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AMD Flash Memory Quick Reference Guide

February 2002 Edition

AMD Flash Memory Web Site Contents

Go to <http://www.amd.com>. Click on the "Flash Memory" tab.

The new AMD web site contains a wealth of information relating to AMD flash memory. You can now view information for individual products, and have access directly to all related documentation and software.

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 and then click on "Flash Memory"
StepSearch Selector	A database of flash memory products that is searchable by part number or by device parameters, such as density, access speed, and voltage.	Click on "Memory Products Catalog," then enter a part number in the text field, or click on StepSearch Selector and select device parameters.
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.
Techdocs	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.	Click on "Technical Documentation." Items are listed by type of content. A list of selected obsolete data sheets is available by clicking on "Obsolete Products" at the top of the page.
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.
Segment-based 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.	Click on "Flash Applications" tab.
Flash Programming Tool (FPT)	An AMD-supplied kit that, along with the user's PC, allows an AMD flash to be programmed as soon as the device is available. Facilitates flash evaluation and integration earlier in the system design cycle.	Click on "Technical Resources," then on "Flash Programming Tool."
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	Click on "Technical Resources," then on "Utilities, Drivers, and Updates."
CAD Models	Files that include parameters and specifications describing AMD flash memory. Files are intended for use with circuit design simulation software.	Click on "Technical Resources," then on "CAD Modeling Support."

3.0 Volt-only MirrorBit™ Flash Memory

Density		Ordering Part Number ¹					Voltage Supply	V _{IO}	Organization	Additional Features, Sector Size/Count ⁴
		Device Number	Sector	Access Times (ns) ²	Package (Pin/Ball Count) ³	Temp. Range				
MirrorBit without Page Mode	16 Mbit	Am29LV017M	U	70, 90, 120	E (40), F (40), WC (48)	I	2.7–3.6 V	NA	2 M x 8	CFI. Sector size (kB): (32)64
	16 Mbit	Am29LV116M	T, B	70, 90, 120	E (40), F (40)	I	2.7–3.6 V	NA	2 M x 8	CFI. Sector sizes (kB): 16,(2)8,32,(15)64
	16 Mbit	Am29LV160M	T, B	70, 90, 120	E (48), F (48), WC (48), PC (64)	I	2.7–3.6 V	NA	1 M x 16, 2 M x 8	CFI. Sector sizes (kB): 16,(2)8,32,(15)64
	32 Mbit	Am29LV033M	U	90R 101, 112, 120	E (40), F (40), WD (63)	I	3.0–3.6 V 2.7–3.6 V	NA	4 M x 8	CFI. Sector size (kB): (64)64
MirrorBit with Page Mode	32 Mbit	Am29LV320M	H, L	90R	E (56), F (56), PC (64)	I	3.0–3.6 V	V _{IO}	2 M x 16, 4 M x 8	SecSi Sector, WP#/ACC, CFI. Sector size (kB): (64)64
				101, 112, 120			2.7–3.6 V			SecSi Sector, WP#/ACC, CFI. Sector sizes (kB): (8)8,(63)64
			T, B	90R	E (48), WM (48), PC (64)	I	3.0–3.6 V	NA		SecSi Sector, WP#/ACC, CFI. Sector sizes (kB): (8)8,(63)64
				101, 112, 120			2.7–3.6 V			
	64 Mbit	Am29LV065M	U	90R	E (48), F (48), WH (63)	I	3.0–3.6 V	3.0–3.6 V	8 M x 8	SecSi sector, ACC, CFI. Sector size (kB): (128)64
				101			2.7–3.6 V	2.7–3.6 V		
				112, 120			2.7–3.6 V	1.65–3.6 V		
	64 Mbit	Am29LV640M	U	90R	WH (63)	I	3.0–3.6 V	3.0–3.6 V	4 M x 16	SecSi sector, ACC, CFI. Sector size (kW): (128)32
				101			2.7–3.6 V	2.7–3.6 V		
				112, 120			2.7–3.6 V	1.65–3.6 V		
			H, L	90R	E (56), F (56), PC (64)	I	3.0–3.6 V	3.0–3.6 V	4 M x 16, 8 M x 8	SecSi sector, WP#/ACC, CFI. Sector size (kB): (128)64
				101			2.7–3.6 V	2.7–3.6 V		
				112, 120			2.7–3.6 V	1.65–3.6 V		
			T, B	90R	E (48), WH (63), PC (64)	I	3.0–3.6 V	NA		SecSi sector, WP#/ACC, CFI. Sector sizes (kB): (8)8,(127)64
				101, 112, 120			2.7–3.6 V	NA		
	64 Mbit	Am29LV641M	H, L	90R	E (48), F (48)	I	3.0–3.6 V	3.0–3.6 V	4 M x 16	SecSi sector, WP#, ACC, CFI. Sector size (kW): (128)32
				101			2.7–3.6 V	2.7–3.6 V		
				112, 120			2.7–3.6 V	1.65–3.6 V		
	128 Mbit	Am29LV642M	U	90R	PA (64)	I	3.0–3.6 V	3.0–3.6 V	8 M x 16	Same-Die Stack (2 Am29LV640MU in the same package), ACC, CFI. Sector size (kW): (256)32
				101			2.7–3.6 V	2.7–3.6 V		
112, 120				2.7–3.6 V			1.65–3.6 V			
128 Mbit	Am29LV652M	U	90R	MA (63)	I	3.0–3.6 V	3.0–3.6 V	16 M x 8	Same-Die Stack (2 Am29LV065MU in the same package), ACC, CFI. Sector size (kB): (256)64	
			101			2.7–3.6 V	2.7–3.6 V			
			112, 120			2.7–3.6 V	1.65–3.6 V			
128 Mbit	Am29LV128M	H, L	90R	E (56), F (56), PC (64)	I	3.0–3.6 V	3.0–3.6 V	8 M x 16, 16 M x 8	WP#/ACC, CFI. Sector size (kB): (256)64	
			101			2.7–3.6 V	2.7–3.6 V			
			112, 120			2.7–3.6 V	1.65–3.6 V			
256 Mbit	Am29LV256M	H, L	90R	E (56), F (56), PC (64)	I	3.0–3.6 V	3.0–3.6 V	16 M x 16, 32 M x 8	WP#/ACC, CFI. Sector size (kb): (512)64	
			101			2.7–3.6 V	2.7–3.6 V			
			112, 120			2.7–3.6 V	1.65–3.6 V			

