Am29F010B KGD

Data Sheet

July 2003

The following document specifies 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 datasheet as a result of offering the device as a Spansion product. Any changes that have been made are the result of normal datasheet improvement 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.

Publication Number **23479** Revision **A** Amendment **0** Issue Date **October 23, 2003**

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SUPPLEMENT

Am29F010B Known Good Die

1 Megabit (128 K x 8-Bit)

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

DISTINCTIVE CHARACTERISTICS

- **Single power supply operation**
  - 5.0 V ± 10% for read, erase, and program operations
  - Simplifies system-level power requirements
- **Manufactured on 0.32 µm process technology**
  - Compatible with Am29F010 and Am29F010A device
- **High performance**
  - 90 or 120 ns maximum access time
- **Low power consumption**
  - 12 mA typical active read current
  - 30 mA typical program/erase current
  - <1 µA typical standby current
- **Flexible sector architecture**
  - Eight uniform sectors
  - Any combination of sectors can be erased
  - Supports full chip erase
- **Sector protection**
  - Hardware-based feature that disables/re-enables program and erase operations in any combination of sectors
  - Sector protection/unprotection can be implemented using standard PROM programming equipment
- **Embedded Algorithms**
  - Embedded Erase algorithm automatically pre-programs and erases the chip or any combination of designated sector
  - Embedded Program algorithm automatically programs and verifies data at specified address
- **Erase Suspend/Resume**
  - Supports reading data from a sector not being erased
- **Minimum 1,000,000 program/erase cycles guaranteed**
- **20-year data retention at 125°C**
  - Reliable operation for the life of the system
- **Compatible with JEDEC standards**
  - Pinout and software compatible with single-power-supply flash
  - Superior inadvertent write protection
- **Data# Polling and Toggle Bits**
  - Provides a software method of detecting program or erase cycle completion
- **Tested to datasheet specifications at temperature**
- **Quality and reliability levels equivalent to standard packaged components**

Publication# **23479** Rev: **A** Amendment/**0**
Issue Date: **October 23, 2003**

GENERAL DESCRIPTION

The Am29F010B in Known Good Die (KGD) form is a 1 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.

The Am29F010B is a 1 Mbit, 5.0 Volt-only Flash memory organized as 131,072 bytes. The Am29F010B is offered in 32-pin PDIP, PLCC and TSOP packages. The byte-wide data appears on DQ0-DQ7. The 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 or erased in standard EPROM programmers.

This device is manufactured using AMD's 0.32 µm process technology, and offers all the features and benefits of the Am29F010 and Am29F010A.

The standard device offers access times of 45, 55, 70, 90, and 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 invokes 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 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 host system can detect whether a program or erase operation is complete by reading the DQ7 (Data# Polling) and DQ6 (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 erased when shipped from the factory.

The **hardware data protection** measures include a low V_{CC} detector 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, and is implemented using standard EPROM programmers.

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 bytes are programmed one byte at a time using the EPROM programming mechanism of hot electron injection.

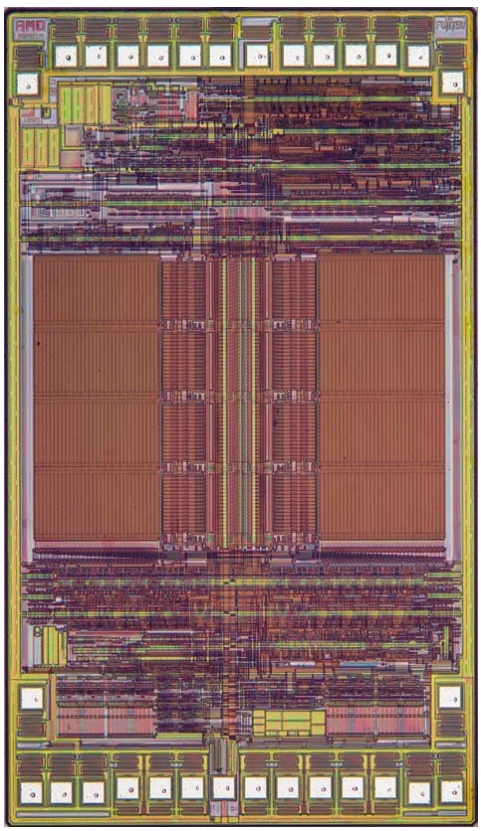
Electrical Specifications

Refer to the Am29F010B data sheet, publication number 22336, for full electrical specifications for the Am29F010B in KGD form.

