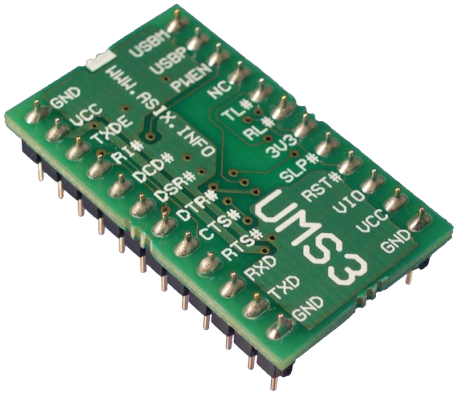
UMS3

USB to UART interface module

User's Guide

- I/O with voltage levels 1.8 V to 5 V - CMOS/TTL compatible
- Powered from USB or by 3.3 V to 5.25 V from application
- Data rate up to 3 MBd
- Full hardware flow control
- Data buffers 256/128 bytes
- Support for driving RS485 transceiver
- USB 1.1, USB 2.0 compatible, FullSpeed
- Supports OEM applications (custom VID & PID)
- BitBang mode
- Support for high power applications (up to 500 mA)
- 5 signals with configurable function
- Optional clock output for application use
- Optimized data flow using handshaking signals
- Drivers for WIN 98/2K/ME/XP/CE, Mac OS8/OS9/OS X and Linux available royalty-free
- Fits into standard DIL24 socket or soldered directly to a PCB



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Note: this document contains hyperlinks pointing to web pages on the Internet. If the links happen to be broken (point to non existing page), please download recent version of this manual from FTDI section at www.asix.cz*.*

1. UMS3

UMS3 is a module based on FT232RL integrated circuit manufactured by FTDI Ltd., which provides with easy to use USB connectivity to PC without any need of additional knowledge about USB itself.

2. USAGE

UMS3 is a USB to UART interface with full hardware data flow control capability. It is capable of data transfer rates up to 3 MBd. The module operates on power from USB or on 3.3 V to 5.25 V from the application. The signaling voltage level for communication with the application circuitry is 1.8 V to 5.25 V. The module is also capable of using custom VID and PID for OEM applications. Identification string, which appears after connecting the device to a computer, VID and PID, required current consumption, module serial number and other parameters concerning USB connection may be programmed directly over USB using MPROG utility.

The module connects directly to USB connector, the application side provides with UART signals including hardware flow control. Typical wiring is presented in chapter 4. All UATR signals may be inverted to obtain negative signaling without any additional components (by default the signaling is set as expected by TTL application or a TTL/RS232 converter).

From mechanical standpoint, the module is arranged as DIP28 with standard pin spacing of 0.1 inch (2.54 mm) so it is possible to fit it into either standard or precise DIP28 socket, or to solder it directly to printed circuit board. The USB connector is to be connected externally which allows the designer to choose the placement of the connector and its type: 'B' or 'mini B' or USB cable soldered directly to the board may be used. This design significantly simplifies the development in small production series.

There is a separate power supply for IO pins (VCCIO), which allows the module to be easily connected to application using 1.8 V to 5.25 V signaling.

PWREN# signal is designated to drive a P-channel MOSFET for applications which consume more than 100 mA (max. 500 mA) from USB. In such case it is advisable to turn enable pull-down resistors in the EEPROM configuration.

UMS3 module can operate in "BitBang mode", in which the data pins act as 8-bit parallel input/output. This mode can be used for example to configure field-programmable logic array directly from PC over USB. However this mode is not intended for use with applications requiring precise jitter free timing.

Another option is to use "synchronous BitBang mode". In this case data is read from application just upon sending out data written from PC, i.e. the amount of data read is the same as the amount of data written.

Moreover it is possible to use configurable pins to bring out internal RD/WR signals, so that application is informed about timing and validity of the data.

At last, there is "CBus BitBang mode" using up to 4 special IO signals. This mode is significantly slower the previous two and is mainly suitable for writing and reading signal states.

