PCB-UX-232F

UEXT RS-232 to Logic Level Adapter with DB9F Connector and Power LED

Part Number: **PCB-UX-232F (unpopulated PCB, no parts)**

Features

- RS-232 to logic level adapter with DB9F connector (DCE style) and power LED.
  Tx and Rx drivers provided.
- UEXT standard 2x5 header pinout for interchangeable serial interface modules with drivers for Tx and Rx provided.
- Bare PCB only (unpopulated, no parts provided). BOM and schematic available for download.
- All thru-hole construction allows for easy assembly. Using a DIP IC socket provides easy IC replacement.
- Double-sided, FR4 glass-epoxy PCB, 1oz/ft2 copper, anti-tarnish coating. Soldermask & silkscreen. Lead free and RoHS compatible.
- DB9 connector can be replaced with a 2x5 shrouded header for use with ribbon cable connectors.

Details

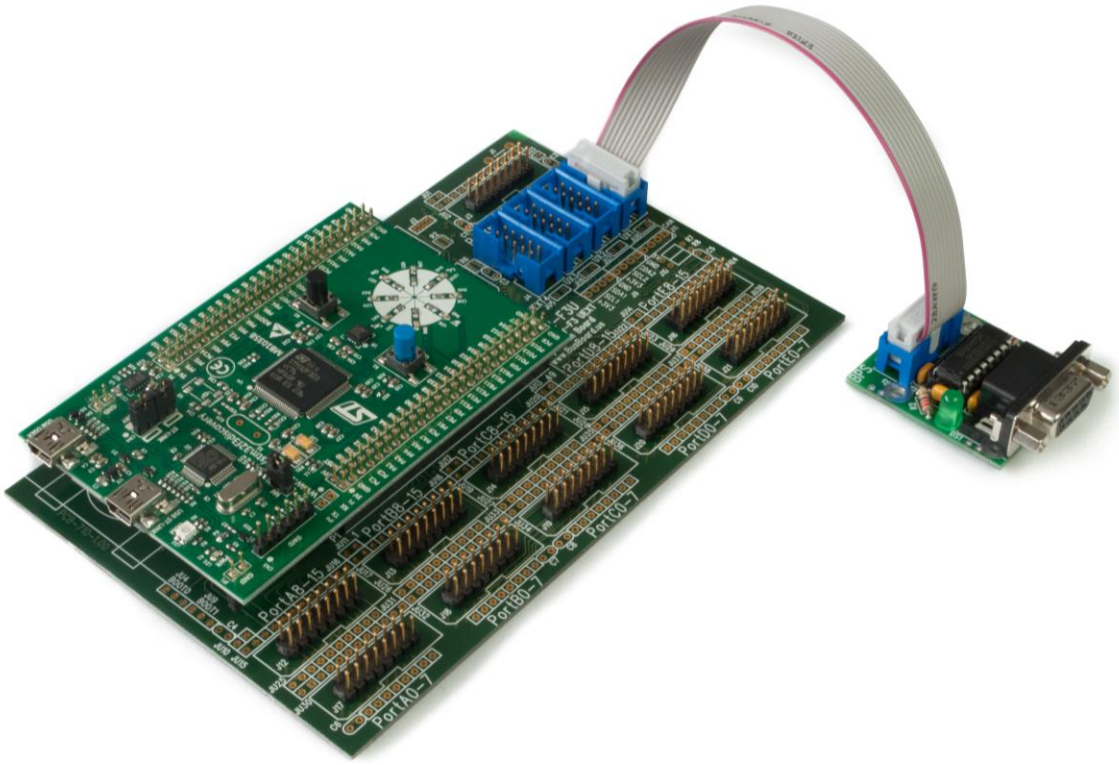
The PCB-UX-232F is a bare PCB to build the UX-232F logic-level to RS-232 adapter. This is an unpopulated board and no parts are included. The BOM (bill of materials) and schematic diagram are available at **http://www.busboard.us/products/PCB-UX-232F/** to construct the circuit. Soldering is required and prior experience with electronic assembly is recommended. A PCB soldermask helps prevent solder bridges on tracks and a silkscreen legend provides part locations.

