



Description

The Thermal Test Vehicle, as “Thermal Twin” in a compact 60x60 mm² package is a highly versatile and precise temperature testing tool, designed to meet the demands of a wide range of temperature-related applications.

The TTV10 allows for the independent control of its four main heater zones and six hotspots, enabling users to simulate a wide range of thermal environments. The device's interface provides easy-to-use controls for customizing temperature profiles and setting up experiments.

The package comes with 16 temperature sensors inside the chip and 4 NTCs on the substrate backside that utilize a four-wire sensing to provide accurate and reliable temperature readings.

General Information

Chip type	NT20-3k-FC
Chip configuration	10 x 10 matrix
Chip size	24.9 x 24.9 x 0.5 mm ³
Assembly technology	Flip chip and underfill
Solder type	SAC305
Under bump metallization	NiAu (4 µm)
Solder bump diameter	300 µm
Bump raster	500 µm
PCB substrate	FR4 High TG
Chip material	Silicon, undoped
Chip surface finish	w/o BSM or NiV 300 nm Pt 100 nm Au 200 nm
Chip warpage	150 – 200 µm @RT
Substrate size	60 x 60 x 1.56 mm ³
Package size	60 x 60 x 2.24 mm ³

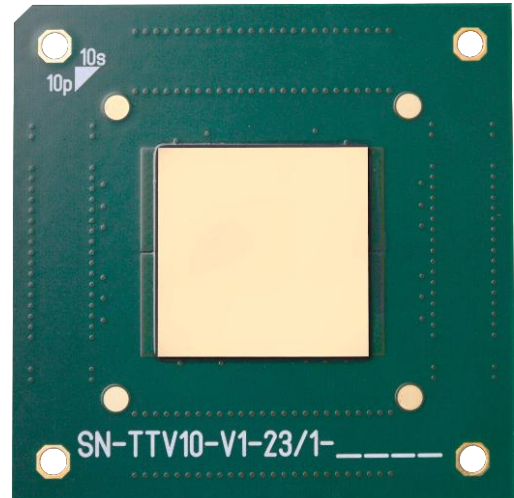
Heater (electrical specification)

Heater type	Resistor
Heater material	Ti 100 nm
Number of heater zone	4
Number of hotspots	6*
Electrical resistance per heater zone or hotspots	(7.0 ± 0.2) Ω
Max voltage per heater zone	60 V
Max current per heater zone	8.5 A
Max power per heater zone	500 W
Max theoretical package power	2000 W
Power density of heater zone hotspots	3.2 W/mm ² 10 W/mm ²
Max operating temperature	125 °C

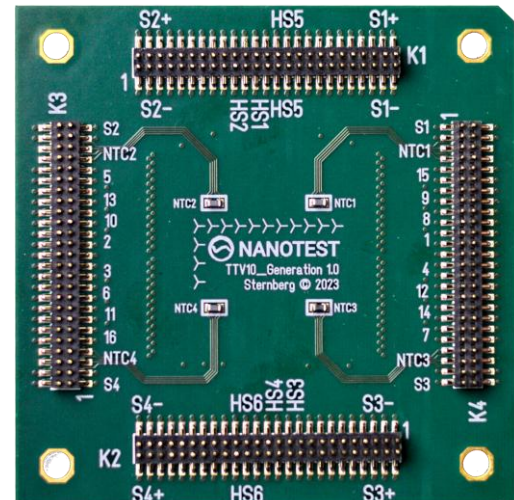
Sensor

Sensor type	Meander-structured RTD
Sensor material	Ti 100 nm
Number of sensors	16
Sensor position	See Figure 3
Resistance value at RT	(3.0 ± 0.2) kΩ
Sensitivity	10.0 Ω/K
Sensor connection	4-wire sensing
Dimensions (l × w)	820 × 100 µm ²

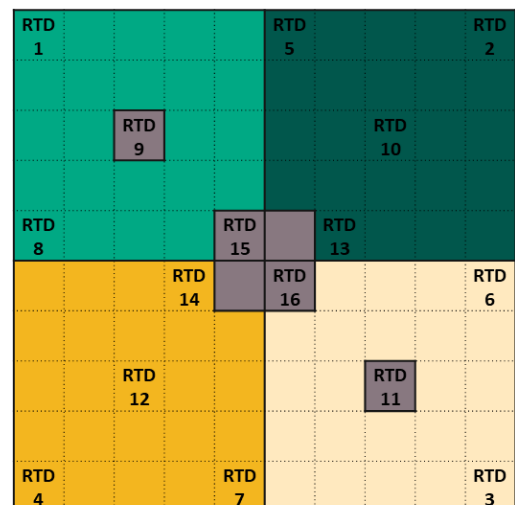
* Approximately 20% of the power is parasitically consumed by the adjacent primary heater, no absolute power measurement possible.



