



USB Host (Vinculum) and Serial Controllers



Vinculum USB Host Controller IC



VNC1L-1A: The Vinculum VNC1L is the first in its family of Embedded USB host controller integrated circuit devices. The device utilizes its built-in MCU and embedded flash memory to handle the USB host interface by encapsulating the USB device classes in the firmware. When interfacing to mass storage devices such as USB flash drives, Vinculum transparently handles the FAT file structure communicating via UART, SPI or parallel FIFO interfaces through a simple to implement command set. Vinculum provides a new cost effective solution for providing USB host capability into products that previously did not have the hardware resources available. **Features:** • 8/32 bit V-MCU Core • Dual DMA controllers for hardware acceleration • 64KByte embedded flash ROM program memory • 4KByte internal data SRAM • 2 USB 2.0 Low/Full speed USB Host/Slave ports • UART, SPI and parallel FIFO interfaces • Up to 28 GPIO interface pins for data I/O • 3.3V operation with 5V safe inputs • Low operating and USB suspend current • Full driver support for the target/slave applications • Package: 48-LQFP • Multi-processor configuration capable • FIFO interface mode with 8 bit bidirectional data bus and simple 4 wire handshake for data I/O and command monitor interface • Single chip embedded USB host/slave controller IC device • Entire USB protocol handled on the chip • Firmware easily upgradable in the field • Support for bus powered, self powered, and high powered USB device configurations • -40°C - 85°C operating temperature range

VPROG-1: The VPROG-1 is used to program individual Vinculum Host Controller devices or it can be used to program Vinculum Host Controller devices used on the VDIP1 and VDIP2. **Features:** • USB controlled and powered • Quick and easy programming of individual Vinculum host controller devices • Quick and easy programming of VDIP host controller prototyping modules • Quick and easy programming of ganged VPROG-1 (up to 10) programmers • Easy to use VNC, VPROG software • Visual indication of programming progress and status using LEDs • Requires Socket Module

Digi-Key Part No.	Cut Tape Pricing			Digi-Key Part No.	Tape & Reel Pricing		FTDI Part No.
	1	10	50		2,000		
768-1000-1-ND	12.23	116.70	558.27	768-1000-2-ND	7799.03/M		VNC1L-1A-REEL
768-1045-ND† NEW!	61.72	—	—				VPROG-1

† Bulk

NEW! Vinculum II Embedded Dual USB Host Controller ICs



Vinculum-II is FTDI's 2nd generation of USB Host ICs. The CPU has been upgraded from the previous VNC1L device dramatically increasing the processing power. The IC architecture was designed to take care of most of the general USB data transfers, thus freeing up processing power for user applications. Flash and RAM memory has been increased providing larger user areas of memory for the designer to incorporate his own code. The designers also have the ability to create their own firmware using the new suite of software development tools. **Features:** • Embedded processor core • 16-bit Harvard architecture • Two full-speed or low-speed USB 2.0 interfaces capable of host or slave functions • 256Kbytes on-chip E-Flash Memory (128K x 16-bits) • 16Kbytes on-chip Data RAM (4K x 32-bits) • Programmable UART up to 3Mbaud • Two SPI (Serial Peripheral) slave interfaces and one SPI master interface • Reduced power modes capability • Variable instruction length • Native support for 8, 16 and 32 bit data types • 8-bit wide FIFO Interface • Firmware upgrades via UART, SPI, FIFO interface or USB Flash Drive • 12MHz oscillator using external crystal • General-purpose timers • Up to 44 configurable I/O pins using the I/O multiplexer • 3.3 Volt Supply • -40°C - 85°C extended operating temperature range

