

**Future Technology Devices International Ltd****USB-COM485-PLUS1**CE FC UK
CA**Datasheet**

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1 Introduction

1.1 Functional Description

The USB-COM-Plus modules are a family of communication devices. This model, USB-COM485-Plus1, provides a simple method of adapting legacy serial devices with RS485 interfaces to modern USB ports. This is accomplished by incorporating the industry standard FTDI FT232RQ USB-Serial bridge chip.

The integrated electronics of the USB-COM485-PLUS1 utilise the FTDI FT232RQ and includes RS485 level shifters plus TXD/RXD LEDs to provide a visual indication of data traffic through the module.

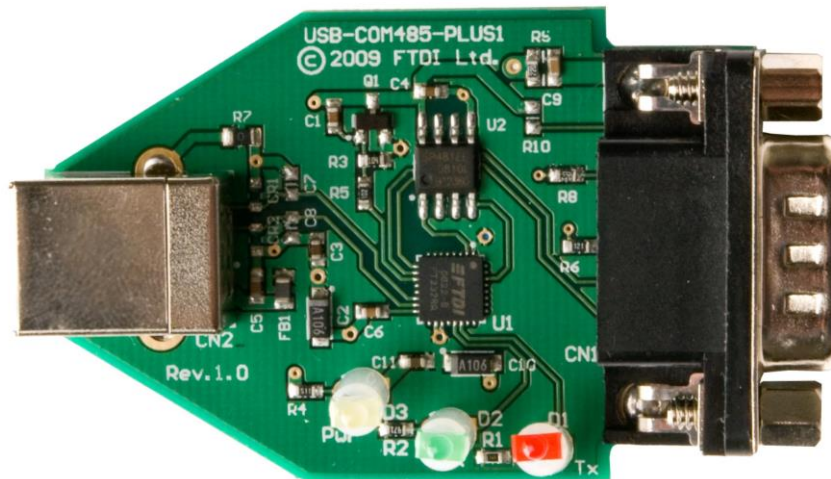


Figure 1.1 USB-COM485-Plus1

The module uses a standard USB-B device connector for connection to an upstream host or hub port. RS485-level signals are available on an industry-standard DE-9P connector. The maximum RS485-level data rate is 3Mbps.

Pin 9 of the DE-9P connector can provide +5V DC at 250mA.

The USB-COM485-Plus1 module requires USB device drivers, available free from <https://ftdichip.com/>, which are used to make the USB-COM485-Plus1 appear as a Virtual COM Port (VCP). This allows existing serial communications software, such as HyperTerminal, to exchange data through the USB-COM485-Plus1 to a legacy RS485 peripheral device.

1.2 LED Description

The USB-COM485-Plus1 uses three LEDs to indicate a valid link as well as data traffic according to the following table:

LED Color	Function	Description
Yellow	Enumerated	ON when USB-COM485-Plus1 is configured and ready
Green	TxD Activity	Flashes when data is transmitted from the USB-COM485-Plus1 to the attached RS485 device
Red	RxD Activity	Flashes when data is transmitted from the attached RS485 device to the USB-COM485-Plus1

Table 1.1 LED Description

1.3 Block Diagram

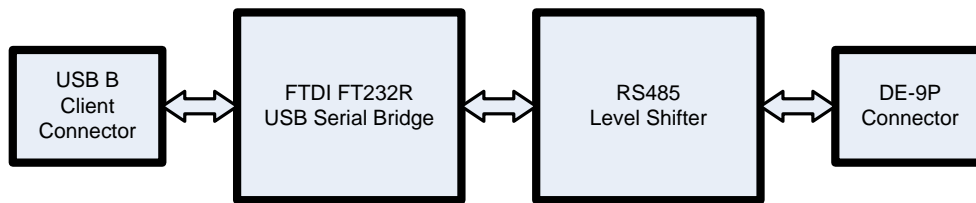


Figure 1.2 USB-COM485-Plus1 Block Diagram

1.3.1 Block description

USB B Client Connector

This connector provides the interface for connection to a USB Host or Hub port. The maximum cable length is 5 meters, according to the USB 2.0 specification.