Notes:

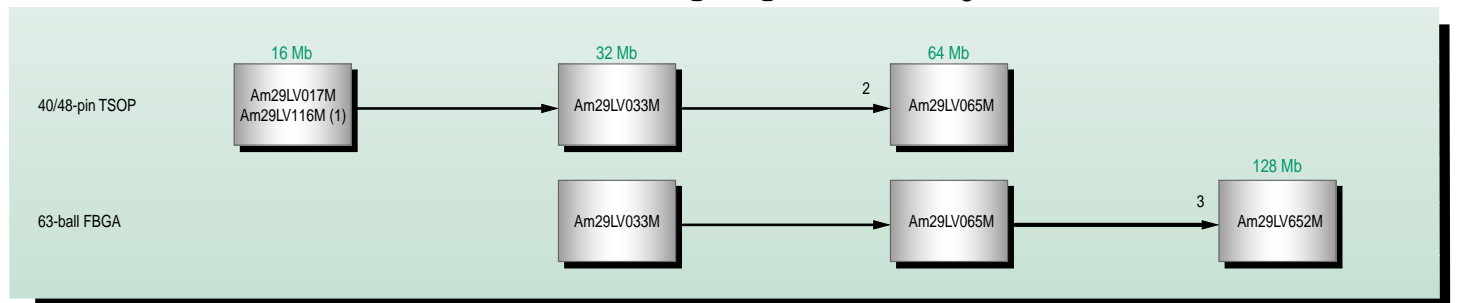
1. Contact an AMD representative for availability. See Ordering Part Number Designators table and individual data sheets for details. MirrorBit products listed are scheduled for future introduction. Some features may be pending, and specifications may be subject to change.
2. Access times are as follows: 90R = 90 ns, 101 = 100 ns, 112 = 110 ns, 120 = 120 ns.
3. Pin/ball count is provided in parenthesis 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. **Sector Size/Count:** Sector counts are given in parentheses. Kw = kilowords, KB = kilobytes, Mb = megabits.

MirrorBit Drop-in Compatibility

Density	MirrorBit Device	TSOP	FBGA	Conventional Flash Device
16 Mbit	Am29LV160M	E (48), F (48)	WC (48)	Am29LV160D
			PC (64)	Am29DL163D ¹
	Am29LV017M	E (40), F (40)	WC (48)	Am29LV017D
	Am29LV116M	E (40), F (40)		Am29LV116D
32 Mbit	Am29LV320MT/B	E (48)	WM (48)	Am29LV320D
			PC (64)	Am29DL323D/G
	Am29LV320MH/L	E (56), F (56)		Am29LV320D ¹
			PC (64)	Am29DL323D/G ¹
	Am29LV033M	E (40), F (40)	WD (63)	Am29LV033C
64 Mbit	Am29LV640MU		WH (63), PC (64)	Am29LV640D
	Am29LV640T/B	E (48)	WH (63), PC (64)	Am29DL640G
	Am29LV640H/L	E (56), F (56)	PC (64)	Am29DL640G ^{1,2,3}
	Am29LV641MU	E (48), F (48)		Am29LV641D
	Am29LV065MU	E (48), F (48)	WH (63)	Am29LV065D
128 Mbit	Am29LV128M		PC (64)	Am29LV642D
	Am29LV642M		PA (64)	Am29LV642D
	Am29LV652M		MA (63)	Am29LV652D