Package	Digi-Key Part No.	Cut Tape Price Each			Tape and Reel†		FTDI Part No.
		1	50	100	Qty.	Pricing	
64-QFN	768-1046-1-ND	5.54	4.82	4.59	3,000	4152.00/M	VNC2-6401B-REEL
64-LQFP	768-1047-1-ND	5.54	4.82	4.59	1,000	4236.15	VNC2-64L1B-REEL
48-QFN	768-1048-1-ND	4.93	4.29	4.09	3,000	3675.08/M	VNC2-4801B-REEL
48-LQFP	768-1049-1-ND	4.93	4.29	4.09	1,000	3731.18/M	VNC2-48L1B-REEL
32-QFN	768-1050-1-ND	4.49	3.91	3.72	3,000	3352.46/M	VNC2-3201B-REEL
32-LQFP	768-1051-1-ND	4.49	3.91	3.72	3,000	3394.54/M	VNC2-32L1B-REEL

† For Tape and Reel part number, change 1-ND to 2-ND.

NEW! Vinculum II Evaluation Board and Debug Module

The V2-EVAL is a hardware platform designed to support easy evaluation of FTDI's VNC2 series of embedded USB host controller devices. • Operating Temperature Range: 0°C - 55°C • Requires Daughter Board Modules

The Debug module provides connectivity between the VNC2 development software and the debug interface pin on the VNC2 USB host controller device.

Description	Digi-Key Part No.	Price Each			FTDI Part No.
		1	10	50	
V2-EVAL Kit with Base Board, Power Supply and Cables	768-1062-ND	88.65	80.80	—	V2-EVAL
Daughterboard Module with 32-Pin QFN VNC2 Device	768-1061-ND	13.98	12.72	11.56	V2-EVAL-EXT32
Daughterboard Module with 48-Pin QFN VNC2 Device	768-1060-ND	15.38	13.99	12.72	V2-EVAL-EXT48
Daughterboard Module with 64-Pin QFN VNC2 Device	768-1059-ND	16.79	15.27	13.87	V2-EVAL-EXT64
VNC2 Debugger Module	768-1052-ND	18.89	17.17	15.79	VNC2 DEBUG MODULE

VDrive2 Module

The VDrive2 module provides an easy solution for adding a USB flash disk interface to an existing product. Only four signal lines plus 5V supply and ground are required to be connected. Using the VDAP firmware, the I/O interface can be selected between the serial UART or SPI using the on-board jumper pins. **Features:** • Uses VNC1L embedded USB host controller IC device • USB 'A' type socket to connect USB flash disk • Traffic indicator LED • 2mm (0.08") pitch 8 pin connector • 8-way header interconnect cable provided • Jumper selectable UART or SPI interfaces • Enclosure with snap in place clips allows for easy front panel mounting • Program or update firmware via USB flash disk or via UART interface



768-1003-ND (VDRIVE2) \$27.49

V-Evaluation Board

The V-Evaluation kit is a hardware platform that designers can use to develop embedded USB host systems based on VNC1L devices.

Features: • Inbuilt VNC1L USB device programmer/terminal emulator/command monitor hardware • Two VNC1L USB Host/Slave ports • Generous prototyping area for standard DIP and SIL devices • Multiple I/O port connectors grouped by port name and/or function • LEDs and switches for user interaction • Downloadable programming, terminal emulation and debug monitor software • Downloadable HID class example project including PIC source code in "C"

Kit Includes: • V-Evaluation development board • 5V/1A universal plug top PSU • USB A/B cable to connect to a host PC in programming/terminal emulation or debugging modes • USB gender changer for USB slave mode applications

768-1006-ND (V-EVAL-1) \$78.54

VMusic2 Audio Module

The VMusic2 module is a product which not only lets you add USB flash disk interfacing to your product, but also allows you to play back MP3 and other popular digital audio formats directly from a USB flash disk. Extensions to the Vinculum VDAP command set allows you to play a selected file, as well as control the volume and balance of the sound channel, and monitor the status of the file being played.



