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Heat Dissipation

The operation of C2 sensors requires sufficient heat dissipation. Due to the small size of the camera housing there is not enough cooling surface to dissipate the thermal power loss generated by the core electronics and sensor chip.

All 3D sensors of the C2-series feature high-speed CMOS sensor chips. A typical property of a CMOS sensor is that it provides best image quality by low temperatures. High temperatures will lead to an increase of dark current, noise and hence to a reduction of signal-to-noise ratio (SNR).

To eliminate these effects it is often sufficient to mount the C2 sensor on a heat conductive material, such as a metal surface. **However if it is not possible to mount the camera on any heat dissipating carrier, then it is necessary to use a heat sink with the recommended specification of AT.**

Temperature Range (Operation/Storage)

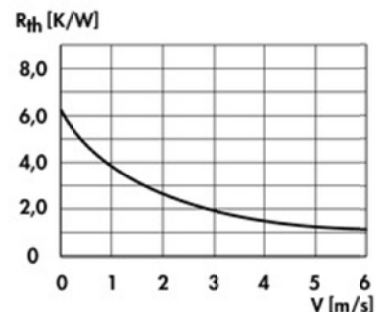
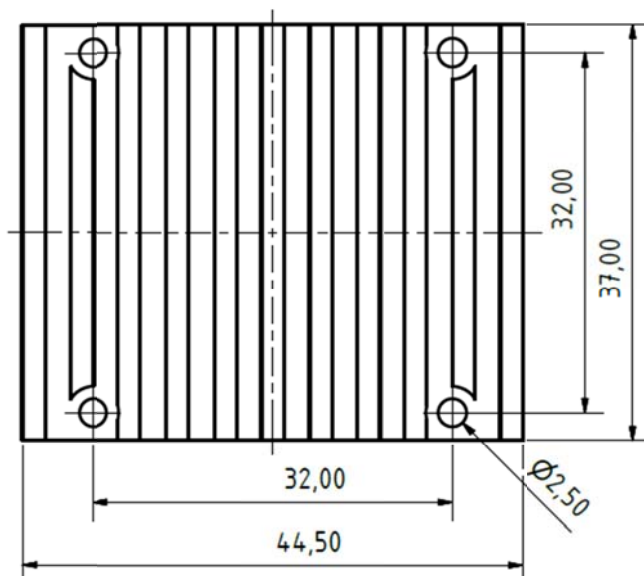
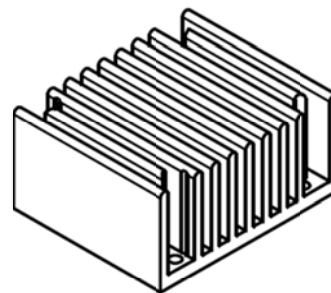
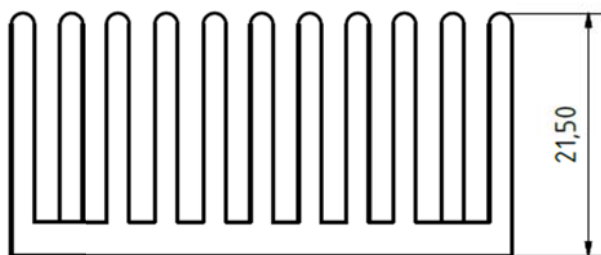
Housing temperature during operation:	0 °C to +50 °C (+32 °F to +122 °F)
Sensor chip temperature (on-board) during operation:	0 °C to +65 °C (+32 °F to +149 °F)
Humidity during operation:	20% to 80%, relative, non-condensing
Storage temperature:	-20 °C to +80 °C (-4 °F to +176 °F)
Storage humidity:	20% to 80%, relative, non-condensing

General Guidelines for Heat Dissipation

- **Mount the 3D sensor to a heat conductive material with an absolute thermal resistance of at least 6 K/W.**
- Always monitor the temperature of the sensor (on-board, available over GenICam) and make sure that the temperature does not exceed 65 °C.
- Keep in mind that dark current and noise performance for CMOS sensor will degrade at higher temperature.
- The 3D sensor of the C2 series will gradually become warmer during the first hour of operation. After one hour of operation, the housing temperature as well as the sensor temperature should be stabilized and no longer increased.

