

## Applications

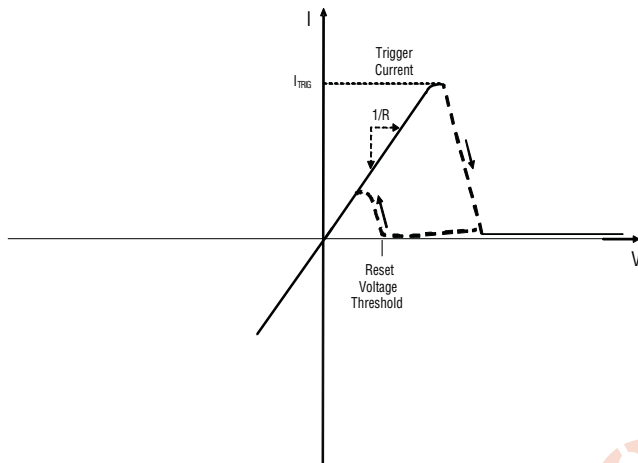
- Mb Ethernet port protection
- Gb Ethernet port protection
- Isolated and floating interfaces

## P650-U and P850-U Series TBU® High-Speed Protectors

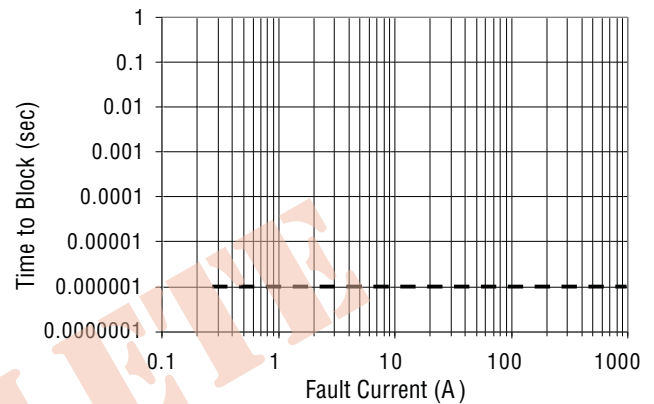
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### Typical Performance Characteristics

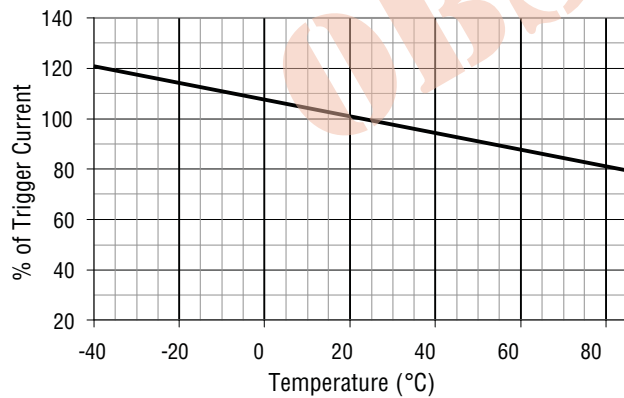
#### V-I Characteristics



#### Time to Block vs. Fault Current



#### Trigger Current vs. Temperature



Specifications are subject to change without notice.  
The device characteristics and parameters in this data sheet can and do vary in different applications and actual device performance may vary over time.  
Users should verify actual device performance in their specific applications.

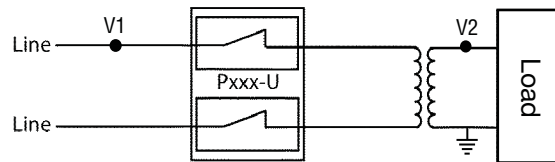
# P650-U and P850-U Series TBU® High-Speed Protectors

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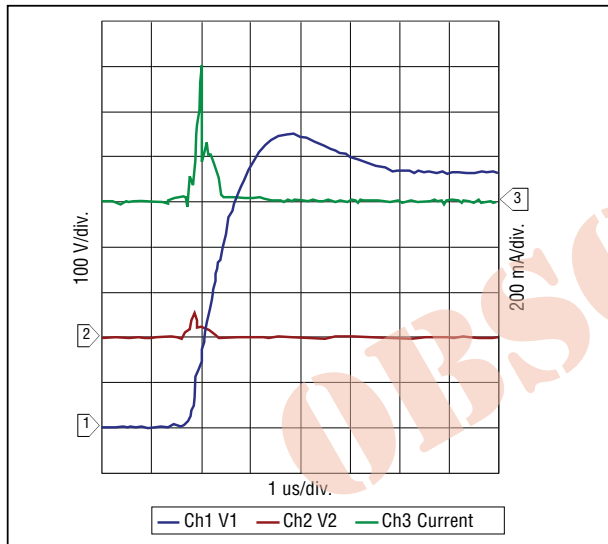
## Operational Characteristics

