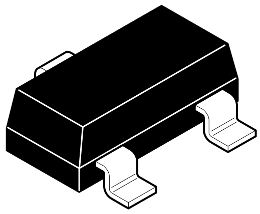
SEMICONDUCTORS

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

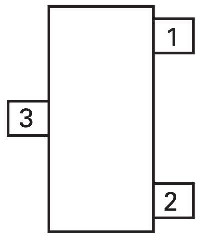
- Resistance at 0°C: 1000
- Nickel temperature detector
- Specified to DIN 43760
- SOT23 package

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 [$I_{CC} \leq (20mW/R)^{½}$, R=func(T_A)=718 to 1986Ω].

Recommended operating conditions

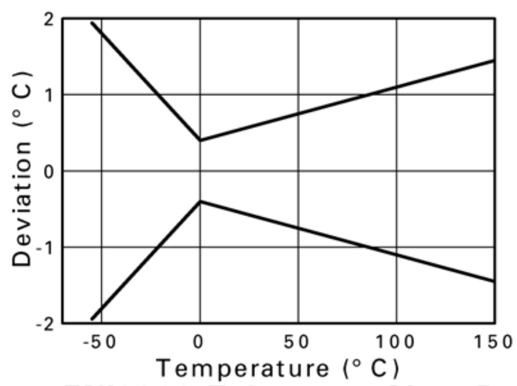
Symbol	Parameter	Min.	Typ.	Max.	Unit
I_{MDC}	Steady state measurement current[(b)]	0,1	1,2	3,0	mA

NOTES:
(b) limited by self heating effects (recommended current range 0,1 to 1,5mA)
[typ. case → temperature error ΔT= (R·1,2mA·1,2mA)/1,7mW/K ≤ 1,7K]
[worst case → temperature error ΔT= (1,986kΩ·3,0mA·3,0mA)/1,4mW/K = 13,8K].

Electrical characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
R0	Resistance 0°C	T=0°C, I_M<1mA	-	1000	-	Ω
R25	Resistance 25°C	T=25°C, I_M = 3mA[(c)]	1100	1141	1200	Ω
R100	Resistance 100°C	T=100°C, I_M <1mA	-	1618	-	Ω
	Tolerance class B[(d)]	-55 to 0°C	-	±(0.4+0.028 x ¦T¦)	-	°C
	Tolerance class B[(d)]	0 to 150°C	-	±(0.4+0.007 x ¦T¦)	-	°C
ΔR	Long Term stability:	1000h at 150°C		0.1		%

NOTES:
(c) Measured under pulse conditions.
(d) See ZNi1000 Tolerance class figure.



