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Future Technology Devices International Ltd

TTL-234X **CE** **FC**

TTL234X Series Range of Cables

Datasheet

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1 Description

The **TTL-234X** cables are a family of USB to TTL serial UART converter cables incorporating FTDI's FT234XD USB to basic UART interface IC device which handles all the USB signalling and protocols. The cables provide a fast, simple way to connect devices with a TTL level serial interface to USB.

Each TTL-234X cable contains a small internal electronic circuit board, utilising the FT234XD, which is encapsulated into the USB connector end of the cable. The FT234XD datasheet, [DS_FT234XD](http://www.ftdichip.com), is available at <http://www.ftdichip.com>. The other end of the cable comes with a selection of different connectors supporting various applications – see Table 1.1

Cables are FCC, CE, RoHS compliant and are available at TTL levels of +5V and +3.3V.

Cables are available with either a 6-way SIL,0.1" pitch connector, a 3.5mm Audio Jack, an 8 way, keyed 2mm pitch connector (intended for use with VMUSIC2 or VDRIVE2), or bare, tinned wire ended connections (see Table 1.1)

The USB side of the cable is USB powered and USB 2.0 full speed compatible. Each cable is 1.8m long and supports a data transfer rate up to 3 Mbaud.

The TTL-234X cables require USB drivers, available free from <http://www.ftdichip.com>, which are used to make the FT234XD in the cable appear as a virtual COM port (VCP). This then allows the user to communicate with the USB interface via a standard PC serial emulation port (for example TTY). Another FTDI USB driver, the D2XX driver, can also be used with application software to directly access the FT234XD on the cable through a DLL. This is illustrated in the Figure 1.1

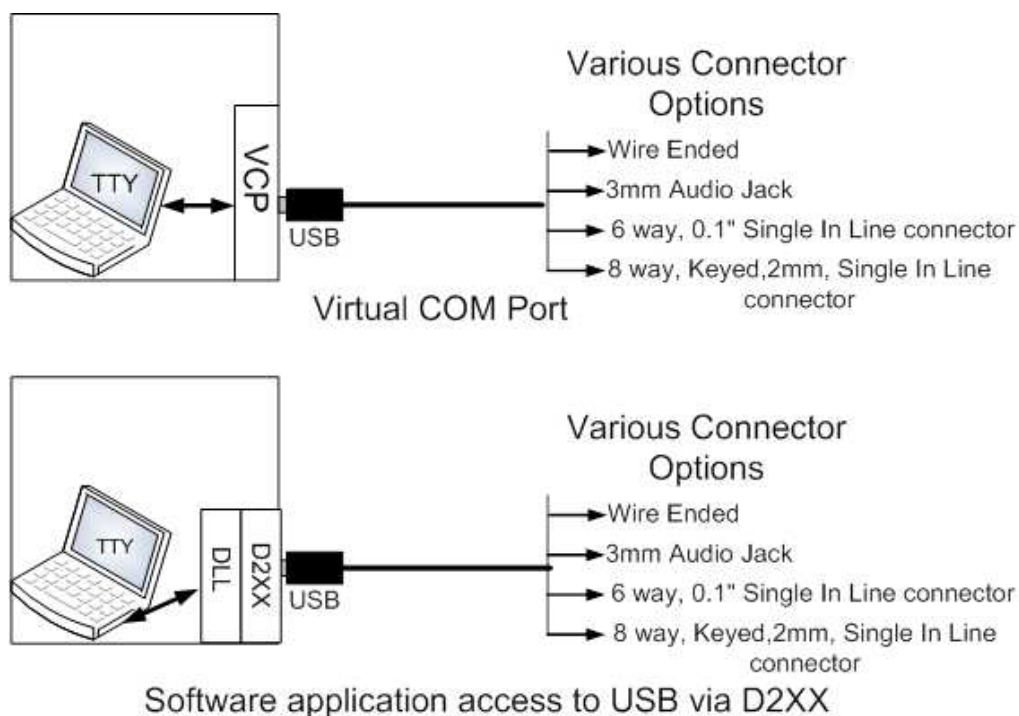


Figure 1.1 Using the TTL-234X Cable

1.1 Available Cables and Part Numbers

The following Table 1.1 gives details of the available TTL-234X cables.

Part Number	Description	End Connector*	Cable details
TTL-234X-5V	USB to UART cable with +5V TTL level UART signals.	6 pin SIL, 0.1" pitch	6 core, UL2464 24 AWG, diam=5mm
TTL-234X-3V3	USB to UART cable with +3.3V TTL level UART signals.	6 pin SIL, 0.1" pitch	6 core, UL2464 24 AWG, diam=5mm
TTL-234X-5V-WE	USB to UART cable with +5V TTL level UART signals.	Wire Ended (no connector)	6 core, UL2464 24 AWG, diam=5mm
TTL-234X-3V3-WE	USB to UART cable with +3.3V TTL level UART signals.	Wire Ended (no connector)	6 core, UL2464 24 AWG, diam=5mm
TTL-234X-5V-AJ	USB to UART cable with +5V TTL level UART signals.	3.5mm Audio Jack	2 core and spiral, 24 AWG diam=5mm
TTL-234X-3V3-AJ	USB to UART cable with +3.3V TTL level UART signals.	3.5mm Audio Jack	2 core and spiral, 24 AWG diam=5mm
TTL-234X-3V3-2mm	USB to UART cable with +3.3V TTL level UART signals.	8 way, keyed, 2mm connector for use with FTDI VDRIVE2 or VMUSIC2 modules	7 core, UL2464 26 AWG, diam=5mm

Table 1.1 TTL-234X Cables Descriptions and Part Numbers

* FTDI supports customised end connector designs. For more information, please contact FTDI Sales Team (sales1@ftdichip.com)

1.2 Certifications

FTDI TTL-234X range of cables is fully RoHS compliant as well as CE and FCC certified



1.3 USB Compliant

The TTL-234X cables is fully compatible with the USB 2.0 specification.

