CORINTIS   HARDWARE   2025

THERMINATOR & TTV -
CORINTIS THERMAL TEST AND
VALIDATION INSTRUMENTS
FOR DATA CENTER COOLING

Accelerate thermal testing
with Therminator

The Therminator is a benchtop testing device for rapid pre-silicon thermal testing and cooling validation. It emulates the thermal behavior of an integrated circuit (IC) by using a physically similar test vehicle (TTV), allowing engineers to validate their cooling solutions.

DESCRIPTION

The Therminator uses spatial power density information from the powermap to control the array of heating elements on the Thermal test chip (TTC) to emulate the thermal characteristics of the IC chip. Temperature sensors in each heating element on the TTC measure the local junction temperature of the chip to provide a real-time heatmap of the chip surface. A cooling device, of the user's choice, is mounted on the TTV to cool the TTC down.

The powermap of the IC chip under test is uploaded to the device through the Display unit (DU). The control software allows the user to run several tests, cycle through various power maps, or run transient experiments. User can select multiple RTDs to compare them on the plot and save the data. Test results can be exported in standard, portable formats (CSV) and analyzed with common open-source packages.

PHYSICAL OVERVIEW

Length: **428 mm**
Width: **300 mm**
Height: **143 mm**

Weight: **11 kg**
Color: **Black**
Material: **Anodized aluminum**

Power control and distribution unit
The electrical system that ensures safe and efficient operation.

Thermal test vehicle (TTV)
Consists of PCB substrate and Thermal Test Chip (TTC)

Display unit
Display for controlling experiments with real-time readout and data visualization

TECHNICAL OVERVIEW

Current range: **50 A**
DC power capacity: **2000W***
Output voltage: **48 V**
Input voltage supply: **90-264 V(AC)**

DISPLAY OVERVIEW

Screen size: **13.3 inch**
Operating system: **Linux**
Display: **IPS touch**
Resolution: **1920x1080**

REQUIREMENTS

The device is powered by plugging into the power grid through 2x single-phase power cable, one each for two power supply units.

It is required by the client to have each power cable plugged into a different power grid socket line to not trip the circuit breaker.

143 mm

428 mm

300 mm

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Experiment control

- Load cell map & TTV calibration files to define sensor layout and ensure accurate temperature data.
- Apply multiple power maps with custom time ranges to simulate static & transient heating scenarios.
- Select RTDs for side-by-side comparison using live plots.
- Record & save the experiment data at any moment for later review.
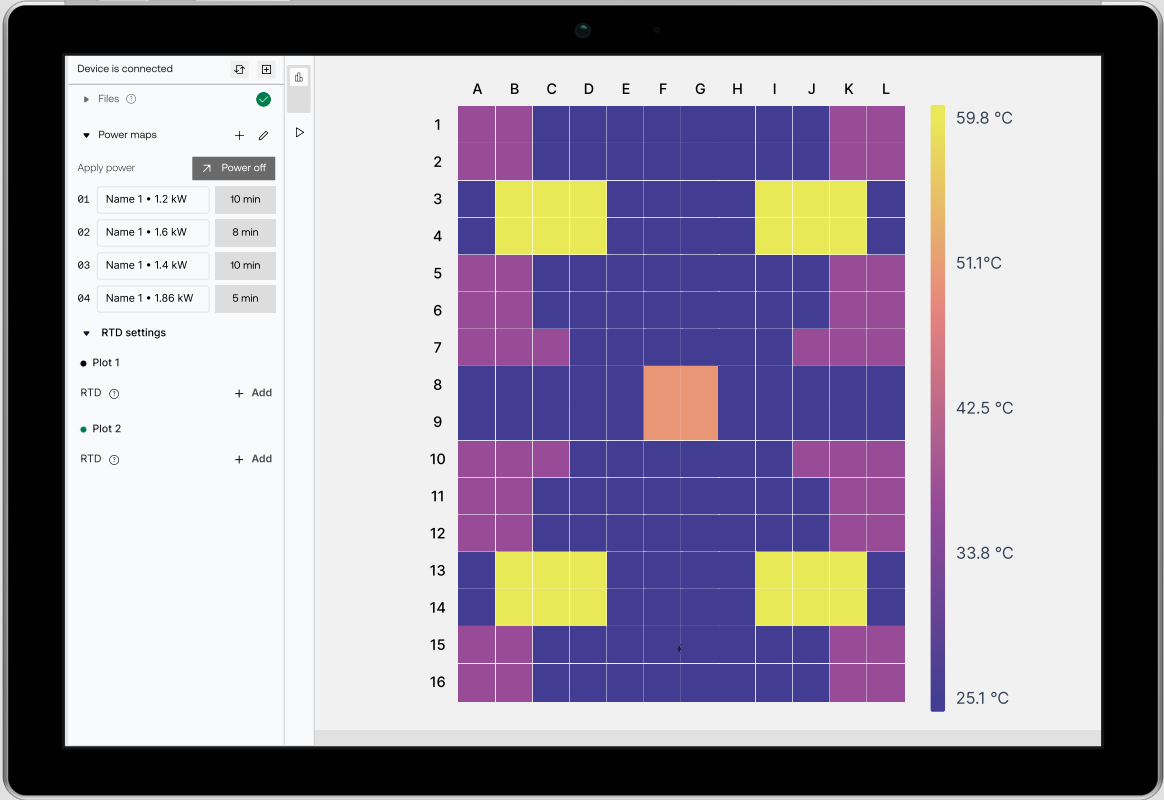
*DC capacity of up to 4KW available end of 2026

