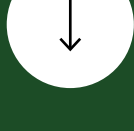


The Importance of Thermal Management for an LED Driver's Operating Lifetime



When an LED driver is doing its job, you never have to think about it. But when something goes wrong, the whole fixture stops working.

Other than surges, the biggest contributor in most LED driver equipment failure is overheating.

That's because the lifetime of an LED driver is directly correlated to the average operating temperature of its electrolytic capacitors. Minimizing the operating temperature of the driver as measured at its Tc (Temperature of the Case) point will increase the lifetime and reliability of the fixture.

Most driver engineers know this, but it's easy to overlook during fixture design – especially when fixture engineers are primarily occupied with determining how to manage the heat generated by the LED module itself.



Here are **some tips** for both fixture engineers and driver engineers **to help ensure the lifetime of your drivers**.

For Fixture Engineers:

01

Choosing the right driver is an essential step in the process. Well-built LED drivers are designed with sound thermal management in mind.

02

The lower the temperature of the driver, the longer it will operate. Look for the Temperature vs. Lifetime curve in the LED driver's specifications.

03

LED drivers have a point on the driver indicated by Tc (Temperature of the Case) as a reference point for LED driver temperature. On Hatch LED drivers, the temperature marked on the Tc point indicates the maximum temperature at which the driver will operate at full specifications.

To design a fixture in a way that helps reduce the temperature of the LED driver, be sure to:

- ✓ Mount the driver in a way that minimizes thermal coupling from the LED module.
- ✓ Incorporate venting strategies that promote adequate natural airflow around the driver.
- ✓ Include thermal breaks such as nylon or rubber washers to separate the driver's heat sink area from other heat sources to help increase thermal isolation of the driver.
- ✓ Double check to make sure you've set the proper driver ratings for wattage, output current, and LED load voltage.

For Driver Engineers

01

Carefully select electrolytic capacitor ratings to make sure that the capacitor lifetime at the specified operating temperature is maximized. Be sure to use circuit design strategies that reduce the ripple current in the capacitors. The ripple current through the capacitor and the temperature on the capacitor are directly related to the lifetime of the capacitor in the circuit.

02

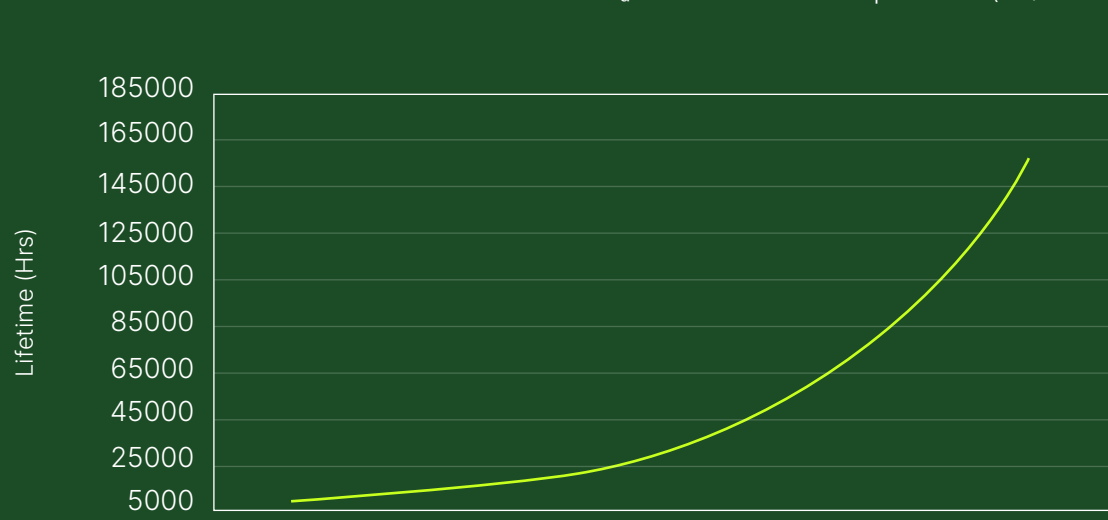
In some instances, you can eliminate electrolytic capacitors by replacing them with high dielectric Y5V ceramic capacitors depending on the capacitance needed. Ceramic capacitors employ a very different type of material and construction: their electrical parameters may provide a suitable alternative for some electrolytic capacitors in a circuit design. Although there may be a cost impact, this simple step removes the electrolytic capacitor from lifetime considerations.

03

Reducing the output current when undergoing thermal stress will help manage the thermal conditions of the driver. Most LED drivers have onboard diagnostic capabilities that include temperature sensing. During development, driver engineers should understand the heat distribution well enough that the temperature on any component (including electrolytic capacitors) can be determined if the temperature on the Tc location is known. Based on that, it's possible to predict – and even control – the electrolytic capacitor temperatures by reducing the output current of the LED driver. In many cases the amount of output current reduction needed to prolong the life of the capacitors may be imperceptible.

$$L = L_0 \times 2^{\left(\frac{T_{max} - T_a}{10}\right)}$$

L : Estimated Life (Hr)
 L₀ : Life at rated temperature (Hr)
 T_{max} : Rated Temperature (°C)
 T_a : Ambient Temperature (°C)



Temperature makes a big difference. Electrolytic capacitor manufacturers specify the design lifetime of capacitors at their maximum rated ambient temperature. But as the above equation shows, that lifetime roughly doubles for each 10°C reduction in temperature. So a capacitor rated at 5,000 hours at 105°C would have a service life of 10,000 hours at 95°C, 20,000 hours at 85°C, and so on.



At Hatch Lighting, we specialize in building reliable, long-lasting custom power supply solutions that solve problems for clients and put customers' minds at ease. Durable thermal management drives every step of our production: from the components we choose to the circuit topology, the manufacturing process, and the size and shape of the driver enclosure.

Our customers trust our quality. Over the past 40 years, we've shipped nearly 50 million units with the Hatch name on them, all of them built to operate well beyond their warranties. We've built our reputation on products that last in the field for years past their guaranteed lifetime.



The Foundation Series is Hatch's new flagship programmable Constant Current LED driver product line. The drivers are programmed by The Foundation Portal, Hatch's cloud-based LED driver application. It makes programming secure, quick, and simple.

Accessible via a Chrome browser from Windows-based PCs or Android devices, the Foundation Portal is always current, no software downloads or updates required.

The Portal provides a modern user experience to enable quick settings for output current and dimming parameters. Programming profiles and sessions are backed up and securely stored on the cloud.

Features

- Programmable Class 2 Output
- High Power Density
- Excellent Thermal Management
- Tri-Dim Capability Most Models (1% for Triac, ELV and 0-10V)
- Dim-to-Off Capability (selected during programming)
- Universal Input Range (120V-277V)
- Dry and Damp Location Rated