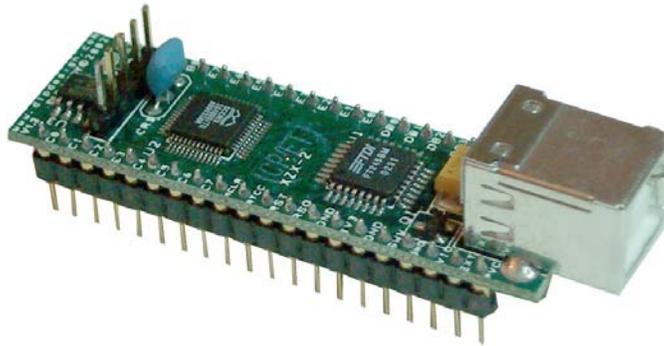


USB / Microcontroller Module



The DLP-245SY combines the same USB interface used in the DLP-USB245M module with a Ubicom SX48 microcontroller to form a rapid development tool. The SX48 microcontroller is preprogrammed with basic functionality for accessing the port pins and can be reprogrammed with user hex code via a 5-pin header that is compatible with the DLP-FLASH device programmer (purchased separately).

DLP-245SY FEATURES

- Send/receive data over USB to a host computer at up to 7 megabits per second
- 20 digital I/O lines plus the 8-bit data bus available for interfacing to user electronics (refer to the schematic for the DLP-245SY at the end of this datasheet for more details)
- Ubicom SX48 processor with 4K FLASH ROM, 262 bytes RAM, and a 2K (256x8) EEPROM
- No in-depth knowledge of USB is required as all USB protocol is handled automatically by the on-board FT245BM and its support circuitry
- Royalty-free device drivers eliminate the need for USB driver development in most cases
- USB bulk or isochronous data-transfer modes
- Required 5V supply can be taken directly from the USB port or supplied by user electronics
- USB 1.1 and USB 2.0 compatible

- USB VID, PID, serial number, and product description strings stored in on-board EEPROM
- Virtual com port (VCP) drivers for:
 - Windows 98 and Windows 98 SE
 - Windows 2000/ME/XP
 - Windows CE**
 - MAC OS-8 and OS-9
 - MAC OS-X**
 - Linux 2.40 and greater
- D2XX (USB direct drivers + DLL S/W interface)
 - Windows 98 and Windows 98 SE
 - Windows 2000/ME/XP

** In planning or under development.

APPLICATION AREAS

- Prototype development
- USB ISDN and ADSL modems
- USB interface for digital cameras
- USB interface for MP3 players
- High-speed USB instrumentation
- USB smart-card readers
- Set top box (STB) PC-USB interface
- USB hardware modems
- USB wireless modems
- USB bar code readers

GENERAL DESCRIPTION

The DLP-245SY provides a cost-effective, microcontroller-based method of interfacing an electronic peripheral to a host computer via USB.

To send data from the peripheral to the host computer, the microcontroller simply writes the byte-wide data into the FT245BM when TXE# is low. If the FT245BM's transmit buffer fills up or is busy storing the previously written byte, it will take its TXE# high in order to stop further data from being written until some of the FIFO data has been transferred over USB to the host. When the host sends data to the peripheral over USB, the FT245BM will take RXF# low to let the microcontroller know that at least one byte of data is available. The microcontroller then reads the data until RXF# goes high indicating that no more data is available to read.

By using FTDI's virtual COM port drivers, the peripheral looks like a standard COM port to the application software. Commands to set the baud rate are ignored--the FT245BM always transfers data at its fastest rate regardless of the application's baud-rate setting. The latest versions of the drivers are available for download from DLP Design's website at <http://www.dlpdesign.com>.

DRIVER SOFTWARE

FTDI's VCP (virtual com port) driver-executable files are provided royalty free on the condition that they are used only with designs incorporating an FTDI device (i.e. the FT245BM and DLP-245SY). The latest version of the drivers can be downloaded from dlpdesign.com or ftdichip.com.

The VCP driver download file is a combined set of drivers for Windows 98, Windows ME, and Windows 2000/XP. Unzip the file to a blank floppy disk or folder on your PC. (The drivers can coexist on the same floppy disk or folder since the INF files determine which set of drivers to load for each operating system version.) Once loaded, the VCP drivers allow your application software running on the host PC to communicate with the DLP-245SY as though it were connected to a COM (RS-232) port.

