SINC SQUARED

SS-USB3-SMA

USB-3.0 to SMA Breakout Board

FEATURES

- USB-3.0 type-A plug or receptacle
- SMA connectors for 5Gbps data signals
- Certified 50 Ω microstrip transmission lines
- USB-2.0 signals accessible via header pins
- Optional tap-off connectors for monitoring high-speed traffic on oscilloscope

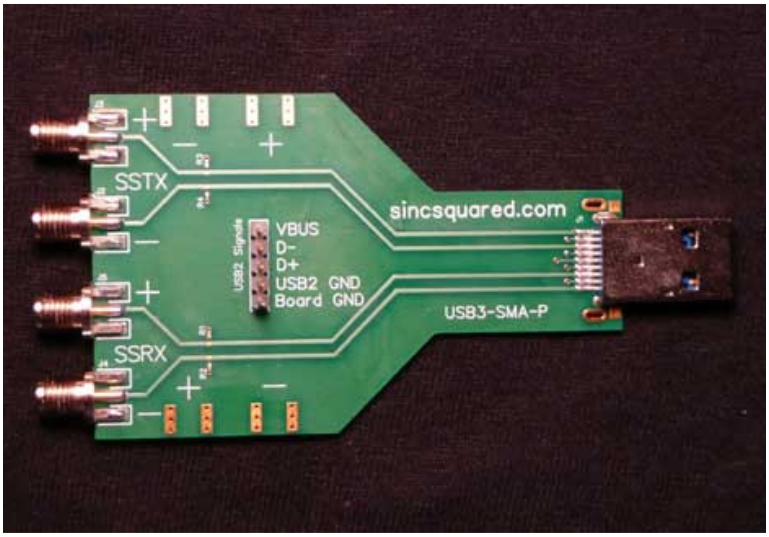
APPLICATIONS

- Testing PC boards,cables, redrivers, etc. in a USB-3.0 link between host and device
- Interfacing USB-3.0 signal to 50 Ω test equipment
- Debug and test of USB-3.0 host/device

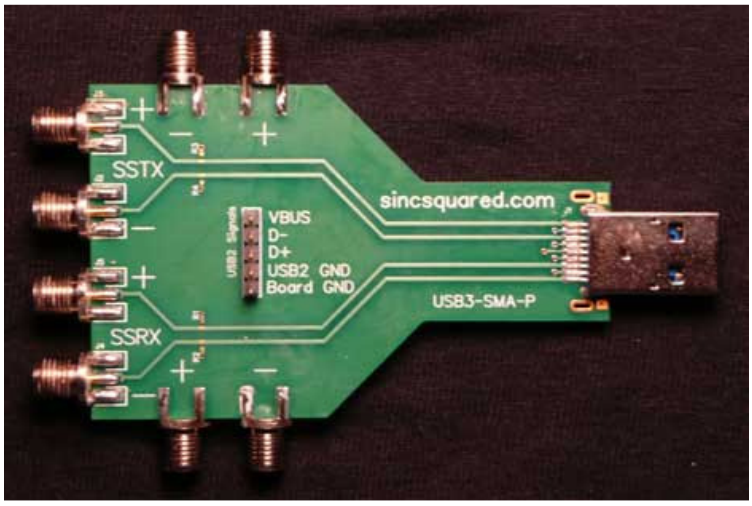
DESCRIPTION

The SS-USB3-SMA breakout boards incorporate a standard USB-3.0 type-A connector on one end of a printed circuit (PC) board and high-speed SMA connectors on the other end of the PC board. Super Speed 5Gbps pins are routed to the SMA connectors via 50-ohm microstrip transmission lines. USB-2.0 signals (VBUS, D-, D+, and GND) are routed to standard 0.1 inch header pins. The breakout boards enable test, debug, and development of USB-3.0 links.

