世界微处理器与微控制器 第三卷

WORLD MICROPROCESSOR & MICROCONTROLLER Volume Ⅲ

——电路数据手册

電子工業出版社

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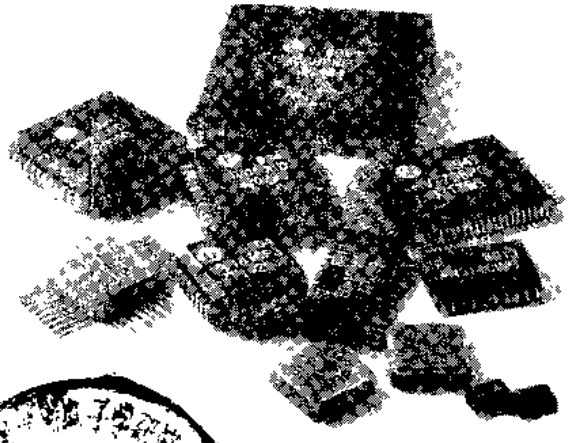

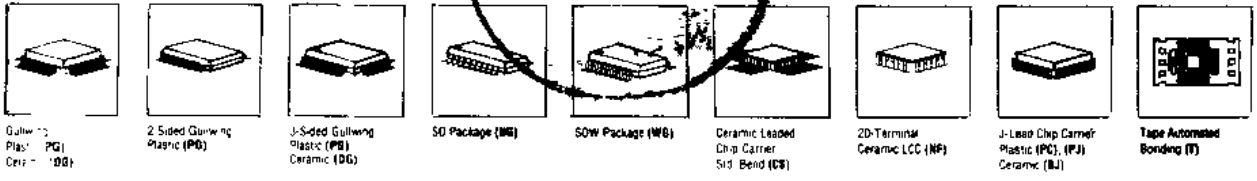

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内 容 提 要

本书收集了 INTEL、MOTORALA、TI、AMD、NSC、SIEMENS 等世界知名厂商生产的二十二位微处理器及部分微控制器，资料均取材于各厂商的 OEM 手册，数据翔实准确，资料新颖全面，并直接采用原文，避免因翻译而引起的失真。为了便于读者快速阅读和浏览，在每章的开头，都有一个简单的中文简介，言简意赅地描述了本章所介绍的微处理器或控制器的主要特性。

本书可供科研院所的科研人员、大专院校师生在科研学习过程中作为参考书使用，也可供系统维护及维修人员、硬件营销人员参考。

世界微处理器与微控制器
第三卷
三十二位机
顺年选编
责任编辑　韩瑞宗

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编 者 的 话

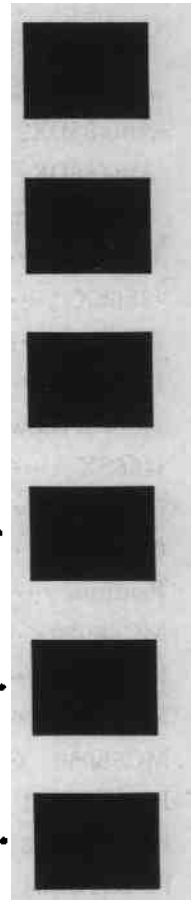
随着计算机产业的蓬勃发展，作为计算机心脏的微处理器的应用越来越广泛，从家用电器到航空航天事业，无处不用到微处理器和微控制器。而国内的科研人员面对浩若繁星的国外各厂商的微处理器，常有茫然不知所措之感觉。有鉴于此，为了帮助国内科研人员对世界各大厂商生产的微处理器有一个全面的了解，北京瑞特电子技术公司集多年器件、信息资料服务之经验，凭借与国外各大厂商之密切关系，搜集国外最新资料，与电子工业出版社通力合作，编纂而成这套《世界微处理器集锦》，以奉献给国内读者。本书编排思想以最新、最全、最实用为主旨，紧跟国际潮流，适应国内需求，力求能解决读者在工作中遇到的实际问题，在选型上力求全而新，以扩大读者的视野，在此基础上，侧重国内外流行的微处理器，并注重当前流行的"绿色浪潮"，较多的选用了一些低功耗，高集成度，小型化的型号，另外，根据国内客观环境和市场调研，本书也注意选用一些军用、工业用抗恶劣环境的高性能微处理器。

另外，在此书成书之前，我们作了大量的调查研究工作，广泛听取了用户和科研人员的意见和建议，吸取了国内其他单位编写同类书刊的经验，根据此书读者的知识结构和外语水平，在内容上大胆采用OEM手册中的原文，以避免因翻译而引起失真和笔误。这样作会给部分读者造成阅读上的困难，在此深表抱歉。

因时间仓促，且编者能力有限，本书必有不少不尽人意之处，望各界同仁通过书后所附意见反馈表提出宝贵意见和建议，以期我们进一步改进。

编　　者

公司索引



型号索引

第一章
先进微器件公司(AMD)

