The Super7™ Platform Initiative

Enhancing the Future of Mainstream Desktop Computing

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> "For a uniprocessor system, the Pentium bus is just as good as—if not better than—the P6 [Pentium® II/Slot 1] bus. It also has far more chip sets available, and they are less expensive."
>
> -- Michael Slater, *Microprocessor Report*, Dec. 30, 1996

Executive Summary

The personal computer industry stands at a crossroads: Which PC infrastructure—today's open, industry-standard Socket 7 or Intel's proprietary, new Slot 1—provides the optimal platform for Microsoft® Windows® compatible computing?

The answer is the Socket 7/Super7™ platform, an infrastructure that delivers performance and features competitive with Slot 1 systems at the same clock rate—at significantly lower cost. Socket 7 compatibility enables PC manufacturers and resellers to take advantage of existing high-volume, low-cost designs. Because Socket 7 is a proven infrastructure, OEMs can develop high-performance mainstream desktop systems without the increased research and development costs associated with a new platform like Slot 1.

AMD and its industry partners are investing in the future of Socket 7 with the new Super7™ platform initiative. The goal of the initiative is to maintain the competitive vitality of the Socket 7 infrastructure through a series of planned enhancements, including the introduction of chipsets that support the Accelerated Graphics Port (AGP) specification and the development of an industry-standard 100-MHz local bus protocol. These and other forthcoming enhancements will enable Super7 platform-based systems to keep pace with the performance requirements of leading-edge, sixth-generation processors throughout 1998 and into 1999 and 2000 while maintaining Socket 7 cost advantages for the life of the sixth generation.

Socket 7/Super7™ Advantages

- Delivers performance and features competitive with Slot 1 at the same clock speed—at significantly lower cost
- Leverages existing system designs for superior value and fast time to market
- 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 PC users, as well as a bridge to legacy users

Slot 1 Disadvantages

- Requires new investment in a proprietary infrastructure for no new benefit
- Puts OEMs and resellers at the beginning of the learning curve with minimal installed base
- Does not offer an upgrade path for the broad base of existing PC users
- Forces OEMs/resellers to support multiple platforms for consumer and business PC lines

- Reduces the opportunity to differentiate and innovate within industry standards

The Super7™ Platform Initiative: Investing in the Future of Socket 7

Today's Socket 7 marketplace is robust and will remain viable throughout 1998 and into 1999. According to Scottsdale-based Mercury Research, the Socket 7 market totaled 83.9 million units in 1997 and is estimated to be 55.2 million units in 1998. Shipments of Slot 1 or Pentium® II motherboards totaled 5.1 million units in 1997 (not counting 4.9 million Pentium Pro units) and will grow to no more than 50 percent of the total desktop system market in 1998. An estimated 24.5 million Socket 7 units are expected to ship in 1999, with 14 million of those units shipping in the first half of 1999.

Recognizing the continuing strength of the Socket 7 marketplace and the undesirable higher cost of Slot 1 solutions, AMD is committed to supporting and enhancing the Socket 7 infrastructure. Today, AMD is working closely with its customers and top-tier third-party infrastructure partners to enable their Socket 7-compatible products to support the AMD-K6® processor and the AMD-K6-2 processor with 3DNow!™ technology with the latest system features. To support third-party chipset development, AMD provides guidance on feature set and performance optimizations, as well as full validation services in AMD labs. Chipset products that support the AMD-K6 are available from members of AMD's FusionPC℠ program, such as Acer Labs Inc. (ALI), SiS, and Via Technologies. Leading third-party BIOS suppliers include American Megatrends, Inc., Award Software, and Phoenix. AMD regularly publishes lists of third-party infrastructure products that support the AMD-K6 processor. These lists, as well as motherboard design guidelines, are available on AMD's web site (www.amd.com).

To further augment third-party infrastructure solutions, AMD has entered the chipset business with the AMD-640™ chipset, an AMD-developed product optimized for high-performance, Socket 7-compatible processors, such as the AMD-K6. The AMD-640 chipset, which includes the AMD-640 System Controller and the AMD-645™ Peripheral Bus Controller, provides a highly integrated, affordable, and feature-rich solution for mainstream desktop PCs. Additional high-performance chipset solutions from AMD are currently under development to support future AMD microprocessor products.

