

ANTREX Electronics

Electronic Components Sourcing Information

Product Reference Information

Part Number: C650-260-WH
Manufacturer: Bourns Inc.
Package: 3-DFN
Availability: Please confirm with sales

Product Page:

<https://antrexco.com/product/details/bourns-inc/c650-260-wh.html>

Request a Quote:

[Submit RFQ for this part](#)



Scan for product page

Contact Information

Email: info@antrexco.com

WhatsApp: +86-186-8066-5326

Website: <https://antrexco.com>

Quality & Trust

New & Original Components

Supplier verification and packaging condition review

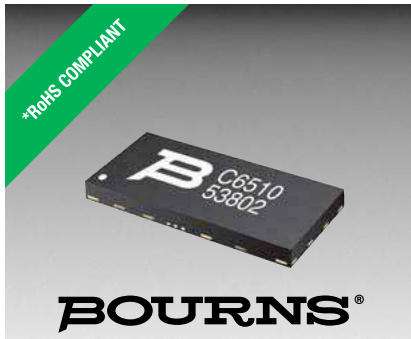
CoC / RoHS / REACH documents available on request

Secure sourcing support for OEM / EMS projects

Note:

This PDF includes an ANTREX product reference cover page.

The original manufacturer datasheet follows from the next page.



Features

- Formerly **FulTec** brand
- Extremely high speed performance
- Blocks high voltages and currents
- Very high bandwidth; GHz compatible
- Small package, minimal PCB area
- Simple, superior circuit protection
- RoHS compliant*, UL Recognized 



The C650 & C850 Series are currently available, but not recommended for new designs. Bourns® [TBU-CA](#) Series is preferred.

C650 and C850 Series TBU® High-Speed Protectors

Transient Blocking Units - TBU® Devices

Bourns® C650 and C850 series products are high-speed bidirectional protection components, constructed using MOSFET semiconductor technology, designed to protect against faults caused by short circuits, AC power cross, induction and lightning surges.

The TBU® high-speed protector, triggering as a function of the MOSFET, blocks surges and provides an effective barrier behind which sensitive electronics are not exposed to large voltages or currents during surge events. The TBU® device is provided in a surface mount DFN package and meets industry standard requirements such as RoHS and Pb Free solder reflow profiles.

Industry Standards

Description			Model
Telcordia	GR-1089	Port Type 1, 3, 5	C650
	GR-974		C850
ITU-T	K.20, K.20E, K.21, K.21E, K.45		C850

Additional Information

Click these links for more information:



[PRODUCT
SELECTOR](#)



[TECHNICAL
LIBRARY](#)



[INVENTORY](#)



[SAMPLES](#)



[CONTACT](#)

Agency Approval

Description	
UL	File Number: E315805

Absolute Maximum Ratings (T_{amb} = 25 °C)

Symbol	Parameter		Value	Unit
V _{imp}	Maximum protection voltage for impulse faults with rise time ≥ 1 μsec	C650-xxx-WH C850-xxx-WH	650 850	V
V _{rms}	Maximum protection voltage for continuous V _{rms} faults	C650-xxx-WH C850-xxx-WH	300 425	V
T _{op}	Operating temperature range		-40 to +85	°C
T _{stg}	Storage temperature range		-65 to +150	°C

BOURNS®

Asia-Pacific: Tel: +886-2 2562-4117 • Email: asiacus@bourns.com

EMEA: Tel: +36 88 885 877 • Email: eurocus@bourns.com

The Americas: Tel: +1-951 781-5500 • Email: americus@bourns.com

www.bourns.com



WARNING Cancer and Reproductive Harm - www.P65Warnings.ca.gov

*RoHS Directive 2015/863, Mar 31, 2015 and Annex.

Specifications are subject to change without notice.

Users should verify actual device performance in their specific applications.

The products described herein and this document are subject to specific legal disclaimers as set forth on the last page of this document, and at www.bourns.com/docs/legal/disclaimer.pdf.

