LUMENERA QUICK START GUIDE

Lumenera Lt16059 / Lt29059 Series Thermal Characteristics and Requirements

A guide to understanding the thermal characteristics of the Lumenera Lt16059 / Lt29059 Series cameras and how to obtain the best performance

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OVERVIEW

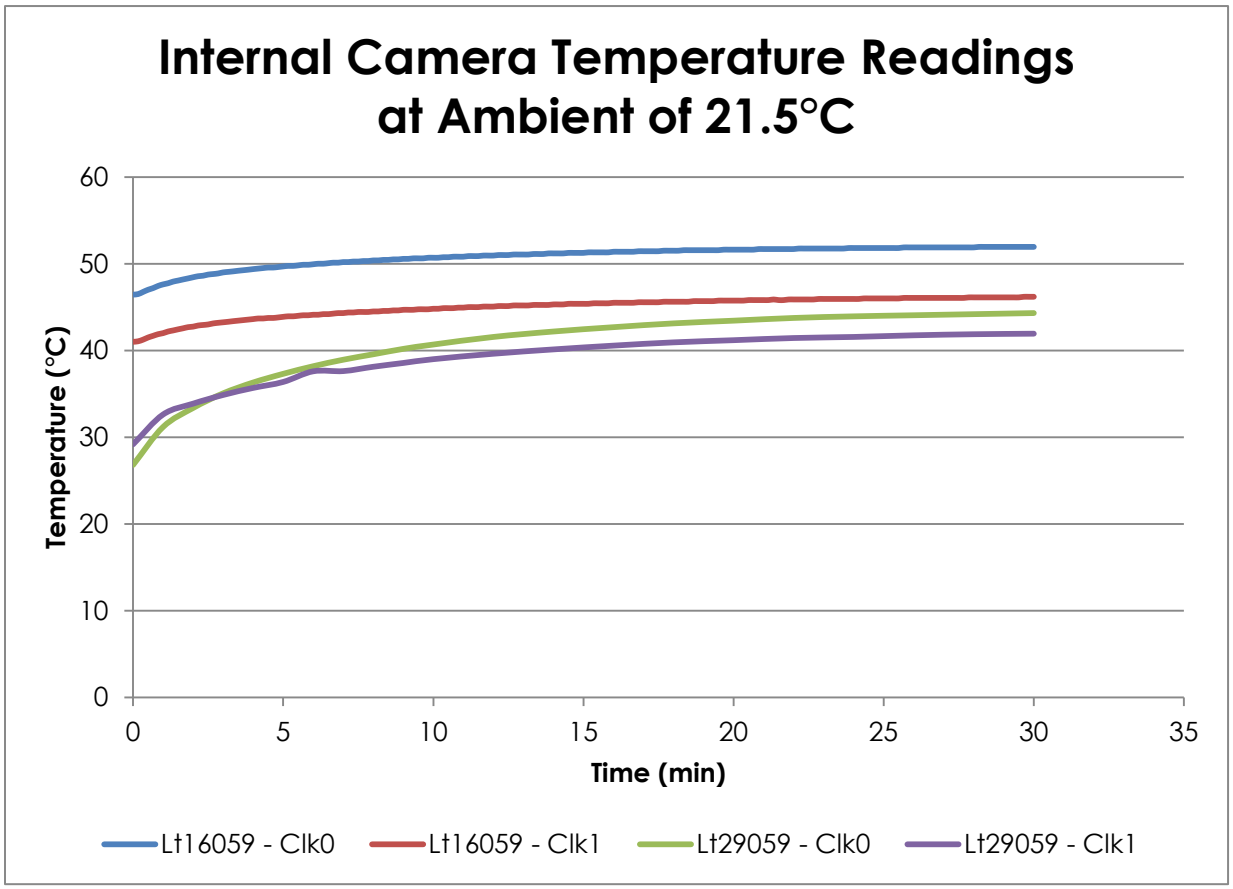
The Lt16059 / Lt29059 Series cameras use CCD sensors from the high-performance KAI-family combined with amplifiers and other circuitry required to read images off the sensor from 4 taps. This combination of technology, along with FPGAs and other components creates considerable heat within the camera housing. High operating temperatures impact the quality of images, thus the use of active and passive cooling techniques can improve operating and imaging performance of this camera. In deployments with very high ambient temperatures (50°C and above), heat sinking or convection cooling is required to avoid the risk of damage due to thermal overload.

Lumenera's Lt16059 / Lt29059 Series camera design heat sinks the imager to the enclosure to aid in the dissipation of heat. The use of air convection or a heatsink attached to the enclosure will reduce the internal temperature of the camera.

TEMPERATURE MEASUREMENTS

Environment at Room Temperature

Running the Lt16059 and the Lt29059 Series cameras at room temperature (21.5°C), the internal temperature of the cameras quickly ramp up to a steady value after approximately 10 minutes. Figure 1 illustrates the internal temperature of each camera at its fastest and second fastest clock speed while in quad-tap mode.



