8)64]
Conventional	8 Mbit	Am29SL400C	T, B	100R 110, 120, 150	E (48), WB (48)	C, I	1.75–2.2 1.65–2.2	NA	512 K x 8, 256 K x 16	Sector sizes (KB): 16,8,8,32,(7)64
	8 Mbit	Am29SL800D	T, B	100, 120, 150	E (48), F (48), WC (48)	C, I	1.65–2.2	NA	1 M x 8, 512 K x 16	Sector sizes (KB): 16,8,8,32,(15)64
	16 Mbit	Am29SL160C	T, B	90, 100, 120, 150	E (48), WC (48)	C, I, E	1.8–2.2	NA	2 M x 8, 1 M x 16	WP#/ACC, CFI. Sector sizes (KB): (8)8,(31)64

2.5 Volt-only Flash Memory

Architecture ²	Density	Ordering Part Number ¹					Voltage Supply	Byte/Word Count x Bus Width	Additional Features, Sector Size/Count ⁵
		Device Number	Sector ³	Access Times (ns), (Clock Speed)	Package (Pin/Ball Count) ⁴	Temp. Range			
Sim. R/W + Burst Mode	16 Mbit	Am29BDD160G	T, B ⁷	54D, 65D (66 MHz), 64C (56 MHz), 65A (40 MHz) ⁸	K (80), PB (80)	I, E	2.3–2.75 V	1 M x 16, 512 K x 32	SecSi Sector, VersatileIO, WP#, ACC, CFI, Advanced Sector Protection, Bank Split 4/12 Mb or 12/4 Mb. ⁷

3.0 Volt-only Flash Memory

Architecture ²	Density	Ordering Part Number ¹					Voltage Range		Byte/Word Count x Bus Width	Additional Features, Sector Size/Count ⁵
		Device Number	Sector ³	Access Times (ns)	Package (Pin/Ball Count) ⁴	Temp. Range	V _{CC}	V _{IO}		
Sim. R/W + Page Mode	64 Mbit	Am29PDL640G	T, B ⁹	73 (25), 83 (30) ¹⁰ 98 (30) ¹⁰	WH (63), WS (80)	I	2.7–3.1 2.7–3.1	2.7–3.6 1.65–1.95	4 M x 16	Advanced Sector Protection, WP#/ACC, CFI, VersatileIO. Bank split 16/48/48/16Mb. Banks 1–4 (Kw): [(8)4,(15)32] [(48)32] [(48)32] [(15)32,(8)4]
	128 Mbit	Am29PDL127H	T, B ⁹	53 (20), 63, 83 (30) ¹⁰ 68, 88 (30) ¹⁰	VK (80), PC (64)	I	2.7–3.6 2.7–3.6	2.7–3.6 1.65–1.95	8 M x 16	Two PDL640H devices in a single package with single CE# input. Advanced Sector Protection, WP#/ACC, CFI. Bank split 16/48/48/16Mb. Banks 1–4 (Kw): [(8)4,(31)32] [(96)32] [(96)32] [(31)32,(8)4]
	128 Mbit	Am29PDL128G	T, B ⁹	70R (25) ¹⁰ 70 (25), 80 (30) ¹⁰	PE (80)	I I, E	3.0–3.6 2.7–3.6	NA NA	8 M x 16, 4 M x 32	Advanced Sector Protection, WP#/ACC, CFI. Bank split 16/48/48/16Mb. Banks 1–4 (Kw): [(8)4,(31)32] [(96)32] [(96)32] [(31)32,(8)4]
	128 Mbit	Am29PDL129H	T, B ⁹	53 (20), 63, 83 (30) ¹⁰ 68, 88 (30) ¹⁰	VK (80)	I	2.7–3.6 2.7–3.6	2.7–3.6 1.65–1.95	8 M x 16	Two PDL640H devices in a single package with dual CE# inputs. Advanced Sector Protection, WP#/ACC, CFI. Bank split 16/48/48/16Mb. Banks 1–4 (Kw): [(8)4,(31)32] [(96)32] [(96)32] [(31)32,(8)4]

Notes:

- Contact AMD or an AMD representative for availability. See Ordering Part Number Designators table and individual data sheets for details. Products listed in *italics* are not yet introduced.
- Sim R/W = Simultaneous Read/Write feature: Read from one bank while writing to any other bank.
- Sector architecture: U = Uniform, T = Top boot, B = Bottom boot.
- Pin/ball count provided in parenthesis is for information only, and is not included in the actual ordering part number.
- Features:** WP# = Write protect input. ACC = Programming acceleration input. SecSi Sector = Secured Silicon (unique/random ID). CFI = Common Flash Interface. **Bank & Sector Size/Count:** Bank contents are given in square brackets. Sector counts are given in parentheses. Kw = kilowords, KB = kilobytes, Mb = megabits.
- PDS322D asynchronous access time is given first (10 = 100 ns, 12 = 120 ns), followed by the page mode access time in parentheses.
- BDD160G: T = 4/12 Mbit bank split, Banks 1/2 (Kw): [(8)4,(7)32] [(8)4,(23)32]; B = 12/4Mbit bank split, Banks 1/2 (Kw): [(8)4,(23)32] [(8)4,(7)32]
- BDD160G access times are for maximum initial burst read or asynchronous read operations.
- This product has the Flexible Bank feature, which allows the device to be configured as a top or bottom boot device. Sector designators (T, B) are thus not included in part number.
- The asynchronous access time is given first, followed by the burst (or page) mode access time in parentheses. For PDL640G/127H/129H asynchronous access times: 53 = 55 ns; 63, 68 = 65 ns; 73 = 70 ns; 83, 88 = 80 ns; 98 = 90 ns. speed designators ending in "3" indicate a 3 V (2.7–3.1 V) V_{IO} range, while those ending in "8" indicate a 1.8 V (1.65–1.95 V) V_{IO} range.

