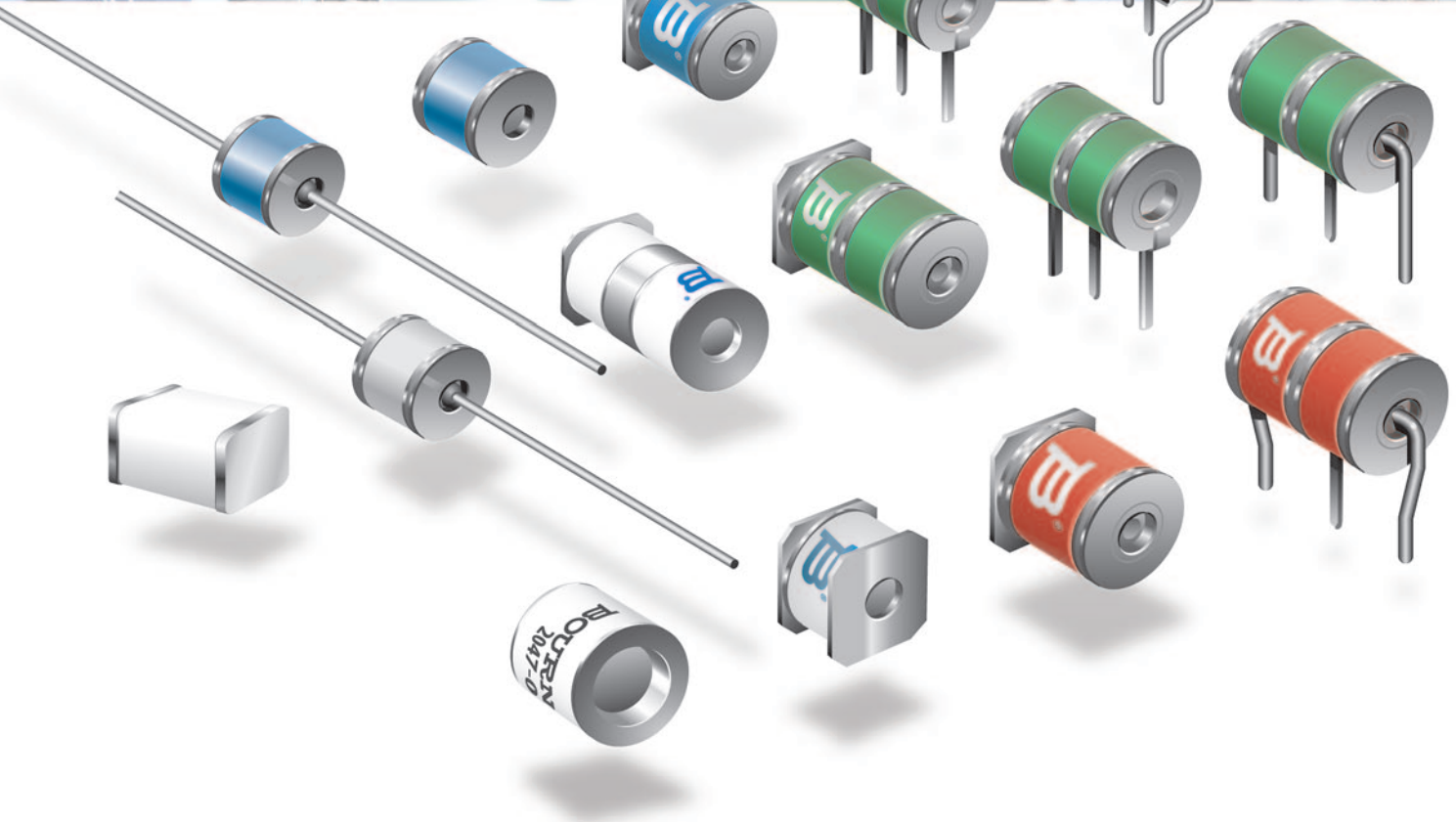


Bourns® Gas Discharge Tubes

Short Form Brochure



BOURNS®

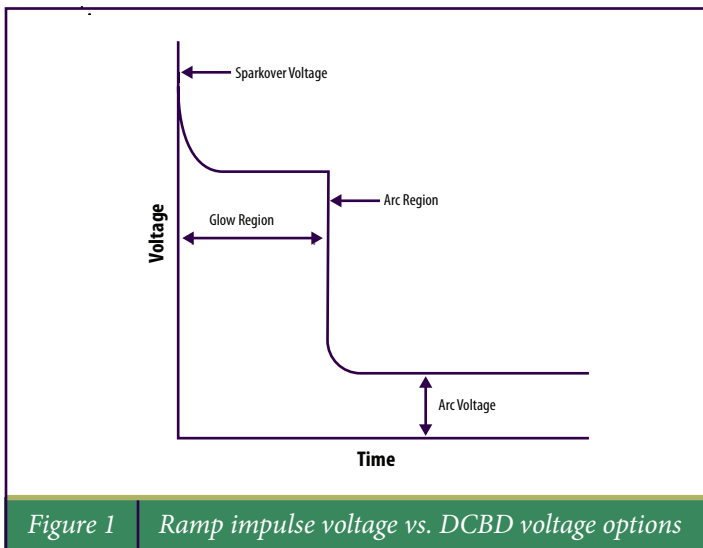
Bourns® GDT Product Overview

Introduction

Customers in many different industries rely on Bourns® Gas Discharge Tubes (GDTs) to protect an ever increasing array of electronic equipment. Bourns engineers have innovated and improved its GDT technology by designing devices with faster response times, stable capacitance, and smaller sizes while at the same time increasing impulse service life.

GDT Operation

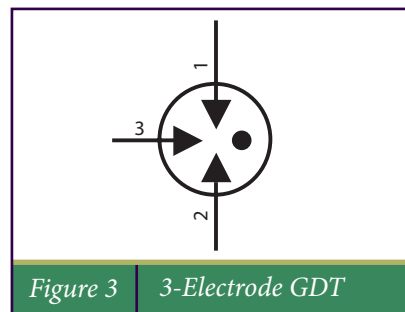
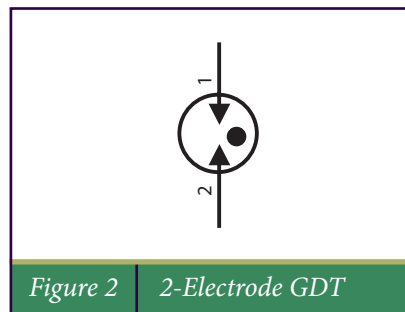
GDT devices are designed to prevent damage from transient disturbances by acting as a “crowbar”, i.e. short circuit. When an electrical surge exceeds the GDT’s defined sparkover voltage, the GDT becomes ionized and conduction takes place within a fraction of a microsecond. When the surge event subsides and the system voltage returns to normal levels, the GDT will reset to its high-impedance (off) state. The crowbar effect of the GDT effectively limits the overvoltage to a low level and shunts the associated surge current away from downstream components and circuitry.



Innovative products such as our TRIGARD®, Mini TRIGARD™, Balanced TRIGARD®, MSP® (Multi-Stage Protector), T-Series fast acting GDT and μ GDT provide our customers with a wide array of GDT solutions that can be used to address the protection needs of today’s sensitive electronic equipment.

GDT Types

Bourns offers a broad range of 2-electrode and 3-electrode GDT devices. 2-electrode GDTs are single chamber devices designed to provide protection to single lines referenced to another line or ground. 3-electrode GDTs provide dual line protection from Line to Line (1-2) and Line to Ground (1-3, 2-3). Also available are common chamber 3-electrode GDT devices that provide symmetric protection in all three modes (1-2, 1-3, 2-3). Bourns® GDTs are available in a variety of DC breakdown voltages, current ratings, sizes and mechanical configurations.



