USB2X
Interface Converter

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TRINAMIC
MOTION CONTROL

Trinamic Motion Control GmbH & Co. KG
Sternstraße 67
D - 20357 Hamburg, Germany
Phone +49-40-51 48 06 - 0
FAX: +49-40-51 48 06 - 60
http://www.trinamic.com

Version

Version	Date	Author	Comment
1.00	27-Nov-03	OK	Initial version
1.01	1-Oct-04	OK	Minor error corrections
2.00	24-Jan-05	OK	Describes USB2X Version 2
2.01	23-Nov-05	OK	CAN connector pin assignments corrected

Contents

1 Introduction

The USB2X device is an interface converter that is equipped with a CAN interface, an IIC interface, a LIN interface, an SPI interface and an RS485 interface. It can be connected to the PC via the USB interface. The USB2X device is mainly designed for use with some of the Trinamic evaluation kits, but it can also be used in any other purpose where a connection between a PC and a CAN interface, an IIC interface, a LIN interface, an SPI interface or an RS485 interface is needed.

The software supplied with this product can be used with every version of the Windows operating system that supports USB (Windows 98, Windows ME, Windows 2000, Windows XP). Windows 95 and Windows NT4.0 do not support USB, so the USB2X device can not be used with such systems.

The USB2X device can be connected to USB 1.1 or USB 2.0 hosts and supports the full bitrate of 12MBit/s. It is also powered by the bus, so no extra power supply is needed.

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2 The USB2X Hardware

2.1 Overview

Figure 1 gives an overview of the USB2X devices and shows where which interfaces are located. Figure 2 shows the PCB of the USB2X interface.
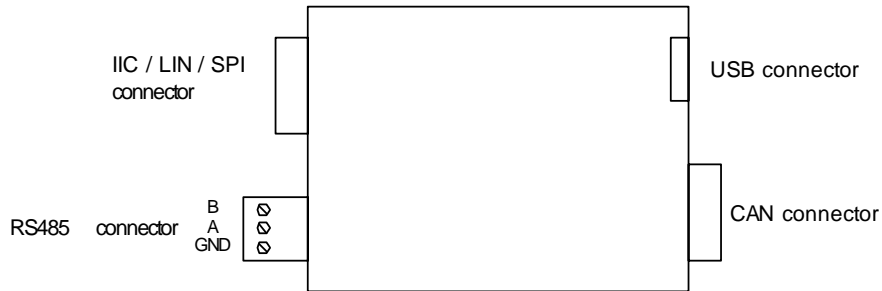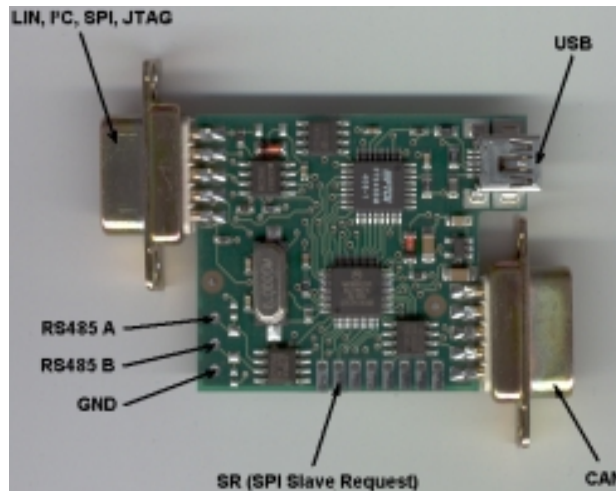

Figure 1: The USB2X device

Figure 2: The PCB of the USB2X device

2.2 Connectors

The pin assignments of the connectors of the USB2X device are as follows:

2.2.1 CAN

Pin	Signal
2	CAN_LOW
7	CAN_HI
3	GND
6	GND

A CAN termination resistor of 120 ohms can be switched in by the jumper that is located under the USB socket.

2.2.2 LIN / IIC / SPI:

Pin	Signal (LIN)	Signal (IIC)	Signal (SPI)	Signal (JTAG)
1		SCL		
2			SCK	TCK
3	GND	GND	GND	GND
4			SS	TMS
5			MOSI	TDO
6		SDA		
7	LIN (data)			
8			MISO	TDI
9	LIN supply voltage (+8..18VDC)			

When LIN is to be used, the LIN transceiver of the USB2X device has to be powered by the target via pin 9 of the connector. The pin assignment of the connector is so that the Trinamic TMC211 evaluation board or the Trinamic TMC222 evaluation board can be plugged directly onto the connector.

The JTAG functionality is not implemented yet. When JTAG functionally should be implemented in future versions the JTAG signals will be on the pins shown in the table above.

Please note that the additional **SR** (slave request) line of the SPI interface is not available on this connector but on a board edge solder pad (the second of eight solder pads counted starting from IC labeled '75176').

