

# Re: Flash memory

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<http://www.tech-archive.net/Archive/WinXP/microsoft.public.windowsxp.hardware/2007-01/msg01141.html>

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- *From:* Paul <nospam@xxxxxxxxxxx>
  - *Date:* Wed, 24 Jan 2007 21:22:48 -0500
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Terry wrote:

From what I have read so far, flash memory is slower than DRAM. How

much slower?

How you would compare it's speed to a hard drive?

I know that most flash memory has a USB interface. How much faster would flash memory be if it were plugged into the computer bus?

The flash design is divided into two parts. The flash memory chip is one part. A controller is the second part. The controller converts the USB packets, into a format suitable for driving the memory chip.

(Works for me in IE...)

[http://www.toshiba.com/taec/adinfor/mlcnand/popup\\_nand\\_nor.html](http://www.toshiba.com/taec/adinfor/mlcnand/popup_nand_nor.html)

NAND flash is divided into two types. SLC is single level. MLC is multi level (2 bits per cell). MLC gives higher density, but has a reduced number of write cycles. And if you look at the charts for "program" or write rate, SLC has the better write performance.

SLC is rated at 8MB/sec write and 24MB/sec read. A hard drive is 60MB/sec speed near the start of the disk, and 40MB/sec near the end of the disk. So flash is not even close, when it comes to write speed.

The USB bus is 60MB/sec theoretical cable speed, but around 57MB/sec using real packets, and a lot less than that, when real time overheads are taken into account. But using USB2 for flash, in the example cited above, should not be the limiting factor.

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And flash is constantly being improved, so there could well be designs that go faster than the chart above. More companies than just Toshiba, make flash.

DRAM is a lot faster. If we take just one chip off a DDR2-800 DIMM, a chip that has an 8 bit interface, then it would transfer 800MB/sec. The whole DIMM would be PC2-6400 or 6400MB/sec.

<http://en.wikipedia.org/wiki/DDR2>

If you operate the flash chips in parallel, then any speed you want is possible (assumes min transfer size is huge). It just takes a large enough number of chips. Sort of like a RAID 0 array, only using flash chips. For example, a PCI Express x16 card, filled with flash chips, would make a dandy ReadyBoost.

This is an older card, holding a number of flash chips. This whole board is only twice as fast as a USB stick :-)

<http://www.cetia.com/graphics/products/flash.jpg>

Paul

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