




**THE DATASHEET OF
TBU-PL085-100-WH**





Features

- Superior circuit protection
- Overcurrent & overvoltage protection
- Blocks surges up to rated limits
- High-speed performance
- Small SMT package
- RoHS compliant*
- Agency recognition: 

Applications

- SLIC protection
- Cable & DSL
- MDU/MTU modems
- ONT
- Voice/DSL line cards

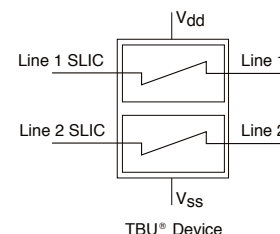
TBU-PL Series - TBU® High-Speed Protectors

General Information

The TBU-PL Series of Bourns® TBU® products are low capacitance dual 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.

In addition to overcurrent protection, an added feature is the voltage monitoring on the two lines. If the voltage on the line drops below V_{SS} then the voltage will trigger the device to switch to the blocking state.

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.



Agency Approval

Description	
UL	File Number: E315805

Industry Standards (in Conjunction with OVP Device)

Solutions available for GR-1089-CORE, ITU-T and a combination of both.

Absolute Maximum Ratings (@ $T_A = 25^\circ\text{C}$ Unless Otherwise Noted)

Symbol	Parameter	Part Number	Value	Unit
V_{imp}	Peak impulse voltage withstand with duration less than 10 ms	TBU-PL050-xxx-WH	500	V
		TBU-PL060-xxx-WH	600	
		TBU-PL075-xxx-WH	750	
		TBU-PL085-xxx-WH	850	
V_{rms}	Continuous A.C. RMS voltage	TBU-PL050-xxx-WH	300	V
		TBU-PL060-xxx-WH	350	
		TBU-PL075-xxx-WH	400	
		TBU-PL085-xxx-WH	425	
T_{op}	Operating temperature range		-55 to +125	$^\circ\text{C}$
T_{stg}	Storage temperature range		-65 to +150	$^\circ\text{C}$
T_{jmax}	Maximum Junction Temperature		+125	$^\circ\text{C}$
ESD	HBM ESD Protection per IEC 61000-4-2 on line pads		± 2	kV

Electrical Characteristics (@ $T_A = 25^\circ\text{C}$ 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-PLxxx-100-WH	100	150	200	mA	
		TBU-PLxxx-200-WH	200	300	400		
R_{device}	Series resistance of the TBU® device		40	50	55	Ω	
R_{match}	Package resistance matching of the TBU® device #1 - TBU® device #2			± 0.5	± 1.0	Ω	
t_{block}	Time taken for the device to go into current limiting				1	μs	
I_Q	Current through the triggered TBU® device with 50 Vdc circuit voltage		0.25	0.70	1.50	mA	
I_{ss}	Operating current with $V_{SS} = -50\text{ V}$			100		μA	
V_{reset}	Voltage below which the triggered TBU® device will transition to normal operating state	TBU-PLxxx-100-WH	Forward Mode	12	15	22	V
			Reverse Mode	10	13	20	
		TBU-PLxxx-200-WH	Forward Mode	15	20	25	
			Reverse Mode	12	17	22	
V_{to}	Voltage threshold offset with 60 Hz applied voltage, with $V_{SS} = -50\text{ V}$ ($V_{SS} - V_{lineSLIC}$)		-1.0		0.2	V	
V_{SS}	Operating voltage range relative to V_{dd}		-180		-20	V	
$R_{th(j-l)}$	One side junction to package pads - FR4 using minimum recommended pad layout			110		$^\circ\text{C/W}$	
$R_{th(j-l)}$	Both sides junction to package pads - FR4 using minimum recommended pad layout			65		$^\circ\text{C/W}$	
$R_{th(j-l)}$	One side junction to package pads - FR4 using heat sink on board (6 cm ²) (0.5 in. ²)			70		$^\circ\text{C/W}$	
$R_{th(j-l)}$	Both sides junction to package pads - FR4 using heat sink on board (6 cm ²) (0.5 in. ²)			40		$^\circ\text{C/W}$	



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

*RoHS Directive 2002/95/EC Jan. 27, 2003 including annex and RoHS Recast 2011/65/EU June 8, 2011. 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.

