PI74SSTVF16857 for DDR Applications

By Jimmy Ma

Introduction

DDR is short form for Double Data Rate, a new generation of memory technology that has evolved from its predecessor, the single data rate PC100/PC133. This technology of acquiring data on the rising and falling edge has enabled memory modules, or DIMM's, to be used in high-performance servers and routers for the networking market. The technology has also been well adopted in the consumer market such as workstation, desktop PC, and add-in video cards. Table 1 provides an overview of where the memory technology is heading.

Table 1. Memory Technology Trend

DRAM	Voltage	System	DIMM	Clock Frequency	Data Rate
SDR	3.3V	PC100	N/A	100MHz	0.8GB/s
SDR	3.3V	PC133	N/A	133MHz	1.06GB/s
DDR	2.5V	PC1600	DDR200	100MHz	1.6 GB/s
DDR	2.5V	PC2100	DDR266	133MHz	2.1 GB/s
DDR	2.5V	PC2700	DDR333	166MHz	2.7 GB/s
DDR*	2.5V	PC3200	DDR400	200MHz	3.2 GB/s
DDR-II	1.8V	PC3200	DDR400	200MHz	3.2 GB/s
DDR-II	1.8V	PC4300	DDR533	266MHz	4.3 GB/s

Note: * = Proposed, but not yet approved by JEDEC
SDR = Single Data Rate
DDR = Double Data Rate

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Although DDR technology is applied to vast majority of applications, in high-performance systems such as servers, workstations, routers, and switches, the use of Registered DIMMs is required. Registered DIMMs offer reduced system loading by including on-board registers for additional signal drives. Registers are also critical in order to latch the address and command signals. A typical Registered DIMM application is shown in Figure1.

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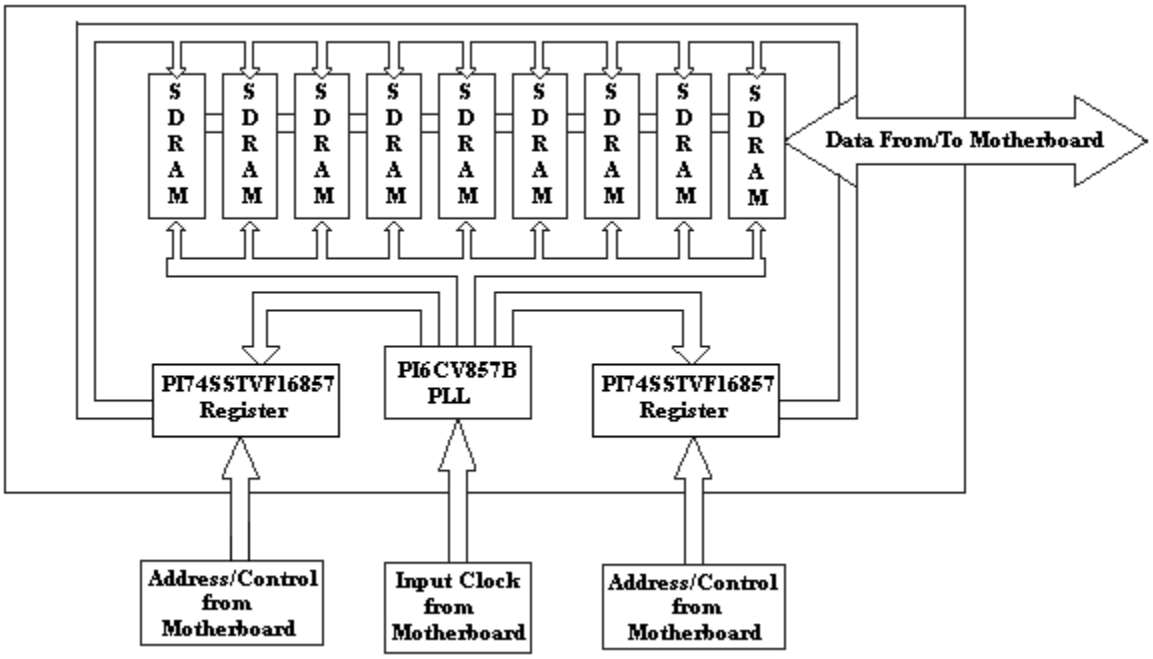

Figure 1. A typical DDR application.

