


Features

- Superior circuit protection
- Overcurrent and overvoltage protection
- Blocks surges up to rated limits
- High-speed performance
- Small SMT package
- Agency listing: 

Applications

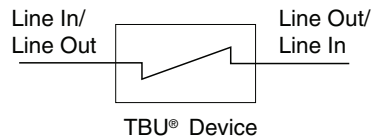
- Voice / VDSL cards
- Protection modules and dongles
- Process control equipment
- Test and measurement equipment
- General electronics

TBU-CA Series - TBU® High-Speed Protectors

General Information

The TBU-CA Series of Bourns® TBU® products are low capacitance single bidirectional high-speed protection components, constructed using MOSFET semiconductor technology, and designed to protect against faults caused by short circuits, AC power cross, induction and lightning surges.

The TBU® high-speed protector placed in the system circuit will monitor the current with the MOSFET detection circuit triggering to provide an effective barrier behind which sensitive electronics will not be 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.



Additional Information

Click these links for more information:



Agency Listing

Description	
UL	File Number: E315805

Absolute Maximum Ratings (@ T_A = 25 °C Unless Otherwise Noted)

Symbol	Parameter	Part Number	Value	Unit
V _{imp}	Peak impulse voltage withstand with duration less than 10 ms	TBU-CA025-xxx-WH	250	V
		TBU-CA040-xxx-WH	400	
		TBU-CA050-xxx-WH	500	
		TBU-CA065-xxx-WH	650	
		TBU-CA085-xxx-WH	850	
V _{rms}	Continuous A.C. RMS voltage	TBU-CA025-xxx-WH	100	V
		TBU-CA040-xxx-WH	200	
		TBU-CA050-xxx-WH	250	
		TBU-CA065-xxx-WH	300	
		TBU-CA085-xxx-WH	425	
T _{op}	Operating temperature range		-55 to +125	°C
T _{stg}	Storage temperature range		-65 to +150	°C
T _{jmax}	Maximum Junction Temperature		+125	°C
ESD	HBM ESD protection per IEC 61000-4-2		±2	kV

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

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

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Users should verify actual device performance in their specific applications.

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TBU-CA Series - TBU® High-Speed Protectors

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Electrical Characteristics (@ T_A = 25 °C Unless Otherwise Noted)