The module features 5 user configurable pins (TL#, RL#, TXDE, PWE#, SLP#), which are by default used for functions they were designed for, however it is possible to change their functions to one of the following: TXDEN, PWREN#, TXLED#, RXLED#, TX&RXLED#, SLEEP#, CLK48, CLK24, CLK12, CLK6. In addition these signals, except of SLP# can be configured for CBitBangIO function, BitBangWRn or BitBangRDn. More information about BitBang modes can be found at the FTDI website.

Options CLK6, CLK12, CLK24 and CLK48 result in bringing out 6MHz, 12MHz, 24MHz or 48MHz clock to a user configurable pin.

A new progressive feature of UMS3 module is its unique serial number to identify particular product.

The module is suitable for use in industrial applications (-40°C to +85°C) and it is RoHS compliant. If ordered in higher quantities it is possible to obtain customized module with by internally connecting VIO to VCC or +3V3.

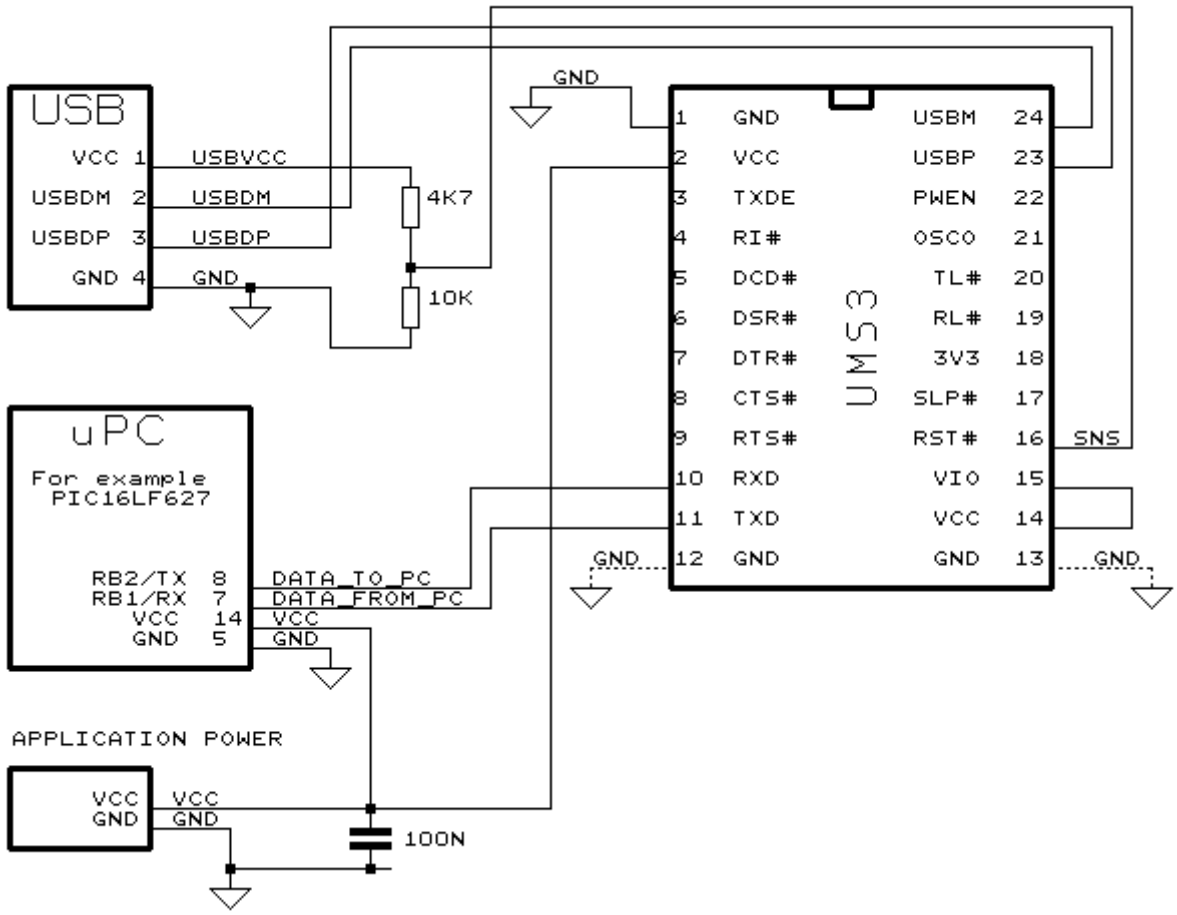
Royalty-free drivers for WIN 98/ME/2K/XP/CE, Mac OS8/OS9/OS X and Linux are available at our website.