Pericom Semiconductor offers its latest logic device for Registered DIMM applications – Pericom's PI74SSTVF16857. With its sub-micron technology, propagation delay has been reduced allowing memory module designers to meet tight timing margin requirements.

Timing is becoming more and more critical as speed increases. With the DDR initial release of PC1600, clock speed was only 100MHz. But with demands for higher speed in the networking and consumer markets, DDR has moved to 133MHz and 166MHz and now proposed by JEDEC, 200MHz. The move to higher speeds means the allowable timing margin will become even tighter for memory module designers. A solution to meet this tight timing margin requirement is to have a fast part with less propagation delay.

PI74SSTVF16857 in a Real Application

In an actual test using a RAM Stress Test (R.S.T.), system failure was caused by long propagation delay introduced by the Registers. Figure 2 shows this system failure due to the long propagation delay between the clock and the register. Figure 3 and Figure 4 both show a reduced propagation delay, which was able to resolve the system failure. Figure 3 shows a competitor's SSTVF16857. Figure 4 shows a Pericom's PI74SSTVF16857, which is faster than the competitor part by 680ps. With DDR running at such higher speeds, in some cases as little as 100ps off is enough to cause an entire system to fail. Therefore having a fast register is the key to this rising problem. Currently, Pericom Semiconductor has the fastest registers in the industry.

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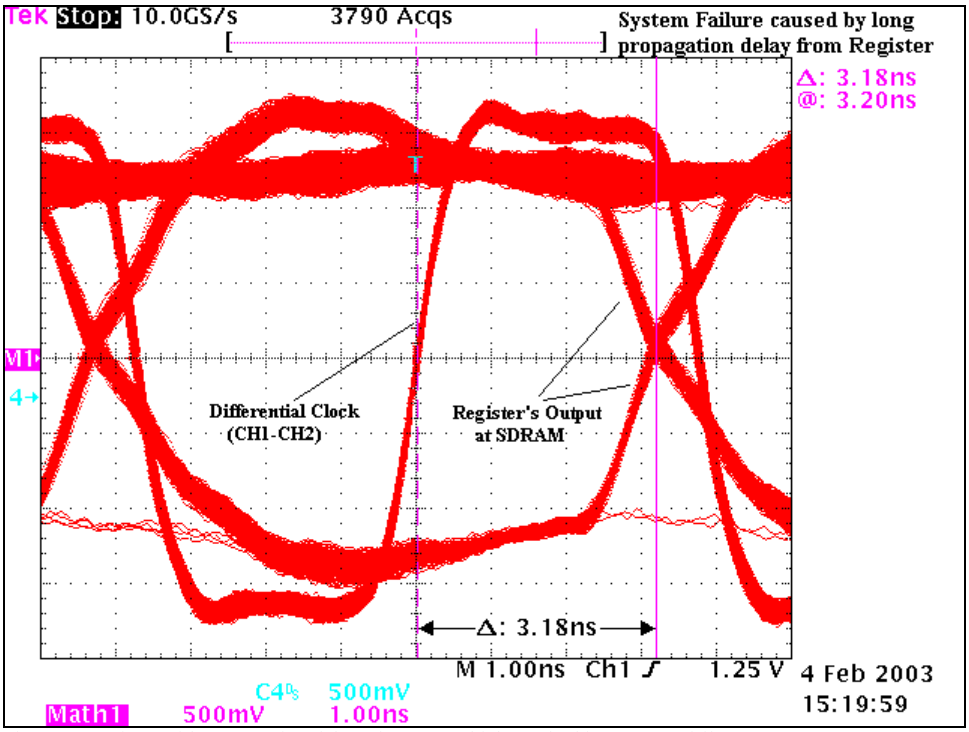

Figure 2. Register with propagation delay of 3.18ns, which resulted in a system failure.