Applications

- Combo voice / xDSL linecards
- Voice linecards
- MDF, primary protection modules
- Process control equipment
- Test and measurement equipment
- General electronics

C650 and C850 Series TBU® High-Speed Protectors

BOURNS®

Electrical Characteristics (T_{amb} = 25 °C)

Symbol	Parameter		Min.	Typ.	Max.	Unit
I _{op}	Maximum current through the device that will not cause current blocking	Cx50-100-WH Cx50-180-WH Cx50-260-WH			100 180 260	mA
I _{trigger}	Typical current for the device to go from normal operating state to protected state	Cx50-100-WH Cx50-180-WH Cx50-260-WH		150 220 330		mA
I _{out}	Maximum current through the device	Cx50-100-WH Cx50-180-WH Cx50-260-WH			200 360 520	mA
R _{device}	Series resistance of the TBU® device	C650-100-WH C650-180-WH C650-260-WH C850-100-WH C850-180-WH C850-260-WH		12 8 8 17 11 11	14.5 10 10 19 14 14	Ω
t _{block}	Maximum time for the device to go from normal operating state to protected state				1	μs
I _{quiescent}	Current through the triggered TBU® device with 50 Vdc circuit voltage			1		mA
V _{reset}	Voltage below which the triggered TBU® device will transition to normal operating state			14		V

C650 and C850 TBU® High-Speed Protectors are bidirectional; specifications are valid in both directions.

Specifications are subject to change without notice.

Users should verify actual device performance in their specific applications.

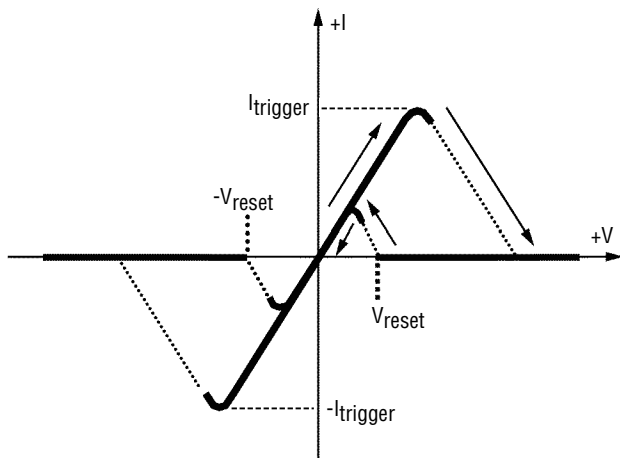
The products described herein and this document are subject to specific legal disclaimers as set forth on the last page of this document, and at www.bourns.com/docs/legal/disclaimer.pdf.

