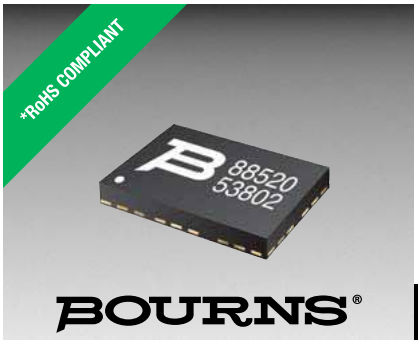


Features

- Extremely high speed performance
- Blocks high voltages and currents
- Two TBU® protectors in one small package
- Simple, superior circuit protection
- Minimal PCB area
- RoHS compliant*, UL Recognized

Bourns® Model P850-G Series TBU® HSPs are not recommended for POTS applications. This series is suited for applications requiring a dual bidirectional device where 50 ohms of series resistance is acceptable. For new SLIC applications, we recommend that customers evaluate our TBU-PL Series.

P850-G Series Dual TBU® High-Speed Protectors

Transient Blocking Units - TBU® Devices

Bourns® Model P850-G TBU® products are dual 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 3, 5	P850-G
ITU-T	K.20, K.20E, K.21, K.21E, K.45		

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	850	V
V_{rms}	Maximum protection voltage for continuous V_{rms} faults	425	V
T_{op}	Operating temperature range	-40 to +85	°C
T_{stg}	Storage temperature range	-65 to +150	°C

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

Symbol	Parameter	Model	Min.	Typ.	Max.	Unit
I_{op}	Maximum current through the device that will not cause current blocking	P850-G120-WH P850-G200-WH			100 200	mA
$I_{trigger}$	Typical current for the device to go from normal operating state to protected state	P850-G120-WH P850-G200-WH		150 275		mA
I_{out}	Maximum current through the device	P850-G120-WH P850-G200-WH			200 400	mA
R_{device}	Series resistance of the TBU® device			50	55	Ω
R_{bal}	Line-to line series resistance difference between two TBU® devices				2	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			0.7		mA
V_{reset}	Voltage below which the triggered TBU® device will transition to normal operating state			22		V

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

The P-G series TBU® devices are bidirectional; specifications are valid in both directions.
*RoHS Directive 2015/863, Mar 31, 2015 and Annex.
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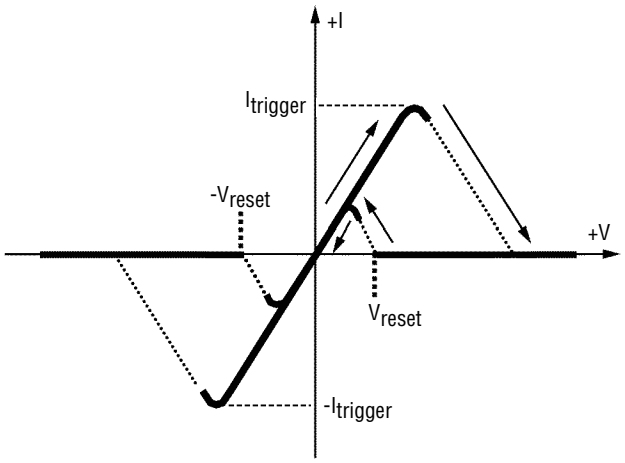
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Applications

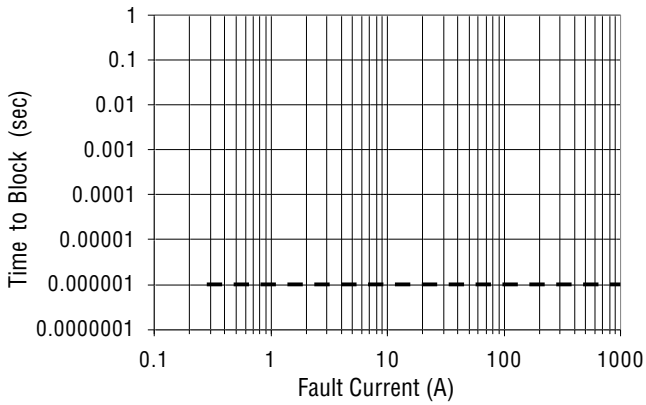
- Sensor protection
- Signal line protection