Symbol	Parameter	Part Number	Min.	Typ.	Max.	Unit
I _{trigger}	Current required for the device to go from operating state to protected state	TBU-CAxxx-050-WH	50	75	100	mA
		TBU-CAxxx-100-WH	100	150	200	
		TBU-CAxxx-200-WH	200	300	400	
		TBU-CAxxx-300-WH	300	450	600	
		TBU-CAxxx-500-WH	500	750	1000	
R _{device}	Series resistance of the TBU device	V _{imp} = 250 V I _{trigger} (min.) = 50 mA		13.3	15.3	Ω
		TBU-CA025-050-WH		13.3	15.3	
		V _{imp} = 250 V I _{trigger} (min.) = 100 mA		7.1	8.2	
		TBU-CA025-100-WH		7.1	8.2	
		V _{imp} = 250 V I _{trigger} (min.) = 200 mA		4.2	4.8	
		TBU-CA025-200-WH		4.2	4.8	
		V _{imp} = 250 V I _{trigger} (min.) = 300 mA		3.2	3.8	
		TBU-CA025-300-WH		3.2	3.8	
		V _{imp} = 250 V I _{trigger} (min.) = 500 mA		2.6	3.0	
		TBU-CA025-500-WH		2.6	3.0	
		V _{imp} = 400 V I _{trigger} (min.) = 50 mA		14.3	16.5	
		TBU-CA040-050-WH		14.3	16.5	
		V _{imp} = 400 V I _{trigger} (min.) = 100 mA		8.1	9.4	
		TBU-CA040-100-WH		8.1	9.4	
		V _{imp} = 400 V I _{trigger} (min.) = 200 mA		5.2	6.0	
		TBU-CA040-200-WH		5.2	6.0	
		V _{imp} = 400 V I _{trigger} (min.) = 300 mA		4.3	5.0	
		TBU-CA040-300-WH		4.3	5.0	
		V _{imp} = 400 V I _{trigger} (min.) = 500 mA		3.6	4.2	
		TBU-CA040-500-WH		3.6	4.2	
		V _{imp} = 500 V I _{trigger} (min.) = 50 mA		15.7	18.0	
		TBU-CA050-050-WH		15.7	18.0	
		V _{imp} = 500 V I _{trigger} (min.) = 100 mA		9.5	10.9	
		TBU-CA050-100-WH		9.5	10.9	
V _{imp} = 500 V I _{trigger} (min.) = 200 mA		6.6	7.5			
TBU-CA050-200-WH		6.6	7.5			
V _{imp} = 500 V I _{trigger} (min.) = 300 mA		5.6	6.5			
TBU-CA050-300-WH		5.6	6.5			
V _{imp} = 500 V I _{trigger} (min.) = 500 mA		5.0	5.7			
TBU-CA050-500-WH		5.0	5.7			
V _{imp} = 650 V I _{trigger} (min.) = 50 mA		17.7	20.3			
TBU-CA065-050-WH		17.7	20.3			
V _{imp} = 650 V I _{trigger} (min.) = 100 mA		11.5	13.2			
TBU-CA065-100-WH		11.5	13.2			
V _{imp} = 650 V I _{trigger} (min.) = 200 mA		8.6	9.8			
TBU-CA065-200-WH		8.6	9.8			
V _{imp} = 650 V I _{trigger} (min.) = 300 mA		7.6	8.8			
TBU-CA065-300-WH		7.6	8.8			
V _{imp} = 650 V I _{trigger} (min.) = 500 mA		7.0	8.0			
TBU-CA065-500-WH		7.0	8.0			
V _{imp} = 850 V I _{trigger} (min.) = 50 mA		21.4	24.5			
TBU-CA085-050-WH		21.4	24.5			
V _{imp} = 850 V I _{trigger} (min.) = 100 mA		15.2	17.4			
TBU-CA085-100-WH		15.2	17.4			
V _{imp} = 850 V I _{trigger} (min.) = 200 mA		12.3	14.0			
TBU-CA085-200-WH		12.3	14.0			
V _{imp} = 850 V I _{trigger} (min.) = 300 mA		11.3	13.0			
TBU-CA085-300-WH		11.3	13.0			
V _{imp} = 850 V I _{trigger} (min.) = 500 mA		10.7	12.2			
TBU-CA085-500-WH		10.7	12.2			
t _{block}	Time for the device to go from normal operating state to protected state				1	μs
I _Q	Current through the triggered TBU® device with 50 Vdc circuit voltage		0.25	0.50	1.00	mA
V _{reset}	Voltage below which the triggered TBU® device will transition to normal operating state		12	16	20	V
R _{th(j-l)}	Junction to package pads - FR4 using recommended pad layout			98		°C/W
R _{th(j-l)}	Junction to package pads - FR4 using heat sink on board (6 cm ²) (1 in ²)			40		°C/W

Environmental Characteristics

Parameter	Value
Moisture Sensitivity Level	1
ESD Classification (HBM)	1B

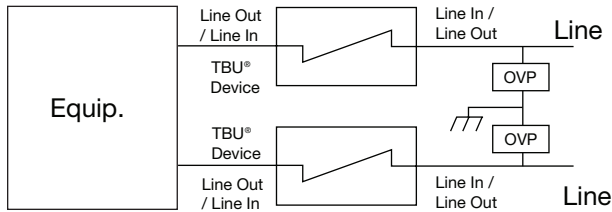
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Reference Application

The TBU® devices are general use protectors used in a wide variety of applications. The maximum voltage rating of the TBU® device should never be exceeded. Where necessary, an OVP should be employed to limit the maximum voltage. A cost-effective protection solution combines Bourns® TBU® protection devices with a pair of Bourns® MOVs. For bandwidth sensitive applications, a Bourns® GDT may be substituted for the MOV.



Basic TBU Operation

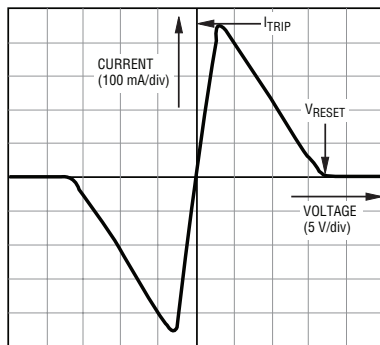
The TBU® device, constructed using MOSFET semiconductor technology, placed in the system circuit will monitor the current with the MOSFET detection circuit triggering to provide an effective barrier behind which sensitive electronics are not exposed to large voltages or currents during surge events. The TBU® device operates in approximately 1 μ s - once line current exceeds the TBU® device's trigger current I_{trigger} . When operated, the TBU® device will limit the current to less than the I_{trigger} value within the t_{block} duration. If voltage above V_{reset} is continuously sustained, the TBU® device will subsequently reduce the current to a quiescent current level within a period of time that is dependent upon the applied voltage.