C650 and C850 Series TBU® High-Speed Protectors

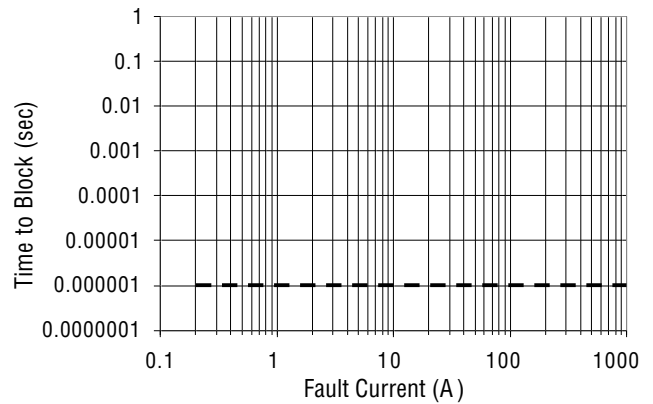
BOURNS®

Typical Performance Characteristics

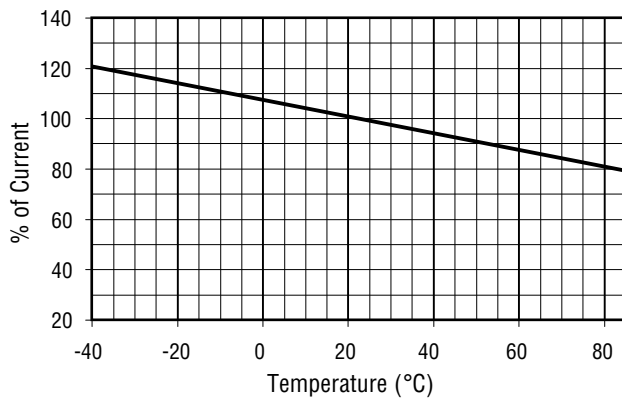
V-I Characteristics



Time to Block vs. Fault Current



Current vs. Temperature



Specifications are subject to change without notice.

Users should verify actual device performance in their specific applications.

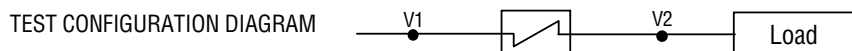
The products described herein and this document are subject to specific legal disclaimers as set forth on the last page of this document, and at www.bourns.com/docs/legal/disclaimer.pdf.

C650 and C850 Series TBU® High-Speed Protectors

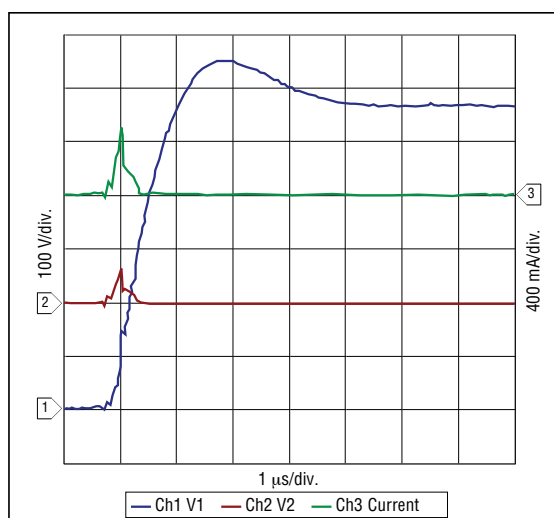
BOURNS®

Operational Characteristics

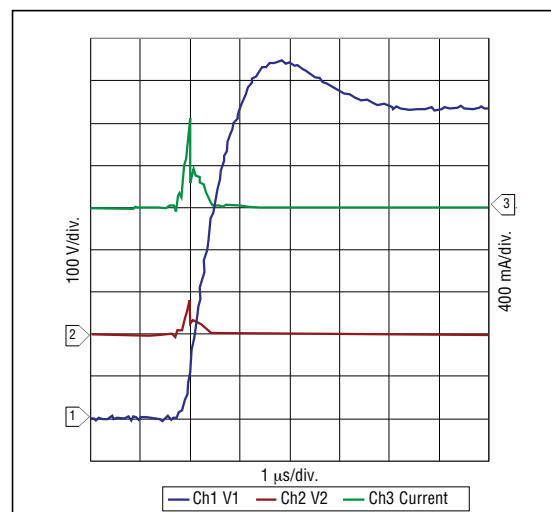
The graphs below demonstrate the operational characteristics of the TBU® protector. For each graph the fault voltage, protected side voltage, and current is presented.