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

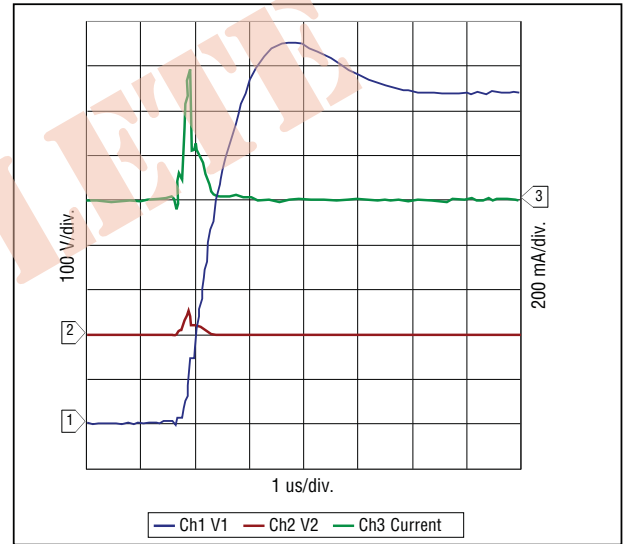
TEST CONFIGURATION DIAGRAM



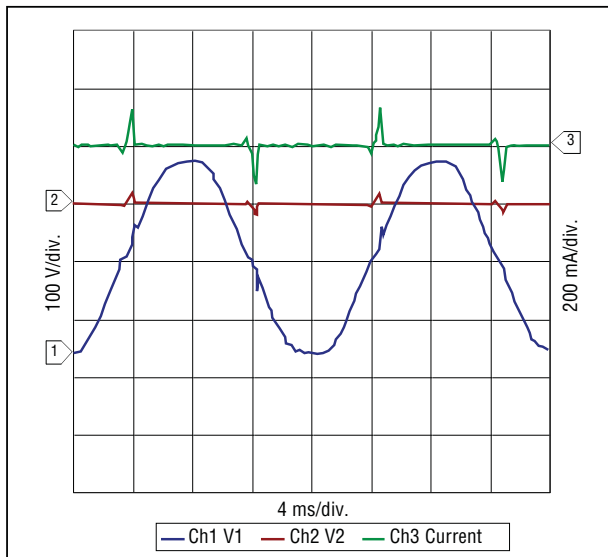
P650-U Lightning, 650 V



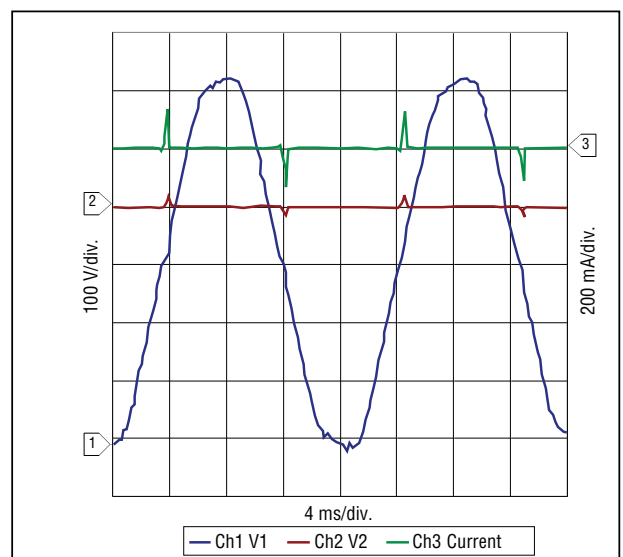
P850-U Lightning, 850 V



P650-U Power Fault, 120 Vrms, 25 A



P850-U Power Fault, 230 Vrms, 25 A



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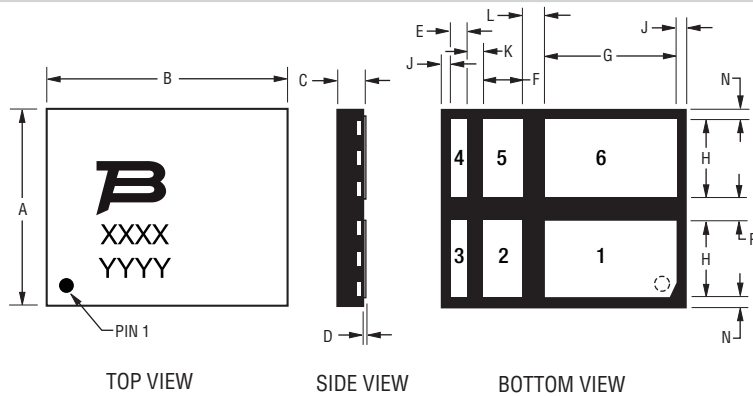
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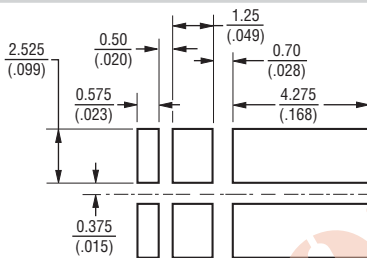
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## Product Dimensions



Dim.	Min.	Typ.	Max.
A	6.15 (.242)	6.25 (.246)	6.35 (.250)
B	7.65 (.301)	7.75 (.305)	7.85 (.309)
C	0.80 (.031)	0.85 (.033)	0.90 (.035)
D	0.000 (.000)	0.025 (.001)	0.050 (.002)
E	0.50 (.020)	0.55 (.022)	0.60 (.024)
F	1.20 (.047)	1.25 (.049)	1.30 (.051)
G	4.20 (.165)	4.25 (.167)	4.30 (.169)
H	2.45 (.096)	2.50 (.098)	2.55 (.100)
J	0.20 (.008)	0.25 (.010)	0.30 (.012)
K	0.45 (.018)	0.50 (.020)	0.55 (.022)
L	0.65 (.026)	0.70 (.028)	0.75 (.030)
N	0.20 (.008)	0.25 (.010)	0.30 (.012)
P	0.70 (.028)	0.75 (.030)	0.80 (.031)
Q	3.20 (.126)	3.25 (.128)	3.30 (.130)

## Recommended Pad Layout



### Pad Designation

Pad #	Apply
1	In1
2	NC
3	Out1
4	Out2
5	NC