TBU-PL Series - TBU® High-Speed Protectors

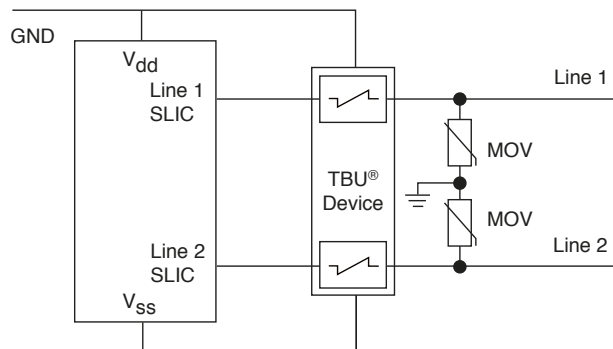
BOURNS®

Environmental Characteristics

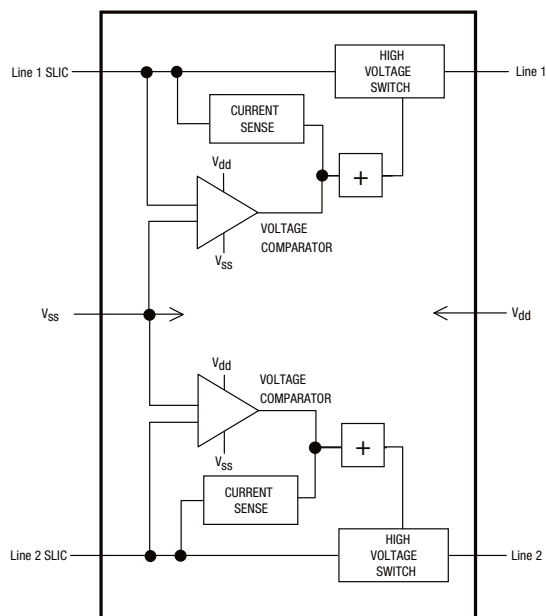
Parameter	Value
Moisture Sensitivity Level	1
ESD Classification (HBM)	1B

Reference Application

The TBU-PL Series are high-speed protectors used in voice/VoIP SLIC applications. The maximum voltage rating of the TBU® device should never be exceeded. Where necessary, an OVP device 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. If EN55024 EMC compliance is required, the TBU® device may require capacitors to be fitted between the Tip and Ring connections and ground.



Functional Block Diagram



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.

When the voltage on the SLIC output is driven below ($V_{bat} - V_{TO}$) the TBU-PL series device switches to the blocking state, regardless of output current in the device.

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.

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.

TBU-PL Series - TBU® High-Speed Protectors

BOURNS®

Bourns® TBU® Device Solutions

Industry Standard	Surge & AC Withstand	TBU® Device P/N	Qty.	OVP Device P/N	Qty.
Telcordia GR-1089-CORE Intra-building Port Type 4	1500 V, 100 A 2/10 μ s 120 V _{rms} , 25 A, 900 s	TBU-PL050-200-WH	1	MOV-07D201K	2
Telcordia GR-1089-CORE Intra-building Port Type 4a	1000 V, 100 A 10/1000 μ s 120 V _{rms} , 25 A, 900 s	TBU-PL060-200-WH	1	MOV-10D201K	2
Non-GR-1089-CORE Intra-building Specifications	5000 V, 500 A 2/10 μ s 230 V _{rms} , 25 A, 900 s	TBU-PL085-200-WH	1	MOV-10D361K	2
	1500 V, 100 A 2/10 μ s 275 V _{rms} , 25 A, 900 s	TBU-PL085-200-WH	1	MOV-10D431K	2
ITU-T Basic K.20, K.21, K.45	4000 V, 40 Ω 10/700 μ s 230 V _{rms} 10 Ω - 1000 Ω , 900 s 600 V _{rms} 600 Ω , 0.2 s	TBU-PL075-200-WH	1	MOV-10D361K	2
	4000 V, 40 Ω 10/700 μ s 230 V rms 10 Ω - 1000 Ω , 900 s 600 V rms 600 Ω , 0.1 s	TBU-PL060-200-WH	1	TISP4400M3BJ	2
ITU-T Enhanced K.20, K.21, K.45	6000 V, 40 Ω 10/700 μ s 240 V _{rms} 10 Ω - 1000 Ω , 900 s 600 V _{rms} 600 Ω , 0.2 s 600 V _{rms} 600 Ω , 1 s* 1500 V _{rms} , 200 Ω , 2 s*	TBU-PL085-200-WH	1	MOV-10D391K	2
	6000 V, 40 Ω 10/700 μ s 240 V _{rms} 10 Ω - 1000 Ω , 900 s 600 V _{rms} 600 Ω , 1 s 1500 V _{rms} , 200 Ω , 2 s	TBU-PL060-200-WH	1	TISP4500H3BJ	2

