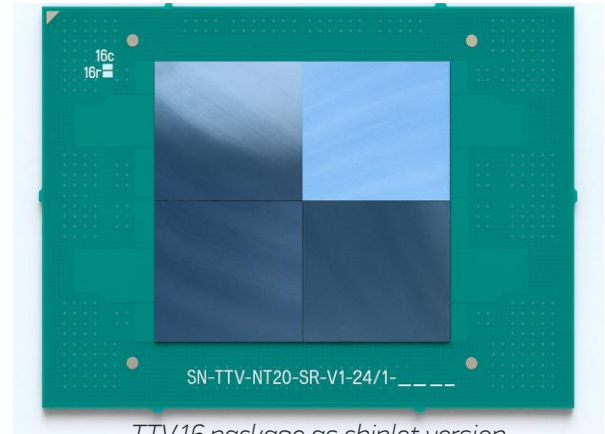


## Description

The **TTV16** is a thermal test vehicle designed to emulate the thermal and power characteristics of modern CPU architecture. With its large **40 × 40 mm<sup>2</sup> die area, available as monolithic or 4 dies chiplet**, the TTV16 provides a versatile and precise platform for advanced thermal testing across a wide range of temperature-related applications.

The **TTV16 module** supports independent control of up to **24 heater zones**, enabling the simulation of a wide range of thermal scenarios. The intuitive interface allows easy configuration of temperature profiles and complex test setups.

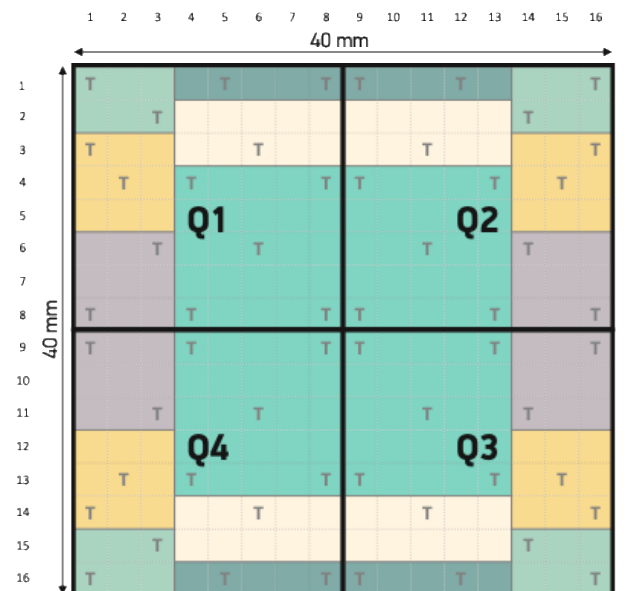
The package integrates **56 on-die temperature sensors**.



*TTV16 package as chiplet version*

## General Information

Chip type	NT20-3k-FC
Chip version	Monolithic / Chiplet
Chip configuration	16 x 16 matrix/ (4x) 8 x 8 matrix
Packaging technology	Flip chip
PCB substrate	MCL-E-795G
Chip substrate	Silicon, undoped
Chip surface	With or w/o backside metallization
Chip size	39.9 x 39.9 mm <sup>2</sup> = (4x) 19.9 x 19.9 mm <sup>2</sup>



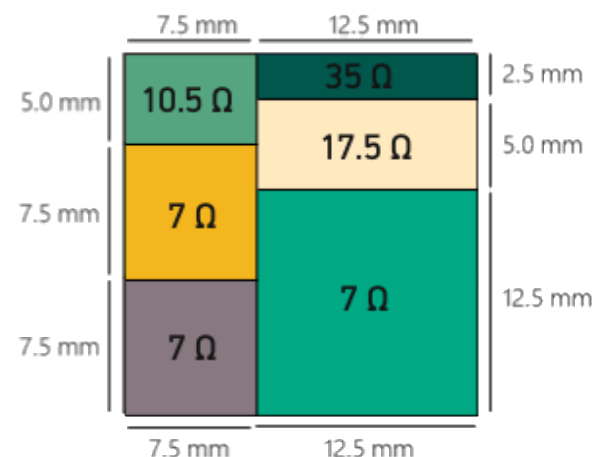
*Heater zone and temperature sensor distribution map of complete die*

## Heater (electrical specification)

Heater type	Resistor
Heater material	Ti 100 nm
Number of heater zone	24
Electrical resistance p	7 / 10.5 / 17.5 / 35 Ω
Max voltage per heater zone	60 V
Max current per heater zone	≤ 8.5 A
Max package power	5000 W
Power density of heater zone	≤ 3.2 W/mm <sup>2</sup>
Max operating temperature	125 °C

## Sensor

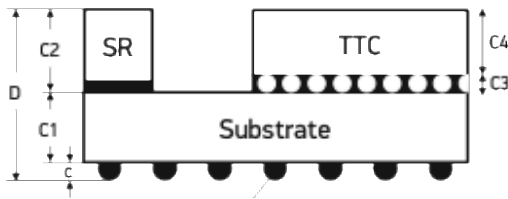
Sensor type	Meander-structured RTD
Sensor material	Ti 100 nm
Number of sensors	56
Resistance value at RT	(3.2 ± 0.1) kΩ
Sensitivity	10.0 Ω/K
Sensor connection	4-wire sensing
Dimensions (l × w)	820 × 100 μm <sup>2</sup>



