PRELIMINARY

AMD

AMD-K6™-2E Embedded Processor

Standard- and Low-Power Processor Featuring Super7™ and Socket 7 Platform Compatibility, Superscalar MMX™ Unit, and 3DNow!™ Technology

DISTINCTIVE CHARACTERISTICS

- **Advanced 6-Issue RISC86® Superscalar Microarchitecture**
  - Ten parallel specialized execution units
  - Multiple sophisticated x86-to-RISC86 instruction decoders
  - Advanced two-level branch prediction
  - Speculative execution
  - Out-of-order execution
  - Register renaming and data forwarding
  - Up to six RISC86 instructions per clock
- **Large On-Chip Split 64-Kbyte Level-One (L1) Cache**
  - 32-Kbyte instruction cache with additional 20 Kbytes of predecode cache
  - 32-Kbyte writeback dual-ported data cache
  - Two-way set associative
  - MESI protocol support
- **3DNow!™ Technology**
  - Additional instructions to improve 3D graphics and multimedia performance
  - Separate multiplier and ALU for superscalar instruction execution
- **321-Pin Ceramic Pin Grid Array (CPGA) Package**
- **Socket 7 Platform Compatible, 66-MHz Frontside Bus**
- **Super7™ Platform Compatible, 100-MHz Frontside Bus Supported on the 300-MHz and 350-MHz Versions of the AMD-K6-2E Processor**
- **High-Performance Industry-Standard MMX™ Instructions**
  - Dual integer ALU for superscalar execution
- **High-Performance IEEE 754-Compatible and 854-Compatible Floating-Point Unit**
- **Industry-Standard System Management Mode (SMM)**
- **IEEE 1149.1 Boundary Scan**
- **x86 Binary Software Compatibility**
- **Low-Power 0.25-micron Process Technology**
  - Split-plane power with support for full 3.3 V I/O
  - Available with a low-power 1.9-V core voltage and extended temperature rating or with a standard-power 2.2-V core voltage and standard temperature rating
- **Operating Frequencies**
  - Standard-power devices: 233, 266, 300, 333, and 350 MHz
  - Low-power devices: 233, 266, 300, and 333 MHz

GENERAL DESCRIPTION

The AMD-K6-2E processor with 3DNow!™ technology is a functionally compatible embedded version of the sixth generation, Microsoft® Windows® compatible AMD-K6-2 processor.

The AMD-K6-2E embedded processor delivers the same high performance and incorporates the same leading-edge features, including the innovative and efficient RISC86® microarchitecture, a large 64-Kbyte level-one cache (32-Kbyte dual-ported data cache, 32-Kbyte instruction cache with predecode data), and a powerful IEEE 754-compatible and 854-compatible floating-point execution unit.

The AMD-K6-2E embedded processor also supports the new features incorporated into the AMD-K6-2 processor. These features include superscalar MMX™ instruction execution support, support for the Super7™ 100-MHz frontside bus, and AMD's innovative 3DNow!™ technology for high-performance multimedia and 3D graphics operation based on high-performance single instruction multiple data (SIMD) execution resources.

The AMD-K6-2E embedded processor includes several key features that are very beneficial to the embedded market. The AMD-K6-2E processor offers leading-edge performance for embedded systems requiring compatibility with the extensive installed base of x86 software. The AMD-K6-2E processor's Socket 7 and Super7 platform-compatible, 321-pin ceramic pin grid array (CPGA) package allows the product designer to reduce time-to-market by leveraging today's cost-effective industry-standard infrastructure to deliver a superior-performing embedded solution.

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AMD-K6™-2E PROCESSOR FEATURES

The AMD-K6-2E embedded processor is available in two versions.

- The low-power version has a 1.9-V core voltage and extended temperature rating.
- The standard-power version has a 2.2-V core voltage and is the embedded equivalent of the industry-standard desktop version of the AMD-K6-2 processor.

System Management Mode and Power Management

The AMD-K6-2E processor includes the complete industry-standard system management mode (SMM), which is critical to system resource and power management.

The AMD-K6-2E processor also features industry-standard Stop-Clock (STPCLK#) control circuitry and the Halt instruction, both required for implementing the ACPI power management specification.

Microarchitecture

The AMD-K6-2E processor's RISC86 microarchitecture is a decoupled decode/execution superscalar design that implements state-of-the-art techniques to achieve leading-edge performance.

Advanced design techniques implemented in the AMD-K6-2E processor include multiple x86 instruction decode, single-clock internal RISC operations, ten execution units that support superscalar operation, out-of-order execution, data forwarding, speculative execution, and register renaming.

In addition, the processor supports advanced branch prediction logic by implementing an 8192-entry branch history table, a branch target cache, and a return address stack, which combine to deliver better than a 95% prediction rate. These design techniques enable the AMD-K6-2E to issue, execute, and retire multiple x86 instructions per clock, resulting in excellent scalable performance.

3DNow!™ Technology

AMD's 3DNow! technology is an instruction-set extension to x86, which includes 21 new instructions to accelerate 3D graphics and other single-precision floating-point compute intensive operations.

