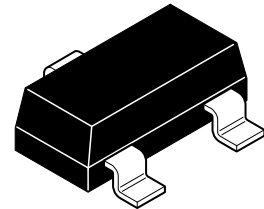

ZNI1000

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

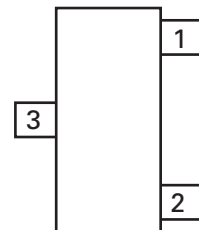
- Resistance at 0°C: 1000
- Nickel temperature detector
- Specified to DIN 43760
- SOT23 package

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

Recommended operating conditions

| Symbol | Parameter | Min. | Typ. | Max. | Unit |
|-----------|---|------|------|------|------|
| I_{MDC} | Steady state measurement current ^(b) | 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 $\Delta T = (R \cdot 1,2\text{mA} \cdot 1,2\text{mA}) / 1,7\text{mW}/\text{K} \leq 1,7\text{K}$]

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

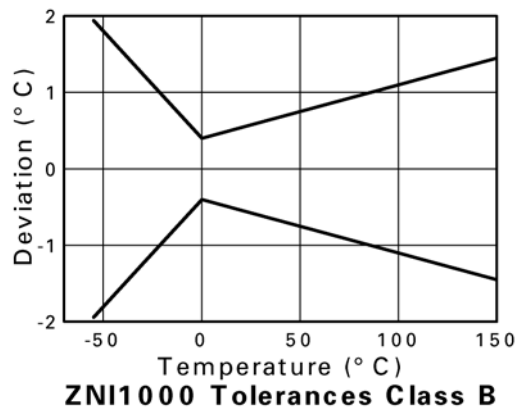
Electrical characteristics

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

NOTES:

(c) Measured under pulse conditions.

(d) See ZNi1000 Tolerance class figure.