6	In2

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

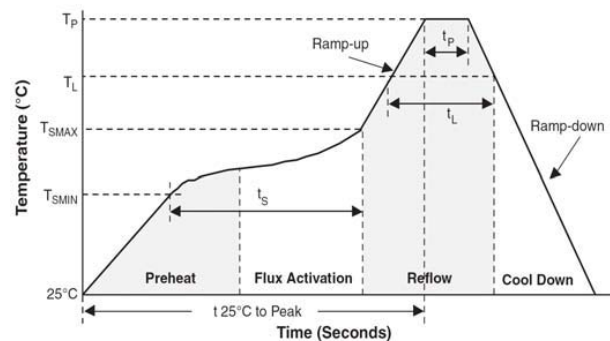
TBU® devices have matte-tin termination finish. Suggested layout should use non-solder mask define (NSMD). Recommended stencil thickness is 0.10-0.12 mm (.004-.005 in.) with stencil opening size 0.025 mm (.0010 in.) less than the device pad size. As when heat sinking any power device, it is recommended 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.

## Thermal Resistances

Symbol	Parameter	Value	Unit
R <sub>th(j-a)</sub>	Junction to leads (package)	105	°C/W
	Junction to leads (per TBU® device)	202	°C/W

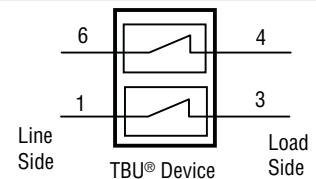
## Reflow Profile

Profile Feature	Pb-Free Assembly
Average Ramp-Up Rate (T <sub>smax</sub> to T <sub>p</sub> )	3 °C/sec. max.
Preheat	
- Temperature Min. (T <sub>smin</sub> )	150 °C
- Temperature Max. (T <sub>smax</sub> )	200 °C
- Time (t <sub>smin</sub> to t <sub>smax</sub> )	60-180 sec.
Time maintained above:	
- Temperature (T <sub>L</sub> )	217 °C
- Time (t <sub>L</sub> )	60-150 sec.
Peak/Classification Temperature (T <sub>p</sub> )	260 °C
Time within 5 °C of Actual Peak Temp. (t <sub>p</sub> )	20-40 sec.
Ramp-Down Rate	6 °C/sec. max.
Time 25 °C to Peak Temperature	8 min. max.