* GDT Special Test Protector with DC breakdown (DCBD) of less than 330 V.

Notes:

- 1) The MOV maximum continuous rms voltage rating should not be exceeded. The exception is where the data sheet highlights withstand capability such as the 600 V_{rms}, 1 A for 0.2 s, for example.
- 2) If EN55024 EMC compliance is required, the TBU® device may require capacitors to be fitted between the Tip and Ring connections and ground (i.e. in parallel with the MOV device). The capacitance value can be chosen to meet levels as follows:
 - 10 nF for EN55024 Level 1
 - 20 nF for EN55024 Level 2
 - 47 nF for EN55024 Level 3

Selection of capacitor voltage rating depends upon TBU® part number selection. Recommendations include:

- TBU-PL050 & TBU-PL060 Series: 120 VAC, 500 V Peak Surge Rated
- TBU-PL075 & TBU-PL085 Series: 240 VAC, 750 V Peak Surge Rated

Depending upon the SLIC type, it is usually possible to remove any EMI capacitors present between the output of the SLIC and ground when using capacitors C1 and C2 in parallel with the MOVs.

Specifications are subject to change without notice.

Users should verify actual device performance in their specific applications.

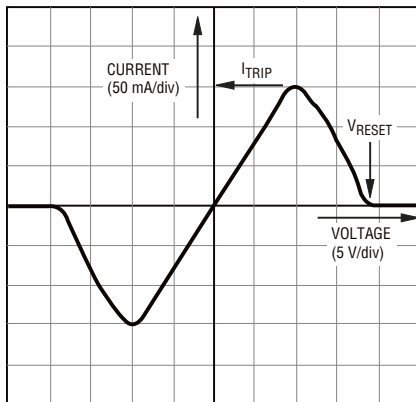
The products described herein and this document are subject to specific legal disclaimers as set forth on the last page of this document, and at www.bourns.com/docs/legal/disclaimer.pdf.

TBU-PL Series - TBU® High-Speed Protectors

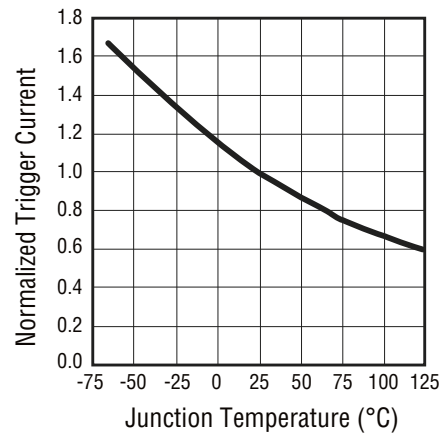
BOURNS®

Performance Graphs

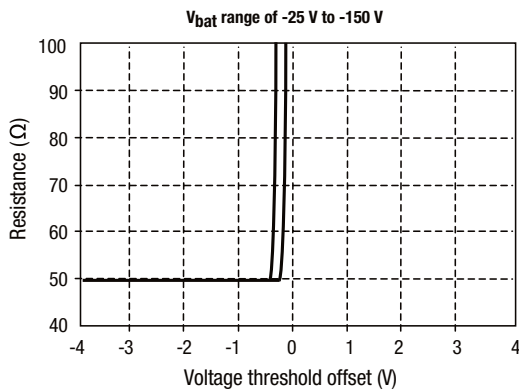
Typical V-I Characteristics (TBU-PL085-200-WH)