3.0 Volt-only Flash Memory (continued)

Architecture ²	Density	Ordering Part Number ¹					V _{CC} (V)	Byte/Word Count x Bus Width	Additional Features, Sector Size/Count ⁵
		Device Number	Sector ³	Access Times (ns)	Package (Pin/Ball Count) ⁴	Temp. Range			
Sim. R/W	4 Mbit	Am29DL400B	T, B	70 80, 90, 120	E (48), F (48), S (44)	C, I C, I, E	2.7–3.6	512 K x 8, 256 K x 16	Split 1Mb/3Mb. Banks 1–2 (KB): [16,32,(4)8,32,16] [(6)64]
	8 Mbit	Am29DL800B	T, B	70 90, 120	E (48), F (48), S (44), WB (48)	C, I C, I, E	2.7–3.6	1 M x 8, 512 K x 16	Split 1Mb/7Mb. Bank 1–2 (KB): [16,32,(4)8,32,16] [(14)64]
	16 Mbit	Am29DL161D/ 162D/163D/164D	T, B	70, 90, 120	E (48), WC (48), PC (64)	I	2.7–3.6	2 M x 8, 1 M x 16	SecSi Sector, WP#/ACC, CFI. 161 split 0.5/15.5Mb, 162 split 2/14Mb, 163 split 4/12Mb, 164 split 8/8Mb. Sector sizes (KB): (8)8,(31)64
	32 Mbit	Am29DL320G	T, B ⁶	70, 90, 120	E (48), WD (63), WM (48), PC (64)	I, E	2.7–3.6	4 M x 8, 2 M x 16	SecSi Sector, WP#/ACC, CFI. Four banks, split 4/12/12/4 Mb. Sector sizes (KB): [(8)8,(7)64] [(24)64] [(8)64]
	32 Mbit	Am29DL322G/ 323G/324G	T, B	70, 90, 120	PC (64) E (48), WD (63), WM (48)	I I, E	2.7–3.6	4 M x 8, 2 M x 16	SecSi Sector, WP#/ACC, CFI. 322 split 0.5/15.5Mb, 323 split 8/24Mb, 324 split 16/16Mb. Sector sizes (KB): (8)8,(63)64
	64 Mbit	Am29DL640G	T, B ⁶	70, 90 120	E (48), WH (63), PC (64)	I I, E	2.7–3.6	8 M x 8, 4 M x 16	SecSi Sector, WP#/ACC, CFI. Four banks, split 8/24/24/8Mb. Sector sizes (KB): [(8)8,(15)64] [(48)64] [(8)8,(15)64].
	128 Mbit	Am29DL642G	T, B ⁶	70, 90	MD (63)	I	2.7–3.6	16 M x 8, 8 M x 16	Two Am29DL640G devices in a single package.
Burst Mode	8 Mbit	Am29BL802C	B	65R (17) ⁷ 65R (18) ⁷ 70R (24), 90R (26), 120R (26) ⁷	Z (56)	I E I, E	3.0–3.6	512 K x 16	5V tolerant I/O, 32 word sequential burst. Sector sizes (Kw): 8,4,4,48,(3)64,(2)128 Also available in KGD.
				65R (17) ⁷ 65R (18) ⁷ 70R (24), 90R (26), 120R (26) ⁷		I E I, E	3.0–3.6	1 M x 16	5V tolerant I/O, 32 word sequential burst, CFI, also available in KGD. Sector sizes (Kw): 8,4,4,112,(7)128
				65R (17) ⁷ 65R (18) ⁷ 70R (24), 90R (26), 120R (26) ⁷		I E I, E	3.0–3.6	1 M x 16	5V tolerant I/O, 32 word sequential burst, CFI, also available in KGD. Sector sizes (Kw): 8,4,4,112,(7)128
	16 Mbit	Am29BL162C	B	65R (17) ⁷ 65R (18) ⁷ 70R (24), 90R (26), 120R (26) ⁷	Z (56)	I E I, E	3.0–3.6	1 M x 16	5V tolerant I/O, 32 word sequential burst, CFI, also available in KGD. Sector sizes (Kw): 8,4,4,112,(7)128
Page Mode	16 Mbit	Am29PL160C	B	65R (25), 70R (25), 90R (30) ⁷ 90 (30), 120 (30) ⁷	E (48), S (44), SK (44)	I I	3.0–3.6 2.7–3.6	2 M x 8, 1 M x 16	5V tolerant I/O, 16-byte page, CFI. Sector sizes (KB): 16,8,8,224,(7)256
	32 Mbit	Am29PL320D	T, B	60R (20), 70R (25) ⁷ 70 (25), 90 (35) ⁷	WP (84)	I	3.0–3.6 2.7–3.6	2 M x 16, 1 M x 32	SecSi Sector, ACC, WP#, CFI, x32 bit data bus. Sector Sizes (Kw): 16,8,8,96,(15)128

Notes:

- Contact AMD or an AMD representative for availability. See Ordering Part Number Designators table and individual data sheets for details.
- Sim R/W = Simultaneous Read/Write feature: Read from one bank while writing to any other bank.
- Sector architecture: U = Uniform, T = Top boot, B = Bottom boot.
- Pin/ball count provided in parenthesis is for information only, and is not included in the actual ordering part number.
- Features:** WP# = Write protect input. ACC = Programming acceleration input. SecSi Sector = Secured Silicon (unique/random ID). CFI = Common Flash Interface. **Bank & Sector Size/Count:** Bank contents are given in square brackets. Sector counts are given in parentheses. Kw = kilowords, KB = kilobytes, Mb = megabits.
- This product has the Flexible Bank feature, which allows the device to be configured as a top or bottom boot device. Sector designators (T, B) are thus not included in part number.
- The asynchronous access time is given first, followed by the burst (or page) mode access time in parentheses.
- Part number designator not required for uniform sector.

3.0 Volt-only Flash Memory

Architecture	Density	Ordering Part Number ¹					V _{CC} (V)	Byte/Word Count x Bus Width	Additional Features, Sector Size/Count ⁵
		Device Number	Sector ²	Access Times (ns)	Package (Pin/Ball Count) ³	Temp. Range			
Ultra NAND™	64 Mbit	Am30LV0064D	Uniform ⁶	J40 ⁷	E2 (40/44), F2 (40/44), WG (40)	I	2.7–3.6	8 M x 8	5V tolerant I/O, 7 µs initial read, 50 ns sequential 1024 blocks, 1 block = 528 bytes x 16 pages
Conventional	1 Mbit	Am29LV001B	T, B	45R	E (32), F (32), J (32)	C	3.0–3.6	128 K x 8	Sector sizes (KB): 8,4,4,(7)16
				55, 70, 90		C, I, E	2.7–3.6		
	1 Mbit	Am29LV010B	Uniform ⁶	45R	E (32), F (32), J (32)	C	3.0–3.6	128 K x 8	Sector size (KB): (8)16
				55, 70, 90		C, I, E	2.7–3.6		
	2 Mbit	Am29LV002B	T, B	55R	E (40), F (40)	C, I	3.0–3.6	256 K x 8	Sector sizes (KB): 16,8,8,32,(3)64
				70, 90, 120		C, I, E	2.7–3.6		
	2 Mbit	Am29LV200B	T, B	55R	E (48), F (48), S (44)	C, I	3.0–3.6	256 K x 8, 128 K x 16	Sector sizes (KB): 16,8,8,32,(3)64
				70		C, I	2.7–3.6		
				90, 120		C, I, E	2.7–3.6		
	4 Mbit	Am29LV004B	T, B	70	E (40), F (40)	C, I	2.7–3.6	512 K x 8	Sector sizes (KB): 16,8,8,32,(7)64
				90, 120		C, I, E			
	4 Mbit	Am29LV040B	Uniform ⁶	60R	E (32), F (32), J (32)	C, I	3.0–3.6	512 K x 8	Sector size (KB): (8)64
				70, 90, 120		C, I, E	2.7–3.6		
	4 Mbit	Am29LV400B	T, B	55R	E (48), F (48), S (44), WA (48)	C, I	3.0–3.6	512 K x 8, 256 K x 16	Also available in KGD. Sector sizes (KB): 16,8,8,32,(7)64
				70, 90, 120		C, I, E	2.7–3.6		
	8 Mbit	Am29LV008B	T, B	70R	E (40), F (40)	C, I	3.0–3.6	1 M x 8	Sector sizes (KB): 16,8,8,32,(15)64
				90, 120		C, I, E	2.7–3.6		
	8 Mbit	Am29LV081B	Uniform ⁶	70	E (40), F (40)	C, I	3.0–3.6	1 M x 8	Sector size (KB): (16)64
				90, 120		C, I, E	2.7–3.6		
	8 Mbit	Am29LV800B	T, B	70	E (48), F (48), S (44)	C, I	2.7–3.6	1 M x 8, 512 K x 16	Also available in KGD. Sector sizes (KB): 16,8,8,32,(15)64
				90, 120	E (48), F (48), S (44)	C, I, E			
					WB (48)	C, I			
	16 Mbit	Am29LV017D	Uniform ⁶	70, 90, 120	E (40), F (40), WC (48)	C, I	2.7–3.6	2 M x 8	Address don't care, CFI. Sector size (KB): (32)64
	16 Mbit	Am29LV116D	T, B	70, 90, 120	E (40), F (40)	C, I	3.0–3.6	2 M x 8	CFI. Sector sizes (KB): 16,8,8,32,(15)64
	16 Mbit	Am29LV160B	T, B	70R	E (48), F (48), S (44), WC (48)	C	3.0–3.6	2 M x 8, 1 M x 16	CFI. Sector sizes (KB): 16,8,8,32,(31)64, 0.32 µm process technology
				80, 90, 120		C, I, E	2.7–3.6		
	16 Mbit	Am29LV160D	T, B	70, 90, 120	E (48), F (48), S (44), WC (48)	C, I, E	2.7–3.6	2 M x 8, 1 M x 16	CFI. Sector sizes (KB): 16,8,8,32,(31)64, 0.23 µm process technology
	32 Mbit	Am29LV033C	Uniform ⁶	70	E (40), F (40), WD (63)	I	2.7–3.6	4 M x 8	Address don't care, ACC, CFI. Sector size (KB): (64)64
				90, 120		I, E			
	32 Mbit	Am29LV320D	T, B	90, 120	E (48), WM (48)	C, I	2.7–3.6	4 M x 8, 2 M x 16	SecSi Sector, WP#/ACC, CFI. Sector sizes (KB): (8)8, (63)64

