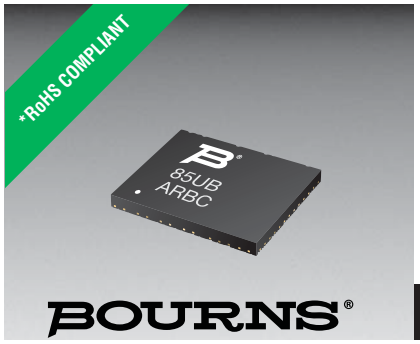


Features

- Formerly FulTec brand
- Extremely high speed performance
- Blocks high voltages and currents
- Low insertion loss
- Two TBU™ protectors in one small package
- Very high bandwidth; GHz compatible
- RoHS compliant*, UL Recognized

Applications

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

TBU™ P650-U and P850-U Protectors

Transient Blocking Units - TBU™ Devices

Bourns® Model P650-U and P850-U products are high speed, unidirectional 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.

Agency Approval

UL recognized component File # E315805.

Industry Standards

Description			Model
Telcordia	GR-1089	Port Type 3, 5	P650-U
		Port Type 2, 4	P850-U
ITU-T	K.20, K.20E, K.21, K.21E, K.45		P850-U

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

Symbol	Parameter		Value	Unit
V_{imp}	Maximum protection voltage for impulse faults with rise time ≥ 1 µsec	P650-Uxxx-WH P850-Uxxx-WH	650 850	V
V_{rms}	Maximum protection voltage for continuous V_{rms} faults connected as a series pair (refer to page 3 Test Configuration Diagram)	P650-Uxxx-WH P850-Uxxx-WH	300 425	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)

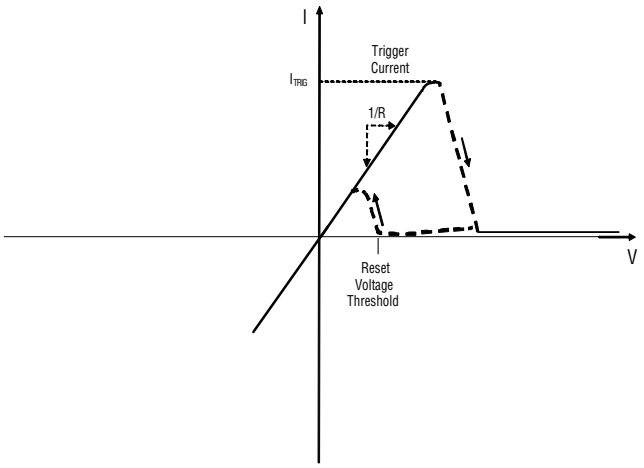
Symbol	Parameter		Min.	Typ.	Max.	Unit
I_{op}	Maximum current through the device that will not cause current blocking	P650-U180-WH P650-U260-WH P850-U180-WH P850-U260-WH			180 260 180 260	mA
$I_{trigger}$	Typical current for the device to go from normal operating state to protected state	P650-U180-WH P650-U260-WH P850-U180-WH P850-U260-WH		220 330 220 330		mA
I_{out}	Maximum current through the device	P650-U180-WH P650-U260-WH P850-U180-WH P850-U260-WH			360 520 360 520	mA
R_{TBU}	Series resistance of the TBU™ device	P650-Uxxx-WH P850-Uxxx-WH		6 8	7 9	Ω
R_{bal}	Line-to line series resistance difference between two TBU™ device				0.5	Ω
t_{block}	Maximum time for the device to go from normal operating state to protected state	P650-Uxxx-WH P850-Uxxx-WH			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	P650-Uxxx-WH P850-Uxxx-WH		11 14		V

The P-U Series TBU™ devices are unidirectional; specifications are valid for input direction only. For the output direction, the TBU™ device is a resistor.