To continue to provide even higher performance PC platforms, AMD and other industry leaders are supporting an enhanced infrastructure called the Super7 platform. *(For further details, see **Figures 1-4** in Appendix, pages 8-9.)* The introduction of Super7 solutions in 1998 will enable Socket 7 to continue to offer improved system performance and competitive feature sets for the life of the sixth generation.

Planned Super7 performance and feature-set enhancements include:

- ***100-MHz local bus frequency.*** AMD has introduced the AMD-K6-2 processor, with current clock speeds of 333, 300, and 266 MHz. The new processor includes 3DNow!™ technology (an instruction set designed to accelerate 3D graphics, audio, and other multimedia applications through enhanced floating-point performance) and support for a 100-MHz, 800-Mbytes/sec frontside bus to provide a high-speed interface to Super7 platform-based chipsets. The addition of a 100-MHz interface to the frontside Level 2 (L2) cache and main system memory speeds up access to the frontside cache and main memory by 50 percent—a significant increase in system performance equivalent to a jump of up to two processor speed grades. In fact, a 100-MHz bus has many more positive implications for a Super7 system than a Slot 1 system because much of Pentium II's performance comes from its tight integration of the half-speed L2 cache. Implementing a 100-MHz bus within Slot 1 will have minimal if any impact on Pentium II system performance.
- ***Accelerated Graphics Port (AGP) support.*** AGP improves the performance of mid-range PCs that have small amounts of video memory on the graphics card. The industry-standard AGP specification enables a 133-MHz graphics interface and will scale to even higher levels of performance. Via, SiS, and ALI have already announced AGP-enhanced chipset solutions with 66- and 100-MHz system buses.
- ***Support for backside L2 cache and frontside L3 cache.*** The Super7 platform will have the "headroom" to support higher-performance AMD-K6 processors with clock speeds scaling to 400 MHz and beyond. The 21.3-million-transistor AMD-K63 processor, planned for the second half of 1998, will feature a full-speed, on-chip backside 256K L2 cache designed to deliver new levels of system performance to mainstream desktop systems. The AMD-K6-3 processor will also support an optional 100-MHz frontside L3 cache for even higher performance system configurations.

Slot 1 Infrastructure and Dual Independent Bus Architecture

While much of the PC industry continues to embrace existing Socket 7 infrastructure as an optimal desktop platform, Intel wants to take the industry in another direction. With the debut of the Pentium II, Intel is no longer driving the state of the art in Socket 7 designs and is instead investing resources in its proprietary Pentium Pro (also known as the P6 or Split Transaction) bus. Pentium Pro uses the Socket 8 pinout designed for a zero insertion force (ZIF) socket on the motherboard. Pentium II, however, uses an entirely new package technology called the Single Edge Connect (S.E.C.) cartridge, a daughtercard that fits into a motherboard slot (Slot 1).

A key component of the Slot 1 infrastructure is Intel's Dual Independent Bus (DIB) architecture, which supports two independent buses (a system bus and a backside L2 bus) as opposed to Socket 7's single-bus architecture. In reality, the DIB architecture implemented in the Slot 1 card is not a technological breakthrough but a repackaged version of the existing Pentium

Pro/Socket 8 infrastructure introduced in late 1995. In other words, DIB is little more than a new marketing term for the bus architecture used by both Pentium Pro and Pentium II.

Slot 1: A Costly Alternative With No Additional Benefits

The DIB/Slot 1 design may benefit Intel's infrastructure and systems business. However, Intel's abrupt shift from a PGA-style package to Slot 1 processor modules will not benefit the infrastructure for mainstream computing. Fundamentally, Slot 1 requires investment in a new infrastructure, resulting in more costly motherboards, chipsets, and redesigns—with no increase in bus bandwidth to the CPU. Because Slot 1 is not an open standard, it puts Intel in control of a divergent infrastructure direction. At present, it is unclear how Intel will license DIB/Slot 1 technology to third-party chipset and motherboard suppliers. Slot 1 also places PC makers at the beginning of the learning curve while reducing their ability to differentiate and innovate within open industry standards.

***Bus Bandwidth*.** Intel claims that the DIB architecture implemented in Slot 1 provides "headroom for future generations of processors." The same holds true for Socket 7. In fact, the bus bandwidths of both infrastructures are equal at the same clock speeds (533.33 Mbytes/sec for 66-MHz bus and 800 Mbytes/sec for 100-MHz bus). Benchmarks demonstrate that sixth-generation performance competitive with Pentium II easily can be obtained from the AMD-K6 processor within the existing Socket 7 infrastructure.