Notes:

1. Contact AMD or an AMD representative for availability. See Ordering Part Number Designators table and individual data sheets for details. Products listed in *italics* are not yet introduced.
2. Sector architecture: U = Uniform, T = Top boot, B = Bottom boot.
3. Pin/ball count provided in parenthesis is for information only, and is not included in the actual ordering part number.
4. **Features:** WP# = Write protect input. ACC = Programming acceleration input. SecSi Sector = Secured Silicon (unique/random ID). CFI = Common Flash Interface. **Bank & Sector Size/Count:** Bank contents are given in square brackets. Sector counts are given in parentheses. Kw = kilowords, KB = kilobytes, Mb = megabits.
5. This product has not yet been introduced; features may be pending, and specifications may be subject to change. Contact AMD or an AMD representative for more information.
6. Part number designator not required for uniform sector.
7. Am30LV family: In the part number, the designator indicates the percentage of good blocks instead of the access speed.

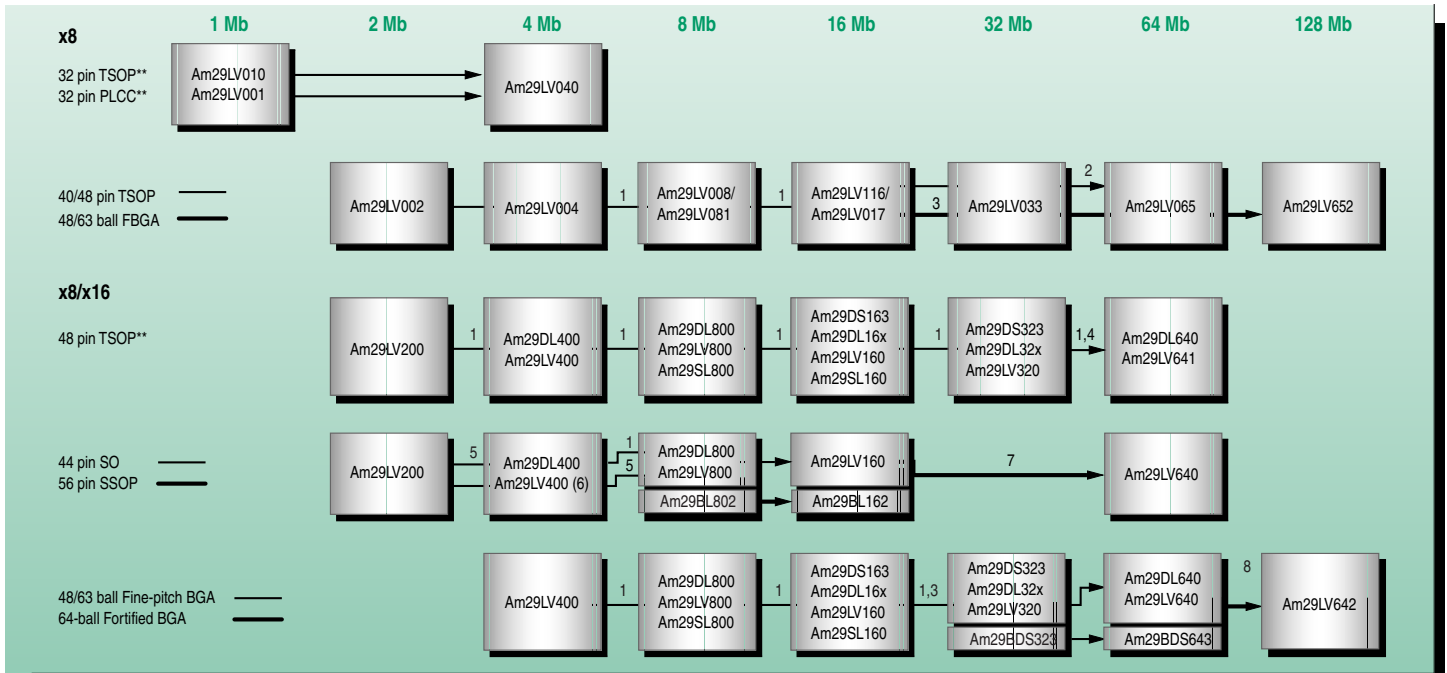
3.0 Volt-only Flash Memory (continued)