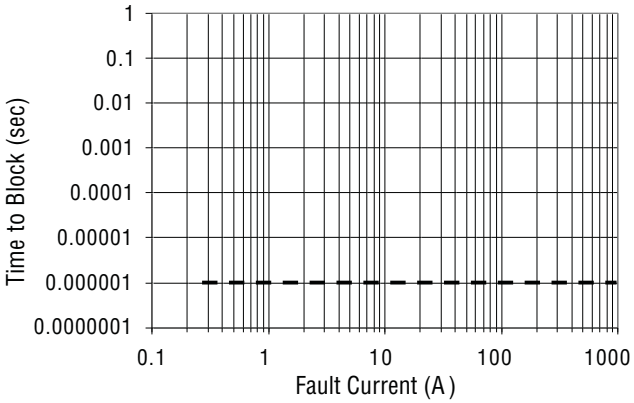
*RoHS Directive 2002/95/EC Jan 27 2003 including Annex.
Specifications are subject to change without notice.
Customers should verify actual device performance in their specific applications.

Typical Performance Characteristics

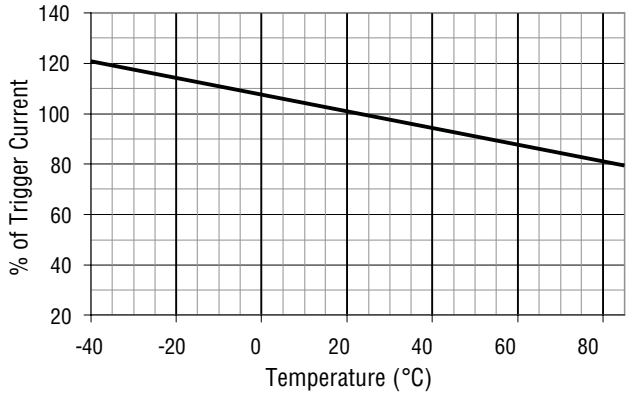
V-I Characteristics



Time to Block vs. Fault Current



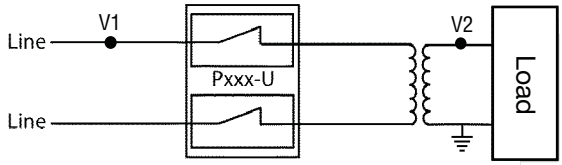
Trigger Current vs. Temperature



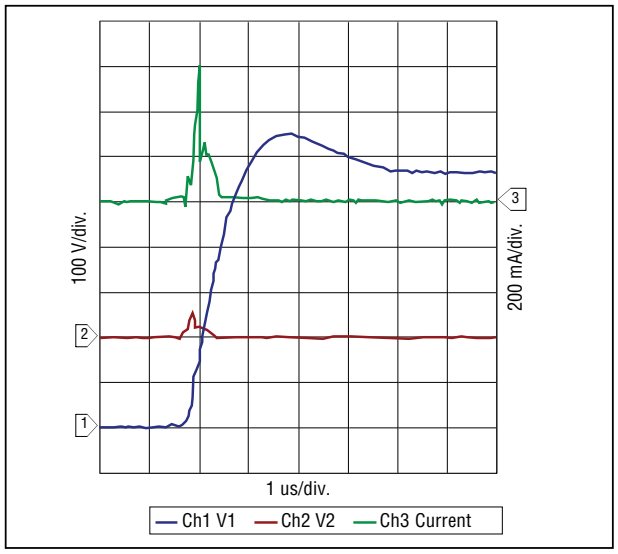
Operational Characteristics

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

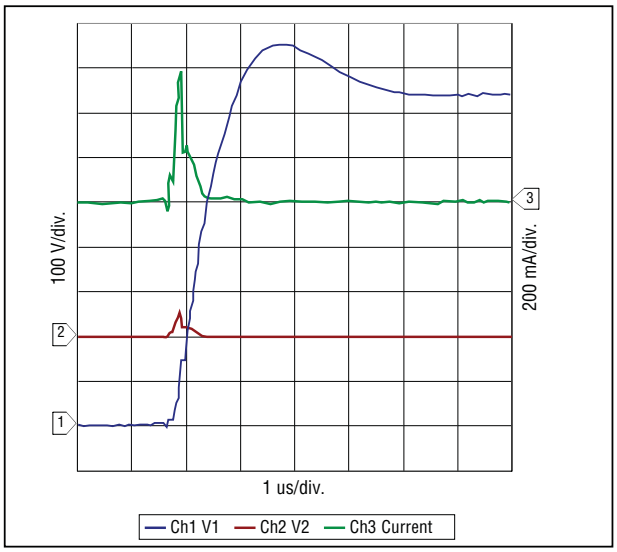
TEST CONFIGURATION DIAGRAM



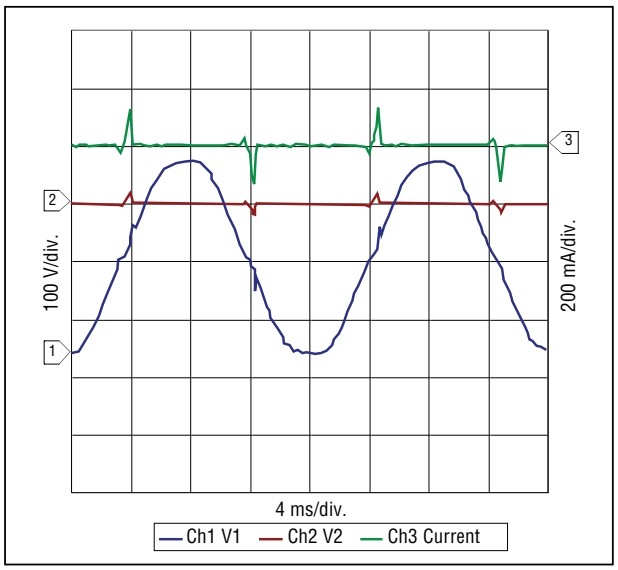