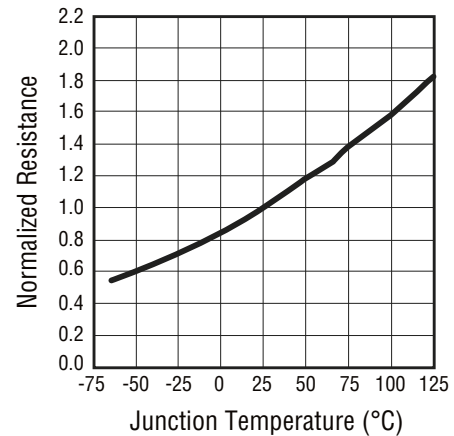
Typical Trigger Current vs. Temperature



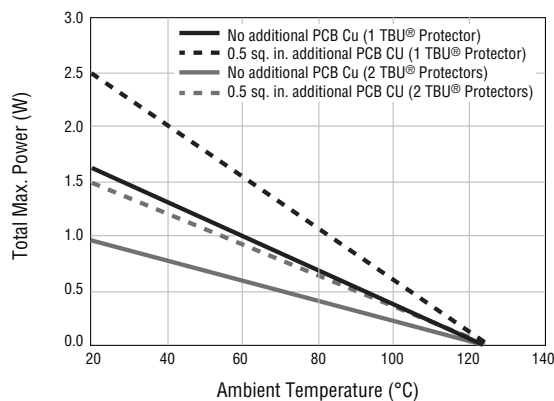
Tracking Voltage Characteristics



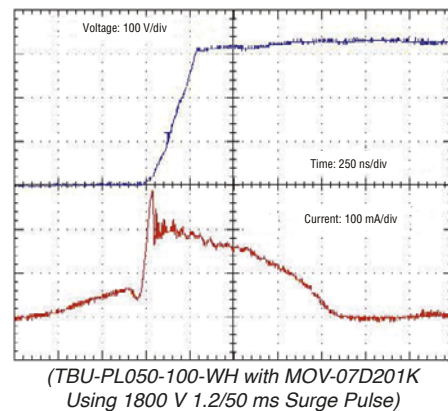
Typical Resistance vs. Temperature



Power Derating Curve



Typical Surge Response

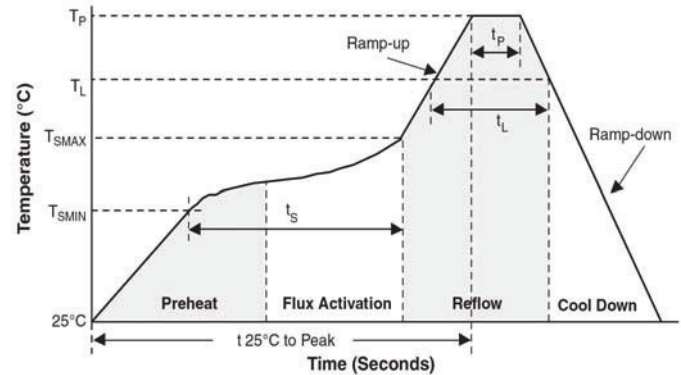


Specifications are subject to change without notice. Users should verify actual device performance in their specific applications. The products described herein and this document are subject to specific legal disclaimers as set forth on the last page of this document, and at www.bourns.com/docs/legal/disclaimer.pdf.