Architecture	Density	Ordering Part Number ¹					V _{CC}		Byte/Word Count x Bus Width	Additional Features, Sector Size/Count ⁵
		Device Number	Sector ²	Access Times (ns)	Package (Pin/Ball Count) ⁴	Temp. Range	V _{CC}	V _{IO}		
Conventional (continued)	64 Mbit	Am29LV065D	U	90R, 101R 120R, 121R	E (48), F (48), WH (63)	I I, E	3.0–3.6	3.0–5.0 1.8–2.9	8 M x 8	Address don't care, SecSi Sector, ACC, CFI, VersatileIO. Sector size (KB): (128)64.
	64 Mbit	Am29LV640D	H, L	90R ⁵ 101R (100 ns) ⁵ 120R ⁵ 121R (120 ns) ⁵	Z (56)	I I, E	3.0–3.6	3.0–5.0 1.8–2.9 3.0–5.0 1.8–2.9	4 M x 16	SecSi Sector, WP#, ACC, CFI, VersatileIO. Sector size (Kw): (128)32. Package Z has WP#, no RY/BY#. Package WH & PC have RY/BY#, no WP#.
			U	90R ⁵ 101R (100 ns) ⁵ 120R ⁵ 121R (120 ns) ⁵	WH (63), PC (64)	I I, E		3.0–5.0 1.8–2.9 3.0–5.0 1.8–2.9		
	64 Mbit	Am29LV640G	U	53R (55 ns) 73 (70 ns) ⁵	WH (63), PC (64)	I	3.0–3.6 2.7–3.6	3.0–3.6 2.7–3.6	4 M x 16	SecSi Sector, WP#, ACC, CFI, VersatileIO. Sector size (Kw): (128)32.
	64 Mbit	Am29LV641G	H, L	53R (55 ns) 73 (70 ns) ⁵	E (48), F (48) (WP#, no RY/BY#)	I	3.0–3.6 2.7–3.6	3.0–3.6 2.7–3.6	4 M x 16	SecSi Sector, WP#, ACC, CFI, VersatileIO. Sector size (Kw): (128)32.
	64 Mbit	Am29LV641D	H, L	90R ⁵ 101R (100 ns) ⁵ 120R ⁵ 121R (120 ns) ⁵	E (48), F (48)	I I, E	3.0–3.6	3.0–5.0 1.8–2.9 3.0–5.0 1.8–2.9	4 M x 16	SecSi Sector, WP#, ACC, CFI, VersatileIO. Sector size (Kw): (128)32. Device has WP#, but no RY/BY#.
	128 Mbit	Am29LV642D	U	90R (100 ns) ⁵ 12R (120 ns) ⁵	PA(64)	I I, E	3.0–3.6	3.0–5.0	8 M x 16	Two Am29LV640D devices in a single package. SecSi Sector, WP#, ACC, CFI, VersatileIO.
	128 Mbit	Am29LV652D	U	90R (100 ns) ⁵ 12R (120 ns) ⁵	MA(63)	I I, E	3.0–3.6	3.0–5.0	16 M x 8	Two Am29LV065D devices in a single package. Address don't care, SecSi Sector, ACC, CFI, VersatileIO.

Notes:

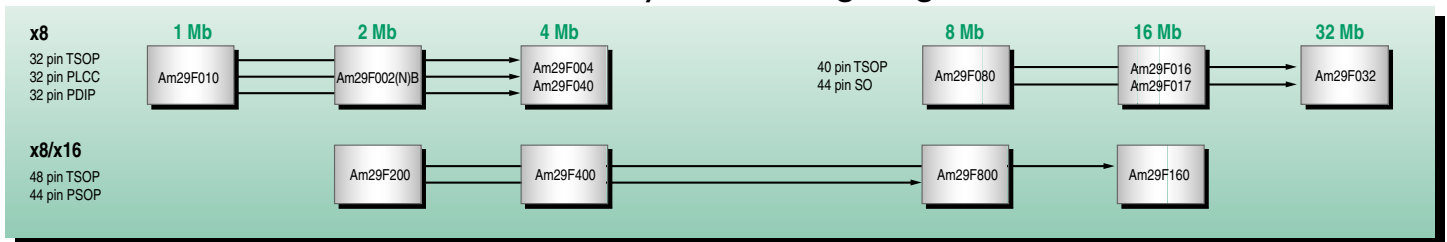
1. Contact an AMD representative for availability. See Ordering Part Number Designators table and individual data sheets for details.
2. Sector architecture: U = Uniform, T = Top boot, B = Bottom boot.
3. Pin count provided in parenthesis is for information only; and is not included in the actual ordering part number.
4. **Features:** WP# = Write protect input. CFI = Common Flash Interface. Address don't care: Specific addresses during unlock cycles in command sequence are not required.
Sector Size/Count: Sector counts are given in parentheses. KB = kilobytes.
5. Part numbers with 101R and 121R have V_{IO} = 1.8–2.9 V. Part numbers with 90R and 120R have V_{IO} = 3.0–5.0 V.

Low-Voltage Package Migration



**Compatible with 5-Volt Equivalents. (1) Migration may be to either/any indicated device (2) 40 to 48 pin migration (3) 48 to 63 ball migration (4) 3 pin change (5) 1 pin change (6) 1 pin change from LV400 to DL400 (7) 44 to 56 pin migration, 1 pin requires reroute to opposite side of package. (8) 63-ball Fine-pitch BGA to 64-ball Fortified BGA migration. See page 5 or publication number 26677 for MirrorBit drop-in compatibility.

5.0 Volt-only Flash Package Migration



5 Volt-only Conventional Flash Memory

Density	Ordering Part Number ¹					Voltage Supply	Organization	Additional Features, Sector Size/Count ⁴	
	Device Number	Sector	Access Times (ns)	Package (Pin Count) ³	Temp. Range				
1 Mbit	Am29F010B	Uniform ⁴	45	P (32)	C, I	5 V±5%	128 K x 8	Also available in KGD. Sector size (KB): (8)16	
				J (32), E (32), F (32)	C, I, E				
			55, 70	P (32)	C, I	5 V±10%			
				J (32), E (32), F (32)	C, I, E				
			90, 120	P (32), J (32), E (32), F (32)	C, I, E				
2 Mbit	Am29F002B, Am29F002NB	T, B	55	P (32)	C	5 V±5%	256 K x 8	F002NB has no RESET# input. Sector sizes (KB): 16,8,8,32,(3)64	
			55	J (32), E (32)	C, I				
			70	P (32), J (32), E (32)	C, I	5 V±10%			
			90, 120	P (32), J (32), E (32)	C, I, E				
2 Mbit	Am29F200B	T, B	45	E (48), F (48), S (44)	C, I	5 V±5%	256 K x 8, 128 K x 16	Sector sizes (KB): 16,8,8,32,(3)64. Also available in KGD	
			50		C, I, E				
			55, 70, 90, 120		C, I, E	5 V±10%			
4 Mbit	Am29F004B	T, B	55	J (32)	I	5 V±5%	512 K x 8	Sector sizes (KB): 16,8,8,32,(7)64	
			70		I	5 V±10%			
			90, 120		I, E				
4 Mbit	Am29F040B	Uniform ⁴	55	J (32), E (32), F (32)	C, I, E	5 V±5%	512 K x 8	Sector size (KB): (8)64	
			70	J (32), E (32), F (32)	C, I, E	5 V±10%			
			90, 120, 150	P (32), J (32), E (32), F (32)	C, I, E				
4 Mbit	Am29F400B	T, B	45	E (48), F (48), S (44)	C, I	5 V±5%	512 K x 8, 256 K x 16	Also available in KGD. Sector sizes (KB): 16,8,8,32,(7)64	
			50, 55		C, I, E	5 V±10%			
			55		C0, I0, E0 ⁵				
			70, 90, 120, 150		C, I, E				
8 Mbit	Am29F080B	Uniform ⁴	55	E (40), F (40), S (44)	C, I	5 V±5%	1 M x 8	Address don't care. Sector size (KB): (16)64	
			70		C, I	5 V±10%			
			90, 120, 150		C, I, E				
8 Mbit	Am29F800B	T, B	55, 70, 90, 120, 150	E (48), F (48), S (44), WB (48)	C, I, E	5 V±10%	1 M x 8, 512 K x 16	Also available in KGD. Sector sizes (KB): 16,8,8,32,(15)64	
16 Mbit	Am29F016D	Uniform ⁴	70	E4 (40), F4 (40), E (48), F (48), S (44)	C, I	5 V±10%	2 M x 8	Also available in KGD. Sector size (KB): (32)64	
			90, 120, 150		C, I, E				
16 Mbit	Am29F017D	Uniform ⁴	70	E4 (40), F4 (40), E (48), F (48), S (44)	C, I	5 V±10%	2 M x 8	Address don't care. Sector size (KB): (32)64	
			90, 120, 150		C, I, E				
16 Mbit	Am29F160D	T, B	75 (70 ns)	E (48), F (48)	C, I	5 V±5%	2 M x 8, 1 M x 16	WP#, CFI. Sector sizes (KB): 16,8,8,32,(31)64	
			90, 120		C, I	5 V±10%			
32 Mbit	Am29F032B	Uniform ⁴	75 (70 ns)	E (40), F (40), S (44)	C, I	5 V±5%	4 M x 8	Sector size (KB): (64)64	
			90, 120, 150		C, I, E	5 V±10%			