P650-U Lightning, 650 V



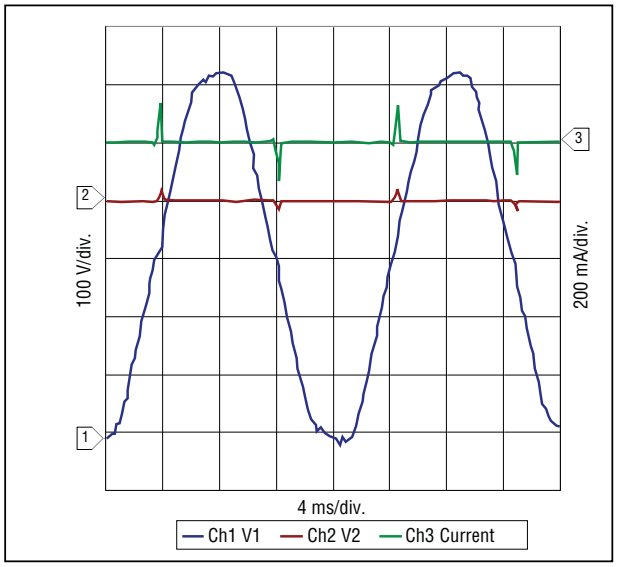
P850-U Lightning, 850 V



P650-U Power Fault, 120 Vrms, 25 A

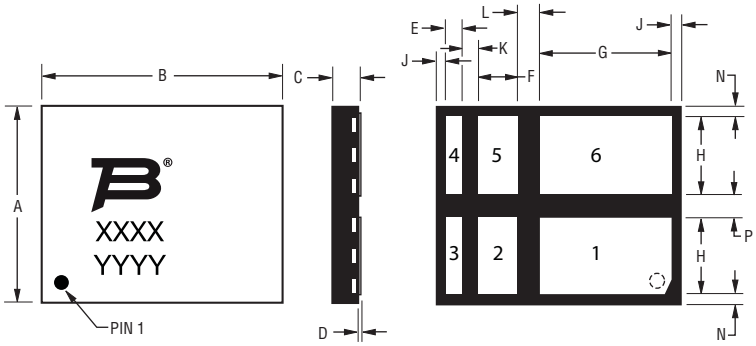


P850-U Power Fault, 230 Vrms, 25 A



Specifications are subject to change without notice.
Customers should verify actual device performance in their specific applications.

Product Dimensions

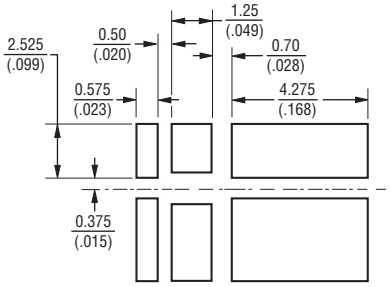


TOP VIEW SIDE VIEW BOTTOM VIEW

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)

DIMENSIONS: MM (INCHES)

Recommended Pad Layout



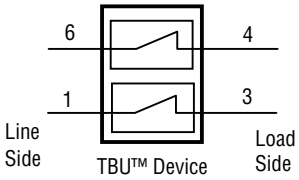
Pad Designation

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.