Improvements include fast frame rates on high-resolution graphics applications, superior modeling of real-world environments and physics, life-like images, graphics, and audio.

AMD has already shipped millions of processors with 3DNow! technology for desktop and notebook PCs, revolutionizing the 3D experience with up to four times the peak floating-point performance of previous sixth generation solutions. AMD is now bringing this advanced capability to embedded systems.

AMD has taken a leadership role in developing these new instructions that enable exciting new levels of performance and realism. 3DNow! technology was defined and implemented in collaboration with Microsoft, application developers, and graphics vendors, and has received an enthusiastic reception. It is compatible with today's existing x86 software, is supported by industry-standard APIs, and requires no operating system support, thereby enabling a broad class of applications to benefit from 3DNow! technology.

Industry-Standard x86 Architecture

The AMD-K6-2E processor is x86 binary code compatible. AMD's extensive experience with six generations of x86 processors has been carefully integrated into the processor to enable compatibility with Windows®-based operating systems, including Windows 95, Windows 98, Windows CE, Windows NT®, and Windows NTE.

The AMD-K6-2E processor is also compatible with DOS, OS/2, UNIX, and other leading operating systems, including real-time operating systems (RTOS) commonly used in embedded applications such as pSOS, QNX, RTXC, and VxWorks.

The AMD-K6-2E processor is compatible with more than 60,000 software applications, including the latest software optimized for 3DNow! and MMX technologies. AMD has shipped more than 120 million x86 microprocessors, including more than 60 million Windows-compatible processors.

The AMD-K6-2E processor is among a long line of Microsoft Windows compatible processors from AMD. The combination of state-of-the-art features, leading-edge performance, high-performance multimedia engine, x86 compatibility, and low-cost infrastructure enable decreased development costs and improved time-to-market, making the AMD-K6-2E processor the superior choice for embedded systems.

Process Technology

The AMD-K6-2E processor is implemented using an advanced CMOS 0.25-micron process technology that utilizes a split core and I/O voltage supply, which allows the core of the processor to operate at a low voltage while the I/O portion operates at the industry-standard 3.3 V.

This technology enables high performance while reducing power consumption by operating the core at a low voltage and limiting power requirements to the acceptable levels for today's embedded systems.

Super7™ Platform Initiative

All AMD-K6-2E processors remain pin compatible with existing Socket 7 solutions; however, for maximum system performance, the 300-MHz and 350-MHz versions of the processor work optimally in Super7 designs that incorporate advanced features such as support for the 100-MHz frontside bus and AGP graphics.

The Super7 platform has the following advantages:

- Delivers performance and features competitive with alternate platforms at the same clock speed, and at a significantly lower cost
- Takes advantage of existing system designs for superior value
- Enables OEMs and resellers to take advantage of mature, high-volume infrastructure supported by multiple BIOS, chipset, graphics, and motherboard suppliers
- Reduces inventory and design costs with one motherboard for a wide range of products
- Builds on a huge installed base of more than 100 million motherboards
- Provides an easy upgrade path for future embedded applications, as well as a bridge to legacy applications

By taking advantage of the low-cost, mature Socket 7 infrastructure, the Super7 platform will continue to provide superior value and leading-edge performance for embedded systems.

Block Diagram

As shown in Figure 1, the high-performance, out-of-order execution engine of the AMD-K6-2E processor is mated to a split level-one 64-Kbyte writeback cache with 32 Kbytes of instruction cache and 32 Kbytes of data cache. The instruction cache feeds the decoders and, in turn, the decoders feed the scheduler. The Instruction Control Unit (ICU) issues and retires RISC86 operations contained in the scheduler. The system bus interface is an industry-standard 64-bit Super7 and Socket 7 demultiplexed bus.

The AMD-K6-2E processor combines the latest in processor microarchitecture to provide the highest x86 performance for today's computational systems. The AMD-K6-2E offers true sixth-generation performance and x86 binary software compatibility

