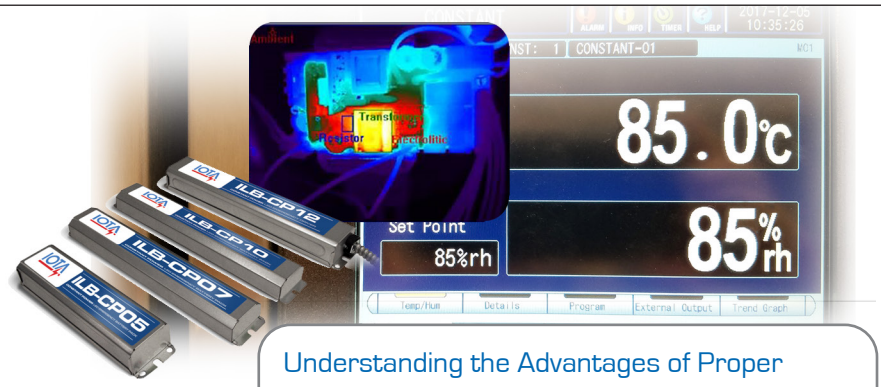
Longer Product Life Through Increased Thermal Performance and Efficiency



Thermal Standards

As a general rule, the life span of electronic equipment is cut in half for every 10°C above normal ambient temperature. The negative affects of increased temperature on electronic components has long been understood, but these affects are not always given proper credence where critical Life Safety lighting systems are concerned. Emergency LED drivers typically reside in a ceiling space removed from controlled climates and are operating within or attached to normal lighting equipment that is generating heat for extended periods. Due to the crucial nature of Life Safety equipment and the exposure to increased temperature levels, it is good practice that emergency lighting systems be designed and manufactured to a higher-than-normal performance standard. For this reason, IOTA's LED emergency drivers are rated for operation in temperatures from 0-55°C rather than the 0-50°C range common for this type of equipment.

IOTA's ability to specify a higher temperature operating range is achieved by understanding the sources of heat (internal and external) inherent in the system. Internally, some consumed power is unavoidably transformed into heat due to inefficiencies in the system. Externally, LED emergency drivers operate in a naturally-high temp environment with components confined in a protective enclosure (per UL requirements.) This makes heat dissipation from within the unit much more difficult. Very little can be done to control the external temperature conditions of the emergency lighting equipment, therefore effectively managing the internal temperature factors is key in designing a viable emergency solution that performs for prolonged life. Ensuring that electrical designs deliver maximum efficiency means less internally-generated heat within the unit itself (in addition to promoting overall energy savings.) To determine overall design efficiency, refer to the unit's input power rating and overall power factor specifications - a lower input rating and higher PF contribute to many circuit improvements, one of which is minimal internal temperature and longer life of the unit. IOTA LED emergency drivers are designed for minimum power consumption with an overall power factor rating of ≥ 0.9 (1.0 being unity power factor.)

Designing for Thermal Performance

During the design and development process, IOTA engineers evaluate product for proper operation and temperature performance. Thermal imaging allows IOTA engineers and technicians to identify temperature ranges at the circuit board level during operation and confirm temperature values are within allowable parameters. Particular attention is given to the electrolytic capacitors and relays which must be the most robust when dealing with the internally-generated heat. Compared to common emergency driver designs under thermal equipment, IOTA emergency LED drivers demonstrate overall lower operating temperatures. It is important to note, however, that thermal imaging takes place at ambient temperature (about 25°C) using an open board design that allows observation of the components during testing. Under 'real life' conditions, actual component temperature will be even higher due to operating in an above-average temp environment and within a

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Understanding the Advantages of Proper Thermal Management:

- For every 10°C above normal operating temperature, the functional life of electronic devices and components is cut in half.
- An emergency LED driver experiences high temperatures both internally and externally and must be properly designed to withstand the negative effects caused by these high-temp conditions.

Below: Temperature readings comparing key components of emergency driver designs (Image 1) during operation. Thermal analysis shows IOTA designs performing at significantly cooler levels than comparable EM driver designs.

Image 1: IOTA ILB-CP10 thermal analysis

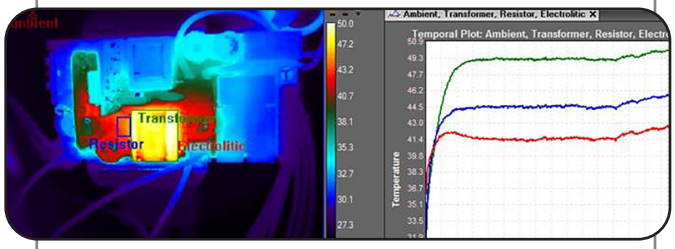
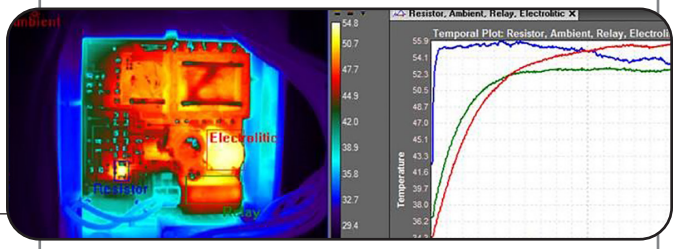


