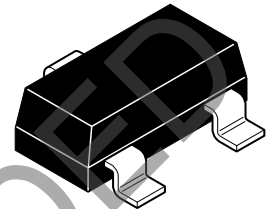


## ZNI1000

### Temperature sensor

#### Description

The ZNI1000 is a Ni thin film Resistance Temperature Detector (RTD), specified to DIN 43760. The high temperature coefficient offers higher signal outputs than other RTD's, which results in higher accuracy with smaller temperature changes.



#### Features

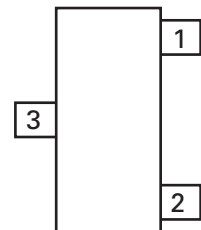
- Resistance at 0°C: 1000
- Nickel temperature detector
- Specified to DIN 43760
- SOT23 package

#### Applications

- Automotive electronic
- Circuit protection
- Temperature compensation
- Temperature measurement

#### Ordering information

Device	Reel size (inches)	Tape width (mm)	Quantity per reel	Device marking
ZNI1000TA	7	8	3,000	ZNI
ZNI1000TC	13	8	10,000	ZNI



Pinout - top view

**Pin 1** - Ni1000  
**Pin 2** - Ni1000  
**Pin 3** - Need a good thermal contact for short response time

## Absolute maximum ratings

Parameter	Symbol	Limit	Unit
Continuous current <sup>(a)</sup>	$I_{CC}$	5	mA
Total power dissipation	$P_{TOT}$	20	mW
Operating temperature range	$T_A$	-55 to +150	°C
Storage temperature range	$T_{stg}$	-55 to +150	°C

### NOTES:

(a) Limited by operating temperature [  $I_{CC} \leq (20mW/R)^{1/2}$ ,  $R = \text{func}(T_A) = 718 \text{ to } 1986\Omega$  ].

## Recommended operating conditions

Symbol	Parameter	Min.	Typ.	Max.	Unit
$I_{MDC}$	Steady state measurement current <sup>(b)</sup>	0,1	1,2	3,0	mA

### NOTES:

(b) limited by self heating effects (recommended current range 0,1 to 1,5mA)

[ typ. case  $\rightarrow$  temperature error  $\Delta T = (R \cdot 1,2mA \cdot 1,2mA) / 1,7mW/K \leq 1,7K$  ]

[ worst case  $\rightarrow$  temperature error  $\Delta T = (1,986k\Omega \cdot 3,0mA \cdot 3,0mA) / 1,4mW/K = 13,8K$  ].

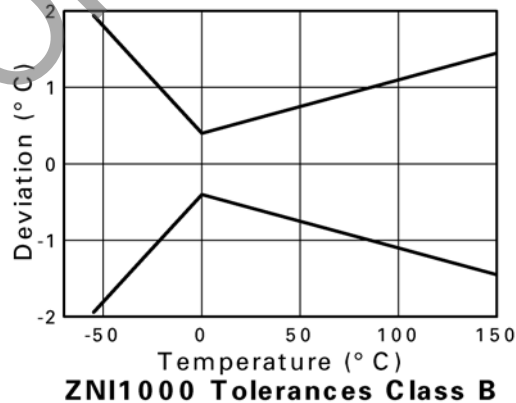
## Electrical characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
R0	Resistance 0°C	$T=0^\circ\text{C}$ , $I_M < 1\text{mA}$	-	1000	-	$\Omega$
R25	Resistance 25°C	$T=25^\circ\text{C}$ , $I_M = 3\text{mA}^{(c)}$	1100	1141	1200	$\Omega$
R100	Resistance 100°C	$T=100^\circ\text{C}$ , $I_M < 1\text{mA}$	-	1618	-	$\Omega$
	Tolerance class B <sup>(d)</sup>	-55 to 0°C	-	$\pm(0.4+0.028 \times  T )$	-	°C
	Tolerance class B <sup>(d)</sup>	0 to 150°C	-	$\pm(0.4+0.007 \times  T )$	-	°C
$\Delta R$	Long Term stability:	1000h at 150°C		0.1		%

### NOTES:

(c) Measured under pulse conditions.