Using the C2 Heat Sink

AT provide a specially designed heat sink to improve the cooling of C2 sensors in applications lacking sufficient thermal dissipation:



Absolute thermal resistance for camera housing: $R_{th} = 5 \text{ [K/W]}$

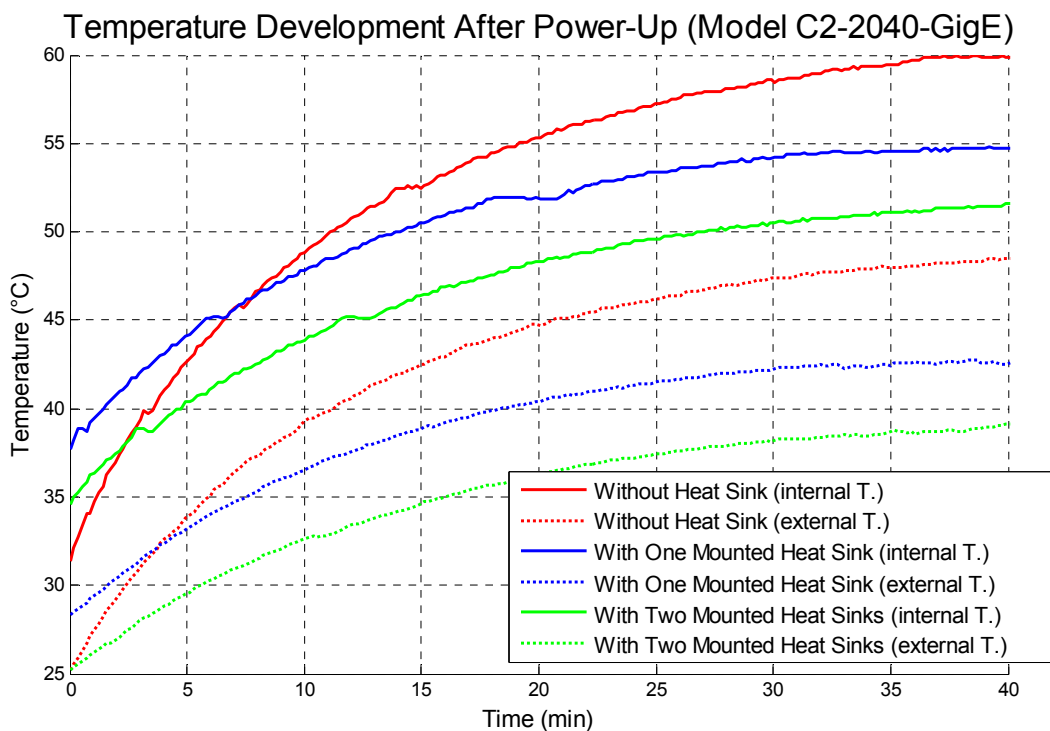
Absolute thermal resistance for heat sink: $R_{th} = 6 \text{ [K/W]}$