TBU-PL Series - TBU® High-Speed Protectors

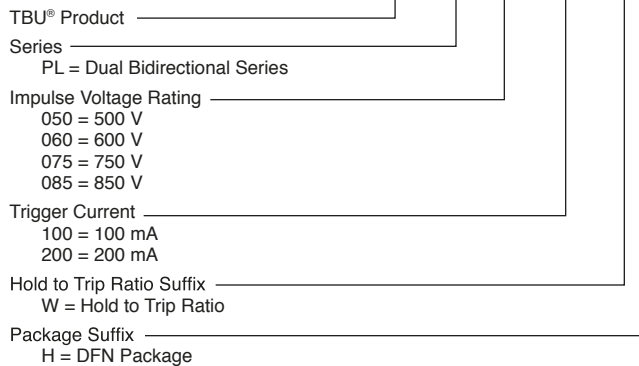
Reflow Profile

Profile Feature	Pb-Free Assembly
Average Ramp-Up Rate (T _{smax} 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.

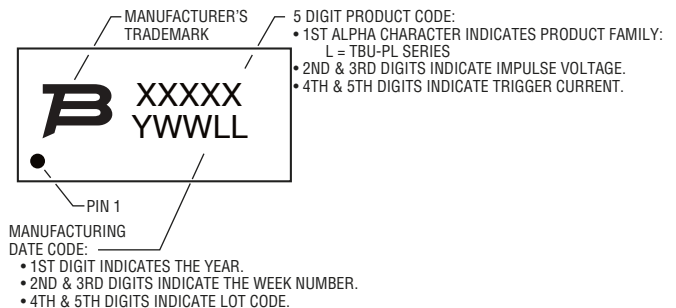


How to Order

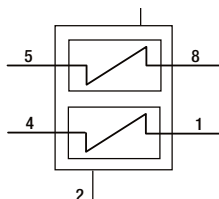
TBU - PL 085 - 100 - WH



Typical Part Marking



Device Pin Out



Pad Designation

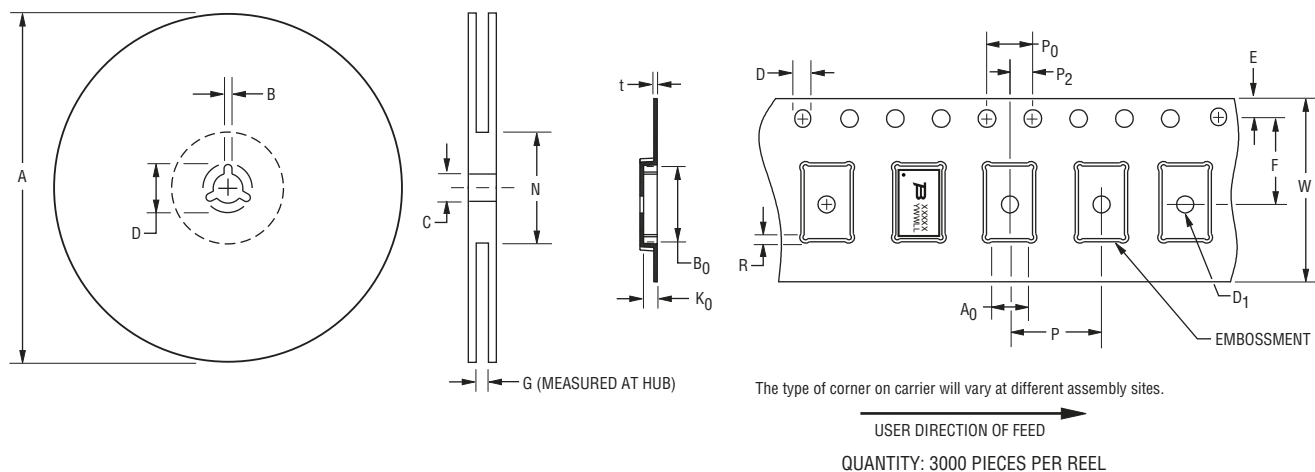
Pad #	Pin Out
1	Line 1
2	V _{dd} (SLIC Ground or 0 V)
3	Not Used
4	Line 1 SLIC

Pad #	Pin Out
5	Line 2 SLIC
6	V _{SS} (SLIC Negative Supply or -V _{bat})
7	Not Used
8	Line 2