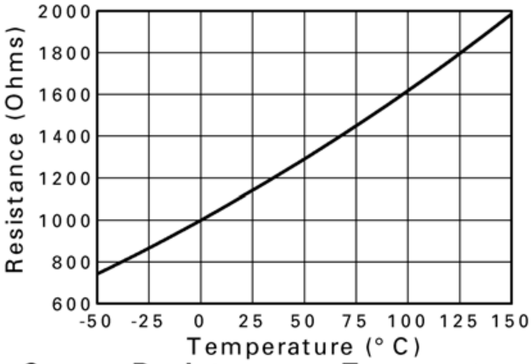
ZNI1000 Tolerances Class B

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 = -6.25×10^{-17}

E = -1.25×10^{-24}

Self heating

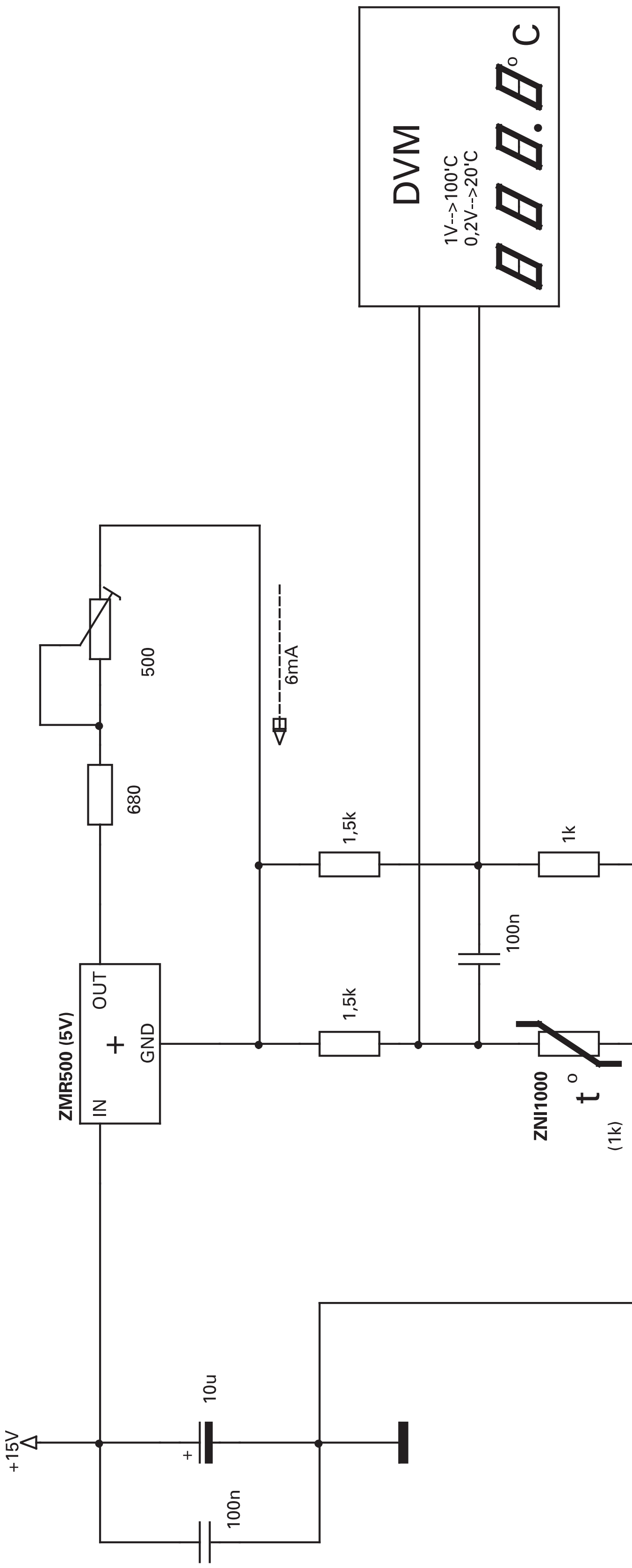
For accurate temperature measurement it's recommended to choose a small current in order to avoid self heating of the resistor. The temperature failure caused by the measurement current can be calculated with:

$$\Delta T = P/EK$$

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

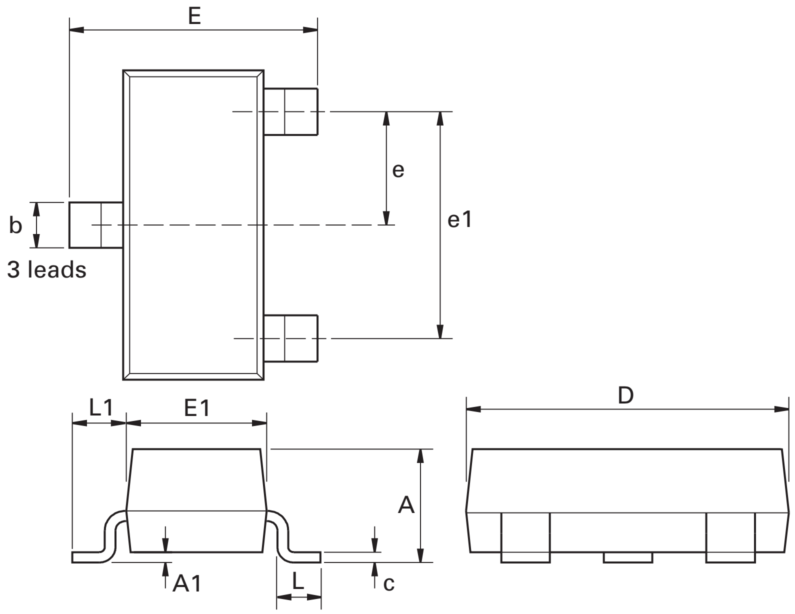
The self heating coefficient for the Ni1000-SOT is:

EK = (1.7 ± 0.3) 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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