

Metal Hybrid PPTC (MHP) Devices Resettable Circuit Protection for High-Rate-Discharge Li-ion Battery Applications

The rapidly expanding market for high-rate-discharge lithium ion (Li-ion) batteries used in applications such as cordless power tools, e-bikes and back-up power supplies has created the need for cost-effective circuit protection devices capable of providing 30A+ hold currents at voltage ratings over 30V_{DC}. To meet this need, a new hybrid device has been developed that connects a bimetal protector in parallel with a PPTC (polymeric positive temperature coefficient) device. The resulting Metal Hybrid PPTC (MHP) device helps provide resettable overcurrent protection while also utilizing the low resistance of the PPTC device to help prevent arcing in the bimetal protector at higher currents.



Benefits:

- Fills market need for battery protection devices rated above 30A and 30V_{DC}
- Provides resettable overcurrent and short circuit protection in Li-ion battery packs
- Helps protect Li-ion cells from damage due to abnormal high currents that could cause heat damage and lead to premature cell end of life and potential field returns
- Arc suppression: Current shunts to the PPTC due to its low resistance helping to suppress arcing all while helping protect the contacts from damage or welding shut
- Double make/double break contact design allows for a high current rating in a smaller device package

Features:

- 30A hold current
- Rated at 36V_{DC}, 100A max.
- Low device resistance (< 2mOhm) compared to other breaker devices
- Able to withstand heavy vibration and impact
- Device allows easy mounting between 18650 cells

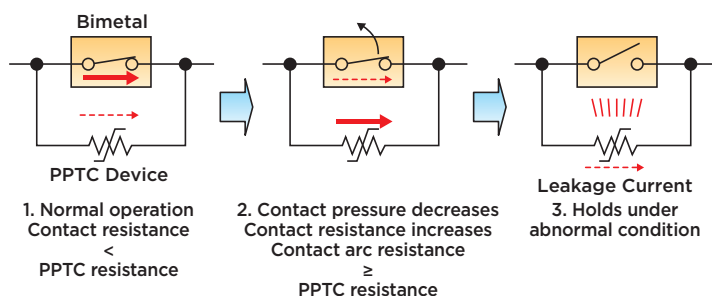
Applications:

- Li-ion battery packs for high-rate-discharge applications
 - Cordless power tools
 - E-bikes
 - Back-up power supplies (UPS)
 - Back-up power for medical devices
- Motor protection

Design Concept

In normal operation, current passes through the bimetal contact due to its low contact resistance. During an abnormal event, such as a power tool rotor lock, higher current is generated in the circuit causing the bimetal contact to open and its contact resistance to increase. At this point, the current shunts to the lower resistance PPTC device which helps prevent arcing between the contacts while also heating the bimetal, keeping it open and in a latched position. This integrated design addresses the need for compact,

resettable overcurrent protection devices capable of arc suppression in high current DC power applications.

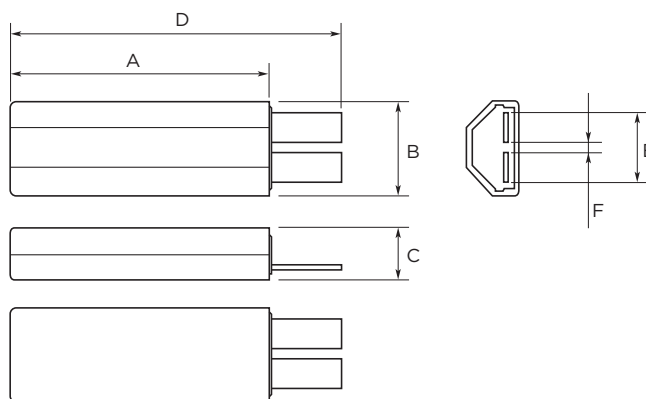


Electrical Characteristics (Typical)

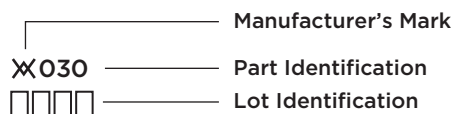
Part Number	Current Trip Limits		Operating Voltage V_{MAX}	Time-to-Trip		R_{Typ} (mOhms)
	I_{HOLD} @25°C	I_{TRIP} @25°C		100A @25°C	60A @25°C	
	(A)	(A)	(V _{DC})	(Seconds)	(Seconds)	
MHP30-36-T	30	50	36	4.5 ±1.5	17 ±10	1.6

Dimensions in Millimeters

	A		B		C		D		E		F	
	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
mm	25.8	26.2	9.2	9.6	5.1	5.5	32.8	33.6	6.8	7.2	0.9	1.1



Marking Information



Rated Trip Cycles

DC16V, 100A (resistive) - 500 cycles
 DC36V, 100A (resistive) - 100 cycles
 (No welding of contacts)

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