

## IDT's RC32334 INTEGRATES PCI

By Tom R. Halfhill {6/26/00-05}

IDT's new Internetworking Products Division has announced its first chip, a 32-bit MIPS-compatible embedded processor with integrated PCI and SDRAM controllers. The new RC32334 joins a growing number of similarly endowed chips from other vendors

that make life a little easier for system designers.

The 32334 is intended for low-cost network equipment, such as small-office routers, LAN switches, and home DSL gateways. Production quantities are available now in three speed grades: 150MHz (\$24), 133MHz (\$21), and 100MHz (\$19). A part rated for industrial temperatures costs \$22.50. All of the chips are packaged in 256-contact PBGAs measuring 17mm<sup>2</sup>.

The new processor is based on IDT's 32300 core, also found in IDT's 32364. It's a uniscalar implementation of the MIPS32 instruction-set architecture introduced last year by MIPS Technologies (see [MPR 5/31/99-05](#), "Jade Enriches MIPS Embedded Family"). It has a five-stage pipeline, an 8K instruction cache, a 2K data cache, and an MMU. The MIPS32 instruction set includes some DSP-type multiply-add (MADD) instructions, but the 32334 doesn't have the fast hardware multiplier found in the MIPS32 4Kc core.

Like most other integrated processors with PCI, the 32334 has a 32-bit PCI 2.1 interface that works with 33- or 66MHz peripherals. An on-chip four-channel DMA controller

allows direct PCI-memory transfers. The I/O interface is 5V tolerant.

Memory controllers are also becoming standard features on integrated processors, and the 32334 has a 32-bit SDRAM memory interface. The bus frequency is programmable and will most likely be half the CPU's core frequency in typical applications, although other integer ratios are possible. The interface supports four banks of SDRAM, either in DIMMs or small-outline DIMMs (SODIMMs). A second memory controller supports 8-, 16-, and 32-bit devices, including ROM, EPROM, flash, and SRAM.

Feature	IDT RC32334	QED RM5720	IBM 405GP	Hitachi SH7751	Motorola MPC8240
Architecture	MIPS	MIPS	PowerPC	SuperH	PowerPC
CPU Core	RC32300	RM5261	PPC 405	SH-4	PPC 603e
Max Freq	150MHz	300MHz	266MHz	167MHz	250MHz
Bus Freq	75MHz	133MHz	100MHz	83MHz	100MHz
Memory Bus	32 bits	64 bits	32 bits	32 bits	64 bits
Cache (I/D)	8K/2K	32K/32K	16K/8K	8K/16K	16K/16K
PCI Ctrl	33/66MHz	33/66MHz	33/66MHz	33/66MHz	33/66MHz
DRAM Ctrl	SDRAM	SDRAM	SDRAM	SDRAM	SDRAM
Dhrystone 2.1	197 mips	338 mips*	375 mips	300 mips	352 mips
Power (typ)	1.7W	<2W*	1.6W	400mW	3.6W
Perf Ratio	1.3 mips/MHz	1.1 mips/MHz*	1.4 mips/MHz	1.8 mips/MHz	1.4 mips/MHz
Power Ratio	116 mips/W	169 mips/W*	234 mips/W	750 mips/W	98 mips/W
Price (10K)	\$24	\$35	\$51 (200MHz)	\$39	\$58.44
Availability	Now	2H00	3Q00	Now	Now

**Table 1.** IDT's 32334 has a lower CPU clock frequency, a slower SDRAM interface, and smaller caches than its likely competitors. But it also costs less and is shipping today. (\*Based on estimates by vendors and MDR.)

Customers who are evaluating MIPS-compatible integrated processors will most likely compare the 32334 to QED's RM5720 Alpine (see [MPR 12/28/98-02](#), "QED Demonstrates Improved PCI I/O"). As Table 1 shows, the 5720 has several advantages: a higher maximum clock rate, a 64-bit SDRAM interface that runs at 133MHz, much larger caches, and about 50% higher performance. However, the 32334 is available now and costs significantly less than QED's announced price for the long-delayed 5720—which isn't sampling until next quarter and won't ship until later this year.

A look beyond the MIPS architecture shows that some other speedy competitors are Hitachi's SH7751 (see [MPR 6/21/99-02](#), "Hitachi SH7751 Gains a PCI Interface"),

IBM's PowerPC 405GP (see [MPR 7/12/99-03](#), "PowerPC 405GP Has CoreConnect Bus"), and Motorola's MC8240 (see [MPR 11/16/98-en](#), "Motorola PowerPC 8240 Gets PCI Bus"). All of them are faster than the 32334, and some have other desirable qualities. The SH7751 and 8240 have FPUs, a luxury not found in the 32334 and 405GP. The SH7751 also has exceptionally low power consumption. And the 405GP has an on-chip Ethernet controller, which might be an advantage in a processor intended for networking applications. But all of them, like QED's 5720, cost significantly more than the 32334. IDT's saving grace is low pricing. That may be enough to compensate for the 32334's shortcomings in applications that don't require higher performance. ♦

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