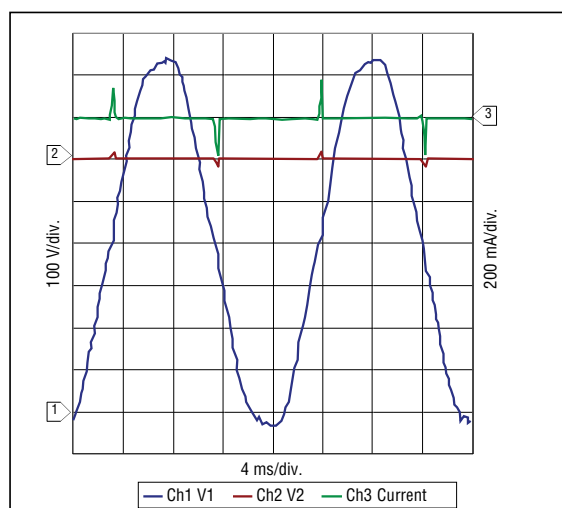
C650 Lightning, 650 V



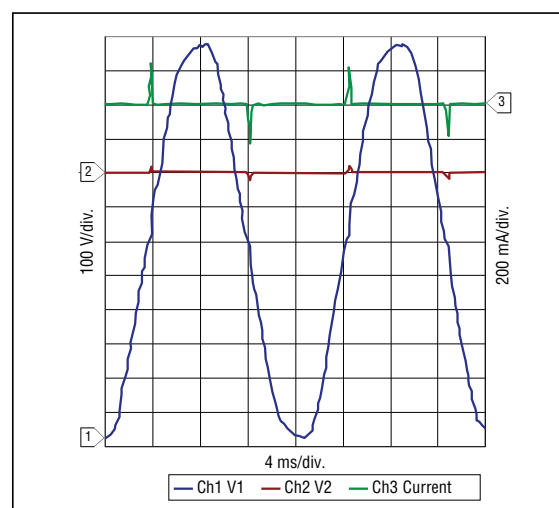
C850 Lightning, 850 V



C650 Power Fault, 300 Vrms, 100 A



C850 Power Fault, 425 Vrms, 100 A



Specifications are subject to change without notice.

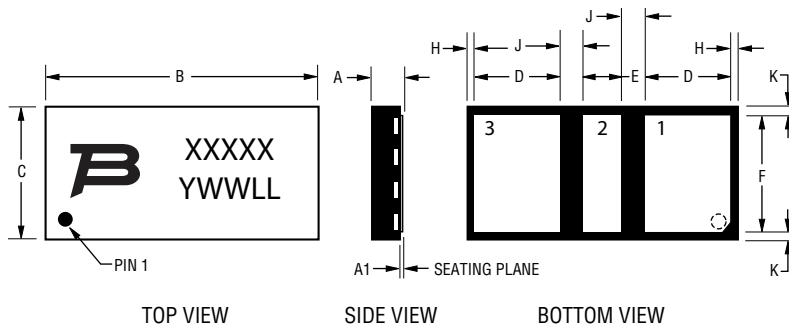
Users should verify actual device performance in their specific applications.

The products described herein and this document are subject to specific legal disclaimers as set forth on the last page of this document, and at www.bourns.com/docs/legal/disclaimer.pdf.

C650 and C850 Series TBU® High-Speed Protectors

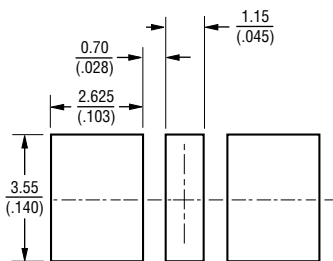
BOURNS®

Product Dimensions



Dim.	Min.	Typ.	Max.
A	0.80 (.031)	0.90 (.035)	1.00 (.039)
A1	0.00 (.000)	0.025 (.001)	0.050 (.002)
B	8.15 (.321)	8.25 (.325)	8.35 (.329)
C	3.90 (.154)	4.00 (.157)	4.10 (.161)
D	2.55 (.100)	2.60 (.102)	2.65 (.104)
E	1.10 (.043)	1.15 (.045)	1.20 (.047)
F	3.45 (.136)	3.50 (.138)	3.55 (.140)
H	0.20 (.008)	0.25 (.010)	0.30 (.012)
J	0.65 (.026)	0.70 (.028)	0.75 (.030)
K	0.20 (.008)	0.25 (.010)	0.30 (.012)

Recommended Pad Layout



Pad Designation

Pad #	Apply
1	In/Out
2	NC
3	In/Out

NC = Solder to PCB; do not make electrical connection, do not connect to ground.

