SUPPLEMENT

Am29F016B Known Good Die

16 Megabit (2 M x 8-Bit)

CMOS 5.0 Volt-only, Sector Erase Flash Memory—Die Revision 1

DISTINCTIVE CHARACTERISTICS

- **5.0 V ± 10%, single power supply operation**
  - — Minimizes system level power requirements
- **Manufactured on 0.35 µm process technology**
- **High performance**
  - — 120 ns access time
- **Low power consumption**
  - — 25 mA typical active read current
  - — 30 mA typical program/erase current
  - — <1 µA typical standby current (standard access time to active mode)
- **Flexible sector architecture**
  - — 32 uniform sectors of 64 Kbytes each
  - — Any combination of sectors can be erased.
  - — Supports full chip erase
  - — Group sector protection:

    A hardware method of locking sector groups to prevent any program or erase operations within that sector group

    Temporary Sector Group Unprotect allows code changes in previously locked sectors
- **Embedded Algorithms**
  - — Embedded Erase algorithm automatically preprograms and erases the entire chip or any combination of designated sectors
  - — Embedded Program algorithm automatically writes and verifies bytes at specified addresses
- **Minimum 100,000 write/erase cycles guaranteed**
- **Compatible with JEDEC standards**
  - — Pinout and software compatible with single-power-supply Flash standard
  - — Superior inadvertent write protection
- **Data# Polling and toggle bits**
  - — Provides a software method of detecting program or erase cycle completion
- **Ready/Busy output (RY/BY#)**
  - — Provides a hardware method for detecting program or erase cycle completion
- **Erase Suspend/Resume**
  - — Suspends a sector erase operation to read data from, or program data to, a non-erasing sector, then resumes the erase operation
- **Hardware reset pin (RESET#)**
  - — Resets internal state machine to the read mode
- **Tested to datasheet specifications at temperature**
- **Quality and reliability levels equivalent to standard packaged components**

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GENERAL DESCRIPTION

The Am29F016B in Known Good Die (KGD) form is a 16 Mbit, 5.0 volt-only Flash memory. AMD defines KGD as standard product in die form, tested for functionality and speed. AMD KGD products have the same reliability and quality as AMD products in packaged form.

Am29F016B Features

The Am29F016B is a 16 Mbit, 5.0 volt-only Flash memory organized as 2,097,152 bytes of 8 bits each. The 2 Mbytes of data are divided into 32 sectors of 64 Kbytes each for flexible erase capability. The 8 bits of data appear on DQ0–DQ7. The Am29F016B is manufactured using AMD's 0.35 µm process technology. This device is designed to be programmed in-system with the standard system 5.0 volt V_{CC} supply. A 12.0 volt V_{PP} is not required for program or erase operations. The device can also be programmed in standard EPROM programmers.

The standard device offers an access time of 120 ns, allowing high-speed microprocessors to operate without wait states. To eliminate bus contention, the device has separate chip enable (CE#), write enable (WE#), and output enable (OE#) controls.

The device is entirely command set compatible with the JEDEC single-power-supply Flash standard. Commands are written to the command register using standard microprocessor write timings. Register contents serve as input to an internal state machine that controls the erase and programming circuitry. Write cycles also internally latch addresses and data needed for the programming and erase operations. Reading data out of the device is similar to reading from 12.0 volt Flash or EPROM devices.

The device is programmed by executing the program command sequence. This invokes the Embedded Program algorithm—an internal algorithm that automatically times the program pulse widths and verifies proper cell margin. The device is erased by executing the erase command sequence. This invokes the Embedded Erase algorithm—an internal algorithm that automatically preprograms the array (if it is not already programmed) before executing the erase operation. During erase, the device automatically times the erase pulse widths and verifies proper cell margin.

The sector erase architecture allows memory sectors to be erased and reprogrammed without affecting the data contents of other sectors. A sector is typically erased and verified within one second. The device is erased when shipped from the factory.

The hardware sector group protection feature disables both program and erase operations in any combination of the eight sector groups of memory. A sector group consists of four adjacent sectors.

The Erase Suspend feature enables the system to put erase on hold for any period of time to read data from, or program data to, a sector that is not being erased. True background erase can thus be achieved.