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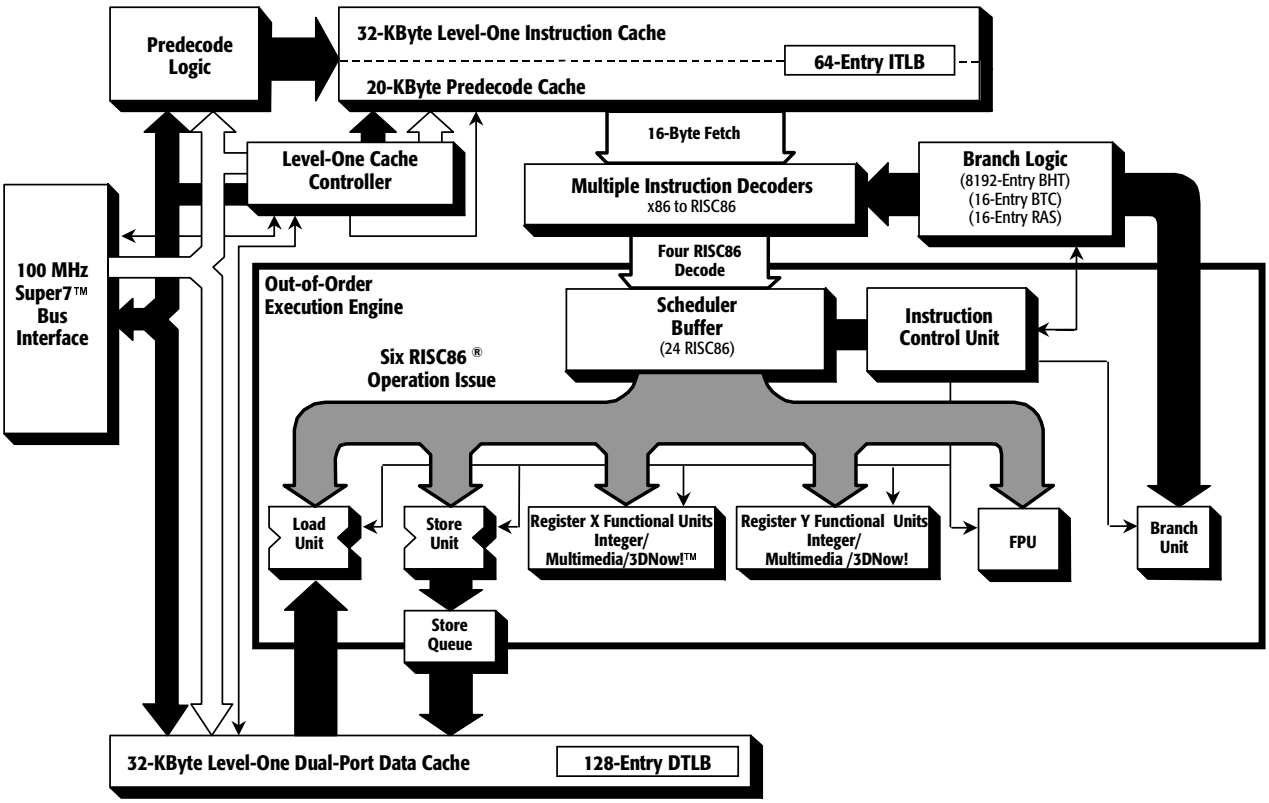

Figure 1. AMD-K6™-2E Processor Block Diagram

ORDERING INFORMATION

AMD standard- and low-power products are available in several operating ranges. The ordering part number (OPN) is formed by a combination of the elements below. See Table 1 for valid ordering part number combinations.

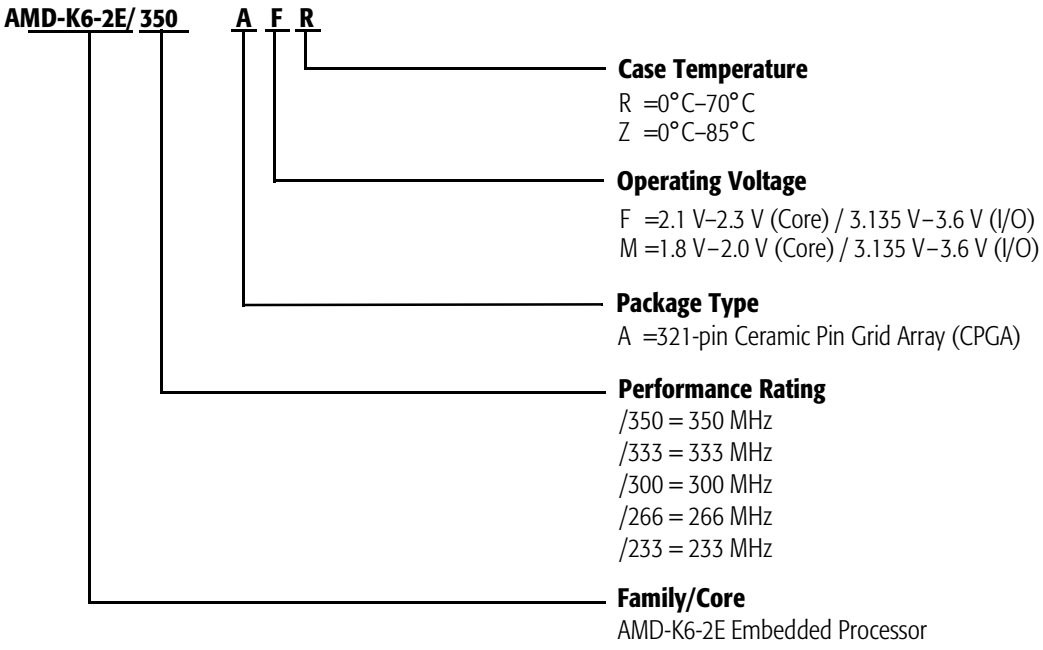

Table 1. Valid Ordering Part Number Combinations[1]