DIMENSIONS: $\frac{\text{MM}}{\text{(INCHES)}}$

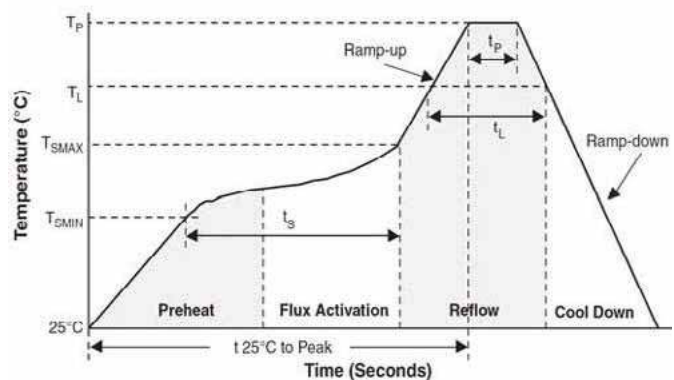
TBU® protectors have matte-tin termination finish. Suggested layout should use non-solder mask define (NSMD). Recommended stencil thickness is 0.10-0.12 mm (.004-.005 in.) with stencil opening size 0.025 mm (.0010 in.) less than the device pad size. As when heatsinking any power device, it is recommended that, wherever possible, extra PCB copper area is allowed. For minimum parasitic capacitance, do not allow any signal, ground or power signals beneath any of the pads of the device.

Thermal Resistances

Symbol	Parameter	Value	Unit
$R_{th(j-a)}$	Junction to leads (package)	116	°C/W

Reflow Profile

Profile Feature	Pb-Free Assembly
Average Ramp-Up Rate (T_{smax} to T_p)	3 °C/sec. max.
Preheat	
- Temperature Min. (T_{smin})	150 °C
- Temperature Max. (T_{smax})	200 °C
- Time (t_{smin} to t_{smax})	60-180 sec.
Time maintained above:	
- Temperature (T_L)	217 °C
- Time (t_L)	60-150 sec.
Peak/Classification Temperature (T_p)	260 °C
Time within 5 °C of Actual Peak Temp. (t_p)	20-40 sec.
Ramp-Down Rate	6 °C/sec. max.
Time 25 °C to Peak Temperature	8 min. max.



Specifications are subject to change without notice.

Users should verify actual device performance in their specific applications.

The products described herein and this document are subject to specific legal disclaimers as set forth on the last page of this document, and at www.bourns.com/docs/legal/disclaimer.pdf.