After the surge, the TBU® device resets when the voltage across the TBU® device falls to the V_{reset} level. The TBU® device will automatically reset on lines which have no DC bias or have DC bias below V_{reset} (such as unpowered signal lines).

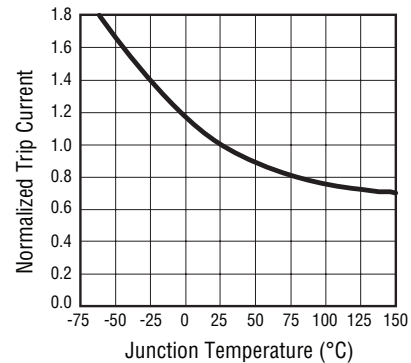
If the line has a normal DC bias above V_{reset} , the voltage across the TBU® device may not fall below V_{reset} after the surge. In such cases, special care needs to be taken to ensure that the TBU® device will reset, with software monitoring as one method used to accomplish this. Bourns application engineers can provide further assistance.

Performance Graphs

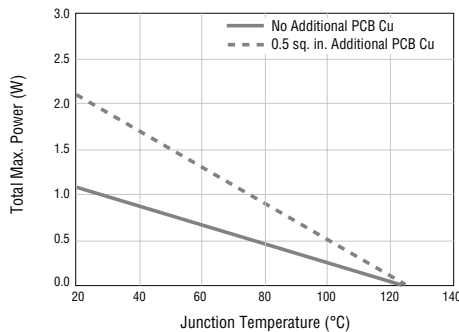
Typical V-I Characteristics (TBU-CA050-300-WH)



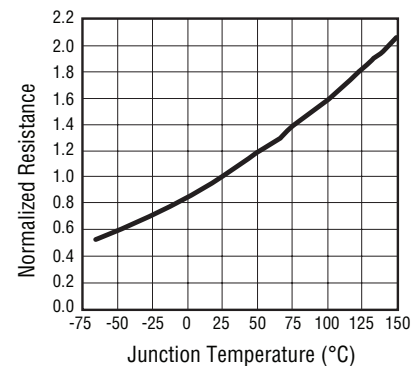
Typical Trigger Current vs. Temperature



Power Derating Curve



Typical Resistance vs. Temperature



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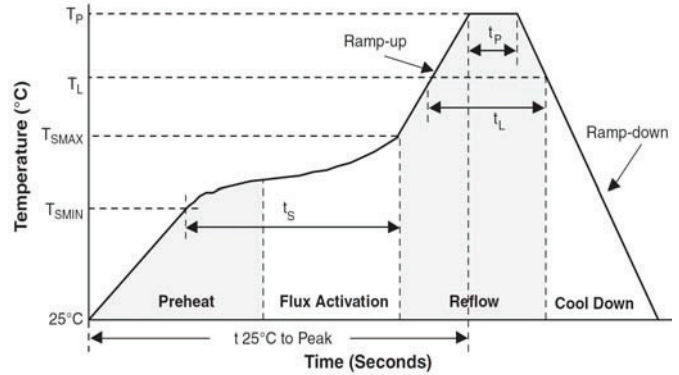
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TBU-CA Series - TBU® High-Speed Protectors



Reflow Profile

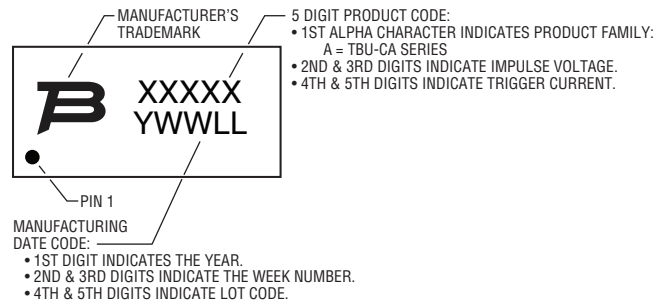
Profile Feature	Pb-Free Assembly
Average Ramp-Up Rate (T _S max to T _p)	3 °C/sec. max.
Preheat <ul style="list-style-type: none"> - Temperature Min. (T_Smin) - Temperature Max. (T_Smax) - Time (t_Smin to t_Smax) 	150 °C 200 °C 60-180 sec.
Time maintained above: <ul style="list-style-type: none"> - Temperature (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.
Recommended Number of Reflow Cycles per J-STD-020	3 max.