The FT234XD chipset has used in this design has full USB-IF compliance.

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2 Typical Applications

- USB to Serial TTL Level Converter
- Upgrading Legacy Peripherals to USB
- Interface Microcontroller UART or I/O to USB
- Interface FPGA / PLD to USB
- Firmware download and debug cable
- USB Instrumentation PC interface
- USB Industrial Control
- USB Software / Hardware Encryption Dongles
- "Maker" projects test cable

2.1 Driver Support

Royalty free VIRTUAL COM PORT (VCP) DRIVERS for...

- Windows 10 32,64-bit
- Windows 8/8.1 32,64-bit
- Windows 7 32,64-bit
- Server 2003, Server 2008 and server 2012 R2
- Windows CE 4.2, 5.0 and 6.0
- Mac OS OS-X
- Linux 2.4 and greater

Royalty free D2XX *Direct* Drivers (USB Drivers + DLL S/W Interface)

- Windows 10 32,64-bit
- Windows 8/8.1 32,64-bit
- Windows 7 32,64-bit
- Windows Server 2003, Server 2008 and server 2012 R2
- Windows CE 4.2, 5.0 and 6.0
- MAC OS-X
- Linux 2.4 and greater
- Android (J2xx)

The drivers listed above are all available to download for free from www.ftdichip.com . Various 3rd Party Drivers are also available for various other operating systems - see www.ftdichip.com for details.

2.2 Features

- TTL-234X Converter Cable provides a USB to TTL Serial interface with various end connectors.
- On board FT234XD provides single chip USB to asynchronous serial data transfer interface.
- Entire USB protocol handled by the electronics in the cable USB.
- Connect directly to a microcontroller UART or I/O pins.
- UART interface support for 7 or 8 data bits, 1 or 2 stop bits and odd / even / mark / space / no parity.
- Fully assisted hardware (RTS#/CTS#) or X-On / X-Off software handshaking.
- Data transfer rates from 300 baud to 3 Mbaud at TTL levels.
- Internal MTP MEMORY with user writeable area.
- 5V CMOS drive outputs and 5V safe TTL inputs makes the TTL-234X easy to interface to 5V MCU's.
- FTDI's royalty-free VCP allows for communication as a standard emulated COM port and D2XX 'direct' drivers provide DLL application programming interface.
- +5V output allows external logic to be powered from the USB port.
- 6 way outputs provide Tx, Rx, RTS#, CTS#, VCC and GND (except Audio Jack which provide only TX, RX and GND).
- 8 way, keyed connector to support FTDI VDRIVE2 and VMUSIC2.
- 3 way Audio Jack connector provides Tx, Rx and GND.
- Low USB bandwidth consumption.
- UHCI / OHCI / EHCI host controller compatible.
- USB 2.0 Full Speed compatible.
- -40°C to +85°C operating temperature range.
- Cable length is 1.80m (6 feet).
- FCC and CE compliant.
- Custom versions also available (subject to MOQ).

3 Features of the FT234XD applicable to TTL-234X Cables

The TTL-234X cables uses FTDI's FT234XD USB to serial IC device. This section summarises the key features of the FT234XD which apply to the TTL-234X USB to serial TTL converter cables. For further details, and a full features and enhancements description consult the FT234XD datasheet, this is available from www.ftdichip.com.

Internal MTP MEMORY. The internal MTP MEMORY in each cable is used to store USB Vendor ID (VID), Product ID (PID), device serial number, product description string and various other USB configuration descriptors. Each cable is supplied with the internal MTP MEMORY pre-programmed as described in **Contact Information**

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Appendix A - Cable MTP MEMORY Configuration. A user area of the internal MTP MEMORY is available to system designers to allow storing additional data. The internal MTP MEMORY descriptors can be programmed in circuit, over USB without any additional voltage requirement. It can be programmed using the FTDI utility software called [FT_PROG](#), which can be downloaded from FTDI Utilities on the FTDI website (www.ftdichip.com).

Lower Operating and Suspend Current. The FT234XD has a low 8mA operating supply current and a very low USB suspend current of approximately 125 μ A. (Note that during suspend mode, the current drawn by an application should not exceed 2.5mA to remain USB compliant)

UART Pin Signal Inversion. The sense of each of the four UART signals can be individually inverted by configuring options in the internal MTP MEMORY. For example CTS# (active low) can be changed to CTS (active high), or TXD can be changed to TXD#.

Improved EMI Performance. The TTL-234X cables is FCC and CE certified.

Extended Operating Temperature Range - The TTL-234X cables are capable of operating over an extended temperature range of -40 $^{\circ}$ C to +85 $^{\circ}$ C thus allowing them to be used in automotive or industrial applications.

4 TTL-234X-5V & TTL-234X-3V3 Cables

The TTL-234X-5V and TTL-234X-3V3 cables are both terminated by a 6 way, 0.1", Single-In-Line (SIL) connector. The difference between the two cables is that the TTL-234X-5V operates at +5V levels (signals and power supply) and the TTL-234X-3V3 operates at +3.3V levels (signals only, VCC= +5V).

