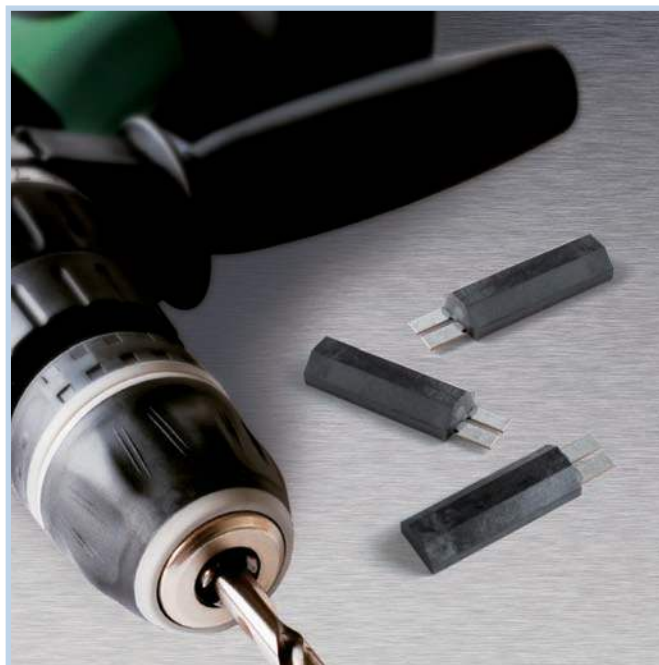




## Metal Hybrid PPTC (MHP) Devices



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<sub>DC</sub>. 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 36V<sub>DC</sub>
- 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

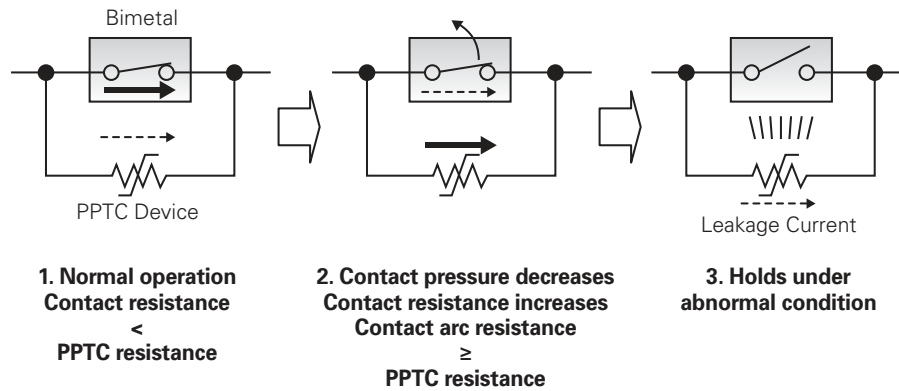
- RoHS compliant
- 30A hold current
- Rated at 36V<sub>DC</sub>, 100A max.
- Low device resistance (< 2mOhm) compared to other breaker devices
- Able to withstand heavy vibration and impact
- Device allows easy mounting between 18650 cells

### 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 for MHP Devices

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.

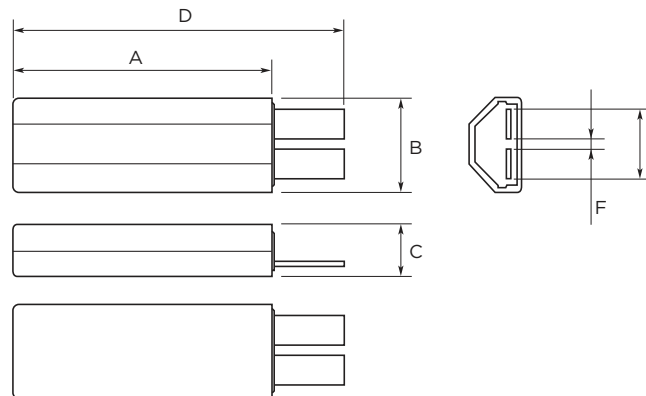


**Table M1 Electrical Characteristics (Typical) for MHP Devices**

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

**Table M2 Dimensions for MHP Devices in Millimeters**

Part Number	A		B		C		D		E		F	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
MHP30-36-T	25.8	26.2	9.2	9.6	5.1	5.5	32.8	33.6	6.8	7.2	0.9	1.1