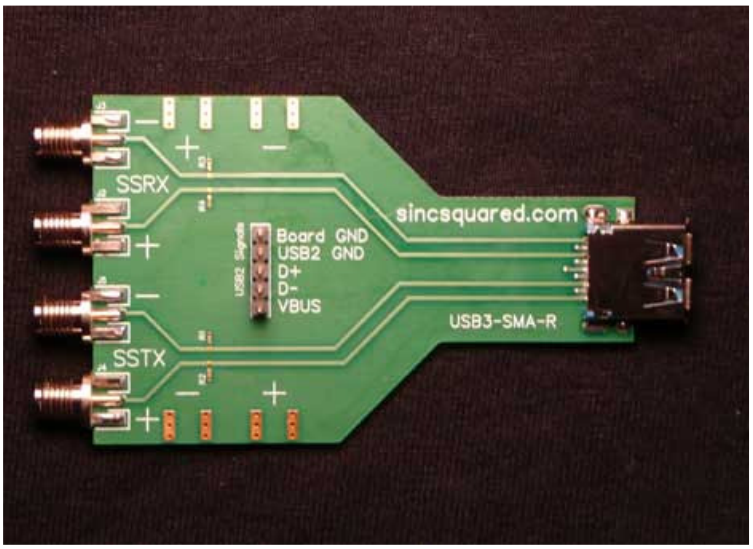
Four variations of the SS-USB3-SMA breakout boards are available. Two are configured with a USB-3.0 type-A plug and the other two are configured with a USB-3.0 type-A receptacle. Both the plug and receptacle versions of the board include optional Super Speed monitoring connections that split off 10% of the 5Gbps signals for monitoring on an oscilloscope. Monitoring connections use high-speed SMA connectors on the sides of the boards.



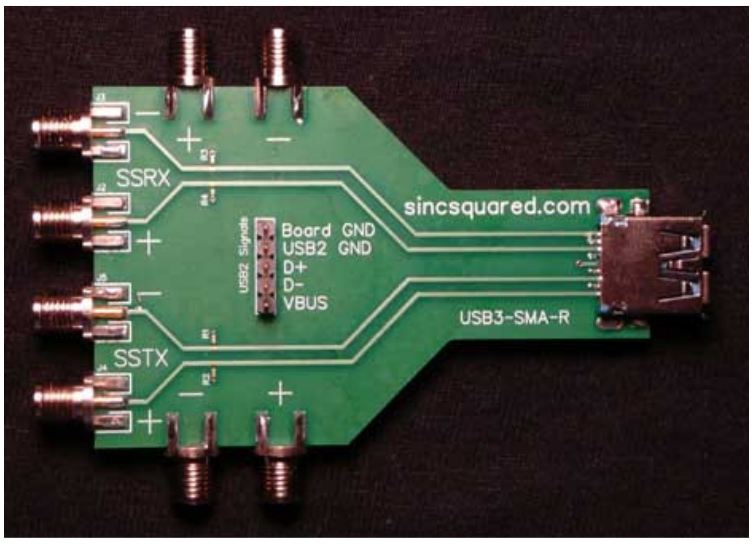
SS-USB3-SMA-P: USB-3.0 Plug to SMA Breakout Board



SS-USB3-SMA-P-M: USB-3.0 Plug to SMA Breakout Board with Monitor Connectors



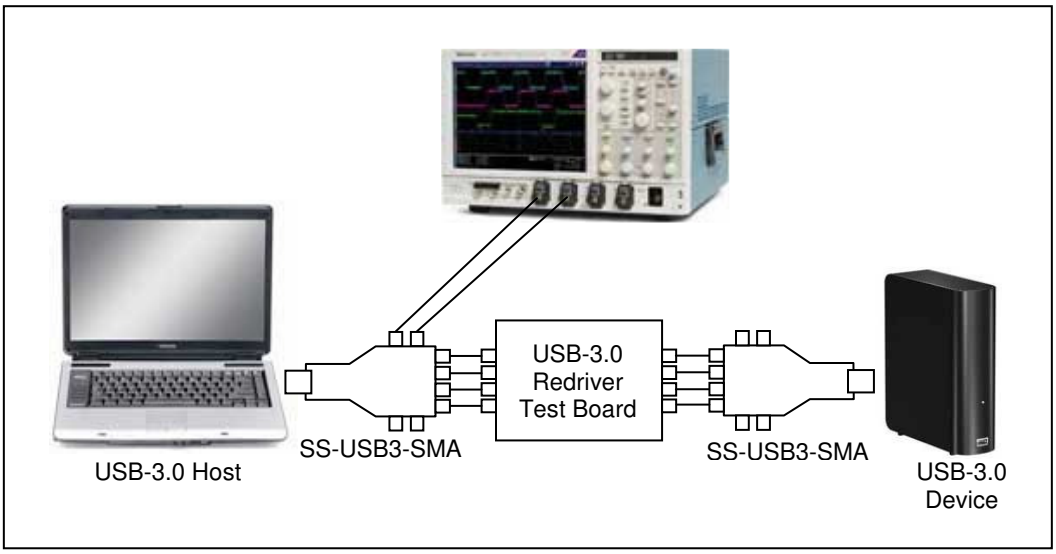
SS-USB3-SMA-R: USB-3.0 Receptacle to SMA Breakout Board



