TI Designs: TIDA-00540
RS232/RS485 Multiprotocol Transceivers

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Design Resources

TRS3223E	Product Folder
SN65LBC180Q1	Product Folder

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Design Features

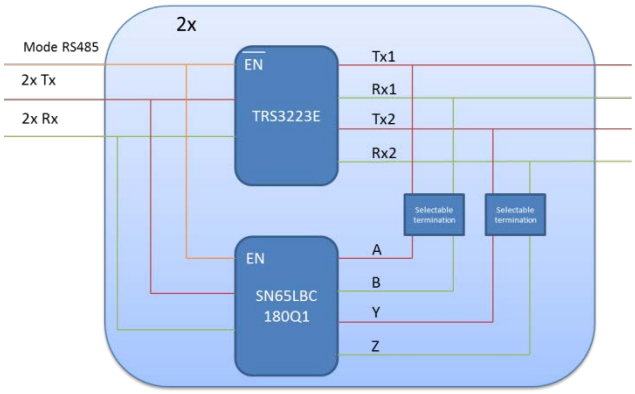
High value devices

- Two full duplex RS485 and four RS232 transceivers
- 5V supply voltage
- 20Mbps RS485 and 500kbps RS232

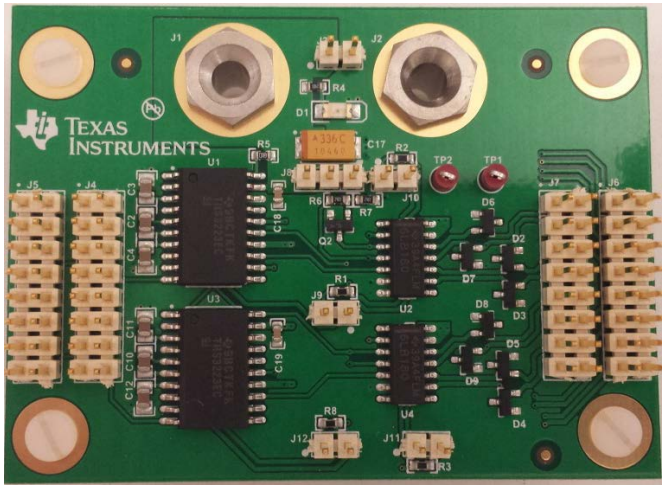
Featured Applications

- Software selectable RS232/RS485/RS422 Interface
- Point-of-sale terminals
- Cable repeaters
- Protocol translators

Block Diagram



Board Image



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1 Design Overview

Many industrial communication networks require support for multiple different interfaces. The RS-232, RS-485 and RS-422 interfaces are some of the most commonly used in industrial systems. Various options exist for an integrated multiprotocol transceiver capable of switching between these interfaces. While these highly-integrated circuits offer interesting solutions for some customers, a discrete, value-oriented circuit can offer an interesting solution for price driven applications.

The TI ICs used on this reference design, two TRS3223E and two SN65LBC180, enable either four UART-to-RS-232 or two UART-to-full-duplex-RS-485 interfaces to be active. As alternative, two UART-to-RS-232 and one UART-to-full-duplex-RS-485 interface can be active.

There are eight ESD protection diodes on the board to ensure protection on the data transmission lines. An inverting logic circuit enables and disables the RS-232 and RS-485/422 transceivers. The power supply of the devices is 5V, and the headers on the input and output sides are each doubled to enable both a signal and a measurement connector to be applied. There are four jumpers to terminate the differential bus lines with 120-Ω termination resistors in RS-485/RS-422 mode.

2 Schematic

The schematic for the RS232/RS485 multiprotocol transceivers reference design is shown below.