The Therminator is currently uncertified and undergoing certification process.

Mimic any power distribution on the chip with TTVs

The Thermal Test Vehicle is a Chip-on-Board package, which hosts a single full-reticle-sized Thermal Test Chip. The TTV package is based on Open Compute Project standard and utilizes their standards for electrical connectors and mounting points.

DESCRIPTION

TTV package designed to simulate real processor behavior under thermal conditions. TTVs are used to test cooling solutions, validate thermal management systems, characterize TIM stability during power cycling, and calibrate measurement tools without relying on functional silicon. It consists of PCB substrate and Thermal Test Chip (TTC). The TTC implements a dense, tiled heating array designed to emulate heterogeneous power maps typical of real semiconductor dies.

Designed with flip-chip on low-CTE FR4 substrate and SAC305 solder, each TTV includes:
- 221 temperature sensing cells with 2x2 mm² resolution
- Support for up to 5 W/mm² heat flux
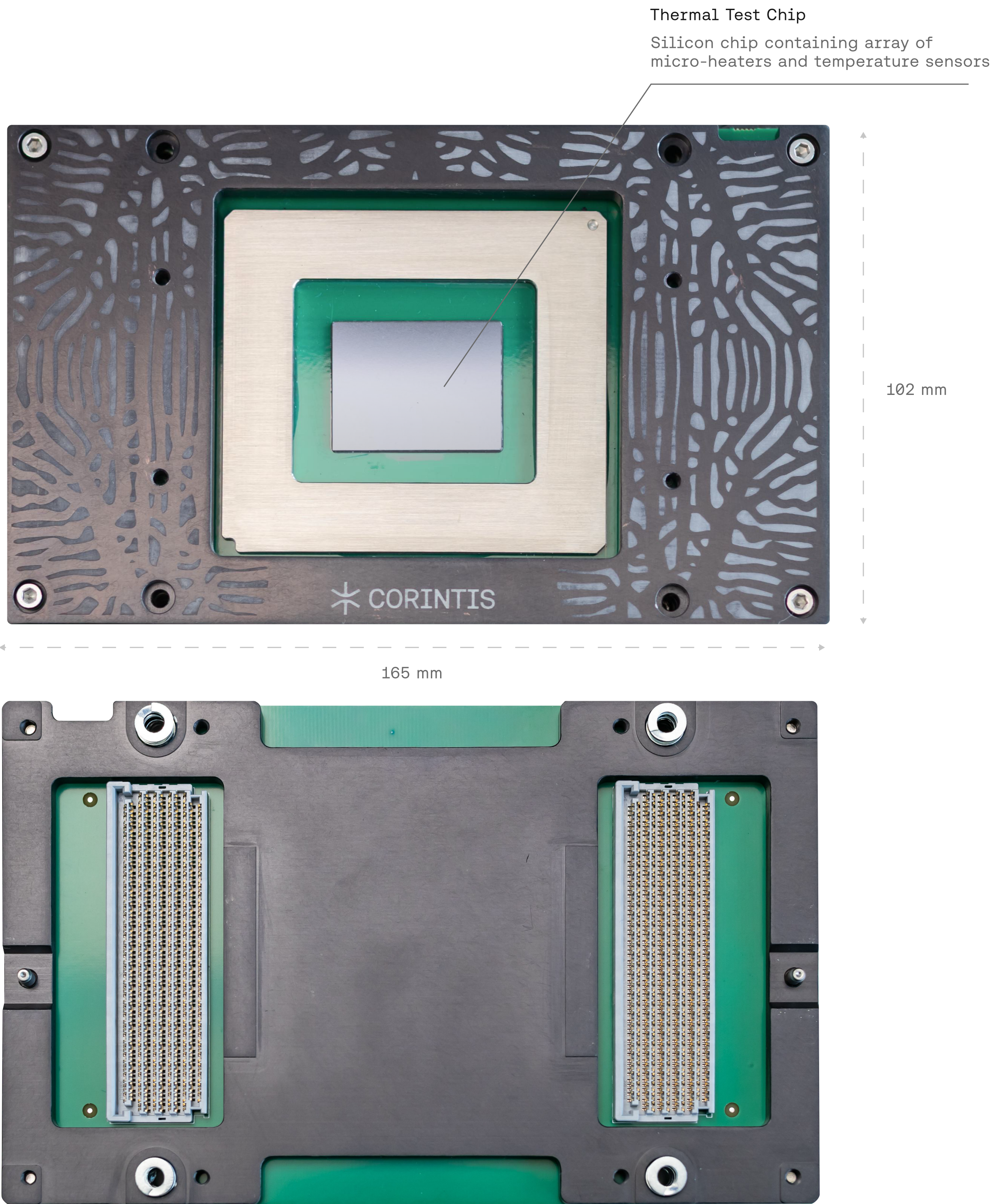- Reliable performance up to 100 °C

PHYSICAL OVERVIEW

TTV Length: 165 mm
TTV Width: 102 mm

TTC Length: 34 mm
TTC Width: 26 mm

TECHNICAL OVERVIEW

Assembly technology:
Flipchip on Substrate
Substrate: Low CTE FR4
Solder type: SAC305
Solder bump diameter: 400 µm
Mounting screws: M3.5 20

TTC Fabrication technology:
Thin film
TTC Temperature sensor:
Resistance temp. detector
Maximum operating temp.:
100 °C
Maximum heat flux:
5 W/mm²

Thermal Test Chip
Silicon chip containing array of micro-heaters and temperature sensors