The UX-232F provides a DCE RS-232 serial port with a DB9 female connector. Drivers are provided for the Tx and Rx lines with the other port lines unconnected. All thru-hole construction allows for easy assembly, maintenance, and modification. A DIP IC socket can be used to allow easy IC replacement to use different voltage/feature parts or to replace damaged parts.

The UX-232F uses the UEXT standard for interchangeable serial interface modules. UEXT is an open standard developed by Olimex providing 3 Volt I2C, SPI, and USART signals on one connector. A 10-pin ribbon cable is used to connect to UEXT peripheral boards. It can be plugged into microcontroller dev boards with UEXT headers.

A power LED provides a visual indication of power status.

It can be used with several different RS-232 converter ICs using the MAX202 or MAX3232 16-pin DIP pinout. The Exar SP3232ECP-L is recommended to support both 3V and 5V operation, and it provides ESD protection. We recommend you use a socket for the driver IC so it can be easily replaced if they are damaged.



UEXT Module Attached to the STM32-F3U Discovery-F3 BaseBoard

UEXT Header

The Universal-EXTension-Connector (UEXT) is an expansion connector standard created by Olimex Ltd. (www.Olimex.com). It provides an asynchronous serial port (USART), SPI and I2C all on the same connector. Peripheral modules for UEXT are available from Olimex (and stocked at www.Mouser.com) as well as from other suppliers.

The UEXT interface standard uses a 2x5 polarized header with 0.1" spacing. Modules connect to the UEXT connector with a 10-pin ribbon cable.

The UEXT pinout is as follows:

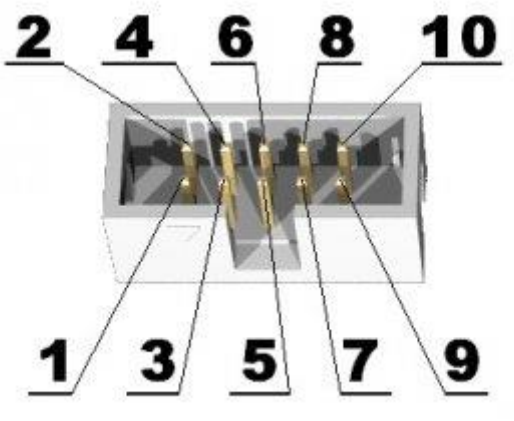
Direction	Signal Function	Pin	Pin	Signal Function	Direction
Output	+3.3 Volts	1	2	GND	-
Output from MCU	USART-TX	3	4	USART-RX	Input to MCU
Output	I2C-SCL	5	6	I2C-SDA	Bi-directional
Master In Slave Out	SPI-MISO	7	8	SPI-MOSI	Master Out Slave In
Master Out Slave In	SPI-SCK	9	10	SPI-SSN	Master Out Slave In

MCU = the microcontroller

All signal levels on this header are CMOS logic levels.

Pins 5-10 Not Used on UX-232x modules.

The UX-232x adapters can be used for 3.3V or 5V operation, but most development boards only provide 3.3V on UEXT headers. Most UEXT modules are designed for 3.3V operation only.

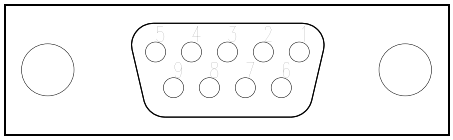


Olimex UEXT Connector Pins

DB9F (DCE) Connector (J1), RS232 Levels

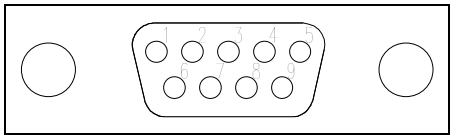
DTE devices use a DB9 male connector while DCE devices use a female connector. Some equipment does not follow this convention.

The UX-232F adapter uses a DB9 female connector.



DB-9 Female Connector Pin Numbers
For DCE Devices

It connects DB9 male connector. Note that pin 1 is on the opposite side.



