

## Description

The **TTV200** is a thermal test vehicle designed to emulate the thermal and power characteristics of modern GPU architecture. With its large **52.5 × 50 mm<sup>2</sup> die area**, the TTV200 provides a versatile and precise platform for advanced thermal testing across a wide range of temperature-related applications.

The **TTV200 module** supports independent control of up to **18 heater zones** (custom design up to 48), enabling the simulation of a wide range of thermal scenarios. The intuitive interface allows easy configuration of temperature profiles and complex test setups.

The package integrates **112 on-die temperature sensors** and additional **8 package temperature sensors**. It consists of 2 main dies, and 8 satellite dies in **chiplet configuration**.

## General Information

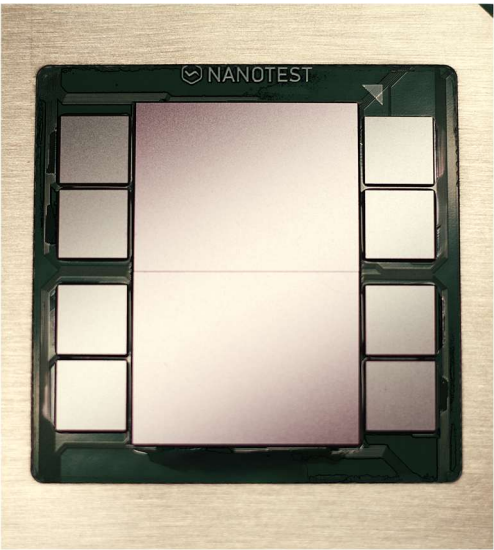
|                      |                                                               |
|----------------------|---------------------------------------------------------------|
| Chip Type            | NT20-3k-FC                                                    |
| Chip Configuration   | (2x) 10 x 13 matrix   (8x) 4 x 4 matrix                       |
| Packaging Technology | Flip Chip                                                     |
| PCB Substrate        | MCL-E-705G                                                    |
| Chip Substrate       | Undoped Silicon                                               |
| Chip Surface         | Bare Silicon   Backside Metallization                         |
| Chip Size            | (2x) 32,5 x 50 mm <sup>2</sup>   (8x) 10 x 10 mm <sup>2</sup> |

## Heater (Electrical Specification)

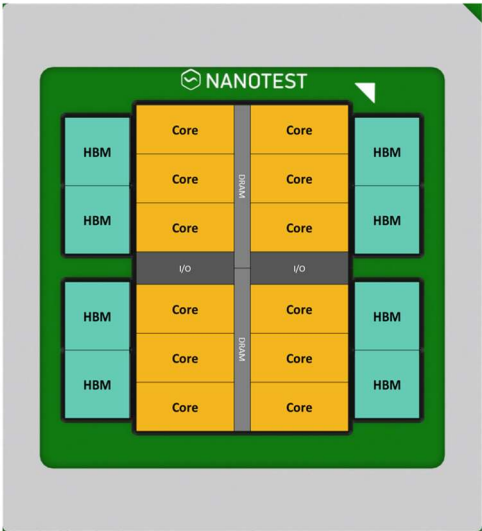
|                           |                         |
|---------------------------|-------------------------|
| Heater Type               | Resistor                |
| Heater Material           | Ti 100 nm               |
| Number of Heater Zones    | Up to 48                |
| Electrical Resistance     | 2,3 / 2,8 / 7 / 10,5 Ω  |
| Max Voltage               | 36 V                    |
| Max Current               | ≤ 24 A                  |
| Max Power                 | 7400 W                  |
| Power Density             | ≤ 6.5 W/mm <sup>2</sup> |
| Max Operating Temperature | 125 °C                  |