C650 and C850 Series TBU® High-Speed Protectors

BOURNS®

How to Order

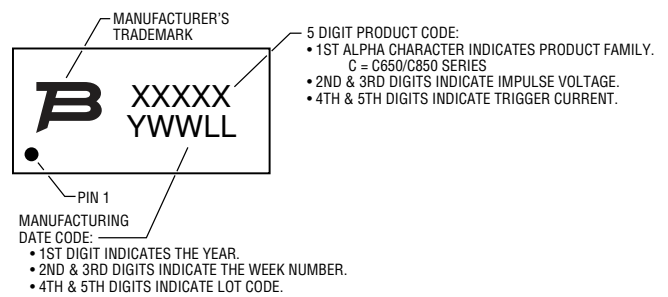
C 650 - 180 - WH

Form Factor _____
 C = One TBU® protector in the device

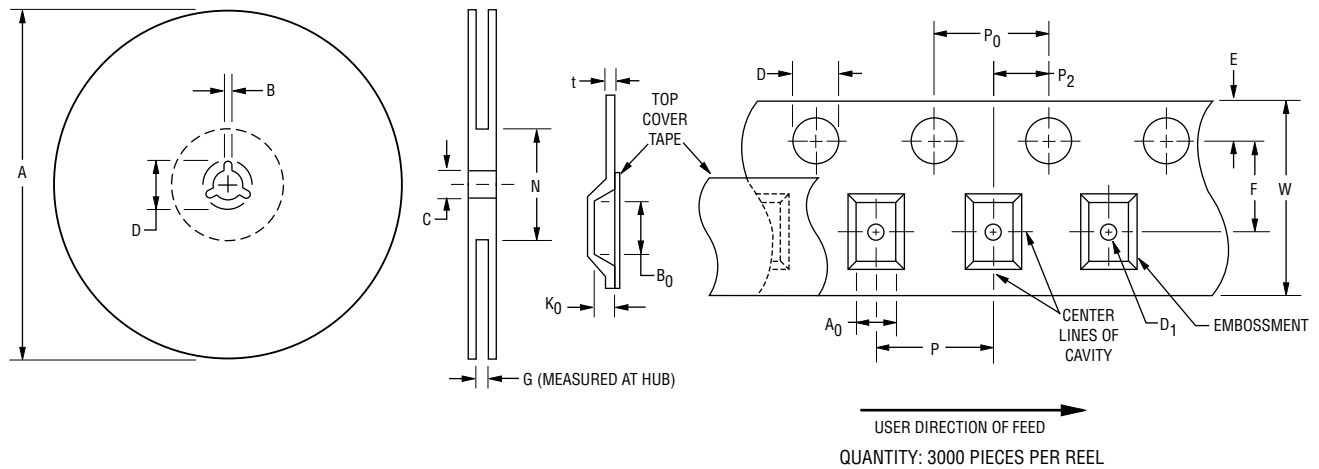
Impulse Voltage Rating _____
 650 = 650 V
 850 = 850 V

lop Indicator _____
 100 = 100 mA
 180 = 180 mA
 260 = 260 mA

Typical Part Marking



Packaging Specifications (per EIA468-B)



Device	A		B		C		D		G	N
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Ref.	Ref.
C650, C850	326 (12.835)	330.25 (13.002)	1.5 (.059)	2.5 (.098)	12.8 (.504)	13.5 (.531)	20.2 (.795)	—	16.5 (.650)	102 (4.016)

Device	A0		B0		D		D1		E		F	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
C650, C850	4.2 (.165)	4.4 (.173)	8.45 (.333)	8.65 (.341)	1.5 (.059)	1.6 (.063)	1.5 (.059)	—	1.65 (.065)	1.85 (.073)	7.4 (.291)	7.6 (.299)
Device	K0		P		P0		P2		t		W	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
C650, C850	1.1 (.043)	1.3 (.051)	7.9 (.311)	8.1 (.319)	3.9 (.159)	4.1 (.161)	1.9 (.075)	2.1 (.083)	0.25 (.010)	0.35 (.014)	15.7 (.618)	16.3 (.642)

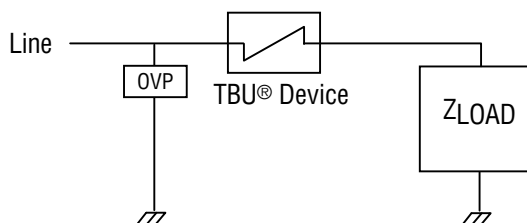
DIMENSIONS: $\frac{\text{MM}}{(\text{INCHES})}$