Block Diagram

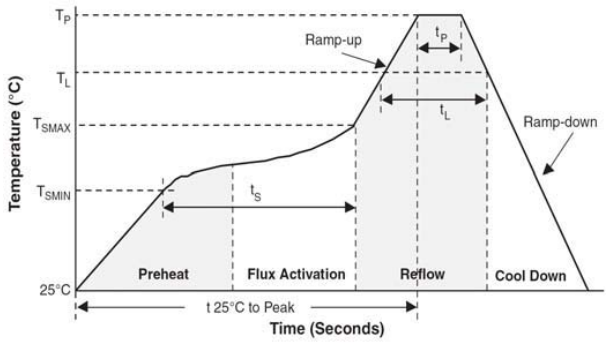


Thermal Resistances

Symbol	Parameter	Value	Unit
$R_{th(j-a)}$	Junction to leads (package)	105	°C/W
	Junction to leads (per TBU)	202	°C/W

Reflow Profile

Profile Feature	Pb-Free Assembly
Average Ramp-Up Rate (Tsmax to Tp)	3 °C/sec. max.
Preheat - Temperature Min. (Tsmin) - Temperature Max. (Tsmax) - Time (tsmin to tsmax)	 150 °C 200 °C 60-180 sec.
Time maintained above: - Temperature (TL) - Time (tL)	 217 °C 60-150 sec.
Peak/Classification Temperature (Tp)	260 °C
Time within 5 °C of Actual Peak Temp. (tp)	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.
Customers should verify actual device performance in their specific applications.

TBU™ P650-U and P850-U Protectors

BOURNS®

How to Order

P 650 - U 180 - WH

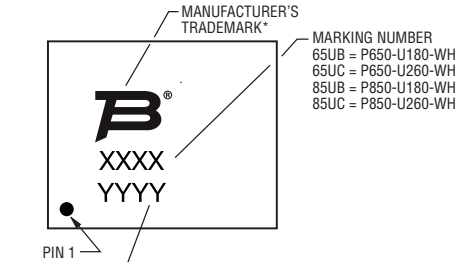
Form Factor
P = Two TBU™ protectors in one device

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



- 1ST DIGIT INDICATES THE YEAR'S 6-MONTH PERIOD.
- 2ND DIGIT INDICATES THE WEEK NUMBER IN THE 6-MONTH PERIOD.
- 3RD & 4TH DIGITS INDICATE SPECIFIC LOT FOR THE WEEK.

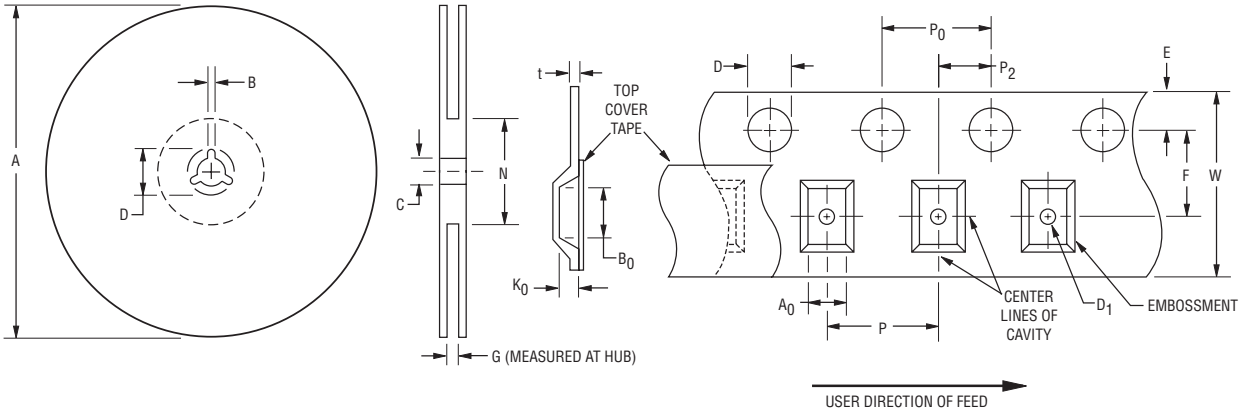
6-MONTH PERIOD CODES:

A = JAN-JUN 2009	C = JAN-JUN 2010	E = JAN-JUN 2011
B = JUL-DEC 2009	D = JUL-DEC 2010	F = JUL-DEC 2011

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 (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	A_0		B_0		D		D_1		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	**K_0**		**P**		**P_0**		**P_2**		**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)

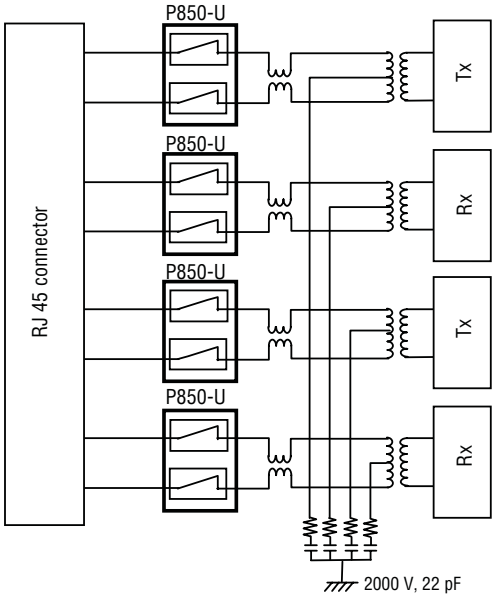
DIMENSIONS: MM (INCHES)

Specifications are subject to change without notice.
Customers should verify actual device performance in their specific applications.

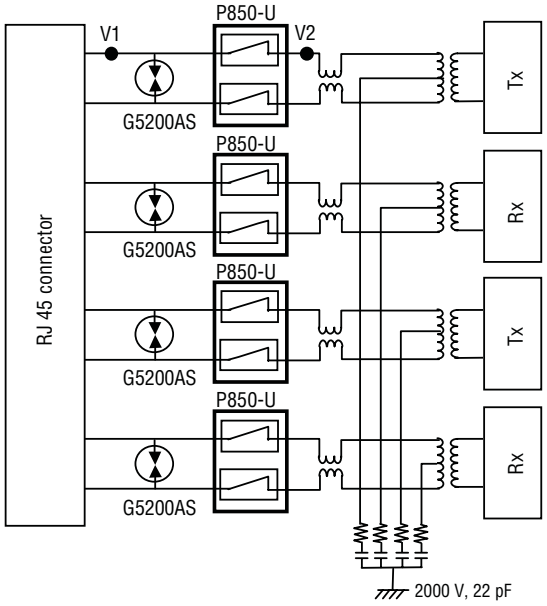
Reference Applications

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.

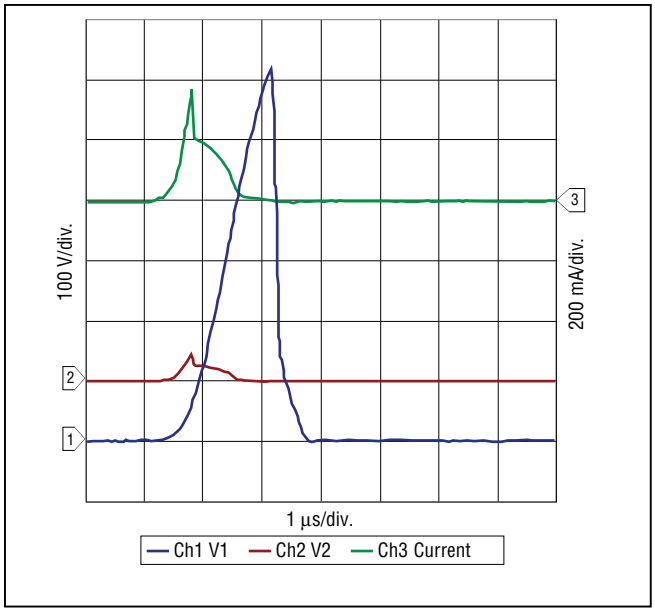
Typical Configuration Diagrams



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

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