

# Am29F200A Known Good Die

2 Megabit (256 K x 8-Bit/128 K x 16-Bit)

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

## DISTINCTIVE CHARACTERISTICS

- **5.0 V  $\pm$  10% for read and write operations**
  - Minimizes system level power requirements
- **High performance**
  - 90 or 120 ns access time
- **Low power consumption**
  - 20 mA typical active read current (byte mode)
  - 28 mA typical active read current for (word mode)
  - 30 mA typical program/erase current
  - 1  $\mu$ A typical standby current
- **Sector erase architecture**
  - One 16 Kbyte, two 8 Kbyte, one 32 Kbyte, and three 64 Kbyte sectors (byte mode)
  - One 8 Kword, two 4 Kword, one 16 Kword, and three 32 Kword sectors (word mode)
  - Supports full chip erase
  - Sector Protection features:
    - A hardware method of locking a sector to prevent any program or erase operations within that sector
    - Sectors can be locked via programming equipment
    - Temporary Sector Unprotect feature allows code changes in previously locked sectors
- **Top or bottom boot block configurations available**
- **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 data at specified addresses
- **Minimum 100,000 write/erase cycles guaranteed**
- **Compatible with JEDEC standards**
  - Pinout and software compatible with single-power-supply flash
  - Superior inadvertent write protection
- **Data# Polling and Toggle Bit**
  - Detects program or erase cycle completion
- **Ready/Busy# output (RY/BY#)**
  - Hardware method for detection of program or erase cycle completion
- **Erase Suspend/Resume**
  - Supports reading data from a sector not being erased
- **Hardware RESET# pin**
  - Resets internal state machine to the reading array data
- **Tested to datasheet specifications at temperature**
- **Quality and reliability levels equivalent to standard packaged components**

## GENERAL DESCRIPTION

The Am29F200A in Known Good Die (KGD) form is a 2 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.

### Am29F200A Features

The Am29F200A is organized as 262,144 bytes of 8 bits each or 131,072 words of 16 bits each. The 8-bit data appears on DQ0-DQ7; the 16-bit data appears on DQ0-DQ15. 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 standard Am29F200A in KGD form offers an access time of 90 or 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 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.

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 other Flash or EPROM devices.

Device programming occurs by executing the program command sequence. This initiates the **Embedded Program** algorithm—an internal algorithm that automatically times the program pulse widths and verifies proper cell margin.

Device erasure occurs by executing the erase command sequence. This initiates the **Embedded Erase** algorithm—an internal algorithm that automatically preprograms the array (if it is not already pro-

grammed) before executing the erase operation. During erase, the device automatically times the erase pulse widths and verifies proper cell margin.

The host system can detect whether a program or erase operation is complete by observing the RY/BY# pin, or by reading the DQ7 (Data# Polling) and DQ6/DQ2 (toggle) **status bits**. After a program or erase cycle has been completed, the device is ready to read array data or accept another command.

The **sector erase architecture** allows memory sectors to be erased and reprogrammed without affecting the data contents of other sectors. The device is fully erased when shipped from the factory.

**Hardware data protection** measures include a low  $V_{CC}$  detector that automatically inhibits write operations during power transitions. The **hardware sector protection** feature disables both program and erase operations in any combination of the sectors of memory. This can be achieved via programming equipment.

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

The **hardware RESET# pin** terminates any operation in progress and resets the internal state machine to reading array data. The RESET# pin may be tied to the system reset circuitry. A system reset would thus also reset the device, enabling the system microprocessor to read the boot-up firmware from the Flash memory.

The system can place the device into the **standby mode**. Power consumption is greatly reduced in this mode.

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 data is programmed using hot electron injection.