Device Type	OPN	Package Type	Operating Voltage	Case Temperature	Maximum CPU/Bus Frequency
Low Power	AMD-K6-2E/333AMZ	321-pin CPGA	1.8V–2.0V (Core) 3.135V–3.6V (I/O)	0°C–85°C	333 MHz/95 MHz[2]
	AMD-K6-2E/300AMZ	321-pin CPGA	1.8V–2.0V (Core) 3.135V–3.6V (I/O)	0°C–85°C	300 MHz/100 MHz[2]
	AMD-K6-2E/266AMZ	321-pin CPGA	1.8V–2.0V (Core) 3.135V–3.6V (I/O)	0°C–85°C	266 MHz/66 MHz
	AMD-K6-2E/233AMZ	321-pin CPGA	1.8V–2.0V (Core) 3.135V–3.6V (I/O)	0°C–85°C	233 MHz/66 MHz
Standard Power	AMD-K6-2E/350AFR	321-pin CPGA	2.1V–2.3V (Core) 3.135V–3.6V (I/O)	0°C–70°C	350 MHz/100 MHz
	AMD-K6-2E/333AFRl	321-pin CPGA	2.1V–2.3V (Core) 3.135V–3.6V (I/O)	0°C–70°C	333 MHz/95 MHz[2]
	AMD-K6-2E/300AFR	321-pin CPGA	2.1V–2.3V (Core) 3.135V–3.6V (I/O)	0°C–70°C	300 MHz/100 MHz[2]
	AMD-K6-2E/266AFR	321-pin CPGA	2.1V–2.3V (Core) 3.135V–3.6V (I/O)	0°C–70°C	266 MHz/66 MHz
	AMD-K6-2E/233AFR	321-pin CPGA	2.1V–2.3V (Core) 3.135V–3.6V (I/O)	0°C–70°C	233 MHz/66 MHz

Notes:

1. This table lists 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.

2. Also supports 66-MHz bus operation.

OPERATING RANGES

The AMD-K6-2E processor is designed to provide functional operation if the voltage and temperature parameters are within the limits defined in Table 2.

Table 2. Operating Ranges

Parameter	Parameter Description	Minimum	Typical	Maximum
V_{CC2}[1]	Core Supply Voltage—Low Power[2]	1.8 V	1.9 V	2.0 V
	Core Supply Voltage—Standard Power[3]	2.1 V	2.2 V	2.3 V
V_{CC3}[1]	I/O Supply Voltage—Standard and Low Power	3.135 V	3.3 V	3.6 V
T_{CASE}	Case Temperature—Low Power[4]	0°C	–	85°C
	Case Temperature—Standard Power[5]	0°C	–	70°C

Notes:

1. *V_{CC2} and V_{CC3} are referenced from V_{SS}.*
2. *V_{CC2} specification for 1.9-V component.*
3. *V_{CC2} specification for 2.2-V component.*
4. *Case temperature range required for AMD-K6-2E/xxxAMZ valid ordering part number combinations, where xxx represents the processor core frequency.*
5. *Case temperature range required for AMD-K6-2E/xxxAFR valid ordering part number combinations, where xxx represents the processor core frequency.*

ABSOLUTE RATINGS

The AMD-K6-2E processor is not designed to be operated beyond the operating ranges listed in Table 2. Exposure to conditions outside these operating ranges for extended periods of time can affect long-term reliability. Permanent damage can occur if the absolute ratings listed in Table 3 are exceeded.

Note: *If the AMD-K6-2E processor shows a "7" after the date code, refer to the numbers in the last (rightmost) column of Table 3. The* AMD-K6®-2 Revision Guide *(order #21641) available on AMD's web site contains package marking details, including the location of the date code.*

Table 3. Absolute Ratings

Parameter	Minimum	Maximum for OPN Suffixes: 233AFR, 233AMZ, 266AFR, 266AMZ, 300AFR[1]	Maximum for All OPNs[2]
V_{CC2}	–0.5 V	2.6 V	2.4 V
V_{CC3}	–0.5 V	3.6 V	3.6 V
V_{PIN}[3]	–0.5 V	V_{CC3} + 0.5 V and ≤ 4.0 V	V_{CC3} + 0.5 V and ≤ 4.0 V
T_{CASE} (under bias)	–65°C	+110°C	+110°C
$T_{STORAGE}$	–65°C	+150°C	+150°C

Notes:

1. *The data in this column applies to OPN suffixes 233AFR, 233AMZ, 266AFR, 266AMZ, and 300AFR, provided that the processor is* not *marked with "7" following the date code (i.e., is blank).*
2. *The data in this column applies to all OPNs listed in Table 1, "Valid Ordering Part Number Combinations," on page 4 (including 233AFR, 233AMZ, 266AFR, 266AMZ, and 300AFR when the processor is marked with a "7" following the date code).*
3. *V_{PIN} (the voltage on any I/O pin) must not be greater than 0.5 V above the voltage being applied to V_{CC3}. In addition, the V_{PIN} voltage must never exceed 4.0 V.*

DC CHARACTERISTICS

The DC characteristics of the AMD-K6-2E processor are shown in Table 4.