Typical Performance Characteristics

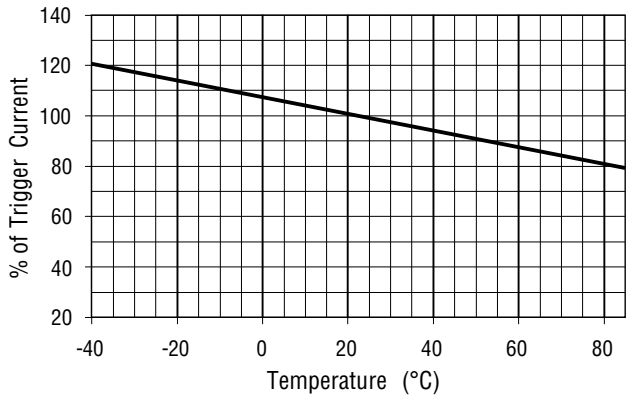
V-I Characteristics



Time to Block vs. Fault Current



Trigger Current Temperature



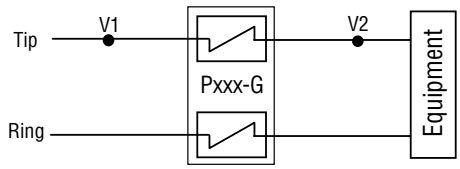
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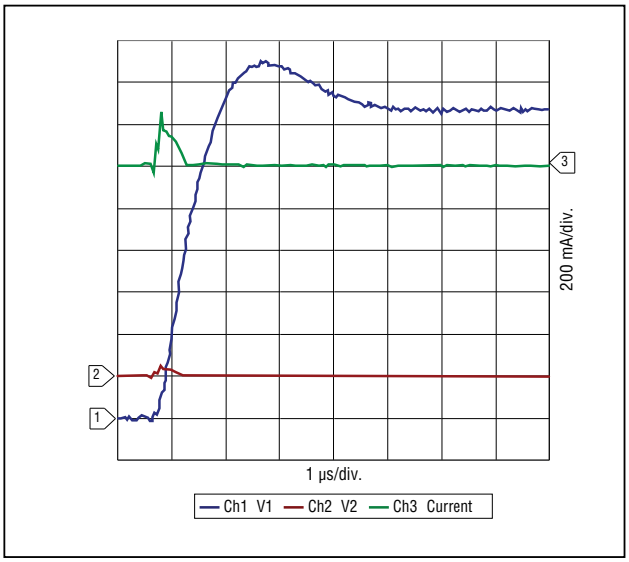
Operational Characteristics

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

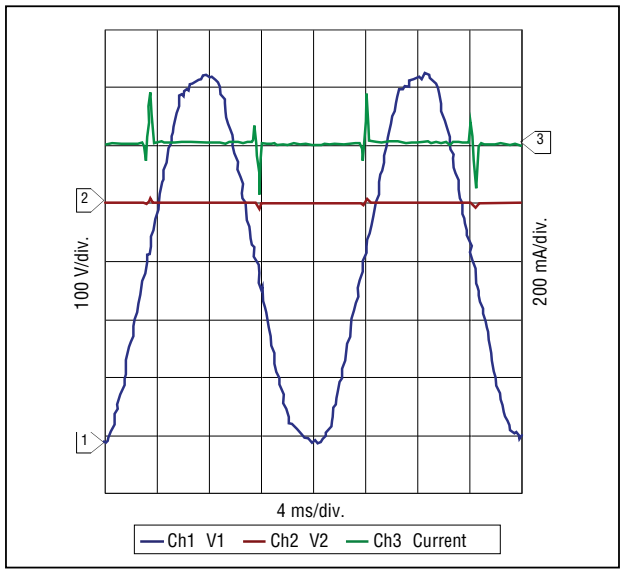
TEST CONFIGURATION DIAGRAM



P850-G Lightning, 850 V



P850-G Power Fault, 230 Vrms, 25 A



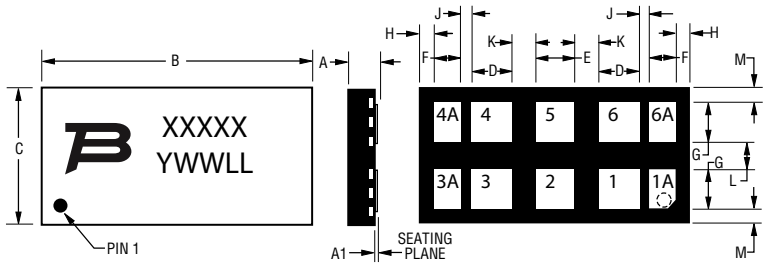
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P850-G Series Dual TBU® High-Speed Protectors

