





## Features

- Compact, space-saving 1210 footprint
- Low profile and symmetrical design
- Small size promotes fast response time to thermal runaway events
- Ultra-low resistance
- RoHS compliant\*
- Agency recognition:  

## Applications

- Thermal protection for USB-C 2.0, 3.0 and 3.1 cables and ports
- Mobile device fast charging port protection

# P-TCO-U Series - Polymeric Thermal Cutoff Device

## Electrical Characteristics

Model	V <sub>max</sub>	I <sub>max</sub>	I <sub>hold</sub>	Thermal Cutoff		Max. Time To Trip		Resistance		Certifications	
	Volts	Amps	at 23 °C	at 3 A	at 2 A	at 23 °C		Ohms at 23 °C		cUL	TÜV
			Amps	°C	°C	Amps	Seconds	R <sub>Min.</sub>	R <sub>1Max.</sub>	E174545	R50405491
P-TCO-U350/12	12	50	3.5	75 ±20	90 ±20	17.0	5.0	0.002	0.022	✓	✓
P-TCO-U400/12	12	50	4.0	80 ±15	95 ±15	20.0	5.0	0.002	0.018	✓	✓
P-TCO-U450/12	12	50	4.5	85 ±15	100 ±10	22.5	2.0	0.002	0.014	✓	✓

## Environmental Characteristics

Operating Temperature.....	-40 °C to +85 °C
Storage Condition	
Before Opening .....	+40 °C max. / 70 % RH max.
After Opening.....	+40 °C max. / 10 % RH max.
Floor Condition After Opening .....	Consumption within 4 weeks at floor condition +30 °C max. / 60 % RH max.
Passive Aging .....	+85 °C, 1000 hours..... ±10 % typical resistance change
Humidity Aging.....	+85 °C, 85 % R.H. 100 hours..... ±15 % typical resistance change
Thermal Shock .....	+85 °C to -40 °C, 20 times..... ±30 % typical resistance change
Solvent Resistance.....	MIL-STD-202, Method 215..... No change (marking still legible)
Vibration .....	MIL-STD-883C, Method 2007.1,..... No change (R <sub>min</sub> <R<R <sub>1max</sub> ) Condition A
Moisture Sensitivity Level (MSL) .....	See Note
ESD Classification - HBM.....	6

## Test Procedures and Requirements

Test	Test Conditions	Accept/Reject Criteria
Visual/Mech.....	Verify dimensions and materials.....	Per MF physical description
Resistance.....	In still air @ 23 °C.....	R <sub>min</sub> ≤ R ≤ R <sub>1max</sub>
Time to Trip.....	At specified current, V <sub>max</sub> , 23 °C.....	T ≤ max. time to trip (seconds)
Hold Current .....	30 min. at I <sub>hold</sub> .....	No trip
Trip Cycle Life.....	V <sub>max</sub> , I <sub>max</sub> , 100 cycles.....	No arcing or burning
Trip Endurance .....	V <sub>max</sub> , 48 hours.....	No arcing or burning
Solderability.....	245 °C ±5 °C, 5 seconds.....	95 % min. coverage



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**WARNING Cancer and Reproductive Harm - [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)**

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

\*\* Bourns considers a product to be "halogen free" if (a) the Bromine (Br) content is 900 ppm or less; (b) the Chlorine (Cl) content is 900 ppm or less; and (c) the total Bromine (Br) and Chlorine (Cl) content is 1500 ppm or less.

Specifications are subject to change without notice.

Users should verify actual device performance in their specific applications.

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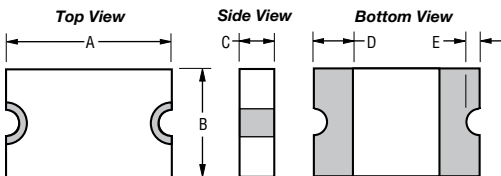
# P-TCO-U Series - Polymeric Thermal Cutoff Device