DIMENSIONS: MM  
(INCHES)

## Block Diagram



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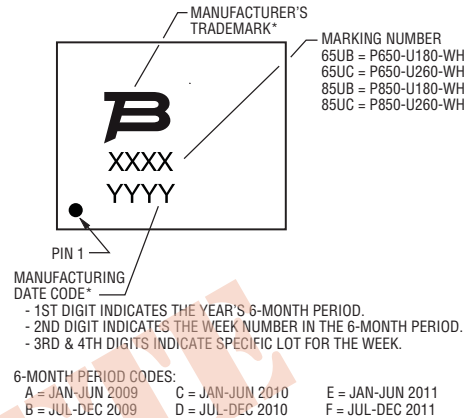
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## How to Order

**P 650 - U 180 - WH**

Form Factor \_\_\_\_\_  
 P = Two TBU® protectors in one device  
 Impulse Voltage Rating \_\_\_\_\_  
 650 = 650 V  
 850 = 850 V  
 Directional Indication for Paired Devices \_\_\_\_\_  
 U = Unidirectional  
 Iop Indicator \_\_\_\_\_  
 180 = 180 mA  
 260 = 260 mA

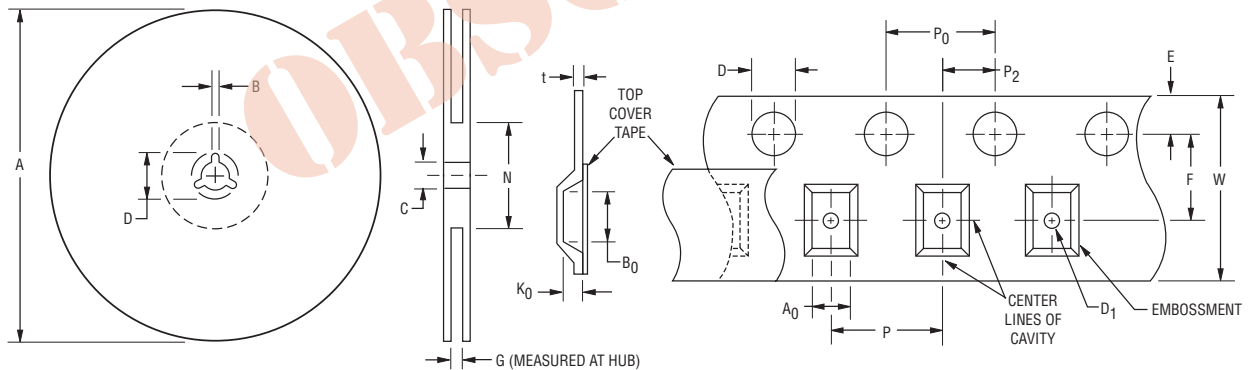
## Typical Part Marking



EXAMPLE: ARBC  
 - 1ST DIGIT 'A' = JAN-JUN 2009  
 - 2ND DIGIT 'R' = WEEK 18; WEEK OF APRIL 27  
 - 3RD & 4TH DIGITS 'BC' = LOT SPECIFIC INFORMATION

\*TRANSITION FROM FULTEC TRADEMARK AND LOT CODE TO BOURNS TRADEMARK AND DATE CODE IN 2009.