Benefits of Using Bourns® GDT Products

- RoHS compliant*
- Wide range of voltages available (75 V-1100 V)
- Wide range of GDT sizes available (3 mm, 5 mm, 8 mm, 12 mm diameter devices)
- Hybrid technology designs (MSP® GDT)
- Low arc (on-state) voltage
- Low capacitance and insertion loss
- Non-radioactive materials
- Devices tested per ITU-T K.12, GR1361 and GR974 recommendations
- Low work function designs contribute towards long service life
- Switch-Grade Fail-Short available on some models
- Special leadform and voltage screening capabilities

Benefits of Partnering with Bourns for Your GDT Circuit Protection Needs

- Performance and reliability backed up by 47+ years of designing and manufacturing GDTs
- Technical design support
- Bourns lab facilities available for design verification of customer circuits
- Technical committee participation and leadership
- Dedicated design and manufacturing resources
- Bourns offers multiple circuit protection components for total design support including thyristors, diodes, Multifuse® PPTCs, CPTCs, TBU® High-Speed Protectors and inductors.

Switch-Grade Fail-Short

Reduce the risk of thermal runaway with our Switch-Grade Fail-Short device available on selected Bourns® GDTs.

- Fail-Short contacts are spring loaded switch grade electrical conductors with no insulating burn through media or solder pellets under compression.
- Fail-Short mechanism is activated by a breakaway action, preventing solder residues from freezing fail-short mechanism and diurnal temperature failures.
- Superior thermal coupling between the fail-short and suppression components allows rapid fail-short activation in both vented and non-vented GDTs, with one of the industry's lowest contact resistance.
- Available on Models 2026, 2036 and 2026 MSP® GDT.



*RoHS Directive 2002/95/EC Jan 27, 2003 including Annex.

GDT General Information



Quality Systems

Bourns® GDTs are produced in ISO 9001 certified facilities.

Quality Monitoring

Bourns® GDTs are 100% production tested to assure compliance of key product parameters.

Quality Sampling Inspections

Bourns® GDTs are inspected to an AQL 0.65, DIN ISO 2859.

Regulated Substances

Bourns® GDTs with an LF designator are RoHS compliant as defined in the Annex to 2002/95/EC. By definition, Bourns® GDTs and fail-short option with an LF suffix are below maximum concentration values (no exemptions used) for:

- Lead
- Cadmium
- Hexavalent Chromium
- Mercury and Mercury Compounds
- PBBs and PBDEs

Operating and Storage Conditions

Bourns® GDT devices comply with the general operating and storage conditions as detailed in ITU-T, K.12 unless otherwise specified in the specific product series datasheets.

Operating temperature range: -40 °C to +85 °C.

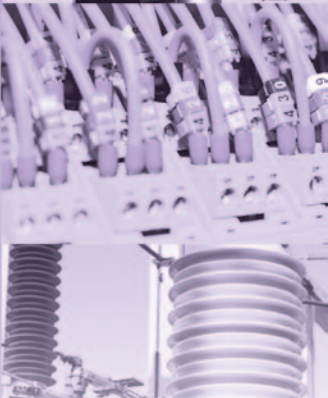
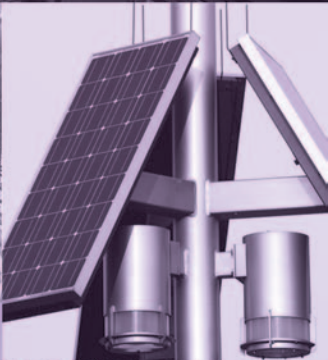
GDT are assigned climatic category 40/90/21 in accordance with IEC 60068-1.

Performance by Design

Bourns® GDT device designs are based on standard ITU-T K.12 as well as key considerations of RUS-80/ IEEE 465.1, GR1361, GR974, GR1089, ITU-T K.20/21, IEC 6143-311 (EN61643-311), IEC 6143-11 (EN 61643-11) and DIN VDE 0845 part 2.

