# AI Camera Thermal Simulation by using FloTHERM XT

Luxonis

# WHY

4K Camera

+

Stereo Depth

+

AI Processor

Product and engineering cost to get working: $2M and 2 years

$149 and 2 hours

# Product

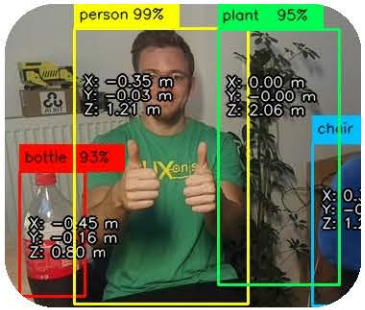
## Embedded
Small size
Low weight
Low power
Fast boot
Standalone

## Performant
48 megapixel
High frame rate
Low latency
Up to 10 cameras

## Spatial
Disparity Depth
Time of Flight
LIDAR
Structured light

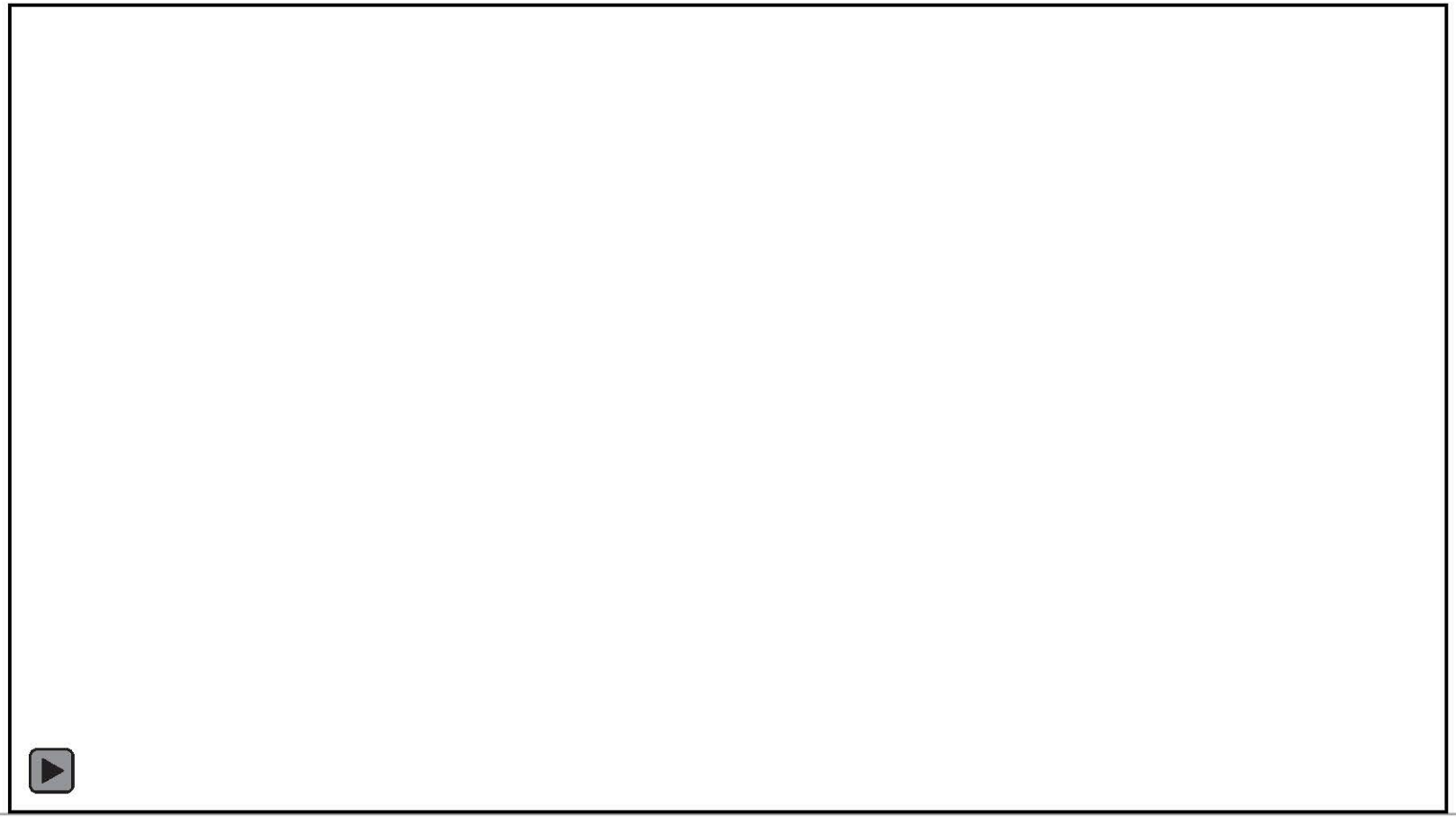
## AI
Neural inference
Object detection
Semantic segmentation
9 DoF localization