FTDI FT232RQ

The FTDI FT232RQ provides the USB-to-Serial conversion. Operating system device drivers are required in order to work with the FT232RQ to provide the Virtual COM Port serial functionality.

RS485 Level Shifter

The RS485 level shifter converts the signals provided by the FT232RQ into the voltage levels required by RS485 devices.

DE-9P Connector (Male)

The DE-9P connector is configured in an industry standard (TIA/EIA-485) pin-out to provide connection to RS485 peripherals through standard cables. See section 3.1.2.

1.4 Features

- Adds one RS-485 serial port by connecting to USB
- Easy plug & play installation and RS-485 device connection
- Works with USB 1.1 & 2.0 Host and Hub ports
- Industry Standard FTDI chip set & device drivers for maximum compatibility
- Microsoft Windows® WHQL-certified, Mac OS X, Linux and Android device drivers
- Installs as a standard Windows COM port
- COM port number can be changed to any available COM port number, to support HyperTerminal, or any other serial communications software application running in Windows
- FIFO: 128 bytes transmit buffer, 256 bytes receive buffer
- RS-485 data signals: Data+, Data-, GND
- Option to enable or disable local echo
- Powered by USB port. No external power adapter required.
- Pin 9 of DE-9P can provide +5VDC output at 250mA.
- Serial port speed up to 3Mbps
- Serial Communication Parameters
 - Parity: None, Even, Odd
 - Data bits: 7, 8
 - Flow control: None
- One DE-9P male connector
- LEDs indicate USB Enumeration, RxD, TxD for monitoring port status & easy diagnostics
- Operating temperature of -40°C to +85°C

1.5 Driver Support

Royalty free VIRTUAL COM PORT (VCP) and D2XX Direct Drivers are available for the following Operating Systems (OS):

- Windows
- Linux
- Mac
- Android (J2xx / D2xx only)

See the following website link for the full driver support list including OS versions and legacy OS.

<https://ftdichip.com/drivers/>.

Virtual COM Port (VCP) drivers cause the USB device to appear as an additional COM port available to the PC. Application software can access the USB device in the same way as it would access a standard COM port.

D2XX Direct Drivers allow direct access to the USB device through a DLL. Application software can access the USB device through a series of DLL function calls. The functions available are listed in the [D2XX Programmer's Guide](#) document which is available from the [Documents](#) section of our website.

Please also refer to the [Installation Guides](#) webpage for details on how to install the drivers.

1.6 Performance Figures

Parameter	Performance
USB Interface	12Mbps USB 2.0 Full-Speed
RS485 Interface	Standard baud rates (300bps to 921.6Kbps) Custom baud rates (300bps to 3Mbps) through baud rate aliasing. See FTDI Application Note: Configuring FT232R, FT2232 and FT232BM Baud Rates
Max Cable Length	USB = 5m, RS485 =1200m

Table 1.2 Performance Figures

Part Number	Description
USB-COM485-Plus1	USB-COM-Plus Full-Speed USB to 1-Port RS485 module

Table 1.3 Ordering Information

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2 Installation

2.1 Example Applications and Configurations

2.1.1 Wiring

Insert the A-plug into an available USB Host or Hub port. Insert the B-plug into the B-receptacle on the USB-COM485-Plus1.

DTE Pin Number	Signal Name	Expected Connect Signal
1	DATA- = Transmit/Receive Data, negative polarity Also Terminator 2	DATA- Pin 2 of 120R Terminating Resistor. Only Required if the USB-COM485-PLUS1 is the first or last device in a multi-drop RS485 System, to meet RS485 Termination Requirements.
2	DATA+ = Transmit/Receive Data, positive polarity	DATA+
3	Terminator 1	Pin 1 of 120R Terminating Resistor. Only Required if the USB-COM485-PLUS1 is the first or last device in a multi-drop RS485 System, to meet RS485 Termination Requirements.
4	N/A	N/A
5	GND = signal ground	GND
6	N/A	N/A
7	N/A	N/A
8	N/A	N/A
9	PWR = +5V DC output	PWR