3. UMS3 CHARECTERISTICS

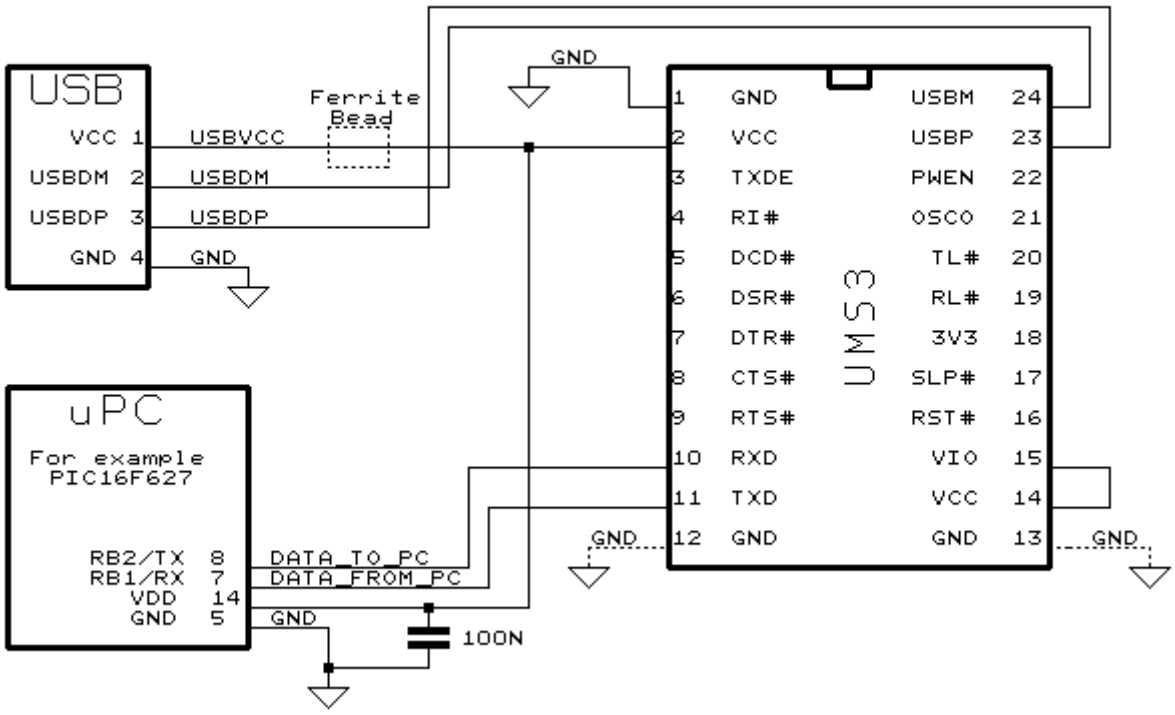
- Inputs/outputs with voltage levels 1.8 V to 5 V - CMOS/TTL compatible
- Powered by 3.3 V to 5.25 V from USB or externally
- Data rate up to 1 MBd for RS232 and up to 3 MBd for RS485
- Capable of full hardware flow control
- Buffers: 256 bytes for reception / 128 bytes for transmission
- Support for driving RS485 transceiver
- USB 1.1, USB 2.0 compatible
- Supports OEM applications
- BitBang mode / Synchronous BitBang mode / CBUS BitBang mode
- PWE# signal to control P-channel MOSFET for applications which draw more than 100 mA from USB (max. 500 mA)
- Configurable function of TL#, RL#, TXDE, PWE#, SLP# signals
- Optional clock output for application use (6 MHz, 12 MHz, 24 MHz, 48 MHz)
- Possibility to optimize data flow by changing CTS, DSR, DCD or RI signal (for more information see application note 4)
- Drivers for WIN 98/2K/ME/XP/CE, Mac OS8/OS9/OS X and Linux available royalty-free for download from the Internet, section technical support
- The module fits into standard DIL24 socket or may be directly soldered to a PCB