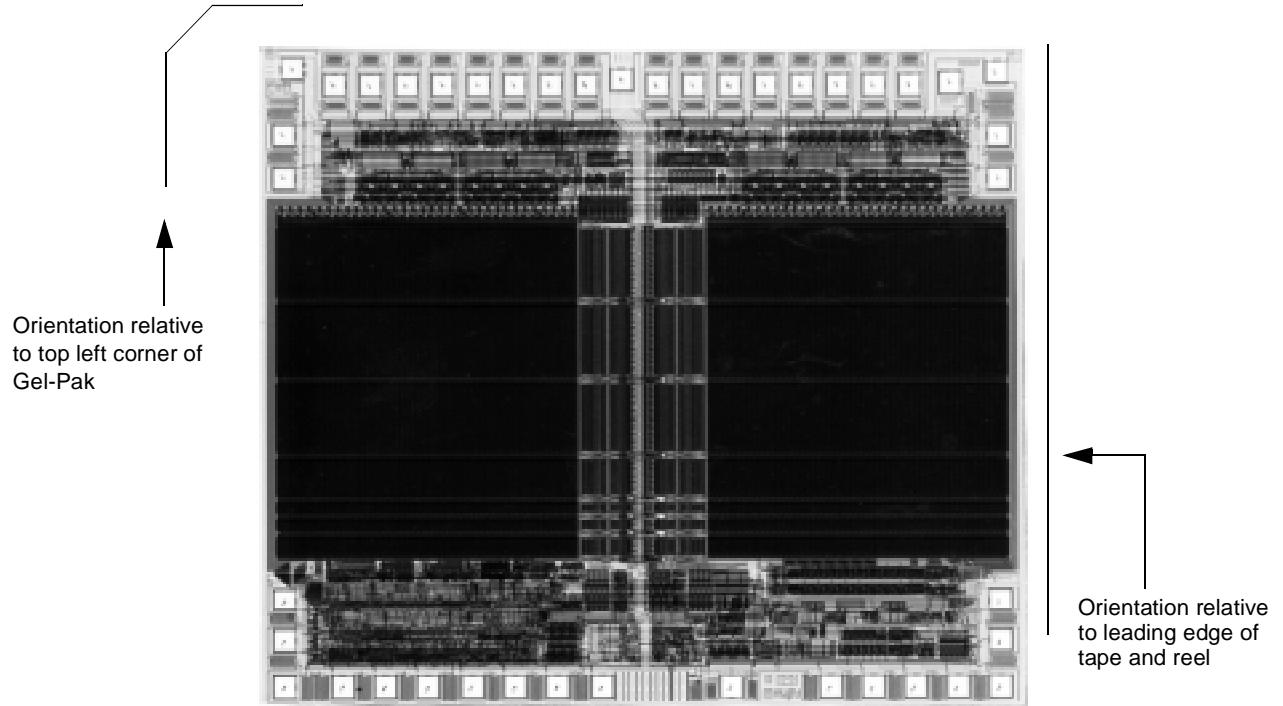
## ELECTRICAL SPECIFICATIONS

Refer to the Am29F200A data sheet, publication number 20380, for full electrical specifications on the Am29F200A.