UL Certification

Bourns® GDT devices are recognized to UL 497B under UL file E153537.



Applications by Market

Telecom/DataComm

Ethernet (Exposed)
 Ethernet (POE)
 Primary Protection Modules
 MDF Modules
 Splitters
 Telecom CPE
 Telecom Line Cards
 ADSL Modems
 VDSL Modems
 Set Top Boxes
 Gateways
 IAD
 Base Station Antennas
 Voice Modems
 MDC/PCI Modems
 VoIP

Industrial Consumer

RS-485
 RS-232
 Antenna Protection
 Railroads
 Irrigation Systems
 Home Office Equipment
 Instrumentation
 TVSS Protection Devices
 Power Supplies
 Solar Power
 Smart Grid/Smart Power
 Security Equipment
 Transportation Signalling
 Industrial Process Controls
 Oil and Gas Equipment

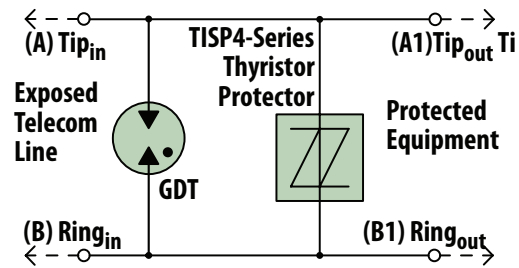


Figure 4 2-Electrode Devices for Ungrounded Circuits

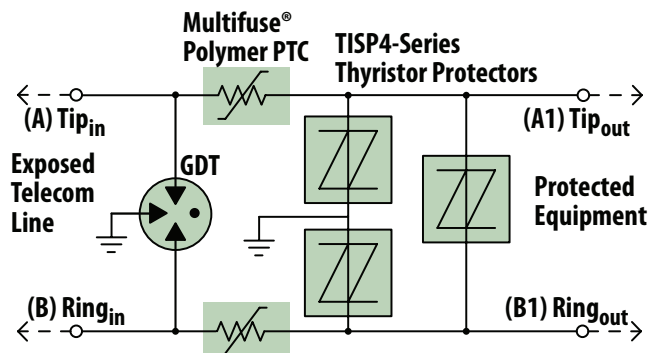






Figure 5 3-Electrode Devices for Grounded Circuits

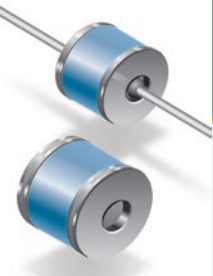
2-Electrode GDTs

2027-xx-XX		2-Electrode GDT						
Size (ø x L)	Max. 8/20 µs Impulse Discharge Current	100 A, 10/1000 µs Impulse Life Rating	DC Breakdown Range	Capacitance @ 1 MHz	Packaging	Leadforms Available	Advantages	
 8 x 6 mm	20 kA	>1000 operations	75 - 600 V	<1 pF	Bulk, Tape & Reel	Core, axial leaded, lead formed	<ul style="list-style-type: none"> • High surge current rating • ±15 % DCBD tolerance on 150 - 600 V devices • Stable breakdown throughout life • Custom configurations available • Low and stable capacitance • RoHS and non-RoHS versions available • Multiple leadforms available 	

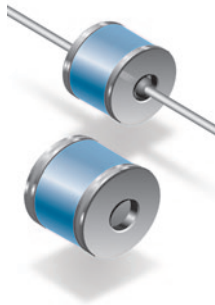
2027-xx-SM		2-Electrode Surface Mount GDT						
Size (ø x L)	Max. 8/20 µs Impulse Discharge Current	100 A, 10/1000 µs Impulse Life Rating	DC Breakdown Range	Capacitance @ 1 MHz	Packaging	Leadforms Available	Advantages	
 8 x 6 mm	20 kA	>1000 operations	75 - 600 V	<1 pF	Bulk, Tape & Reel		<ul style="list-style-type: none"> • Surface mountable for economical assembly • ±15 % DCBD tolerance on 150 - 600 V devices • High surge current rating • Low capacitance and insertion loss • Stable breakdown throughout life 	