In addition to VCP drivers, FTDI's D2XX direct drivers for Windows offer an alternative solution to the VCP drivers that allow application software to interface with the DLP-245SY using a DLL instead of a virtual com port. The architecture of the D2XX drivers consists of a Windows WDM

driver that communicates with the FT245BM device via the Windows USB stack and a DLL that interfaces the application software (written in VC++, C++ Builder, Delphi, VB, etc.) to the WDM driver. An INF installation file, uninstaller program, and D2XX Programmer's Guide complete the package.

The D2XX direct drivers add support for simultaneous access and control of multiple FT245BM devices. The extended open function (FT_OpenEx) allows the device to be opened either by its product description or serial number, both of which can be programmed to be unique. The list devices function (FT-ListDevices) allows the application software to determine which devices are currently available for use, again by product description or by serial number.

Several new features have been recently added to the D2XX drivers. Functions are provided to program the EEPROM (FT_EE_Program) and read the EEPROM (FT_EE_Read). Unused space in the EEPROM is called the user area (EEUA), and functions are provided to access the EEUA. FT_EE_UASize gets its size, FT_EE_UAWrite writes data into it, and FT_EE_UARead is used to read its contents.

Download FTDI Application Notes AN232-03, AN232-05, AN232-06, and AN232-07 for detailed instructions on how to install and remove the drivers.

EEPROM WRITE UTILITY

The DLP-245SY has the option to accept manufacturer-specific information that is written into the on-board 93C46 EEPROM. Parameters that can be programmed include the VID and the PID identifiers, the manufacturer's product string, and a serial number.

FTD2XXST is the latest EEPROM serializer and testing utility from FTDI for the FT245BM device. It replaces the VCP-based 232Prog utility. FTD2XXST is based on the new D2XX drivers and will work on Windows 98, Windows ME, and Windows 2000/XP platforms. You must install the latest release of the D2XX drivers in order to run this application. (Refer to the SER200.PDF guide that is included in the EEPROM write utility's download zip file for details on how to use the serializer.)

The DLP Design Test Application V2.0, available from DLP Design as a separate purchase, can also be used to program the DLP-245SY's EEPROM with manufacturer-specific strings. For more details, visit <http://www.dlpdesign.com/test.shtml>.

If you have VCP drivers installed on the PC that will be used to perform the EEPROM write process, you must uninstall these drivers using the uninstaller program (included with the driver files) and install the D2XX drivers prior to running the serializer utility.

QUICK START GUIDE

This guide requires the use of a Windows 98/2000/XP PC that is equipped with a USB port.

1. Download the DLL version of the device drivers from either dlpdesign.com or ftdichip.com. Unzip the drivers onto a blank floppy disk or into a folder on the hard drive.
2. Refer to the schematics for the DLP-245SY at the end of this document. The board can be configured to receive its operating power from the USB port or from user electronics. Pins 10, 11, and 12 allow for this configuration. (Refer to the Pinout Description in the next section for a detailed description of the DLP-245SY electrical interface.)

Note: The board will not operate until a power source has been selected as mentioned in Step 2.

3. Connect the DLP-245SY board to the PC via a standard A-B, 6-foot USB cable. This action initiates the loading of the USB drivers. When prompted, select the folder where the DLL version of the device drivers was stored in Step 1. Windows will then complete the installation of the device drivers for the DLP-245SY board. The next time the DLP-245SY board is attached, the host PC will immediately load the correct drivers without any prompting. Reboot the PC if prompted to do so.

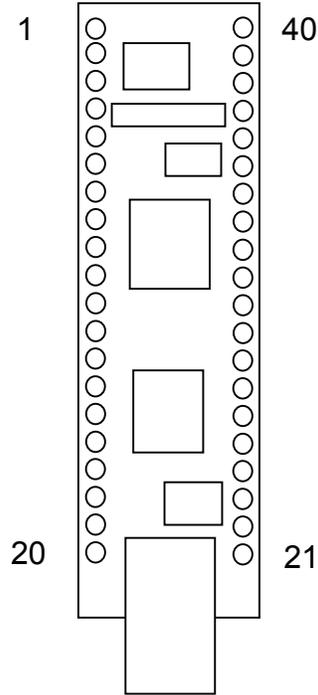
The DLP-245SY is shipped with default VID, PID, etc. values programmed into the EEPROM. You only need to run the serializer program if you want to change the default values.

At this point, the DLP-245SY is ready for use. Note that the DLP-245SY will appear non-responsive if data sent from the host PC is not read from the FT245BM device by the SX48 microcontroller.

If changing drivers from the VCP to the DLL type (or vice versa), you must first uninstall the currently loaded drivers. This is accomplished by first disconnecting the DLP-245SY adapter from the host computer and then running the uninstall program for the currently loaded version of

the drivers (Ftdiunin.exe for VCP and Ftd2xxun.exe for DLL). These uninstall programs are included with the driver files.