Table 2.1 RS485 DTE to DCE connection

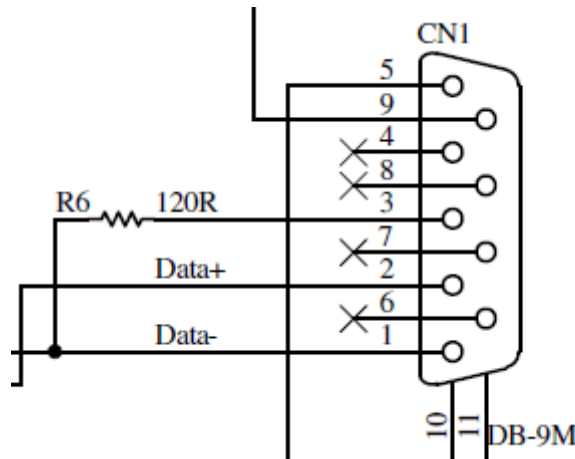


Figure 2.1 USB-COM485-PLUS1 Termination resistor

2.2 Device Driver Installation

The USB-COM485-Plus1 module drivers are available for download from <https://ftdichip.com/>.

2.2.1 Microsoft Windows

With the device drivers being Windows Hardware Quality Labs (WHQL) certified, they are also available through download directly from the Microsoft® Windows® Update service. Simply plug the device into the Windows PC and the drivers should load automatically if the PC is connected to the internet. Additional installation instructions can be found on the [Installation Guides](#) page of our website.

2.2.2 Mac OS X, Linux, Windows CE

Device drivers and FTDI installation guides for Mac OS X, Linux and Android are available for download on the FTDI Chip website. Follow the respective FTDI [Installation Guides](#) for the chosen operating system.

2.3 Local Echo

The ability to enable or disable local echo on the RS485 data is controlled by the setting in the FT232RQ EEPROM. A free [utility](#) is provided to change the configuration. The default is for local echo to be disabled.

3 Connections

3.1 External Connectors

3.1.1 USB

The USB-COM485-Plus1 is a downstream USB 2.0 Device. A standard USB Series "B" receptacle is reference to USB-COM485-Plus1 to facilitate connection to an upstream USB Host or Hub.

Pin Number	Pin Type	Description
1	Power	VBUS = USB Power provided from upstream USB Host or Hub
2	Bidirectional	D- = USB data signal, negative polarity
3	Bidirectional	D+ = USB data signal, positive polarity
4	Ground	GND = USB signal ground
Shield	Case Ground	Drain = typically connected to the host PC case

Table 3.1 USB "B" Receptacle Pin-Out

3.1.2 RS485

The RS485 port is configured as Data Terminal Equipment (DTE), with a 9-contact D-Sub Pin connector. Pin assignments are according to TIA/EIA-485. In addition, pin9 of DE-9P may be assigned to provide +5VDC to an external device with a maximum current draw of 250mA once the USB-COM485-Plus1 has been enumerated by the system.

Pin Number	Pin Type	Description
1	Input/Output	DATA- = Transmit/Receive Data, negative polarity Pin 2 of 120R Terminating Resistor. Only Required if the USB-COM485-PLUS1 is the first or last device in a multi-drop RS485 System, to meet RS485 Termination Requirements.
2	Input/Output	DATA+ = Transmit/Receive Data, positive polarity
3	Input/Output	Pin 1 of 120R Terminating Resistor. Only Required if the USB-COM485-PLUS1 is the first or last device in a multi-drop RS485 System, to meet RS485 Termination Requirements.
4	N/A	N/A
5	Ground	GND = signal ground
6	N/A	N/A
7	N/A	N/A
8	N/A	N/A
9	Power	provide +5VDC to an external device

Table 3.2 DE-9P RS485 Pin-Out

A 120R Resistor is connected internally between pin 1 and pin 3 of the 9 way D-type connector – see Figure 2.1.