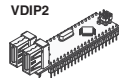
Features: • Uses VNC1L-1A embedded USB host controller IC device combined with VLSI VS1003 IC for music playback • USB 'A' type socket to connect USB flash disk • Stereo 3.5mm headphone jack socket and audio line-out connector for audio playback • Jumper selectable UART or SPI interfaces • Only four signals to connect, excluding power and ground • 2mm (0.08") pitch 8-pin connector compatible with TTL-232R-3V3-2mm cable for easy evaluation • Single 5V supply input • Traffic indicator LED • Program or update firmware via USB flash disk or UART interface

768-1004-ND (VMUSIC2) \$42.08

VDIP1, VDIP2, V2DIP1 and V2DIP2 Modules

VDIP1 and VDIP2 Modules

The VDIP modules are MCU to embedded USB host controller development modules for the VNC1L IC device. The VDIP1 is supplied on a PCB designed to fit a 24-pin Dip socket and the VDIP2 is supplied on a PCB designed to fit into a 40-pin Dip socket which provides access to UART, parallel FIFO, and SPI interface pins on the VNC1L device with its AD and AC bus pins. **Features:** • Jumper selectable UART, parallel FIFO or SPI MCU interfaces • Uses VNC1L embedded USB host controller IC device • Single 5V supply input • Auxiliary 3.3V/200mA power output to external logic • Power indicator, and USB traffic indicator LEDs • VDIP1: USB 'A' type socket to interface with USB peripheral devices • VDIP2: Two vertically mounted USB 'A' type socket to interface with USB peripheral devices



768-1001-ND (VDIP1) \$27.49

768-1002-ND (VDIP2) \$33.10

V2DIP1 and V2DIP2 Vinculum II Modules

The V2DIP modules are designed to allow rapid development of designs using the VNC2 embedded USB host controller IC devices. The module provides access to the UART, parallel FIFO and SPI interface pins of the VNC2 device via its IO bus pins. **Features:** • UART, parallel FIFO and SPI interfaces can be programmed to a choice of available I/O pins • Single 5V supply input from DIL connectors or 5V supplied via USB VBUS slave interface or debugger module • Auxiliary 3.3V / 200mA power output to external logic • Power and traffic indicator LEDs • Debugger interface pin available on DIL pins or via 6 way male header which interfaces to separate debugger module • Firmware upgrades via UART or debugger interface pin header

768-1058-ND (V2DIP1-32) **NEW!** \$20.97

768-1057-ND (V2DIP1-48) **NEW!** \$24.13

768-1056-ND (V2DIP1-64) **NEW!** \$27.27

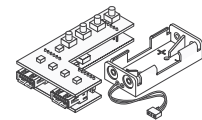
768-1055-ND (V2DIP2-32) **NEW!** \$25.17

768-1054-ND (V2DIP2-48) **NEW!** \$28.32

768-1053-ND (V2DIP2-64) **NEW!** \$31.47

VF2F2 Module

The VF2F2 is a reference design for the Vinculum VNC1L. It is designed as a stand alone application which allows for the back up of files from a digital camera onto a USB flash disk. At the push of a button, all the picture files on the camera are copied to a unique folder on a USB flash disk so that the digital camera memory can be re-used to take further pictures. The VF2F2 is powered by two AAA size alkaline batteries. In addition this reference design and evaluation kit could be used with other USB mass storage class devices such as MP3 players, or even for copying files directly from one USB flash disk onto another.



Features: • Two USB 'A' type sockets connect to digital camera and USB flash disk respectively • Uses VNC1L embedded USB host controller IC device • Single button file backup function • Intelligent LED illustrate successful USB flash disk enumeration, file copy function, and error conditions • On-board DC-DC converter supplies the circuitry with 5V and 3.3V power from two AAA cells • Program or update firmware via USB flash disk or UART interface

768-1005-ND (VF2F2) \$42.08

USB-Serial and USB Interface ICs



USB to Serial UART IC Devices (FT232): The FT232BL includes a 3.3V regulator, a USB transceiver that provides USB 1.1/USB 2.0 full speed physical interface and a 6MHz oscillator. The FT232RL/RQ has all the features of the BL but includes on-board EEPROM, as well as a 12MHz oscillator and the FTDIChip™ security dongle feature. All FTDI ICs feature a wide range of royalty free device drivers for 32 and 64-bit operating systems including Windows CE, XP, Vista, Linux and Mac OS.