Notes:

1. Contact an AMD representative for availability. See Ordering Part Number Designators table and individual data sheets for details.
2. Pin count provided in parenthesis is for information only, and is not included in the actual ordering part number.
3. **Features:** WP# = Write protect input. CFI = Common Flash Interface. Address don't care: Specific addresses during unlock cycles in command sequence are not required.
Sector Size/Count: Sector counts are given in parentheses. KB = kilobytes.
4. Part number designator not required for uniform sector.
5. "0" after temperature range indicates $V_{CC} = 5.0 V \pm 10\%$.

Am29LV	640	D	U	90R	WH	I	OPTIONAL PROCESSING
							Blank = Standard Processing
							N = ESN devices
							TEMPERATURE RANGE
							C = Commercial (0°C to +70°C)
							E = Extended (–55°C to +125°C)
							I = Industrial (–40°C to +85°C)
							PACKAGE TYPE
							J = Rectangular Plastic Leaded Chip Carrier (PLCC)
							K = 80-pin Plastic Quad Flat Package (PQFP) (PQR080)
							P = Plastic Dual Inline Package (PDIP)
							S = 44-pin Small Outline (SO) Package (SO 044)
							SK = 44-pin Reverse Pinout Small Outline Package (SOR044)
							Z = 56-pin Shrink Small Outline Package (SSOP) (SSO056)
							<i>Thin Small Outline Packages (TSOP):</i>
							E = 32, 40, or 48-Pin Standard Pinout (TS 048)
							(for Am29F016/017 devices only,
							E = 48-pin, E4 = 40-pin)
							E2 = 40/44-pin Type-II Standard Pinout (TS 044)
							F = 32, 40, or 48-pin Reverse Pinout (TSR048)
							(for Am29F016/017 devices only,
							F = 48-pin, F4 = 40-pin)
							F2 = 40/44-pin Type-II Reverse Pinout (TSR044)
							<i>Fine-Pitch Ball Grid Array Packages,</i>
							<i>0.8 mm ball pitch (unless otherwise noted):</i>
							MA = 63-ball, 11 x 12 mm body (FSA063)
							MD = 63-ball, 10.95 x 11.95 body (FSD063)
							VA = 44-ball, 9.2 x 8 mm body, 0.5 mm pitch (VDA044)
							VK = 80-ball, 11.5 x 9 mm body (VBB080)
							VM = 64-ball, 8 x 9 mm (VBD064)
							SPEED OPTION (t_{ACC}), VOLTAGE REGULATION
							<i>1.8 Volt Devices</i>
							**(*) = 2 or 3 digits: (Am29SL, DS) Indicates speed in ns, V _{CC} = 1.8–2.2 V
							**(*) = (Am29BDS) 2 or 3 characters indicate clock rate, asynchronous read access, handshaking type. See listing notes.
							<i>2.5 V Devices</i>
							**(*) = (Am29BDD) 3 digits indicate initial burst or asynchronous read access
							<i>3 Volt MirrorBit Devices</i>
							**(*)R = Two (or three) digits: 1 (or 2) represent speed in ns x 10. Last digit indicates V _{IO} range. 0 = no V _{IO} . 1: V _{IO} = V _{CC} .
							3: V _{IO} = 3 V. 5: V _{IO} = 1.8 V. "R" indicates regulated voltage range
							<i>3 Volt non-MirrorBit Devices</i>
							**(*)R = 2 or 3 digits: Indicates speed in ns; device is full voltage range. "R" indicates regulated voltage range.
							()1(R) = (Am29LV64xD/G) First two digits indicate speed in ns x 10. "1" indicates V _{IO} < V _{CC} ; "R" indicates regulated voltage range
							** = (Am29PDL) First digit represents speed in ns x 10. Last digit indicates V _{IO} range. 3: V _{IO} = 3 V. 8: V _{IO} = 1.8 V.
							<i>5 Volt Devices</i>
							()0 = Speed option ends in "0": Indicates speed in ns. V _{CC} = 5.0 V ±10% (4.5–5.5 V)
							*5 = Speed option ends in "5": Check table and/or data sheet for actual speed and voltage range.
							(Am29F400) If part number has a "0" after the temperature range, then V _{CC} = 5.0 V ±10% (4.5–5.5 V)
							SECTOR ARCHITECTURE AND SECTOR WRITE PROTECTION
							T = Top boot sector
							L = Uniform sector device, WP# protects
							B = Bottom boot sector
							lowest addressed sector
							H = Uniform sector device, WP# protects
							U/blank = Uniform sector device
							highest addressed sector
							J40 = (UltraNAND only) 100% usable blocks
							PROCESS TECHNOLOGY
							B = 0.32 μm technology
							G = 0.17 μm thin-film technology
							C = 0.32 μm thin-film technology
							M = 0.23 μm MirrorBit technology
							D = 0.23 μm thin-film technology
							N = 0.13 μm MirrorBit technology
							DENSITY, BUS WIDTH, AND SECTOR ORGANIZATION
							***(*) = Density is as noted in table. Digits broadly give an indication of device density.
							Bus width and organization vary by family.
							FLASH MEMORY DEVICE FAMILY
							Am29BDS = 1.8 Volt-only, Simultaneous
							Am29DL = 3 Volt-only, Simultaneous Read/Write
							Read/Write, Burst Mode
							Am29BL = 3 Volt-only, Burst Mode
							Am29DS = 1.8 Volt-only, Simultaneous Read/Write

