

ANTREX Electronics

Electronic Components Sourcing Information

Product Reference Information

Part Number:	TBU-RS085-300-WH
Manufacturer:	Bourns Inc.
Package:	7-DFN (8x5.5)
Availability:	Please confirm with sales

Product Page:

<https://antrexco.com/product/details/bourns-inc/tbu-rs085-300-wh.html>

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Contact Information

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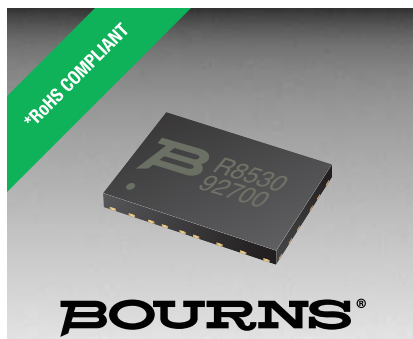
CoC / RoHS / REACH documents available on request

Secure sourcing support for OEM / EMS projects

Note:

This PDF includes an ANTREX product reference cover page.

The original manufacturer datasheet follows from the next page.



Features

- Dual channel protector for RS-485 interfaces
- Aids compliance to IEC 61000-4-2 (ESD), IEC 61000-4-4 (EFT) and IEC 61000-4-5 (Surge) standards
- Fast protection response time (1 μ s)
- RoHS compliant*

Additional Information

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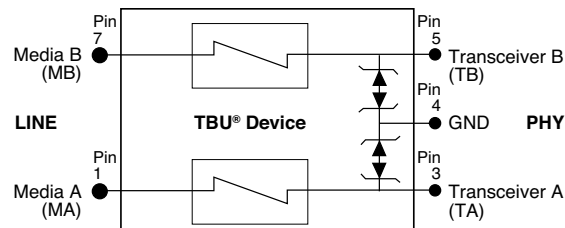
TBU-RSxxx-300-WH - TBU® High-Speed Protector

General Information

Bourns® Model TBU-RSxxx-300-WH Series is an integrated dual channel Transient Blocking Unit (TBU) overcurrent device and TVS overvoltage protector for the RS-485 communications interface. When coupled with an overvoltage protector like the Bourns® GDT [Model 2036-23-SM-RPLF](#) or [2030-42T-SM-RPLF](#) or TISP® Thyristor Surge Protector Model [TISP4350J3BJR-S](#) or [TISP4350H3BJR-S](#), the integrated solution aids compliance to IEC 61000-4-2 (ESD), IEC 61000-4-4 (EFT) and IEC 61000-4-5 (Surge) standards (see Application section). Apart from a reduction in the number of components used, there is also a savings of 52 % in board space when compared to a discrete solution. Check out the latest [RS-485 Evaluation Board Design Note](#) for more information on RS-485 application integration.

The Model TBU-RSxxx-300-WH Series is available in a DFN package and meets industry standards such as RoHS and Pb-free solder reflow profiles.

Functional Block Diagram



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

Symbol	Parameter	Part Number	Value	Unit
V _{imp}	+/- MA to TA or +/- MB to TB; Peak impulse voltage withstand with duration less than 10 ms	TBU-RS055-300-WH TBU-RS085-300-WH	550 850	V
V _{rms}	+/- MA to TA or +/- MB to TB with GND floating; Continuous A.C. RMS voltage	TBU-RS055-300-WH TBU-RS085-300-WH	250 425	V
T _{op}	Operating temperature range		-55 to +125	°C
T _{amax}	Maximum ambient temperature		+125	°C
ESD	ESD protection per IEC 61000-4-2 - Contact discharge		±2	kV
V _{WM}	Maximum working voltage (Line to PHY or reverse)		12 or -7	V