4.1 TTL-234X-5V, TTL-234X-3V3 Connector Pin Out and Mechanical details

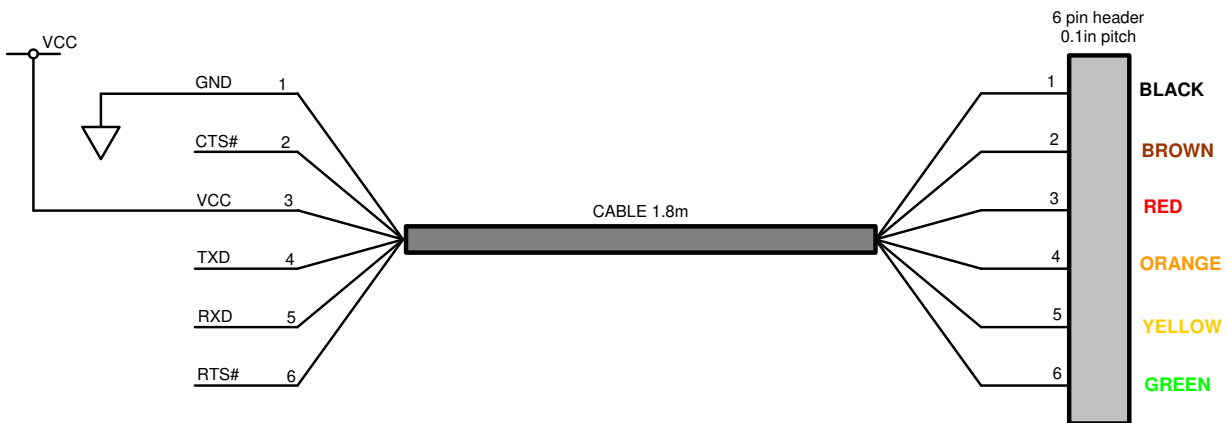


Figure 4.1 TTL-234X-5V and TTL-234X-3V3, 6 Way Header Pin Out

The mechanical details of the 6 way connector are shown in the following diagram

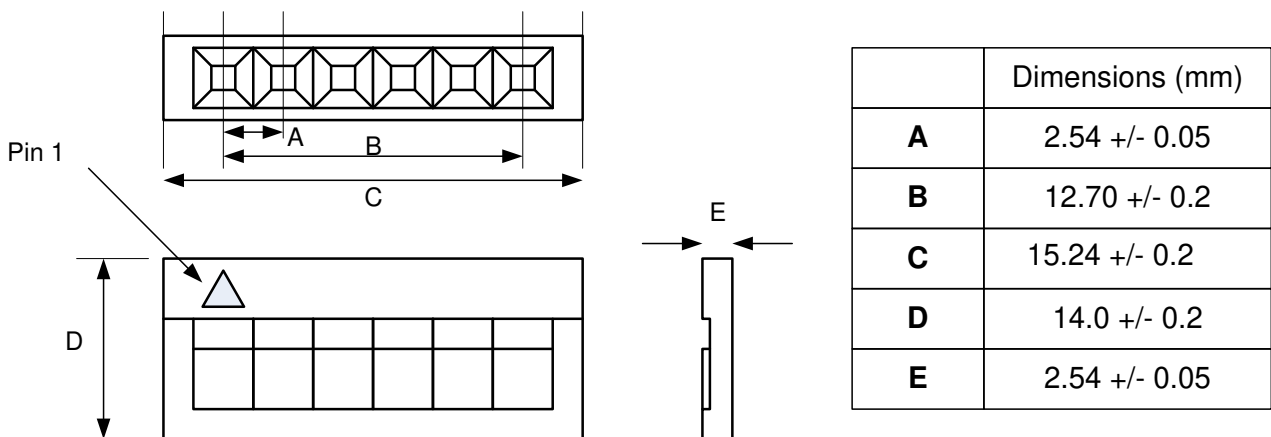


Figure 4.2 TTL-234X-5V TTL-234X-3V3, 6 Way Header Mechanical Details

4.2 TTL-234X-5V & TTL-234X-3V3 Cable Signal Descriptions

Header Pin Number	Name	Type	Colour	Description
1	GND	GND	Black	Device ground supply pin.
2	CTS#	Input	Brown	Clear to Send Control input / Handshake signal.
3	VCC	Output	Red	+5V output,
4	TXD	Output	Orange	Transmit Asynchronous Data output.
5	RXD	Input	Yellow	Receive Asynchronous Data input.
6	RTS#	Output	Green	Request To Send Control Output / Handshake signal.

