

Advantages of Compact Resettable Overtemperature Protection in Multiple Types of Heater Designs

WHITE PAPER



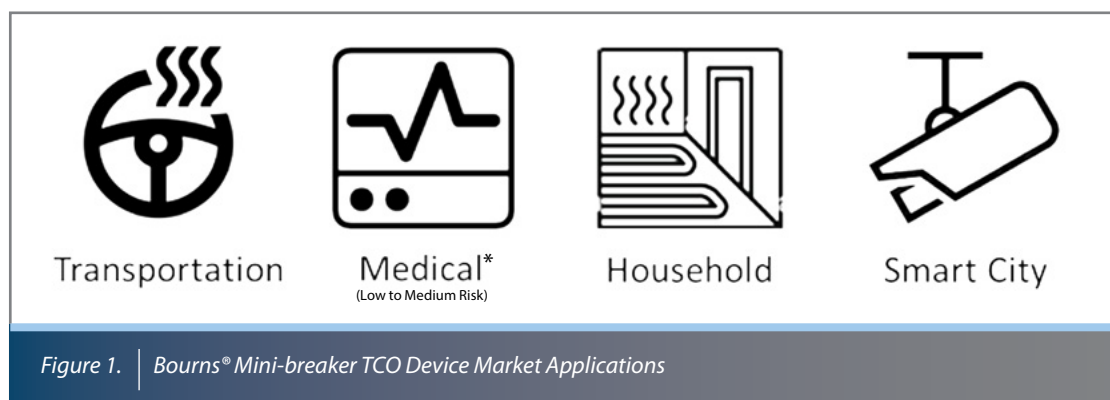
AD Series



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CONSIDERATIONS IN BMS DESIGNS

In the era of electric vehicles, innovative solutions are imperative for maintaining driver and passenger comfort, especially with the absence of an internal combustion engine as a heat source. Electric vehicles rely on alternative heating elements such as foil heaters that use a variety of power electronics-based heating elements and modules. Alternative forms of heaters are not just employed in automotive applications but also in other industries to heat various medical and household equipment as well as in transportation and smart city applications.



CHALLENGES IN HEATING ELEMENTS & HEATER MODULES

Heating elements and modules with power electronic components face potential issues related to overheating. Factors such as electrical overload, thermal runaway, inefficient heat dissipation and environmental factors are known to contribute to the risks associated with surpassing optimal temperature levels. Overheating can lead to damage from fire or smoke, and can compromise the overall safety in the integrated device or system.

INCREASING SAFETY WITH OVERTEMPERATURE PROTECTION

Proven to safeguard batteries in notebooks, PCs, tablets, digital cameras, and smartphones, Bourns® Miniature Thermal Cutoff (TCO) Devices, also called Mini-breakers come into play as an ideal compact solution for overtemperature protection in heaters. Featuring an ultra-small (6.95 x 3.75 x 1.4 mm) footprint, Bourns engineers its resettable mini-breakers to enhance safety in automotive and other types of heating systems.

* Bourns® products have not been designed for and are not intended for use in "lifesaving," "life-critical" or "life-sustaining" applications nor any other applications where failure or malfunction of the Bourns® product may result in personal injury or death. See Legal Disclaimer Notice <http://www.bourns.com/docs/legal/disclaimer.pdf>.

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KEY FEATURES OF BOURNS® MINI-BREAKER DEVICES

The operational characteristics of Bourns® Mini-breakers make them good solutions to protect heaters. These devices mechanically shut off the current by flipping their bimetal disc at a specified trip temperature.

- Constructed with a combination of bimetal & Ceramic Polymer Temperature Coefficient material
- High accuracy and reliability at $\pm 5^\circ\text{C}$
- Extremely low resistance $< 1\text{ m}\Omega$