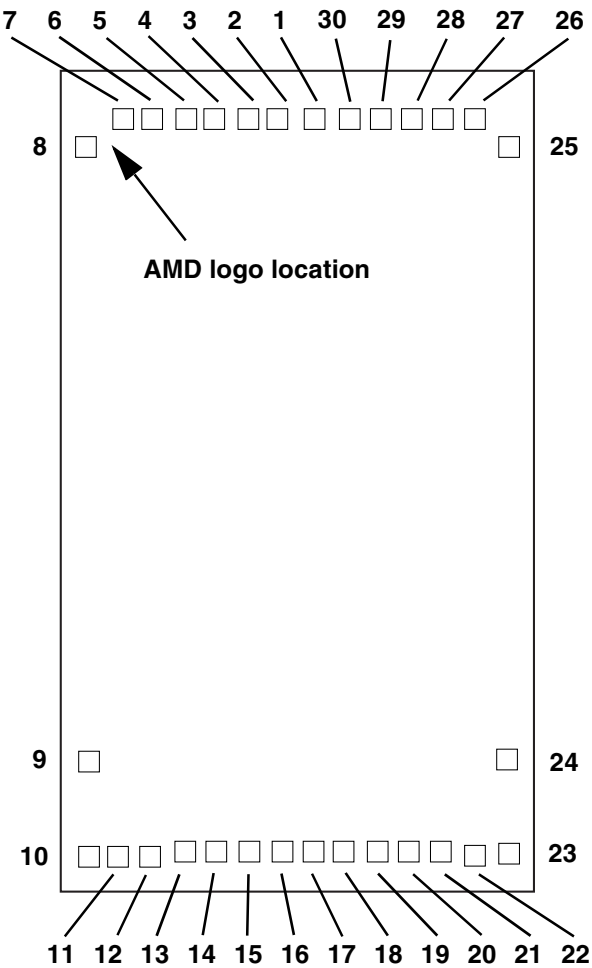
PRODUCT SELECTOR GUIDE

Family Part Number	Am29F010B KGD	
Speed Option (V_{CC} = 5.0 V ± 10%)	**-90**	**-120**
Max Access Time, t_{ACC} (ns)	90	120
Max CE# Access, t_{CE} (ns)	90	120
Max OE# Access, t_{OE} (ns)	35	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	A16	–6.78	0.00	–0.17	0.00
3	A15	–12.20	0.00	–0.31	0.00
4	A12	–18.03	0.00	–0.46	0.00
5	A7	–23.46	0.00	–0.60	0.00
6	A6	–29.29	0.00	–0.74	0.00
7	A5	–34.72	0.00	–0.88	0.00
8	A4	–41.75	–5.01	–1.06	–0.13
9	A3	–41.14	–116.93	–1.04	–2.97
10	A2	–41.30	–134.13	–1.05	–3.41
11	A1	–35.88	–134.13	–0.91	–3.41
12	A0	–30.04	–134.13	–0.76	–3.41
13	D0	–23.81	–133.31	–0.60	–3.39
14	D1	–17.89	–133.31	–0.45	–3.39
15	D2	–12.06	–133.31	–0.31	–3.39
16	V_{SS}	–6.40	–133.31	–0.16	–3.39
17	D3	–0.59	–133.31	–0.01	–3.39
18	D4	5.25	–133.31	0.13	–3.39
19	D5	11.16	–133.31	0.28	–3.39
20	D6	17.00	–133.31	0.43	–3.39
21	D7	22.92	–133.31	0.58	–3.39
22	CE#	29.09	–134.37	0.74	–3.41
23	A10	35.02	–134.13	0.89	–3.41
24	OE#	34.68	–116.93	0.88	–2.97
25	A11	35.45	–5.01	0.90	–0.13
26	A9	29.27	–0.25	0.74	–0.01
27	A8	23.34	0.00	0.59	0.00
28	A13	17.92	0.00	0.46	0.00
29	A14	12.08	0.00	0.31	0.00
30	WE#	6.66	0.00	0.17	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 KGD products are available in several packages and operating ranges. The order number (Valid Combination) is formed by a combination of the following:

Am29F010B -90 DP C 1

DIE REVISION
This number refers to the specific AMD manufacturing process and product technology reflected in this document. 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)

PACKAGE TYPE AND MINIMUM ORDER QUANTITY
DP =Waffle Pack
400 die per 5 tray stack
DG =Gel-Pak® Die Tray
648 die per 6 tray stack
DT =Surftape™ (Tape and Reel)
2500 per 7-inch reel
DW = Gel-Pak® Wafer Tray (sawn wafer on frame)
Call AMD sales office for minimum order quantity