Both Socket 7 and Slot 1 can be scaled to accommodate higher levels of processor performance. Currently, the Socket 7 bus operates at 66 MHz, and AMD plans to introduce 100-MHz bus frequencies in Q2 1998. As shown in the table below, Socket 7 and Slot 1 have the same maximum peak bus bandwidth and bus width at 66 MHz and 100 MHz bus speeds. Note also that Socket 7 benefits from shorter data latency more than Slot 1.

Processor Bus Scoreboard			
	Socket 7 (AMD-K6®)	**Super7™ (AMD-K6-2)**	**P6/Slot 1 Bus (Pentium® II)**
Bus Width	64-bit	64-bit	64-bit
Bus Speed	66.67 MHz	100 MHz	66.67 MHz & 100 MHz
Maximum Bus Bandwidth	533.33 Mbytes/sec	800 Mbytes/sec	533.33 Mbytes/sec & 800 Mbytes/sec
Data Bursting	Yes	Yes	Yes
Data Latency	2 Bus Phases	2 Bus Phases	5-7 Bus Phases
Bus Protocol	Address Pipelining	Address Pipelining	Split Transaction

The processor bus scoreboard clearly shows that Slot 1 provides no advantage over Socket 7 in uniprocessor system designs. Although Intel's Slot 1 split-transaction bus protocol may enhance multiprocessor system development, the Socket 7/Super7 platform targets the

mainstream market, which does not require multiprocessor support. Indeed, the vast majority of mainstream desktop PCs are based on uniprocessor designs.

Upgradability. Slot 1 poses a major upgrade challenge. While Slot 1 implementations may offer some level of future upgradability, they are not backwards compatible with Socket 7 systems and thus do not provide an easy upgrade path for today's broad base of existing PC users. This incompatibility between infrastructures enlarges the list of system designs and platforms that OEMs and resellers must support. Socket 7 systems offer a cost-effective upgrade path to future high-performance members of the AMD-K6 and AMD-K6-2 families, as well as a bridge to legacy PC users.

Feature sets. The existing Socket 7 and enhanced Super7 platform will deliver feature sets, such as AGP support, competitive with Slot 1. For example, a number of AGP-enabled Socket 7/Super7 chipset solutions are now available from leading third-party infrastructure suppliers, including Via, ALI, and SiS.

Infrastructure cost. Socket 7 remains a more cost-effective platform than Slot 1 because it has been in volume production for several years and manufacturing and learning-curve production issues have long been resolved. Factors contributing to higher Slot 1 infrastructure costs include more expensive chipsets and higher-priced Slot 1 motherboards (as illustrated by the motherboard cost comparison table below). Slot 1 is not only a more costly infrastructure, but it also poses a more difficult mechanical implementation. For example, Slot 1 cartridges can be mechanically unstable in mini-tower configurations, requiring retainers or "goalposts" to keep the cartridge securely in place within the tower system.

Motherboard	Q1 '98	Q2 '98
Enhanced 66-MHz 586-class (Socket 7)	$74.95	$74.65
66-MHz Pentium II-class (Slot 1)	$184.00	$184.00
100-MHz 586-class w/AGP (Super7)	$136.45	$105.22
100-MHz Pentium II-class (Slot 1)	$219.11	$199.95

(Table Source: Estimated and forecasted volume pricing for motherboards used in mainstream PCs from Mercury Research Report, "Desktop PC Build Costs'97")

Conclusion

For reasons of cost, upgradability, and freedom of choice, it does not make sense to abandon Socket 7, a mature infrastructure that continues to provide superior value and leading-edge bandwidth for mainstream desktop systems. Slot 1, on the other hand, means higher cost and limited upgradability and brings no additional benefit to OEMs, resellers, and PC users.

AMD Overview

AMD is a global supplier of integrated circuits for the personal and networked computer and communications markets. AMD produces processors, flash memories, programmable logic devices, and products for communications and networking applications. The world's second-leading supplier of Windows compatible PC processors, AMD has shipped more than 100 million x86 microprocessors, including 55 million Windows compatible processors in the last five years.

Founded in 1969 and based in Sunnyvale, California, AMD has sales and marketing offices worldwide and manufacturing facilities in Sunnyvale; Austin, Texas; Bangkok, Thailand; Penang, Malaysia; Singapore; and Aizu-Wakamatsu, Japan. AMD had revenues of $2.4 billion in 1997. (NYSE: AMD).