4. TYPICAL CONNECTION OF UMS3

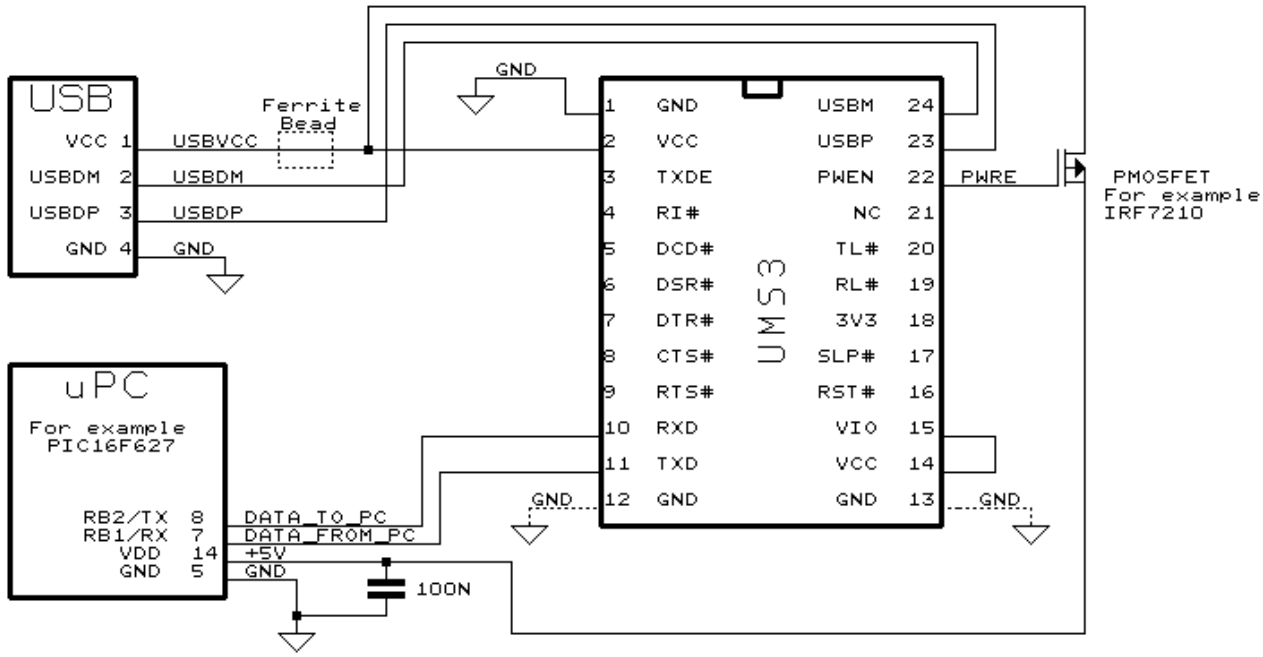
1) APPLICATION POWER +5V/+3V3



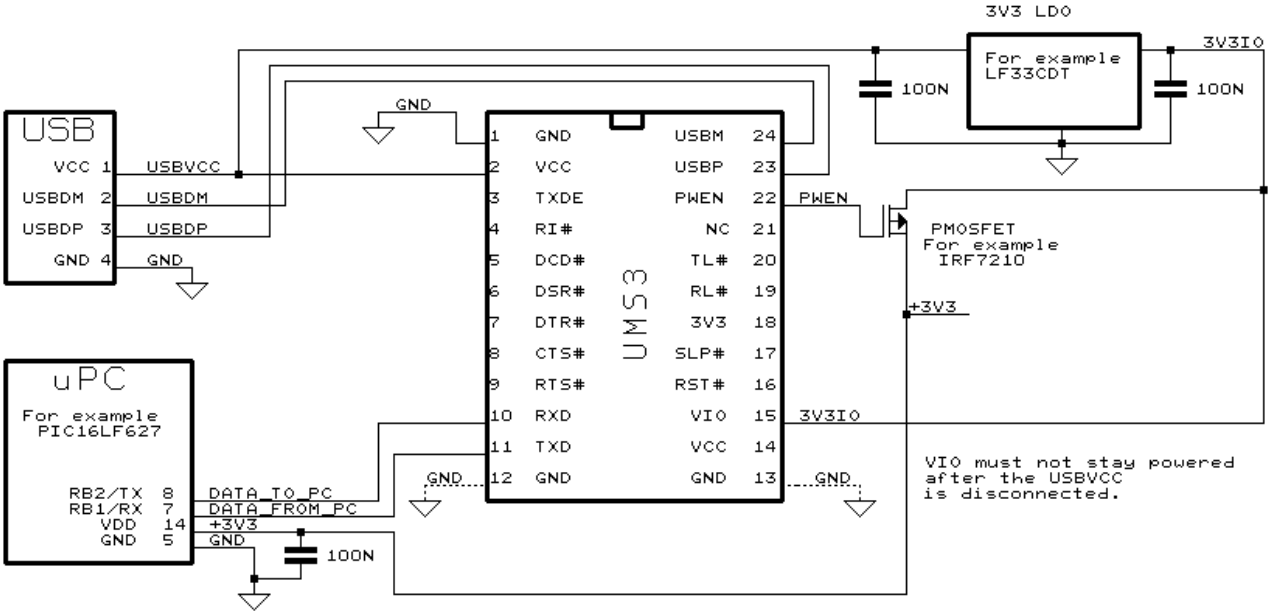
2) USB POWER (5V, max 100 mA), 5V tolerant application



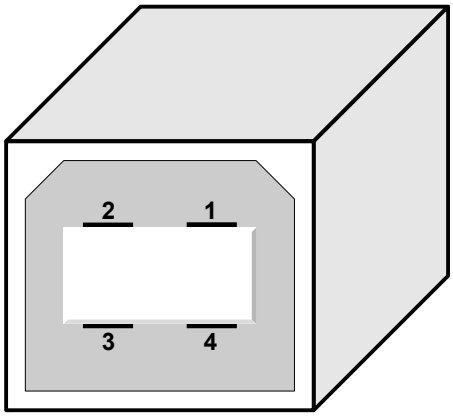
3) USB POWER (upto 500 mA), 5V tolerant application



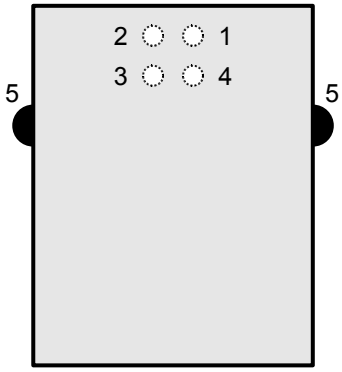
4) USB POWER (upto 500 mA), 3V3 tolerant application



4.1 USB Connector



USB B-type connector, front view



USB B-type connector, top view

pin	*signal*	*color*
1	VCC	red
2	USBDM	white
3	USBDP	green
4	GND	black
5	SHIELD	

USB connector pin assignment

4.2 Practical notes on connecting and using the module

- The device may not draw more than 100 mA from USB upon connection. When more than 100 mA is required (max. 500 mA), it is necessary to use a P-channel MOSFET to switch on power for the rest of the application after USB enumeration.
- If the module is not detected after connecting to USB, the problem is most likely in the cabling. The problem may be also in the RST# signal.
- In case there is a new device detected, but FTDI device (which is the base of UMS3 module) is not recognized, the problem may be with swapped USBDP and USBDM signals or with their interchange with power supply pins.
- When you can see FTDI device (UMS3 module) in the device manager, the USB communication is functioning. If the application still does not communicate with the module, check the voltage on VIO pin, which is used to power the output driver of the module. If the VIO voltage is fine, check the connections to the application. The problem may also reside in software. The LEDs (TL#, RL#), which indicate communication in progress may give some hint.

