![Chipsmall logo]

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RS-485 Port Protection Evaluation Board 1

Introduction

This Evaluation Board serves as an aid in evaluating circuit protection on RS-485 serial device ports, using two Bourns® TBU® High-Speed Protectors (HSP), two fast-acting GDTs and two TVS diodes to meet the required industry standards on RS-485 port interfaces. The recommended Bourns® TBU® device solution, with a low capacitance GDT, offers enhanced high-speed performance features over competing technologies, which can help the design engineer increase the surge and transient protection level on RS-485 ports and place the entire circuit protection solution into a smaller reduced PCB area. Bourns has developed an RS-485 Evaluation Board (measuring 45 mm x 21 mm x 1.2 mm) manufactured using FR4 PCB with nickel gold plating on the top and bottom sides.

How to Connect the Evaluation Board for Test Set-up

- Connect IN1 and IN2 to the exposed lines.
- Connect OUT1 and OUT2 to the RS-485 IC device.

* The default configuration of this board uses 2 GDTs (GDT1, GDT2) and discrete SMB TVS diodes (TVS1,TVS2). The board allows different configurations:
- *2 single 2031 GDTs (GDT1 and GDT2) may be replaced by a dual 2030 GDT (GDT3)*
- *2 SMB TVS diodes (TVS1 and TVS2) may be replaced with a) 2 SOT23 TVS diodes (TVS3, TVS4) or b) a single TVS diode array (TVS5)*
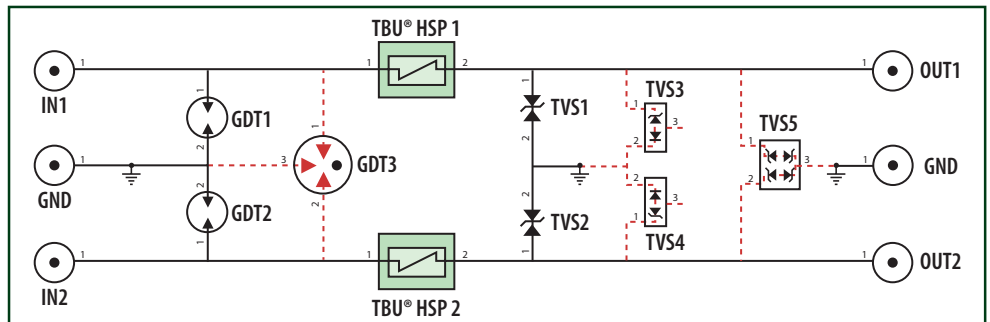

Figure 1   RS-485 Evaluation Board Schematic
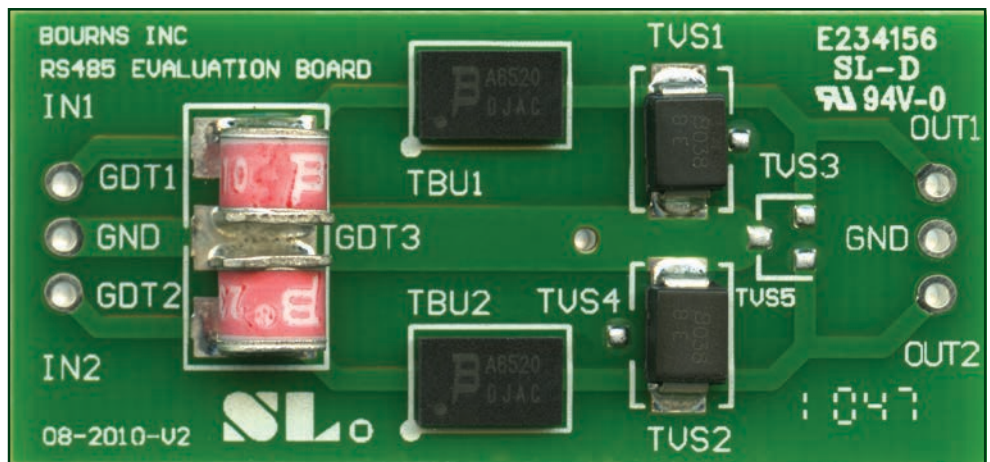
Figure 2   RS-485 Evaluation Board Top Side Layout*

No.	Part Number	Qty.	Description	Reference
1	TBU-CA065-200-WH	2	TBU® Single Bidirectional Line 650 V 200 mA	TBU® HSP 1, TBU® HSP 2
2	2031-23T-SM-RPLF	2	Single Line Fast-acting GDT 650 V	GDT1, GDT2
3	SMBJ12CA	2	Single Bidirectional Line TVS 12 V SMB	TVS1, TVS2