## CV
Feature extraction
Motion estimation
Edge detection
Optical flow
WARP / de-WARP





# OAK-D-Lite



# Simulation Condition

Ambient Temperature : 30 ℃

Atmosphere : 1 atm

Total Power : ~2.5 W

Object Dimension : 17 x 90 x 27 mm

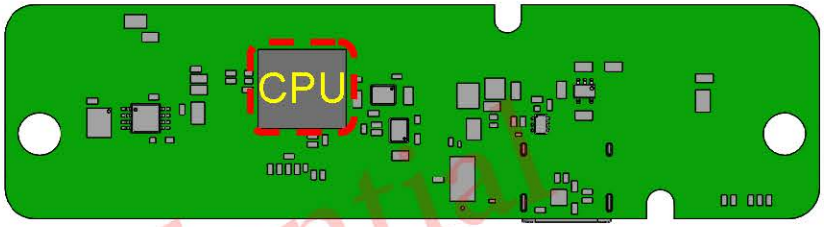
Housing Material : ADC12

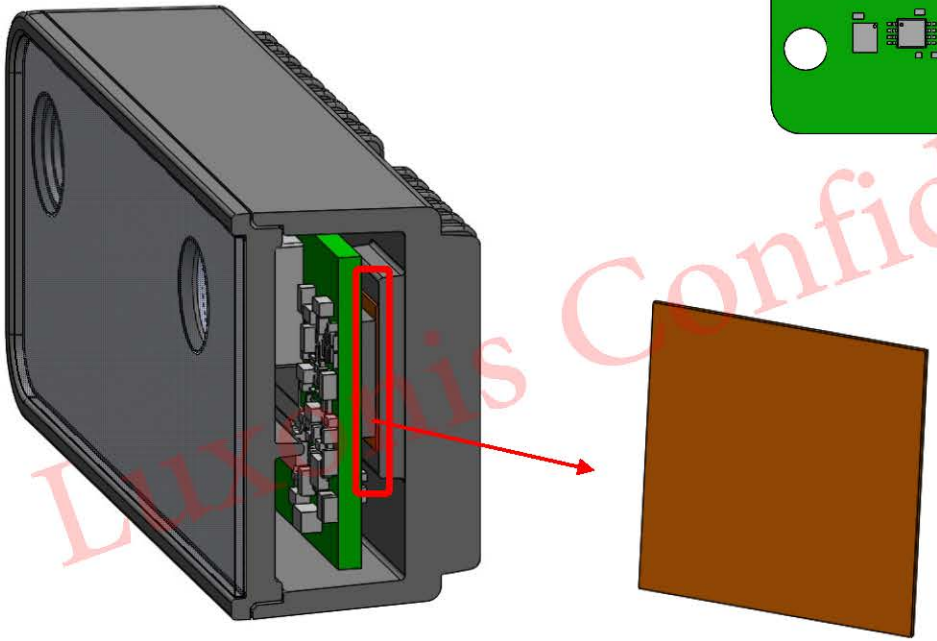
Analysis Type : Steady state

Main Heat-dissipation Mechanism :