4.3 Notes on power supply design

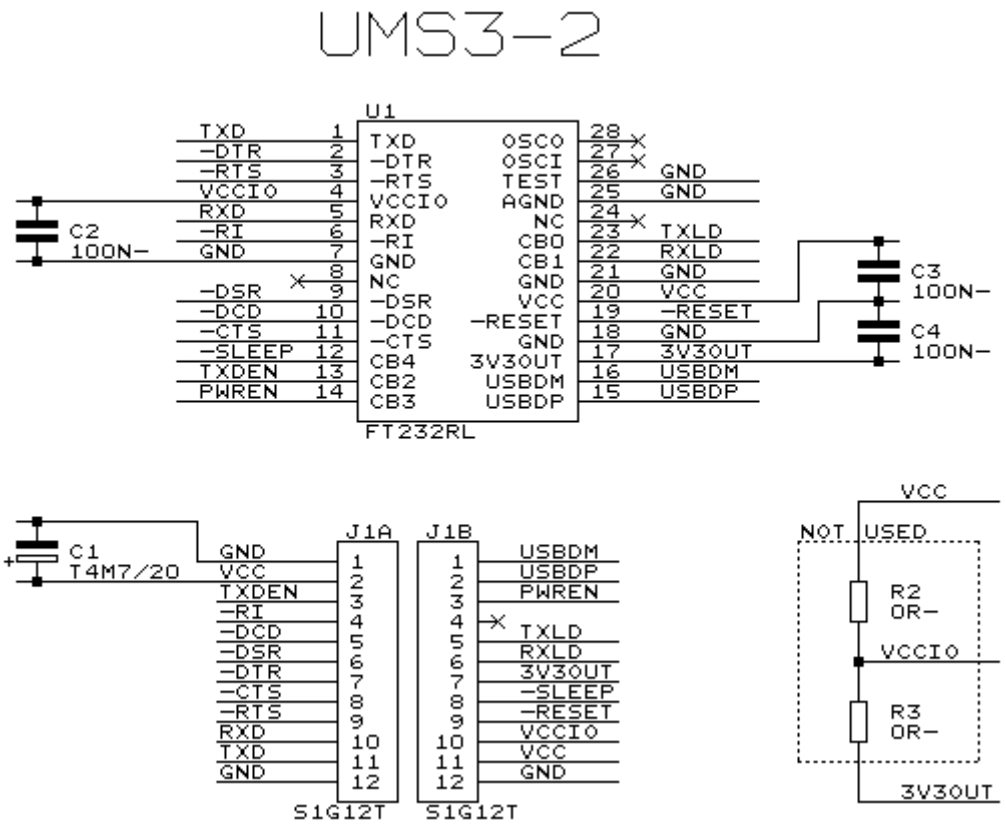
- Capacitors connected directly to USB power lines shall not 10 µF. Current peak caused by larger capacity may result in computer disconnecting corresponding port on the USB controller. Larger capacitor may be connected behind the P-MOS. It is recommended to limit charging of these capacitor keeping in mind that no more than 500 mA shall be drawn.
- *The VIO signal shall not be powered unless there is a power on VCC!* The particular hardware solution has to be designed accordingly. The VIO pin may be powered by 3V3out, up to 50 mA may be drawn from this output.