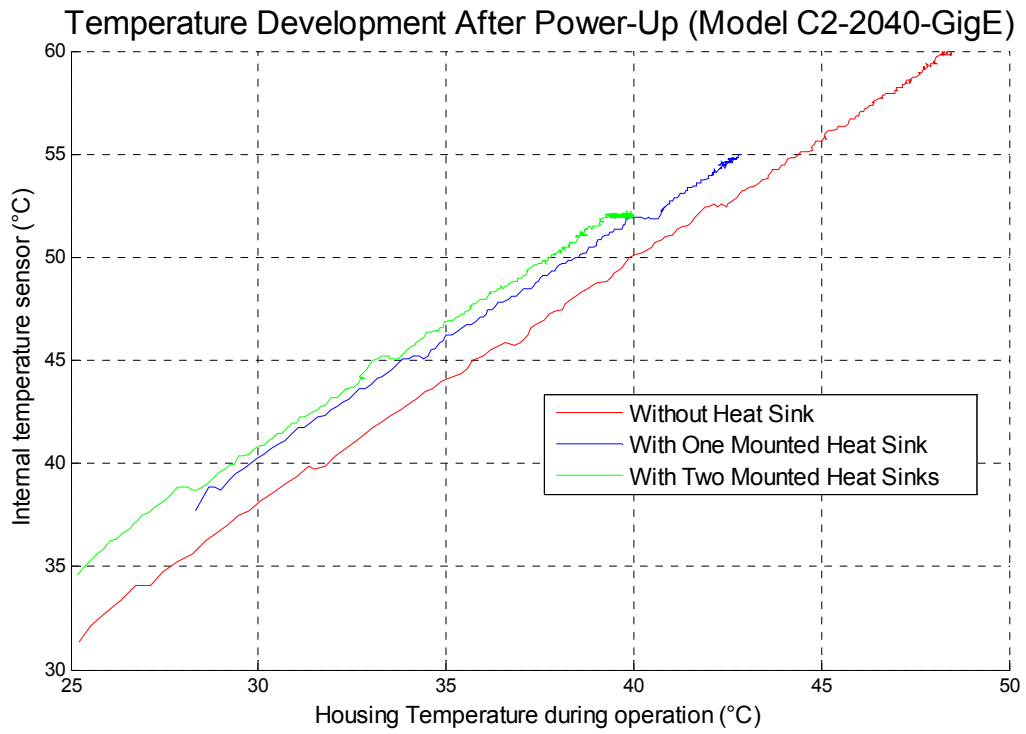
Temperature Development of C2 Series after Power-Up

This section gives information about the temperature development of C2 series after power-up. A total of three temperature measurement cases are shown and compared.

The first case indicates the development of internal temperature and external housing temperature after power-up without any additional mounted heat sink. This case is very seldom, because in most industrial applications the C2 sensor is mounted on a heat conductive carrier (e.g. metal plate), which works as a heat dissipater. The operation of C2 sensor without any metal plate (e.g. during evaluation and/or testing in laboratory environment), requires the mount of a heat sink on the housing.

The other two cases show the temperature development after power-up with one and two mounted heat sinks. In all test cases the ambient temperature was 22°C.



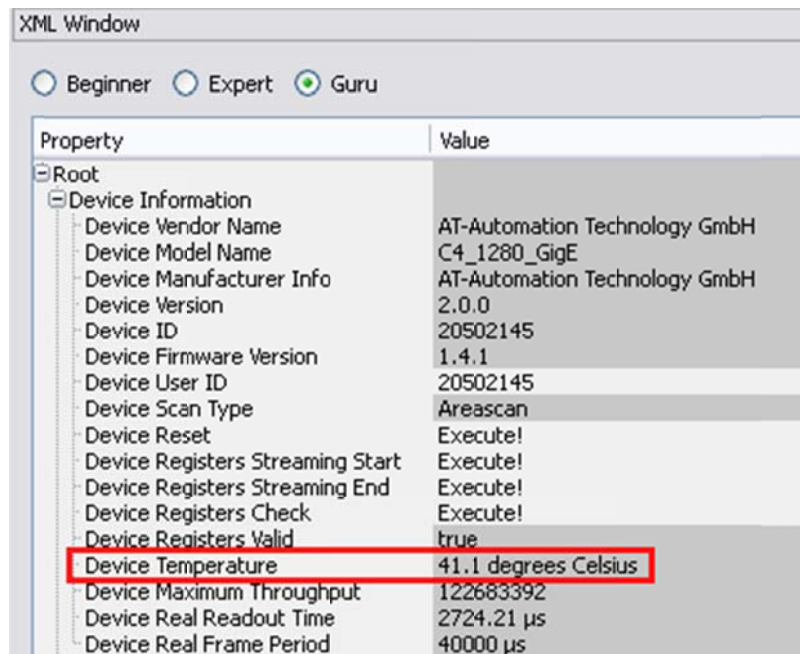


Monitoring the C2 internal Temperature

The internal temperature of a C2 sensor can be monitored over the GenICam interface using the following register:

Name	Type	Visibility	Access	Description
DeviceTemperature	IFloat	Expert	RO	Device temperature in degrees Celsius (°C)

When using the CX-Explorer, the device temperature can be monitored over the XML view pane, by setting the grid visibility to “Expert” or “GURU”.



Document Revision

Rev. Nr.	Date	Modification
1.0	03.06.2013	First draft
1.1	22.08.2013	Minor Corrections, added ambient temperature for the test cases