Table 1   RS-485 Evaluation Board Bill of Materials

Performance Graphs

Ch1 RMS
126.7 V

Ch4 Max
371.2 mA

Ch4 Min
-359.9 mA

Ch 1: AC power generator	The ohm unit following the current units
Ch 2: Voltage on protected side of world (downstream of TBU® device at SMBJ12CA TVS diode side)	shown for Channel 4 (i.e. AOhm) indicates that a 50 ohm termination was
Ch 4: Current consumed (TBU® HSP trigger current)	used internal to the oscilloscope
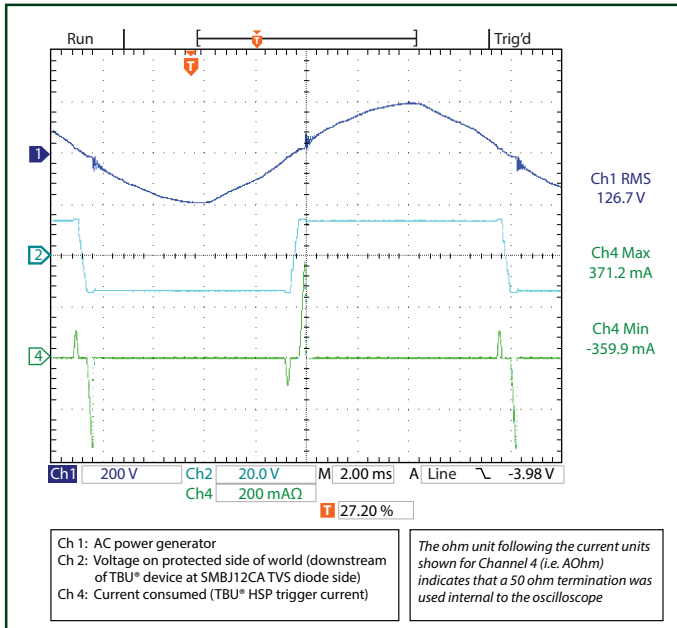
Figure 3 — *Power Cross 120 V$_{rms}$*

Ch1 Max
508 V

Ch4 Max
1.74 A

Ch 1: Surge generator	The ohm unit following the current units
Ch 2: Consumed current (TBU® HSP Trigger current)	shown for Channel 4 (i.e. AOhm)
Note: The noise generated by the GDT when it fires causes a ground bounce and is reflected in current measurement at the time the GDT device is triggered.	indicates that a 50 ohm termination was used internal to the oscilloscope

Figure 4 — *Slew Rate 1 KV/µs*

Ch1 Max
625 V

Ch4 Max
1.64 A

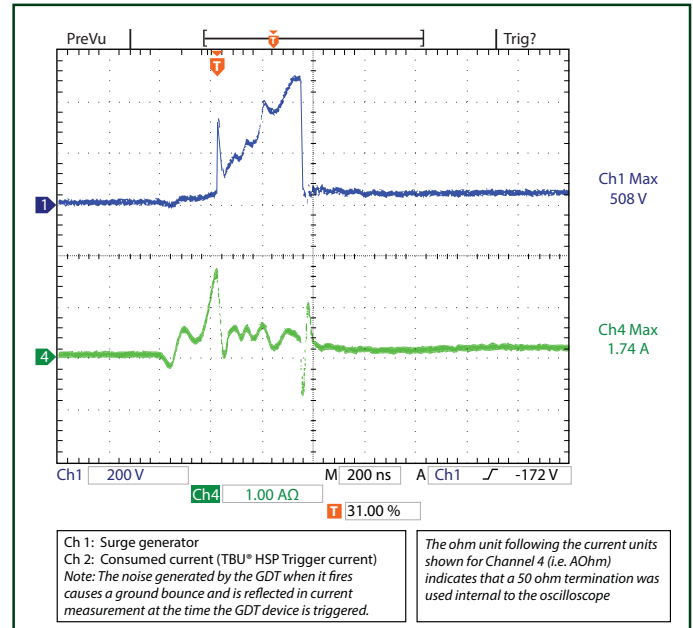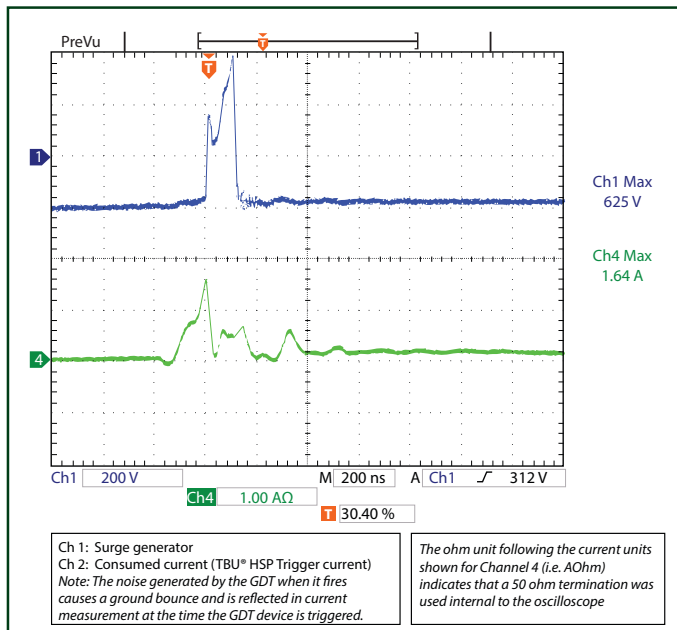| Ch 1: Surge generator | The ohm unit following the current units |
| Ch 2: Consumed current (TBU® HSP Trigger current) | shown for Channel 4 (i.e. AOhm) |
| Note: The noise generated by the GDT when it fires causes a ground bounce and is reflected in current measurement at the time the GDT device is triggered. | indicates that a 50 ohm termination was used internal to the oscilloscope |

Figure 5 — *Slew Rate 5 KV/µs*

Reference

For more information on implementing advanced circuit protection technologies for RS-485 ports, please review the Bourns® RS-485 application note:

http://www.bourns.com/data/global/pdfs/bourns_cpk1047_rs485_circuit_protection_appnote.pdf

Note

Please note that RS-485 Port Protection Evaluation Board 1 was replaced by RS-485 Port Protection Evaluation Board 3 in order to extend the flat GDT configuration option.

For further technical support
and for complete circuit protection solutions,
please visit

www.bourns.com