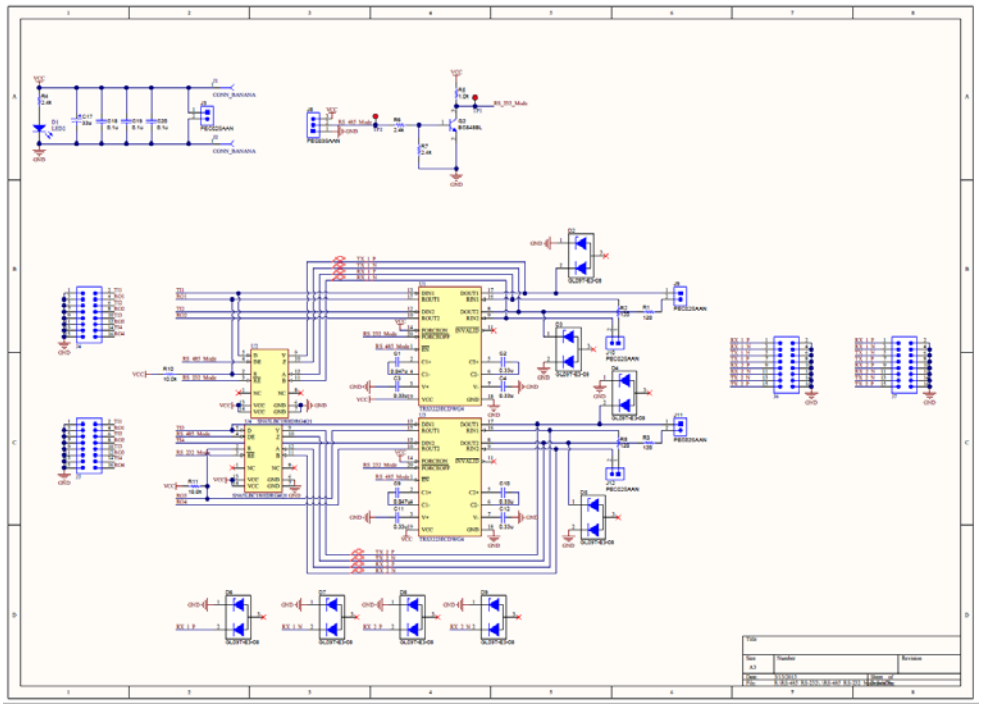

Figure 1. RS232/RS485 multiprotocol transceivers schematic

The connectors on the left side allow the UART signals to be supplied to the transceivers. The connectors on the right side are the signal lines for the RS-232, RS-485 or RS-422 interfaces.

3 Test Waveforms

The following waveforms were recorded using the TRS3223E RS-232 and SN65LBC180Q1 RS-485 transceiver. The distributed DC power supply is 5 V.

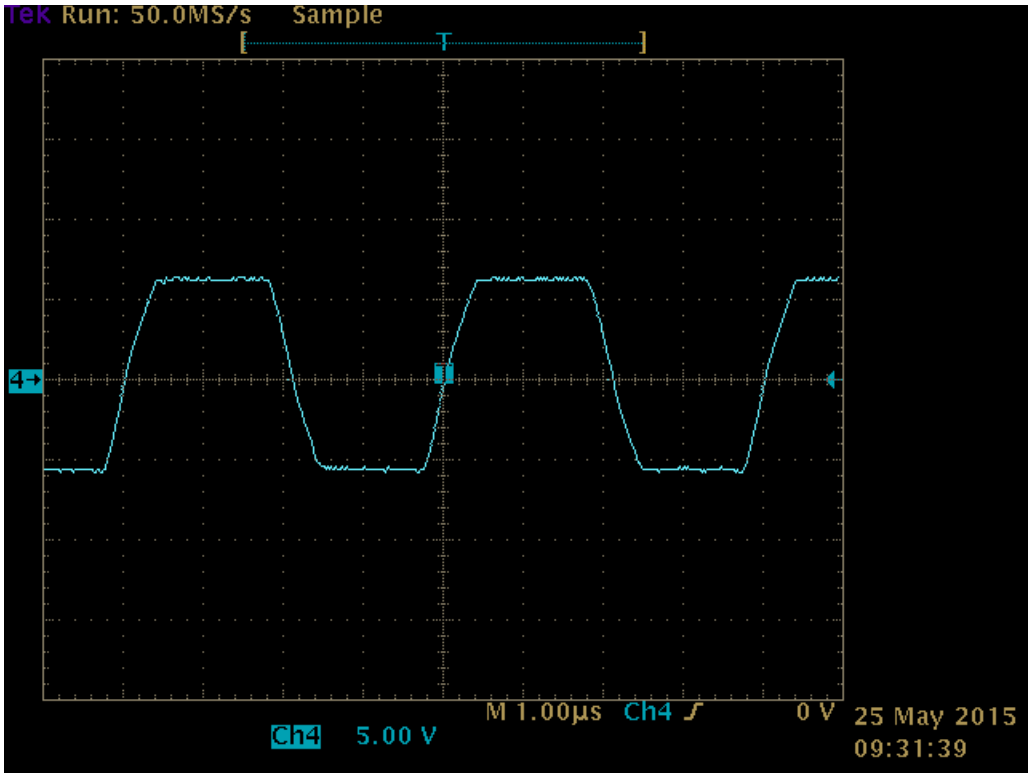

Figure 2. RS-232 transmitting signal (500 kbps)