C650 and C850 Series TBU® High-Speed Protectors

BOURNS®

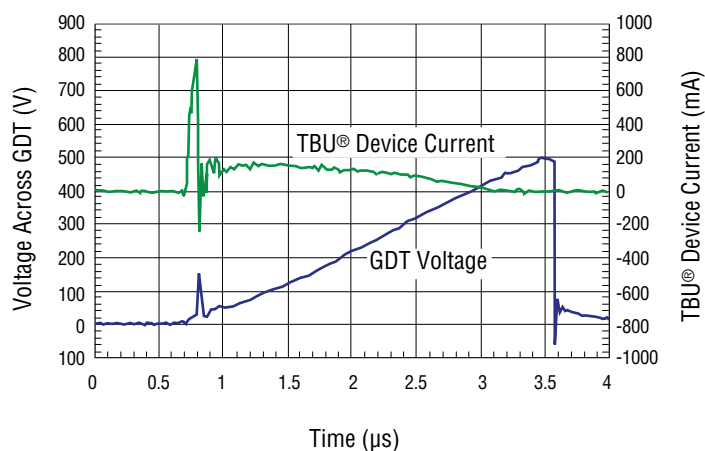
Reference Application

The C-series devices are general protectors that can be used in a variety of applications. The basic operation of the device will be demonstrated using the single line application shown in the figure below. The test circuit was subjected to a 1000 V, 10/700 μ s surge waveform. The devices used were the TBU-C850-100-WH and a 2031-42T-SM-RPLF GDT (OVP) with a 10 ohm resistor for the load impedance.



General Application Circuit

The graph below shows the waveforms for the voltage across the overvoltage protector (GDT) and the current through the TBU® device. As the input line voltage increases, the current through the TBU® device increases rapidly until the trip current is reached. Due to finite reaction time for fast transients, the peak level may exceed the low frequency data sheet maximum for a very short period, typically ~100 ns. After this initial overshoot, the TBU® device will transition to the protected state, setting the current to the nominal current limiting level (~150 mA for this example). The TBU® device will then reduce the current down to its very low quiescent level of 1 mA, typically. As the input line voltage increases to about 500 V, the GDT is triggered, reducing the input line voltage to a very low level which prevents the TBU® device from being subjected to a voltage level which exceeds its maximum rating (850 V in this example). The TBU® High-Speed Protector and the GDT will remain in these states until the surge ends, which is about 700 μ s later in this example. Only the first 4 μ s of the surge are shown in the graph. For surges or AC voltages below the GDT breakover voltage, the GDT will not activate, and the TBU® device will stay in the protecting mode, blocking high voltages from the protected equipment.



TBU-C850-100-WH Response to a 1000 V, 10/700 μ s Surge

REV. 09/15

"TBU" is a registered trademark of Bourns, Inc. in the United States and other countries.

Specifications are subject to change without notice.

Users should verify actual device performance in their specific applications.

The products described herein and this document are subject to specific legal disclaimers as set forth on the last page of this document, and at www.bourns.com/docs/legal/disclaimer.pdf.

This legal disclaimer applies to purchasers and users of Bourns® products manufactured by or on behalf of Bourns, Inc. and its affiliates (collectively, "Bourns").

Unless otherwise expressly indicated in writing, Bourns® products and data sheets relating thereto are subject to change without notice. Users should check for and obtain the latest relevant information and verify that such information is current and complete before placing orders for Bourns® products.

The characteristics and parameters of a Bourns® product set forth in its data sheet are based on laboratory conditions, and statements regarding the suitability of products for certain "typical" applications are based on Bourns' knowledge of typical requirements in generic applications. Bourns assumes that "typical" applications include failsafe/backup features to address critical risks to users and are designed to allow rework of Bourns® product to avoid scrap of a device solely due to malfunctioning Bourns® product. The characteristics and parameters of a Bourns® product in a user application may vary from the data sheet characteristics and parameters due to (i) the combination of the Bourns® product with other components in the user's application, or (ii) the environment of the user application itself. The characteristics and parameters of a Bourns® product also can and do vary in different applications and actual performance may vary over time. Thus, users should always verify the actual performance of the Bourns® product in their specific devices and applications and make their own independent judgments regarding the suitability of Bourns® product and the amount of additional test margin to design into their device or application to compensate for differences between laboratory and real-world conditions.

