

Everline Module Application Note: Linear LED Module Thermal Management

Purpose:

Lifetime of Light Emitting Diodes (LEDs) is reduced when the LED is operated at elevated temperatures. Therefore, it is important to consider thermal management of the LED Module to achieve desired lifetimes, ensure safe operation, and comply with the ULT warranty. The purpose of this application note is to provide guidance for proper thermal management of the linear LED module.

Environment:

Understanding and defining the environment in which the LED Module is to be used is a necessary factor in ensuring good thermal management of a LED module. The maximum ambient temperature for the application must be determined to verify that the LED is maintained at a safe level. However, the average ambient temperature may be considered to more accurately predict LED lifetime.

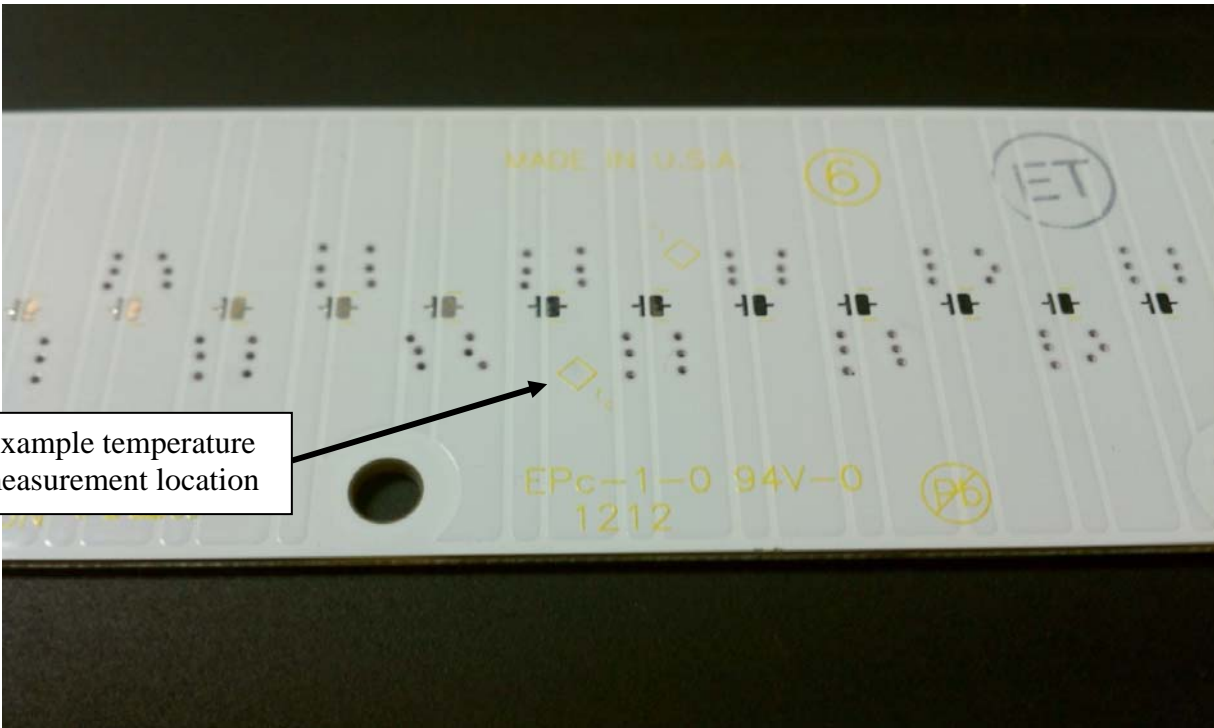
Testing of the fixture should simulate this environment as closely as possible. The thermal environment for the typical application of the linear LED modules does not have guaranteed air movement (or forced convection). Therefore, it is not recommended that testing be performed in a thermal chamber or oven that uses forced convection or has any significant air movement. Also, natural convection requires significant space for the “thermal plume” to form and not restrict natural air movement. The location that the fixture is tested in must have sufficient space around the fixture and be in still air.

Application:

When affixing the module to a fixture it is common practice to utilize a Thermal Interface Material (TIM) to provide good heat transfer between the module and fixture. It is important to consider both the thermal conductivity of the TIM as well as the thickness. The thickness and conformability of the TIM should be sufficient enough to eliminate any air gaps between module and fixture, but not too thick as to greatly increase the distance heat must travel. In less thermally challenged applications a Mylar type electrical barrier may be used in place of the TIM as a more cost effective solution.

Requirement:

ULT has characterized the thermal behavior of the linear LED module and defined a location for standardization of the temperature measurement. The measurement location is located near the center of the module and is marked by a diamond and labeled “ t_c ”.



ULT requires that the temperature of the module at this location be maintained at or below the value outlined in the specification sheet for the module. This requirement was defined to ensure safe operation and stated lifetimes are met.

Measurement:

It is important to follow proper measurement techniques to ensure that the temperature requirement is met. Whether using a thermocouple, thermistor or RTD care should be taken in affixing the temperature probe to the module to ensure an accurate measurement. Ensure that the thermal probe is in intimate contact with the module and not separated by a layer of adhesive or air gap.

A measurement of the ambient temperature should be taken at the same time as the module temperature. The ambient temperature should be recorded near the fixture, but not close enough to be influenced by the heat dissipated by the module.

If the LED module temperature is measured in a location that has a lower ambient temperature than the worst case condition the module temperature can be scaled to estimate what the temperature would be at the higher ambient. This is done by adding the delta in temperature between the worst case ambient and tested ambient to the measured module temperature.

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