The Effect of Local Ambient Air Temperature TC in the Led Driver Design with LEDs

Today, thermal analysis has become a pivotal factor in nearly all modern electronic system designs. The analysis is crucial for system designers to ensure that components don't overheat in a way that affects the components and the overall functionalities of a system. Determining a baseline temperature for their implementations is a critical step in the design process.

Baseline temperature is a principal parameter for thermal analysis, which should be carefully considered in any electronic system design. Subsequently, system and component designers can find other ways to evaluate the ambient temperature of their component of interest and the area encompassing it. This can be achieved through calculations, measurements, modelling, and rule of thumb.

So What Is Local Ambient Air Temperature?

Widely accepted interpretations designers use to estimate the local ambient air temperature include:

- The air temperature inside a system when it is on and running. This reading is generally taken at a distance from the component of interest so that its actual heat doesn't affect the temperature measurements of the air.
- The temperature of the air moving over a component.
- The air temperature driven by fans, usually at the entry or exit of a system.
- Temperature of the air in a room where a system or component is being tested on an evaluation module (EVM).
- The effect of local ambient air temperature in LED driver designs.

The rise in local ambient air temperature affects the longevity of LED systems. Since LEDs are current-driven systems, a surge in the ambient temperature degree can affect the operating temperature of the system and its components.

In order to maintain a sustainable durability of 100,000 hours, the LED system and its components should be redesigned to function within the desired operating temperature range of 35°C to 45°C.

This preferred condition can be achieved by derating the operating current (mA) of the LED design by 0.3 mA, per each degree rise in ambient temperature above its standard average range of 25°C.

For instance, if the ambient temperature increases to 55°C from its preferred range of 25°C, the LED experiences a rise of 30°C in its operating temperature. So, to maintain the LEDs expected longevity, its operating current range should be reduced by 10 mA (70°C – 40°C x 0.3) in order to recompense the rise in local ambient temperature.

On the other hand, if the operating current range is not derated, and the system can operate at an ambient temperature of 55°C, over an operating temperature of 70°C, it will drive 10 mA higher current, leading to overheating of components and decrease in product life cycle.

Ambient temperature is a key factor in LED driver design because its rise can adversely affect the operating temperature of a system. Hence, it is crucially important for designers to precisely determine the ambient temperature in order to ensure an extended lifespan of the LED system.