102 mm

165 mm

Thermal cell configuration

- The TTC is composed of an array of 2 × 2 mm² cells laid out in a grid across the reticle-scale die.
- Each cell contains a thin-film resistive heater and an integrated temperature sensor for direct, local temperature measurement.
- Sensors are implemented as thin film Resistance Temperature Detectors with sub-degree resolution and fast transient response.
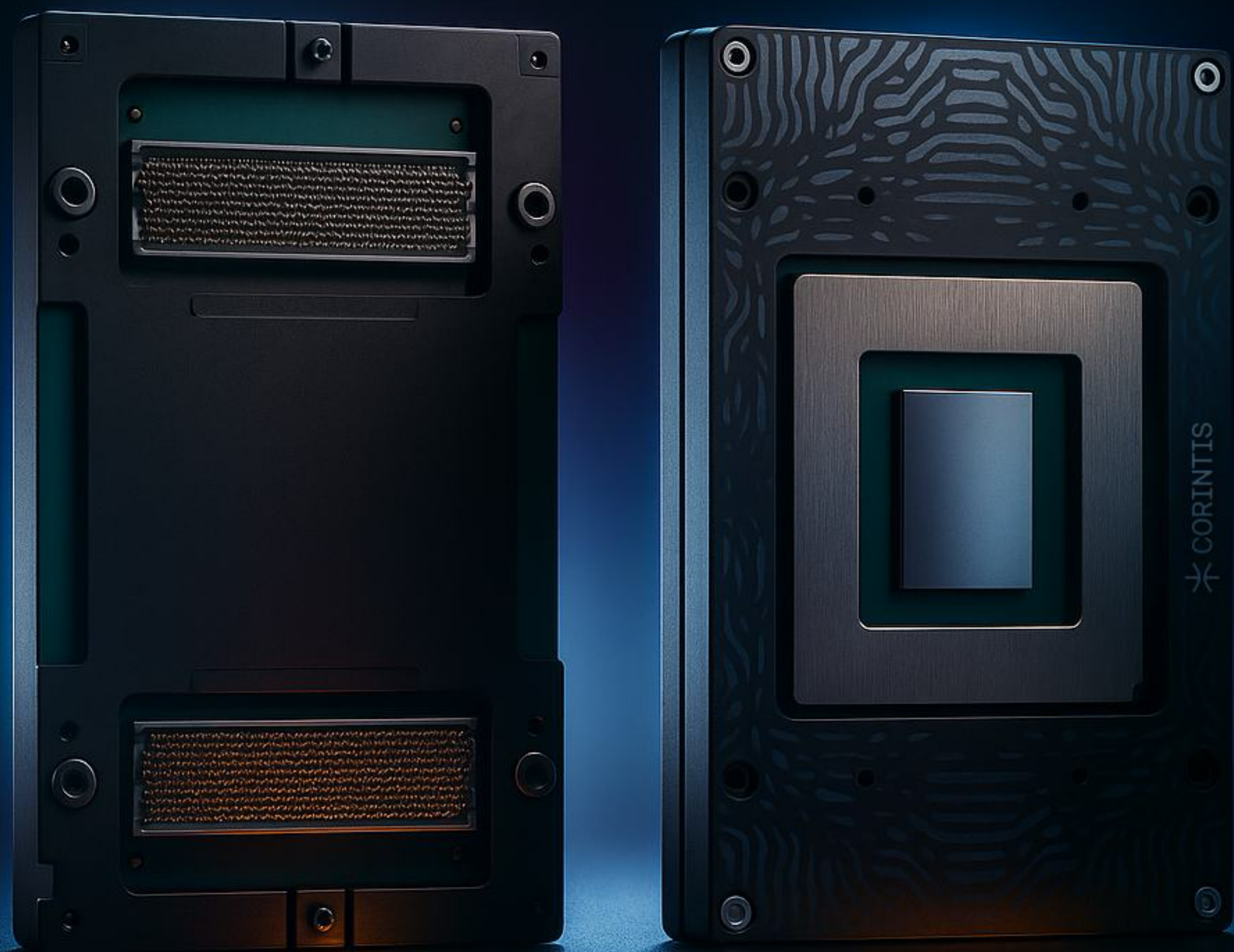
Number of cells:
221 total
Cell size resolution:
2 × 2 mm²
Resistance per cell:
100 Ω
Thermally active cell area:
68%

Electrical contact pads
Solder balls are placed upon them prior to packaging on the PCB