BOURNS®

Product Dimensions



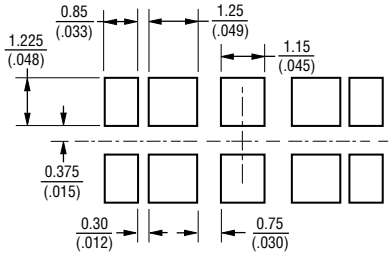
TOP VIEW SIDE VIEW BOTTOM VIEW

Pads 1A and 1 are internally connected; the same for pads 3A with 3, 4A with 4, and 6A with 6. This allows for one PCB layout to accommodate the Model P850.

Dim.	P850-G		
	Min.	Typ.	Max.
A	0.80 (.031)	0.90 (.035)	1.00 (.039)
A1	0.00 (.000)	0.025 (.001)	0.05 (.002)
B	8.15 (.321)	8.25 (.325)	8.35 (.329)
C	3.90 (0.154)	4.00 (0.157)	4.10 (0.161)
D	1.15 (.045)	1.25 (.049)	1.35 (.053)
E	1.05 (.041)	1.15 (.045)	1.25 (.049)
F	0.725 (.029)	0.825 (.032)	0.925 (.036)
G	1.10 (.043)	1.20 (.047)	1.30 (.051)
H	0.375 (.015)	0.425 (.017)	0.475 (.019)
J	0.25 (.010)	0.30 (.012)	0.35 (.014)
K	0.70 (.028)	0.75 (.030)	0.80 (.031)
L	0.70 (.028)	0.75 (.030)	0.80 (.031)
M	0.375 (.015)	0.425 (.017)	0.475 (.018)

DIMENSIONS: MM / (INCHES)

Recommended Pad Layout



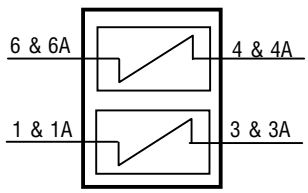
Pad Designation

Pad #	Apply	Pad #	Apply
1A	Tip In	4A	Ring Out
1	Tip In	4	Ring Out
2	NC	5	NC
3	Tip Out	6	Ring In
3A	Tip Out	6A	Ring In

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

TBU® devices 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 heat sinking 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.

Block Diagram

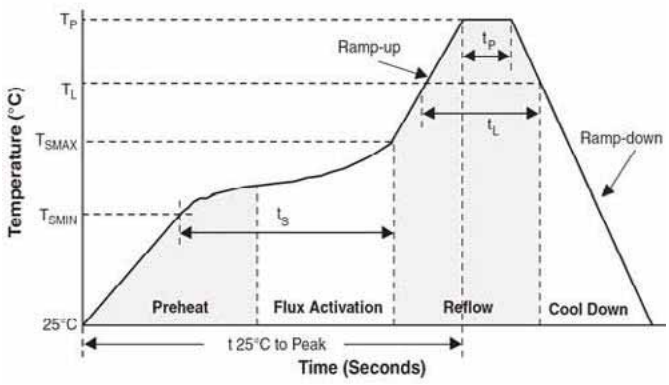


Thermal Resistances

Part #	Symbol	Parameter	Value	Unit
P850-G	$R_{th(j-a)}$	Junction to leads (package)	119	°C/W
		Junction to leads (per TBU® device)	215	°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}) - Temperature Max. (T_{smax}) - Time (t_{smin} to t_{smax})	 150 °C 200 °C 60-180 sec.
Time maintained above: - Temperature (T_L) - Time (t_L)	 217 °C 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.



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P850-G Series Dual TBU® High-Speed Protectors

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How to Order

P 850 - G 120 - WH

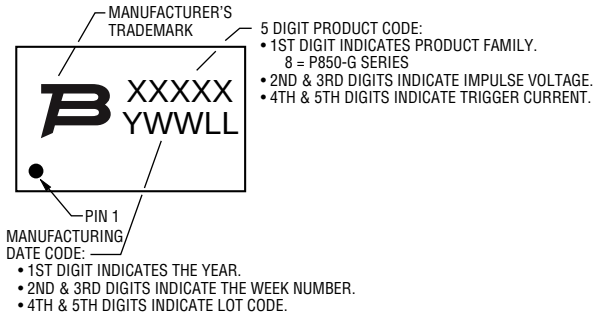
Form Factor
P = Two TBU® protectors in one device