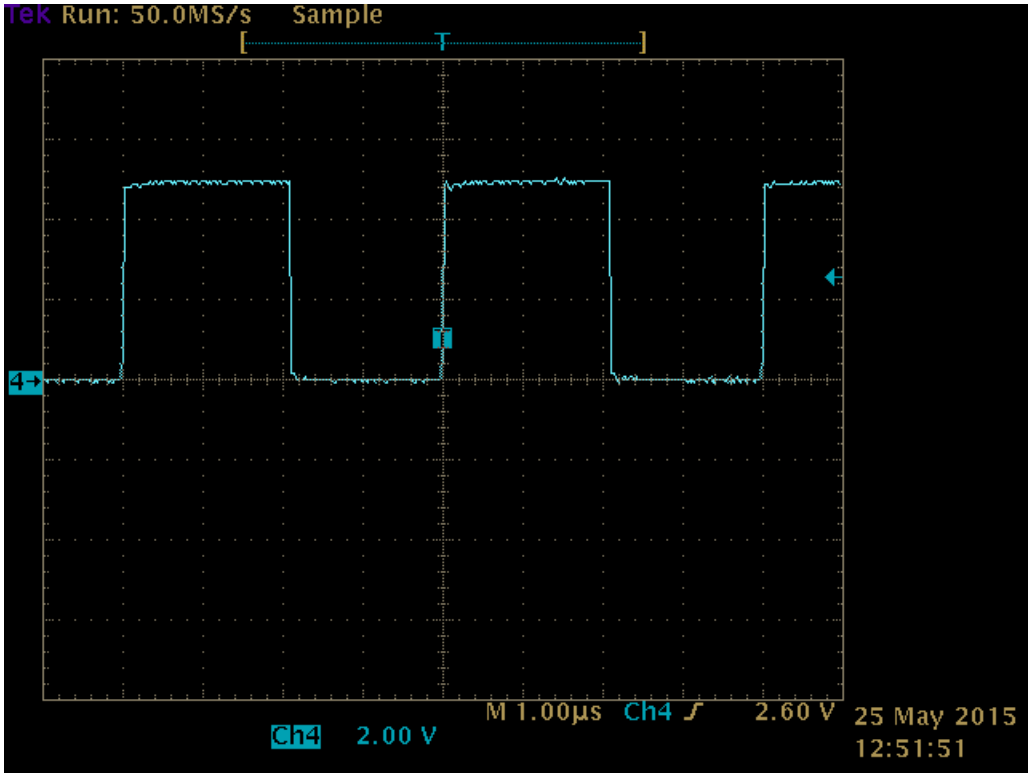

Figure 3. RS-232 receiving single-ended signal (500 kbps)

