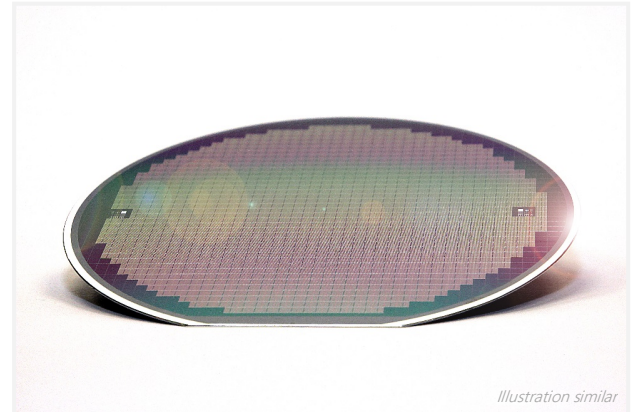## NANOTEST

Description

The NT20-3k Thermotest Chip is designed as a modular system to provide the maximum of flexibility for thermal characterization and qualification of materials, packages, and systems.

Each chip cell of 2.5 × 2.5 mm² size provides two uniform heaters and a centered thermistor, both connected to a large solder ball matrix for flip chip assembly via a robust redistribution layer (RDL). The solder ball matrix additionally provides solder balls explicitly dedicated to health monitoring and thermo-mechanical and reliability investigation.

The chip can be configured in any desired matrix. Temperature sensors, heaters and monitoring solder balls are each addressable individually for maximum flexibility in sensing resolution and heat distribution.

Illustration similar

Technical Specification

Technology and Methodology

Fabrication technology	Thin Film
Assembly technology	Flip chip
Sensor	Resistance thermometer

Wafer

Wafer material	Silicon, undoped	
Wafer size	200	mm
Wafer thickness	500	µm
Cell size	2.4 × 2.4	mm²
Scribe line between cells	100	µm
Topside passivation	7 µm Pi (polymer passivation)	
Backside metal option A	NiV 300 nm | Pt 100 nm | Au 100 nm	
option B	Ti 100 nm | NiV 300 nm | Au 200 nm	
option C	non	
Unit Cell count	4400	

Heater

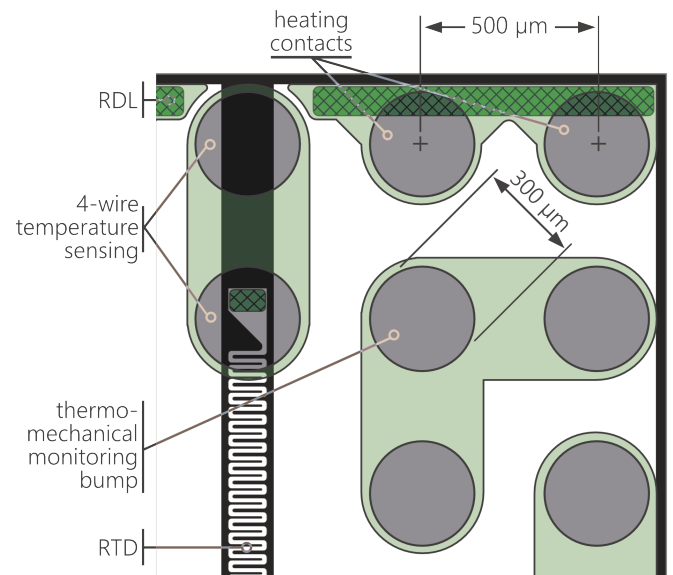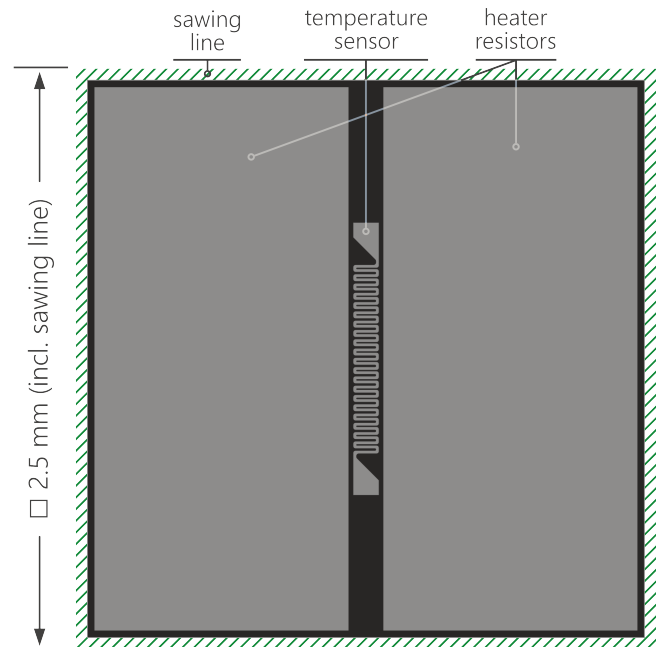|		
Heater type	Resistor	
Resistors per chip	2	
Resistance per resistor	14 ± 1	Ω
Max current per heater	1.5	A
Max power per cell	63	W
Max power density	10	W/mm²
Active heater area	82% of cell area	