Table 4. DC Characteristics

Symbol	Parameter Description	Min	Max	Comments
V_{IL}	Input Low Voltage	–0.3 V	+0.8 V	
V_{IH}[1]	Input High Voltage	2.0 V	V_{CC3}+0.3 V	
V_{OL}	Output Low Voltage		0.4 V	I_{OL} = 4.0-mA load
V_{OH}	Output High Voltage	2.4 V		I_{OH} = 3.0-mA load
I_{CC2} Low Power	1.9 V Power Supply Current[2]		4.75 A	233 MHz[2,3]
			5.35 A	266 MHz[2,3]
			5.50 A	300 MHz[2,3,5]
			5.65 A	333 MHz[2,3,4]
I_{CC2} Standard Power	2.2 V Power Supply Current[6]		6.50 A	233 MHz[3,6]
			7.35 A	266 MHz[3,6]
			8.45 A	300 MHz[3,5,6]
			9.40 A	333 MHz[3,4,6]
			9.85 A	350 MHz[5,6]
I_{CC3} Standard and Low Power	3.3 V Power Supply Current[7]		0.52 A	233 MHz[3,7]
			0.54 A	266 MHz[3,7]
			0.56 A	300 MHz[3,5,7]
			0.58 A	333 MHz[3,4,7]
			0.60 A	350 MHz[5,7]
I_{LI}[8]	Input Leakage Current		±15 µA	
I_{LO}[8]	Output Leakage Current		±15 µA	
I_{IL}[9]	Input Leakage Current Bias with Pullup		–400 µA	
I_{IH}[10]	Input Leakage Current Bias with Pulldown		200 µA	
C_{IN}	Input Capacitance		10 pF	
C_{OUT}	Output Capacitance		15 pF	
C_{OUT}	I/O Capacitance		20 pF	
C_{CLK}	CLK Capacitance		10 pF	
C_{TIN}	Test Input Capacitance (TDI, TMS, TRST#)		10 pF	
C_{TOUT}	Test Output Capacitance (TDO)		15 pF	
C_{TCK}	TCK Capacitance		10 pF	

Notes:

1. V_{CC3} refers to the voltage being applied to V_{CC3} during functional operation.

2. V_{CC2}=2.0 V —The maximum power supply current must be taken into account when designing a power supply.

3. This specification applies to components using a CLK frequency of 66 MHz.

4. This specification applies to components using a CLK frequency of 95 MHz.

5. This specification applies to components using a CLK frequency of 100 MHz.

6. V_{CC2}=2.3 V —The maximum power supply current must be taken into account when designing a power supply.

7. V_{CC3}=3.6 V —The maximum power supply current must be taken into account when designing a power supply.

8. Refers to inputs and I/O without an internal pullup resistor and $0 \le V_{IN} \le V_{CC3}$.

9. Refers to inputs with an internal pullup and V_{IL}=0.4 V.

10.Refers to inputs with an internal pulldown and V_{IH}=2.4 V.

POWER DISSIPATION

Table 5 and Table 6 list the typical and maximum power dissipation of the AMD-K6-2E processor during normal and reduced power states.

Table 5. Typical and Maximum Power Dissipation for OPN Suffix AMZ (Low-Power Devices)

Clock Control State	233 MHz[1]	266 MHz[1]	300 MHz[1,3]	333 MHz[1,2]
Thermal Power (Maximum)[4,5]	9.00 W	10.00 W	10.00 W	10.00 W
Thermal Power (Typical)[6]	6.30 W	7.00 W	7.00 W	7.00 W
Stop Grant/Halt (Maximum)[7]	1.20 W	1.20 W	1.20 W	1.20 W
Stop Clock (Maximum)[8]	1.00 W	1.00 W	1.00 W	1.00 W

Notes:

1. *This specification applies to components using a CLK frequency of 66 MHz.*
2. *This specification applies to components using a CLK frequency of 95 MHz.*
3. *This specification applies to components using a CLK frequency of 100 MHz.*
4. *The maximum power dissipated in the normal clock control state must be taken into account when designing a solution for thermal dissipation for the AMD-K6-2E processor.*
5. *Maximum power is determined for the worst-case instruction sequence or function for the listed clock control states with V_{CC2} = 1.9 V, and V_{CC3} = 3.3 V.*
6. *Typical power is determined for the typical instruction sequences or functions associated with normal system operation with V_{CC2} = 1.9 V, and V_{CC3} = 3.3 V.*
7. *The CLK signal and the internal PLL are still running but most internal clocking has stopped.*
8. *The CLK signal, the internal PLL, and all internal clocking has stopped.*

Table 6. Typical and Maximum Power Dissipation for OPN Suffix AFR (Standard-Power Devices)