Table 4.1 TTL-234X-5V and TTL-234X-3V3 Cable Signal Descriptions

4.3 TTL-234X-5V & TTL-234X-3V3 Electrical Parameters

4.3.1 TTL-234X-5V Electrical Parameters

Parameter	Description	Minimum	Typical	Maximum	Units	Conditions
V _{CC}	Supply Voltage	4.75	5.0	5.25	V	Dependant on the USB port that the TTL-234X-5V is connected to
I _{CC}	Supply Current	-	-	450	mA	Assuming connected to direct to a host port or a powered hub, and enumerated
T	Operating Temperature Range	-40	-	+85	°C	

Table 4.2 TTL-234X-5V Electrical Parameters

Parameter	Description	Minimum	Typical	Maximum	Units	Conditions
V _{oh}	Output Voltage High	4.75	5.0	5.25	V	Dependant to the USB port is connected to
V _{ol}	Output Voltage Low	-	0	0.4	V	
V _{il}	Input Low Switching Threshold	-	-	0.8	V	LVTTTL
V _{ih}	Input High Switching Threshold	2	-	-	V	LVTTTL

Table 4.3 TTL-234X-5V I/O Pin Characteristics

4.3.2 TTL-234X-3V3 Electrical Parameters

Parameter	Description	Minimum	Typical	Maximum	Units	Conditions
V _{CC}	Supply Voltage	4.75	5.0	5.25	V	Dependant on the USB port that the TTL-234X-3V3 is connected to
I _{CC}	Supply Current	-	-	450	mA	Assuming connected to direct to a host port or a powered hub, and enumerated
T	Operating Temperature Range	-40	-	+85	°C	

Table 4.4 TTL-234X-3V3 Electrical Parameters

Parameter	Description	Minimum	Typical	Maximum	Units	Conditions
V _{oh}	Output Voltage High	2.97	VCCIO	VCCIO	V	VCCIO=3.3V
V _{ol}	Output Voltage Low	-	0	0.4	V	
V _{il}	Input Low Switching Threshold	-	-	0.8	V	LVTTL
V _{ih}	Input High Switching Threshold	2	-	-	V	LVTTL

Table 4.5 TTL-234X-3V3 I/O Pin Characteristics

5 TTL-234X-5V-AJ & TTL-234X-3V3-AJ

The TTL-234X-5V-AJ and TTL-234X-3V3-AJ cables are both terminated by a standard 3.5mm Audio Jack (AJ) connector. The difference between the two cables is that the TTL-234X-5V-AJ operates at +5V levels and the TTL-234X-3V3-AJ operates at +3.3V levels. On these cables the VCC power is not transferred.

5.1 TTL-234X-5V-AJ, TTL-234X-3V3-AJ Connector Pin Out and Mechanical details

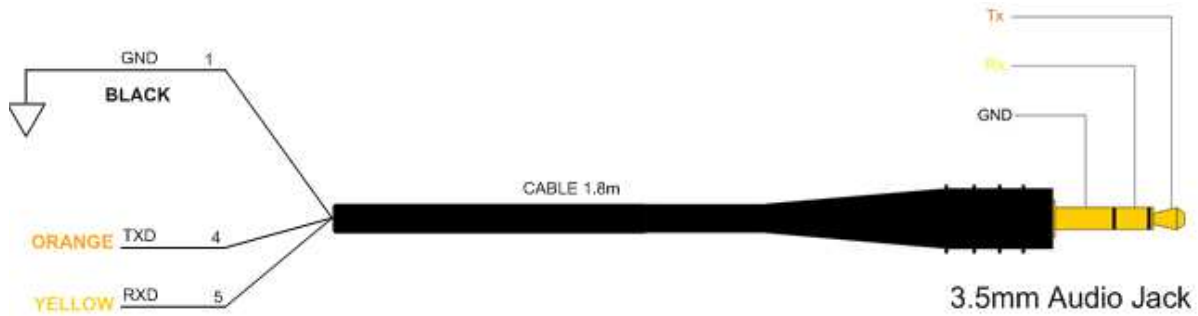
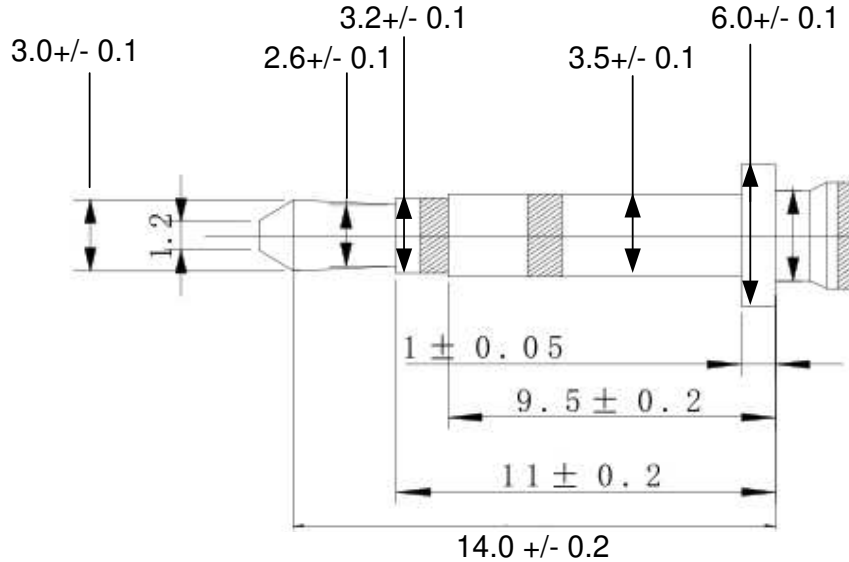


Figure 5.1 TTL-234X-5V-AJ and TTL-234X-3V3-AJ Pin Out

The mechanical details of the Audio Jack connector are shown in the following **Figure 5.2**.