Impulse Voltage Rating
850 = 850 V

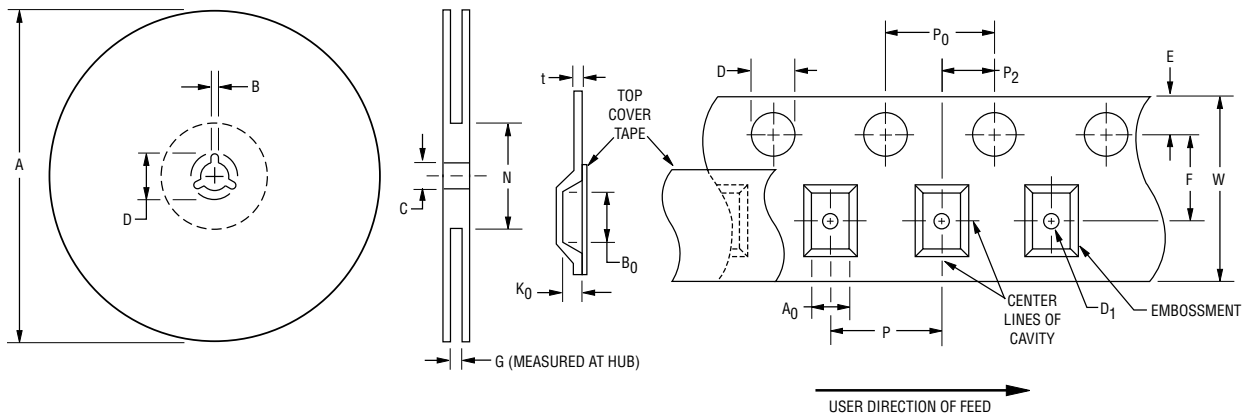
Directional Indication for Paired Devices
G = Bidirectional

Iop Indicator
120 = 100 mA
200 = 200 mA

Typical Part Marking



Packaging Specifications (per EIA468-B)



QUANTITY: 3000 PIECES PER REEL

A		B		C		D		G	N
Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Ref.	Ref.
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)

A_0		B_0		D		D_1		E		F	
Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
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)
K_0		P		P_0		P_2		t		W	
Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
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: MM (INCHES)

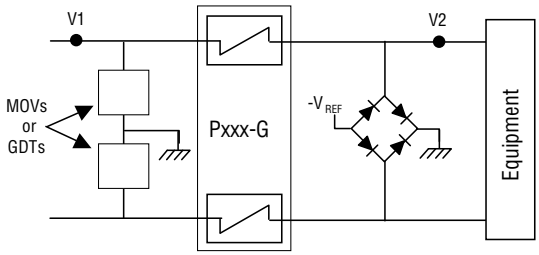
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Reference Designs

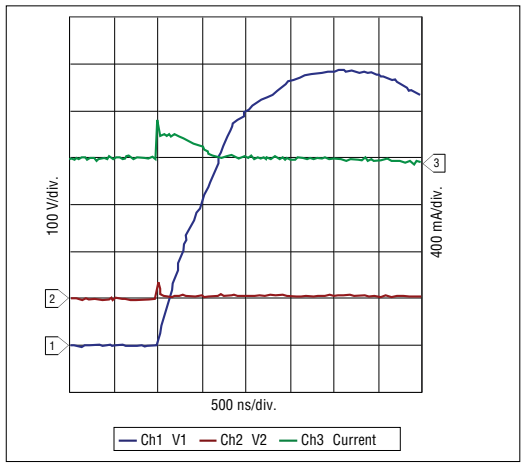
A cost-effective protection solution combines the Bourns® TBU® protection device with a pair of MOVs or Bourns® GDTs and a diode bridge. The diagram below illustrates a common configuration of these components. The graphs to the right demonstrate the operational characteristics of the circuit.

For new SLIC applications, we recommend that customers evaluate our new TBU-PL series.



Common Configuration Diagram

P850-G Configuration (ITU-T K.20, K.21, K.20E, K.21E, K.45)			
Product	**Qty.**	**Part Number**	**Source**
TBU® Device	1	P850-G120-WH	Bourns, Inc.
MOV	2	MOV-10D361K	Bourns, Inc.
Diode bridge	2	GSD2004S-V MMBD2004S	Vishay Diodes Inc.



P850-G Solution: 4000 V Lightning 10/700 µsec, 100 A

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REV. 09/15

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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.

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