本章介绍 AMD 公司 32 位微处理器,其中包括 Am386DX/DXL、Am386SX/SXL,和 Am486DX2、Am486DX,以及 Am29K 系列。

Am386DX/DXL 是一种高性能、低功耗 32 位微处理器,它是专为低功耗台式机和带后备电池便携机而设计的。它的主要特点如下:

- 便携机标准
  - —真正的静态设计,时钟频率可从最大 40MHz 降低到 0MHz,从而延长电池寿命
  - —等待状态典型电流值小于 20μA
  - —工作电流典型值为 210mA(33MHz)
  - 功耗低于 Intel 386DX 和 386SX
  - 采用 132 引脚 PQFP 封装
- 台式机标准
  - —40、33、25、20MHz 四种工作频率
  - —散热少,允许系统设计者去掉或缩小风扇,从而节省成本,降低噪声
- 与 386DX 系统和软件完全兼容
- 支持 387DX 兼容的算术协处理器
- 采用 AMD 先进的 0.8 微米 CMOS 处理技术

Am386SX/SXL 是采用 16 位外部数据总线和 24 位外部地址总线的高性能 32 位微处理器。它的主要特点如下:

- 工作频率:40、33、25、20MHz
- 在便携机系统中真正实现静态设计
  - —0MHz(DC)的最小频率
  - —等待状态典型电流值小于 20μA
  - 工作电流典型值小于 165μA(20MHz)
- 低散热,在台式机中可减少风扇系统
- 100 引脚 PQFP 封装

Am486DX2 的主要特性如下:

- 完全 32 位结构;
- 高集成度:片内集成有 8KB 代码和数据高速缓存,以及分页式虚拟存储管理单元
- 高性能设计:
  - 常用指令执行速度为一个时钟周期

--50MHz 时钟频率

80MB/S 峰值总线数传率(频率为 25MHz)

-0.7 微米 CMOS 处理技术

动态总线大小(8、16、32 位)

- 多处理器支持能力:

多处理器指令

—Cache —致性协议

支持二级 Cache

- 标准 168 引脚 PGA 封装

Am486DX 的主要特性如下:

- 完全 32 位结构
- 高集成度:片内集成有 8KB 代码和数据高速缓存、浮点运算单元、以及分页式虚拟存储管理单元
- 高性能设计:33MHz 和 40MHz 时钟频率
- 多处理器支持能力
- 168 引脚 PGA 封装

AMD29K 系列微处理器包括 Am29000、Am29005、Am29050、Am29030 和 Am29035,它们主要应用于嵌入式和分布式智能系统之中,如激光打印机、图形系统、网络环境、以及高速外部设备和通讯设备等,其主要特点如下:

- 32 位 RISC 结构
- 优越的性能价格比
- 先进的 CMOS 处理技术
- 高集成度,便于系统设计
- 广泛的软件和硬件开发工具

FINAL

Am386™DX/DXL

High-Performance, Low-Power, 32-Bit Microprocessor

Advanced Micro Devices

DISTINCTIVE CHARACTERISTICS

- **Ideal for portable PCs**
  - — True static design for long battery life (Am386DXL microprocessor)
  - —Typical standby I_{CC} < 20 µA at DC (0 MHz) (Am386DXL microprocessor)
  - —Typical operating I_{CC} = 210 mA at 33 MHz
  - —Lower power consumption than Intel i386DX or Intel i386SX
  - —Small footprint 132-pin PQFP package
  - —Wide range of chip sets and BIOS available to support standby mode capabilities
  - —Performance on demand (0 to 40 MHz)
- **Ideal for desktop PCs**
  - —40-, 33 , 25 , and 20-MHz operating speeds
  - —Lower heat dissipation facilitates fan reduction or elimination for cost savings and noise reduction
  - —Pin-for-pin replacement for Intel i386DX
- **Compatible with 386DX systems and software**
- **Supports 387DX-compatible math coprocessors**
- **AMD advanced 0.8 micron CMOS technology**