Clock Control State	233 MHz[1]	266 MHz[1]	300 MHz[1,3]	333 MHz[1,2]	350 MHz[3]
Thermal Power (Maximum)[4,5]	13.50 W	14.70 W	17.20 W	19.00 W	19.95 W
Thermal Power (Typical)[6]	8.10	8.85 W	10.35 W	11.40 W	11.98 W
Stop Grant/Halt (Maximum)[7]	2.46 W	2.48 W	2.50 W	3.94 W	3.96 W
Stop Clock (Maximum)[8]	2.25 W	2.25	2.25 W	3.50 W	3.50 W

Notes:

1. *This specification applies to components using a CLK frequency of 66 MHz.*
2. *This specification applies to components using a CLK frequency of 95 MHz.*
3. *This specification applies to components using a CLK frequency of 100 MHz.*
4. *The maximum power dissipated in the normal clock control state must be taken into account when designing a solution for thermal dissipation for the AMD-K6-2E processor.*
5. *Maximum power is determined for the worst-case instruction sequence or function for the listed clock control states with VCC2 = 2.2 V, and VCC3 = 3.3 V.*
6. *Typical power is determined for the typical instruction sequences or functions associated with normal system operation with VCC2 = 2.2 V, and VCC3 = 3.3 V.*
7. *The CLK signal and the internal PLL are still running but most internal clocking has stopped.*
8. *The CLK signal, the internal PLL, and all internal clocking has stopped.*

PIN DESIGNATION DIAGRAMS

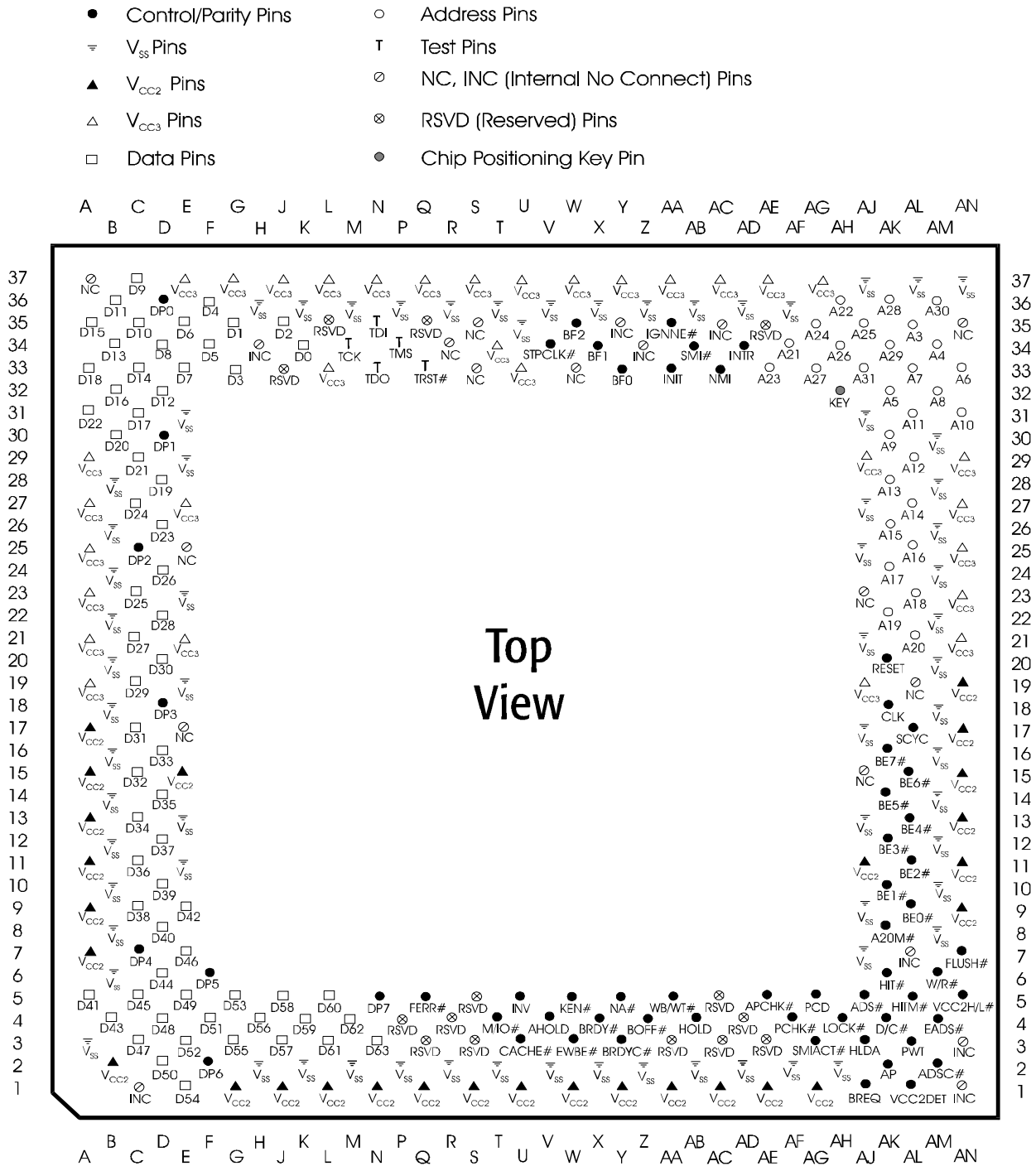

Figure 2. AMD-K6™-2E Processor Connection Diagram (Top-Side View CPGA)