1.8 Volt-only Flash Memory + SRAM in Multi-chip Packages (MCP)

Architecture	Flash + SRAM Density	Ordering Part Number ¹				FBGA Package	Voltage Supply	Bus Width (Flash, SRAM)	Features & Sector/Bank Information (Flash devices only) ⁵
		Device Number	Sector	Access Times (ns)	Temp. Range				
Simultaneous Read/Write, Burst Mode Flash + SRAM	64 Mbit Flash + 8 Mbit SRAM	Am42BDS6408G	T, B	D8, D9, C8, C9 ³	I	FLB093	1.65–1.95 V	x16, x16	WP#, ACC. Separate address and data buses. Bank split 4 x 16Mb. Banks A–D (Kw): [(4)8,(31)32] [(32)32] [(32)32] [(4)8,(31)32]
	64 Mbit Flash + 16 Mbit SRAM	Am42BDS640AG	T, B	D8, D9, C8, C9 ³	I	FSC093	1.65–1.95 V	x16, x16	WP#, ACC. Separate address and data buses. Bank split 4 x 16Mb. Banks A–D (Kw): [(4)8,(31)32] [(32)32] [(32)32] [(4)8,(31)32]
	128 Mbit Flash + 16 Mbit SRAM	Am54BDS128AG	T, B	D8, D9, C8, C9 ³	I	FMA093	1.65–1.95 V	x16, x16	WP#, ACC. Separate address and data buses. Each flash device has 4 banks of 16Mb. Banks A–D (Kw): [(4)8,(31)32] [(32)32] [(32)32] [(4)8,(31)32]
Simultaneous Read/Write, Page Mode Flash + SRAM	32 Mbit Flash + 4 Mbit SRAM	Am41PDS3224D	T, B	10, 11 ⁴	I	FLB073	1.8–2.2 V	x16, x8/x16	SecSi Sector, WP#/ACC, CFI. Bank split 4/28Mb. Banks 1–2 (Kw): [(8)4,(7)32] [(56)32]
	32 Mbit Flash + 8 Mbit SRAM	Am41PDS3228D	T, B	10, 11 ⁴	I	FLB073	1.8–2.2 V	x16, x8/x16	SecSi Sector, WP#/ACC, CFI. Bank split 4/28Mb. Banks 1–2 (Kw): [(8)4,(7)32] [(56)32]

Notes:

- MCP physical packages are marked with an assigned number that does not reflect the part number that does not reflect the ordering part number. To identify the physical device, refer to the appropriate AMD data sheet.
- Simultaneous Read/Write feature: Read from one bank while writing to any other bank.
- Flash speed (clock/asynchronous/SRAM): D = 54 MHz/70 ns/70 ns; C = 40 MHz/85 ns/85 ns. 8 = 1.8 V V_{IO} , reduced wait-state handshaking; 9 = 1.8 V V_{IO} , standard handshaking.
- Flash speed: 10 = 100 ns, 11 = 110 ns. SRAM speed: 10, 11 = 70 ns.
- Features:** WP# = Write protect input. ACC = Programming acceleration input. SecSi Sector = Secured Silicon (unique/random ID). CFI = Common Flash Interface. **Bank & Sector Size/Count:** Bank contents are given in square brackets. Sector counts are given in parentheses. Kw = kilowords, KB = kilobytes, Mb = megabits.

3 Volt-only Flash Memory + SRAM in Multi-chip Packages (MCP)

Architecture ² / Bus Width	Flash/SRAM Density (Mbit)	Ordering Part Number ¹				FBGA Package	Voltage Supply	Features & Sector/Bank Information (Flash devices only)
		Device Number ¹	Sector	Access Times (ns)	Temp. Range			
Simultaneous Read/Write Flash (x8/x16) + SRAM (x8/x16)	16/4	Am41DL1614D/1624D/1634D/1644D	T, B	70, 85	I	FLA069	2.7–3.3 V	161 split 0.5/15.5Mb, 162 split 2/14Mb, 163 split 4/12Mb, 164 split 8/8Mb. Sector sizes (KB): (8)8,(31)64
	32/4	Am41DL3204G	T, B ⁴	70, 85	I	FLB073	2.7–3.3 V	Four banks, split 4/12/12/4 Mb. Sector sizes (KB): [(8)8,(7)64] [(24)64] [(24)64] [(8)64]
	32/4	Am41DL3224G/3234G/3244G	T, B	70, 85	I	FLB073	2.7–3.3 V	322 split 4/28Mb, 323 split 8/24Mb, 324 split 16/16Mb. Sector sizes (KB): (8)8,(63)64
	32/8	Am41DL3208G	T, B ⁴	70, 85	I	FLB073	2.7–3.3 V	Four banks, split 4/12/12/4 Mb. Sector sizes (KB): [(8)8,(7)64] [(24)64] [(24)64] [(8)64]
	32/8	Am41DL3228G/3238G/3248G	T, B	70, 85	I	FLB073	2.7–3.3 V	322 split 4/28Mb, 323 split 8/24Mb, 324 split 16/16Mb. Sector sizes (KB): (8)8,(63)64
	64/8	Am41DL6408G	T, B ⁴	70, 71 ⁶ , 85	I	FLB073	2.7–3.3 V	Four banks, split 8/24/24/8Mb. Sector sizes (KB): [(8)8,(15)64] [(48)64] [(15)64,(8)8]

Notes:

- MCP physical packages are marked with an assigned number that does not reflect the part number that does not reflect the ordering part number. To identify the physical device, refer to the appropriate AMD data sheet.
- Simultaneous Read/Write feature: Read from one bank while writing to any other bank.
- Features:** WP# = Write protect input. ACC = Programming acceleration input. SecSi Sector = Secured Silicon (unique/random ID). CFI = Common Flash Interface. **Bank & Sector Size/Count:** Bank contents are given in square brackets. Sector counts are given in parentheses. Kw = kilowords, KB = kilobytes, Mb = megabits
- This product has the Flexible Bank feature, which allows the device to be configured as a top or bottom boot device. Sector designator (T, B) is thus not included in part number.
- Flash/SRAM speed: 71 = 70 ns/55 ns; 75 = 70 ns/55 ns.