TBU-PL Series - TBU® High-Speed Protectors

BOURNS®

Packaging Specifications



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

A0		B0		D		D1		E		F	
Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
$\frac{4.30}{(.169)}$	$\frac{4.50}{(.177)}$	$\frac{6.70}{(.264)}$	$\frac{6.90}{(.272)}$	$\frac{1.5}{(.059)}$	$\frac{1.6}{(.063)}$	$\frac{1.5}{(.059)}$	-	$\frac{1.65}{(.065)}$	$\frac{1.85}{(.073)}$	$\frac{7.4}{(.291)}$	$\frac{7.6}{(.299)}$

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

W	
Min.	Max.
$\frac{15.7}{(.618)}$	$\frac{16.3}{(.642)}$

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

BOURNS®

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

EMEA: Tel: +36 88 520 390 • Email: eurocus@bourns.com

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

www.bourns.com

REV. 03/18

"TBU" is a registered trademark of Bourns, Inc. in the United States and other countries, except Japan. All references to TBU® in this document for use in Japan shall be deemed to be replaced with Bourns® TBU™.

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 types of applications are based on Bourns’ knowledge of typical requirements in generic applications. 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. 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 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., ISO/TS 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. 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 nuclear, lifesaving, life-critical or life-sustaining applications, nor in any other applications where failure or malfunction may result in personal injury, death, or severe property or environmental damage. Unless expressly and specifically approved in writing by two authorized Bourns representatives on a case-by-case basis, use of any Bourns® products in such unauthorized applications might not be safe and thus is at the user’s sole risk. Life-critical applications include devices identified by the U.S. Food and Drug Administration as Class III devices and generally equivalent classifications outside of the United States.

Bourns expressly identifies those Bourns® standard products that are suitable for use in automotive applications on such products’ data sheets in the section entitled “Applications.” Unless expressly and specifically approved in writing by two authorized Bourns representatives on a case-by-case basis, use of any other Bourns® standard products in an automotive application might not be safe and thus is not recommended, authorized or intended and is at the user’s sole risk. If Bourns expressly identifies a sub-category of automotive application in the data sheet for its standard products (such as infotainment or lighting), such identification means that Bourns has reviewed its standard product and has determined that if such Bourns® standard product is considered for potential use in automotive applications, it should only be used in such sub-category of automotive applications. Any reference to Bourns® standard product in the data sheet as compliant with the AEC-Q standard or “automotive grade” does not by itself mean that Bourns has approved such product for use in an automotive application.

Bourns® standard products are not tested to comply with United States Federal Aviation Administration standards generally or any other generally equivalent governmental organization standard applicable to products designed or manufactured for use in aircraft or space applications. Bourns expressly identifies Bourns® standard products that are suitable for use in aircraft or space applications on such products’ data sheets in the section entitled “Applications.” Unless expressly and specifically approved in writing by two authorized Bourns representatives on a case-by-case basis, use of any other Bourns® standard product in an aircraft or space application might not be safe and thus is not recommended, authorized or intended and is at the user’s sole risk.

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.

Users shall not sell, transfer, export or re-export any Bourns® products or technology 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 in any facility which engages in activities relating to such devices. The foregoing restrictions apply to all uses and applications that violate national or international prohibitions, including embargos or international regulations. 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 may not, without prior authorization from Bourns and/or the U.S. Government, be resold, transferred, or re-exported to any party not eligible to receive U.S. commodities, software, and technical data.

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, 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: <http://www.bourns.com/legal/disclaimers-terms-and-policies>

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

Looking for pricing, stock, or lifecycle information?

Click below to explore more details on WIN SOURCE:

 [View TBU-PL085-100-WH on WIN SOURCE](#)

 [Bourns Inc. Information](#)

Optimize Your Supply Chain with WIN SOURCE Solutions

-  Global Sourcing Solution
-  Obsolete Management
-  Cost Control Management
-  Shortage Management
-  Alternative Solution
-  Excess Inventory Management