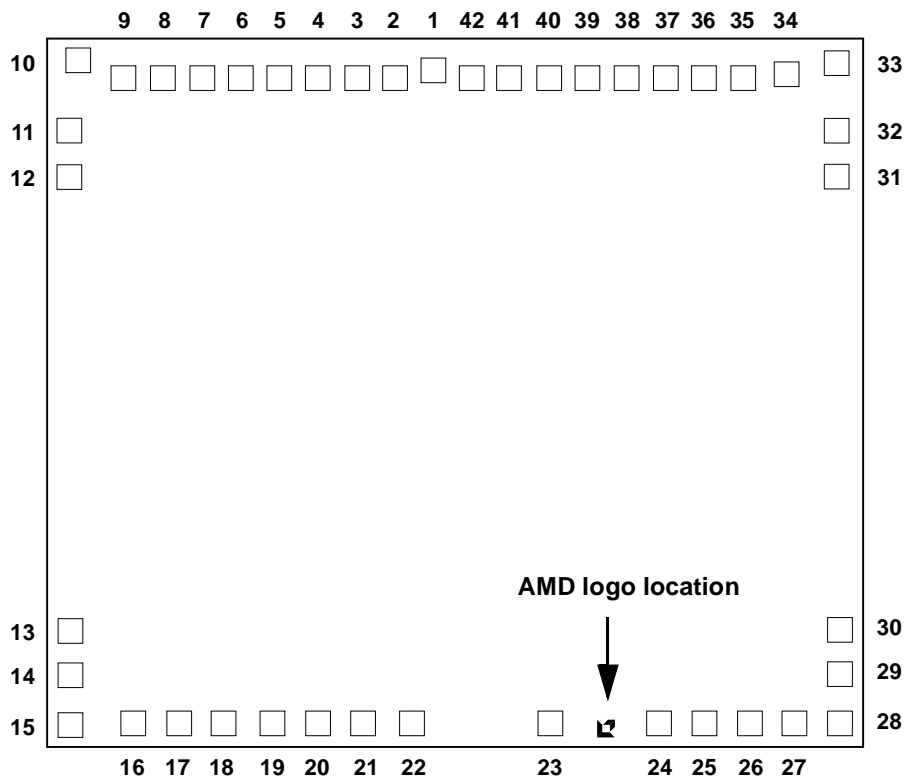
## PRODUCT SELECTOR GUIDE

Family Part Number	Am29F200A KGD	
	-90	-120
Speed Option ( $V_{CC} = 5.0 \text{ V} \pm 10\%$ )		
Max access time, ns ( $t_{ACC}$ )	90	120
Max CE# access time, ns ( $t_{CE}$ )	90	120
Max OE# access time, ns ( $t_{OE}$ )	35	50

