

A Simple Solution for LED Overtemperature Protection

WHITE PAPER



Bourns® SW Series Mini-breakers

INTRODUCTION

There is a lot to like about LED lighting. With a simple swipe of an app, users can change the ambience of their homes from calming Zen temples to flashing multicolor 1970-style discos. Such fun features are not just limited to our homes. Some of the latest electric vehicles now bring fun LED lighting features to enhance the driving experience. Besides the frivolous, the explosion in LED usage has seen it becoming integral to such diverse uses as hydroponic plant factories and smartphone backlights.

Compared to traditional lighting technologies such as incandescent and fluorescent lamps, LED lighting has a much longer life span, consumes far less energy and offers shock and vibration ruggedness. LEDs also produce very little heat and do not contain the toxic materials of predecessor lighting technologies.

Are there any downsides to LEDs? One issue LEDs have is that they tend to fail when they overheat. The fabled long life of LEDs is very much dependent on them remaining cool or at least not being subjected to heat shock.

Helping LEDs run at cooler temperatures is the key to ensuring product longevity. This white paper explains how the addition of a simple surface mount mini-breaker device can provide independent overtemperature protection for LED circuits. It outlines how mini-breaker devices operate to protect the LED circuit while consuming minimal energy from its resistance levels of less than 5 mΩ.

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PROS AND CONS OF EXISTING OVERTEMPERATURE PROTECTION

There are numerous techniques designers have implemented to protect LED lighting applications. One popular method is with NTC (Negative Temperature Coefficient) thermistors that are used as temperature sensors. This method requires the addition of a component that is needed to calculate and compensate for inherent inaccuracies such as the difference between NTC resistance versus temperature dynamics and response time. Adding FETs and ICs to the design increases the component count and cost.

Thermal fuses have also been commonly used. The downside to this approach is that unless the fuse type is replaceable after it is blown, the board and LEDs will need to be replaced.

A STRAIGHTFORWARD PROTECTION SOLUTION

Complementing its comprehensive line of Mini-breaker Thermal Cutoff (TCO) devices, Bourns has recently released its smallest surface mount overcurrent/overtemperature protection device. The Bourns® Model SW Mini-breaker brings a degree of simplicity to the overtemperature protection of LEDs. These ultra-compact devices are small enough to be mounted in thermal proximity to the LEDs. In addition, this model offers advanced features that make it an ideal LED application protection solution. For example, Model SW70AAB has a tripping value of 70 °C and has been thoroughly tested to trigger within ± 5 °C of the predetermined temperature limit.

The schematic on the next page illustrates how Bourns® Mini-breakers provide overtemperature protection. It indicates how the power will be cut to the LEDs once the predetermined trip temperature of the LED is reached. Because the Model SW70AAB Mini-breaker has no internal self-holding PTC heater, this device will completely cut the current when tripped. It will then reset once the ambient temperature has cooled to the assigned temperature. This operation occurs instantaneously, and the Mini-breaker is stable with 5 milliohms impedance.

And since Bourns® Mini-breaker devices also offer resettable activation, they enable normal operation to resume almost immediately once the overcurrent or overtemperature condition is removed. Another advantage is that the Bourns® Model SW Mini-breaker is not susceptible to the false trips which may be experienced with a thermal fuse. Furthermore, it does not require a reset circuit or power cycling, nor does it have to be replaced as would be the case with other types of overtemperature protection alternatives. And, in space-constrained LED designs, the extremely small footprint is compact enough to be placed where it can provide the most optimal protection – in direct thermal proximity to the LED.

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A STRAIGHTFORWARD PROTECTION SOLUTION (Continued)

This simple, yet highly effective solution allows designers to select the precise trip temperature they require in their LED systems to ensure the LED system is adequately protected.

Keeping LED lighting cool means that users can bask in their ambience for years and years to come.

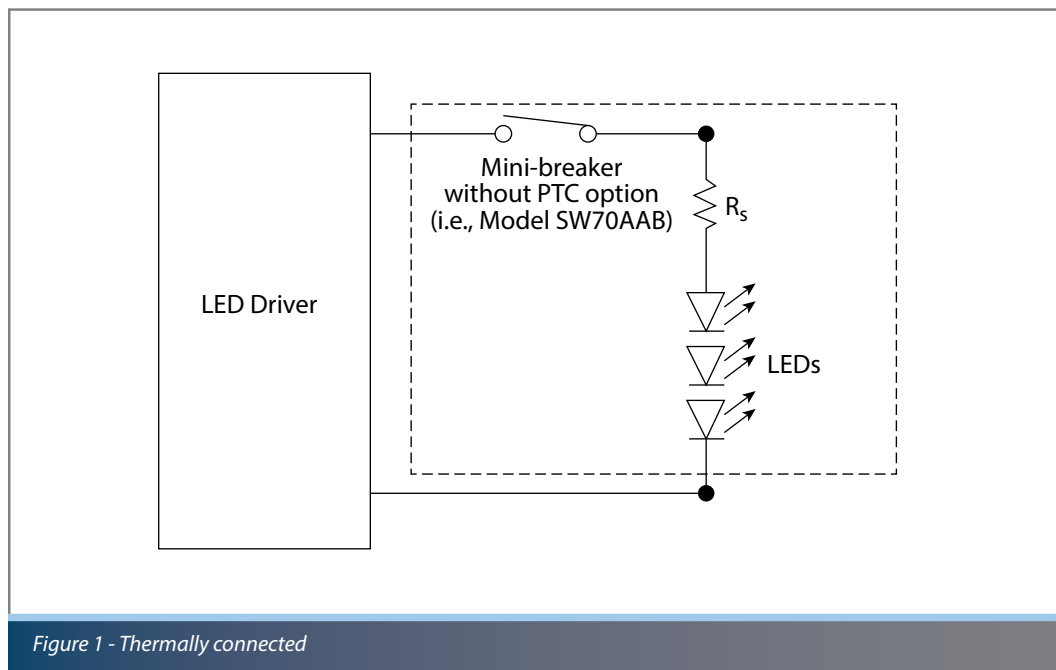


Figure 1 - Thermally connected

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