TTV10 package front side



TTV10 package back side

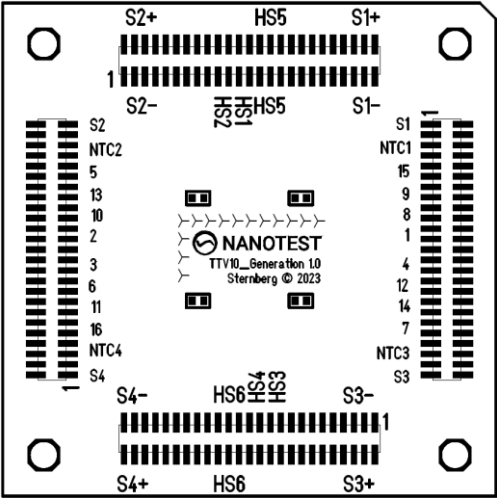


Heater zones, hotspots (grey) and RTD positions

Electrical interface

The rear of the TTV10 is equipped with four connections for the electrical contacting of the TTV10. These connectors are designed to provide power connections to the four main heater sources, six hotspots, and 16 temperature sensors on the TTC and 4 NTC (4.7 kΩ) on the PCB.

	Description	Input	Output
Source 1	Power	S1+	S1-
Source 2	Power	S2+	S2-
Source 3	Power	S3+	S3-
Source 4	Power	S4+	S4-
Hotspot 1	Power	HS1+	HS1- (S1-)
Hotspot 2	Power	HS2+	HS2- (S2-)
Hotspot 3	Power	HS3+	HS3- (S3-)
Hotspot 4	Power	HS4+	HS4- (S4-)
Hotspot 5	Power	HS5+	HS5-
Hotspot 6	Power	HS6+	HS5-
RTD 1-16	Bias	I+	I-
RTD 1-16	Sense	S+	S-
NTC 1-4	Bias	I+	I-
NTC 1-4	Sense	S+	S-

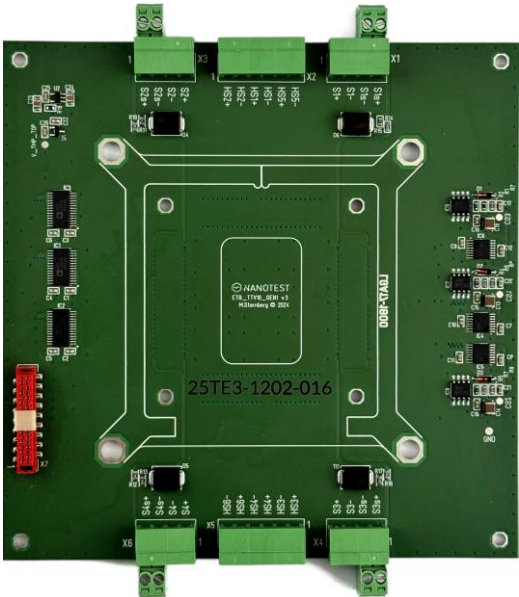


Electrical connections

Electronic test board (optional)

The electronic test board (ETB) is an adapter to plug-in the TTV10. Six connectors (X1 – X6) allow an easy powering of the four heater zones and the six hotspots, additionally power sensing of the four heater zones by 4-wire measurement is enabled via these connectors. The ETB provides three multiplexing units (MUX) which allow the contacting of the individual sensors and three constant current sources to provide sensor bias current via the X7 sensing connector (see table below).

X7	Signal	Name	Description
1	EN	Enable bit	Digital input (5VDC)
2	A0	Control bit 0	Digital input (5VDC)
3	A1	Control bit 1	Digital input (5VDC)
4	A2	Control bit 2	Digital input (5VDC)
5	VGND	supply input	Common supply ground
6	VGND	supply input	Common supply ground
7	VDD	supply input	Positive DC supply
8	VSS	supply input	Negative DC supply
9	VGND	supply input	Common supply ground
10	VGND	supply input	Common supply ground
11	VGND	supply input	Common supply ground
12	VGND	supply input	Common supply ground
13	V3B	V- : NTC/CCS	Sense voltage low
14	V3A	V+ : NTC/CCS	Sense voltage high
15	V2B	V- : RTD	Sense voltage low
16	V2A	V+ : RTD	Sense voltage high
17	V1B	V- : RTD	Sense voltage low
18	V1A	V+ : RTD	Sense voltage high



ETB backside with 6 power connectors (X1-X6, light green) and one sensing connector (X7, red)

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.