## Packaging Specifications (per EIA468-B)



QUANTITY: 3000 PIECES PER REEL

Device	A		B		C		D		G	N
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Ref.	Ref.
P650-U, P850-U	326 (.256)	330.25 (.264)	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.
P650-U, P850-U	6.5 (.256)	6.7 (.264)	8.0 (.315)	8.2 (.323)	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.
P650-U, P850-U	1.4 (.055)	1.6 (.063)	11.9 (.469)	12.1 (.476)	3.9 (.159)	4.1 (.161)	1.9 (.075)	2.1 (.083)	0.25 (.010)	0.35 (.014)	15.7 (.618)	16.3 (.642)

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

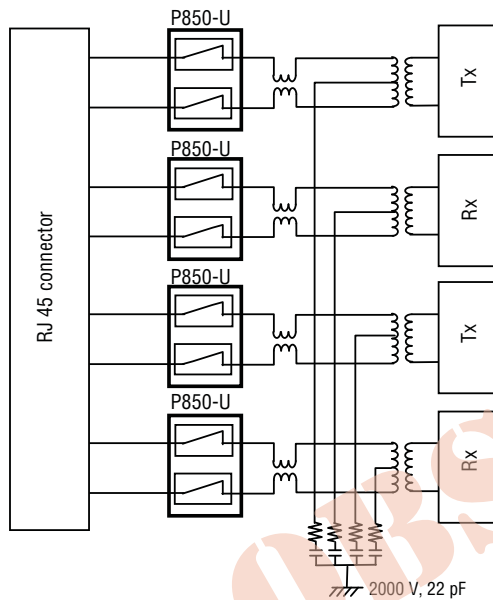
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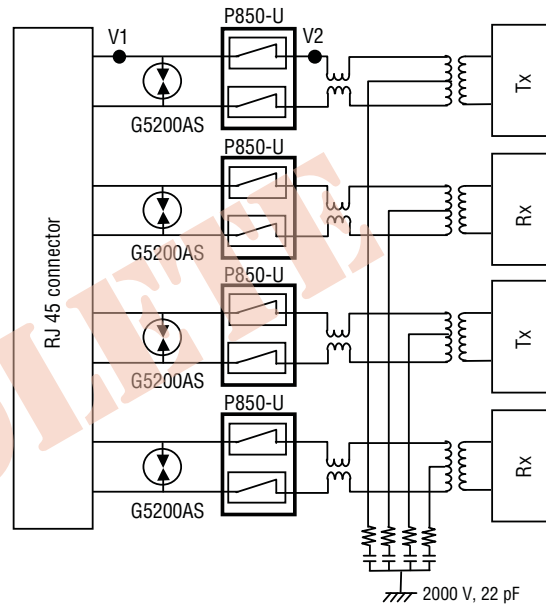
## Reference Applications

A cost-effective protection solution utilizes the Bourns® TBU® protection devices. The diagrams below illustrate common configurations of these components. The graph at the bottom demonstrates the operational characteristics of the circuit.

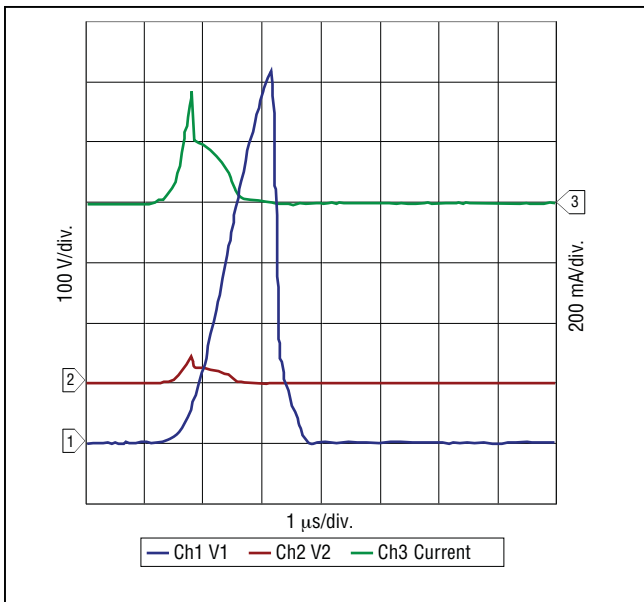
### Typical Configuration Diagrams



GbE Ethernet Protection  
Up to 1500 V Common-Mode Lightning Protection



GbE Ethernet Protection  
Up to 6000 V Common-Mode Lightning Protection



P850-U with G5200AS 4000 V Lightning 10/700 μsec, 150 A

**BOURNS®**

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[www.bourns.com](http://www.bourns.com)

REV. 04/15

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