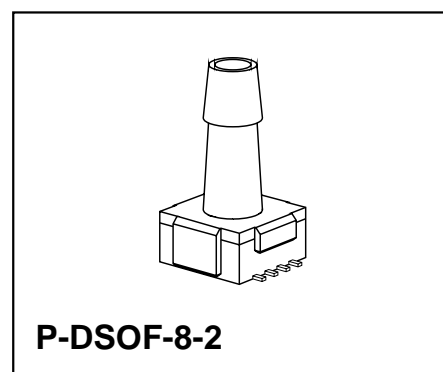
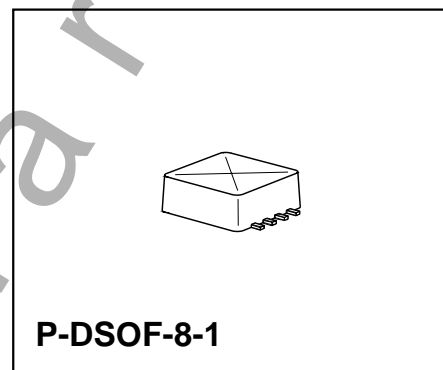


Surface Mount Piezoresistive Silicon Absolute Pressure Sensor

KP202-A/AK
KP203-A/AK
KP205-A

Features

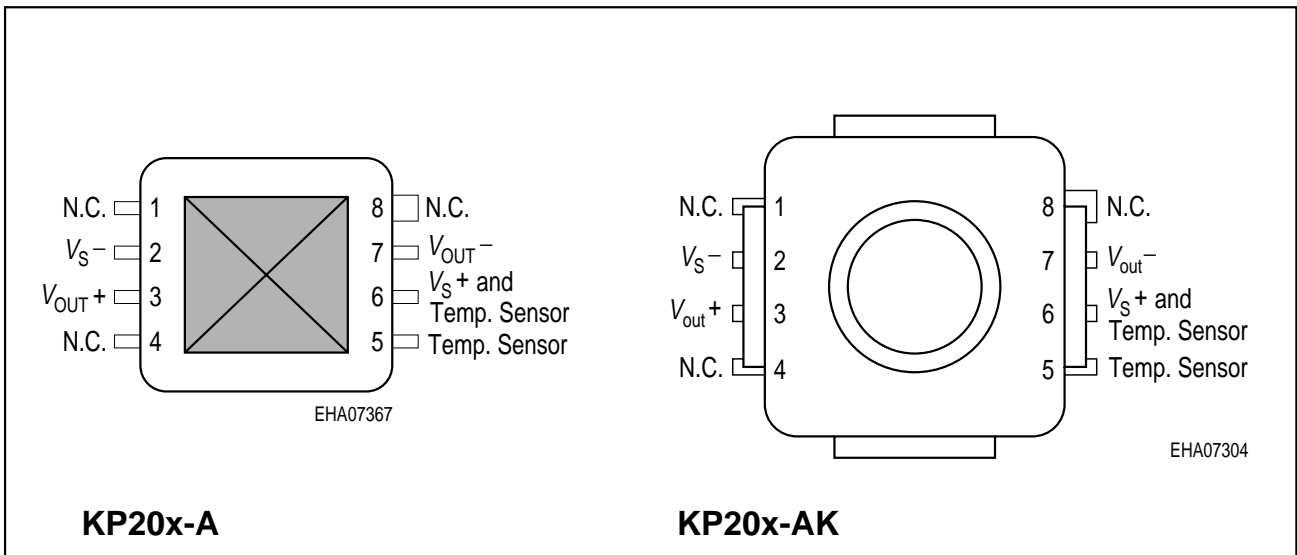
- High sensitivity and linearity
- Fast response
- Very small dimensions
- Low cost
- Produced in qualified semiconductor fabrication lines
- SMD housing
- Built in silicon temperature sensor