Dimensions in mm

Figure 5.2 TTL-234X-5V-AJ and TTL-234X-3V3-AJ Audio Jack Mechanical Details

5.2 TTL-234X-5V-AJ & TTL-234X-3V3-AJ Cable Signal Description

Header Pin Number	Name	Type	Colour	Description
TIP	TXD	GND	Black	Transmit Asynchronous Data output.
RING	RXD	Input	Brown	Receive Asynchronous Data input.
SLEEVE	GND	Output	Red	GND

Table 5.1 TTL-234X-5V-AJ and TTL-234X-3V3-AJ Cable Signal Descriptions

5.3 TTL-234X-5V-AJ & TTL-234X-3V3-AJ Electrical Parameters

5.3.1 TTL-234X-5V-AJ Electrical Parameters

Parameter	Description	Minimum	Typical	Maximum	Units	Conditions
V_{cc}	Operating Voltage	4.75	5.0	5.25	V	Dependant on the USB port that the TTL-234X-5V-AJ is connected to
I_o	Operating Current	-	8	8.3	mA	Normal Operation
T	Operating Temperature Range	-40		+85	°C	

Table 5.2 TTL-234X-5V-AJ Operating Parameters

Parameter	Description	Minimum	Typical	Maximum	Units	Conditions
V_{oh}	Output Voltage High	4.75	5.0	5.25	V	Dependant on the USB port that the TTL-234X-5V-AJ is connected to
V_{ol}	Output Voltage Low	-	0	0.4	V	
V_{il}	Input Low Switching Threshold	-	-	0.8	V	LVTTTL
V_{ih}	Input High Switching Threshold	2	-	-	V	LVTTTL

Table 5.3 TTL-234X-5V-AJ I/O Pin Characteristics

5.3.2 TTL-234X-3V3-AJ Electrical Parameters

Parameter	Description	Minimum	Typical	Maximum	Units	Conditions
V _{cc}	Operating Voltage	4.75	5.0	5.25	V	Dependant on the USB port that the TTL-234X-3V3-AJ is connected to
I _o	Operating Current	-	8	8.3	mA	Normal Operation
T	Operating Temperature Range	-40		+85	°C	

Table 5.4 TTL-234X-3V3-AJ Operating Parameters

Parameter	Description	Minimum	Typical	Maximum	Units	Conditions
V _{oh}	Output Voltage High	2.97	VCCIO	VCCIO	V	VCCIO=3.3V
V _{ol}	Output Voltage Low	-	0	0.4	V	
V _{il}	Input Low Switching Threshold	-	-	0.8	V	LVTTL
V _{ih}	Input High Switching Threshold	2	-	-	V	LVTTL

Table 5.5 TTL-234X-3V3-AJ I/O Pin Characteristics

6 TTL-234X-5V-WE and TTL-234X-3V3-WE Cables

The TTL-234X-5V-WE and TTL-234X-3V3-WE cables are both un-terminated; they are bare and tinned wires. The difference between the two cables is that the TTL-234X-5V-WE operates at +5V levels (signals and power supply) and the TTL-234X-3V3-WE operates at +3.3V levels (signals only, VCC=+5V).

6.1 TTL-234X-5V-WE, TTL-234X-3V3-WE Connections and Mechanical Details

The following Figure 6.1 shows the cable signals and the wire colours for these signals on the TTL-234X-5V-WE and TTL-234X-3V3-WE cables.

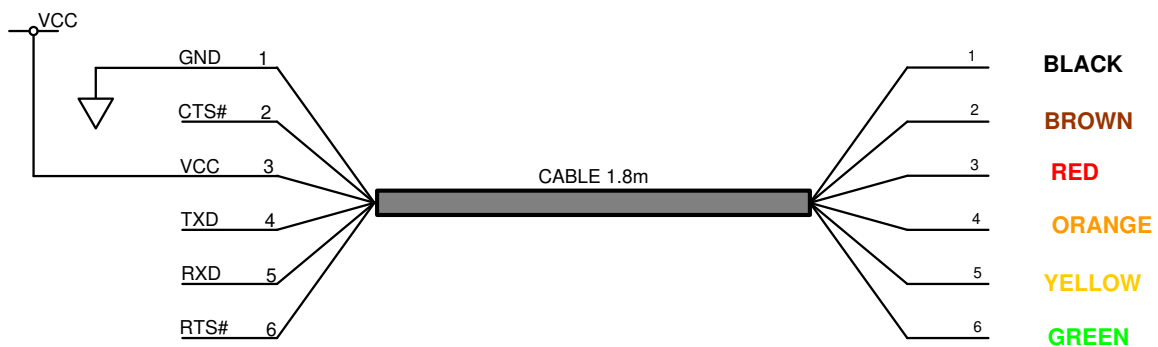


Figure 6.1 TTL-234X-5V-WE and TTL-234X-3V3-WE Connections

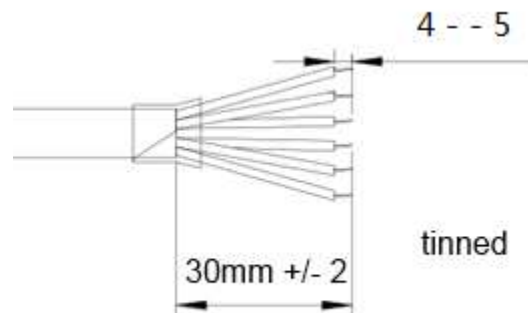


Figure 6.2 TTL-234X-5V-WE and TTL-234X-3V3-WE Mechanical Details (dimensions in mm)

6.2 TTL-234X-5V-WE and TTL-234X-3V3-WE Cable Signal Descriptions

Colour	Name	Type	Description
Black	GND	GND	Device ground supply pin.
Brown	CTS#	Input	Clear to Send Control input / Handshake signal.
Red	VCC	Output	+5V output
Orange	TXD	Output	Transmit Asynchronous Data output.
Yellow	RXD	Input	Receive Asynchronous Data input.
Green	RTS#	Output	Request To Send Control Output / Handshake signal.