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

Symbol	Pin Configuration	Description	Part Number	Min.	Typ.	Max.	Unit
I _{trigger}	Line to PHY or Reverse	Current required for the device to go from operating state to protected state		300	450	600	mA
V _{reset}		Voltage below which the triggered TBU® device will transition to normal operating state		12	16	20	V
I _Q		Current through the triggered TBU® device with 50 Vdc voltage			0.5		mA
R _{device}		On resistance of the TBU® device	TBU-RS055-300-WH TBU-RS085-300-WH	6 15	10 21.5	14 26	Ω
t _{block}		Time for the device to go from normal operating state to protected state			1		μs
V _{BR}	PHY T _{A/B} to GND or Reverse	Minimum breakdown voltage @ 1 mA		13.3 -7.5			V
I _D		Leakage current @ V _{WM}				1 20	μA
V _c		Maximum clamping voltage @ 1 A				19 -11	V
V _c		Maximum clamping voltage @ 5 A (8/20 pulse)				20 -12	V
V _c		Maximum clamping voltage @ 17 A (8/20 pulse)				26 -14	V
C _D		Typical Junction Capacitance, V _{OSC} = 30 mV, V _{bias} = 0 V, Osc. Frequency = 1 MHz			95		pF



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

*RoHS Directive 2015/863, Mar 31, 2015 and Annex. Specifications are subject to change without notice. Users should verify actual device performance in their specific applications.
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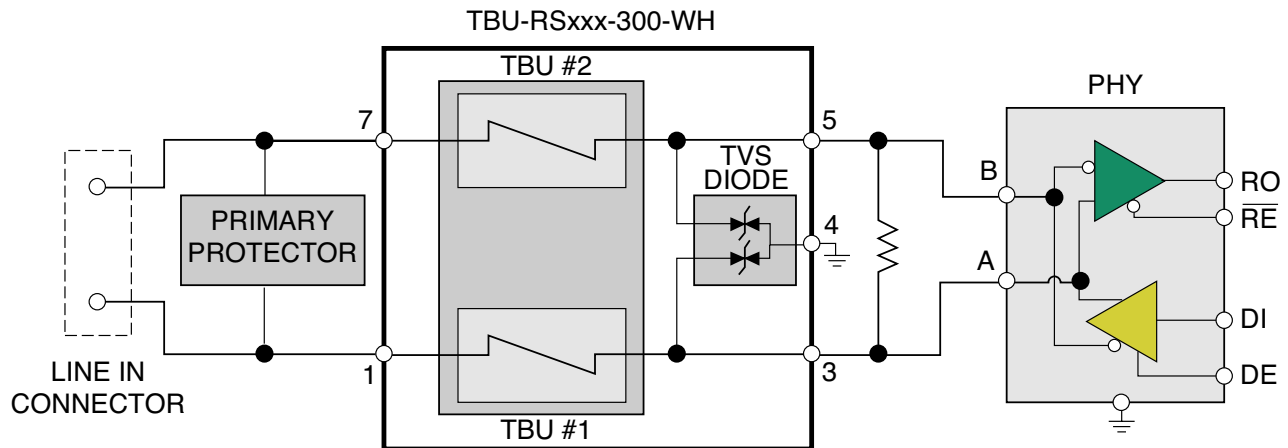
Applications

- RS-485 interface surge protection
- AISG (Antenna Interface Standards Group) modem protection

TBU-RSxxx-300-WH Series - TBU® High-Speed Protector

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Device Description



RS-485 interfaces are popular in industrial and communication applications due to their high immunity to noise. However, RS-485 interface PHYs are subject to damage by threats such as inductive transients, environmental, and lightning surges commonly found in industrial and communication installations. These threats must be taken into consideration in the design stage of the RS-485 link.

Bourns® TBU-RSxxx-300 is a highly integrated and fast RS-485 interface protector that can be used with external overvoltage devices like a GDT or thyristor to deliver IEC 61000-4-5 Class 4 protection. Check out the latest [RS-485 Evaluation Board Design Note](#) for more information on RS-485 application integration.

As shown in the above figure, the device integrates two TBU® HSPs ([click here for more information on TBU® HSPs](#)) and a pair of TVS diodes to provide a total RS-485 interface protection solution in a small footprint.

Device Operation

In normal operation, the TBU-RSxxx-300 device's TBU® HSP exhibits low impedance and the TVS Diode exhibits high impedance which has a minimal impact on circuit operation. When a surge is detected at the RS-485 interface and the surge voltage is above the breakdown voltage (V_{BR}) of the TVS Diode, the device's TVS diode will break down, protecting the RS-485 PHY interface by providing a low impedance path to ground. As the surge current increases above the TBU® HSP's trigger current level ($I_{trigger}$), the TBU® HSP will turn off immediately, thereby blocking the surge energy in less than 1 μ s (typical). During the remainder of the surge, the TBU-RSxxx-300 device remains in the protected blocking state, consuming low quiescent current (I_Q , 0.5 mA).