Type	Marking	Ordering Code	Pressure Range	Package
KP202-A	KP202-A	–	0 ... 100 kPa (1.0 bar)	P-DSOF-8-1
KP202-AK			0 ... 100 kPa (1.0 bar)	P-DSOF-8-2
KP203-A	KP203-A	–	0 ... 200 kPa (2.0 bar)	P-DSOF-8-1
KP203-AK			0 ... 200 kPa (2.0 bar)	P-DSOF-8-2
KP205-A	KP205-A	–	0 ... 1000 kPa (10 bar)	P-DSOF-8-1

Pin Configuration

1	not connected
2	$V_S -$
3	$V_{OUT} +$
4	not connected
5	Temperature Sensor
6	$V_S +$ and Temperature Sensor
7	$V_{OUT} -$
8	not connected



Electric Network

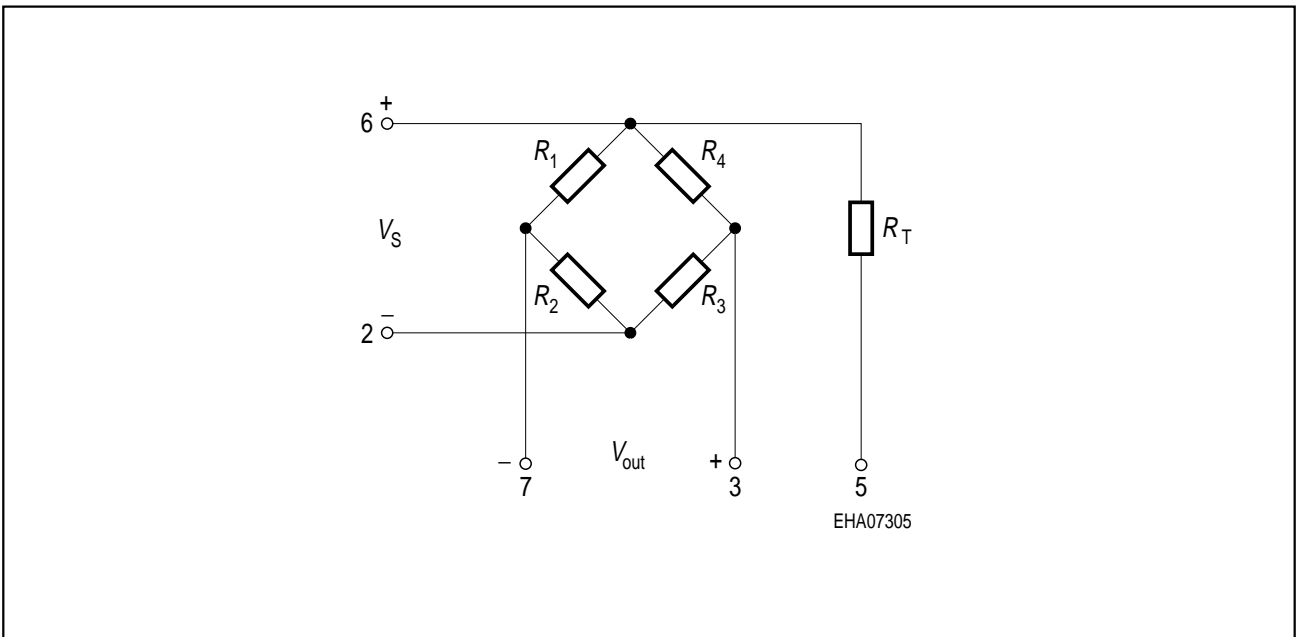
Four piezoresistors form a bridge circuit, providing a very accurate and linear output voltage, directly proportional to the applied pressure.

$$V_{\text{OUT}} = V_{\text{O}} + V_{\text{FIN}} = V_{\text{S}} \times \frac{R_1(p) \times R_3(p) - R_2(p) \times R_4(p)}{[R_1(p) + R_2(p)] \times [R_3(p) + R_4(p)]}$$

with

$$R_1(0) \cong R_2(0) \cong R_3(0) \cong R_4(0) \cong R_B$$

A temperature sensor chip R_T , that is built in the housing, can be used to compensate the temperature drift of the pressure sensor.