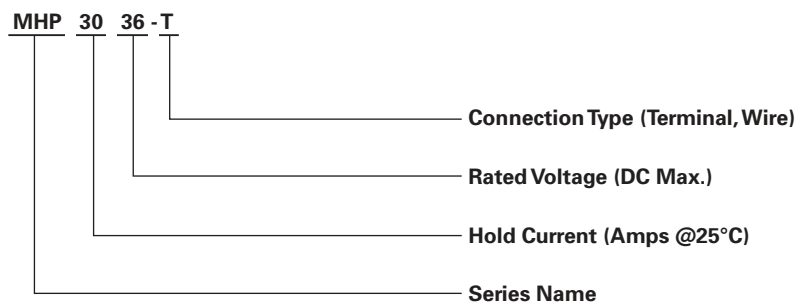
## Rated Trip Cycles for MHP Devices

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

## Agency Recognition for MHP Devices

UL1077 Category QVNU2, File# : E343847

## Part Numbering System for MHP Devices



## Part Marking System for MHP Devices

TE Connectivity — Manufacturer's Name  
 MHP30-36-T — Part Name  
 36V<sub>DC</sub>, 30A, trip @50A — Rated Current and Voltage  
 □□□□□□ — Lot Identification



## Warning :

### • Cautions for storage

Electrical characteristics of this product are not affected by storage under normal environmental conditions. However, terminal electrode weldability and packaging conditions may be impacted by environment. Special attentions should be paid to storage conditions.

Suggested storage temperature (except for packaging material): -20°C min., +60°C max.

The following environments should be avoided for storage:

1. Areas with salt air or with corrosive gas such as Cl<sub>2</sub>, H<sub>2</sub>S, NH<sub>3</sub>, SO<sub>2</sub>, and NO<sub>x</sub>.
2. Areas under direct sunlight.
3. Areas outside of the suggested storage temperature as indicated above.

### • Cautions for Electrical Characteristics

Device electrical characteristics may change depending on installation conditions. Users should independently evaluate the suitability of and test each product selected for their own application.

Especially in the case of high current discharging, the device may be negatively impacted, depending on welding conditions or material of any attached extension terminals. Special attention should be paid to avoid heat being generated around the joint areas or on the extended terminals.

### • Cautions for Rating

1. Power supply voltage must be under the voltage rating. Operation beyond the voltage rating may result in device damage, smoking and flame.
2. Designs must be selected in such a manner that the device hold current is higher than the normal current value in the circuit and that the device trip current is lower than the abnormal current value which may negatively impact the circuit and therefore should be interrupted.
3. This product should not be used in an application where the maximum interrupt current can be exceeded in a short circuit condition.
4. The devices are intended for protection against damage caused by occasional overcurrent or overtemperature fault conditions and should not be used when repeated fault conditions or prolonged trip events are anticipated.
5. The devices may not perform as specified if mechanical pressure is added in the tripped state or under temperature conditions over 100°C.

### • Additional Considerations

It is the responsibility of the user to determine the need for additional or failsafe protection to prevent damage that may occur in the event of abnormal function or failure of the MHP device, particularly in the case of using the device for critical applications where the failure of the product in the application might be reasonably expected to cause the failure or malfunction of the system or device or to affect its safety or effectiveness.

Suggested considerations for additional safety:

1. Provide additional protection circuit and/or protection devices.
2. Avoid redundant circuits.

### • Application Environment

The MHP devices are intended to be used for applications which are common for general electric devices. Usage in special environments or conditions as listed below may adversely impact the device performance and therefore requires users to carefully examine the actual performance and reliability of the device:

1. Environment where the devices are exposed to water, oil, chemical solutions, and/or organic solvents.
2. Installation in an area close to heating point or adjacent or near to inflammable objects, such as plastic wires.
3. Environment in which device is constrained by pressure, sealing or resin coating.
4. Environment where dew condenses on the devices.
5. Environment with salt air or with corrosive gas such as Cl<sub>2</sub>, H<sub>2</sub>S, NH<sub>3</sub>, SO<sub>2</sub>, and NO<sub>x</sub>.
6. Environment with grit and dust and/or under direct sunlight
7. Environment outside of recommended operating temperature: min. -20°C, max. +85°C.