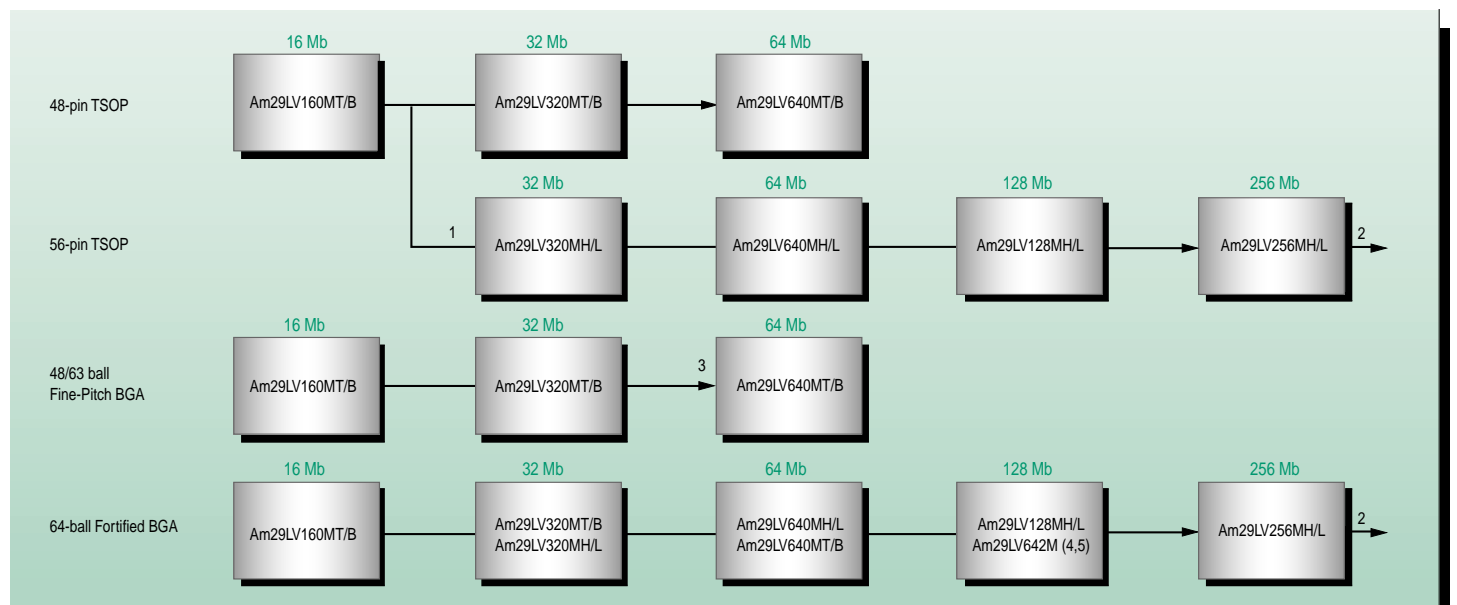
Notes: 1. Sector architecture differences. 2. 48-pin to 56-pin TSOP migration. 3. MirrorBit supports V_{IO} ; DL640 does not support V_{IO} .

MirrorBit Package Migration (x8 only)



Notes: 1. Am29LV116M has boot sectors; all other devices shown have uniform sectors. 2. 40- to 48-pin migration. 3. Same-die stack solution.

MirrorBit Package Migration (x8/x16, x16 only)



Notes: T/B = Top or bottom boot sector WP# protection. H/L = Top or bottom uniform sector WP# protection. U = Uniform sectors without WP# protection. (1) 48- to 56-pin migration. (2) MirrorBit products in these packages will include 512 Mbit and 1 Gbit devices. (3) 48- to 63-ball migration. (4) x16-only. (5) Same-die stack solution.

1.8 Volt-only Flash Memory

Architecture	Density	Ordering Part Number ¹					Voltage Supply	Organization	Additional Features, Sector Size/Count ³
		Device Number	Sector	Access Times (ns)	Package (Pin/Ball Count) ²	Temp. Range			
Simultaneous Read/Write + Burst Mode	32 Mbit	Am29BDS323D	T	11A (20) ^{4,6}	WK (47)	I	1.7–1.9 V	2 M x 16	WP#. Multiplexed address/data bus. Bank split 8/24Mb. Banks A–B (Kw): [(8)4,(15)32] [(48)32]
	64 Mbit	Am29BDS643G	T	7G (20), 7M (13.5) 5K (11) ^{4,6}	VA (44)	I	1.7–1.9 V	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]
	64 Mbit	Am29BDS640G ⁵	T, B	7A, 7B, 7C, 7D, 7E, 7F, 7G, 7H ⁴	60-ball FBGA ⁵	I	1.65–1.95 V	4 M x 16	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]
Simultaneous Read/Write + Page Mode	32 Mbit	Am29PDS322D	T, B	10 (40), 12 (50) ^{4,6}	WM (48)	I	1.8–2.2 V	2 M x 16	SecSi Sector, WP#/ACC, CFI. Bank split 4/28Mb. Banks 1–2 (Kw): [(8)4,(7)32] [(56)32]
Simultaneous Read/Write	16 Mbit	Am29DS163D	T, B	100, 120	WA (48)	I, E	1.8–2.2 V	2 M x 8, 1 M x 16	SecSi Sector, WP#/ACC, CFI. Bank split 16/48Mb. 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 V	4 M x 8, 2 M x 16	SecSi Sector, WP#/ACC, CFI. Bank split 16/48Mb. Banks 1–2 (KB): [(8)8,(15)64] [(48)64]
Conventional	8 Mbit	Am29SL800C	T, B	100, 120, 150	E (48), F (48), WB (48)	C, I	1.8–2.2 V	1 M x 8, 512 K x 16	Sector sizes (KB): 16,8,8,(15)64, 32
	16 Mbit	Am29SL160C	T, B	90, 100, 120, 150	E (48), WC (48)	C, I, E	1.8–2.2 V	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	Density	Ordering Part Number ¹					Voltage Supply	Organization	Additional Features, Sector Size/Count ³
		Device Number	Sector	Access Times (ns), (Clock Speed)	Package (Pin/Ball Count) ²	Temp. Range			
Simultaneous Read/Write + Burst Mode	16 Mbit	Am29BDD160G ⁵	T, B ⁸	54D (66 MHz), 60C (56 MHz), 68A (40 MHz)	K (80), PB (80)	I, E	2.3–2.75 V	1 M x 16, 512 K x 8	SecSi Sector, VersatileIO, WP#, ACC, CFI, New Sector Protection Architecture, Bank Split 4/12 Mb or 12/4 Mb. ⁸