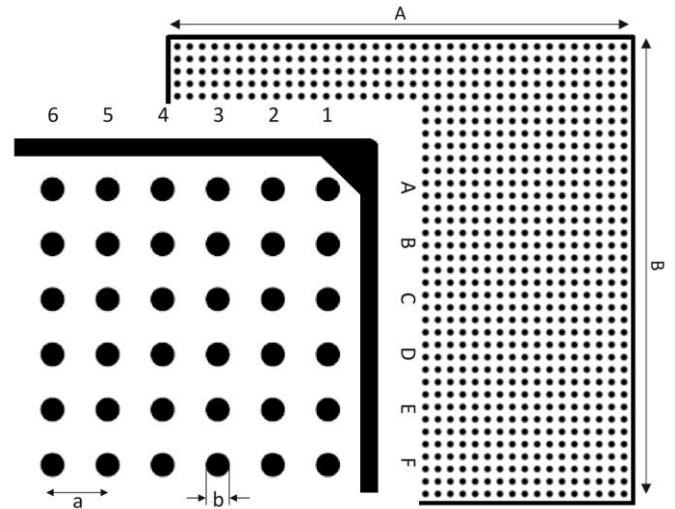
*Heater zone and resistances distribution map of quarter die*

# TTV16 Package

SYMBOL	NOTE	SI
A	Package width	78 mm
B	Package length	57 mm
C1	Substrate	2.50 mm
C2	Stiffener	900 µm
C3	Bump height (soldered)	175 µm
C4	Die	725 µm
D	Package	3.90 mm
a	Pitch	1.50 µm
b	SMD-Pad	550
c	BGA height (soldered)	500
d	Ball diameter	670



## BGA-Package 1976-Lead (78.0 mm x 57.0 mm)

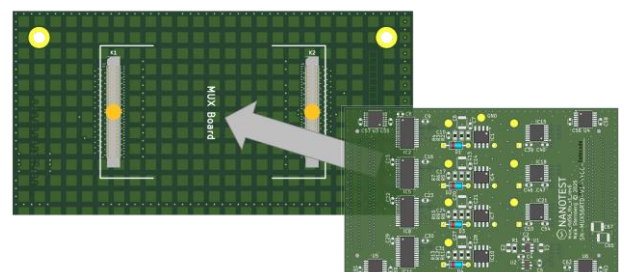
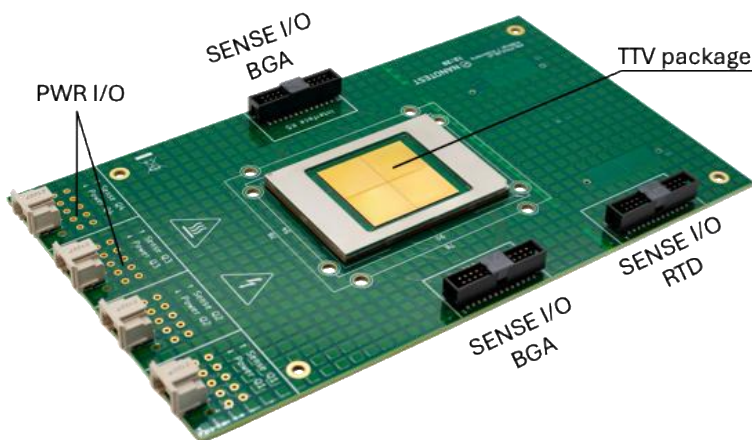


# TTV16 Module

The **TTV16 module** comprises the TTV16 **package**, an Electronic Test Board (**ETB**), and a multiplexer (**MUX**) unit, enabling straightforward electrical interfacing, scalable sensor readout, and reliable long-term testing. Four power connectors (Q1 PWR – Q4 PWR) provide access to the 24 individual heater zones of TTV16, each supporting 4-wire (Kelvin) measurements for accurate power monitoring with minimal influence from lead resistance.

The **ETB** includes a plug-in interface for a MUX unit, which sequentially connects to all **56** integrated on-die temperature sensors, eliminating extensive point-to-point wiring. Integrated constant current sources provide stable sensor biasing for reproducible measurements. A **second-level daisy chain** enables bump health monitoring, allowing early detection of interconnect degradation during thermal cycling and reliability tests.

The **MUX unit** performs time-multiplexed routing of all sensor signals and connects directly to the backside of the ETB, forming a compact and robust interface between the thermal test vehicle and external measurement equipment while improving measurement stability during long-duration testing.



## TTV16 Control Units

### TTV16 Control Unit with 6 Power Supplies (TCU6)

Number of power supplies/number of controllable heater zones	6
Max. heating power (not uniform)	2800 W*
Max. uniform heating power	960 W (0.6 W/mm <sup>2</sup> )
Operating System	Windows 10 IoT
Rated voltage range	100 – 240 V (single-phase AC)
Rated input current	20 A
Rated 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



TCU6-16

### TTV16 Control Unit with 9 Power Supplies (TCU9)

Number of power supplies/number of controllable heater zones	9
Max. uniform heating power	4800 W (3 W/mm <sup>2</sup> )
Operating System	Windows 10 IoT
Rated voltage range	380 - 400 V (3-phase AC)
Rated input current	32 A CEE plug
Rated 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>



TCU9-16

### TTV16 Control Unit with 24 Power Supplies (TCU24)

Number of power supplies/number of controllable heater zones	24
Max. uniform heating power	5120 W (3.2 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>



TCU24-16

## 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.