The device will start its reset process at the end of a surge event; the TBU® HSP will begin the reset process when the voltage across the device drops below the V_{reset} level and will complete the reset process when the signal line returns to its normal operating range.

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Device Operation (Continued)
Protection Against Lightning Surges

To protect against surge levels of 500 V and above (see table below), the TBU-RSxxx-300 will require an external OVP device, also referred to here as “Primary Protector”. The table below outlines how the primary protector, GDT or Thyristor, when used with the TBU-RSxxx-300 device will afford protection of the RS-485 interface device to lightning waveform surges up to 4 kV.

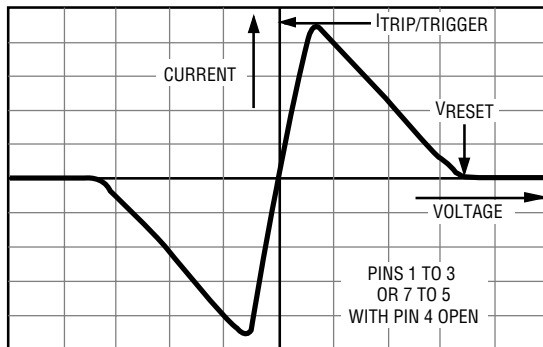
Primary Protectors for TBU-RSxxx-300-WH Series - Passing Combinations

Generator Impedance	Standard	IEC 61000-4-5				
	Class	0	1	2	3	4
	Peak Test	25 V	500 V	1 kV	2 kV	4 kV
Req. = 42 Ω		TBU-RS055-300-WH	TBU-RS055-300-WH	TBU-RS055-300-WH	TBU-RS055-300-WH	TBU-RS085-300-WH
	Primary Protector	None	None	TISP4350H3BJR-S	TISP4350H3BJR-S	TISP4350J3BJR-S
Req. = 12 Ω		TBU-RS055-300-WH	TBU-RS055-300-WH	TBU-RS055-300-WH	TBU-RS055-300-WH	TBU-RS085-300-WH
	Primary Protector	None	TISP4350H3BJR-S	TISP4350H3BJR-S	TISP4350H3BJR-S	TISP4350J3BJR-S
Req. = 2 Ω		TBU-RS055-300-WH	TBU-RS055-300-WH	TBU-RS055-300-WH	TBU-RS085-300-WH	TBU-RS085-300-WH
	Primary Protector	None	TISP4350H3BJR-S	TISP4350J3BJR-S	2036-23-SM-RPLF/ 2030-42T-SM-RPLF	2036-23-SM-RPLF/ 2030-42T-SM-RPLF

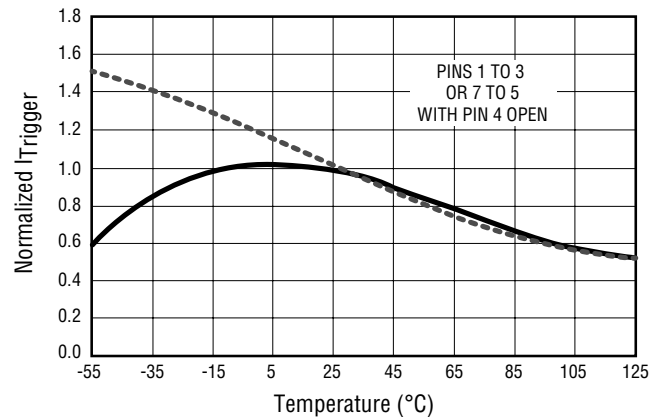
When selecting the Integrated RS-485 interface protector and primary protection components, it is important to be aware of the maximum surge current available. The TISP4350H3BJR can endure 300 A peak and the TISP4350J3BJR can endure 800 A in an 8/20 μs surge. A 1 kV surge can provide 500 A into a 2 ohm load, so the 800 A TISP® device is required. At 4 kV, high voltage and current combine to require the 800 A TISP® device and the 850 V Model TBU-RS085-300. If low impedance exposure to lightning surges is anticipated, the GDT with the 850 V Model TBU-RS085-300 provides the best combination. The GDT takes the current and the 850 V TBU-RS device withstands the GDT let-through voltage.