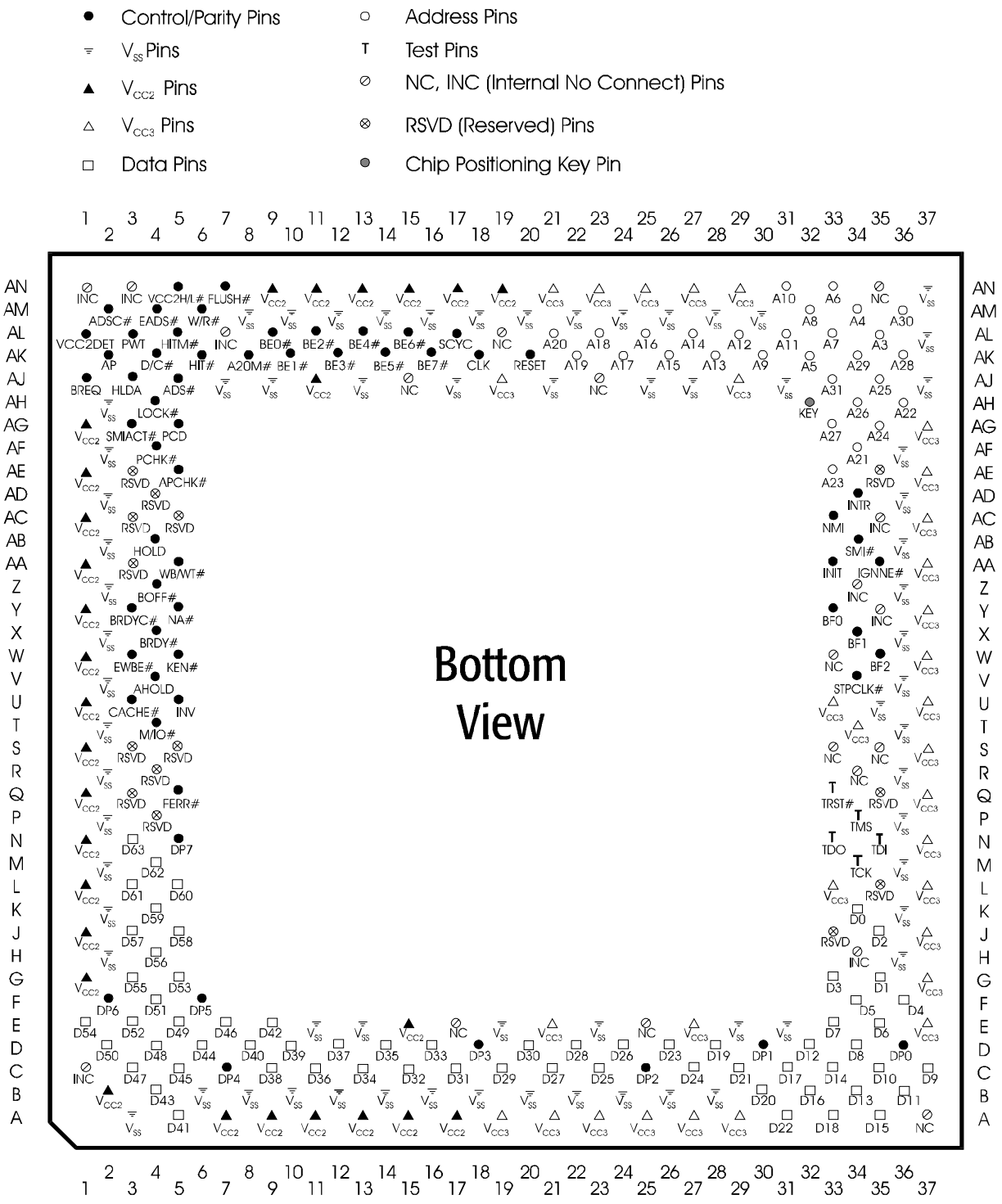

Figure 3. AMD-K6™-2E Processor Connection Diagram (Bottom-Side View CPGA)

PIN DESIGNATIONS BY FUNCTIONAL GROUPING

Pin Name	Pin Number
Control	
A20M#	AK-08
ADS#	AJ-05
ADSC#	AM-02
AHOLD	V-04
APCHK#	AE-05
BE0#	AL-09
BE1#	AK-10
BE2#	AL-11
BE3#	AK-12
BE4#	AL-13
BE5#	AK-14
BE6#	AL-15
BE7#	AK-16
BF0	Y-33
BF1	X-34
BF2	W-35
BOFF#	Z-04
BRDY#	X-04
BRDYC#	Y-03
BREQ	AJ-01
CACHE#	U-03
CLK	AK-18
D/C#	AK-04
EADS#	AM-04
EWBE#	W-03
FERR#	Q-05
FLUSH#	AN-07
HIT#	AK-06
HITM#	AL-05
HLDA	AJ-03
HOLD	AB-04
IGNNE#	AA-35
INIT	AA-33
INTR	AD-34
INV	U-05
KEN#	W-05
LOCK#	AH-04
M/IO#	T-04
NA#	Y-05
NMI	AC-33
PCD	AG-05
PCHK#	AF-04
PWT	AL-03
RESET	AK-20
SCYC	AL-17
SMI#	AB-34
SMIACT#	AG-03
STPCLK#	V-34
VCC2DET	AL-01
VCC2H/L#	AN-05
W/R#	AM-06
WB/WT#	AA-05