The device requires only a single 5.0 volt power supply for both read and write functions. Internally generated and regulated voltages are provided for the program and erase operations. A low V_{CC} detector automatically inhibits write operations during power transitions. The host system can detect whether a program or erase cycle is complete by using the RY/BY# pin, the DQ7 (Data# Polling) or DQ6 (toggle) status bits. After a program or erase cycle has been completed, the device automatically returns to the read mode.

A hardware RESET# pin terminates any operation in progress. The internal state machine is reset to the read mode. The RESET# pin may be tied to the system reset circuitry. Therefore, if a system reset occurs during either an Embedded Program or Embedded Erase algorithm, the device is automatically reset to the read mode. This enables the system's microprocessor to read the boot-up firmware from the Flash memory.

AMD's Flash technology combines years of Flash memory manufacturing experience to produce the highest levels of quality, reliability, and cost effectiveness. The device electrically erases all bits within a sector simultaneously via Fowler-Nordheim tunneling. The bytes are programmed one byte at a time using the EPROM programming mechanism of hot electron injection.

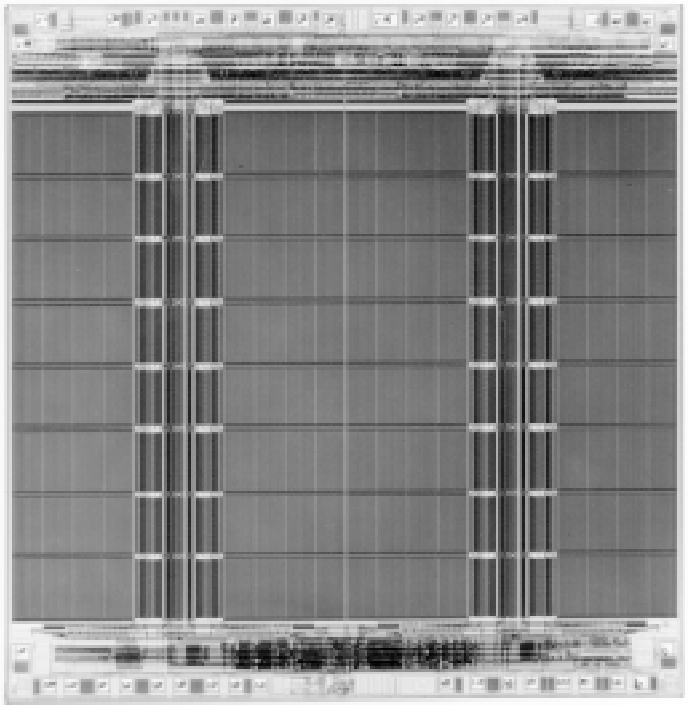
ELECTRICAL SPECIFICATIONS

Refer to the Am29F016B data sheet, PID 21444, for full electrical specifications on the Am29F016B in KGD form.