DB-9 Male Connector Pin Numbers
For DTE Devices

The signals on the pins are shown in the table below.
Note that the signal names for a pin are the same for both DTE and DCE connectors. For example, TX is an output on the DTE connector and an input on the DCE connector.

DTE (Computer), Male			DCE (modem), Female		
Signal Name	Pin Number	Direction	Signal Name	Pin Number	Active State Logic / RS232
DCD	1	<<	DCD	1	LO / SPACE (+)
RX	2	<<	RX	2	HI / MARK (-)
TX	3	>>	TX	3	HI / MARK (-)
DTR	4	>>	DTR	4	LO / SPACE (+)
GND	5	--	GND	5	-
DSR	6	<<	DSR	6	LO / SPACE (+)
RTS	7	>>	RTS	7	LO / SPACE (+)
CTS	8	<<	CTS	8	LO / SPACE (+)
RING	9	<<	RING	9	LO / SPACE (+)

Table 1 - RS-232 DB-9 Connector Signals

DTE = Data Terminal Equipment
DCE = Data Communications Equipment
Traditionally a DTE device would be a terminal with a screen and keyboard, or a PC computer.
A DCE device would have been a modem.
With microcontroller projects, the terms are less obvious because the microcontroller may be the master (the terminal) or the slave communications device, or communicating with a peer. However, we keep the terminology because the RS232 standard is well established.

RS-232 Signal Levels

The reason a RS-232 interface IC is needed is to convert the 0 and 5 Volt logic levels (or 0 and 3.3V) to the positive and negative RS-232 levels. The RS-232 voltages were selected in the days of teleprinters to help transit data reliably over long lengths of cable.

The RS-232 interface converts the conventional 0 to 5 volt signal range (Low/High signals) into two states called Mark and Space.

> Mark is used for the negative state which is from -5 to -15 volts.
> It represents a logical 1 (a High signal).
>
> Space is used for the positive state which is from +5 to +15 volts.
> It represents a logical 0 (a Low signal).

The RS-232 driver also inverts the signal so that a +5V signal is converted to the negative RS-232 (Marking) state. In Figure 2 below, the upper signal is the logic-level serial data going into the interface IC, and the lower signal is the RS-232 level signals coming out.

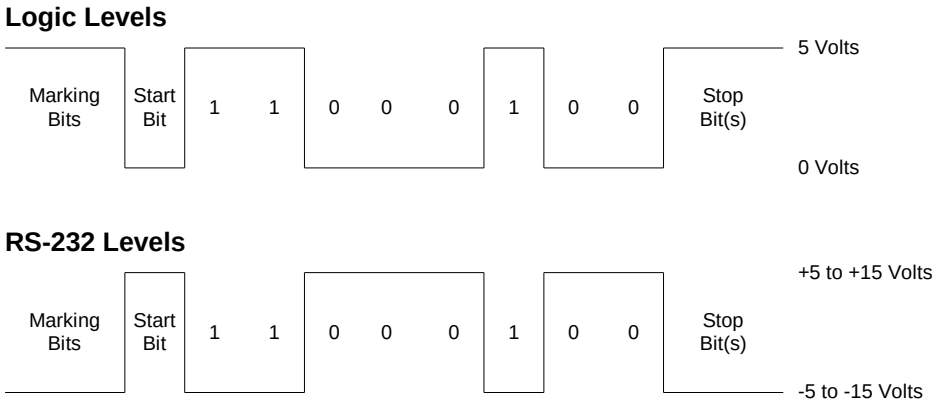


Figure 2 RS-232 Signal Levels

RS-232 Data Format

Figure 2 shows the transmit line voltages for an 8 bit word being sent with no parity. The signal is Marking (logic HI) when no data is being sent.

When a character is transmitted, it begins with a Start Bit which is a Space. It is followed by the 8 bits of the character. The least significant bit (LSB) is sent first and the most significant bit (MSB) of the character is sent last. Finally, Stop Bit (a Mark) is sent at the end of the character. If parity is used, a parity bit is added before the Stop Bit.

Figure 2 shows the binary value 00100011 being sent, which is Hex 0x23, decimal 35, which is the '#' octothorpe character.