Performance Graphs

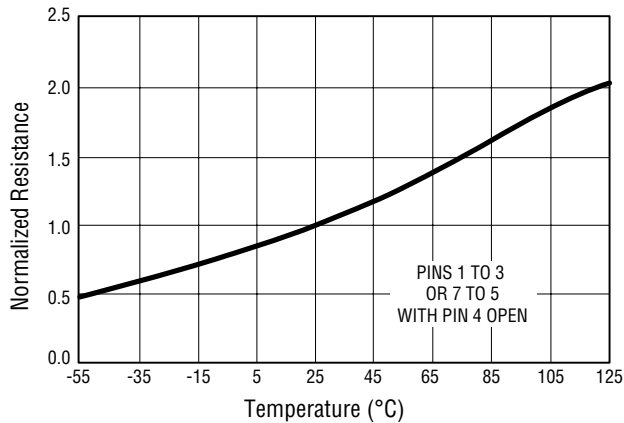
Typical V-I Characteristics



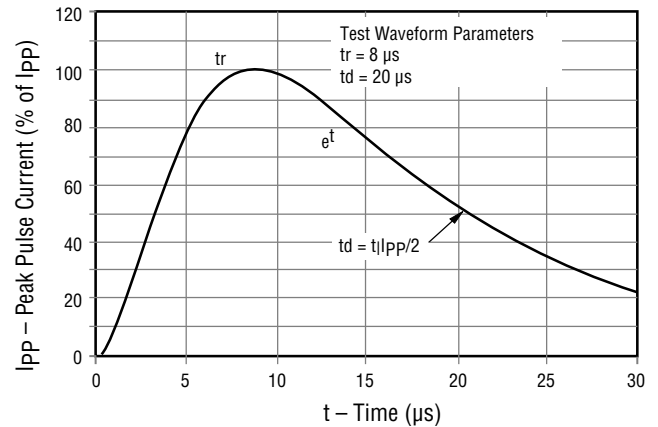
Typical Normalized I_{trigger} vs. Temperature



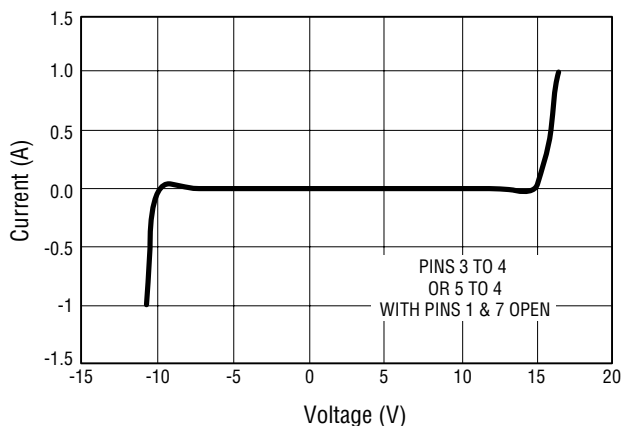
Typical Normalized Resistance vs. Temperature