SS-USB3-SMA-R-M: USB-3.0 Receptacle to SMA Breakout Board with Monitor Connectors

APPLICATION INFORMATION

SS-USB3-SMA breakout boards are generally used in pairs to enable a device under test (DUT) to be placed in the link between the USB-3.0 Host and USB-3.0 Device. The DUT may be as simple as a length of printed circuit board or cable being tested for USB-3.0 compatibility, or it may be a more complex active circuit mounted on a test board. The breakout boards enable connection to the DUT using standard 50-ohm SMA cables. Optional monitor connectors tap 10% of the high-speed signals for observation on a high-speed oscilloscope.



Typical usage for the SS-USB3-SMA breakout boards

Ordering

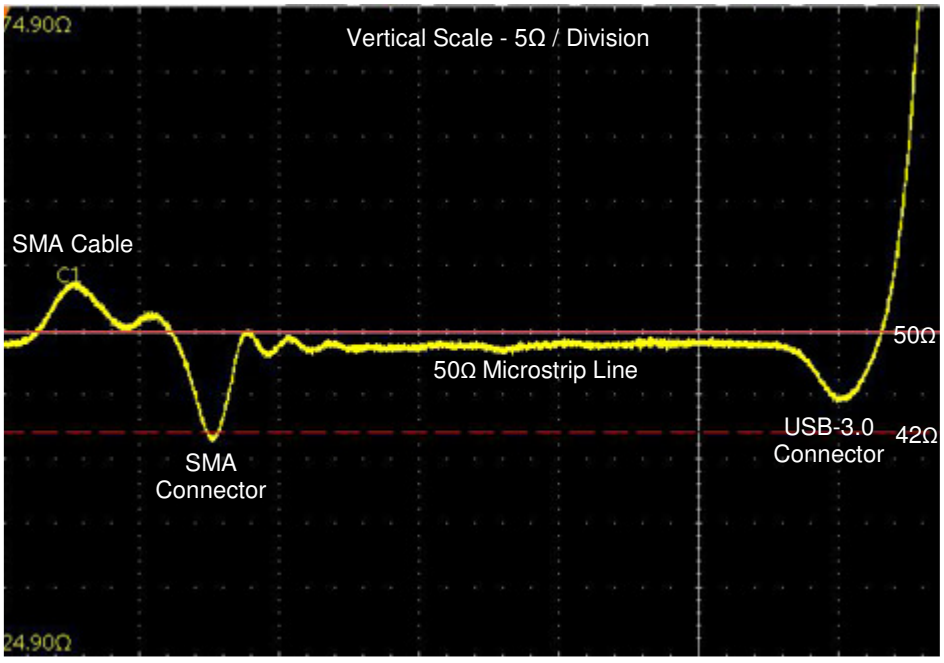
Part Number	Description	USB-3.0 Connector	Monitor Connectors
SS-USB3-SMA-P	USB3 Plug to SMA Breakout Board	Type-A Plug	No
SS-USB3-SMA-P-M	USB3 Plug to SMA Breakout Board w/Monitors	Type-A Plug	Yes*
SS-USB3-SMA-R	USB3 Receptacle to SMA Breakout Board	Type-A Receptacle	No
SS-USB3-SMA-R-M	USB3 Receptacle to SMA Breakout Board w/Monitors	Type-A Receptacle	Yes*

* Monitor option includes 50-ohm terminators that should be attached when the monitor connectors are not used