3.0 Volt-only Flash Memory

Architecture	Density	Ordering Part Number ¹					Voltage Supply	Organization	Additional Features, Sector Size/Count ³
		Device Number	Sector	Access Times (ns)	Package (Pin/Ball Count) ²	Temp. Range			
Simultaneous Read/Write + Page Mode	128 Mbit	Am29PDL128G	Boot ⁹	70 (25), 80 (30) ⁶	PE (80)	I, E	2.7–3.6 V	8 M x 16, 4 M x 32	Persistent Sector Protection, WP#/ACC, CFI. Bank split 16/48/48/16Mb. Banks 1–4 (Kw): [(8)8,(31)64] [(96)64] [(96)64] [(8)8, (31)64]
Simultaneous Read/Write	4 Mbit	Am29DL400B	T, B	70 80, 90, 120	E (48), F (48), S (44)	C, I C, I, E	2.7–3.6 V	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 V	1 M x 8, 512 K x 16	Split 1Mb/7Mb. Bank 1/2 (KB): [16,32,(4)8,32,16] [(14)64]

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.
- Pin/ball count is provided in parenthesis 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.
- Asynchronous read access speeds (in nanoseconds) are represented as follows: 5 = 55, 7 = 70, 9 = 90, 10 = 100, 11 = 110, 12 = 120.
- 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.
- The asynchronous access time is given first, followed by the burst (or page) mode access time in parentheses.
- Asynchronous access time is 70 ns. Burst access, V_{IO} level, and handshaking enable are indicated by a letter: A = 20 ns/1.8V/no, B = 13.5 ns/1.8V/no, C = 20 ns/3.0V/no, D = 14 ns/3.0V/no, E = 20 ns/1.8V/yes, F = 13.5 ns/1.8V/yes, G = 20 ns/3.0V/yes, H = 14 ns/3.0V/yes.
- 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]
- Device contains both top and bottom boot sectors. Part number does not require boot sector designator.

3.0 Volt-only Flash Memory (Continued)

Architecture	Density	Ordering Part Number ¹					Voltage Supply	Organization	Additional Features, Sector Size/Count ³
		Device Number	Sector	Access Times (ns)	Package (Pin/Ball Count) ²	Temp. Range			
Simultaneous Read/Write (continued)	16 Mbit	Am29DL161D, Am29DL162D, Am29DL163D, Am29DL164D	T, B	70, 90 120	E (48), WC (48)	I I, E	2.7–3.6 V	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	Am29DL322G, Am29DL323G, Am29DL324G	T, B	70R, 90 120	E (48), WD (63)	I I, E	2.7–3.6 V	4 M x 8, 2 M x 16	SecSi Sector, WP#/ACC, CFI. 322 split 4/28Mb, 323 split 8/24Mb, 324 split 16/16Mb. Sector sizes (KB): (8)8,(63)64
	32 Mbit	Am29DL320G ⁴	T, B ⁵	70, 90, 120	E (48), WD (63), WM (48)	I, E	2.7–3.6 V	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]
	64 Mbit	Am29DL640G	T, B ⁵	90 120	E (48), WH (63), PC (64)	I I, E	2.7–3.6 V	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] [(48)64] [(8)8,(15)64].
Burst Mode	8 Mbit	Am29BL802C	B	65R (17) ⁶ 65R (18) ⁶ 70R (24), 90R (26), 120R (26) ⁶	Z (56)	I E I, E	3.0–3.6 V	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
	16 Mbit	Am29BL162C	B	65R (17) ⁶ 65R (18) ⁶ 70R (24), 90R (26), 120R (26) ⁶	Z (56)	I E I, E	3.0–3.6 V	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	Am29PL160C	B	65R (25), 70R (25), 90R (30) ⁶ 90 (30), 120 (30) ⁶	E (48), S (44)	I I	3.0–3.6 V 2.7–3.6 V	2 M x 8, 1 M x 16	5V tolerant I/O, 16-byte page, CFI. Sector sizes (Kw): 16,8,8,224,(7)256
	32 Mbit	Am29PL320D	T, B	60R (20), 70R (25) ⁶ 90 (35)	WP	I	3.0–3.6 V 2.7–3.6 V	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
UltraNAND™	64 Mbit	Am30LV0064D	Uniform ⁷	J40 ⁸	E2 (40/44), F2 (40/44), WG (40)	I	2.7–3.6 V	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 55, 70, 90	E (32), F (32), J (32)	C C, I, E	3.0–3.6 V 2.7–3.6 V	128 K x 8	Sector sizes (KB): 8,4,4,(7)16
	1 Mbit	Am29LV010B	Uniform ⁷	45R 55, 70, 90	E (32), F (32), J (32)	C C, I, E	3.0–3.6 V 2.7–3.6 V	128 K x 8	Sector size (KB): (8)16
	2 Mbit	Am29LV002B	T, B	55R 70, 90, 120	E (40), F (40)	C, I C, I, E	3.0–3.6 V 2.7–3.6 V	256 K x 8	Sector sizes (KB): 16,8,8,32,(3)64
	2 Mbit	Am29LV200B	T, B	55R 70 90, 120	E (48), F (48), S (44)	C, I C, I C, I, E	3.0–3.6 V 2.7–3.6 V 2.7–3.6 V	256 K x 8, 128 K x 16	Sector sizes (KB): 16,8,8,32,(3)64

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.
- Pin/ball count is provided in parenthesis 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 not yet been introduced; features may be pending, and specifications may be subject to change. Contact AMD or an AMD representative for more information.
- Device contains both top and bottom boot sectors. Part number does not require boot sector designator.
- 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.
- Am30LV family: In the part number, the designator indicates the percentage of good blocks instead of the access speed.