4 Electrical details

4.1 USB

Parameter	Description	Minimum	Typical	Maximum	Units	Conditions
USB_VCC	Input Power Voltage*	4.25	5.0*	5.25	V	*Present when USB cable is attached and USB Host or Hub powered.
I _{cc}	USB current***		30	50	mA	***Does not include power supplied to external device connected to pin 9

Table 4.1 USB Electrical Details

4.2 RS485

Parameter	Description	Minimum	Typical	Maximum	Units	Conditions
Receiver Input						
VCM	Common-mode input voltage range	-7	+12		V	
IN	Input Current			1.0	mA	VIN = +12V
				-0.8		VIN = -7V
VTH	Differential Threshold Voltage	-0.2		+0.2	V	
VIHYS	Input Hysteresis		20		mV	
RIN	Input Resistance, RIN	12	15		kΩ	
Transmitter Output						
VOD	Differential Output Voltage	1.5		5	V	With RL = 54Ω. CL = 50pF *
ESD Tolerance						
ESD HBM	RS485 Inputs and Outputs		±15		kV	
EN61000-4-2 Contact Discharge	RS-485 Inputs and Outputs		±8		kV	
EN61000-4-2 Air Gap Discharge	RS-485 Inputs and Outputs		±15		kV	

Table 4.2 RS485 Electrical Details

* - The 54ohms is the equivalent of two 120ohms termination resistors placed on each side of the transmission line and the input impedance of 32 receivers on the line.

4.3 Power Output

The USB-COM485-Plus1 assign pin9 of DE-9P to provide +5V DC for an external device that requires power. The maximum allowable current is 500mA, including the circuitry of the USB-COM485-Plus1 itself. Up to 250mA may be used by the external device.

Parameter	Description	Minimum	Typical	Maximum	Units	Conditions
VCC_5V	Output Power Voltage	4.25	5.0	5.25	V	N/A
I _o	Output Power Current	0		250	mA	N/A

Table 4.3 Power Output for USB-COM485-Plus1

5 Mechanical Details

5.1 Module Mechanical Dimensions

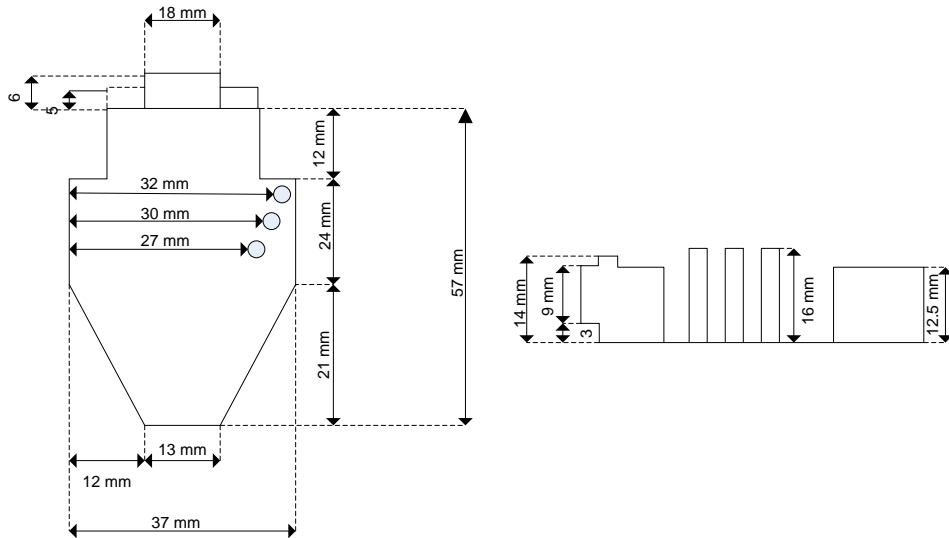


Figure 5.1 USB-COM485-Plus1 PCB Dimensions

6 Physical Environment Details

6.1 Storage

Parameter	Description	Minimum	Typical	Maximum	Units	Conditions
T	Storage Temperature Range	-65		+150	°C	

Table 6.1 Storage Temperature

6.2 Operating

Parameter	Description	Minimum	Typical	Maximum	Units	Conditions
T	Operating Temperature Range	-40		+85	°C	5% to 95% RH, non condensing

Table 6.2 Operating Temperature

7 Environmental Approvals & Declarations

7.1 EMI Compatibility

FCC, CE and UKCA

The USB-COM485-Plus1 has been tested to be compliant with both FCC Part 15 Subpart B, European EMC Directive and UKCA.



NOTE: This is a Class B product. In a domestic environment, this product may cause radio interference, in which case the user may be required to take adequate measures.



NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

7.2 Safety

The USB-COM485-Plus1 is defined as Limited Power Supply (LPS) device, with operating voltages under 60VDC.