SPEED OPTION
See Product Selector Guide and Valid Combinations

DEVICE NUMBER/DESCRIPTION
Am29F010B Known Good Die
1 Megabit (128 K x 8-Bit) CMOS Flash Memory—Die Revision 1
5.0 Volt-only Program and Erase

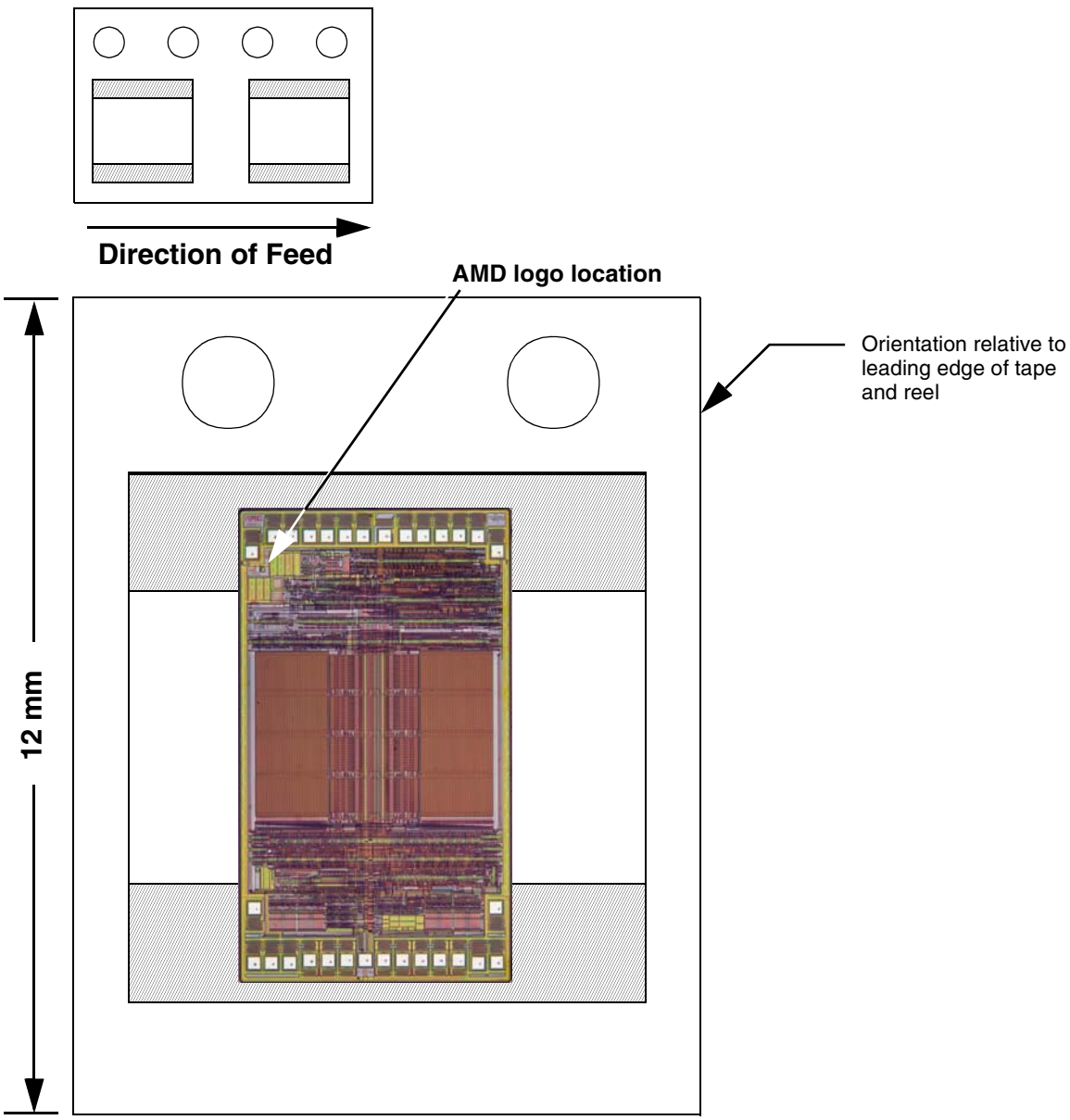
Valid Combinations	
AM29F010B-90	DPC 1, DPI 1, DPE 1, DGC 1, DGI 1, DGE 1, DTC 1, DTI 1, DTE 1, DWC 1, DWI 1, DWE 1
AM29F010B-120	