The IIC interface and the SPI interface can not be used simultaneously. Also, the LIN interface and the RS485 interface can not be used simultaneously.

2.2.3 RS485:

Pin	Signal
1	A (+)
2	B (-)
3	GND

2.3 Technical Data

2.3.1 USB

- Connection to USB 1.1 or USB 2.0 hosts possible (a cable is supplied with the device)
- USB full speed device (12MBit/s)
- Bus powered (no extra power supply needed)

2.3.2 CAN

- CAN 2.0A and 2.0B compatible
- Standard (11 bit) and extended (29 bit) identifier possible
- Transceiver: compatible with ISO 11898 standard
- Maximum bit rate: 1MBit/s
- 120 ohms termination resistor can be activated with a jumper

2.3.3 LIN

- Compatible with LIN specification rev 1.3
- up to 20kBit/s
- Industry standard physical interface transceiver

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2.3.4 IIC

- Single master
- Up to 400kBit/s
- 7-bit addressing

2.3.5 SPI

- Four standard signals: SCK, MOSI, MISO, SS (SlaveSelect)
- Also usable as JTAG interface: TCK, TDO, TDI, TMS (supported in future firmware revisions)
- Additional 5th line SR: slave request signal input (falling edge active, internal pull-up)
- Software selectable signal levels: 5V or 3.3V
- Master mode operation
- Silent slave mode (spy mode) possible when MISO is not connected to the target
- Clock phase and polarity: all four modes software selectable
- Setup and hold time of slave select signal as well as inter-byte delay time software selectable
- Data rates: up to 3.75 Mbit/s at 5V, up to 1.5 Mbit/s at 3.3V

2.3.6 RS485

- Half duplex communication mode
- Industry standard 75176 transceiver
- 2400, 9600 and 19200 bps supported
- Pull-up resistor, pull-down resistor and termination resistor possible (assembly option on request)

2.3.7 Housing

- Compact, metalized standard housing (know as 25 pin Sub-D adapter housing)
- Dimensions: 62.5mm x 54.4mm x 16.9mm (length x width x height)

3 Using the USB2X Device

3.1 Installation

As USB devices are hot-pluggable it is not necessary to turn off the PC when plugging in or removing a USB2X device. Just plug in the device when the PC is switched on and Windows is running. When you plug in the USB2X device for the first time you will be prompted for a suitable device driver after a few seconds. You will have to be logged in as administrator to be able to install device drivers on Windows 2000 or Windows XP. Insert the TMC TechLib CD that is supplied with this product and select the "USB2X.INF" file in the "systems\USB2X" directory on the TechLib CD. The device driver will then be installed.
Now the USB2X device can be used.

3.2 Software

If you are using the USB2X device with a TMC211 evaluation board, use the software that is supplied with the evaluation board: Eval211USB.exe. This software is described in the manual of the TMC211 evaluation board.
If you are using the USB2X device with a TMC222 evaluation board, use the software that is supplied with the TMC222 evaluation board: Eval222USB.exe. It is described in the manual that comes with the TMC222 evaluation board.
There is also a software with which you can just send and receive any data using the interfaces of the USB2X device. This program can be started by double clicking the file "USB2X.EXE" which is supplied in the "systems\USB2X" directory of the TechLib CD. After starting the program its main window appears. Now, select your USB2X device in the "Interface" section and click the "Open" button. After the connection to the device has been successfully established, the firmware revision number of the device is shown.
The "USB2X.EXE" software also makes it possible to update the firmware of the USB2X device via its USB interface. Firmware files for the USB2X device can be downloaded on Trinamic's web site (www.trinamic.com). To install a new firmware file, please do the following:

1. Download the file from Trinamic's web site. Firmware files for the USB2X device normally have the extension ".s19".
2. Start the USB2X PC software and click the "Open" button.
3. Click the "Firmware update" button and a new window appears.
4. Click the "Load" button and select your new firmware file.
5. Click the "Start" button and wait for the update process to complete.
6. Try if the USB2X device still works. If this should not be the case, quit the USB2X software, pull out the USB plug on the USB2X device, wait some seconds and plug it in again. Now restart the USB2X software and try again. If for some reason the USB2X device should still refuse to work, try to update the firmware again.

On the "IIC", "LIN", "CAN", "SPI" and "RS485" pages you can find all functions to make use of the interface of the USB2X device. Please check Trinamic's web site from time to time and watch out for updates (of the PC software and the firmware).
Notes on using the USB2X device in your own PC software can be found in the documentation of the USB2X host interface protocol. There is also an example program, written in Delphi.
In the near future there will also be a DLL that will make integrating the USB2X device into your own devices very easy. Please check Trinamic's web site from time to time if it is already available.

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