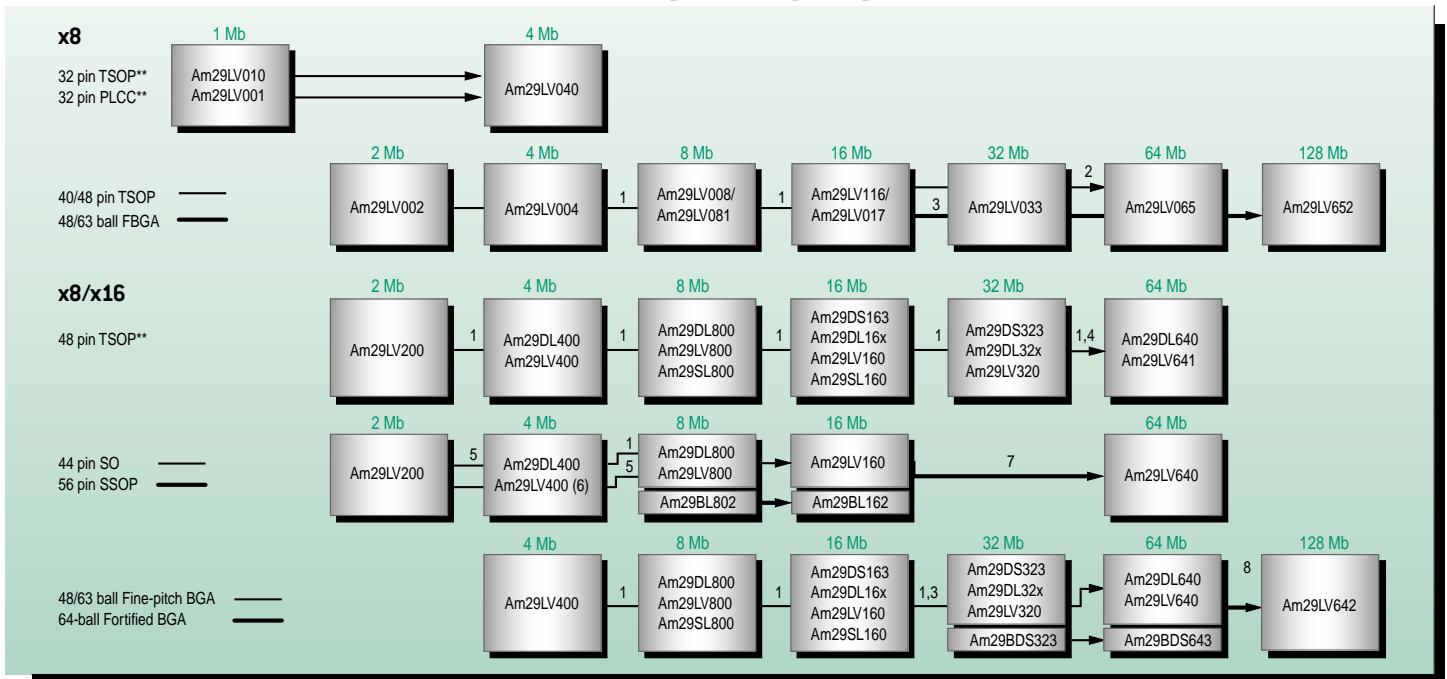
3.0 Volt-only Flash Memory (Continued)