Table 6.1 TTL-234X-5V-WE and TTL-234X-3V3-WE Cable Signal Descriptions

6.3 TTL-234X-5V-WE & TTL-234X-3V3-WE Electrical Parameters

6.3.1 TTL-234X-5V-WE Electrical Parameters

Parameter	Description	Minimum	Typical	Maximum	Units	Conditions
V_{CC}	Supply Voltage	4.75	5.0	5.25	V	Dependant on the USB port that the TTL-234X-5V-WE is connected to
I_{CC}	Supply Current	-	-	450	mA	Assuming connected to direct to a host port or a powered hub, and enumerated
T	Operating Temperature Range	-40		+85	°C	

Table 6.2 TTL-234X-5V-WE Electrical Parameters

Parameter	Description	Minimum	Typical	Maximum	Units	Conditions
V_{OH}	Output Voltage High	4.75	5.0	5.25	V	Dependant on the USB port that the TTL-234X-5V-WE is connected to
V_{OL}	Output Voltage Low	-	0	0.4	V	
V_{IL}	Input Low Switching Threshold	-	-	0.8	V	LVTTTL
V_{IH}	Input High Switching Threshold	2	-	-	V	LVTTTL

Table 6.3 TTL-234X-5V-WE I/O Pin Characteristics

6.3.2 TTL-234X-3V3-WE Electrical Parameters

Parameter	Description	Minimum	Typical	Maximum	Units	Conditions
V_{CC}	Supply Voltage	4.75	5.0	5.25	V	Dependant on the USB port that the TTL-234X-3V3-WE is connected to
I_{CC}	Supply Current	-	-	450	mA	Assuming connected to direct to a host port or a powered hub, and enumerated
T	Operating Temperature Range	-40		+85	°C	

Table 6.4 TTL-234X-3V3-WE Electrical Parameters

Parameter	Description	Minimum	Typical	Maximum	Units	Conditions
V_{oh}	Output Voltage High	2.97	VCCIO	VCCIO	V	VCCIO=3.3V
V_{ol}	Output Voltage Low	-	0	0.4	V	
V_{il}	Input Low Switching Threshold	-	-	0.8	V	LVTTTL
V_{ih}	Input High Switching Threshold	2	-	-	V	LVTTTL

Table 6.5 TTL-234X-3V3-WE I/O Pin Characteristics

7 TTL-234X-3V3-2mm Cable

The TTL-234X-3V3-2mm cable is terminated by an 8 way, 2mm pitch, Single-In-Line (SIL) keyed connector. The TTL-234X-3V3-2mm operates at +3.3V levels (signals only, VCC=+5V). These cables are primarily intended for interfacing the FTDI VDRIVE2 and VMUSIC2 modules.

Note that when connected to VDRIVE2 or VMUSIC2 module, the TTL-234X-3V3-2mm cable 8-way connector pin 1 connects to pin 8 of the module, and pin 8 of the cable connects to pin 1 of the cable.

7.1 TTL-234X-3V3-2mm Connector Pin Out and Mechanical details

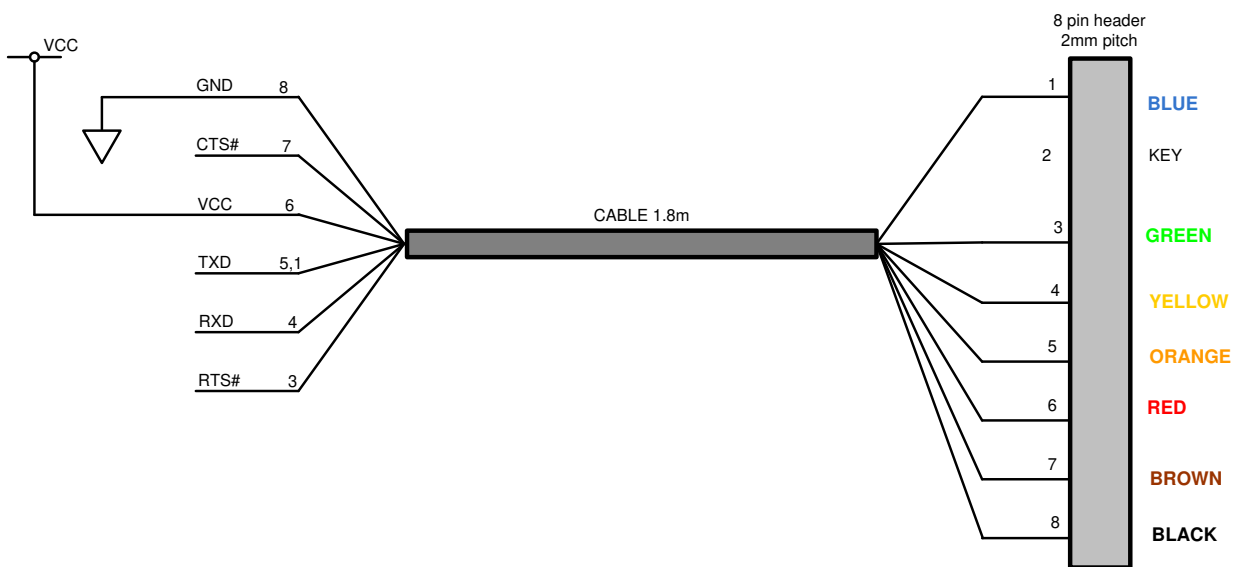


Figure 7.1 TTL-234X-3V3-2mm, 8 Way Header Pin Out

The mechanical details of the 2mm pitch 8 way, keyed, connector are shown in the following diagram