2035-xx-XX		2-Electrode Miniature GDT						
Size (ø x L)	Max. 8/20 µs Impulse Discharge Current	100 A, 10/1000 µs Impulse Life Rating	DC Breakdown Range	Capacitance @ 1 MHz	Packaging	Leadforms Available	Advantages	
 5 x 4 mm	10 kA	>300 operations	90 - 600 V	<1 pF	Bulk, Tape & Reel	Core, axial leaded, lead formed	<ul style="list-style-type: none"> • Small size • ±15 % DCBD tolerance on 150 - 600 V devices • High surge current rating • Stable breakdown throughout life • Low capacitance and insertion loss • Multiple leadforms available 	

2035-xx-SM		2-Electrode Precision Surface Mount GDT						
Size (ø x L)	Max. 8/20 µs Impulse Discharge Current	100 A, 10/1000 µs Impulse Life Rating	DC Breakdown Range	Capacitance @ 1 MHz	Packaging	Leadforms Available	Advantages	
 5 x 5 mm	10 kA	>300 operations	90 - 600 V	<1 pF	Bulk, Tape and Reel		<ul style="list-style-type: none"> • Surface mountable for economical assembly • ±15 % DCBD tolerance on 150 - 600 V devices • Compact mini-size • Low capacitance and insertion loss • Stable breakdown throughout life 	

2037-xx-XX		2-Electrode Miniature GDT						
Size (ø x L)	Max. 8/20 µs Impulse Discharge Current	100 A, 10/1000 µs Impulse Life Rating	DC Breakdown Range	Capacitance @ 1 MHz	Packaging	Leadforms Available	Advantages	
 5 x 5 mm	10 kA	>300 operations	90 - 600 V	<1 pF	Bulk, Tape & Reel	Core, axial leaded, lead formed	<ul style="list-style-type: none"> • Small size • ±15 % DCBD tolerance on 150 - 600 V devices • High surge current rating • Stable breakdown throughout life • Low capacitance and insertion loss • Multiple leadforms available 	

2039-xxx-XX 2-Electrode High Voltage GDT



Size (ø x L)	Max. 8/20 μ s Impulse Discharge Current	100 A, 10/1000 μ s Impulse Life Rating	DC Breakdown Range	Capacitance @ 1 MHz	Packaging	Leadforms Available	Advantages
5 x 4 mm	5 kA	>100 operations	800V , 1100 V up to 1500V	<1 pF	Bulk, Tape and Reel	Core, axial leaded, lead formed	<ul style="list-style-type: none"> • High voltage DCBD • Low capacitance and insertion loss • Fast reponse to transients • Compact mini size • Ideal for dense board applications • Leadless SMT pkg. supports auto assembly

2039-xx-SM 2-Electrode Surface Mount High Voltage GDT



Size (ø x L)	Max. 8/20 μ s Impulse Discharge Current	100 A, 10/1000 μ s Impulse Life Rating	DC Breakdown Range	Capacitance @ 1 MHz	Packaging	Leadforms Available	Advantages
5 x 4 mm	5 kA	>100 operations	800 V, 1100 V	<1 pF	Bulk, Tape and Reel		<ul style="list-style-type: none"> • Low capacitance and insertion loss • Fast reponse to transients • Compact mini size • Ideal for dense board applications • Leadless SMT pkg. supports auto assembly

2047-xx-A 2-Electrode Heavy Duty GDT



Size (ø x L)	Max. 8/20 μ s Impulse Discharge Current	1000 A, 10/1000 μ s Impulse Life Rating	DC Breakdown Range	Capacitance @ 1 MHz	Packaging	Leadforms Available	Advantages
12.7 x 12.7 mm	40 kA+	>1000 operations	90 - 350 V	<5 pF	Bulk	Core	<ul style="list-style-type: none"> • Very high surge current rating • Breakdown stability throughout life • Long life