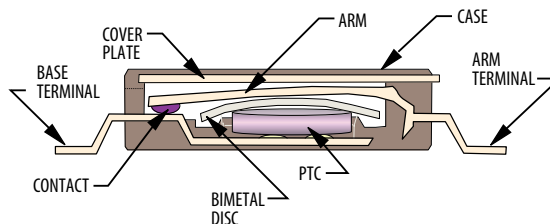


Figure 2. | Construction of Bourns® Mini-breaker TCO Device

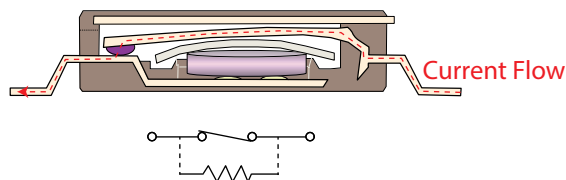


Figure 3. | Miniature TCO Device in the Normally Closed Position

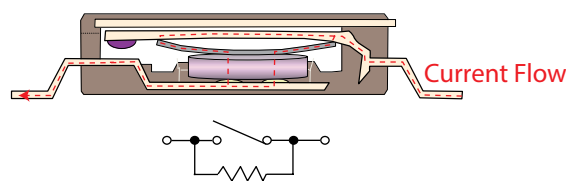


Figure 4. | Mini-breaker Triggered Open

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BOURNS® AUTOMOTIVE GRADE MINI-BREAKERS

The Bourns® Model AD and SD Series Mini-breakers offer features to deliver comprehensive protection against overheating for both heating elements and heating modules in a variety of power electronics. Automotive grade and compliant to AEC-Q200 equivalent standards, the Model AD and SD Series Mini-breakers create an extra level of temperature monitoring safety and warranty confidence for developers of automotive and other heater applications.

- Trip temperature can be calibrated from 55 °C ~ 150 °C
- Repeatable to 10,000 cycles
- Independent overtemperature protection
- Ultra-compact 6.95 x 3.75 x 1.4 mm footprint
- Automotive grade, AEC-Q200 compliant*

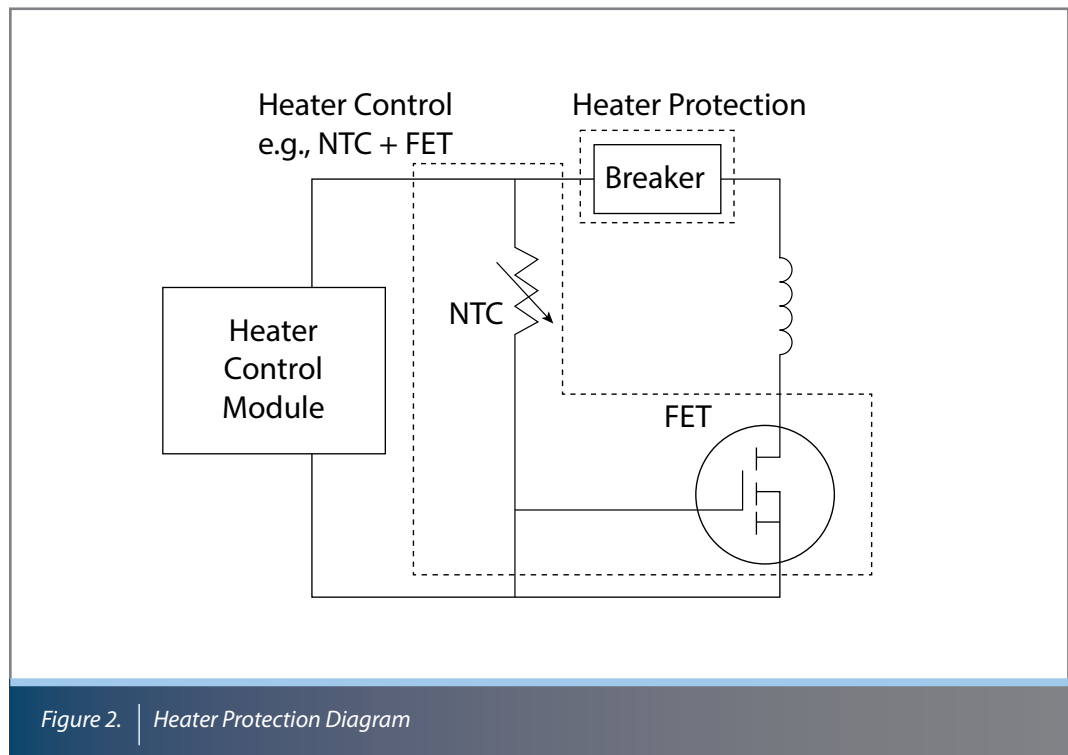


Figure 2. | Heater Protection Diagram

*Tested to Bourns internal AEC-Q200 equivalent standards

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CONCLUSION

Bourns® Mini-breakers help safeguard the expanding range of innovative heating solutions being designed today. Offering a precision, high reliability and compact design, these overtemperature protection solutions enable designers to increase the safety and efficiency of their heating elements and modules in electric vehicles and beyond.

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