Architecture	Density	Ordering Part Number ¹					Voltage Supply	Organization	Additional Features, Sector Size/Count ³
		Device Number	Sector	Access Times (ns)	Package (Pin/Ball Count) ²	Temp. Range			
Conventional (continued)	4 Mbit	Am29LV004B	T, B	70 90, 120	E (40), F (40)	C, I C, I, E	2.7–3.6 V	512 K x 8	Sector sizes (KB): 16,8,8,32,(7)64
	4 Mbit	Am29LV040B	Uniform ⁴	60R 70, 90, 120	E (32), F (32), J (32)	C, I C, I, E	3.0–3.6 V 2.7–3.6 V	512 K x 8	Sector size (KB): (8)64
	4 Mbit	Am29LV400B	T, B	55R 70, 90, 120	E (48), F (48), S (44), WA (48)	C, I C, I, E	3.0–3.6 V 2.7–3.6 V	512 K x 8, 256 K x 16	Also available in KGD. Sector sizes (KB): 16,8,8,32,(7)64
	8 Mbit	Am29LV800B	T, B	70 90, 120	E (48), F (48), S (44) E (48), F (48), S (44) WB (48)	C, I C, I, E C, I	2.7–3.6 V	1 M x 8, 512 K x 16	Also available in KGD. Sector sizes (KB): 16,8,8,32,(15)64
	16 Mbit	Am29LV017D	Uniform ⁴	70, 90, 120	E (40), F (40), WC (48)	C, I	2.7–3.6 V	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 V	2 M x 8	CFI. Sector sizes (KB): 16,8,8,32,(15)64
	16 Mbit	Am29LV160B	T, B	70R 80, 90, 120	E (48), F (48), S (44), WC (48)	C C, I, E	3.0–3.6 V 2.7–3.6 V	2 M x 8, 1 M x 16	CFI. Sector sizes (KB): 16,8,8,32,(31)64, 0.32 µm process technology
	16 Mbit	Am29LV160D	T, B	70, 90, 120	E (48), F (48), S (44), WC (48)	C, I, E	2.7–3.6 V	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 ⁴	70 90, 120	E (40), F (40), WD (63)	I I, E	2.7–3.6 V	4 M x 8	Address don't care, ACC, CFI. Sector size (KB): (64)64
	32 Mbit	Am29LV320D	T, B	90 120	E (48), WM (48)	I I, E	2.7–3.6 V	4 M x 8, 2 M x 16	SecSi Sector, WP#/ACC, CFI. Sector sizes (KB): (8)8, (63)64
	64 Mbit	Am29LV065D	U	90R, 101R 120R, 121R	E (48), F (48), WH (63)	I I, E	3.0–3.6 V	8 M x 8	Address don't care, SecSi Sector, ACC, CFI. Sector size (KB): (128)64.
	64 Mbit	Am29LV640D	H, L H, L U U	90R, 101R (100 ns) ⁵ 120R, 121R (120 ns) ⁵ 90R, 101R (100 ns) ⁵ 120R, 121R (120 ns) ⁵	Z (56) (WP#, no RY/BY#) Z (56) (WP#, no RY/BY#) WH (63), PC (64), (RY/BY#, no WP#) WH (63), PC (64), (RY/BY#, no WP#)	I I, E I I, E	3.0–3.6 V	4 M x 16	SecSi Sector, WP#, ACC, CFI, VersatileIO. Sector size (Kw): (128)32.
	64 Mbit	Am29LV641D	H, L	90R, 101R (100 ns) ⁵ 120R, 121R (120 ns) ⁵	E (48), F (48) (WP#, no RY/BY#)	I I, E	3.0–3.6 V	4 M x 16	SecSi Sector, WP#, ACC, CFI, VersatileIO. Sector size (Kw): (128)32.
	128 Mbit	Am29LV642D	U	90R, 101R (100 ns) ⁵ 120R, 121R (120 ns) ⁵	PA(64)	I I, E	3.0–3.6 V	8 M x 16	Two Am29LV640D devices in a single package.
	128 Mbit	Am29LV652D	U	90R, 101R (100 ns) ⁵ 120R, 121R (120 ns) ⁵	MA(63)	I I, E	3.0–3.6 V	16 M x 8	Two Am29LV065D devices in a single package.

Notes:

1. Contact an AMD representative for availability. See Ordering Part Number Designators table and individual data sheets for details.
2. Pin count is provided in parenthesis 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. Part numbers with 101R and 121R have $V_{IO} = 1.8\text{--}2.9\text{ V}$. Part numbers with 90R and 120R have $V_{IO} = 3.0\text{--}5.0\text{ V}$.

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.

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

Architecture	Flash + SRAM Density	Device Number	Sector	Access Times (ns)	FBGA Package	Temp. Range	Voltage Supply	Bus Width (Flash, SRAM)	Comments
Simultaneous Read/Write Flash + SRAM	16 Mbit Flash + 2 Mbit SRAM	Am42DL1612D, Am42DL1622D, Am42DL1632D, Am42DL1642D	T, B	70, 85	FLA069	I	2.7–3.3 V	x8/x16, x16	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 Mbit Flash + 4 Mbit SRAM	Am41DL1614D, Am41DL1624D, Am41DL1634D, Am41DL1644D	T, B	70, 85	FLA069	I	2.7–3.3 V	x8/x16, x8/x16	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 Flash + 4 Mbit SRAM	Am41DL3204G	T, B	70, 85	FLB073	I	2.7–3.3 V	x8/x16, x8/x16	Four banks, split 4/12/12/4 Mb. Sector sizes (KB): [(8)8,(7)64] [(24)64] [(24)64] [(8)64]
	32 Mbit Flash + 4 Mbit SRAM	Am41DL3224G, Am41DL3234G, Am41DL3244G	T, B	70, 85	FLB073	I	2.7–3.3 V	x8/x16, x8/x16	322 split 4/28Mb, 323 split 8/24Mb, 324 split 16/16Mb. Sector sizes (KB): (8)8,(63)64
	32 Mbit Flash + 8 Mbit SRAM	Am41DL3208G ²	Flexible Bank ³	70, 85	FLB073	I	2.7–3.3 V	x8/x16, x8/x16	Four banks, split 4/12/12/4 Mb. Sector sizes (KB): [(8)8,(7)64] [(24)64] [(24)64] [(8)64]
	32 Mbit Flash + 8 Mbit SRAM	Am41DL3228G, Am41DL3238G, Am41DL3248G	T, B	70, 85	FLB073	I	2.7–3.3 V	x8/x16, x8/x16	322 split 4/28Mb, 323 split 8/24Mb, 324 split 16/16Mb. Sector sizes (KB): (8)8,(63)64
	64 Mbit Flash + 8 Mbit SRAM	Am41DL6408G ²	Flexible Bank ³	70, 85	FLB073	I	2.7–3.3 V	x8/x16, x8/x16	Sector sizes (KB): [(8)8] [(15)64] [(15)64] [(8)8].
	64 Mbit Flash + 16 Mbit SRAM	Am42DL640AG ²	Flexible Bank ³	70, 85	FSB073	I	2.7–3.3 V	x8/x16, x16	Sector sizes (KB): [(8)8] [(15)64] [(15)64] [(8)8].