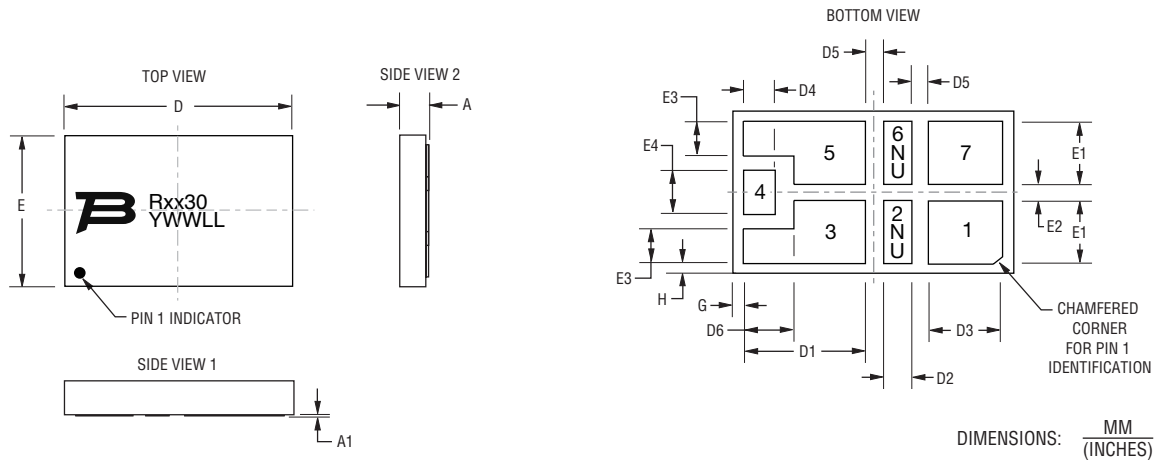
Typical 8/20 μs Pulse Waveform



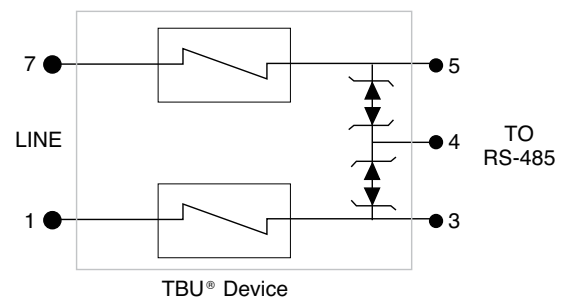
Typical V-I Curve for the Diode



Product Dimensions



Dim.	Min.	Nom.	Max.
A	0.80 (.031)	0.90 (.035)	1.00 (.039)
A1	0.00 (.000)	—	0.50 (.002)
D	8.00 (.315) BSC		
D1	3.45 (.136)	3.50 (.138)	3.55 (.140)
D2	0.75 (.030)	0.80 (.031)	0.85 (.033)
D3	2.05 (.081)	2.10 (.083)	2.15 (.085)
D4	0.85 (.033)	0.90 (.035)	0.95 (.037)
D5	0.45 (.018)	0.50 (.020)	0.55 (.022)
D6	1.35 (.053)	1.40 (.055)	1.45 (.057)
E	5.50 (.217) BSC		
E1	2.15 (.085)	2.20 (.087)	2.25 (.089)
E2	0.45 (.018)	0.50 (.020)	0.55 (.022)
E3	1.15 (.045)	1.20 (.047)	1.25 (.049)
E4	1.45 (.057)	1.50 (.059)	1.55 (.061)
H	0.20 (.008)	0.30 (.012)	0.35 (.014)
G	0.20 (.008)	0.30 (.012)	0.35 (.018)



Pad #	Pin Out
1	Line 1 In
2	Not Used
3	Line 1 Out
4	Ground
5	Line 2 Out
6	Not Used
7	Line 2 In

NOTES:

- Pin 1 Indicator is laser marked; radius and location within the Pin 1 terminal.
Pin 1 dot size: 0.500 ± 0.125 mm / (.020 ± .005 in.).
- Coplanarity on exposed pads shall not exceed 0.08 mm / (.003 in.).
- Warpage shall not exceed 0.10 mm / (.004 in.) on all surfaces.
- Exposed tie bars at package side are not plated.

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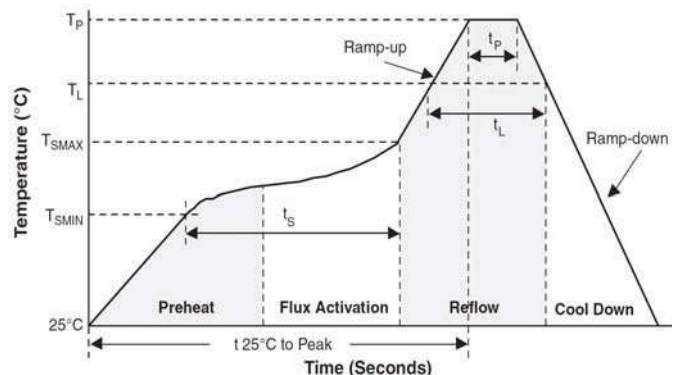
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For minimum parasitic capacitance, it is recommended that signal, ground or power signals are not routed beneath any pad.

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_s (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 t_{25C} to T_p	8 min. max.