Pin Name	Pin Number
Address	
A3	AL-35
A4	AM-34
A5	AK-32
A6	AN-33
A7	AL-33
A8	AM-32
A9	AK-30
A10	AN-31
A11	AL-31
A12	AL-29
A13	AK-28
A14	AL-27
A15	AK-26
A16	AL-25
A17	AK-24
A18	AL-23
A19	AK-22
A20	AL-21
A21	AF-34
A22	AH-36
A23	AE-33
A24	AG-35
A25	AJ-35
A26	AH-34
A27	AG-33
A28	AK-36
A29	AK-34
A30	AM-36
A31	AJ-33

Pin Name	Pin Number
Data	
D0	K-34
D1	G-35
D2	J-35
D3	G-33
D4	F-36
D5	F-34
D6	E-35
D7	E-33
D8	D-34
D9	C-37
D10	C-35
D11	B-36
D12	D-32
D13	B-34
D14	C-33
D15	A-35
D16	B-32
D17	C-31
D18	A-33
D19	D-28
D20	B-30
D21	C-29
D22	A-31
D23	D-26
D24	C-27
D25	C-23
D26	D-24
D27	C-21
D28	D-22
D29	C-19
D30	D-20
D31	C-17
D32	C-15
D33	D-16
D34	C-13
D35	D-14
D36	C-11
D37	D-12
D38	C-09
D39	D-10
D40	D-08
D41	A-05
D42	E-09
D43	B-04
D44	D-06
D45	C-05
D46	E-07
D47	C-03
D48	D-04
D49	E-05
D50	D-02
D51	F-04

Pin Name	Pin Number
Data	
D52	E-03
D53	G-05
D54	E-01
D55	G-03
D56	H-04
D57	J-03
D58	J-05
D59	K-04
D60	L-05
D61	L-03
D62	M-04
D63	N-03
Test	
TCK	M-34
TDI	N-35
TDO	N-33
TMS	P-34
TRST#	Q-33
Parity	
AP	AK-02
DP0	D-36
DP1	D-30
DP2	C-25
DP3	D-18
DP4	C-07
DP5	F-06
DP6	F-02
DP7	N-05

Pin Numbers				
No Connect (NC)	**V_{CC2}**	**V_{CC3}**	**V_{SS}**	**V_{SS}**
A-37	A-07	A-19	A-03	AJ-27
E-17	A-09	A-21	B-06	AJ-31
E-25	A-11	A-23	B-08	AJ-37
R-34	A-13	A-25	B-10	AL-37
S-33	A-15	A-27	B-12	AM-08
S-35	A-17	A-29	B-14	AM-10
W-33	B-02	E-21	B-16	AM-12
AJ-15	E-15	E-27	B-18	AM-14
AJ-23	G-01	E-37	B-20	AM-16
AL-19	J-01	G-37	B-22	AM-18
AN-35	L-01	J-37	B-24	AM-20
Internal No Connect (INC)	N-01	L-33	B-26	AM-22
C-01	Q-01	L-37	B-28	AM-24
H-34	S-01	N-37	E-11	AM-26
Y-35	U-01	Q-37	E-13	AM-28
Z-34	W-01	S-37	E-19	AM-30
AC-35	Y-01	T-34	E-23	AN-37
AL-07	AA-01	U-33	E-29	
AN-01	AC-01	U-37	E-31	
AN-03	AE-01	W-37	H-02	
Reserved (RSVD)	AG-01	Y-37	H-36	
J-33	AJ-11	AA-37	K-02	
L-35	AN-09	AC-37	K-36	
P-04	AN-11	AE-37	M-02	
Q-03	AN-13	AG-37	M-36	
Q-35	AN-15	AJ-19	P-02	
R-04	AN-17	AJ-29	P-36	
S-03	AN-19	AN-21	R-02	
S-05		AN-23	R-36	
AA-03		AN-25	T-02	
AC-03		AN-27	T-36	
AC-05		AN-29	U-35	
AD-04			V-02	
AE-03			V-36	
AE-35			X-02	
Key			X-36	
AH-32			Z-02	
			Z-36	
			AB-02	
			AB-36	
			AD-02	
			AD-36	
			AF-02	
			AF-36	
			AH-02	
			AJ-07	
			AJ-09	
			AJ-13	
			AJ-17	
			AJ-21	
			AJ-25	