4.4 Backward compatibility with UMS1 module

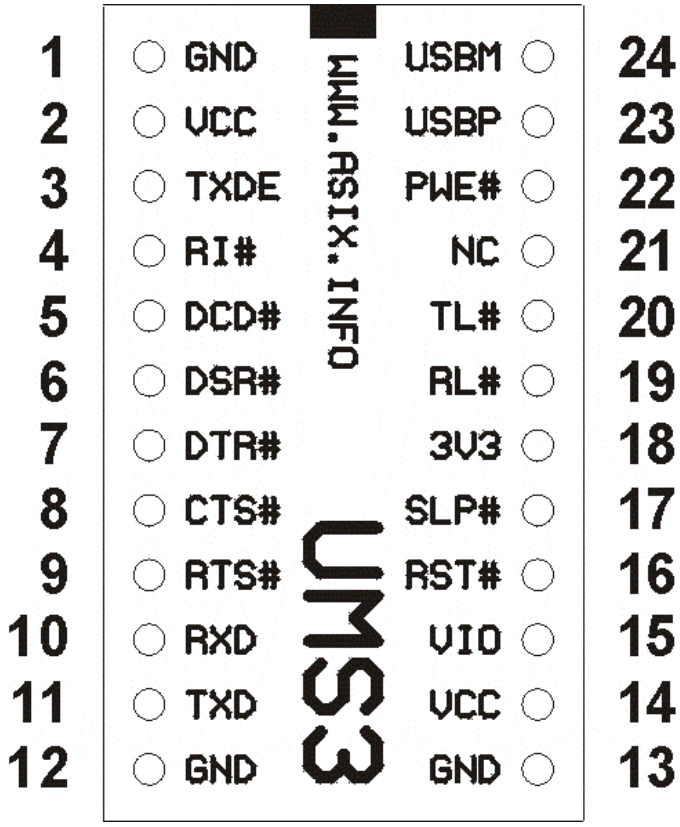
The UMS3 module cannot be used as direct replacement for UMS1 in every application. The following conditions has to be checked first:

1) RST# (pin 16): This pin is used for EEPROM on UMS1. In case of UMS3 the EEPROM is integrated internally. The pin will probably be in high impedance after desoldering EEPROM (which is an acceptable condition).
2) VCC (pin 14): Check for collision between VCC and EECS used on UMS1.
3) VIO (pin 15): Check for collision between VCC and EESK used on UMS1. Moreover a suitable power supply has to be connected to this pin for the module to communicate with the application. This pin may be interconnected with VCC in a typical case.
4) PWE# (pin 22): This pin was originally used for USBEN (log.1 when USB device configured), while PWE# is log.0 when USB is device is configured and not in a sleep state.