2051 2-Electrode Surface Mount μ GDT



Size (ø x L)	Max. 8/20 μ s Impulse Discharge Current	100 A, 10/1000 μ s Impulse Life Rating	DC Breakdown Range	Capacitance @ 1 MHz	Packaging	Leadforms Available	Advantages
2.7 x 3.2 x 4.5 mm	2 kA	>300 operations	90 - 600 V	.6 pF (typical)	Tape and Reel		<ul style="list-style-type: none"> • Compact low profile size • Low capacitance and insertion loss • High insulation resistance • Stability over life

2055-xx-SM 2-Electrode Surface Mount Mini GDT

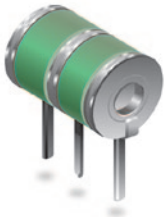


Size (ø x L)	Max. 8/20 μ s Impulse Discharge Current	100 A, 10/1000 μ s Impulse Life Rating	DC Breakdown Range	Capacitance @ 1 MHz	Packaging	Leadforms Available	Advantages
6.2 x 4.2 mm	5 kA	>300 operations	230 - 600 V	.6 pF (typical)	Bulk, Tape and Reel		<ul style="list-style-type: none"> • Compact mini-size • Low capacitance and insertion loss • Surface mount package for economical assembly • Economical



3-Electrode GDTs

2026-xx-XX 3-Electrode Balanced TRIGARD® GDT



Size (ø x L)	Max. 8/20 μ s Impulse Discharge Current	1000 A, 10/1000 μ s Impulse Life Rating	DC Breakdown Range	Capacitance @ 1 MHz	Packaging	Leadforms Available	Advantages
8 x 11 mm	40 kA	>400 operations	75 - 600 V	<2 pF	Bulk	Core, Radial, Custom	<ul style="list-style-type: none"> • Switch-Grade Fail-Short available • Balanced GDT design • High surge current ratings • Stable performance over long life • Custom configurations available

2026-xx-XX-MSP 3-Electrode Multi-Stage Protector MSP® GDT



Size (ø x L)	Max. 8/20 μ s Impulse Discharge Current	500 A, 10/1000 μ s Impulse Life Rating	DC Breakdown Range	Capacitance @ 1 MHz	Packaging	Leadforms Available	Advantages
8 x 14 mm	40 kA	>1000 operations	184 - 276 V, 200 - 300 V, 300 - 400 V	10 pF line to line/ 20 pF line to Gnd (typical)	Bulk	Radial, Custom	<ul style="list-style-type: none"> • Switch-Grade Fail-Short • Hybrid solid-state GDT design • Solid-state reponse combined with robust GDT • Drop-in primary protection solution for all paired copper communication lines

2036-xx-XX 3-Electrode Mini TRIGARD™ GDT



Size (ø x L)	Max. 8/20 μ s Impulse Discharge Current	200 A, 10/1000 μ s Impulse Life Rating	DC Breakdown Range	Capacitance @ 1 MHz	Packaging	Leadforms Available	Advantages
5 x 7.2 mm	20 kA	>300 operations	75 - 600 V	<2 pF	Bulk	Radial, Custom	<ul style="list-style-type: none"> • Switch-Grade Fail-Short available • Balanced mini-GDT design • Compact size • High surge current rating • Low capacitance and insertion loss

2036-xx-SM**3-Electrode Surface Mount Mini TRIGARD™ GDT**

Size (ø x L)	Max. 8/20 µs Impulse Discharge Current	200 A, 10/1000 µs Impulse Life Rating	DC Breakdown Range	Capacitance @ 1 MHz	Packaging	Leadforms Available	Advantages
5 x 7.3 mm	20 kA	>300 operations	75 - 600 V	<2 pF	Bulk, Tape & Reel		<ul style="list-style-type: none"> Balanced mini-GDT design Surface mount Compact size, ideal for board level protection Stable breakdown throughout life Low capacitance and insertion loss