Natural Convection & Radiation

# Thermal Design



Thermal PAD pasted on CPU

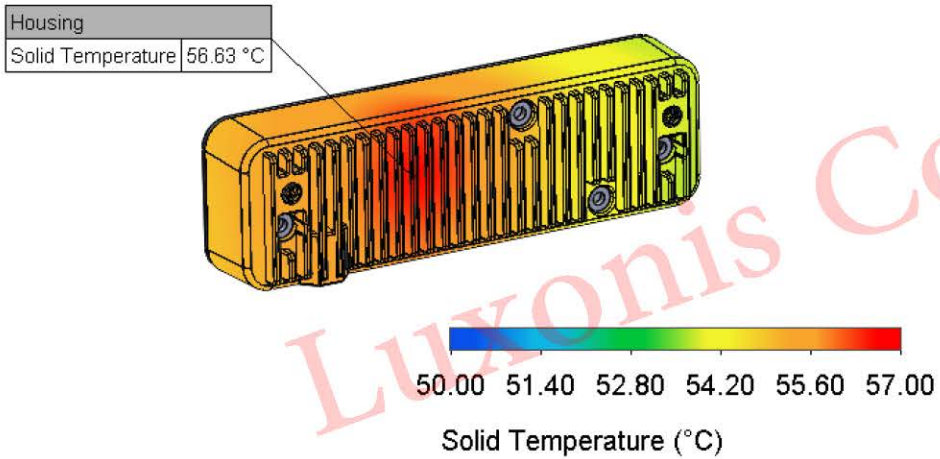
# Simulation Result

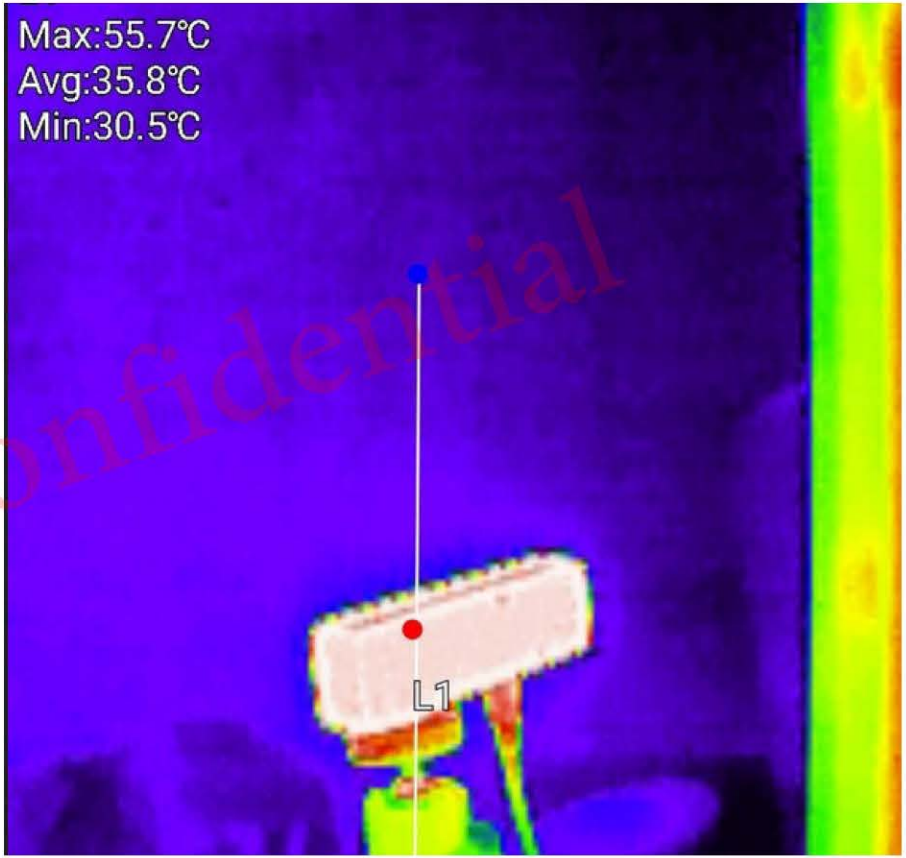
| **CPU** simulate by 2R model | |
|---|---|
| Reading Junction Temperature | 79.84 ℃ |
| Simulation Junction Temperature | 81.22 ℃ |

```
ap: 48.50 / 77.55 MiB, LeonRT Heap: 5.91 / 23.92 MiB
[1844301021DA4BF500] [5231.797] [system] [info] Temperatures - Average: 79.84 °C, CSS: 80.46 °C, MSS 79.70 °C, UPA: 7
9.50 °C, DSS: 79.70 °C
[1844301021DA4BF500] [5231.797] [system] [info] Cpu Usage - LeonOS 57.54%, LeonRT: 29.19%
[1844301021DA4BF500] [5232.798] [system] [info] Memory Usage - DDR: 341.69 / 358.54 MiB, CMX: 2.46 / 2.50 MiB, LeonOS He
ap: 48.50 / 77.55 MiB, LeonRT Heap: 5.91 / 23.92 MiB
[1844301021DA4BF500] [5232.798] [system] [info] Temperatures - Average: 79.31 °C, CSS: 79.31 °C, MSS 79.50 °C, UPA: 7
9.31 °C, DSS: 79.12 °C
```

# Simulation Result

Surface temperature spec < 60 ºC



# Conclusion

- Use 2R model to predict CPU junction temperature by Simulation.
- Surface temperature must be lower than 60 ºC.