3 Volt-only Flash Memory + SRAM in Multi-chip Packages (MCP) (continued)

Architecture ² /Bus Width	Flash/ SRAM Density (Mbit)	Device Number ¹	Sector	Access Times (ns)	FBGA Package	Temp. Range	Voltage Supply	Sector/Bank Information (Flash devices only) ³
Simultaneous Read/Write Flash (x8/x16) + SRAM (x16)	16/2	Am42DL1612D/ 1622D/1632D/1642D	T, B	70, 85	FLA069	I	2.7–3.3 V	161 split 0.5/15.5Mb, 162 split 2/14Mb, 163 split 4/12Mb, 164 split 8/8Mb. Sector sizes (KB): (8)8,(31)64
	16/4	Am42DL1614D/ 1624D/1634D/1644D	T, B	70, 85	FLA069	I	2.7–3.3 V	161 split 0.5/15.5Mb, 162 split 2/14Mb, 163 split 4/12Mb, 164 split 8/8Mb. Sector sizes (KB): (8)8,(31)64
	32/4	Am42DL3224G/ 3234G/3244G	T, B	75 ⁶ , 70, 85	FLB073	I	2.7–3.3 V	322 split 4/28Mb, 323 split 8/24Mb, 324 split 16/16Mb. Sector sizes (KB): (8)8,(63)64
	64/2	Am42DL6402G	T, B ⁵	65, 70, 85, 90	FLB073	I	2.7–3.3 V	Four banks, split 8/24/24/8Mb. Sector sizes (KB): [(8)8,(15)64] [(48)64] [(15)64,(8)8].
	64/4	Am42DL6404G	T, B ⁵	70, 85	FLB073	I	2.7–3.3 V	Four banks, split 8/24/24/8Mb. Sector sizes (KB): [(8)8,(15)64] [(48)64] [(15)64,(8)8].
	64/16	Am42DL640AG	T, B ⁵	70, 71 ⁶ , 85	FSC073	I	2.7–3.3 V	Four banks, split 8/24/24/8Mb. Sector sizes (KB): [(8)8,(15)64] [(48)64] [(15)64,(8)8].
Simultaneous Read/Write Flash (x8/x16) + Pseudo SRAM (x8/x16)	32/8	Am45DL3208G	T, B ⁵	70, 85	FLB073	I	2.7–3.3 V	Four banks, split 4/12/12/4 Mb. Sector sizes (KB): [(8)8,(7)64] [(24)64] [(24)64] [(8)64]
	32/8	Am45DL3228G/ 3238G/3248G	T, B	70, 85	FLB073	I	2.7–3.3 V	322 split 4/28Mb, 323 split 8/24Mb, 324 split 16/16Mb. Sector sizes (KB): (8)8,(63)64
	64/8	Am45DL6408G	T, B ⁵	70, 85	FLB073	I	2.7–3.3 V	Four banks, split 8/24/24/8Mb. Sector sizes (KB): [(8)8,(15)64] [(48)64] [(15)64,(8)8].
Simultaneous Read/Write Flash (x8/x16) + Pseudo SRAM (x16)	32/32	Am49DL320BG	T, B ⁵	70, 85	FLB073	I	2.7–3.3 V	Four banks, split 4/12/12/4 Mb. Sector sizes (KB): [(8)8,(7)64] [(24)64] [(24)64] [(8)64]
	32/32	Am49DL322BG/ 323BG/324BG	T, B ⁵	70, 85	FLB073	I	2.7–3.3 V	322 split 4/28Mb, 323 split 8/24Mb, 324 split 16/16Mb. Sector sizes (KB): (8)8,(63)64
	64/16	Am49DL640AG	T, B ⁵	70, 85	FLJ073	I	2.7–3.3 V	Four banks, split 8/24/24/8Mb. Sector sizes (KB): [(8)8,(15)64] [(48)64] [(15)64,(8)8].
	64/32	Am49DL640BG	T, B ⁵	70, 85	FLB073	I	2.7–3.3 V	Four banks, split 8/24/24/8Mb. Sector sizes (KB): [(8)8,(15)64] [(48)64] [(15)64,(8)8].
	96/8	Am50DL9608G	T, B ⁵	70, 75 ⁶	FTA073	I	2.7–3.3 V	Combines 64 & 32 Mbit Flash. DL640G has four banks, split 8/24/24/8Mb. Sector sizes (KB): [(8)8,(15)64] [(48)64] [(15)64,(8)8]. DL320G has four banks, split 4/12/12/4 Mb. Sector sizes (KB): [(8)8,(7)64] [(24)64] [(24)64] [(8)64]
	128/32	Am50DL128BG	T, B ⁵	70, 85	FTA073	I	2.7–3.3 V	Combines two 64 Mbit Flash. Each DL640G has four banks, split 8/24/24/8Mb. Sector sizes (KB): [(8)8,(15)64] [(48)64] [(15)64,(8)8].
	128/64	Am50DL128CG	T, B ⁵	70, 85	FTA088	I	2.7–3.3 V	Combines two 64 Mbit Flash with a pSRAM. Each DL640G has four banks, split 8/24/24/8Mb. Sector sizes (KB): [(8)8,(15)64] [(48)64] [(15)64,(8)8].
Sim R/W Flash + FastCycle RAM + Pseudo SRAM (all x16)	128/64	Am55DL128C8G	T, B ⁵	70, 85	FNA093	L	2.7–3.1 V	Combines two 64 Mbit Flash, one FCRAM, and one pSRAM. Each DL640G has four banks, split 8/24/24/8Mb. Sector sizes (KB): [(8)8,(15)64] [(48)64] [(15)64,(8)8].
Sim R/W Flash + Pseudo SRAM + DiskOnChip (all x16)	128/64	Am58DL128CDG	T, B ⁵	70, 85	FVC093	LI	2.7–3.3 V	Combines two 64 Mbit Flash, one pSRAM, and one DiskOnChip device. Each DL640G has four banks, split 8/24/24/8Mb. Sector sizes (KB): [(8)8,(15)64] [(48)64] [(15)64,(8)8].

Notes:

- MCP physical packages are marked with an assigned number that does not reflect the part number that does not reflect the ordering part number. To identify the physical device, refer to the appropriate AMD data sheet.
- Sim R/W = Simultaneous Read/Write feature: Read from one bank while writing to any other bank.
- Features:** WP# = Write protect input. ACC = Programming acceleration input. SecSi Sector = Secured Silicon (unique/random ID). CFI = Common Flash Interface. **Bank & Sector Size/Count:** Bank contents are given in square brackets. Sector counts are given in parentheses. Kw = kilowords, KB = kilobytes, Mb = megabits
- This product has not yet been introduced; features may be pending, and specifications may be subject to change. Contact AMD or an AMD representative for more information.
- This product has the Flexible Bank feature, which allows the device to be configured as a top or bottom boot device. Sector designator (T, B) is thus not included in part number.
- Flash/SRAM speed: 71 = 70 ns/55 ns; 75 = 70 ns/55 ns.

Flash + SRAM MCP Ordering Part Number Designators

Am	42	DL	640	A	G	T	85	I	T	
										PACKING METHOD
										T = 7" Tape and Reel
										S = 13" Tape and Reel
										TEMPERATURE RANGE
										I = Industrial (–40°C to +85°C)
										L = Light Industrial (–30°C to +85°C)
										FLASH+SRAM SPEED OPTION (t_{ACC})
										70 = 70 ns Flash and SRAM
										71 = 70 ns Flash, 55 ns SRAM
										85 = 85 ns Flash and SRAM
										SECTOR ARCHITECTURE AND SECTOR WRITE PROTECTION
										T = Top boot sector
										Blank = Uniform sector
										B = Bottom boot sector
										Flexible Bank organization is configurable for top or bottom boot
										PROCESS TECHNOLOGY
										B = 0.32 µm technology
										D = 0.23 µm thin-film technology
										G = 0.17 µm thin-film technology
										SRAM DENSITY
										2 = 2 Mbit
										A = 16 Mbit
										B = 32 Mbit
										C = 64 Mbit
										C8 = 64 Mbit SRAM and 8 Mbit pSRAM
										CD = 64 Mbit SRAM and 128 Mbit DiskOnChip
										FLASH MEMORY DENSITY/BANK SPLIT RATIO
										16x = 16 Mbit
										640 = 64 Mbit
										32x = 32 Mbit
										128 = 128 Mbit
										x = 0 (4 banks, 1:4:4:1 ratio)
										x = 1 (2 banks, 1:3:1 ratio)
										x = 2 (2 banks, 1:7 ratio)
										x = 3 (2 banks, 1:3 ratio)
										x = 4 (2 banks, 1:1 ratio)
										AMD FLASH MEMORY ARCHITECTURE
										BDS = 1.8 V Simultaneous Read/Write + Burst Mode
										DL = 3 V Simultaneous Read/Write
										PDS = 1.8 V Simultaneous Read/Write + Page Mode
										FLASH +SRAM COMBINATIONS
										41 = Flash (x8/x16) + SRAM (x8/x16)
										42 = Flash (x8/x16) + SRAM (x16)
										45 = Flash (x8/x16) + Pseudo SRAM (x8/x16)
										49 = Flash (x8/x16) + Pseudo SRAM (x16)
										50 = Stacked Flash (x8/x16) + Pseudo SRAM (x16)
										55 = Flash + FastCycle RAM + SRAM (all x16)
										58 = Stacked Flash + Pseudo SRAM + DiskOnChip
										AMD PRODUCTS