Valid Combinations

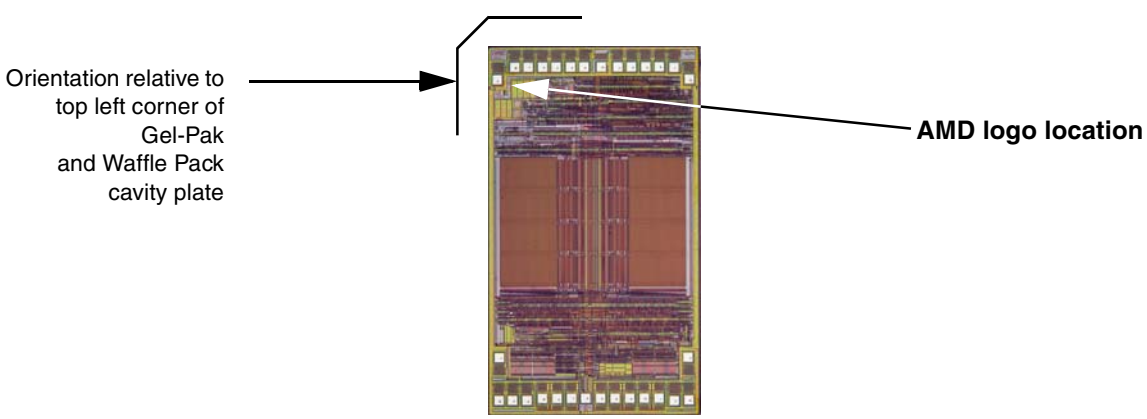
Valid Combinations list configurations planned to be supported in volume for this device. Consult the local AMD sales office to confirm availability of specific valid combinations and to check on newly released combinations.

PACKAGING INFORMATION

Surftape Packaging



Gel-Pak and Waffle Pack Packaging



PRODUCT TEST FLOW

Figure 1 provides an overview of AMD's Known Good Die test flow. For more detailed information, refer to the Am29F010B 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.