## Sensor

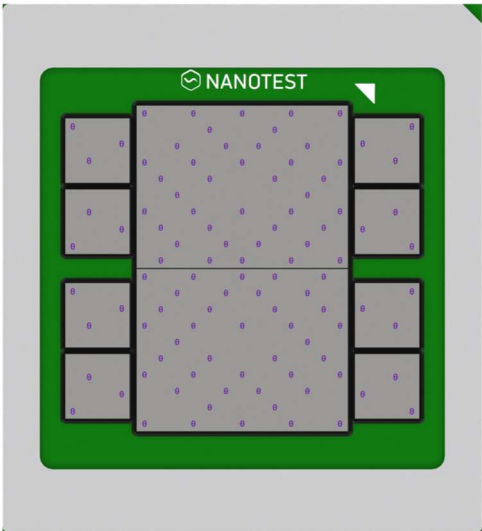
|                        |                           |
|------------------------|---------------------------|
| Sensor Type            | Meander-Structured RTD    |
| Sensor Material        | Ti 100 nm                 |
| Number of Sensors      | 112 RTD                   |
| Resistance Value at RT | (2.9 ± 0.1) kΩ            |
| Sensitivity            | 10.0 Ω/K                  |
| Sensor Connection      | 4-Wire Sensing            |
| Dimensions (l × w)     | 820 × 100 μm <sup>2</sup> |



TTV200



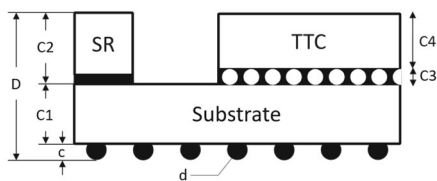
Heater Zone Map



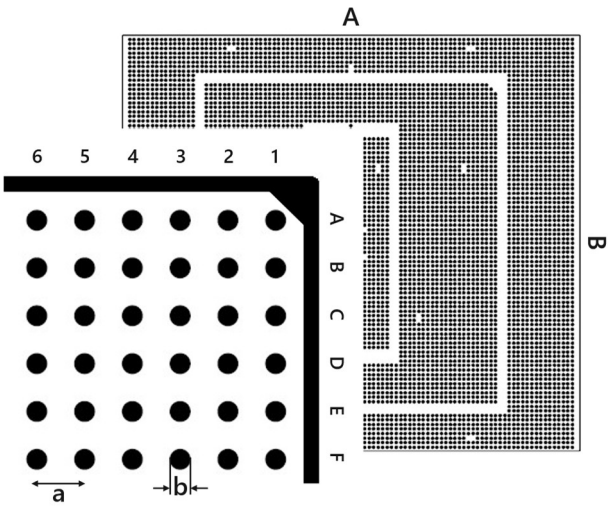
Temperature Sensor Map

# TTV Package

| SYMBOL | NOTE                   | Dimension |
|--------|------------------------|-----------|
| A      | Package Width          | 81.0 mm   |
| B      | Package Length         | 73.4 mm   |
| C1     | Substrate              | 2.63 mm   |
| C2     | Stiffener              | 900 µm    |
| C3     | Bump Height (soldered) | 175 µm    |
| C4     | Die Thickness          | 725 µm    |
| D      | Package Height         | 3.83 µm   |
| a      | Pitch                  | 800 µm    |
| b      | SMD-Pad                | 400 µm    |
| c      | BGA Height (soldered)  | 400 µm    |
| d      | Ball Diameter          | 500 µm    |



## BGA-Package 8110-Lead (81.0 mm x 73.4 mm)



# TTV200 Module

The **Electronic Test Board (ETB)** provides the electrical interface between the **TTV200 Thermal Test Vehicle** and the **TTV Control Unit (TCU)**. It enables precise heater control, high-density temperature monitoring, and interconnect reliability testing while maintaining a compact and easy-to-integrate measurement setup. The TTV200 module significantly **reduces wiring complexity**, improves **measurement stability**, and simplifies **thermal characterization and long-term reliability testing**.

## Heater Power and Monitoring

- Supporting up to **48 independent heaters**
- 4-wire measurement for accurate **heater power sensing**
- Optional **custom adapters** for flexible heater configurations