Technical Details

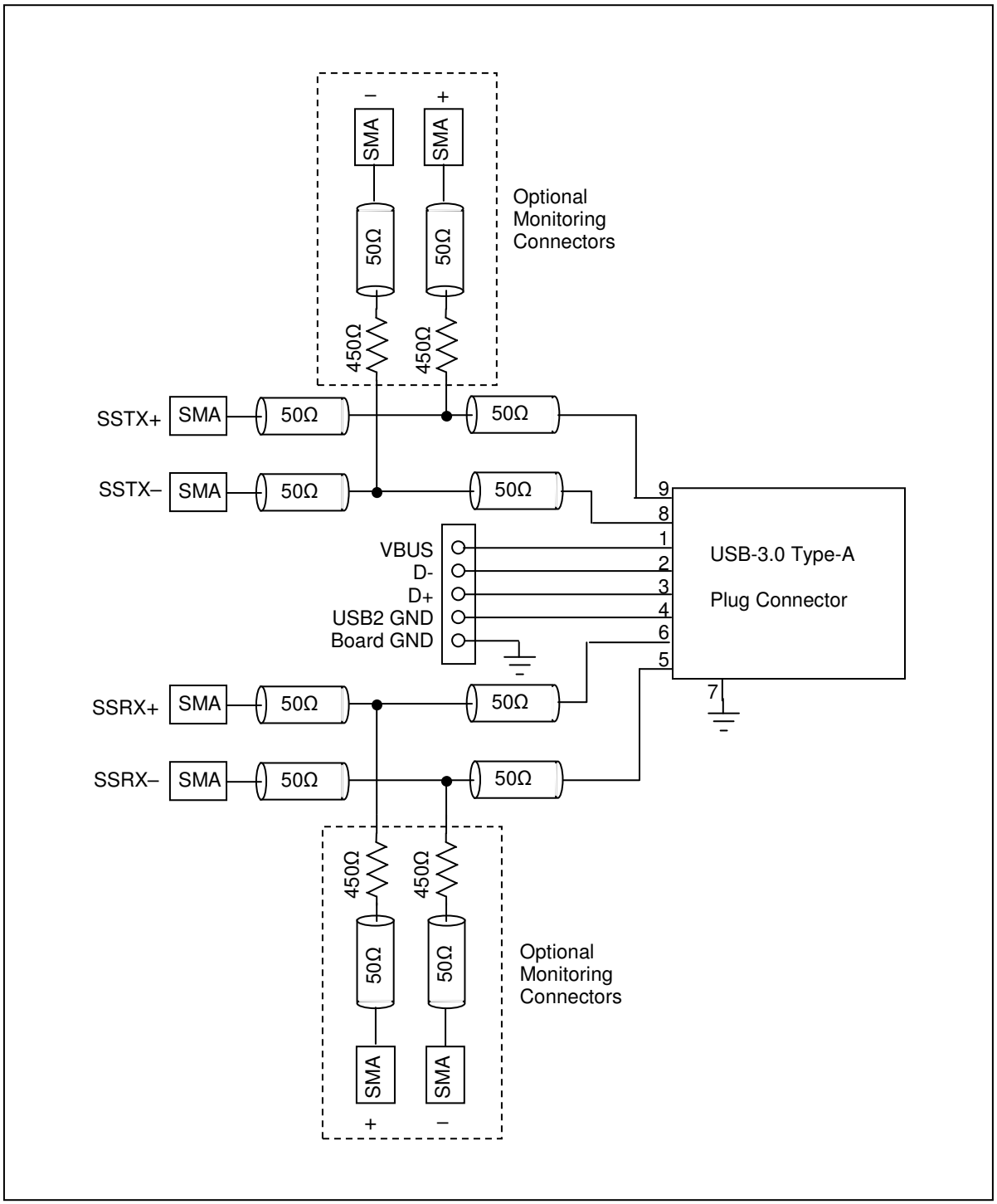
The USB-3.0 physical layer protocol specifies how connected devices are discovered, how links are established, and how data is transferred. In the receiver detect state a USB-3.0 transmitter forces the differential outputs to the common-mode voltage, pulses them simultaneously, and then measures the voltage rise time to determine if the transmission lines are terminated with a low-impedance (device connected), or a high impedance (no device connected). If a device connection is detected, low-frequency periodic signaling (LFPS) transmissions are sent during the polling state and the receiver waits for a corresponding response. Finally, training sequences are exchanged and equalization settings optimized so that full-speed 5.0 Gbps data can be transmitted and received.

The SS-USB3-SMA breakout boards enable engineers to test and debug USB-3.0 physical layer signaling. A standard USB-3.0 type-A plug or receptacle is connected by the breakout board to a USB-3.0 host or device. All of the USB-3.0 signals are “broken out” into appropriate connectors that can be interfaced to evaluation boards, oscilloscopes, and other test equipment using standard 50 ohm SMA cables for the high-speed lines and standard 0.1 inch header connections for the low-speed signals.