7.3 Environmental

The USB-COM485-Plus1 is a lead-free device that complies with the following environmental directives: RoHS, WEEE, REACH, PFOS and DecaBDE.

7.4 Reliability

The USB-COM485-Plus1 is designed as a robust USB-Serial module for use in many environments. There are no user-serviceable parts. Any failure will require a replacement of the unit.

7.4.1 MTTF

The Mean Time To Failure is calculated at TBD hours.

7.5 Import / Export Information

Import / Export Information	
Country of Origin	China
Harmonized Code	TBD
Product Description	USB to RS485 Development Module, Single Port
USA ECCN	EAR99 - No License Required

Table 7.1 Import / Export Information

8 Troubleshooting

8.1 Hardware

Cables are the most common sources of trouble with external devices.

Check the following:

- USB cable is properly inserted at both ends
- Computer power is ON
- Computer is not in Sleep or Standby
- If a USB Hub is used, be sure it is set for "Self-Powered" operation
- If a USB Hub is used, be sure all cables are properly inserted
- If all the above are OK, the Yellow LED should be lit, indicating the device has been recognized by the USB subsystem.

RS485 cables – check the following:

- Check for specific handshake requirements of your RS485 peripheral.
- Because there is no handshake signals, ensure the application is set to "No Hardware Handshake", or equivalent.

8.2 Device Driver

Ensure the latest device driver is in use. See <https://ftdichip.com/>.

If other devices with FTDI chips are installed in the system, check with all manufacturers of these devices for the latest device drivers.

See the FTDI installation guides for additional details: <https://ftdichip.com/document/installation-guides/>.

Common Windows Device Driver Troubles:

- **DEVICE TIMES OUT:** The default settings of the device driver assume typical data transfers of hundreds to thousands or more bytes at a given time. Some applications, such as a GPS device, only send data in short packets, often only a few bytes. If this is the case, it may be necessary to adjust the driver buffer size and/or latency timer to smaller values. These values can be adjusted through the Advanced driver options as noted in Figure 2.13. The buffer size can be reduced to 64 bytes. The latency timer can be set as low as 2ms. A setting of 1ms will cause unnecessary USB traffic and could adversely affect data transmission.
- **ERRATIC MOUSE POINTER:** The device driver defaults to query an attached device to find out whether it is a mouse or modem, consistent with native COM port operation. Some RS485 peripherals constantly send short packets of data, causing the host system to "think" a mouse or modem has been attached. These short packets will interfere with normal mouse operation causing the pointer to jump around the screen. If this happens, disconnect the RS485 device and *uncheck the Serial Enumerator* option, also found on the Advanced driver options screen in Figure 2.13.
- **COM PORT IN USE:** Windows keeps track of all COM port assignments. If multiple FTDIChip products have been connected to a single system, the COM port number will increase, even if the other devices are not attached. If the higher COM port assignments are not acceptable for the application, known unused COM port numbers should be uninstalled according to the FTDI installation guide: <https://ftdichip.com/document/installation-guides/>.

8.3 Technical Support

Technical support may be obtained from your nearest FTDIChip office:

United Kingdom:	support1@ftdichip.com
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Appendix A - List of Figures and Tables

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Appendix B - Revision History

Document Title: USB-COM485-PLUS1 Datasheet
 Document Reference No.: FT_000132
 Clearance No.: FTDI# 95
 Product Page: [Modules](#)
 Document Feedback: [Send Feedback](#)

Revision	Changes	Date
Version Draft	First Draft	13-03-2009
	2 nd Draft	18-03-2009
Version 1.0	text, and update photo of PCB	04-06-2009
Version 1.0	Released	09-06-2009
Version 1.01	Added detail of 120R termination resistor	11-06-2009
Version 1.02	Removed debug suggestion to fit a loopback connector	21-08-2009
	Corrected max power available from 450mA to 250mA	
Version 1.2	Added section 2.3 for local echo	12-04-2010
	Edited Section 1.3.1, Removed the statement "A standard "A to B" cable is provided"	
Version 1.21	Edited table 1.2, RS485 cable length	06-10-2010
Version 1.3	Added UKCA compliance and updated part number to FT232RQ. Updated driver support and links.	19-07-2023