# BOURNS®

## Product Dimensions

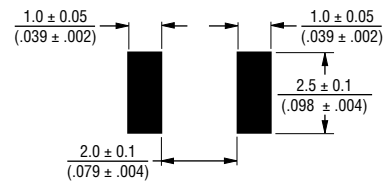
Model	A		B		C		D	E	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Min.	Max.
P-TCO-U350/12	3.00 (0.118)	3.43 (0.135)	2.35 (0.093)	2.80 (0.110)	0.60 (0.024)	1.10 (0.043)	0.25 (0.010)	0.05 (0.002)	0.45 (0.018)
P-TCO-U400/12									
P-TCO-U450/12									

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



Terminal material:  
ENIG-plated terminals

### Recommended Pad Layout



## Packaging Quantity

3500 pcs. per reel

## Thermal Derating Table - I<sub>hold</sub> (Amps)

Model	Ambient Operating Temperature								
	-40 °C	-20 °C	0 °C	23 °C	40 °C	50 °C	60 °C	70 °C	85 °C
P-TCO-U350/12	5.10	4.65	4.13	3.50	2.98	2.65	2.50	2.00	1.75
P-TCO-U400/12	5.80	5.25	4.70	4.00	3.40	3.10	2.80	2.28	2.00
P-TCO-U450/12	6.30	5.65	4.95	4.50	3.83	3.40	2.95	2.50	2.05

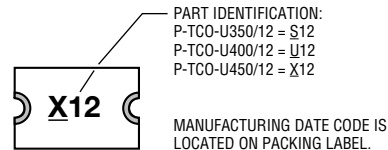
## How to Order

**P-TCO - U 450 / 12 - 2**

Polymeric Thermal Cutoff Device  
 U = 1210 footprint Surface Mount Component  
 Hold Current, I<sub>hold</sub> 350 - 450 (3.50 Amps - 4.50 Amps)  
 Maximum Voltage, V<sub>max</sub> 12 = 12 Volts  
 Packaging -2 = Tape and Reel  
 Packaged per EIA 481

## Typical Part Marking

Represents total content. Layout may vary.



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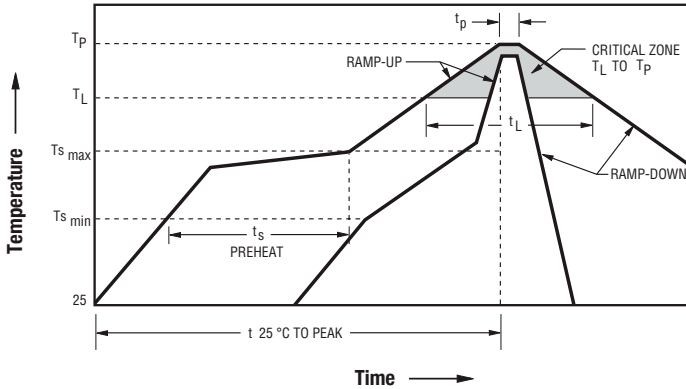
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# P-TCO-U Series - Polymeric Thermal Cutoff Device



## Solder Reflow Recommendations



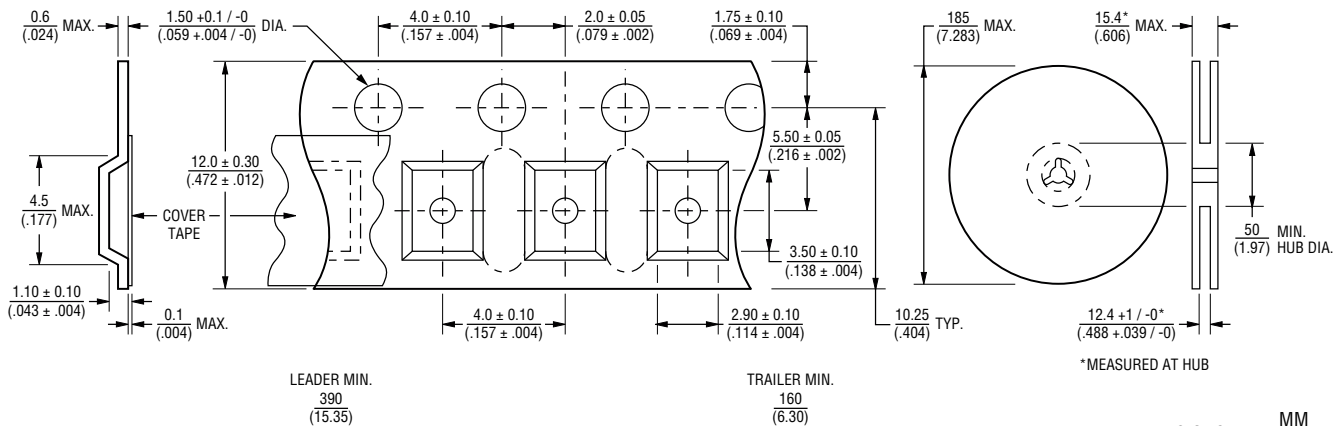
### Notes:

- P-TCO-U models cannot be wave soldered or hand soldered. Please contact Bourns for soldering recommendations.
- All temperatures refer to topside of the package, measured on the package body surface.
- If reflow temperatures exceed the recommended profile, devices may not meet the published specifications.
- Compatible with Pb and Pb-free solder reflow profiles.
- Excess solder may cause a short circuit, especially during hand soldering. Please refer to the Polymeric Thermal Cutoff Soldering Recommendation guidelines.

Profile Feature	Pb-Free Assembly
Average Ramp-Up Rate ( $T_{s_{max}}$ to $T_p$ )	3 °C / second max.
PREHEAT: Temperature Min. ( $T_{s_{min}}$ ) Temperature Max. ( $T_{s_{max}}$ ) Time ( $T_{s_{min}}$ to $T_{s_{max}}$ ) ( $t_s$ )	150 °C 200 °C 60~180 seconds
TIME MAINTAINED ABOVE: Temperature ( $T_L$ ) Time ( $t_L$ )	217 °C 60~150 seconds
Peak Temperature ( $T_p$ )	260 °C
Time within 5 °C of Actual Peak Temperature ( $t_p$ )	20~40 seconds
Ramp-Down Rate	6 °C / second max.
Time 25 °C to Peak Temperature	8 minutes max.

## Packaging Specifications

P-TCO-U Series per EIA 481



P-TCO-U SERIES, REV. A, 02/19

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**Application Notice**

Users are responsible for independent and adequate evaluation of Bourns® Polymeric Thermal Cutoff (P-TCO) devices in the user's application, including the P-TCO device characteristics stated in the applicable data sheet.

- Polymeric Thermal Cutoff devices must not be allowed to operate beyond their stated maximum ratings. Inadequate adherence to such maximum ratings could result in damage to the P-TCO device and lead to electrical arcing and/or fire. Circuits with inductance may generate a voltage above the rated voltage of the P-TCO devices and should be thoroughly evaluated within the user's application during the P-TCO selection and qualification process.
- Polymeric Thermal Cutoff devices are intended to protect against adverse effects of temporary overtemperature conditions and are not intended to serve as protective devices where such conditions are expected to be repetitive or prolonged.
- As a normal function of operation, Polymeric Thermal Cutoff devices experience thermal expansion under fault conditions. Thus, a P-TCO device must be protected against mechanical stress, and must be given adequate clearance within the user's application to accommodate such thermal expansion. Rigid potting materials or fixed housings or coverings that do not provide adequate clearance should be thoroughly examined and tested by the user, and may result in the malfunction of P-TCO devices if the thermal expansion is inhibited.
- Exposure to lubricants, silicon-based oils, solvents, gels, electrolytes, acids, and other related or similar materials may adversely affect the performance of Polymeric Thermal Cutoff devices.
- Aggressive solvents may adversely affect the performance of Polymeric Thermal Cutoff devices. Conformal coating, encapsulating, potting, molding, and sealing materials may contain aggressive solvents including but not limited to xylene and toluene, which are known to cause adverse effects on the performance of P-TCO devices. Such aggressive solvents must be thoroughly cured or baked to ensure complete removal from P-TCO devices to minimize the possible adverse effect on the device.
- Recommended storage conditions should be followed at all times. Such conditions can be found on the applicable data sheet and on the Polymeric Thermal Cutoff Device Moisture/Reflow Sensitivity Classification (MSL) note: [https://www.bourns.com/docs/RoHS-MSL/msl\\_ptco.pdf](https://www.bourns.com/docs/RoHS-MSL/msl_ptco.pdf)

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