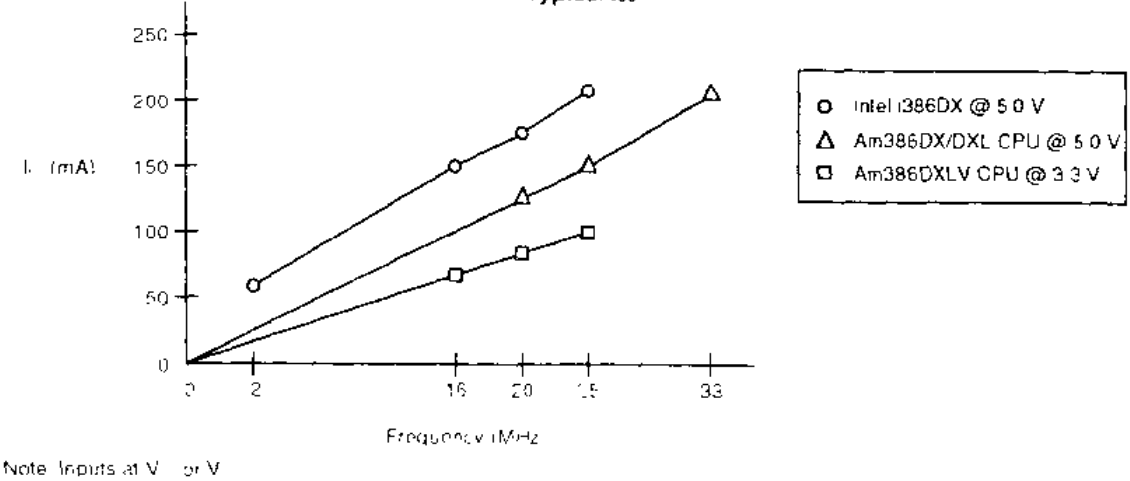
GENERAL DESCRIPTION

The Am386DX/DXL microprocessor is a high-speed, true static implementation of the Intel i386DX microprocessor. It is ideal for both desktop and battery-powered portable personal computers. For desktop PCs, the Am386DXL microprocessor offers a 21% increase in the maximum operating speed from 33 to 40 MHz. Also this device offers lower heat dissipation, allowing system designers to remove or reduce the size and cost of the system cooling fan.

For portables, the Am386DXL microprocessor's true static design offers longer battery life with low operating power consumption and standby mode. At 33 MHz, this device has 40% lower operating I_{CC} than the Intel i386DX. Standby mode allows the Am386DXL microprocessor to be clocked down to 0 MHz (DC) and retain full register contents. In standby mode, typical current draw is less than 20 µA, nearly a 1000× reduction in power consumption versus the Intel i386DX or Intel i386SX.

Additionally, the Am386DXL microprocessor is available in a small footprint 132-pin plastic quad flat pack (PQFP) package. This surface-mount package is 40% smaller than PGA, allowing smaller, lower-cost board designs without the need for a socket.