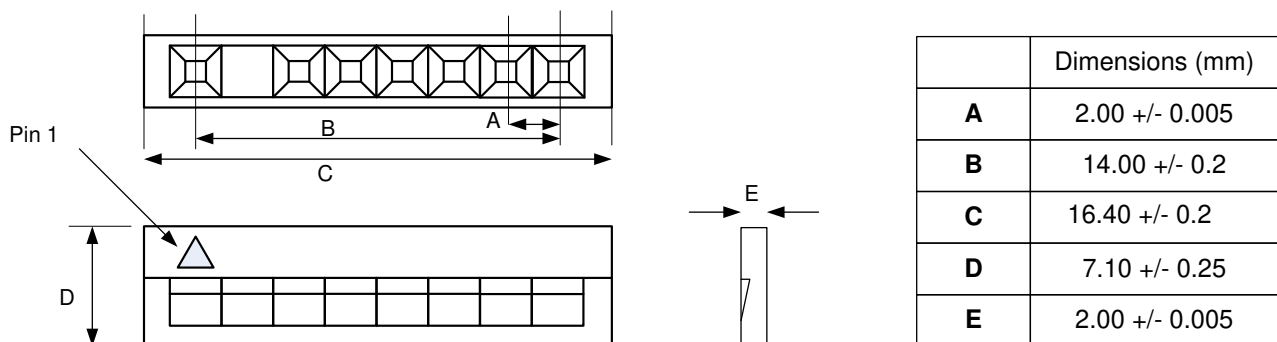


Figure 7.2 TTL-234X-3V3-2mm, 2mm pitch, Keyed, 8 way Header Mechanical Details

7.2 TTL-234X-3V3-2mm Cable Signal Descriptions

Header Pin Number	Name	Type	Colour	Description
1	RI#	Output	Blue	Ring Indicator Control Input. When remote wake up is enabled taking RI# low (20ms active low pulse) can be used to resume the VMUSIC2 or VDRIVE2 host controller from suspend. Connected to TXD.
2	KEY	KEY	KEY	This connection is keyed to connect to the VRDIVE2 or the VMUSIC2 modules
3	RTS#	Output	Green	Request To Send Control Output / Handshake signal.
4	RXD	Input	Yellow	Receive Asynchronous Data input.
5	TXD	Output	Orange	Transmit Asynchronous Data output.
6	VCC	Output	Red	+5V output,
7	CTS#	Input	Brown	Clear to Send Control input / Handshake signal.
8	GND	GND	Black	Device ground supply pin.

Table 7.1 TTL-234X-3V3-2mm Cable Signal Descriptions

7.3 TTL-234X-3V3-2mm Electrical Parameters

Parameter	Description	Minimum	Typical	Maximum	Units	Conditions
V _{CC}	Supply Voltage	4.75	5.0	5.25	V	Dependant on the USB port that the TTL-234X-3V3-2mm is connected to
I _{CC}	Supply Current	-	-	450	mA	Assuming connected to direct to a host port or a powered hub, and enumerated
T	Operating Temperature Range	-40		+85	°C	

Table 7.2 TTL-234X-3V3-2mm Electrical Parameters

Parameter	Description	Minimum	Typical	Maximum	Units	Conditions
V _{oh}	Output Voltage High	2.97	VCCIO	VCCIO	V	VCCIO=3.3V
V _{ol}	Output Voltage Low	-	0	0.4	V	
V _{il}	Input Low Switching Threshold	-	-	0.8	V	LVTTTL
V _{ih}	Input High Switching Threshold	2	-	-	V	LVTTTL

Table 7.3 TTL-234X-3V3-2mm I/O Pin Characteristics

8 Cable PCB Circuit Schematic

The circuit schematic for the small internal electronic circuit board, utilising the FTDI FT234XD, which is encapsulated into the USB connector end of the cable, is shown in Figure 8.1.

Customised versions of these cables are also available. Users interested in customised versions of these cables should contact FTDI sales (sales1@ftdichip.com).