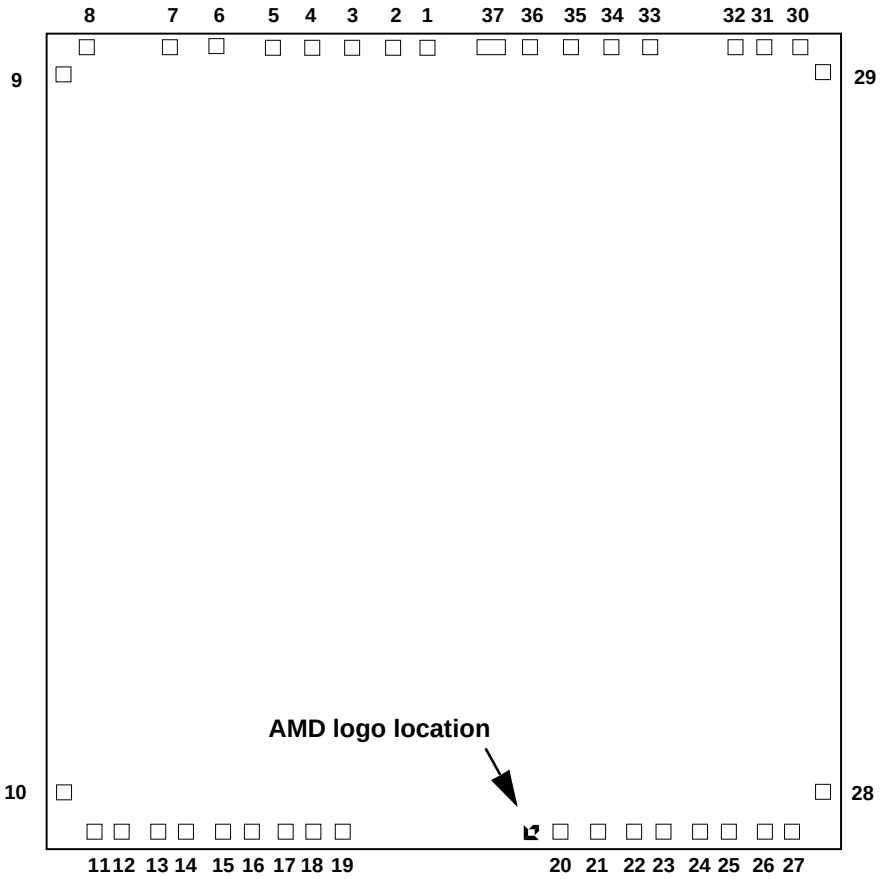
PRODUCT SELECTOR GUIDE

Family Part Number	**Am29F016B KGD**
Speed Option (V_{CC} = 5.0 V ± 10%)	**-120**
Max Access Time, t_{ACC} (ns)	120
Max CE# Access, t_{CE} (ns)	120
Max OE# Access, t_{OE} (ns)	50

DIE PHOTOGRAPH



DIE PAD LOCATIONS



PAD DESCRIPTION

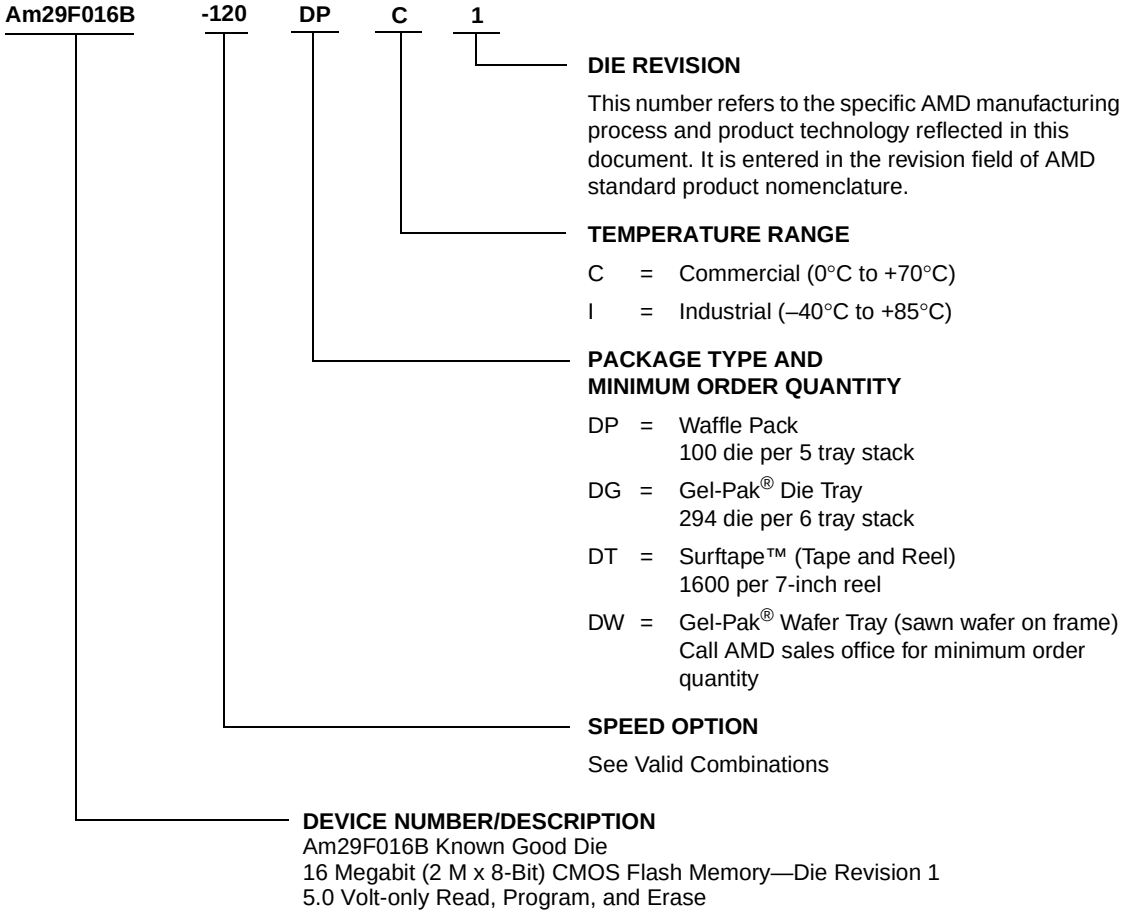
Pad	Signal	Pad Center (mils)		Pad Center (millimeters)	
		X	Y	X	Y
1	V_{CC}	0.00	0.00	0.00	0.00
2	DQ4	–10.60	0.00	–0.27	0.00
3	DQ5	–24.00	0.00	–0.61	0.00
4	DQ6	–37.20	0.00	–0.94	0.00
5	DQ7	–50.50	0.00	–1.28	0.00
6	RY/BY#	–68.90	0.00	–1.75	0.00
7	OE#	–84.20	0.00	–2.14	0.00
8	WE#	–111.80	0.00	–2.84	0.00
9	A20	–119.30	–8.50	–3.03	–0.22
10	A19	–119.30	–245.30	–3.03	–6.23
11	A18	–109.10	–258.20	–2.77	–6.56
12	A17	–100.20	–258.20	–2.55	–6.56