TABLE 1: DLP-245SY PINOUT DESCRIPTION



Pin #	Description
1	C0 (I/O) Port Pin C0 connected to the SX48 microcontroller.
2	C1 (I/O) Port Pin C1 connected to the SX48 microcontroller.
3	C2 (I/O) Port Pin C2 connected to the SX48 microcontroller.
4	C3 (I/O) Port Pin C3 connected to the SX48 microcontroller.
5	C4 (I/O) Port Pin C4 connected to the SX48 microcontroller.
6	C5 (I/O) Port Pin C5 connected to the SX48 microcontroller.
7	C6 (I/O) Port Pin C6 connected to the SX48 microcontroller.
8	C7 (I/O) Port Pin C7 connected to the SX48 microcontroller.
9	MCLR* (In) Can be used by an external device to reset the SX48. Can be left disconnected if not used.
10	RTCC (In) Input to the SX48's Real-Time Clock/Counter.
11	RESET# (In) Can be used by an external device to reset the FT245BM. Can be left disconnected if not used.

12	RESETO# (Out) Output of the FT245BM's internal Reset Generator. Stays high impedance for ~2ms after VCC>3.5v and the internal clock starts up, then clamps its output to the 3.3v output of the internal regulator. Taking RESET# low will also force RESETO# to go high impedance. RESETO# is NOT affected by a USB Bus Reset.
13	GROUND
14	3V3OUT (Out) Output from the integrated L.D.O. regulator. Its primary purpose is to provide the internal 3.3v supply to the USB transceiver cell and the RSTOUT# pin. A small amount of current (<=5mA) can be drawn from this pin to power external 3.3v logic if required.
15	GROUND
16	SWVCC (Out) Power from EXTVCC (Pin 19) controlled via Pin 10 (POWERN#) of the FT245BM and Q1 MOSFET power switch. R5 and C3 control the power-up rate to help limit inrush current.
17	GROUND
18	VCC-IO (In) 3.0 volt to +5.25 volt VCC to the FT245BM's interface Pins 10-12, 14-16, and 18-25. When interfacing with 3.3v external logic, connect VCC-IO to the 3.3v supply of the external logic; otherwise, connect to the VCC to drive out at 5v CMOS level. This pin must be connected to VCC from the target electronics or EXTVCC.
19	EXTVCC (In) Use for applying main power (4.4 to 5.25 volts) to the module. Connect to PORTVCC if the module is to be powered by the USB port (typical configuration).
20	PORTVCC (Out) Power from USB port. Connect to EXTVCC if module is to be powered by the USB port (typical configuration). 500mA is the maximum current available to the DLP-245SY and target electronics if the USB device is configured for high power.
21	DB7 (I/O) Line 7 of the data bus between the SX48 and the FT245BM USB-FIFO.
22	DB6 (I/O) Line 6 of the data bus between the SX48 and the FT245BM USB-FIFO.
23	DB5 (I/O) Line 5 of the data bus between the SX48 and the FT245BM USB-FIFO.
24	DB4 (I/O) Line 4 of the data bus between the SX48 and the FT245BM USB-FIFO.
25	DB3 (I/O) Line 3 of the data bus between the SX48 and the FT245BM USB-FIFO.
26	DB2 (I/O) Line 2 of the data bus between the SX48 and the FT245BM USB-FIFO.
27	DB1 (I/O) Line 1 of the data bus between the SX48 and the FT245BM USB-FIFO.
28	DB0 (I/O) Line 0 of the data bus between the SX48 and the FT245BM USB-FIFO.
29	E0 (I/O) Port Pin E0 connected to the SX48 microcontroller.
30	E1 (I/O) Port Pin E1 connected to the SX48 microcontroller.
31	E2 (I/O) Port Pin E2 connected to the SX48 microcontroller.
32	E3 (I/O) Port Pin E3 connected to the SX48 microcontroller.
33	E4 (I/O) Port Pin E4 connected to the SX48 microcontroller.
34	E5 (I/O) Port Pin E5 connected to the SX48 microcontroller.
35	E6 (I/O) Port Pin E6 connected to the SX48 microcontroller.

36	E7 (I/O) Port Pin E7 connected to the SX48 microcontroller.
37	B3 (I/O) Port Pin B3 connected to the SX48 microcontroller.
38	B2 (I/O) Port Pin B2 connected to the SX48 microcontroller.
39	B1 (I/O) Port Pin B1 connected to the SX48 microcontroller.
40	B0 (I/O) Port Pin B0 connected to the SX48 microcontroller.

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