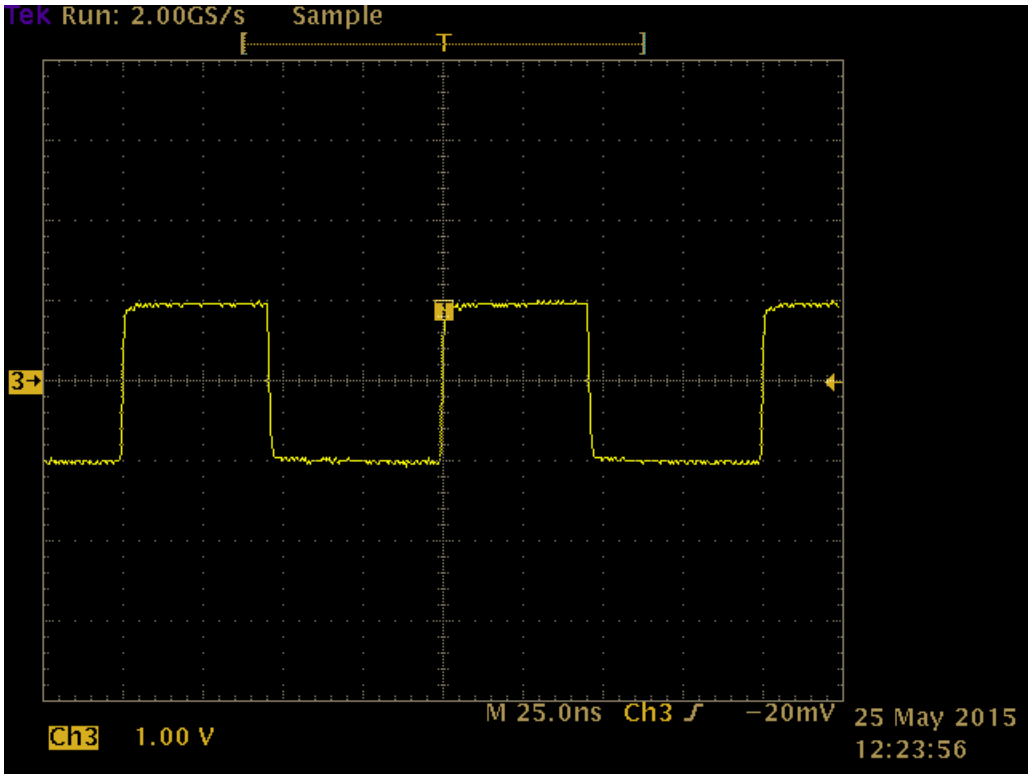

Figure 4. RS-485 transmitting differential signal (20 Mbps)

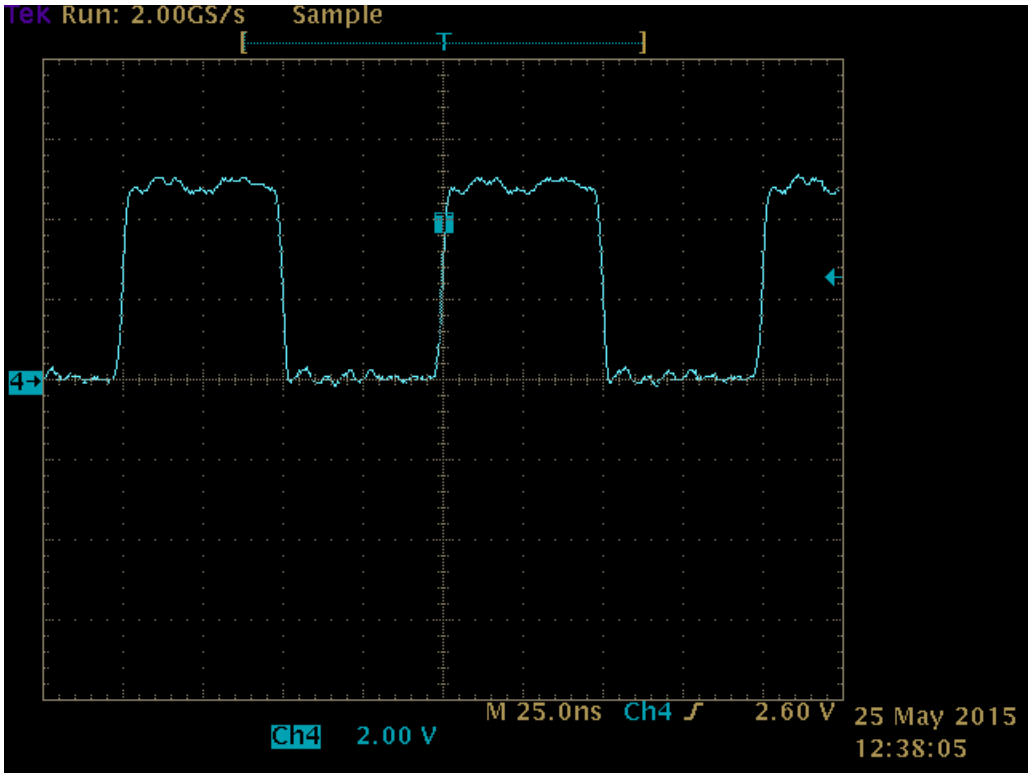

Figure 5. RS-485 receiving single-ended signal (20 Mbps)

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