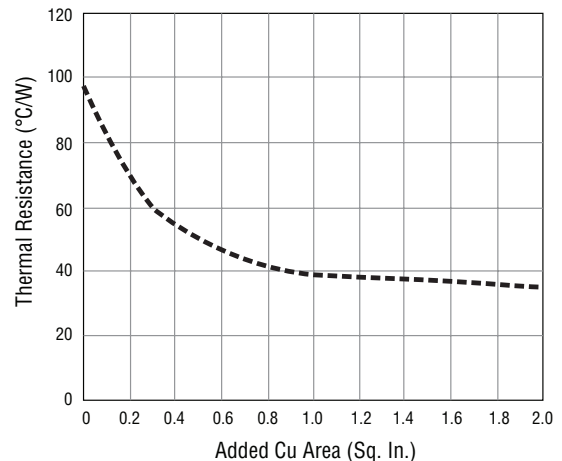
How to Order

TBU® Product	TBU - CA	085 - 500 - WH
Series	CA = Bi-Series	
Impulse Voltage Rating	025 = 250 V 040 = 400 V 050 = 500 V 065 = 650 V 085 = 850 V	
Trigger Current	050 = 50 mA 100 = 100 mA 200 = 200 mA 300 = 300 mA 500 = 500 mA	
Hold to Trip Ratio Suffix	W = Hold to Trip Ratio	
Package Suffix	H = DFN Package	

Typical Part Marking



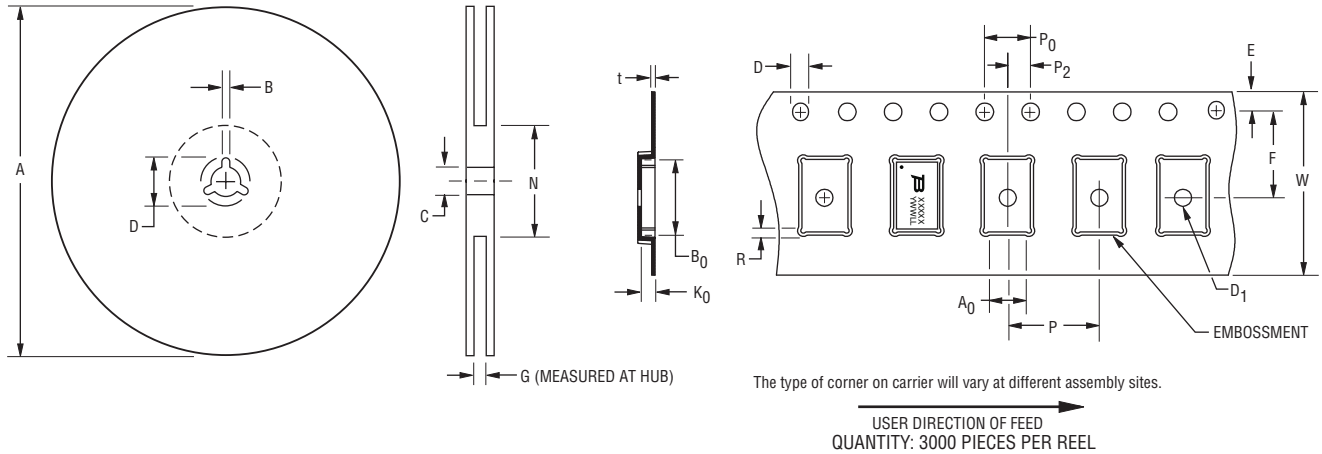
Thermal Resistance vs Additional PCB Cu Area



TBU-CA Series - TBU® High-Speed Protectors

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Packaging Specifications



A		B		C		D		G	N
Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Ref.	Ref.
326	330	1.5	2.5	12.8	13.5	20.2	—	16.5	102
(12.835)	(13.002)	(.059)	(.098)	(.504)	(.531)	(.795)		(.650)	(4.016)

A0		B0		D		D1		E		F	
Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
4.3	4.5	6.7	6.9	1.5	1.6	1.5	—	1.65	1.85	7.4	7.6
(.169)	(.177)	(.264)	(.272)	(.059)	(.063)	(.059)		(.065)	(.073)	(.291)	(.299)

K0		P		P0		P2		R		t	
Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
1.0	1.2	7.9	8.1	3.9	4.1	1.9	2.1	0	0.5	0.25	0.35
(.039)	(.047)	(.311)	(.319)	(.159)	(.161)	(.075)	(.083)	(0)	(.020)	(.010)	(.014)

W	
Min.	Max.
15.7	16.3
(.618)	(.642)

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

REV. 07/25

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