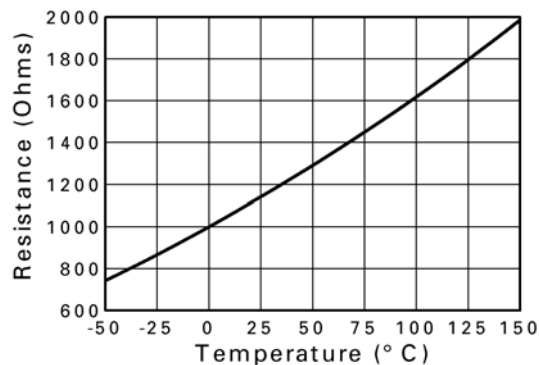


Characteristics according to DIN43760

Resistance at a given temperature

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

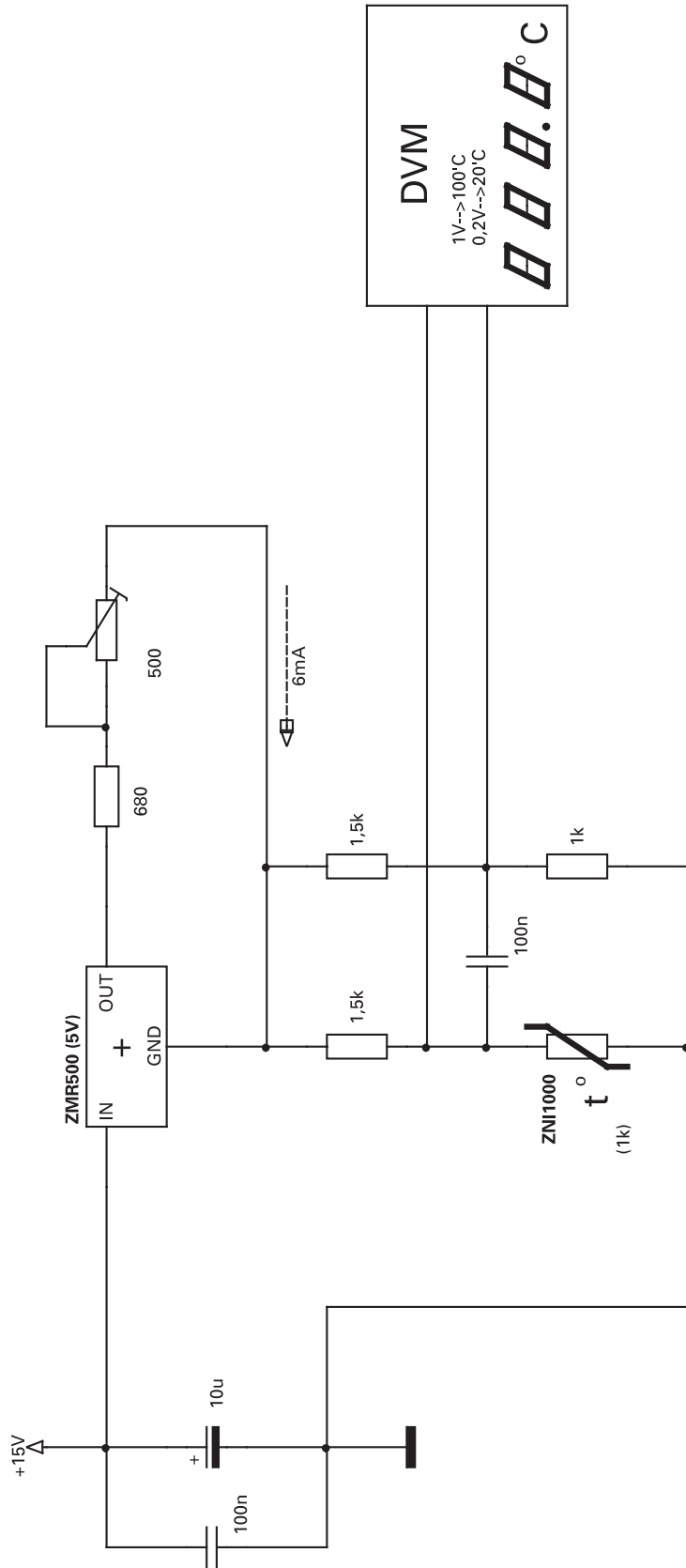
For accurate temperature measurement it's recommended to choose a small current in order to avoid self heating of the resistor. The temperature failure caused by the measurement current can be calculated with:

$$\Delta T = P/EK$$

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

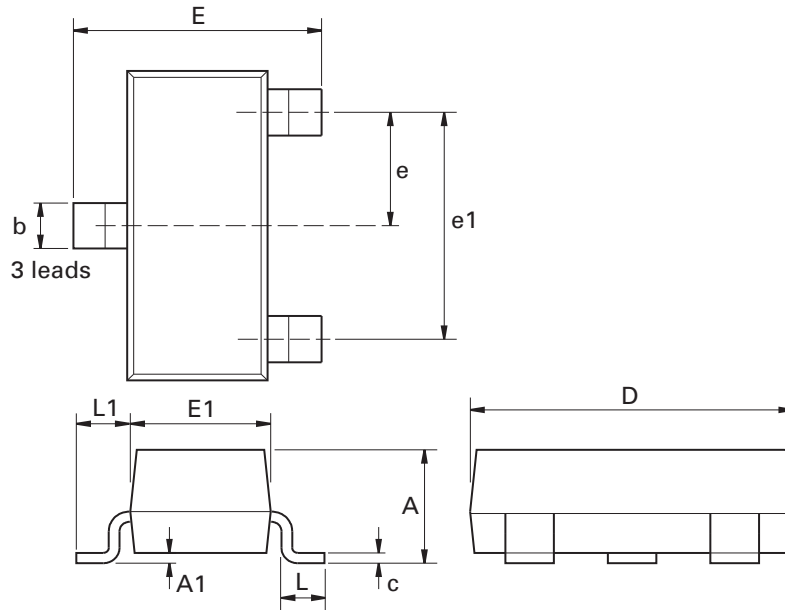
The self heating coefficient for the Ni1000-SOT is:

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



Application of the nickel sensor ZNI 1000

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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| | |
|-----------------------------------|--|
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| | |
|-----------------------|---|
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