Notes:

- The ordering part number consists only of the device number and the sector as shown in the preceding table. The physical packages are marked with an assigned number that does not reflect the part number. To identify the physical device, refer to the appropriate AMD data sheet.
- 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.
- The Flexible Bank feature allows the device to be configured as a top or bottom boot product. See feature column for bank splits and sector sizes. No boot designator in part number required.

Flash + SRAM MCP Ordering Part Number Designators

Am	42	DL	640	A	G	T	85	I	T	
										PACKING METHOD
										T = 7" Tape and Reel
										TEMPERATURE RANGE
										C = Commercial (0°C to +70°C)
										I = Industrial (-40°C to +85°C)
										FLASH+SRAM SPEED OPTION (t_{ACC})
										70 = 70 ns Flash and SRAM
										85 = 85 ns Flash and SRAM
										SECTOR ARCHITECTURE AND SECTOR WRITE PROTECTION
										T = Top boot sector
										B = Bottom boot sector
										Blank = Uniform sector
										Flexible Bank organization is configurable for top or bottom boot
										PROCESS TECHNOLOGY
										B = 0.32 µm technology
										C = 0.32 µm thin-film technology
										SRAM DENSITY
										2 = 2 Mbit
										4 = 4 Mbit
										FLASH MEMORY DENSITY/BANK SPLIT RATIO
										16x = 16 Mbit
										32x = 32 Mbit
										640 = 64 Mbit
										x = 0 (4 banks, 1:4:4:1), 1 (1:3:1), 2 (1:7), 3 (1:3), 4 (1:1)
										AMD FLASH MEMORY ARCHITECTURE
										DL = 3 V Simultaneous Read/Write
										FLASH +SRAM COMBINATIONS
										41 = Flash + x8/x16 SRAM
										42 = Flash + x16-only SRAM
										AMD PRODUCTS

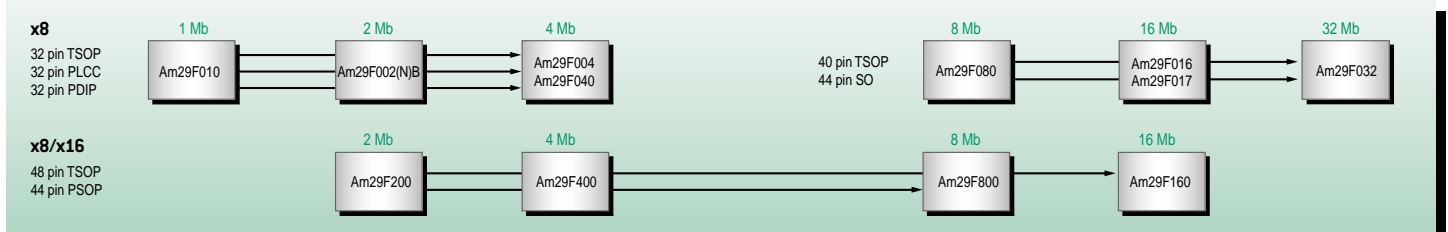
5 Volt-only Conventional Flash Memory

Density	Ordering Part Number ¹					Voltage Supply	Organization	Additional Features, Sector Size/Count ³
	Device Number	Sector	Access Times (ns)	Package (Pin Count) ²	Temp. Range			
1 Mbit	Am29F010B	Uniform ⁴	45 55, 70, 90, 120	P (32), J (32), E (32), F (32)	C, I, E C, I, E	5 V±5% 5 V±10%	128 K x 8	Also available in KGD. Sector size (KB): (8)16
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	P (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, 90, 120		I, E	5 V±10%		
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			
			55		C0, I0, E0 ⁵	5 V±10%		
			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),	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 is provided in parenthesis 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 $V_{CC} = 5.0 V \pm 10\%$.