Sensor

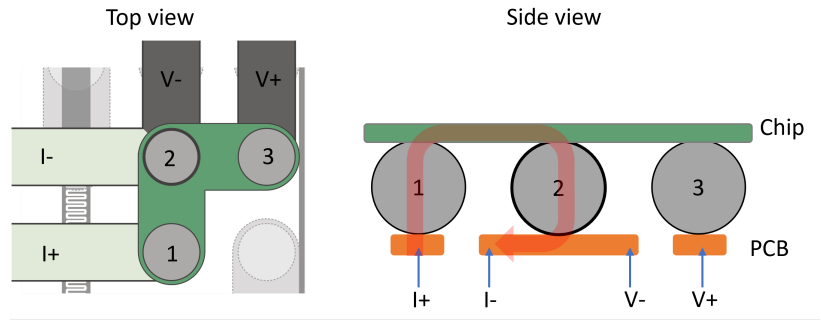|		
Sensor type	meander-structured resistor	
Sensor position	cell center	
Sensor connection	4-wire termination	
Resistance value (25°C)	3.2 ± 0.1	kΩ
Sensitivity	10.0 *	Ω/K
Dimensions (l × w)	820 × 100	µm²

Assembly

Assembly technology	Flip chip	
Solder type	SAC305	
Under bump metallization	NiAu (4 µm)	
Solder bump diameter	300	µm
Pad raster	500	µm

*   theoretical value based on the Ti temperature coefficient
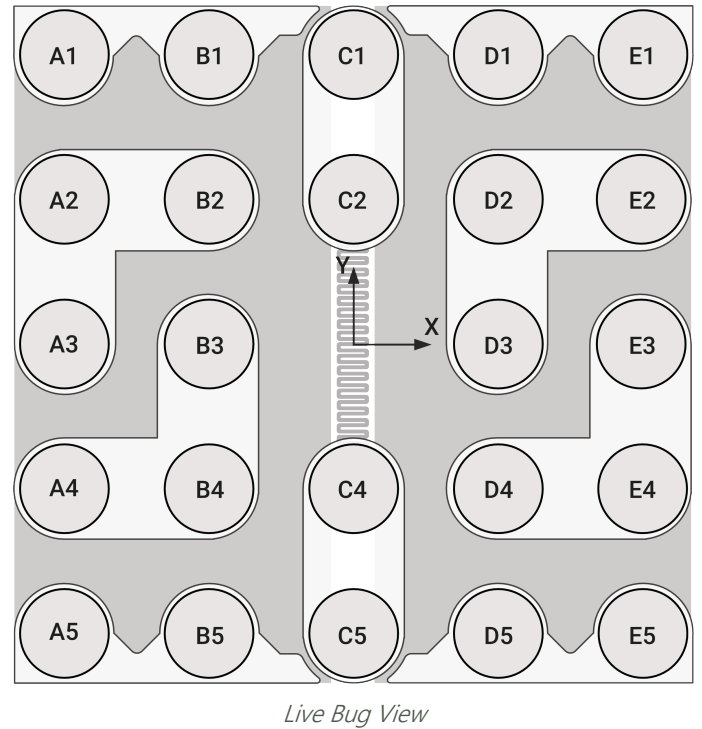
Thermo-mechanical monitoring

The center bump in each thermo-mechanical monitoring structure as depicted on the right (marked with a bold stroke), can be electrically monitored using 4-wire termination in a configuration as shown. The state of health correlates with the measured electrical resistance.

Pin configuration

For absolute coordinates of each pin the point of origin (X=0, Y=0) is the cell center. Nomenclature is involving a prefixed letter which indicates the purpose of the specific pin. `H0` and `H1` pins connect to heating structures, `SI` to the sensor current input and `SV` sensor voltage sensing. `TM0`, `TM1`, `TM2` and `TM3` are connected to the thermo-mechanical monitoring structures.

	Connection	X [µm]	Y [µm]
A1	H0_0		1000
A2	TM0		500
A3	TM0	-1000	0
A4	TM1		-500
A5	H0_1		-1000
B1	H0_0		1000
B2	TM0		500
B3	TM1	-500	0
B4	TM1		-500
B5	H0_1		-1000
C1	SI_0		1000
C2	SV_0		500
C4	SV_1	0	-500
C5	SI_1		-1000
D1	H1_0		1000
D2	TM2		500
D3	TM2	500	0
D4	TM3		-500
D5	H1_1		-1000
E1	H1_0		1000
E2	TM2		500
E3	TM3	1000	0
E4	TM3		-500
E5	H1_1		-1000

Live Bug View

Chip selection guide

The length of the chip edge can be calculated depending on the number of cells per row and column using the following equation.

Edge length = n × cell length **-** scribe line length
Edge length = n × 2.5 mm **-** 0.1 mm

Example: (4 x 4 matrix of cells)

Edge length = 4 x 2.5 mm - 0.1 mm
Chip size = 9.9 x 9.9 mm²

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.

NT20-3k-FC datasheet document rev.73
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