Corner crosses
They are not functional but are used for orientation and dicing

2 mm

2 mm
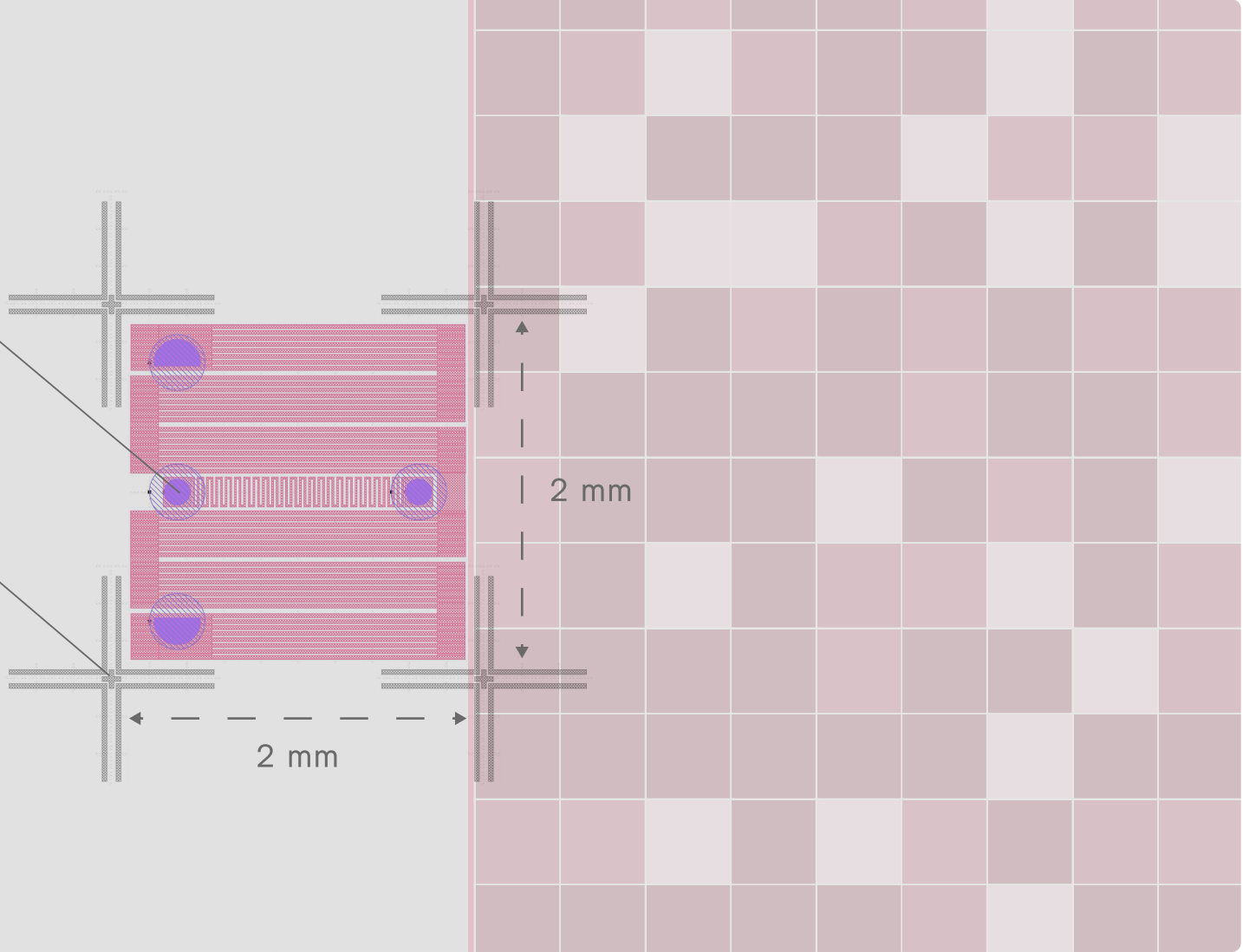
The TTV image is for reference only; actual device may vary.

Bottom and front view of TTV

Contact

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