Cautionary Statement

This Editorial Background contains forward-looking statements that involve risks and uncertainties that could cause actual results to differ materially, including the market acceptance and successful production ramp of AMD processors, the impact of competitive products and pricing, the timely development of wafer fabrication process technologies, the effect of changing economic conditions, and such risks and uncertainties detailed from time to time in the company's SEC reports.

APPENDIX

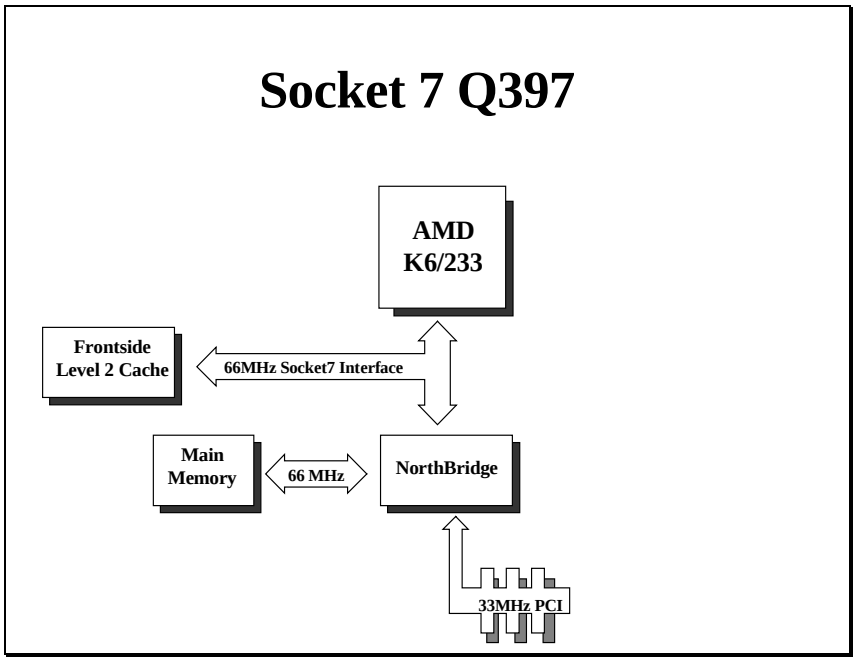

Figure 1: Today's industry-standard Socket 7 platform delivers leading-edge performance and features in a low-cost implementation.

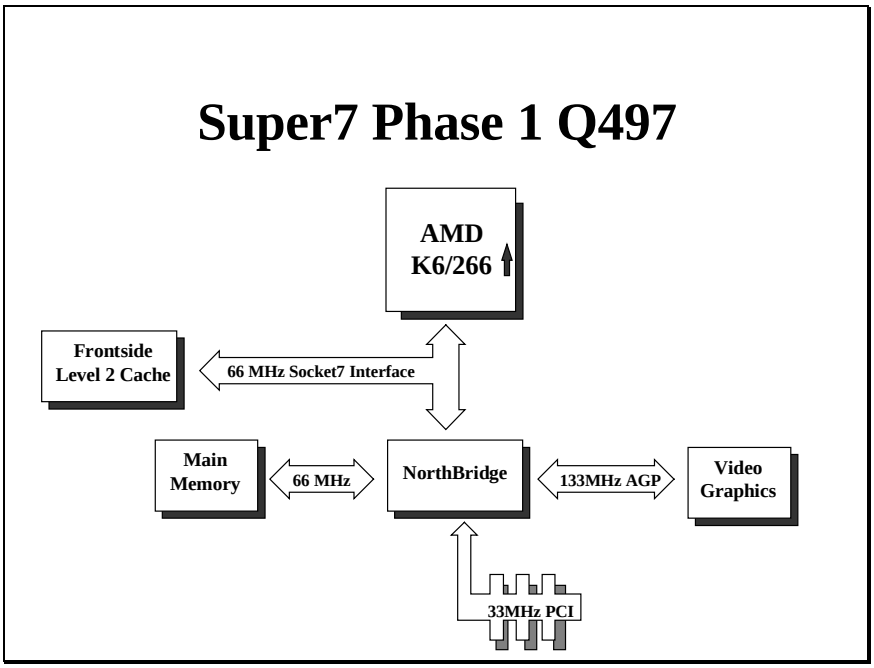

Figure 2: During Q4 1997, AMD and its infrastructure partners plan to introduce the first major enhancements to the Socket 7 platform with the addition of AGP capability.