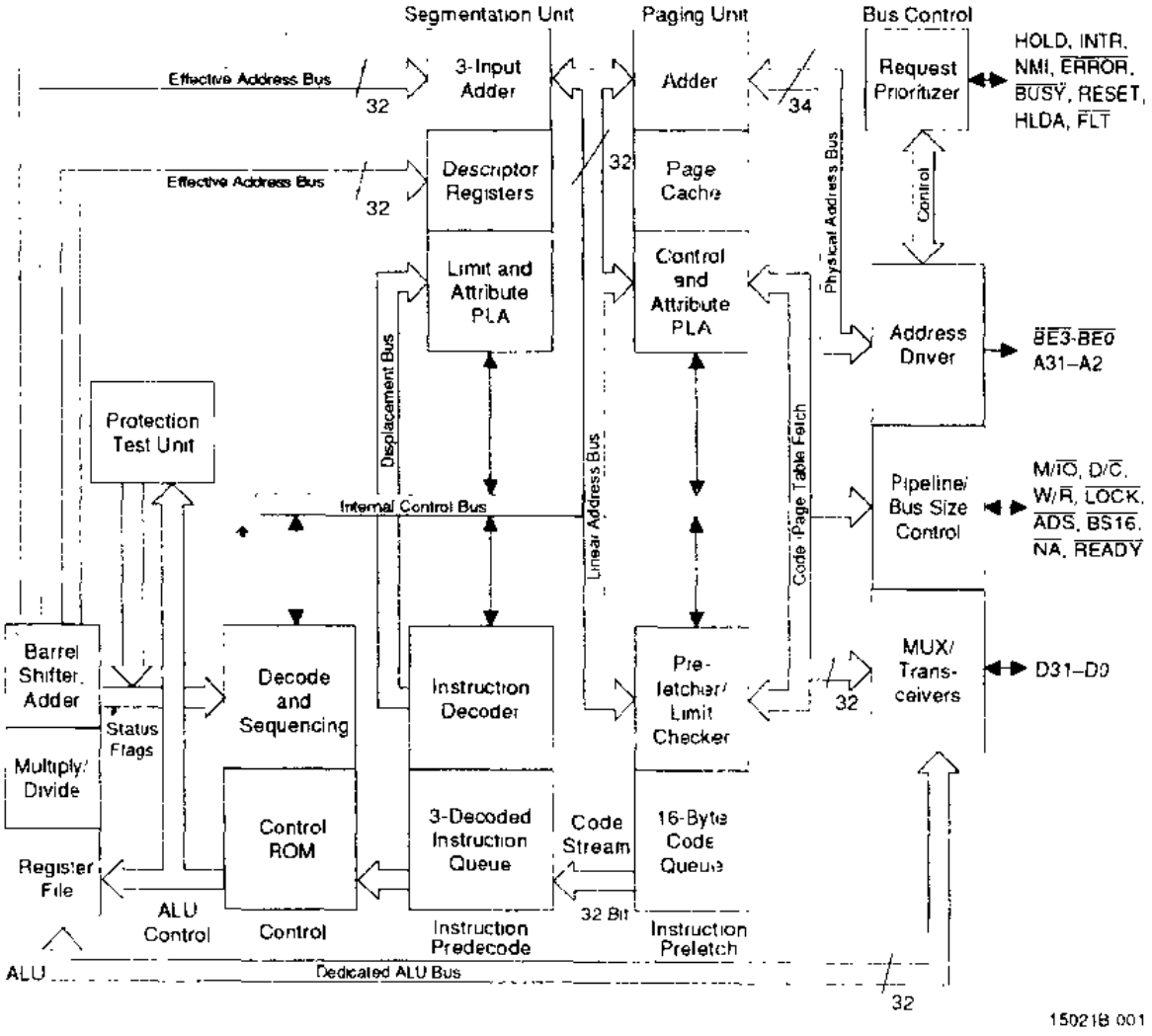
Typical I_{CC}



Note: Inputs at V_{CC} or V

Typical Power Consumption

BLOCK DIAGRAM



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FUNCTIONAL DESCRIPTION

True Static Operation (Am386DXL CPU)

The Am386DXL microprocessor incorporates a true static design. Unlike dynamic circuit design, the Am386DXL device eliminates the minimum operating frequency restriction. It may be clocked from its maximum speed of 40 MHz all the way down to 0 MHz (DC). System designers can use this feature to design true 32-bit battery-powered portable PCs with long battery life.

Standby Mode (Am386DXL CPU)

This true static design allows for a standby mode. At any of its operating speeds (40 MHz to DC), the Am386DXL microprocessor will retain its state (i.e., the contents of all of its registers). By shutting off the clock completely, the device enters standby mode. Since power consumption is a function of clock frequency, operating power consumption is reduced as the frequency is lowered. In standby mode, typical current draw is reduced to less than 20 µA at DC.

Not only does this feature save battery life, but it also simplifies the design of power-conscious notebook computers in the following ways:

1. Eliminates the need for software in BIOS to save and restore the contents of registers.
2. Allows simpler circuitry to control stopping of the clock since the system does not need to know the processor state.

Lower Operating I_{CC}

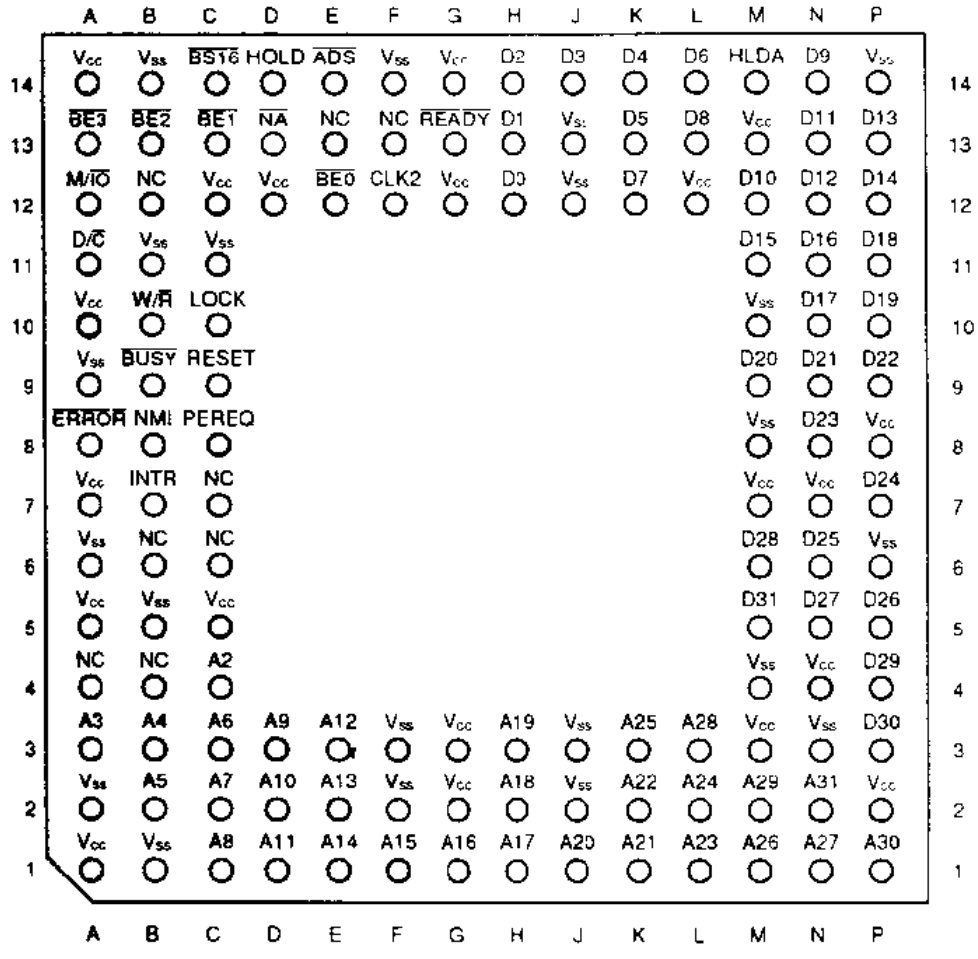
True static design also allows lower operating I_{CC} when operating at any speed. See the following graph for typical current at operating speeds.

