

The Tinker's Toolbox - Talking with Matt Williams of Tyco about Reflowable SMT Protection Devices

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Hosted by Alix Paultre, ECN's Editorial Director, the Tinker's Toolbox is a web-based interview show where we talk about the latest technology, components, and design issues for the electronic design engineering community.



In this episode of the Tinker's Toolbox we talk to Matt Williams of TE Circuit Protection about their latest circuit protection devices. Hybrid PPTC (MHP) technology combines a bimetal protector in parallel with a polymeric positive temperature coefficient (PPTC) device for high-rate-discharge battery applications, and Reflowable Thermal Protection (RTP) technology creates an SMT circuit protector that can mount with as well as alongside the devices it's protecting.

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Here is a link to the product launch presentation: [TE Circuit Protection Presentation](#)

[2]

Here are the product Press Releases



A new hybrid circuit

protection approach, TE Circuit Protection's Metal Hybrid PPTC (MHP) technology combines a bimetal protector in parallel with a polymeric positive temperature coefficient (PPTC) device for high-rate-discharge battery applications at ratings above 30V_{rms}/30A such as cordless power tools, e-bikes and back-up power supplies. . This integrated solution provides resettable overcurrent protection and utilizes the low resistance of the PPTC device to help prevent arcing in the bimetal protector at higher currents, while also heating the bimetal to keep it open and in a latched position.

Due to advances in lithium ion (Li-ion) technology, smaller, lighter weight, and higher power Li-ion batteries can now replace nickel cadmium or lead acid batteries previously used in high-rate-discharge battery applications. This trend has resulted in a rapidly expanding market for high-rate-discharge Li-ion battery applications, which, in turn, has created the need for cost-effective, robust circuit protection devices that help ensure battery safety in end-products.

However, few protection solutions address high-rate-discharge battery applications and traditional circuit protection techniques tend to be large, complex and/or expensive. In response, MHP technology provides a cost-effective,



Reflowable Thermal

Protection (RTP) a breakthrough technology that allows manufacturers to include surface-mountable thermal protection in their standard RoHS-compliant reflow assembly process. Manufacturers can realize significant savings by moving from hand assembly to cost-efficient surface-mount device (SMD) processes. The reflowable RTP can be quickly and easily installed using industry-standard pick-and-place and Pb-free reflow equipment. The RTP device is unique in that it can withstand multiple reflow passes with peak temperatures exceeding well over 200°C and yet, in the field, will open when it detects temperatures above 200°C.

The first device being introduced in the RTP product family, the RTP200R120SA (RTP200) device, helps meet some of the most stringent AECQ-based specification requirements for automotive electronics. The RTP200 device can be used to replace redundant power FETs, relays and heavy heat sinks typically used in automotive designs, while also offering a robust solution for IT server, telecom power supply and other industrial applications. The RTP device helps protect against thermal-runaway damage caused by capacitors, ICs, resistors and other power components that can crack and fail, or from the effects of any type of corrosion-induced heating.

space-saving device that conventional circuit protection approaches are unable to deliver.

The initial product in a planned family of MHP devices, the MHP30-36 device, has a 36V_{DC}/100A maximum rating and a time-to-trip of under five seconds at 100A (at 25 degrees C). The device's hold current is 30A and the initial resistance is under two mOhms.

The MHP30-36 device offers excellent arc suppression characteristics compared to standard breaker devices that must limit the number of switching cycles since arcing between contacts may damage them. The MHP30-36 device can also help reduce the number of discharge FETs and accompanying heat sinks in applications that typically use IC-plus-FET battery protection designs.

"Available in a convenient small form factor, the MHP30-36 device provides a rugged, resettable circuit protection solution that offers battery pack designers and manufacturers a method to optimize space, reduce cost, enhance safety and help meet future battery safety requirements," said Ty Bowman, Global Battery Market Manager.

The MHP device technology can be configured for various applications, and higher voltage (up to 400V_{DC}) and hold current (60A) devices are currently in development. Future design considerations include battery protection in Li-ion battery packs used in e-scooters and light electric vehicles (LEVs), as well as standby-power applications and non-battery applications such as electric motor protection.

For further information or technical assistance, call (800) 227-7040, or visit www.circuitprotection.com/MHP-Launch

The RTP200 device features a low 1.2mOhm (typical) series resistance, as well as high-current DC-interrupt ratings of 200A at 16VDC and 100A at 32VDC. This thermal protection device is used to help meet the reliability requirements of automotive power electronics systems, including ABS, cooling fan and power steering applications. The RTP200 device's 200°C open temperature helps prevent false activations and improves system reliability since it is a value above the normal operating window of most normally functioning electronics, but below the melt-point of typical lead-free solders. As a result, the RTP200 device will not open if surrounding components are operating in their target temperature range, but it will open before a component de-solders and creates the potential risk of additional short circuits.

To allow it to open at 200°C in the field, the RTP device utilizes a one-time electronic activation process to become thermally sensitive. Before activation, it can withstand three Pb-free solder reflow steps without opening. Electronic activation timing is user-determined, and can be implemented to occur automatically at system power up or during system testing.

The device's thermal sensitivity is beneficial since, in some cases, failed power components may not generate a dead short circuit overcurrent condition, but instead may create a resistive short that cannot be opened by a traditional fuse. This type of event may actually reduce load current, but can still result in unsafe thermal runaway conditions. The RTP200 device helps prevent damage caused by both dead short circuit and resistive short circuit conditions.

The RTP200 device is resistant to shock, vibration, temperature cycling and

[3]. To find a sales representative in your area, please go to:

www.circuitprotection.com/contactus.asp

[4].

humidity exposure. It is also tested to meet or exceed some of the strictest automotive AECQ environmental and life testing requirements. To simplify installation, improve system reliability and optimize thermal coupling with the PCB, the reflowable RTP200 device can be installed using standard SMD processes and does not require any special tooling or manual installation. It also helps conserve valuable board space in a cost-effective design.

The Pb-free RTP200 device is also halogen-free, RoHS compliant and allows for conformal coating.

To build upon this new, scalable technology, further product extensions including a 0.6mOhm RTP device will continue to enhance the Tyco Electronics product offering of circuit protection solutions.

For further information or technical assistance, call (800) 227-7040, or visit www.circuitprotection.com/RTP-Launch [5].

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[1] <http://www.ecnmag.com/sites/ecnmag.com/files/legacyfiles/uploadedFiles/ECN/Multimedia/Audio/2011/03/Tyco.mp3>

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