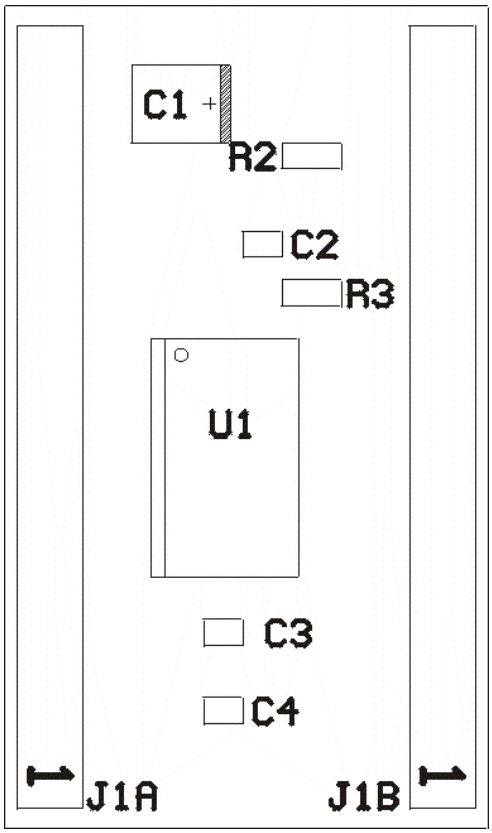
5. INTERNAL SCHEMATICS OF UMS3



5.1 TOP VIEW



5.2 BOTTOM VIEW



5.3 PINOUT DESCRIPTION

Pin	Label	FTDI	Type*	Description
1	GND	GND	PWR	Ground
2	VCC	VCC	PWR	Power supply 3.3 V to 5.25 V
3	TXDE	TXDEN	I/O	Transmit enable signal for RS485
4	RI#	RI#	IN	Ring indicator
5	DCD#	DCD#	IN	Data carrier detect
6	DSR#	DSR#	IN	Data set ready
7	DTR#	DTR#	OUT	Data terminal ready
8	CTS#	CTS#	IN	Clear to send
9	RTS#	RTS#	OUT	Request to send
10	RXD	RXD	IN	Received data (to host PC)
11	TXD	TXD	OUT	Transmitted data (from PC)
12	GND	GND	PWR	Ground
13	GND	GND	PWR	Ground
14	VCC	VCC	PWR	Power supply 3.3 V to 5.25 V
15	VIO	VCCIO	PWR	Power supply 1.8 V to 5.25 V for output drivers on pins 3..11, 17, 19, 20, 22. VIO shall not be powered while there is no power supply on VCC.
16	RST#	RESET#	IN	External reset, if unused, may be left unconnected or connected through a resistor to VIO
17	SLP#	SLEEP#	I/O	Indicates USB suspend (log.0)
18	3V3	3V3OUT	OUT	3.3 V output from internal voltage regulator. May be used to power application circuitry, max. 50 mA
19	RL#	RXLED#	I/O	Receive LED indicator
20	TL#	TXLED#	I/O	Transmit LED indicator
21	NC		NC	Unused pin. May be connected to any potential
22	PWE#	PWREN#	I/O	PWE# goes low (log.0) after the module is connected to USB and configured. Remains in high (log.1) during reset and in USB suspend mode. This signal is used to drive P-channel MOSFET, to enable the application to draw more than 100 mA from USB.
23	USBP	USBDP	I/O	USB data signal plus
24	USBM	USBDM	I/O	USB data signal minus

*voltage levels of **all signals** except of 3V3, USBP and USBM depend on voltage of power supply connected to **VIO**.

note.: this applies also to PWEN, RST#, RL#, TL#,...

6. DRIVER INSTALLATION

The procedures of installing drivers for Windows 98/2K/ME/XP and Mac OS8/ OS9/OS X are described in details on the Internet.

7. TECHNICAL SPECIFICATION

7.1 RECOMMENDED RATING

Power supply	VCC	min. 3.3 V	max. 5.25 V
Power supply	VIO	min. 1.8 V	max. 5.25 V
Power consumption, operating	ICC1		max. 15 mA
Power consumption, suspend	ICC2		max. 100 µA
Input voltage log.1, VIO=5 V	VIH	min. 1.9 V	
VIO=3.3 V		min. 1.5 V	
Input Voltage log.0, VIO=5 V	VIL		max. 1.3 V
VIO=3.3 V			max. 1.0 V
Output voltage log.1, VIO=5 V	VOH	min. 3.2 V @2mA	
VIO=3.3 V		min. 2.2 V @1mA	
Output voltage log.0	VOL		max. 0.6 V @2 mA
			max. 0.5 V @2 mA
Output signal current	Iout		max. 24 mA
Output current of 3V3 out	I3v3out		max. 50 mA
Differential input sensitivity	USBDIF	0.2 V	
Differential input voltage	USBCM	0.8 V	2.5 V

7.2 ABSOLUTE RATING

Storage temperature	TSTR	min. -65 °C	max. 150 °C
Operating temperature	TPWR	min. -40 °C	max. +85 °C
Power supply	VCCMAX	min. -0.5 V	max. 6.00 V
Input voltage - inputs only	VIN1	min. -0.5 V	max. VCC+0.5 V
Input voltage - I/O	VIN2	min. -0.5 V	max. VCC+0.5 V
Output current	Iout		max. 24 mA
Power consumption	WPWR		max. 500 m