**DIE PHOTOGRAPH**



**DIE PAD LOCATIONS**



## PAD DESCRIPTION

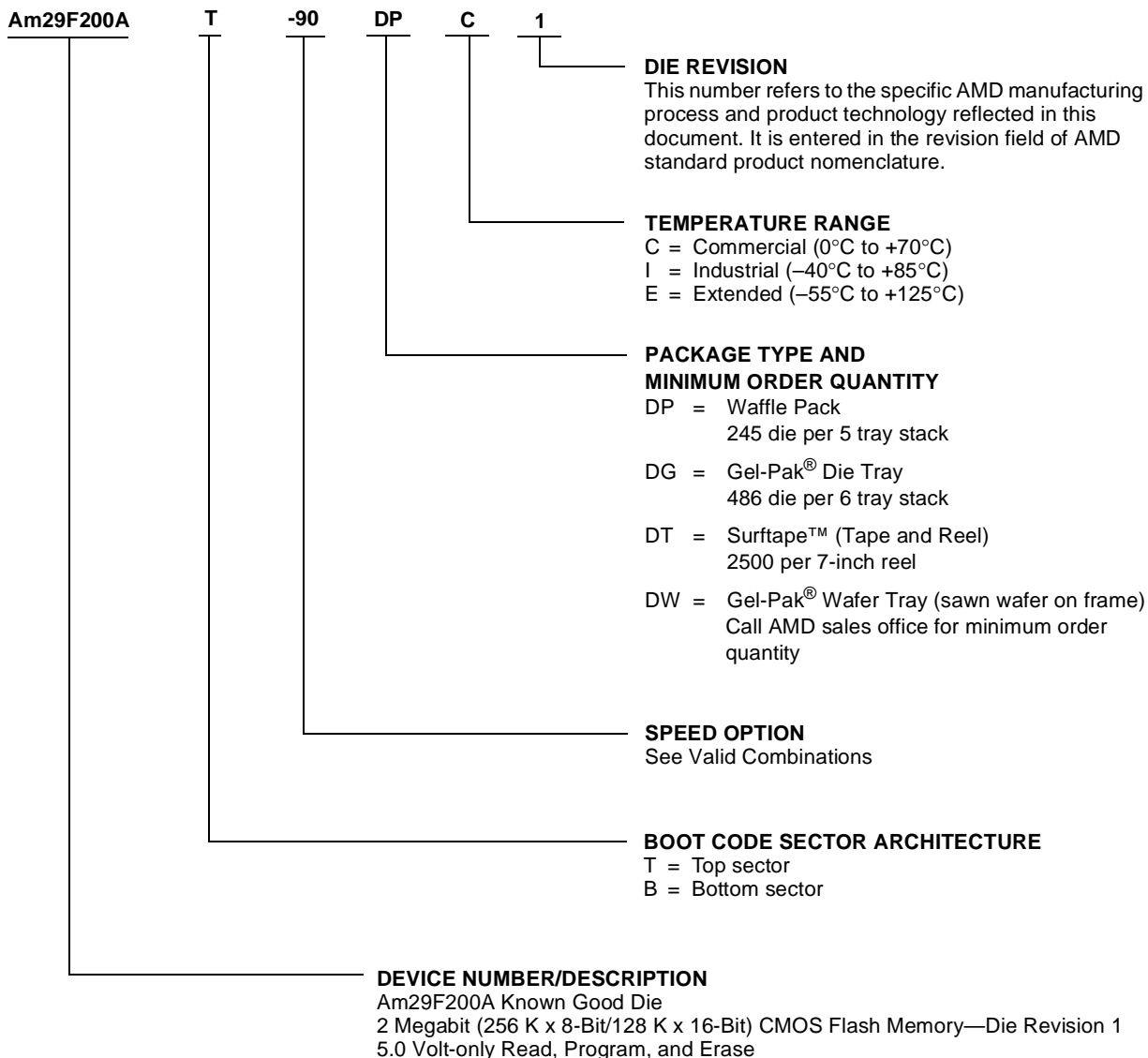
Pad	Signal	Pad Center (mils)		Pad Center (millimeters)	
		X	Y	X	Y
1	V <sub>CC</sub>	0.0	0.0	0.0000	0.0000
2	DQ4	8.5	-1.2	-0.2159	-0.0305
3	DQ12	-17.3	-1.2	-0.4394	-0.0305
4	DQ5	-26.1	-1.2	-0.6629	-0.0305
5	DQ13	-34.9	-1.2	-0.8865	-0.0305
6	DQ6	-43.6	-1.2	-1.1074	-0.0305
7	DQ14	-52.4	-1.2	-1.3310	-0.0305
8	DQ7	-61.2	-1.2	-1.5545	-0.0305
9	DQ15/A-1	-69.9	-1.2	-1.7755	-0.0305
10	V <sub>SS</sub>	-80.2	2.7	-2.0371	0.0686
11	BYTE#	-82.3	-13.5	-2.0904	-0.3429
12	A16	-82.3	-24.1	-2.0904	-0.6121
13	A15	-82.3	-128.4	-2.0904	-3.2614
14	A14	-82.3	-138.7	-2.0904	-3.5230
15	A13	-82.3	-150.0	-2.0904	-3.8100
16	A12	-68.2	-150.0	-1.7323	-3.8100
17	A11	-57.9	-150.0	-1.4707	-3.8100
18	A10	-47.6	-150.0	-1.2090	-3.8100
19	A9	-36.7	-150.0	-0.9322	-3.8100
20	A8	-26.4	-150.0	-0.6706	-3.8100
21	WE#	-16.1	-150.0	-0.4089	-3.8100
22	RESET#	-5.2	-150.0	-0.1321	-3.8100
23	RY/BY#	26.1	-150.0	0.6629	-3.8100
24	A7	50.2	-150.0	1.2751	-3.8100
25	A6	60.5	-150.0	1.5367	-3.8100
26	A5	70.8	-150.0	1.7983	-3.8100
27	A4	81.1	-150.0	2.0599	-3.8100
28	A3	91.4	-150.0	2.3216	-3.8100
29	A2	91.5	-138.7	2.3241	-3.5230
30	A1	91.5	-128.4	2.3241	-3.2614
31	A0	91.5	-24.1	2.3241	-0.6121
32	CE#	91.5	-13.6	2.3241	-0.3454
33	V <sub>SS</sub>	91.1	1.8	2.3139	0.0457
34	OE#	79.8	-0.7	2.0269	-0.0178
35	DQ0	70.0	-1.2	1.7780	-0.0305
36	DQ8	61.3	-1.2	1.5570	-0.0305
37	DQ1	52.5	-1.2	1.3335	-0.0305
38	DQ9	43.7	-1.2	1.1100	-0.0305
39	DQ2	34.9	-1.2	0.8865	-0.0305
40	DQ10	26.2	-1.2	0.6655	-0.0305
41	DQ3	17.4	-1.2	0.4420	-0.0305
42	DQ11	8.6	-1.2	0.2184	-0.0305