Performance On Demand

The Am386DXL microprocessor retains its state at any speed from 0 MHz (DC) to its maximum operating speed (20, 25, 33, or 40 MHz). With this feature, system designers may vary the operating speed of the system to extend the battery life in portable systems.

For example, the system could operate at low speeds during inactivity or polling operations. However, upon interrupt, the system clock can be increased up to its maximum speed. After a user defined time-out period, the system can be returned to a low (or 0 MHz) operating speed without losing its state. This design maximizes life while achieving optimal performance.

CONNECTION DIAGRAMS
132-Lead Ceramic Pin Grid Array (PGA) Package — Top Side View

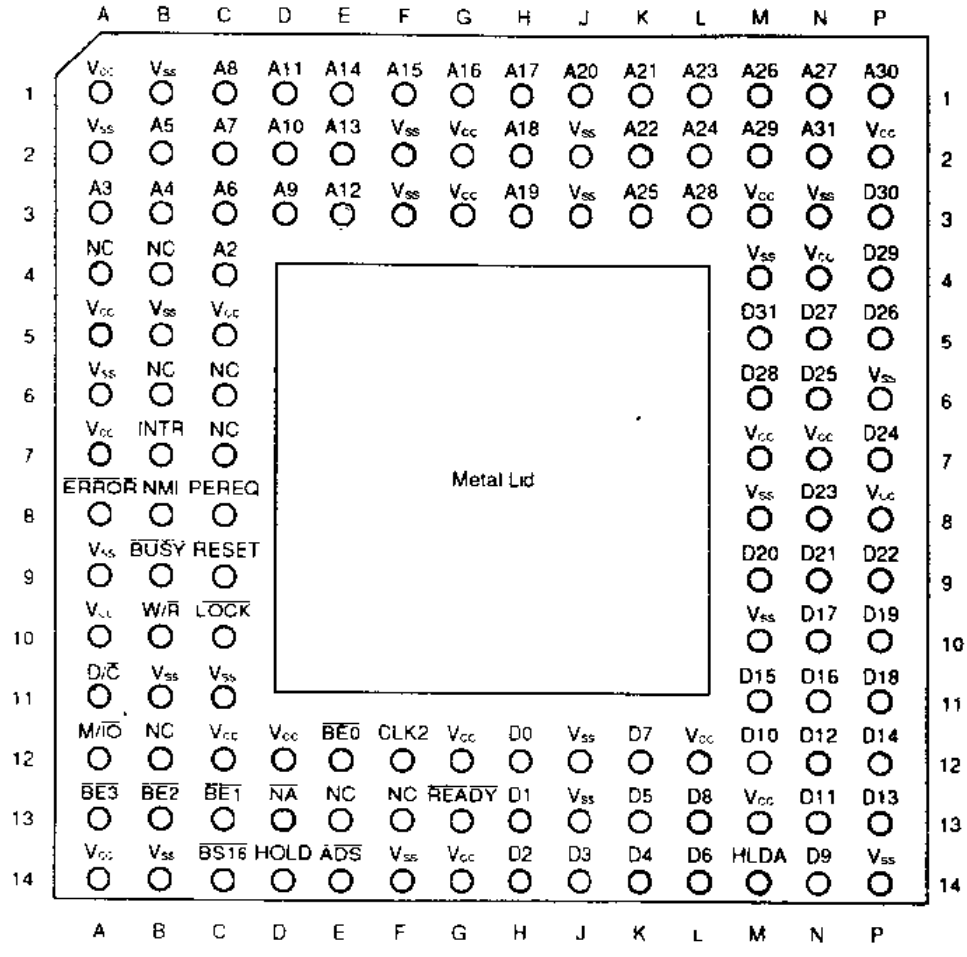


	A	B	C	D	E	F	G	H	J	K	L	M	N	P	
14	V_{CC}	V_{SS}	$\overline{BS16}$	HOLD	$\overline{ADS}$	V_{SS}	V_{CC}	D2	D3	D4	D6	HLDA	D9	V_{SS}	14
13	$\overline{BE3}$	$\overline{BE2}$	$\overline{BE1}$	$\overline{NA}$	NC	NC	$\overline{READY}$	D1	V_{SS}	D5	D8	V_{CC}	D11	D13	13
12	M/$\overline{IO}$	NC	V_{CC}	V_{CC}	$\overline{BE0}$	CLK2	V_{CC}	D0	V_{SS}	D7	V_{CC}	D10	D12	D14	12
11	D/$\overline{C}$	V_{SS}	V_{SS}									D15	D16	D18	11
10	V_{CC}	W/$\overline{R}$	LOCK									V_{SS}	D17	D19	10
9	V_{SS}	$\overline{BUSY}$	RESET									D20	D21	D22	9
8	$\overline{ERROR}$	NMI	PEREQ									V_{SS}	D23	V_{CC}	8
7	V_{CC}	INTR	NC									V_{CC}	V_{CC}	D24	7
6	V_{SS}	NC	NC									D28	D25	V_{SS}	6
5	V_{CC}	V_{SS}	V_{CC}									D31	D27	D26	5
4	NC	NC	A2									V_{SS}	V_{CC}	D29	4
3	A3	A4	A6	A9	A12	V_{SS}	V_{CC}	A19	V_{SS}	A25	A28	V_{CC}	V_{SS}	D30	3
2	V_{SS}	A5	A7	A10	A13	V_{SS}	V_{CC}	A18	V_{SS}	A22	A24	A29	A31	V_{CC}	2
1	V_{CC}	V_{SS}	A8	A11	A14	A15	A16	A17	A20	A21	A23	A26	A27	A30	1
	A	B	C	D	E	F	G	H	J	K	L	M	N	P	

