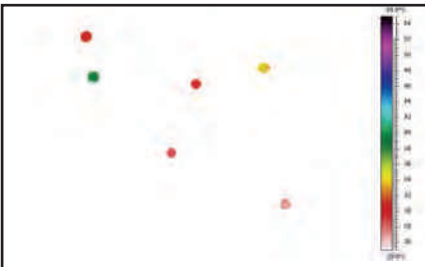


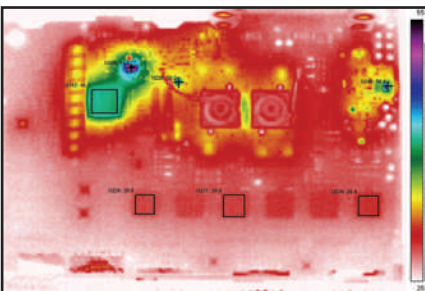
RELIAINT LABS

Accelerated Stress Testing by

Reliant Labs improves product design and manufacturing processes while driving costs down and ensuring customer satisfaction. Using state of the art testing methods to expose latent defects, Reliant Labs effectively determines your products' operating margins and develops solutions that provide measurable results and positive impact to your bottom line.



PCB Observed by Six Thermocouples



PCB Observed by 20,000 Thermocouples

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THERMAL CHARACTERIZATION AND ANALYSIS SERVICE

Smaller, Faster, and More Powerful

As the electronics industry develops smaller, faster, and higher power devices, thermal management becomes increasingly critical. Thermal considerations in high-density, high-performance designs must be managed carefully for optimum performance.

Pitfalls

Higher component and ambient temperatures are known to lower reliability. Placing devices closer together on smaller boards helps decrease system size, lowers cost, and improves electrical performance. However, from a thermal perspective, raising power while reducing size can jeopardize system reliability.

Reliability Testing Yields Results

Reliant Labs provides the resources and expertise required to deliver a comprehensive thermal analysis of your products. Reliant Labs' infrared radiation (IR) thermography scans over 1.2 million non-contact measurements per second. It is no longer necessary to rely on results obtained with only a handful of thermocouples.

FEATURES

- Visualization of the thermal behavior of PCBs.
- Simultaneous, non-contact measurement of temperature at tens of thousands of locations on PCBs.
- Thermal imaging hardware and software convert self-emitted infrared radiation (IR) from electronic devices into accurate temperature measurements. Self-emitting radiation is a property of all objects above absolute zero and does not need to be induced externally.
- Scan over 1.2 million non-contact measurements per second on a PCB.

BENEFITS

- Thermography quickly evaluates your product for hot spots.
- Fault isolation before and after HALT and HASS testing.
- Thermal characterization and engineering assessment.
- Power-on and sequence thermal analysis.
- Verification of thermal design requirements.

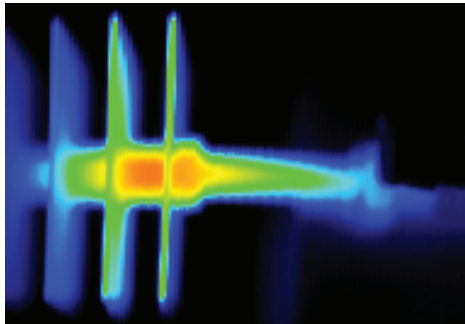
Reliant Labs is an innovative reliability testing laboratory dedicated to partnering with customers to make their products last longer, lower warranty costs, and boost customer satisfaction. Reliant Labs' commitment to unmatched flexibility, responsiveness, and personalized support has helped companies improve their products, manufacturing processes, and profitability since 2002.

Serving engineering and equipment manufacturers with operations in the United States, Mexico, Asia, Europe, and Canada, Reliant Labs offers a wide range of reliability testing services including:

HALT (Highly Accelerated Life Testing)
 HASS (Highly Accelerated Stress Screen Development)
 NTF (No Trouble Found) Verification
 Temperature and Humidity
 Power Supply HALT, HASS, and Comparison Testing

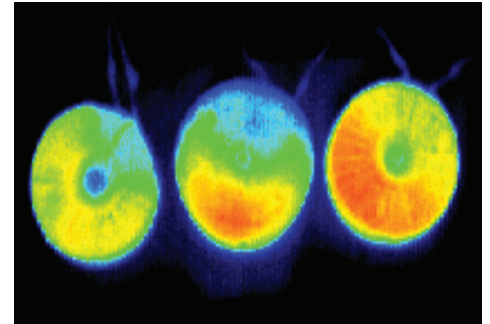
As one of the largest and most successful HALT labs in the world, Reliant Labs quickly and accurately delivers knowledge resources, technical skills, and practical experience along with the most comprehensive test reports in the industry – confidentially, on time, and within budget.

Example 1. RF Load Thermal Profile



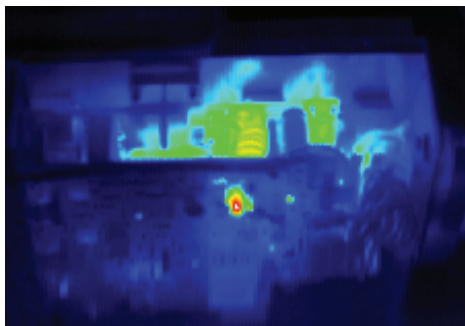
- **Objective:** Evaluation of mechanical cooling and structure effectiveness.
- **Observation:** Heat sink not effectively located/centered over the thermal load.
- **Recommendation:** Based on thermal image data, it was recommended to center the structure over the thermal load.
- **Result:** By centering the structure over the thermal load, all five cooling fins were more effectively utilized and the temperature at the hottest location was reduced by 15°C.

Example 2. High Power Magnetic Assemblies



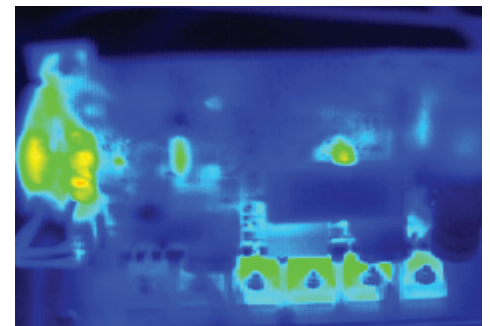
- **Objective:** Evaluate effectiveness of thermal interface materials for toroidal wound inductors.
- **Observation:** Visual indication of temperature gradient indicated ineffective thermal interface medium.
- **Recommendation:** Define flatness specification for assembly documentation. Establish process for application of thermal grease.
- **Result:** Improved flatness and consistent application of thermal grease resulted in lower temperature/higher material operating margins.

Example 3. Power Supply Design Validation



- **Objective:** Capture general thermal images of power supply to collect thermal rise data on all components.
- **Observation:** Design flaw was exposed (unterminated input). Where no power dissipation was expected, significant heat was observed.
- **Recommendation:** Redesign PCB.
- **Result:** Circuit flaw was exposed and corrected.

Example 4. Power Supply Assembly Validation



- **Objective:** Evaluate the integrity of heat sink mounted components.
- **Observation:** Only four of the six power devices mounted to the heat sink were operational (bottom of image).
- **Observation:** Detected inactive components connected in parallel. Incorrect components installed.
- **Recommendation:** Rework assembly.
- **Result:** Assembly (BOM) documentation corrected.

Thermal imaging fault isolation techniques = over 1.2 million non-contact measurements