**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	
Am29F200AT-90, Am29F200AB-90	DPC 1, DPI 1, DPE 1, DGC 1, DGI 1, DGE 1,
Am29F200AT-120, Am29F200AB-120	DTC 1, DTI 1, DTE 1, DWC 1, DWI 1, DWE 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 Am29F200A 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.

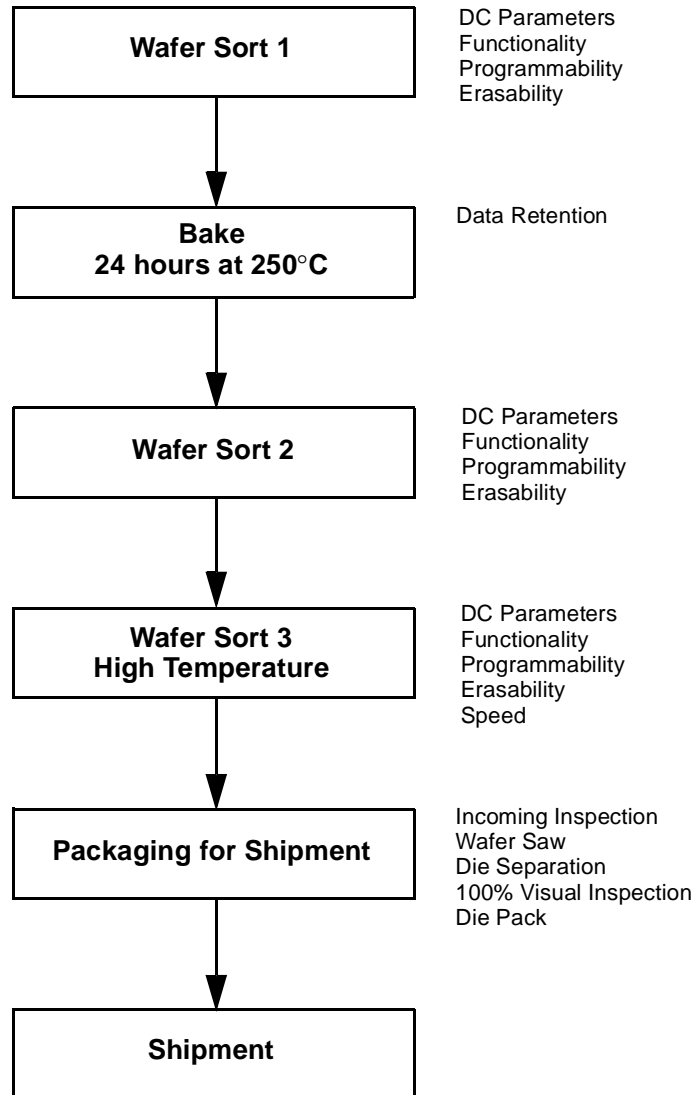


Figure 1. AMD KGD Product Test Flow

**PHYSICAL SPECIFICATIONS**

Die dimensions	191 mils x 174 mils
	4.85 mm x 4.42 mm
Die Thickness	~20 mils
Bond Pad Size	4.55 mils x 4.55 mils
	115.6 $\mu\text{m}$ x 115.6 $\mu\text{m}$
Pad Area Free of Passivation	20.70 mils <sup>2</sup>
	13,363 $\mu\text{m}^2$
Pads Per Die	42
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
Extended	-55°C to +125°C