Dual USB to UART/FIFO IC Devices (FT232SD): The FT232SD device features two multi-purpose UART/FIFO controllers which can be configured individually in several different mode, as well as a UART interface, a FIFO interface and the Bit-Bang I/O mode. The FT232SD offers a variety of additional new modes of operation including a Multi-Protocol Synchronous Serial Engine (MPSEE) interface which is designed specifically for synchronous serial protocols such as I²C, JTAG and SPI bus.

USB to Parallel/FIFO IC Devices (FT245R): The FT245R is a USB to parallel FIFO interface, with the new FTDIChip™ security dongle feature. In addition, asynchronous and synchronous Bit-Bang interface modes are available. USB to parallel designs using the FT245R have been further simplified by fully integrating the external EEPROM, clock circuit and USB termination resistors onto the device. The FT245R adds a new function compared with its predecessors, effectively making it a "2-in-1" chip for some application areas.

Hi-Speed Multichannel USB to UART/FIFO IC Devices (FT232HL/FT4232H): The FT232HL (dual-channel) and the FT4232H (quad-channel) are USB 2.0 Hi-Speed (480Mb/s) to UART/FIFO ICs capable of being configured in a variety of industry standard serial or parallel interfaces by utilizing the Multi-Protocol Synchronous Serial Engines (MPSEE) which allow for communication using JTAG, I²C and SPI.

Description	Package	Digi-Key Part No.	Cut Tape Price Each			Tape and Reel†		FTDI Part No.
			1	10	50	Qty.	Pricing	
USB to Serial UART IC	28-SSOP	768-1007-1-ND	5.05	4.55	4.33	2,000	2973.73/M	FT232RL-REEL
USB to Serial UART IC	32-QFN	768-1008-1-ND	5.05	4.55	4.33	6,000	2440.70/M	FT232RQ-REEL
USB to Serial UART IC	32-LQFP	768-1009-1-ND	6.45	5.56	5.17	1,000	3703.14	FT232BL-REEL
Dual USB UART/FIFO IC	48-LQFP	768-1010-1-ND	7.84	7.05	6.28	1,000	4264.22	FT2232D-REEL
USB to Parallel FIFO IC	28-SSOP	768-1011-1-ND	5.05	4.55	4.33	2,000	2973.73/M	FT245RL-REEL
USB to Parallel FIFO IC	32-QFN	768-1012-1-ND	5.05	4.55	4.33	6,000	2440.70/M	FT245RQ-REEL
USB to Multipurpose UART/FIFO IC	64-LQFP	768-1024-1-ND	7.53	6.96	6.48	1,000	4151.98	FT2232HL-REEL
USB to Multipurpose UART/FIFO IC	64-QFN	768-1025-1-ND	7.53	6.96	6.48	4,000	4039.78/M	FT2232HQ-REEL
USB to Multipurpose UART/MPSEE IC	64-LQFP	768-1026-1-ND	10.76	9.72	9.09	1,000	5554.69	FT4232HL-REEL
USB to Multipurpose UART/MPSEE IC	64-QFN	768-1027-1-ND	10.76	9.72	9.09	4,000	5554.70/M	FT4232HQ-REEL

† For Tape and Reel part number, change 1-ND to 2-ND.

Digi-Reel® Most SMT cutdown parts are available on a Digi-Reel®. For Digi-Reel part number, change 1-ND to 6-ND or CT-ND to DKR-ND. See Digi-Key® Services on page 2 for additional information.

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