Note: NC = Not connected; connection of any NC pin may cause a malfunction or incompatability with future shippings of the Am386DX/DXL microprocessor.

CONNECTION DIAGRAMS (continued)

132-Lead Ceramic Pin Grid Array (PGA) Package—Pin Side View



Note NC = Not connected, connection of any NC pin may cause a malfunction or incompatability with future shippings of the Am386DX/DXL microprocessor

CONNECTION DIAGRAMS (continued)

PGA Pin Designations (sorted by Functional Grouping)

Address		Data		Control		NC	V_{CC}	V_{SS}
Pin Name	Pin No.	Pin Name	Pin No.	Pin Name	Pin No.	Pin No.	Pin No.	Pin No.
A2	C4	D0	H12	$\overline{ADS}$	E14	A4	A1	A2
A3	A3	D1	H13	$\overline{BE0}$	E12	B4	A5	A6
A4	B3	D2	H14	$\overline{BE1}$	C13	B6	A7	A9
A5	B2	D3	J14	$\overline{BE2}$	B13	B12	A10	B1
A6	C3	D4	K14	$\overline{BE3}$	A13	C6	A14	B5
A7	C2	D5	K13	$\overline{BS16}$	C14	C7	C5	B11
A8	C1	D6	L14	$\overline{BUSY}$	B9	E13	C12	B14
A9	D3	D7	K12	CLK2	F12	F13	D12	C11
A10	D2	D8	L13	D/$\overline{C}$	A11		G2	F2
A11	D1	D9	N14	$\overline{ERROR}$	A8		G3	F3
A12	E3	D10	M12	HLDA	M14		G12	F14
A13	E2	D11	N13	HOLD	D14		G14	J2
A14	E1	D12	N12	INTR	B7		L12	J3
A15	F1	D13	P13	$\overline{LOCK}$	C10		M3	J12
A16	G1	D14	P12	M/$\overline{IO}$	A12		M7	J13
A17	H1	D15	M11	$\overline{NA}$	D13		M13	M4
A18	H2	D16	N11	NM	B8		N4	M8
A19	H3	D17	N10	PEREQ	C8		N7	M10
A20	J1	D18	P11	$\overline{READY}$	G13		P2	N3
A21	K1	D19	P10	RESET	C9		P8	P6
A22	K2	D20	M9	W/$\overline{R}$	B10			P14
A23	L1	D21	N9					
A24	L2	D22	P9					
A25	K3	D23	N8					
A26	M1	D24	P7					
A27	N1	D25	N6					
A28	L3	D26	P5					
A29	M2	D27	N5					
A30	P1	D28	M6					
A31	N2	D29	P4					
		D30	P3					
		D31	M5					