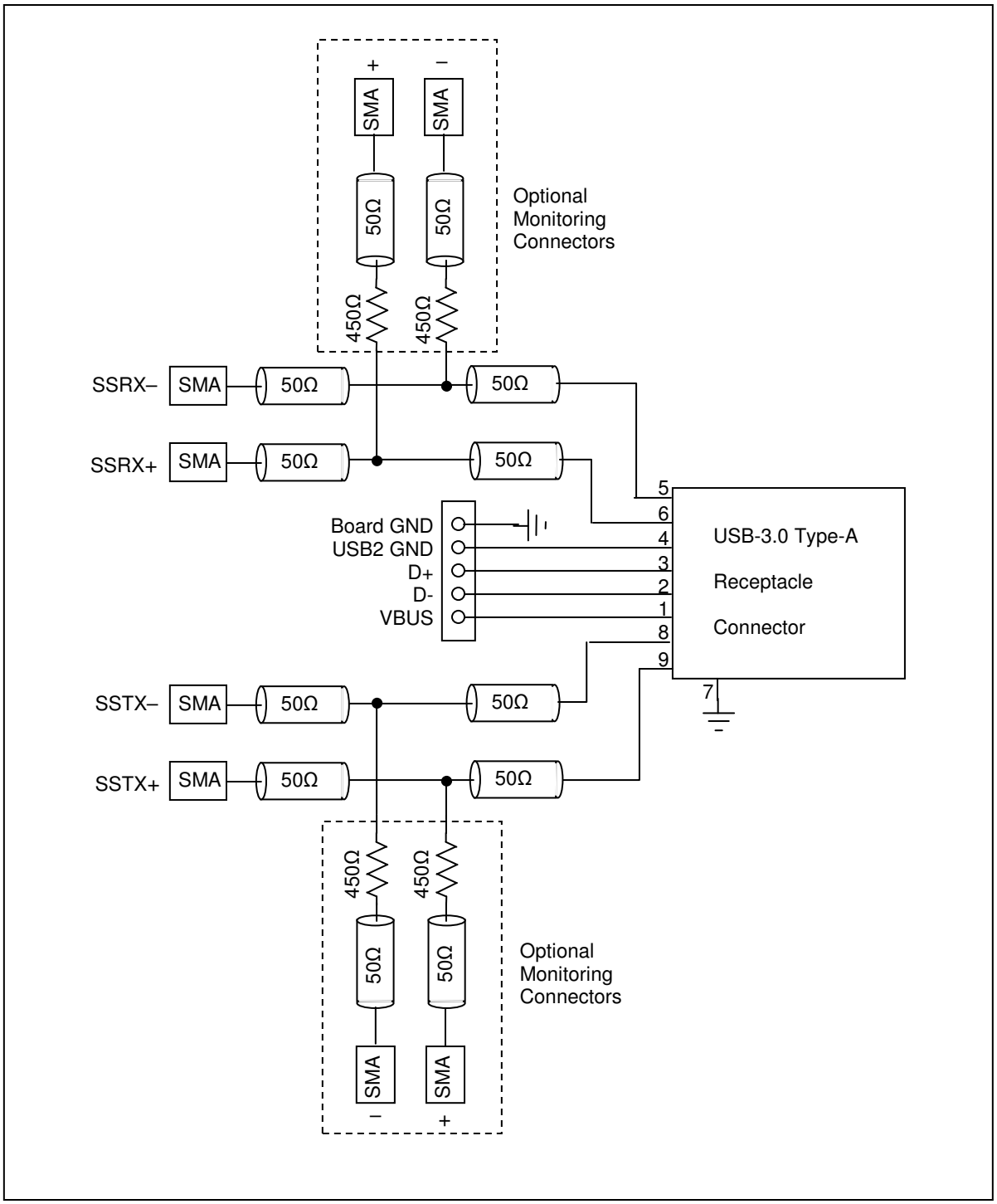


Time Domain Reflectometer (TDR) Plot of SS-USB3-SMA Transmission Lines

Optional monitor connectors can be installed so that active USB-3.0 link signals may be observed on an oscilloscope while the host and device are communicating. The monitor connections are high-speed 50-ohm transmission lines connected in parallel with the main 50-ohm signal lines via a 450-ohm resistor. Thus the monitor connection represents a 500-ohm load in parallel with the 50-ohm main signal line, for a total equivalent impedance of 45-ohms. In this arrangement approximately 10% of the signal power is transmitted to the monitor outputs and 90% to the main signal lines. The optional monitor outputs should be terminated to 50-ohms when not in use (50-ohm terminators are included with the monitor option).



Schematic Diagram: SS-USB3-SMA-P[–M (optional)]



Schematic Diagram: SS-USB3-SMA-R–M (optional)