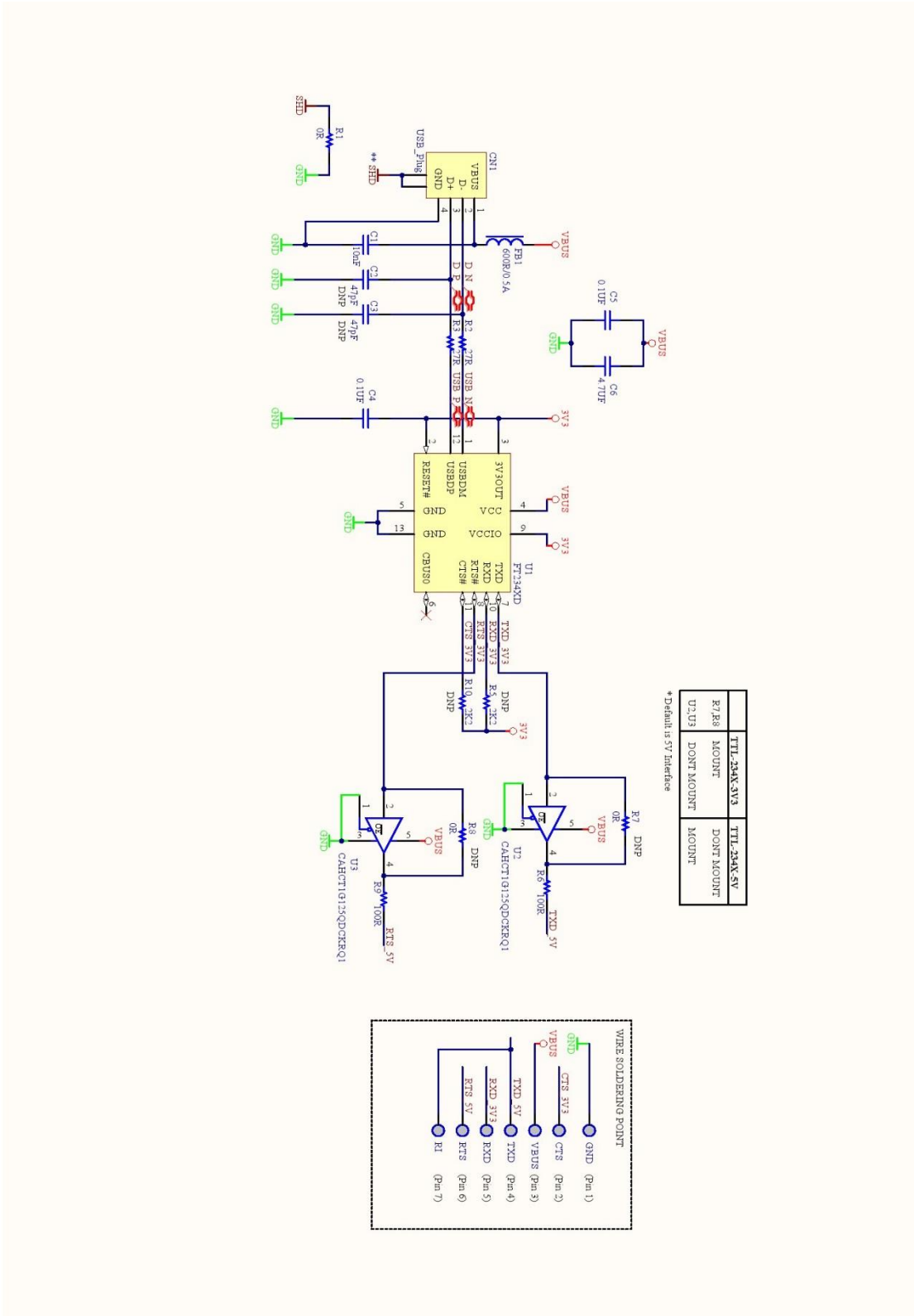


Figure 8.1 Circuit Schematic of PCB Used in the TTL to USB Serial Converter Cables

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Appendix A - Cable MTP MEMORY Configuration

Each TTL-234X cable is controlled by the FTDI FT234XD IC. This FT234XD device contains an MTP MEMORY which contains the USB configuration descriptors for that device. When the cable is plugged into a PC or a USB reset is performed, the PC will read these descriptors. The default values stored into the internal MTP MEMORY are defined in Table 0.1

Parameter	Value	Notes
USB Vendor ID (VID)	0403h	FTDI default VID (hex)
USB Product ID (PID)	6015h	FTDI default PID (hex)
Serial Number Enabled?	Yes	
Serial Number	See Note	A unique serial number is generated and programmed into the MTP MEMORY during device final test.
Pull down I/O Pins in USB Suspend	Disabled	Enabling this option will make the device pull down on the UART interface lines when the power is shut off (PWREN# is high).
Manufacturer Name	FTDI	
Product Description	See note	Product description depends on the cable. The following lists the Product description for each different cable. TTL-234X-5V TTL-234X-3V3 TTL-234X-5V-AJ TTL-234X-3V3-AJ TTL-234X-5V-WE TTL-234X-3V3-WE TTL-234X-3V3-2mm
Max Bus Power Current	90mA	
Power Source	Bus Powered	
Device Type	FT234XD	
USB Version	0200	Returns USB 2.0 device description to the host. Note: The device is a USB 2.0 Full Speed device (12Mb/s) as opposed to a USB 2.0 High Speed device (480Mb/s).
Remote Wake Up	Disabled	
Load VCP Driver	Enabled	Makes the device load the VCP driver interface for the device
Invert TXD	Disabled	Signal on this pin becomes TXD# if enable.
Invert RXD	Disabled	Signal on this pin becomes RXD# if enable.
Invert RTS#	Disabled	Signal on this pin becomes RTS if enable.
Invert CTS#	Disabled	Signal on this pin becomes CTS if enable.

Table 0.1 Default Internal MTP MEMORY Configuration



The internal MTP MEMORY in the cable can be re-programmed over USB using the utility program [FT_PROG](#). FT_PROG can be downloaded from the www.ftdichip.com. Version 2.8a or later is required for the FT234XD chip. Users who do not have their own USB Vendor ID but who would like to use a unique Product ID in their design can apply to FTDI for a free block of unique PIDs. Contact FTDI support for this service.