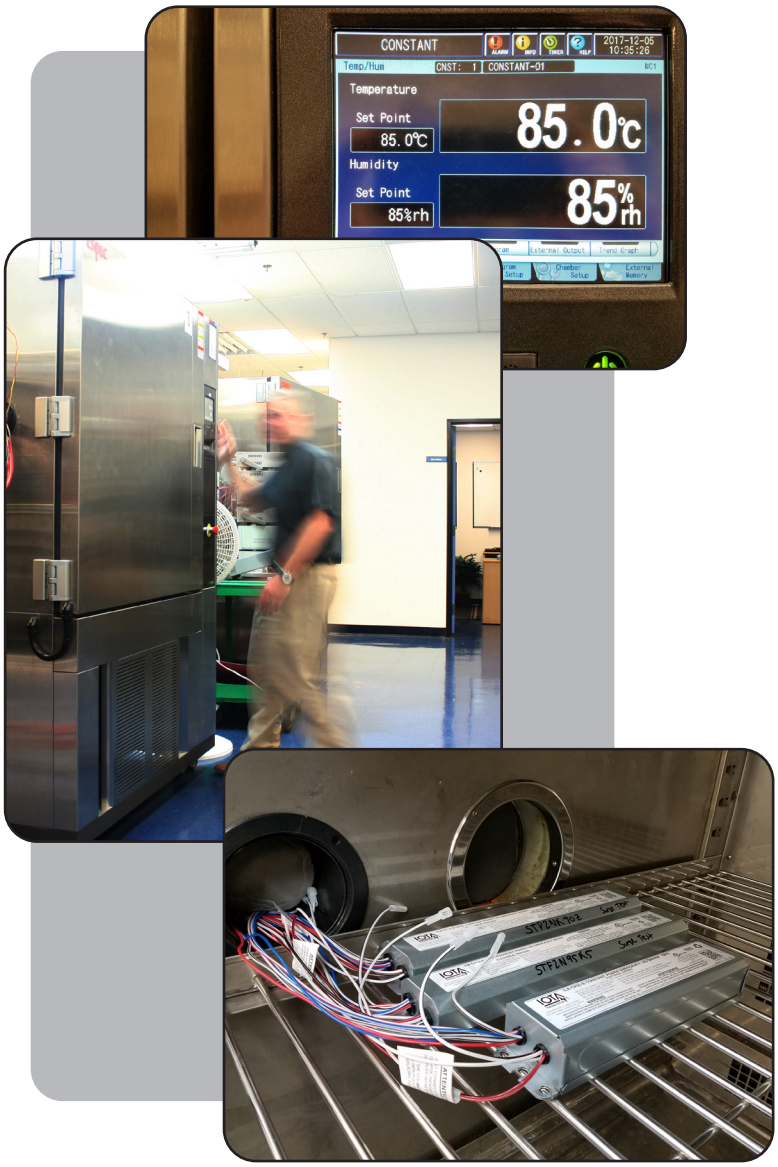
Image 2: Common emergency driver design analysis



Internal increases in emergency driver temperature can be minimized through higher efficiency design, such as:

- Lower power consumption of the emergency driver (Input Watts)
- Higher Power Factor (PF)

Refer to product specifications to ensure operating temperature, input power, and power factor contribute to overall project performance.



Above: ALT equipment in the IOTA labs conduct temperature and humidity testing for design and performance integrity.

fully enclosed casing where internally-generated heat cannot be dissipated as rapidly. Thermal analysis identifies particular components for further testing in IOTA's state-of-the-art Accelerated Life Testing (ALT) chambers. Thermo-couplings are attached to identified components and tested in an enclosed housing to determine actual operating temperatures. This data, in conjunction with component manufacturer specifications, allows the design team to properly select and de-rate circuit board components to ensure optimal life and performance.

IOTA also conducts Accelerated Life Testing on all products at the completed designed level. Using the ALT test chamber equipment, IOTA products are operated under extreme conditions to simulate long-term exposure to temperature and humidity. Fully enclosed products in the ALT test chambers are subjected to an "85/85" test (85°C temperature at 85% humidity) to ensure the design can withstand the rigors of operation in a normal installation. All IOTA product designs must pass the ALT process before continuing to the production phase. By subjecting product designs to more stringent temperature and humidity testing, IOTA is not only able to provide emergency lighting solutions for a wider range of temperature environments, but also guard your emergency lighting from premature failure brought about by continual exposure to higher-than normal ambient temperatures.

For more information on IOTA emergency lighting solutions or our thermal testing process, contact us at 1-800-866-4682 or visit us online at www.iotaengineering.com.