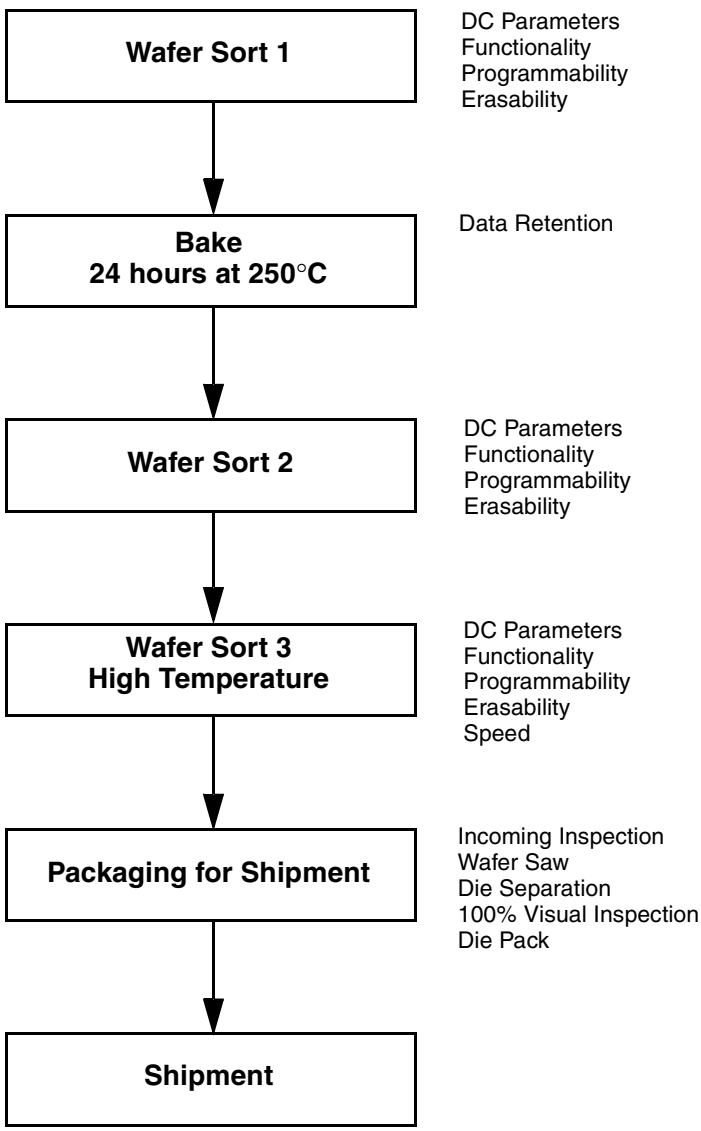


Figure 1. AMD KGD Product Test Flow

PHYSICAL SPECIFICATIONS

Die dimensions . . . . . 90 mils x 159 mils
2.28 mm x 4.04 mm

Die Thickness. . . . . ~20 mils or ~500 µm

Bond Pad Size . . . . . 4.69 mils x 4.69 mils
115.9 µm x 115.9 µm

Pad Area Free of Passivation . . . . . 13.96 $mils^2$
9,025 μm^2

Pads Per Die 30

Bond Pad Metalization . . . . . Al/Cu

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

Passivation . . . . . SiN/SOG/SiN

DC OPERATING CONDITIONS

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

Junction Temperature Under Bias . . T_J (max) = 130°C
For Read-only . . . . . T_J (max) = 140°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

Wafer Sort Test . . . . . Sunnyvale, CA, USA
. . . . . and Penang, Malaysia

Manufacturing ID. 98A01

Preparation for Shipment . . . . . Penang, Malaysia

Fabrication Process CS39S

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 unpackaged die 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 unpackaged die of its manufacture ("Known Good Die" or "Die") against defective materials or workmanship for a period of one (1) year from date of shipment. This warranty does not extend beyond the first purchaser of said Die. Buyer assumes full responsibility to ensure compliance with the appropriate handling, assembly and processing of Known Good Die (including but not limited to proper Die preparation, Die attach, wire bonding and related assembly and test activities), and compliance with all guidelines set forth in AMD's specifications for Known Good Die, and AMD assumes no responsibility for environmental effects on Known Good Die or for any activity of Buyer or a third party that damages the Die due to improper use, abuse, negligence, improper installation, accident, loss, damage in transit, or unauthorized repair or alteration by a person or entity other than AMD ("Warranty Exclusions").

The liability of AMD under this warranty is limited, at AMD's option, solely to repair the Die, to send replacement Die, or to make an appropriate credit adjustment or refund in an amount not to exceed the original purchase price actually paid for the Die returned to AMD, provided that: (a) AMD is promptly notified by Buyer in writing during the applicable warranty period of any defect or nonconformity in the Known Good Die; (b) Buyer obtains authorization from AMD to return the defective Die; (c) the defective Die is returned to AMD by Buyer in accordance with AMD's shipping instructions set forth below; and (d) Buyer shows to AMD's satisfaction that such alleged defect or nonconformity actually exists and was not caused by any of the above-referenced Warranty Exclusions. Buyer shall ship such defective Die to AMD via AMD's carrier, collect. Risk of loss will transfer to AMD when the defective Die is provided to AMD's carrier. If Buyer fails to adhere to these warranty returns guidelines, Buyer shall assume all risk of loss and shall pay for all freight to AMD's specified location. The aforementioned provisions do not extend the original warranty period of any Known Good Die that has either been repaired or replaced by AMD.

WITHOUT LIMITING THE FOREGOING, EXCEPT TO THE EXTENT THAT AMD EXPRESSLY WARRANTS TO BUYER IN A SEPARATE AGREEMENT SIGNED BY AMD, AMD MAKES NO WARRANTY WITH RESPECT TO THE DIE'S PROCESSING OF DATE DATA, AND SHALL HAVE NO LIABILITY FOR DAMAGES OF ANY KIND, UNDER EQUITY, LAW, OR ANY OTHER THEORY, DUE TO THE FAILURE OF SUCH KNOWN GOOD DIE TO PROCESS ANY PARTICULAR DATA CONTAINING DATES, INCLUDING DATES IN AND AFTER THE YEAR 2000, WHETHER OR NOT AMD RECEIVED NOTICE OF THE POSSIBILITY OF SUCH DAMAGES.

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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.

Known Good Die are not designed or authorized for use as components in life support appliances, devices or systems where malfunction of the Die can reasonably be expected to result in a personal injury. Buyer's use of Known Good Die 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

Revision A+1 (August 4, 2000)

Physical Specifications

Deleted Si from bond pad metalization specification.

Revision A+2 (June 27, 2001)

Added Penang, Malaysia, as a test facility (ACN 2016).

Publication Number 23479

Revision A (October 23, 2003)

Changed publication number for document.

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