APPLICATION BRIEF

Importance of Protecting Automotive Seat and Steering Wheel Heaters from Thermal Runaway

SITUATION

In electric vehicles (EVs) and hybrid electric vehicles (HEVs), designers have had to develop other ways of maintaining internal cabin comfort due to the absence of an internal combustion engine, which traditionally acts as a heat source. Alternative heating solutions such as film heaters are one source that has been employed, providing localized warmth in key areas such as seats and steering wheels.

Unfortunately, there is a risk of a heater exceeding its safe operating temperature. This can lead not only to device damage and reduced lifespan, but can also significantly impact user safety. In addition, heating elements and modules with integrated power electronics face potential issues related to overheating.

Factors such as electrical overload, thermal runaway, and inefficient heat dissipation, as well as environmental factors contribute to the risks associated with surpassing optimal temperature levels. This overheating risk can result in damage, fire hazards, and compromised system safety. To address such risks, advanced and efficient thermal management technologies are essential, especially those that can meet the limited space requirements within EV and HEV designs.

BENEFITS

- **Enhanced Safety:** Effectively protects heating systems from overheating risks, helps increase user safety and aids in preventing damage or fire hazards.
- **Compact Design:** Among the smallest bimetal resettable overtemperature protection devices on the market enable seamless integration into modern automotive systems with space constraints.
- **Long-Term Reliability:** High cycle durability and low resistance assist in maintaining consistent performance over the lifespan of the heating system.
- **Proven Solutions:** Bourns has been a leading developer of miniaturized overtemperature protection solutions for more than 30 years.

SOLUTION

Compact Overtemperature Protection Helps Ensure Safety

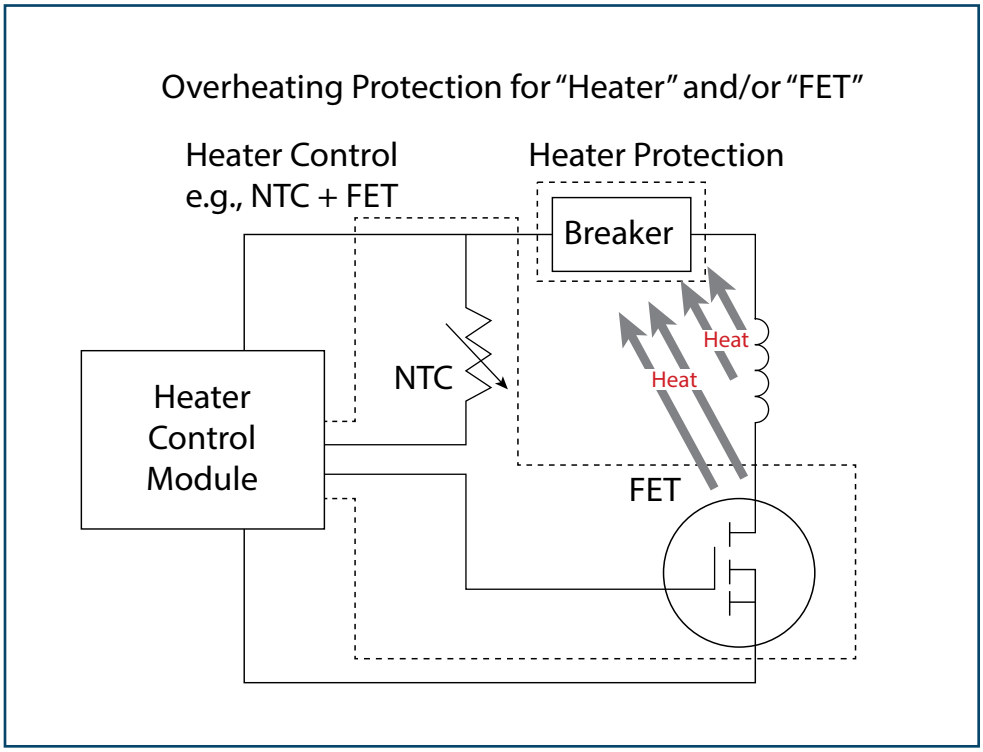
Offering an effective overtemperature protection solution for automotive seat and steering wheel heaters, Bourns® Miniature Thermal Cutoff (TCO) devices, also known as mini-breakers, help enhance safety and comfort in EVs and HEVs. As the smallest bimetal resettable overtemperature protection devices available currently at Bourns, the Model SD and AD Series TCO devices are tested to AEC-Q200 requirements, making them optimal solutions that meet space-constrained vehicle application needs. Their wide trip temperature range is ideally suited for a variety of heater circuits that previously either did not have overtemperature protection or had to use bulky solutions.

Key Model SD and AD Series Features:

Bourns® Model SD and AD Series TCO devices are designed to mechanically shut off the current by flipping a bimetal switch at a specified trip temperature. In the event of overheating or a control malfunction in an EV or HEV heating system, the TCO device activates to interrupt the circuit and protect the heater. It serves as a key overtemperature defense element that contributes to increased heating system safety.

- Compact: Surface mount package with a miniature 6.95 x 3.75 x 1.4 mm footprint
- High temperature accuracy and wide trip temperature range: +55 °C up to +150 °C, ±5 °C
- Reliable performance: Contact rating of 14 VDC / 8 A, with 10,000 cycles
- Extremely low resistance: ~2 mΩ
- AEC-Q200 compliant

HEATER PROTECTION CIRCUIT DIAGRAM



www.bourns.com

Americas: *Tel* +1-951 781-5500
Email americus@bourns.com

EMEA: *Tel* +36 88 885 877
Email eurocus@bourns.com

BOURNS®

Asia-Pacific: *Tel* +886-2 256 241 17
Email asiacus@bourns.com

Mexico: *Tel* +52 614 478 0400
Email mexicus@bourns.com