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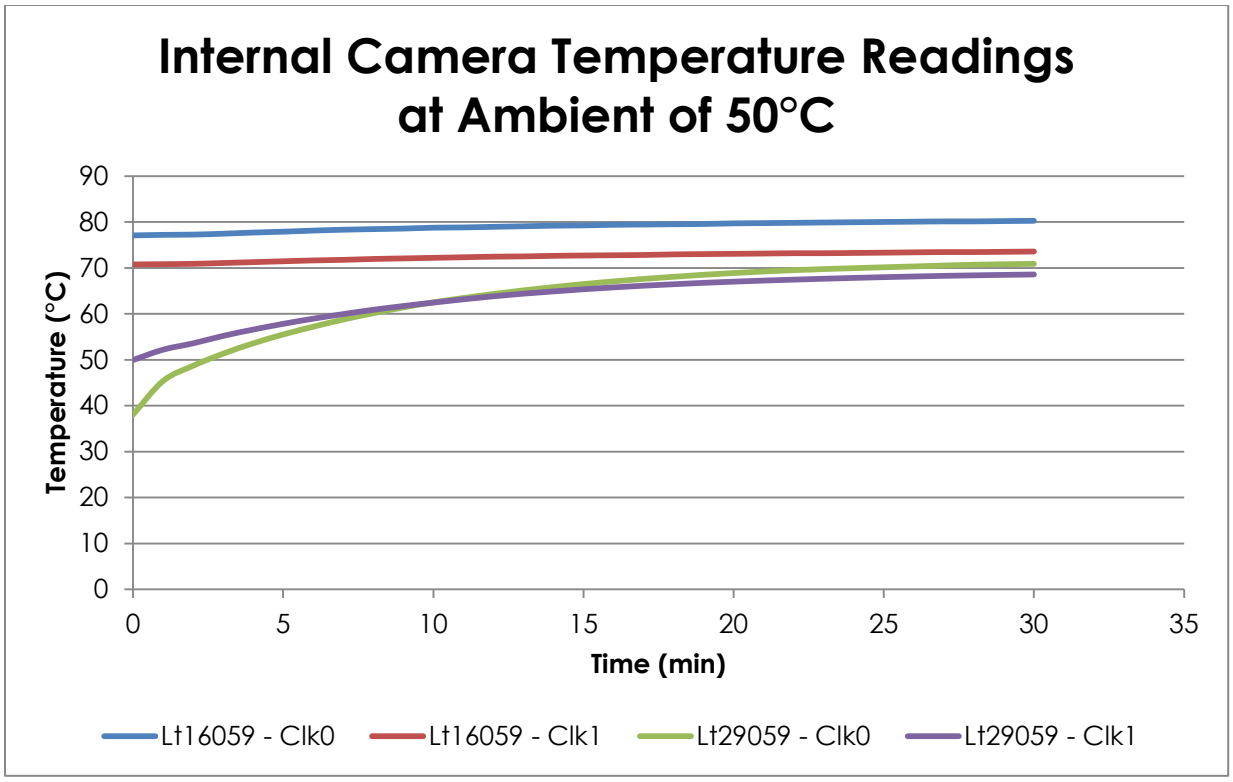
The steady state temperature of the Lt16059 is higher than that of the Lt29059 due to the fact that the Lt16059's sensor is being overclocked to achieve a frame rate of 12 fps for Clk0 and 8 fps for Clk1. At these framerates, it can be expected that the Lt16059 will run hotter than the Lt29059.

Environment at Maximum Operating Temperature (50°C)

When running the Lt16059 and Lt29059 at their maximum operating temperature of 50°C the internal temperature of the camera approaches that of the maximum operating temperature of the image sensor. At these temperatures, image quality can degrade and tap mismatch may become apparent as they are not calibrated at these temperatures.



RECOMMENDATIONS

Using a heat sink can reduce the internal temperature of the camera. When the camera is operating in a room temperature environment, a heat sink is not necessary to comply with warranty conditions as the camera is operating well within normal operating specifications. Adding a heat sink, using external thermoelectric (Peltier) cooling, or using air convection will improve imaging performance by reducing noise in images.

When operating the camera in high temperature environments (i.e. 50°C / 122°F or more), it is strongly recommended that a heat sink, external thermoelectric (Peltier) cooling, and/or air flow across the enclosure be used to reduce the operating temperature of the camera. It is extremely important in cases where the camera will be operating at the fastest frame rate. If the camera is integrated into an enclosure as part of a larger system for applications such as ITS or UAV, then thermal regulation is all the more critical as temperatures can be very high at particular times of

day and in warmer regions of the world. Consider using a solid metal coupling to the enclosure if made of metal to aid with heat dissipation. Fans within the system enclosure can also improve the temperature of the camera, even if not venting directly to the exterior of the enclosure.

Enclosed system with venting to exterior

Enclosed system with air circulation inside system

Enclosed system camera thermal coupling to system metal enclosure

Since each application can be unique in how the camera is integrated and the environments deployed, Lumenera's pre-sales and post-sales team can provide suggestions to improve thermal conditions if required.

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