



NTC-Thickfilm Temperature Sensors

Type: TNS

Sizes: 0402, 0603, 0805, 1206

Features:

- NTC-Chip Resistors in Thickfilm
- Contact areas tinned or PtAg
- Small sizes with short response time
- Versions for active trimming available

Sizes/Dimensions:

Size	L	B	H	C
0402	1.04 ± 0.05	0.5 ± 0.05	0.3 ± 0.05	0.1 $+0.17/-0.05$
0603	1.5 $+0.15/-0.05$	0.8 $+0.15/-0.05$	0.4 $+0.15/-0.05$	0.2 $+0.2/-0.1$
0805	2.0 $+0.15/-0.05$	1.2 $+0.2/-0.05$	0.4 $+0.15/-0.1$	0.3 $+0.2/-0.1$
1206	3.2 $+0.15/-0.05$	1.5 $+0.2/-0.05$	0.6 $+0.2/-0.05$	0.3 $+0.2/-0.1$

L = length, B = width, D = thickness, C = width wrap-around (in mm)

Packaging:

Bulk or tape/reel acc. To DIN IEC 286-3/E/A481-1-A

Tape width 8 mm, reel diameter 180 mm/330 mm)

Minimum quantity bulk 100 pieces per value

Minimum quantity reel 1000 pieces per vaule

Ordering Data:

Type – value – tolerance –TCR – Packaging

Example: TNS 0805 1K $\pm 5\%$ TCR -4800 taped



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Issue: April-2001



NTC-Thickfilm Temperature Sensors

Type: TNS

Sizes: 0402, 0603, 0805, 1206

Technical data – depending on size:

Size	0402	0603	0805	1206
Power rating (P ₇₀ /mW)	25	50	65	125
Working voltage				
trimmed	30	75	100	200
untrimmed	90	220	300	600

Range/TCR/Tolerance (25°C)	0402	0603	0805	1206
1K – 4K7	-4800/-6600 10/20%	4800/-6600 10/20%	4800/-6600 5/10/20%	4800/-6600 5/10/20%
5K6 – 47K	-6600/-7500 10/20%	-6600/-7500 5/10/20%	-6600/-7500 5/10/20%	-6600/-7500 5/10/20%
56K – 500K	-7500/-9000 10/20%	-7500/-9000 5/10/20%	-7500/-9000 5/10/20%	-7500/-9000 5/10/20%

Standard-TCR/Tolerance: ±500 ppm/K

Available combinations of value and TCR restricted

Closer tolerance of value and TCR on request

General technical data:

Temperature range	-55°C ... +155°C
Climatic category to DIN IEC 68	55/155/56
Solderability ¹⁾	235°C 2s
Maximum soldering temperature ²⁾	260°C 10s

Long term stability	
Storage 125°C/1000h	<1%
Storage 155°C/1000h	<2%
Load P ₇₀ /70°C/1000h	<2%
Damp heat (56d/40°C/96%)	<1%

¹⁾ DIN IEC 68 T2-20, Ta Meth.1

²⁾ DIN IEC 68 T2-20, Tb Meth. 1A



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PTC-Thickfilm Temperature Sensors

Type: TPS

Sizes: 0402, 0603, 0805, 1206

Features:

- PTC-Chip Resistors in Thickfilm
- Contact areas tinned
- Resistance element glass-passivated
- Versions for conductive glueing, with heating functions and for active trimming available

Dimensions:

Size	L	B	D	C
0402	1.04 ^{±0.05}	0.50 ^{±0.05}	0.3 ^{±0.05}	0.1 ^{+0.1/-0.05}
0603	1.5 ^{+0.15/-0.05}	0.80 ^{+0.15/-0.05}	0.4 ^{+0.1/-0.05}	0.2 ^{+0.2/-0.1}
0805	2.0 ^{+0.15/-0.05}	1.2 ^{+0.2/-0.05}	0.4 ^{+0.15/-0.1}	0.3 ^{+0.2/-0.1}
1206	3.2 ^{+0.15/-0.05}	1.5 ^{+0.2/-0.05}	0.6 ^{+0.15/-0.1}	0.3 ^{+0.2/-0.1}

L = Length, B = Width, D = Thickness, C = Width wrap-around (in mm)

Packaging:

Bulk or Tape/Reel acc. to DIN IEC 286-3/E/A481-1-A
(tape width 8 mm, reel diameter 180 mm/330 mm)