(d) See ZNI1000 Tolerance class figure.

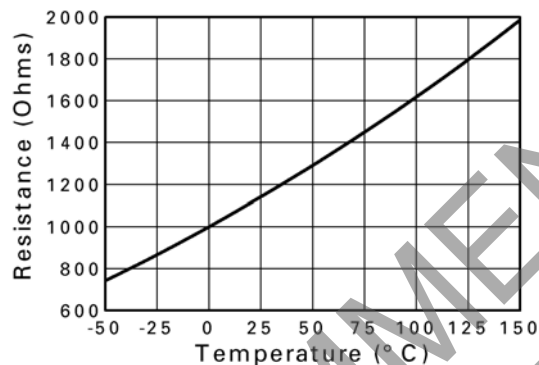


## Characteristics according to DIN43760

### Resistance at a given temperature

R0	Resistance at 0°C	B	$6.650 \times 10^{-6}$
T	Temperature in °C	C	$2.805 \times 10^{-11}$
A	$5.485 \times 10^{-3}$	D	$-2.000 \times 10^{-17}$

$$R(T) = R0 \times (1 + A \times T + B \times T^2 + C \times T^4 + D \times T^6)$$



**Sensor Resistance vs Temperature**

### Formula for temperature at a given resistance

$$T(R) = A + B \times \sqrt{1 + C \times R + D \times R^5 + E \times R^7}$$

coefficients:

$$A = -412.6$$

$$B = 140.41$$

$$C = 0.00764$$

$$D = -6.25 \times 10^{-17}$$

$$E = -1.25 \times 10^{-24}$$

### Self heating

For accurate temperature measurement it's recommended to choose a small current in order to avoid self heating of the resistor. The temperature failure caused by the measurement current can be calculated with:

$$\Delta T = P/EK$$

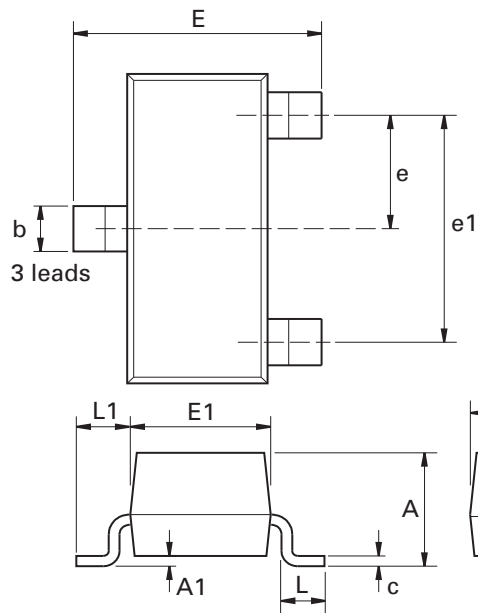
where  $P = I^2 \times R$  is the heat power caused by the measurement current and EK is the self heating coefficient.

The self heating coefficient for the Ni1000-SOT is:

$$EK = (1.7 \pm 0.3) \text{ mW/K (Air: 23°C; no air flow).}$$



## Package outline - SOT23



Dim.	Millimeters		Inches		Dim.	Millimeters		Inches	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	-	1.12	-	0.044	e1	1.90 NOM		0.075 NOM	
A1	0.01	0.10	0.0004	0.004	E	2.10	2.64	0.083	0.104
b	0.30	0.50	0.012	0.020	E1	1.20	1.40	0.047	0.055
c	0.085	0.20	0.003	0.008	L	0.25	0.60	0.0098	0.0236
D	2.80	3.04	0.110	0.120	L1	0.45	0.62	0.018	0.024
e	0.95 NOM		0.037 NOM		-	-	-	-	-

**Note:** Controlling dimensions are in millimeters. Approximate dimensions are provided in inches

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