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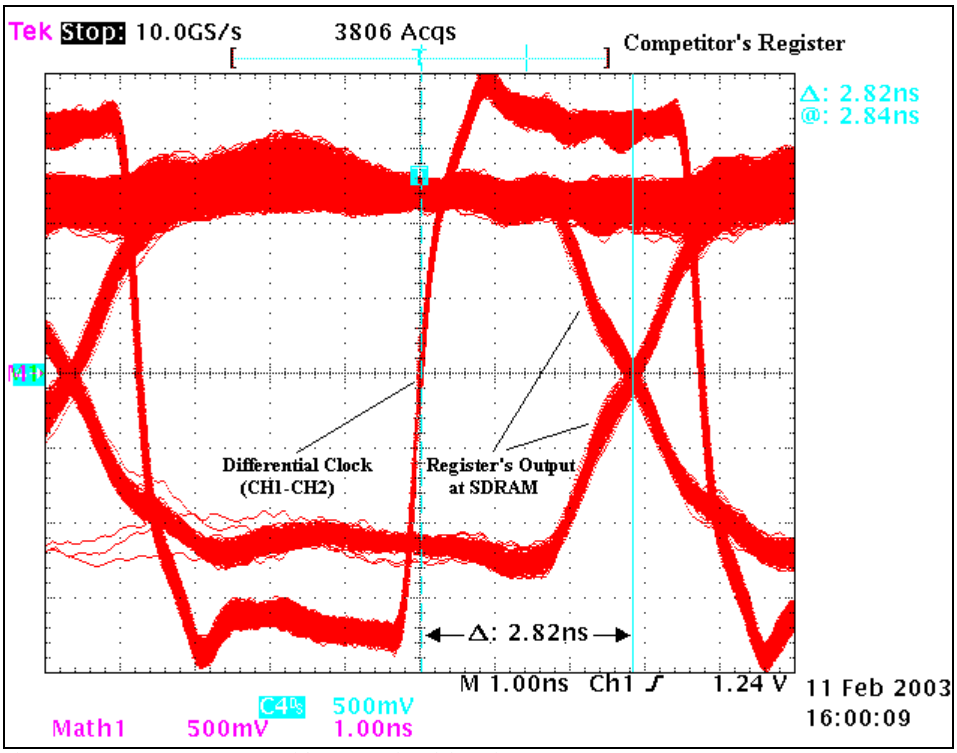

Figure 3. **Competitor Register** with propagation delay of 2.82ns.

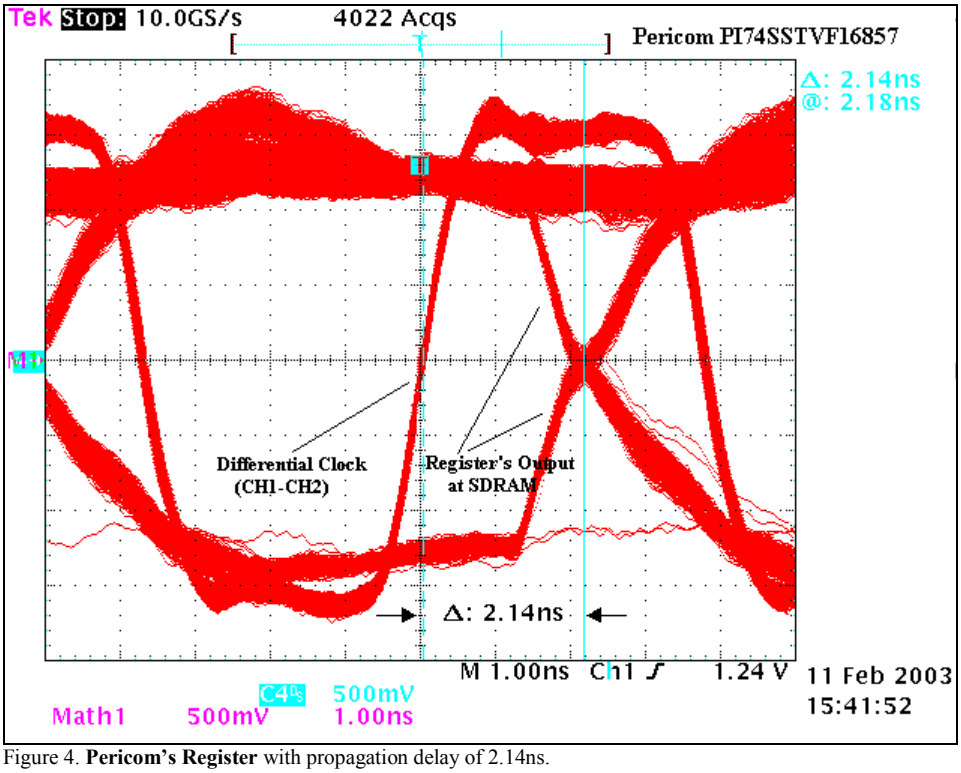

Figure 4. **Pericom's Register** with propagation delay of 2.14ns.

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