13	A16	–88.20	–258.20	–2.24	–6.56
14	A15	–79.00	–258.20	–2.01	–6.56
15	A14	–67.00	–258.20	–1.70	–6.56
16	A13	–57.80	–258.20	–1.47	–6.56
17	A12	–45.80	–258.20	–1.16	–6.56
18	CE#	–36.60	–258.20	–0.93	–6.56
19	V_{CC}	–27.20	–258.20	–0.69	–6.56
20	RESET#	45.00	–258.20	1.14	–6.56
21	A11	57.20	–258.20	1.45	–6.56
22	A10	69.20	–258.20	1.76	–6.56
23	A9	78.40	–258.20	1.99	–6.56
24	A8	90.60	–258.20	2.30	–6.56
25	A7	99.80	–258.20	2.53	–6.56
26	A6	112.00	–258.20	2.84	–6.56
27	A5	121.10	–258.20	3.08	–6.56
28	A4	131.20	–245.30	3.33	–6.23
29	A3	131.20	–8.50	3.33	–0.22
30	A2	123.80	0.00	3.14	0.00
31	A1	111.90	0.00	2.84	0.00
32	A0	102.40	0.00	2.60	0.00
33	DQ0	74.40	0.00	1.89	0.00
34	DQ1	61.20	0.00	1.55	0.00
35	DQ2	47.90	0.00	1.22	0.00
36	DQ3	34.70	0.00	0.88	0.00
37	V_{SS}	21.70	0.00	0.55	0.00