Minimum quantity bulk: 100 pieces per value

Minimum quantity tape: 1000 pieces per value

Ordering data

Type – Value – Tolerance – TCR – Tolerance of TCR – Packaging

Example: TPS 0805 1k ± 5% TCR + 2000 ± 400 taped

SRT Resistor Technology

PTC-Thickfilm Temperature Sensors

Type: TPS

Sizes: 0402, 0603, 0805, 1206

Technical data – depending on size:

Size	0402	0603	0805	1206
Power rating (P_{70}/mW)	25	50	65	125
Working voltage U_{-} , U_{eff} (V) trimmed untrimmed	30 90	75 220	100 300	200 600

Range/TCR/ Tolerance (25°C)				
1 R – 9R1	+3600 10/20 %	+3600 10/10 %	+3600 5/10/20 %	+3600 5/10/20 %
10 R – 95R3	+3000/+3500 5/10/20 %	+3000/+3500 5/10/20 %	+3000/+3500 2/5/10 %	+3000/+3500 2/5/10 %
100 R – 953R	+2000/+2800 5/10/20 %	+2000/+2800 5/10/20 %	+2000/+2800 2/5/10 %	+2000/+2800 2/5/10 %
1K – 2K05	+1600/+2000/+2800 5/10/20 %	+1600/+2000/+2800 5/10/20 %	+1600/+2000/+2800 2/5/10 %	+1600/+2000/+2800 2/5/10 %
2K15 – 5K11	–	–	–	+1600/+2800 2/5/10 %

Standard-TCR/Tolerance: ± 400 ppm/K
Closer tolerance of value an TCR on request

General technical data:

Temperature range	$-55^{\circ}C \dots +155^{\circ}C$
Climatic category to DIN IEC 68	55/155/56
Solderability ¹⁾	235°C 2s
Max. soldering temperature ²⁾	260°C 10s

Long term stability:	
Storage 125°C/1000 h	< 1 %
Storage 155°C/1000 h	< 2 %
Load $P_{70}/70^{\circ}C/1000$ h	< 2 %
Damp heat (56 d/40°C/96 %)	< 1 %

1) DIN IEC 68 T2-20, Ta Meth. 1

2) DIN IEC 68 T2-20, Tb Meth. 1A

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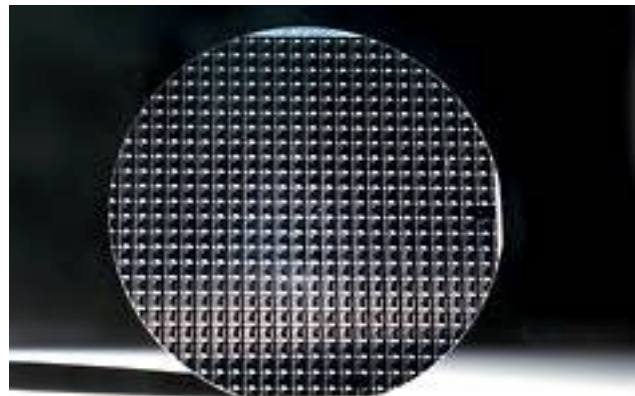
PTC-Thinfilm Chip Resistors

Type: **TRS-C, TRS-S**

Sizes: **RR0805, RR1206**

Features:

- PTC-Chip Resistors in Thinfilm
- Contact areas tinned - resistant to leaching
- Resistance element resin-passivated
- Tolerances down to 0.1% - TC available from +3300 to +3850
- Linearity of TCR better than $\pm 5\%$



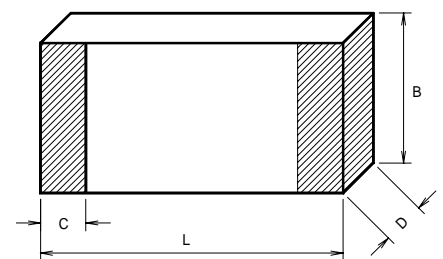
Dimensions TRS-C:

Baugröße	metrisch	L	B	D	C
RR0805	RR2012M	2,0 \pm 0,1	1,25 \pm 0,1	0,55 \pm 0,1	0,4 \pm 0,2
RR1206	RR3216M	3,2 \pm 0,2	1,6 \pm 0,15	0,55 \pm 0,1	0,5 \pm 0,2

(L=Länge, B=Breite, D=Dicke, C=Breite Umkontakt in mm)

Dimensions TRS-S:

Size	Contact system
0,5 x 0,5 mm ²	solderable
0,76 x 0,76 mm ²	bondable
2 x 1 mm ²	





Ordering data (example):

Example: TRS-C 1206 - 10K \pm 0,5% - TK 3850 \pm 200 - bulk Packaging (if not bulk)

Type Value Tolerance TCR Tolerance TCR

Technische Daten-baugrößenabhängig:

Size	TRS-C 0805	TRS-C 1206	TRS-S
Power rating P ₇₀ (mW) (P ₁₂₅ = 0 mW)	62,5	125	25 mW/mm ²

Range/TC/Tolerance		TRS-C 0805	TRS-C 1206	TRS-S
100 Ω 1, 5, 10 k Ω	TC (ppm/K):	+3300, +3850	+3300, +3850	+3300, +3850
	TC-tolerances (ppm/K):	\pm 500, \pm 200	\pm 500, \pm 200	\pm 500, \pm 200
	Value tolerances at 25°C:	\pm 0,5/1/5 %	\pm 0,5/1/5 %	\pm 0,25/0,5/1/5 %
100 k Ω	TCe (ppm/K):		+3300, +3850	+3300, +3850
	TC-tolerances (ppm/K):		\pm 500, \pm 200	\pm 500, \pm 200
	Value tolerances at 25°C:		\pm 0,5/1/5 %	\pm 0,25/0,5/1/5 %

Andere Parameter auf Anfrage.

Technical data - general:

	TRS-C	TRS-S
Temperature range	-55°C...+125°C	-55°C...+125°C
Climatic category to DIN IEC 68	55/155/56	Structural elements are to be protected from environmental influences.
Solderability ¹⁾	235 °C, 2s	
Max. soldering temperature ²⁾	260 °C, 10s	

Long term stability	TRS-C	TRS-S
Storage 125 °C/1000h	< 0,35 %	< 0,25 %
Storage 155 °C/1000h	< 0,5 %	< 0,25 %
Load P70/70°C/1000h	< 0,5 %	< 0,25 %
Damp heat (56d/40°C/96%)	< 0,75 %	

Data not specified: CECC 40401-801

1) DIN IEC 68 T2-20, Ta Meth. 1

2) DIN IEC 68 T2-20, Ta Meth. 1A



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Packaging:

TRS-C: Bulk or Tape/Reel to DIN IEC 60286-3

(tape width: 8 mm, reel diameter: 180 mm)

Minimum quantity: bulk - 100 pieces per value; tape - 2000 pieces per value

TRS-S: Chip Trays, Wafer inked, Wafer foil/inked

Stand: 02/99



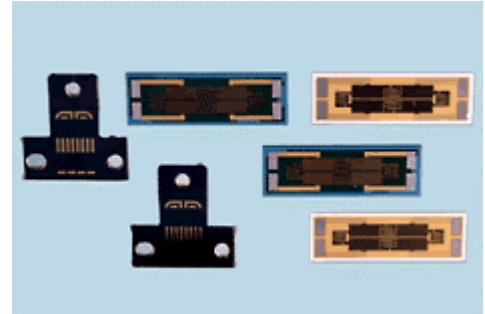
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Force and Acceleration Sensors

Type: FAS

- DF-DMS auf Biegebalken aus Edelstahl, Keramik und Sonderwerkstoffen
- Nominal value: 2 mV/V (bridge voltage)
- Force voltage range: 0,5 V ... 20 V
- Resistance of bridge: 1 kW ... 20 kW
- TCR of Zero-signal: 0,1 μ V/V/K





Precision Pressure Sensors in Thinfilm

Type: PDS

Features:

- Thinfilm strain gauges are placed on elastic membranes of steel, ceramic or silicon
- Deformation of the membranes creates a change of the electrical resistance
- 4 resistors with low TCR and high precision connected to a Wheatstone Bridge result in an accurate measuring signal
- Anorganic isolation systems minimize the influence of climatic disturbances to the strain gauges

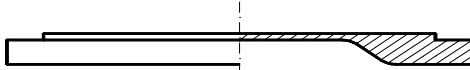


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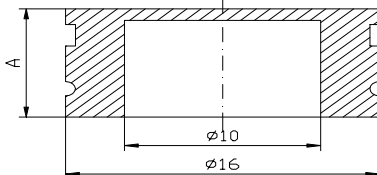
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Standard dimensions:

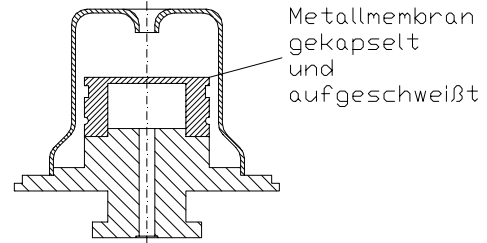
a) quasi-front-flush membran



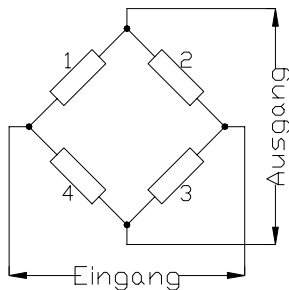
b) Cup-type membrane



Fitting example

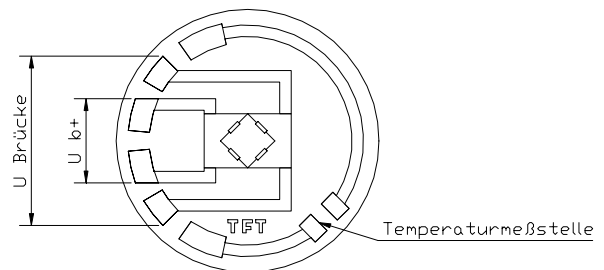


Electric block diagram



- Resistance range: 350 Ω, 5 kΩ, 10 kΩ

Layout contact system on metal membrane (example)



- Outdoor connections pre-tinned, solderable

Styles:

- Dices of ceramic or metal alloy
- Polygons of ceramic or metal alloy
- Cylindrical elements with metal membrane

• Pressure sensors are supplied user-specific, in accordance with the measuring body specifications.

Technical data:

Feature	Unit	Cup-type membrane		Quasi-front-flush membrane
Membrane diameter	mm	5	10	10
Total diameter	mm	10	16	19
Measuring range up to	bar	50, 60, 100, 160, 200, 315, 400, 500, 600, 1000, 1600	10, 20, 50, 100, 200, 500, 1000, 2000	10, 20, 50, 100
Resistance of bridge	Ω	350 \pm 15%, 5k \pm 15%, 10k \pm 15%		5k \pm 15%, 10k \pm 15%
TCR	ppm/K	< \pm 50	< \pm 50	< \pm 50
Zero-signal	mV/V	< \pm 0,2	< \pm 0,2	< \pm 0,2
TCR of zero-signal	μ V/V/K	< \pm 0,4	< \pm 0,6	< \pm 0,4
Resistance of isolation (100 V DC)	Ω	> 10 ⁹	> 10 ⁹	> 10 ⁹
Nominal value	mV/V	2	2	2
Range of nominal value	mV/V	1,6 ... 2,6	1,6 ... 2,4	1,6 ... 2,6
TCR of nominal value	%/K	0,01 ... 0,03	0,01 ... 0,03	0,01 ... 0,03
Failure of linearity	% FS			
10 bar	%	/	< 3	< 3
20 bar	%	/	< 1,5	< 1,5
50 ... 2000 bar	%	< 1,0	< 0,5	< 0,5
Hysteresis	%	< 0,1	< 0,1	< 0,1
Repeatability	%	< 0,1	< 0,05	< 0,05
Change of zero-signal after				
60 °C 120 h	μ V/V	< 1,0	< 1,0	< 1,0
20 °C, 50% r.F. \rightarrow 95% r.F. – 100% Overload	μ V/V	< 10	< 10	< 10
	μ V/V	< 2	< 2	< 2
Range of nominal temperature	° C	- 20 ... + 70		
Temperature range	° C	- 40 ... + 140		
Source voltage range	(UB) V	0,5 ... 20 (350 Ω) 0,5 ... 30 (\geq 5 k Ω)		
Overload		> 2 x nominal load (2000 bar 1,5x)		
Bursting load		> 5 x nominal load (2000 bar 2x)		
CMF-temperature resistance				
Value at 0 °	Ω	5k \pm 5%		
CTK-R (0°C... 100°C)	ppm/K	3850 \pm 300		
Contact		To customer specification, e.g. approx. 100 mm ribbon cable or colour-coded flexible leads		

Other specifications on request.

Required data for layout:

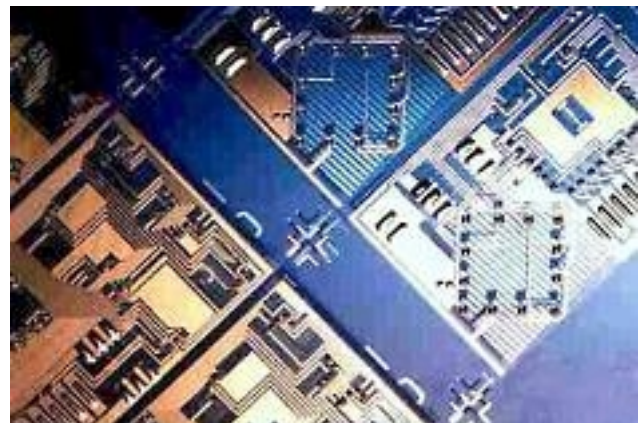
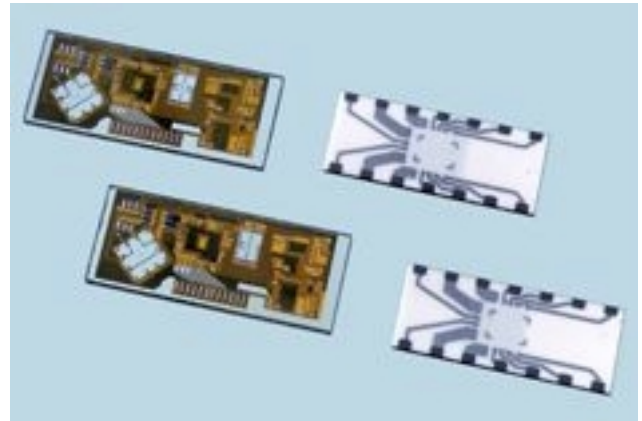
- Construction of the measuring element
- Number and position of connected resistors
- Value of resistors
- Tolerance of the bridge-Zero-signal
- Temperature coefficient
- Temperature range
- Stability requirements

Stand: 02/99

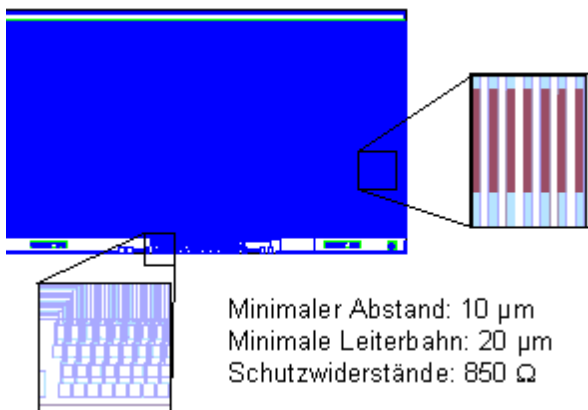
Thin film connecting pattern with flip chip-, chip and wire- and SMD contacts

Type: DFS

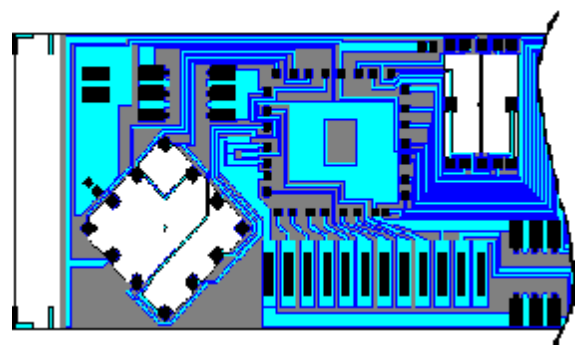
- low cost systems in high integrated one-layer wiring with highest line size resolution
- specific substrat material for use
- possibilities of combination of different construction and interconnection technologies
- bumps for flip chip assembly until ultrafine pitch area (pad distance minimum 80 μm) on glass too



Verdrahtungsstruktur mit integrierten Widerständen



Layout Verdrahtungsträger auf Glas



**Composite:**

- Cu
- Al
- Au

Resistors:

- $2\ \mu\text{m} \approx 10\ \text{m}\Omega/$
- $1,5\ \mu\text{m} \approx 25\ \text{m}\Omega/$
- $1,5\ \mu\text{m} \approx 25\ \text{m}\Omega/$
- CrNi-resistor layer variable
(50, 100, 200 $\Omega/$)

System technique:

- Flip-Chip and SMD
- Chip & Wire, SMD and Flip-Chip
(each with internal resistors)
- Chip & Wire, SMD-Kleben (each
with internal resistors)

Substrat materials:

- Borosilikate glass, Quartz glass
- Aluminiumoxid- and Aluminiumnitritceramic
- Glass-ceramic
- Silicon

Connecting grid for components:

- Flip-Chip: pad size minimum 100 x 140 μm
pad spacing minimum 80 μm
Solder bumps LSn 63
bump altitude 30 ... 100 \pm 10 μm variable
- Chip and Wire: Metallisation Al or Au
Pad size 1000 μm^2 Pad spacing variable 10 μm variabel
- SMD: with LSn 63 pre plumbed contactpads
pad size and pad spacing variable

Dimensions:

- maximum circuit size 4''
- minimum structure width: 20 μm
- minimum structure distance: 10 μm

Temperature loadability:

- flip chip system: until 125 °C
- bonding batch system: until 150 °C
- bonding-solder batch combination: until 150°C

Packaging:

- Circuits on substrate
- Diced circuits



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