2038-xx-SM**3-Electrode Surface Mount Symmetric Mini TRIGARD™ GDT**

Size (ø x L)	Max. 8/20 µs Impulse Discharge Current	200 A, 10/1000 µs Impulse Life Rating	DC Breakdown Range	Capacitance @ 1 MHz	Packaging	Leadforms Available	Advantages
5 x 7.3 mm	10 kA	>300 operations	150 - 1100 V	<1 pF	Bulk, Tape & Reel		<ul style="list-style-type: none"> Balanced mini-GDT design Symmetrical breakdown voltage (L-L, L-G) High surge current rating Low capacitance and insertion loss Leadless SMT design for economical assembly

2054-xx-SM**3-Electrode Surface Mount GDT**

Size (ø x L)	Max. 8/20 µs Impulse Discharge Current	200 A, 10/1000 µs Impulse Life Rating	DC Breakdown Range	Capacitance @ 1 MHz	Packaging	Leadforms Available	Advantages
5 x 7.2 mm	5 kA	>100 operations	230 - 470 V	<2 pF	Tape & Reel		<ul style="list-style-type: none"> Compact mini-size Surface mount Low capacitance and insertion loss Economical

T-Series Fast Acting GDTs


T-Series Fast Acting GDTs


Bourns has developed a line of fast acting GDTs designed specifically for use with the Bourns® TBU® High-Speed Protector (HSP). The T-Series GDTs are designed to limit high-speed 5k V/μs impulse voltages to levels below the TBU® HSP peak voltage impulse rating (V_{imp}). Voltages exceeding the TBU® HSP V_{imp} rating can damage to TBU® HSP.

The T-Series GDT and TBU® HSP provide an extremely fast, low energy let-through protection solution that is well-suited for sensitive and high value electronics that can be damaged by transients.

T-Series Fast Acting GDT Advantages

- Designed specifically for the TBU® HSP
- Simplifies designing with the TBU® HSP
- Extremely fast overvoltage protection limiting surges below the V_{imp} of the TBU® HSP at 5k V/μs
- Low capacitance, making it ideal for high speed applications
- 2-Element and 3-element designs available
- Optional Switch-Grade Fail-Short available for the Model 2020

2020-xxT	3-Electrode T-Series Fast Acting GDT							
	Size (ø x L)	Max. 8/20 μs Impulse Discharge Current	100 A, 10/1000 μs Impulse Life Rating	DC Breakdown Range	Capacitance @ 1 MHz	Packaging	Leadforms Available	Optional Fail-Short
	8 x 11.2 mm	5 kA	>100 operations	60 V, 185 V, 360 V	< 1 pF	Bulk	Radial leaded, Custom	Yes

2031-xxT-SM	2-Electrode Surface Mount T-Series Fast Acting GDT							
	Size (ø x L)	Max. 8/20 μs Impulse Discharge Current	100 A, 10/1000 μs Impulse Life Rating	DC Breakdown Range	Capacitance @ 1 MHz	Packaging	Leadforms Available	Optional Fail-Short
	5 x 4.4 mm	2 kA	>25 operations	60 V, 185 V, 360 V	< 1 pF	Bulk, Tape & Reel		