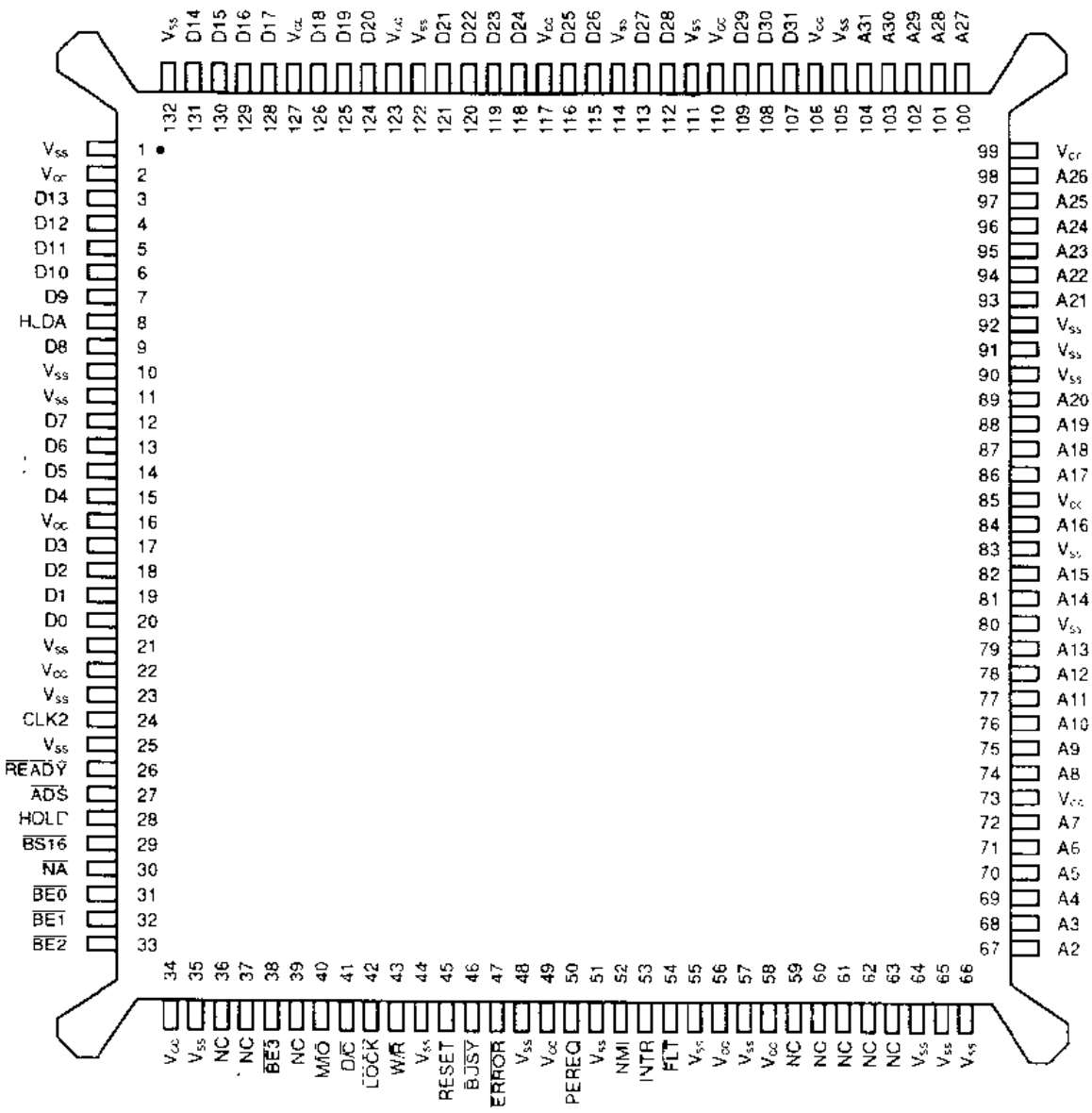
CONNECTION DIAGRAMS (continued)

PGA Pin Designations (sorted by Pin Number)

Pin No.	Pin Name	Pin No.	Pin Name	Pin No.	Pin Name	Pin No.	Pin Name	Pin No.	Pin Name	Pin No.	Pin Name
A1	V_{CC}	B9	$\overline{BUSY}$	D3	A9	H1	A17	L13	D8	N7	V_{CC}
A2	V_{SS}	B10	W/$\overline{R}$	D12	V_{CC}	H2	A18	L14	D6	N8	D23
A3	A3	B11	V_{SS}	D13	$\overline{NA}$	H3	A19	M1	A26	N9	D21
A4	NC	B12	NC	D14	HOLD	H12	D0	M2	A29	N10	D17
A5	V_{CC}	B13	$\overline{BE2}$	E1	A14	H13	D1	M3	V_{CC}	N11	D16
A6	V_{SS}	B14	V_{SS}	E2	A13	H14	D2	M4	V_{SS}	N12	D12
A7	V_{CC}	C1	A8	E3	A12	J1	A20	M5	D31	N13	D11
A8	$\overline{ERROR}$	C2	A7	E12	$\overline{BE0}$	J2	V_{SS}	M6	D28	N14	D9
A9	V_{SS}	C3	A6	E13	NC	J3	V_{SS}	M7	V_{CC}	P1	A30
A10	V_{CC}	C4	A2	E14	$\overline{ADS}$	J12	V_{SS}	M8	V_{SS}	P2	V_{CC}
A11	D/$\overline{C}$	C5	V_{CC}	F1	A15	J13	V_{SS}	M9	D20	P3	D30
A12	M/$\overline{IO}$	C6	NC	F2	V_{SS}	J14	D3	M10	V_{SS}	P4	D29
A13	$\overline{BE3}$	C7	NC	F3	V_{SS}	K1	A21	M11	D15	P5	D26
A14	V_{CC}	C8	PEREQ	F12	CLK2	K2	A22	M12	D10	P6	V_{SS}
B1	V_{SS}	C9	RESET	F13	NC	K3	A25	M13	V_{CC}	P7	D24
B2	A5	C10	$\overline{LOCK}$	F14	V_{SS}	K12	D7	M14	HLDA	P8	V_{CC}
B3	A4	C11	V_{SS}	G1	A16	K13	D5	N1	A27	P9	D22
B4	NC	C12	V_{CC}	G2	V_{CC}	K14	D4	N2	A31	P10	D19
B5	V_{SS}	C13	$\overline{BE1}$	G3	V_{CC}	L1	A23	N3	V_{SS}	P11	D18
B6	NC	C14	$\overline{BS16}$	G12	V_{CC}	L2	A24	N4	V_{CC}	P12	D14
B7	INTR	D1	A11	G13	$\overline{READY}$	L3	A28	N5	D27	P13	D13
B8	NMI	D2	A10	G14	V_{CC}	L12	V_{CC}	N6	D25	P14	V_{SS}

