Future Technology Devices International Ltd.

Application Note AN_112

VNC1L Data Transfer Speeds

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This application note explains the access times achievable with the VNC1L.

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1 Introduction

The VNC1L is a USB host controller IC which allows data to be transferred via a monitor port that can be configured to be a UART, SPI or 8 bit wide FIFO interface to a USB device. This document will explain the speed of such transfers when connected to a memory device.

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2 Data transfer speeds

2.1 UART Transfers

The VNC1L works at 12Mb/sec as all USB devices on a Full Speed USB bus must do. If it did not achieve this then no USB device would ever work with it.

The actual throughput is not solely dependent upon the VNC1L but also on the device attached to the USB port. Factors such as disk size, format and how full a disk is all impact on the overall speed as the bulk of the processing time is related to handling the FAT table.

Performance testing is normally carried out at 115200 baud on the monitor port. However, additional measurements with 3Mbaud data rate using a Flash disk with 4kB cluster size are recorded here.

The 3Mbaud UART data rate gives a theoretical PEAK data rate of around 272kB/sec. The peak data rate is not indicative of the rate for sustained throughput due to the other overheads which are applicable to this. The readings into theoretical, achievable, measured and sustained rates:

Maximum theoretical throughput: 272kB/sec
- UART interface is limiting factor
- 4kB transfer from UART to USB bus (16.775ms)

Maximum achievable throughput (without flash disk response time): 233kB/sec
- SCSI protocol overhead reduces theoretical throughput
- same 4kB transfer from UART to USB flash disk response time (17.588ms)

Maximum achievable throughput (with flash disk response time): 216kB/sec
- same 4kB transfer from UART to USB including flash disk response time (18.9ms)

Peak measured throughput: 159.4kB/sec
- File system overhead reduces achievable throughput
- 40kB file written in single block (40448 bytes in 253.66ms)
- Optimum file system conditions: with FAT table cached, DIR table cached, no file fragmentation, cluster added in first sector of FAT table, DIR entry in first sector of DIR table.

Typical measured throughput: 25.45kB/sec
- 40kB file written in 512 byte blocks (40448 bytes in 1589ms)
- File system overhead increases with extra SCSI commands required
- Flash disk write response increases
- Optimum file system conditions: with FAT table cached, DIR table cached, no file fragmentation, cluster added in first sector of FAT table, DIR entry in first sector of DIR table.

Reading data is faster as the VNC1L can store the data on the chip before passing to the monitor port. Typical maximum rate is 200kbyte/s

2.2 FIFO Transfers

The peak and sustained throughputs of the FIFO interface at any given baud rate will be similar to the UART interface at the same baud rate due to the architecture of the VNC1L device.

Reading data is faster as the VNC1L can store the data on the chip before passing to the monitor port. Typical maximum rate is 400kbyte/s

2.3 SPI Transfers

The peak and sustained throughputs of the SPI interface at any given baud rate will be lower than the UART interface at the same baud rate due to the architecture of the VNC1L device.

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Appendix A - References

Document Reference	Description
DS_VNC1L-1A	Vinculum Embedded USB Host Controller IC Data Sheet http://www.ftdichip.com

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Appendix B - Revision History

Revision History

Version 1.00	Initial Release	February, 2009