Unless Bourns has explicitly designated an individual Bourns® product as meeting the requirements of a particular industry standard (e.g., IATF 16949) or a particular qualification (e.g., UL listed or recognized), Bourns is not responsible for any failure of an individual Bourns® product to meet the requirements of such industry standard or particular qualification even if such industry standard or qualification is a "state of art". Users of Bourns® products are responsible for ensuring compliance with safety-related requirements and standards applicable to their devices or applications.

Bourns® products are not recommended, authorized or intended for use in applications where failure or malfunction may result in personal injury, death, or severe property or environmental damage, such as without limitation nuclear, life-critical medical and certain automotive and aviation applications. Except as set forth in the bullet points below or unless expressly and specifically approved in writing on a case-by-case basis by an authorized Bourns' representative, use of any Bourns® products in such unauthorized high-risk applications is at the user's sole risk.

- Bourns considers implantable/invasive devices and devices/procedures designed as life-supporting or life-sustaining by the U.S. Food and Drug Administration or equivalent organizations outside of the United States as "life-critical" medical applications. Bourns expressly identifies those Bourns® standard products that are suitable for use in typical medical applications that are not life-critical in its publication entitled "Bourns Medical Grade Component Guide."
- Bourns expressly identifies those Bourns® standard products that are suitable for use in typical automotive applications associated with any Automate Safety Integrity Level (ASIL) in its publication entitled "Bourns Automotive Grade Component Guide." Bourns' designation of Bourns® product as compliant with the AEC-Q standard does not by itself mean that Bourns has approved such product for use in an automotive application.
- Bourns expressly identifies Bourns® standard products that are suitable for use in the typical aviation applications/systems requiring System Design Assurance Level (RTCA DO-254 DAL) of C, D or E in its publication entitled "Bourns Civilian Aerospace/Aviation Grade Component Guide." Bourns does not test its products for compliance with United States Federal Aviation Administration standards or any other generally equivalent governmental organization standard applicable to products designed or manufactured for use in aviation applications. Use of Bourns® standard components in aviation applications associated with RTCA DO-254 DAL A or B without proper approval noted above shall be at the user's sole risk.
- Bourns will review and authorize on a case-by-case basis the use of Bourns® standard products which are at least AEC-Q compliant in space-related civil applications (rockets, satellites) with a negotiated cross-waiver and indemnity agreement.

The use and level of testing applicable to Bourns® custom products shall be negotiated on a case-by-case basis by Bourns and the user for which such Bourns® custom products are specially designed. Absent a written agreement between Bourns and the user regarding the use and level of such testing, the above provisions applicable to Bourns® standard products shall also apply to such Bourns® custom products.

Use of Bourns® products or Bourns' technology in military/defense applications must be reviewed with Bourns for compliance with applicable export control laws and embargoes. Users shall not sell, transfer, export or re-export (which includes transfers within a country) any Bourns® products or technology or technical data for use in activities which involve the design, development, production, use or stockpiling of nuclear, chemical or biological weapons or missiles, nor shall they use Bourns® products or technology or technical data in any facility which engages in activities relating to such devices. Further, Bourns® products and Bourns' technology and technical data may not under any circumstance be exported or re-exported to countries subject to international sanctions or embargoes. Bourns® products and technology may not, without prior authorization from Bourns and/or the Government of a country where such product/technology is designed and/or manufactured, be resold, transferred, or re-exported (including within the same country) to any party not eligible to receive commodities, software, and technical data originating in such country.

To the maximum extent permitted by applicable law, Bourns disclaims (i) any and all liability for special, punitive, consequential, incidental or indirect damages or lost revenues or lost profits, and (ii) any and all implied warranties (those not based on parameters specified in Bourns' data sheets and/or specifications), including implied warranties of fitness for particular purpose, non-infringement and merchantability.

For your convenience, copies of this Legal Disclaimer Notice with German, Spanish, Japanese, Traditional Chinese and Simplified Chinese bilingual versions are available at:

Web Page: <https://www.bourns.com/legal/disclaimers-terms-and-policies>

PDF: <https://www.bourns.com/docs/Legal/disclaimer.pdf>