CONNECTION DIAGRAMS (continued)

132-Lead Plastic Quad Flat Pack (PQFP) Package—Top Side View

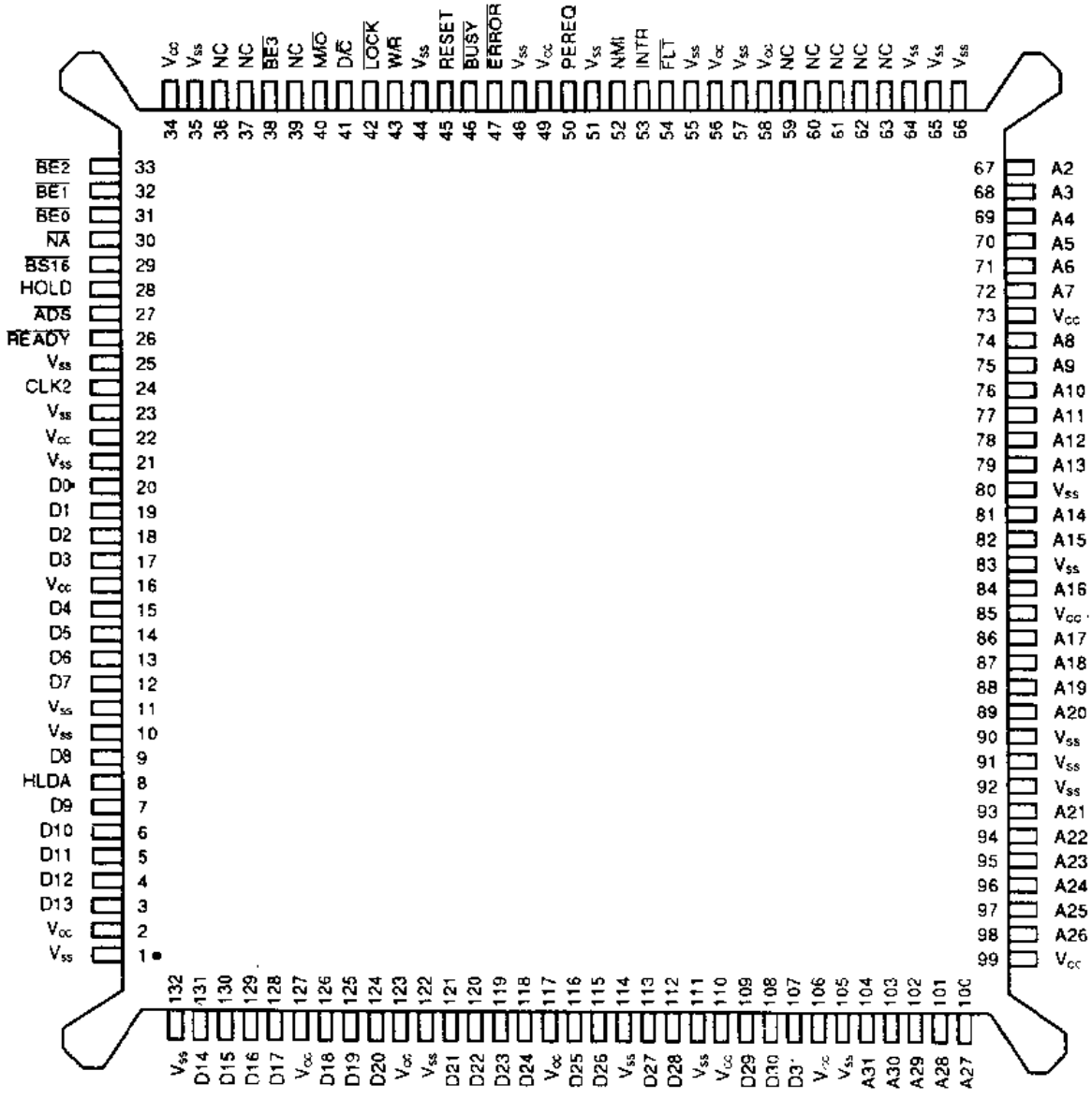


Notes: Pin 1 is marked for orientation.

NC = Not connected. connection of an NC pin may cause a malfunction or incompatibility with future shippings of the Am386DX/DXL microprocessor.

CONNECTION DIAGRAMS (continued)

132-Lead Plastic Quad Flat Pack (PQFP) Package—Pin Side View



Notes Pin 1 is marked for orientation

NC = Not connected, connection of an NC pin may cause a malfunction or incompatibility with future shippings of the Am386DX/DXL microprocessor