**MANUFACTURING INFORMATION**

Manufacturing	FASL
Test	SDC
Manufacturing ID (Top Boot)	98483AK
(Bottom Boot)	98483ABK
Preparation for Shipment	Penang, Malaysia
Fabrication Process	CS29AF
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.

AMD warrants articles of its manufacture against defective materials or workmanship for a period of ninety (90) days from date of shipment. This warranty does not extend beyond AMD's customer, and does not extend to die which has been affixed onto a board or substrate of any kind. The liability of AMD under this warranty is limited, at AMD's option, solely to repair or to replacement with equivalent articles, or to make an appropriate credit adjustment not to exceed the original sales price, for articles returned to AMD, provided that: (a) The Buyer promptly notifies AMD in writing of each and every defect or nonconformity in any article for which Buyer wishes to make a warranty claim against AMD; (b) Buyer obtains authorization from AMD to return the article; (c) the article is returned to AMD, transportation charges paid by AMD, F.O.B. AMD's factory; and (d) AMD's examination of such article discloses to its satisfaction that such alleged defect or nonconformity actually exists and was not caused by negligence, misuse, improper installation, accident or unauthorized repair or alteration by an entity other than AMD. The aforementioned provisions do not extend the original warranty period of any article which has either been repaired or replaced by AMD.

THIS WARRANTY IS EXPRESSED IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING THE IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, THE IMPLIED WARRANTY OF MERCHANTABILITY AND OF ALL OTHER OBLIGATIONS OR LIABILITIES ON AMD'S PART, AND IT NEITHER ASSUMES NOR AUTHORIZES ANY OTHER PERSON TO ASSUME FOR AMD ANY OTHER LIABILITIES. THE FOREGOING CONSTITUTES THE BUYERS SOLE AND EXCLUSIVE REMEDY FOR THE FURNISHING OF DEFECTIVE OR NON CONFORMING ARTICLES AND AMD SHALL NOT IN ANY EVENT BE LIABLE FOR DAMAGES BY REASON OF FAILURE OF ANY PRODUCT TO FUNCTION PROPERLY OR FOR ANY SPECIAL, INDIRECT, CONSEQUENTIAL, INCIDENTAL OR EXEMPLARY DAMAGES, INCLUDING BUT NOT LIMITED TO, LOSS OF PROFITS, LOSS OF USE OR COST OF LABOR BY REASON OF THE FACT THAT SUCH ARTICLES SHALL HAVE BEEN DEFECTIVE OR NON CONFORMING.

Buyer agrees that it will make no warranty representations to its customers which exceed those given by AMD to Buyer unless and until Buyer shall agree to indemnify AMD in writing for any claims which exceed AMD's warranty. Buyer assumes all responsibility for successful die prep, die attach and wire bonding processes. Due to the unprotected nature of the AMD Products which are the subject hereof, AMD assumes no responsibility for environmental effects on die.

AMD products are not designed or authorized for use as components in life support appliances, devices or systems where malfunction of a product can reasonably be expected to result in a personal injury. Buyer's use of AMD products for use in life support applications is at Buyer's own risk and Buyer agrees to fully indemnify AMD for any damages resulting in such use or sale.

## REVISION SUMMARY FOR AM29F200A KNOWN GOOD DIE

Formatted to match current template. Updated Distinctive Characteristics and General Description sections using the current main data sheet.

### Trademarks

Copyright © 1998 Advanced Micro Devices, Inc. All rights reserved.

AMD, the AMD logo, and combinations thereof are registered trademarks of Advanced Micro Devices, Inc.

Product names used in this publication are for identification purposes only and may be trademarks of their respective companies.