The right heat in the right place.

CALIENTÉ

HEAT SMARTER WITH SPOT HEATERS FROM CALIENTÉ.

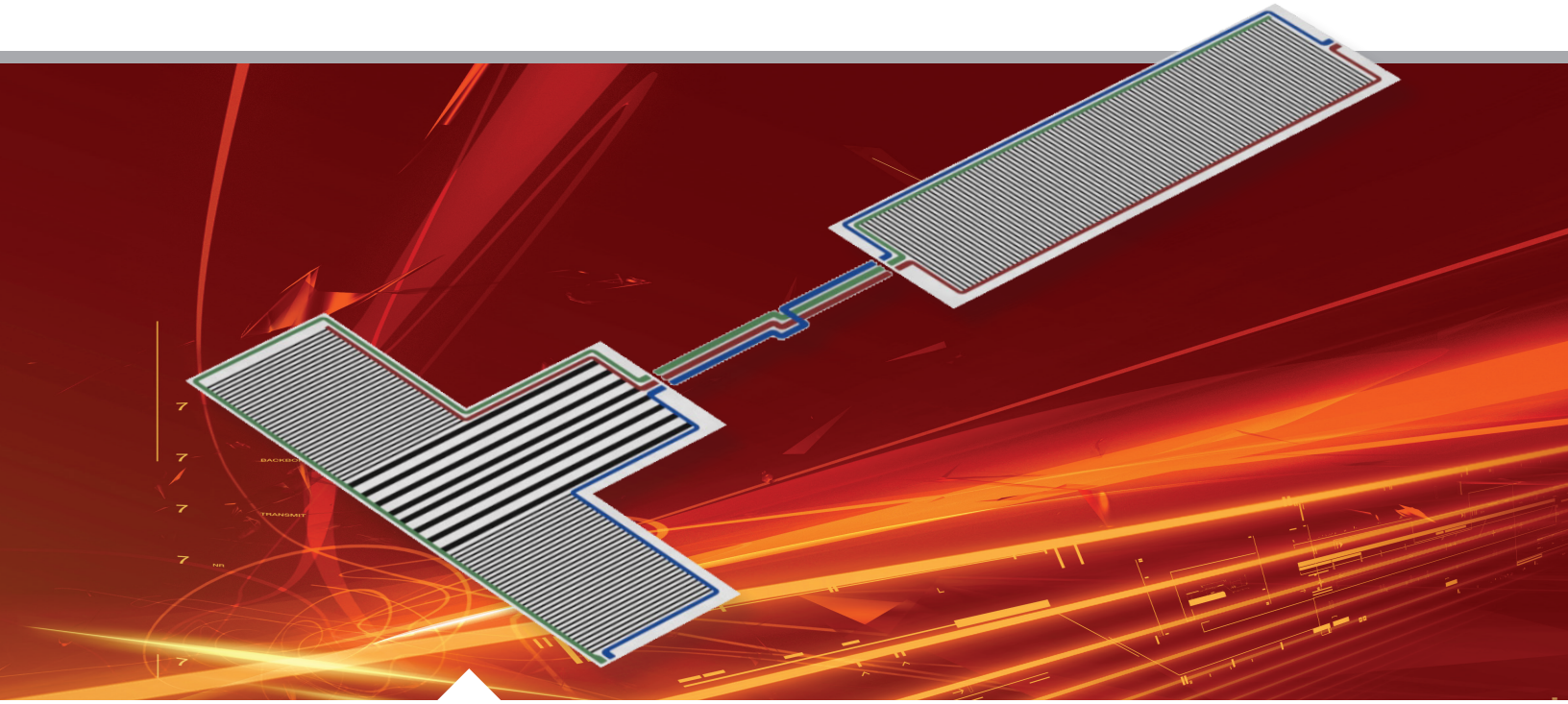
As the electric and hybrid vehicle market has evolved, many have become aware of how critical battery heating is at low temperatures. Issues of slow charging and/or drastically reduced range led Calienté to develop battery heater pads specifically for the electric and hybrid vehicle market.

Calienté EV/HEV battery heater pads can be used to maintain the thermal mass of the batteries at an optimal performance temperature as ambient temperatures drop, and/or to precondition a vehicle for cold weather starting and charging.

There are several advantages to Calienté EV/HEV battery heater pads. The heaters are extremely thin (0.28mm), delivering heat very quickly exactly where it is needed, while minimizing the amount of power needed to do so. The heater pads can be easily adapted to fit existing HVAC infrastructure like cold plates, and cost effectively spread heat out over a wider area, eliminating concerns about touch temperature and hot spots in battery packs.

They are available with fixed resistance/wattage, or with a self-regulating PTC (positive temperature coefficient) feature. Interestingly, this same technology can be used to effectively discharge voltage from the battery as a discharge resistor.

Calienté also offers heater solutions for air and liquid cooled solutions--contact Calienté today for a solution that best fits your EV/HEV application!



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SPOT HEATERS:

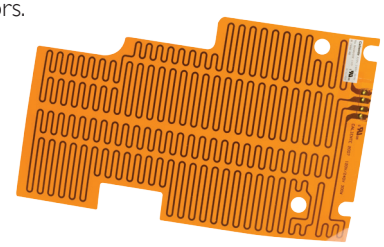
Proven to perform. Thermal imaging and modifications based on your specs allows for design optimization.

Fits your specific apps. Ideal for a variety of usages, including battery, board, display and cold start.

Design assistance. Our designers can assist in your design efforts to build a battery or enclosure heater specifically for your application.

Gets the job done. Available in 105C, 150C, 200C UL ratings.

Quick lead times. Three to four weeks typical, versus months for our competitors.



Design Specifications

Heater Substrate Materials/UL Temp. Ratings

Polyester 105°C/221°F
Polyimide 200°C/392°F
Silicone Rubber 200°C/392°F

Pressure Sensitive Adhesives (PSA)/UL Temp Ratings

Available for mounting at temperatures up to 200°C.

Typical Element Profile/Thickness (with PSA/Adhesive)

Polyester, PVC, Valox, PEN, Polyimide 0.33mm or .013"
Silicone Rubber 1.27mm or .050"

Watt Density Dependent upon three key factors: heat sink and air flow, the maximum operating temperature and the control of the heater. Watt density can range up to 0.8W/cm2 (25W/in2) if the element is controlled sufficiently, or if heat is taken away by air or a heat sink. More typical designs fall at or below 0.3W/cm2 (1OW/in2). With the design flexibility of thick film, watt densities can be varied across an element, precisely concentrating heat.

Thermal Conductivity Materials are chosen based on thermal conductivity/ resistance to provide a hybrid effect for high energy efficiency. The heaters also operate at a cooler temperature due to their low profile, extending the life of the element.

Abrasion, Acid Resistance and Ease of Installation

Elements are designed to provide the appropriate mix of abrasion and acid resistance along with ease of installation based upon the needs of your application.

Pull Strength Pull strength of 20+ pounds is typical, with more robust constructions available for heavier grade applications such as battery heaters.

Size and Dielectric Strength Elements can range from 25.4mm X 25.4mm (1" X 1") to well over 0.6m X 1.83m (24" X 72"). Each element is configured to best match your particular application.

All heaters are 100% tested to the greater of 1500V or the widely accepted standard approval agency recommendation of 2x input voltage + 1000 volts for dielectric integrity.

Flammability and Telecordia GR-487 UL94V-0 rated flammability designs are available. Elements also comply with Telecordia GR-487 specs, including salt fog, chemical and fungus resistance