5.0 Volt-only Flash Package Migration



Ordering Part Number Designators

Am29LV	640	D	U	90R	WH	I	
							OPTIONAL PROCESSING
							Blank = Standard Processing
							N = ESN devices
							TEMPERATURE RANGE
							C = Commercial (0°C to +70°C)
							I = Industrial (−40°C to +85°C)
							PACKAGE TYPE
							P = Plastic Dual Inline Package (PDIP)
							J = Rectangular Plastic Leaded Chip Carrier (PLCC)
							S = 44-Pin Small Outline (SO) Package (SO 044)
							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, 0.8 mm ball pitch (unless otherwise noted):</i>
							MA = 63-Ball, 11 x 12 mm body, 1.7 mm height (FSA063)
							VA = 44-Ball, 9.2 x 8 mm body, 0.5 mm pitch (VDA044)
							<i>Fine-Pitch Ball Grid Array Packages (continued)</i>
							WA = 48-Ball, 6 x 8 mm body (FBA048)
							WB = 48-Ball, 6 x 9 mm body (FBB048)
							WC = 48-Ball, 8 x 9 mm body (FBC048)
							WD = 63-Ball, 8 x 14 mm body (FBD063)
							WG = 40-Ball, 8 x 15 mm body (FBE040)
							WH = 63-Ball, 12 x 11 mm body (FBE063)
							WK = 47-Ball, 7 x 10 mm body, 0.5 mm ball pitch (FDD047)
							WL = 48-Ball, 11 x 10 mm body, 0.5 mm ball pitch (FDE048)
							WM = 48-Ball, 6 x 12 mm body (FBD048)
							WN = 84-Ball, 11 x 12 mm body (FBF084)
							TBD = 60-Ball (FDE060) Contact AMD for further information
							<i>Fortified Ball Grid Array Packages, 1.0 mm ball pitch (unless otherwise noted):</i>
							PA = 64-Ball, 13 x 11 mm body, 1.7 mm height (LSA064)
							PB = 80-Ball, 13 x 11 mm body (LAA080)
							PC = 64-Ball 13 x 11 mm body (LAA064)
							PE = 80-Ball, 10 x 15 mm body (LAB080)
							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
							*A, *B = (Am29BDS) Digit indicates asynchronous speed (5 = 55 ns, 7 = 70 ns, 9 = 90 ns, 11 = 110 ns), letter represents burst mode speed and handshaking availability (A=40 MHz, B=54 MHz, etc. See page 5 notes), V _{CC} = 1.7–1.9 V unless otherwise specified
							<i>3 Volt Devices</i>
							**(*) = 2 or 3 digits: Indicates speed in ns; device is full voltage range, V _{CC} = 2.7–3.6 V
							**(*)R = 2 or 3 digits indicate speed in ns, "R" indicates regulated voltage range V _{CC} = 3.0–3.6 V
							()1(R) = (Am29LV64x) First two digits indicate speed in ns x 10. "1" indicates V _{IO} < V _{CC} , "R", if present, indicates regulated voltage range as defined above
							<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
							B = Bottom boot sector
							H = Uniform sector device, highest address sector protected
							L = Uniform sector device, lowest address sector protected
							U/blank = Uniform sector device
							J40 = (UltraNAND only) 100% usable blocks
							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
							M = 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 Read/Write, Burst Mode
							Am29DL = 3 Volt-only, Simultaneous Read/Write
							Am29DS = 1.8 Volt-only, Simultaneous Read/Write
							Am29BL = 3 Volt-only, Burst Mode
							Am29PL = 3 Volt-only, Page Mode
							Am29PDS = 1.8 Volt-only, Simultaneous Read/Write, Page Mode
							Am29PDL = 3 Volt-only, Simultaneous Read/Write, Page Mode
							Am29SL = 1.8 Volt-only
							Am290LV = 3 Volt-only, UltraNAND™
							Am29BDD = 2.5 Volt-only, Simultaneous Read/Write, Burst Mode
							Am29F = 5 Volt-only
							Am29LV = 3 Volt-only

3.0 Volt-only Flash 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
8 Mb	Am29BL802C	B	80R	125	336	1600	I, E, H	51	3.0–3.6V	6.85 x 5.44	512 K x 16. Burst mode.
16 Mb	Am29BL162C	B	80R	16	42	1600	I, E, H	51	3.0–3.6 V	6.85 x 7.72	1 M x 16. Burst mode.
4 Mbit	Am29LV400B	T, B	60R, 70	210	not avail.	2500	C, I	43	2.7–3.6 V	4.70 x 3.56	512 K x 8, 256 K x 16.
			80, 90, 120				C, I, E				
8 Mbit	Am29LV800B	T, B	90, 120	140	462	2500	C, I	44	2.7–3.6 V	3.56 x 7.09	1 M x 8, 512 K x 16.

5.0 Volt-only Flash 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
1 Mbit	Am29F010B	Uniform ³	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	3.42 x 7.42	1 M x 8, 512 K x 16.
16 Mbit	Am29F016B	Uniform ³	120	100	294	1600	C, I	37	4.5–5.5	6.78 x 7.11	2 M x 8.
	Am29F016D	Uniform ³	120	100	294	1600	C, I	37	4.5–5.5	6.78 x 7.11	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

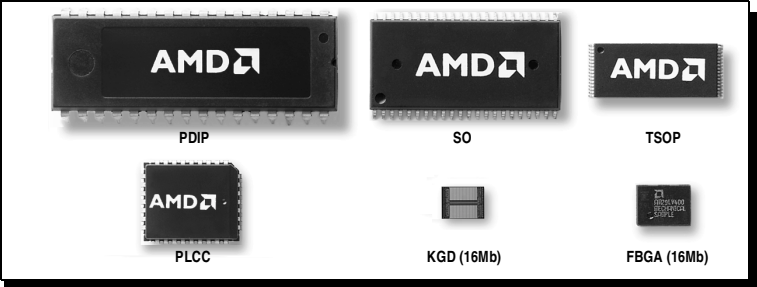
Am29LV	800	B	T	90	DT	C	1	
								DIE REVISION
								This number refers to the specific AMD manufacturing process and product technology. It is entered in the revision field of AMD standard product nomenclature.
								TEMPERATURE RANGE
								C = Commercial (0°C to +70°C) E = Extended (–55°C to +125°C)
								I = Industrial (–40°C to +85°C) H = Super Extended (–55°C to +145°C)
								PACKAGE TYPE
								DP = Waffle Pack DT = Surftape (Tape and Reel)
								DG = Gel-Pak Die Tray DW = Gel-Pak Wafer Tray (call AMD for minimum order quantity)
								SPEED OPTION (t_{ACC}), VOLTAGE REGULATION
								<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
								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 Am29F = 5 Volt-only
								Am29BL = 3 Volt-only, Burst Mode

Chip Scale Packaging Options

Package	Features	Benefits
KGD (Known Good Die)	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	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



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