RS-485 Evaluation Board Top Side Layout*

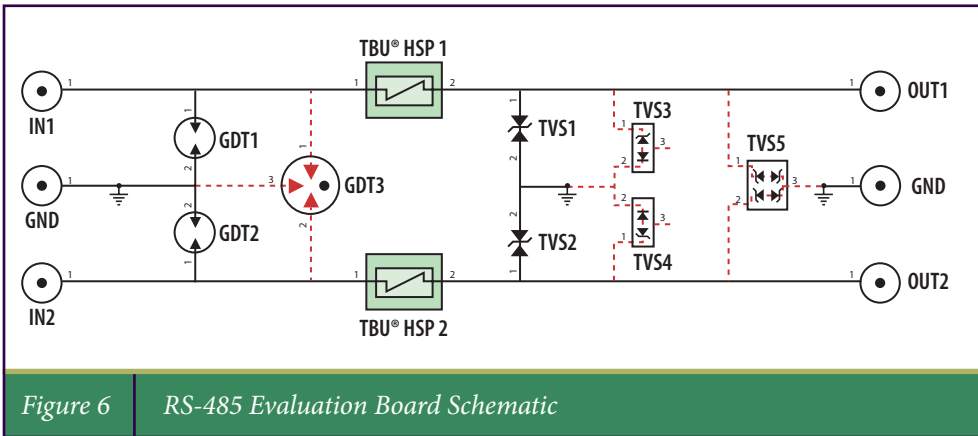
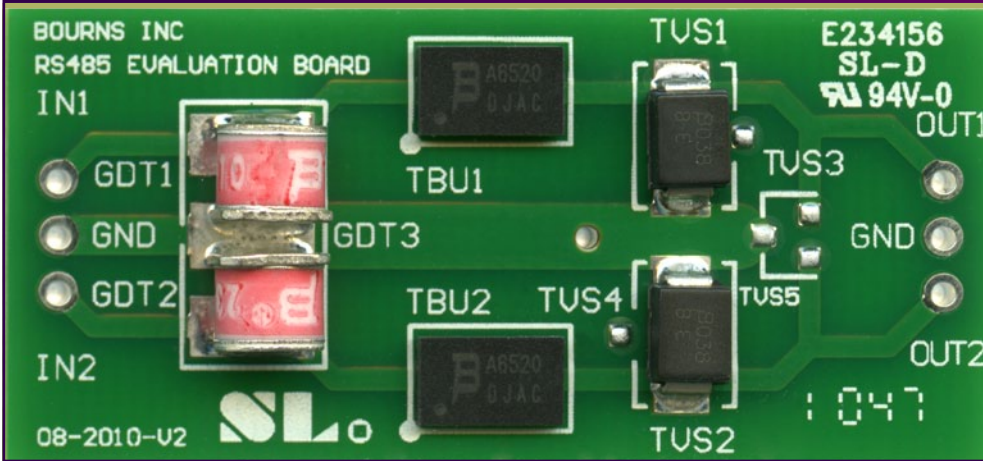


Figure 6 RS-485 Evaluation Board Schematic

GDTs in Evaluation Boards

This Evaluation Board serves as an aid in evaluating circuit protection on RS-485 serial device ports using two Bourns® TBU® High-Speed Protectors (HSPs), two fast acting GDTs and two TVS diodes to meet the required industry standards on RS-485 port interfaces. The recommended Bourns® TBU® HSP 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.

* 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 GDT (future release).
- 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).

Applications

Port Protection	2020 GDT Part Number	2031 GDT Part Number	TBU® HSP Part Number
CAN-bus	2020-23T-xxxLF	2031-23T-SM-RPLF	TBU-065-100-WH
RS-232	2020-23T-xxxLF	2031-23T-SM-RPLF	TBU-065-200-WH
RS-422	2020-23T-xxxLF	2031-23T-SM-RPLF	TBU-065-200-WH
RS-485	2020-23T-xxxLF	2031-23T-SM-RPLF	TBU-065-200-WH
RS-485	2020-42T-xxxLF	2031-42T-SM-RPLF	TBU-065-200-WH
SDI	2020-23T-xxxLF	2031-23T-SM-RPLF	TBU-065-100-WH
VDSL	2020-15T-xxxLF	2031-15T-SM-RPLF	TBU-050-500-WH

See data sheet for lead form options

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Singapore:	+65 6348 7227	+65 6348 1272
Taiwan:	+886 2 25624117	+886 2 25624116
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Bourns® products are available through an extensive network of manufacturer's representatives, agents and distributors. To obtain technical applications assistance, a quotation, or to place an order, contact a Bourns representative in your area.

Specifications subject to change without notice. Actual performance in specific customer applications may differ due to the influence of other variables. Customers should verify actual device performance in their specific applications.

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