Note: *The coordinates above are relative to the center of pad 1 and can be used to operate wire bonding equipment.*

ORDERING INFORMATION

Standard Products

AMD standard products are available in several packages and operating ranges. The order number (Valid Combination) is formed by a combination of the following:



Valid Combinations	
Am29F016B-120	DPC 1, DPI 1, DGC 1, DGI 1, DTC 1, DTI 1, DWC 1, DWI 1

Valid Combinations

Valid Combinations list configurations planned to be supported in volume for this device. Consult the local AMD sales office to confirm availability of specific valid combinations and to check on newly released combinations.

PRODUCT TEST FLOW

Figure 1 provides an overview of AMD's Known Good Die test flow. For more detailed information, refer to the Am29F016B product qualification database supplement for KGD. AMD implements quality assurance procedures throughout the product test flow. In addition, an off-line quality monitoring program (QMP) further guarantees AMD quality standards are met on Known Good Die products. These QA procedures also allow AMD to produce KGD products without requiring or implementing burn-in.

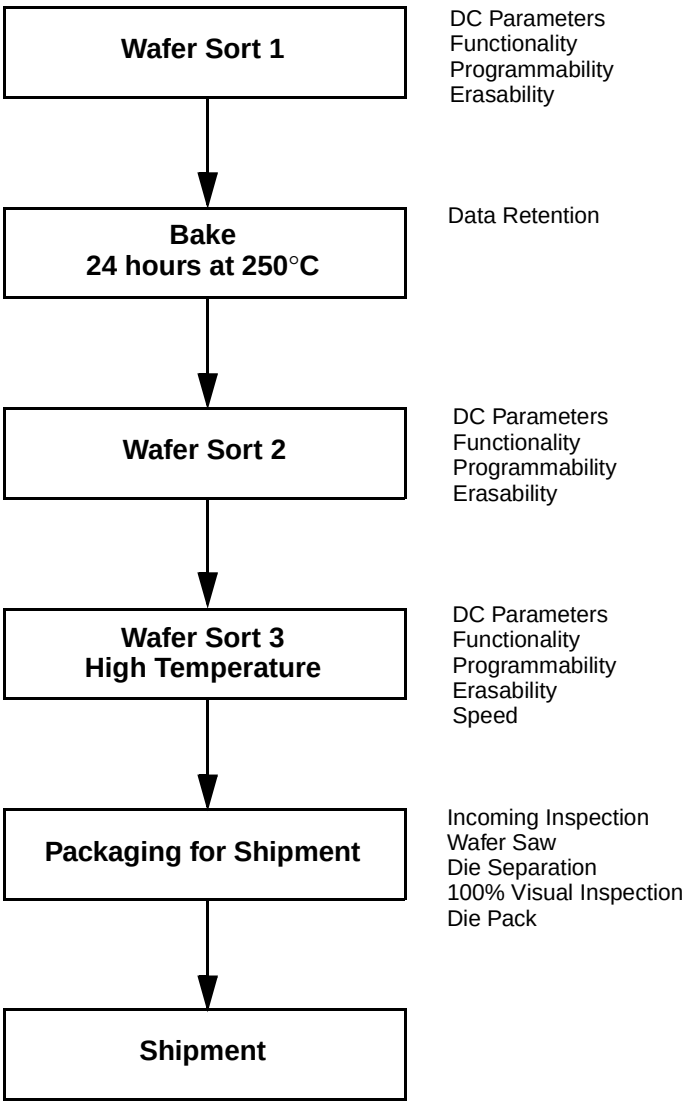


Figure 1. AMD KGD Product Test Flow

PHYSICAL SPECIFICATIONS

Die dimensions, X x Y . . . . . 267 mils x 280 mils
. . . . . 6.78 mm x 7.11 mm

Die Thickness. . . . . ~20 mils

Bond Pad Size . . . . . X3.94 mils x 3.94 mils
. . . . . 100 µm x 100 µm

Pad Area Free of Passivation . . . . . 15.52 $mils^2$
. . . . . 10,000 μm^2

Pads Per Die 37

Bond Pad Metalization . . . . . Al/Cu/Si

Die Backside . . . . . No metal,
may be grounded (optional)

Passivation. . . . . Nitride/SOG/Nitride

DC OPERATING CONDITIONS

V_{CC} (Supply Voltage) . . . . . 4.5 V to 5.5 V

Junction Temperature Under Bias . . T_J (max) = 130°C

Operating Temperature

Commercial . . . . . 0°C to +70°C

Industrial . . . . . –40°C to +85°C

MANUFACTURING INFORMATION

Manufacturing . . . . . FASL

Test . . . . . SDC

Manufacturing ID 98163DK

Preparation for Shipment . . . . . Penang, Malaysia

Fabrication Process CS39

Die Revision 1

SPECIAL HANDLING INSTRUCTIONS

Processing

Do not expose KGD products to ultraviolet light or process them at temperatures greater than 250°C. Failure to adhere to these handling instructions will result in irreparable damage to the devices. For best yield, AMD recommends assembly in a Class 10K clean room with 30% to 60% relative humidity.

Storage

Store at a maximum temperature of 30°C in a nitrogen-purged cabinet or vacuum-sealed bag. Observe all standard ESD handling procedures.

TERMS AND CONDITIONS OF SALE FOR AMD NON-VOLATILE MEMORY DIE

All transactions relating to AMD Products under this agreement shall be subject to AMD's standard terms and conditions of sale, or any revisions thereof, which revisions AMD reserves the right to make at any time and from time to time. In the event of conflict between the provisions of AMD's standard terms and conditions of sale and this agreement, the terms of this agreement shall be controlling.

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REVISION SUMMARY FOR AM29F016B KGD

Valid Combinations

Deleted designators in base part number to top and bottom boot.

Physical Specifications

Clarified X and Y die dimensions

Manufacturing Information

Deleted references to top and bottom boot