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TBU-RSxxx-300-WH Series - TBU® High-Speed Protector

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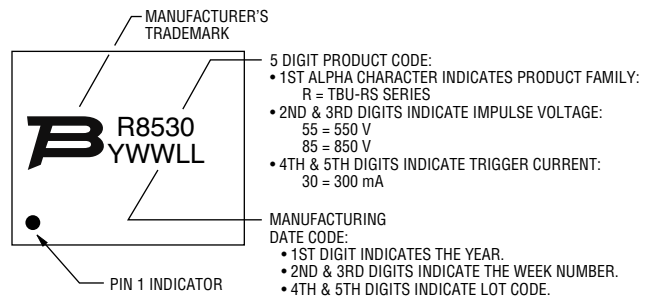
TBU - RS 085 - 300 - WH

TBU® Product _____
Series _____
RS = Dual Unidirectional Model for RS-485 Interfaces
Impulse Voltage Rating _____
055 = 550 V
085 = 850 V
Trigger Current _____
300 = 300 mA
Hold to Trip Ratio Suffix _____
W = Hold to Trip Ratio
Package Suffix _____
H = DFN Package

Environmental Specifications

Moisture Sensitivity Level 1
ESD Classification (HBM) 2

Typical Part Marking



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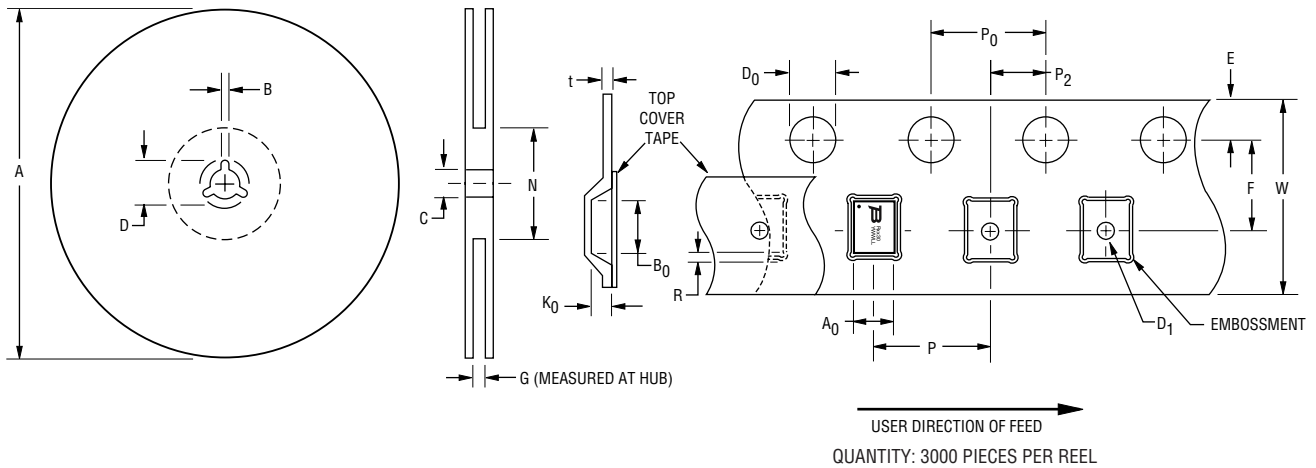
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TBU-RSxxx-300-WH Series - TBU® High-Speed Protector

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Packaging Specifications



A		B		C		D		G	N
Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Ref.	Ref.
328.5 (12.93)	331 (13.05)	2.0 (0.079)	2.4 (0.094)	12.8 (0.504)	13.5 (.531)	17.0 (0.669)	17.4 (0.690)	16.5 (0.650)	100 ± 1.5 (3.94 ± 0.059)

A0		B0		D0		D1		E		F	
Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
5.75 (0.224)	5.95 (0.234)	6.75 (0.266)	6.95 (0.274)	1.5 (0.059)	1.6 (0.063)	1.5 (0.059)	—	1.65 (0.065)	1.85 (0.073)	7.4 (0.291)	7.6 (0.299)
K0		P		P0		P2		R		t	
Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
1.05 (0.041)	1.25 (0.049)	7.9 (0.311)	8.1 (0.319)	3.9 (0.159)	4.1 (0.161)	1.9 (0.075)	2.1 (0.083)	0 (0)	0.5 (.020)	0.25 (0.010)	0.35 (0.014)

W	
Min.	Max.
15.7 (0.618)	16.3 (0.642)

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

BOURNS®

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REV. 12/19/22

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