PACKAGE TYPE

Package designators are not included in MCP part numbers. See device listings in this publication for package types. Package type definitions for MCP are as follows:

FLA069	=	69 balls, 8 x 11 mm body
FLB073	=	73 balls, 8 x 11.6 mm body
FLB093	=	93 balls, 8 x 11.6 mm body
FLJ073	=	73 balls, 8 x 11.6 mm body
FMA093	=	93 balls, 10 x 10 mm body
FNA093	=	93 balls, 10 x 10 mm body
FSC073	=	93 balls, 8 x 11.6 mm body
FSC093	=	93 balls, 8 x 11.6 mm body
FTA073	=	73 balls, 8 x 11.6 mm body
FTA088	=	88 balls, 8 x 11.6 mm body
FVC093	=	93 balls, 9 x 13 mm body

All packages are Fine-pitch Ball Grid Arrays (BGAs), 0.8 mm ball pitch. Differences between package dimensions may also include body height and thickness, ball grid size, and ball height and diameter. Consult the physical dimensions section in the appropriate data sheet for more details.

Flash Memory in Known Good Die (KGD) form^{1,2}

	Density	Part Number	Sector	Access Times (ns)	Waffle Pack Qty. (DP)	Gel-Pak® Qty. (DG)	Surftape™ Qty. (DT)	Temp. Range	Pad Count	Voltage Supply (V)	Die Size (mm)	Organization/ Additional Comments
2.5 V	16 Mbit	Am29BDD160G	T, B	64C, 65A	140	66	1600	I, E, H	76	2.5–2.7	4.54 x 7.50	1 M x 16/512 K x 32. Simultaneous read/write and Burst mode.
3 V	8 Mbit	Am29BL802C	B	80R	125	336	1600	I, E, H	51	3.0–3.6	6.85 x 5.44	512 K x 16. Burst mode.
	16 Mbit	Am29BL162C	B	80R	80	252	1600	I, E, H	52	3.0–3.6	6.85 x 7.72	1 M x 16. Burst mode.
	2 Mbit	Am29LV200B	T, B	60R	245	not avail.	2500	C, I	43	3.0–3.6	3.55 x 3.51	256 K x 8, 128 K x 16.
				70, 90 120						2.7–3.6		
	4 Mbit	Am29LV400B	T, B	60R	210	not avail.	2500	C, I	43	3.0–3.6	4.70 x 3.56	512 K x 8, 256 K x 16.
				70				C, I		2.7–3.6		
				80, 90, 120				C, I, E				
8 Mbit	Am29LV800B	T, B	80, 90, 120	140	462	2500	C, I	44	2.7–3.6	3.56 x 7.09	1 M x 8, 512 K x 16.	
5 V	1 Mbit	Am29F010B	Uniform³	90, 120	400	648	2500	C, I, E	30	4.5–5.5	2.28 x 4.04	128 K x 8.
	2 Mbit	Am29F200B	T, B	75 (70 ns)	245	486	2500	C, I, E	42	4.75–5.25	3.43 x 3.81	256 K x 8, 128 K x 16.
				90, 120						4.5–5.5		
	4 Mbit	Am29F400B	T, B	75 (70 ns)	140	594	2500	C, I, E	43	4.75–5.25	3.42 x 5.02	512 K x 8, 256 K x 16.
				90, 120						4.5–5.5		
	8 Mbit	Am29F800B	T, B	90, 120	140	396	1600	C, I, E	44	4.5–5.5	3.43 x 7.42	1 M x 8, 512 K x 16.
16 Mbit	Am29F016D	Uniform³	120	100	294	1600	C, I	38	4.5–5.5	4.74 x 5.30	2 M x 8.	

Notes:

- For additional product information, see the device listings in the tables for packaged devices.
- Contact an AMD representative for minimum order quantity in Gel-Pak wafer tray packing (ordering designator is DW).
- Part number designator not required for uniform sector.

KGD Ordering Part Number Designators

Am29LV	800	B	T	90	DT	C	1	
								DIE REVISION This number refers to the specific AMD manufacturing process and product technology. It is entered in the revision field of AMD standard product nomenclature.
								TEMPERATURE RANGE C = Commercial (0°C to +70°C) I = Industrial (–40°C to +85°C) E = Extended (–55°C to +125°C) H = Super Extended (–55°C to +145°C)
								PACKAGE TYPE DP = Waffle Pack (5-tray stack) DG = Gel-Pak Die Tray (6-tray stack) WJ = Wafer Jar (contact AMD for availability) DT = Surftape (7" Tape and Reel) DW = Gel-Pak Wafer Tray (contact AMD for minimum order quantity)
								SPEED OPTION (t_{ACC}), VOLTAGE REGULATION <i>2.5 Volt Devices</i> *** = Digits indicate initial burst or asynchronous speed in ns; A = 40 MHz clock, C = 56 MHz clock. V _{CC} = 2.5–2.7 V <i>3 Volt Devices</i> **(*) = Digits indicate speed in ns; device is full voltage range, V _{CC} = 2.7–3.6 V **(*)R = Digits indicate speed in ns, "R" indicates regulated voltage range V _{CC} = 3.0–3.6 V <i>5 Volt Devices</i> *(*)0 = Speed option ends in "0": Indicates speed in ns. V _{CC} = 5.0 V ±10% (4.5–5.5 V) *5 = Speed option ends in "5": Check table listing and/or data sheet for actual speed and voltage range.
								SECTOR ARCHITECTURE AND SECTOR WRITE PROTECTION T = Top boot sector B = Bottom boot sector
								PROCESS TECHNOLOGY B = 0.32 µm technology C = 0.32 µm thin-film technology D = 0.23 µm thin-film technology G = 0.17 µm thin-film technology
								DENSITY, BUS WIDTH, AND SECTOR ORGANIZATION ***(*) = Density is as noted in table. Digits broadly give an indication of device density. Bus width and organization vary by family.
								FLASH MEMORY DEVICE FAMILY Am29LV = 3 Volt-only Am29BL = 3 Volt-only, Burst Mode Am29F = 5 Volt-only Am29BDD = 2.5 Volt-only, Simultaneous Read/Write, Burst Mode