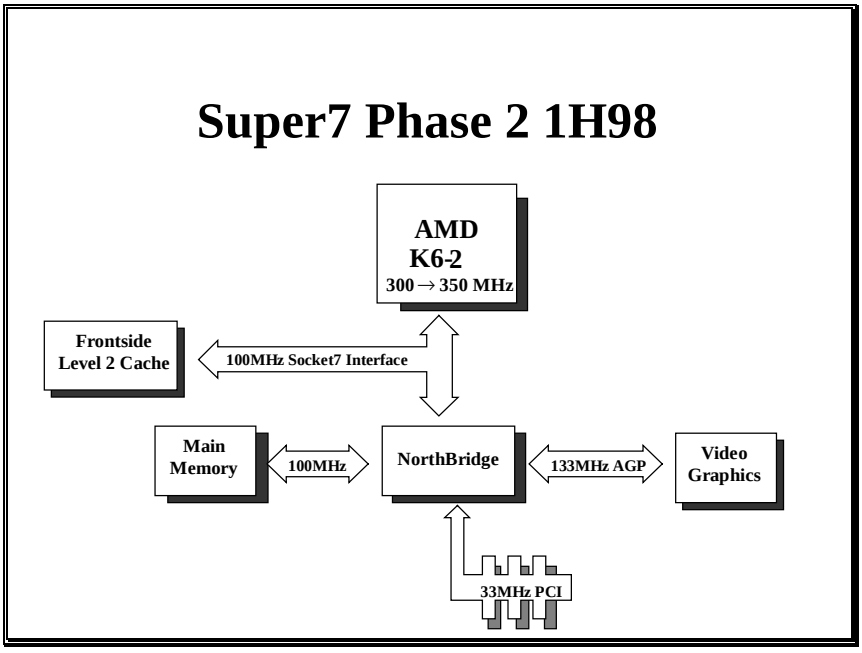

Figure 3: In the first half of 1998, AMD and its infrastructure partners have enhanced the Socket 7 platform by adding a 100-MHz interface to the frontside L2 cache and main system memory. This will speed up access to the frontside cache and main memory by 50 percent, resulting in a significant system performance increase.

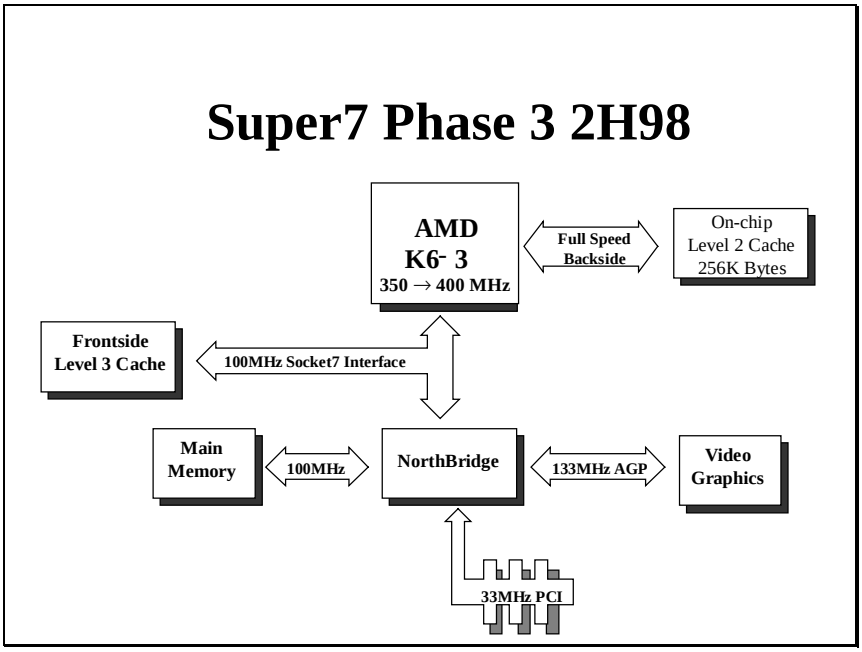

Figure 4: Planned Super7 platform enhancements for the second half of 1998 include a 100-MHz local bus, AGP with 133-MHz data transfers, and full-speed backside L2 cache for scalable performance—all with the cost advantages of Socket 7.