## Temperature Sensors

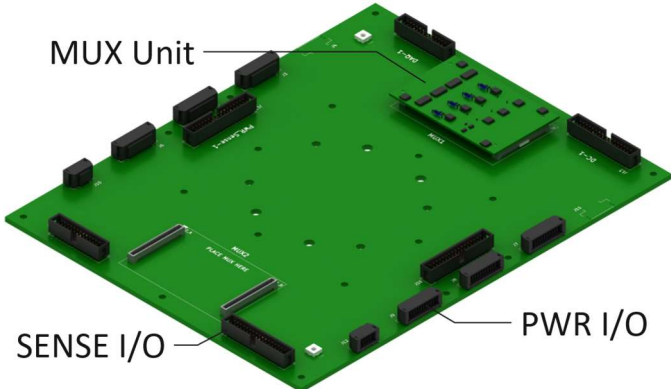
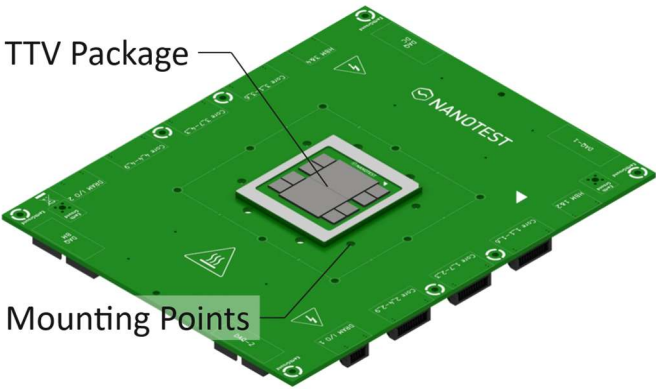
- Access to **104 on-die temperature sensors**
- Additional **8 NTC sensors on the package bottom side**

## MUX-Units

- Plug-in **multiplexer unit (MUX)** enables easy **monitoring of temperature sensors**
- Two MUX units connect directly to the backside of the ETB for a compact and robust system setup

## Interconnect Health Monitoring

- **16 integrated daisy chains** (8 first-level, 8 second level)
- Enables **resistance monitoring** of interconnect



# TTV200 Control Units

## 19" Unit with 6 Power Supplies (TCU6)

|                                     |                                 |
|-------------------------------------|---------------------------------|
| Number of Controllable Heater Zones | 6                               |
| Max. Heating Power (not uniform)    | 3500 W*                         |
| Max. Uniform Heating Power          | 1500 W (0.6 W/mm <sup>2</sup> ) |
| Operating System                    | Windows 10 IoT                  |
| Rated Supply Voltage Range          | 100 – 240 V (1-phase AC)        |
| Rated Supply Input Current          | 20 A                            |
| Rated Supply Line Frequency         | 50 Hz/60 Hz                     |
| Weight                              | 30 kg                           |
| Dimensions (w x h x d)              | 44 x 17.5 x 51 cm <sup>3</sup>  |

\*Not guaranteed with voltage supply below 230 V



TCU6-200

## Rack Unit with 12 Power Supplies (TCU12)

|                                     |                                 |
|-------------------------------------|---------------------------------|
| Number of Controllable Heater Zones | 12                              |
| Max. Heating Power (not uniform)    | 7400 W                          |
| Max. Uniform Heating Power          | 4800 W (1.9 W/mm <sup>2</sup> ) |
| Operating System                    | Windows 10 IoT                  |
| Rated Supply Voltage Range          | 380 - 400 V (3-phase AC)        |
| Rated Supply Input Current          | 32 A CEE Plug                   |
| Rated Supply Line Frequency         | 50 Hz/60 Hz                     |
| Power Distribution Unit             | Yes, with emergency stop switch |
| Weight                              | 90 kg                           |
| Dimensions (h x w x d)              | 86 x 60 x 80 cm <sup>3</sup>    |



TCU12-200

## Rack Unit with 18 Power Supplies (TCU18)

|                                     |                                 |
|-------------------------------------|---------------------------------|
| Number of Controllable Heater Zones | 18                              |
| Max. Heating Power (not uniform)    | 7400 W                          |
| Max. Uniform Heating Power          | 4800 W (1.9 W/mm <sup>2</sup> ) |
| Operating System                    | Windows 10 IoT                  |
| Rated Supply Voltage Range          | 380 - 400 V (3-phase AC)        |
| Rated Supply Input Current          | 32 A CEE Plug                   |
| Rated Supply Line Frequency         | 50 Hz/60 Hz                     |
| Power Distribution Unit             | Yes, with emergency stop switch |
| Weight                              | 120 kg                          |
| Dimensions (h x w x d)              | 86 x 60 x 80 cm <sup>3</sup>    |



TCU18-200

## Application remarks

The offered products are supposed to be used for characterization purposes. The application of the data from the test die to a functional system lies in the responsibility of the user. Nanotest makes no warranty, express or implied including the implied warranties of merchantability and fitness for a particular purpose, that the user's system designed using that data will perform as intended.