Sensor Schematic

Piezoresistors $R_1 \dots R_4$ denote the pressure sensitive resistors connected as a Wheatstone bridge. R_T is a KTY-series temperature dependent resistor with a positive TC.

Maximum Ratings

Parameter	Symbol	Value	Unit
Supply voltage	$V_{S\ MAX}$	12	V
Overpressure ¹⁾	p_{MAX}	250	kPa
Burst Pressure KP202-A, KP202-AK KP203-A, KP203-AK KP205-A	p_{BURST}	400 800 2000	kPa
Operating temperature range	T_{OP}	- 40 ... + 125	°C
Storage temperature range	T_{STG}	- 40 ... + 125	°C
Mechanical shock survival		2000	g

¹⁾ Overpressure is limited to p_{MAX} , due to absorption of gas into the protective gel covering the sensor at higher pressures. Abrupt decrease of pressure from values higher than p_{MAX} to low pressures can cause in the gel to rupture.

Electrical Characteristics

at $T_A = 25\text{ °C}$ and $V_S = 5\text{ V}$ unless otherwise specified

Parameter	Symbol	Value			Unit
		min.	typ.	max.	
Pressure Range KP202-A, KP202-AK KP203-A, KP203-AK KP205-A	P_N	0 0 0	– – –	100 200 1000	kPa
Bridge Resistance	R_B	4	6	8	k Ω
Sensitivity KP202-A, KP202-AK KP203-A, KP203-AK KP205-A	s	0.24 0.11 0.036	0.44 0.20 0.052	0.74 0.30 0.080	mV/V \times kPa
Full Scale Span ($p = p_N$, $V_S = 5\text{ V}$) KP202-A, KP202-AK KP203-A, KP203-AK KP205-A	V_{FIN}	120 110 180	220 200 260	370 300 400	mV
Offset signal $p = p_0$	V_o	– 25	–	+ 25	mV
Linearity error (best fit straight line) $p = p_0 \dots p_N$ KP202-A, KP202-AK KP203-A, KP203-AK KP205-A	F_L	– – –	± 0.4 ± 0.4 ± 0.3	– – –	% V_{FIN}
Pressure Hysteresis KP202-A, KP202-AK KP203-A, KP203-AK KP205-A	P_H	– – –	– ± 0.1 ± 0.1	– – –	% V_{FIN}

Temperature Characteristics

at $T_1 = 25\text{ °C}$, $T_2 = 90\text{ °C}$, $T_3 = 25\text{ °C}$ and $V_S = 5\text{ V}$ unless otherwise specified

Parameter	Symbol	Value			Unit
		min.	typ.	max.	
Temperature Coefficient of Span ¹⁾	$TC_{V_{FIN}}$	–	– 0.17	–	% K ⁻¹
Temperature Coefficient of Offset ¹⁾ KP202-A, KP202-AK KP203-A, KP203-AK KP205-A	TC_{V_0}	–	± 0.01	–	% K ⁻¹
Temperature Coefficient of Bridge Resistance ²⁾	TC_{RB}	–	+ 0.26	–	% K ⁻¹
Temperature Hysteresis of Span ³⁾ KP202-A, KP202-AK KP203-A, KP203-AK KP205-A	$TH_{V_{FIN}}$	–	± 0.4	–	% K ⁻¹
Temperature Hysteresis of Offset ³⁾ KP202-A, KP202-AK KP203-A, KP203-AK KP205-A	TH_{V_0}	–	± 0.3	–	% V_{FIN}^{-1}

¹⁾ Change in value of $TC_{V_{FIN}}$ or TCV between 25 °C and 125 °C relative to V_{FIN} (25 °C)

²⁾ Change in RB between 25 °C and 125 °C relative to RB (25 °C)

³⁾ Change in V_0 (25 °C) or V_{FIN} (25 °C) after temperature cycle 25 °C → 125 °C → 25 °C relative to V_{FIN} (25 °C)

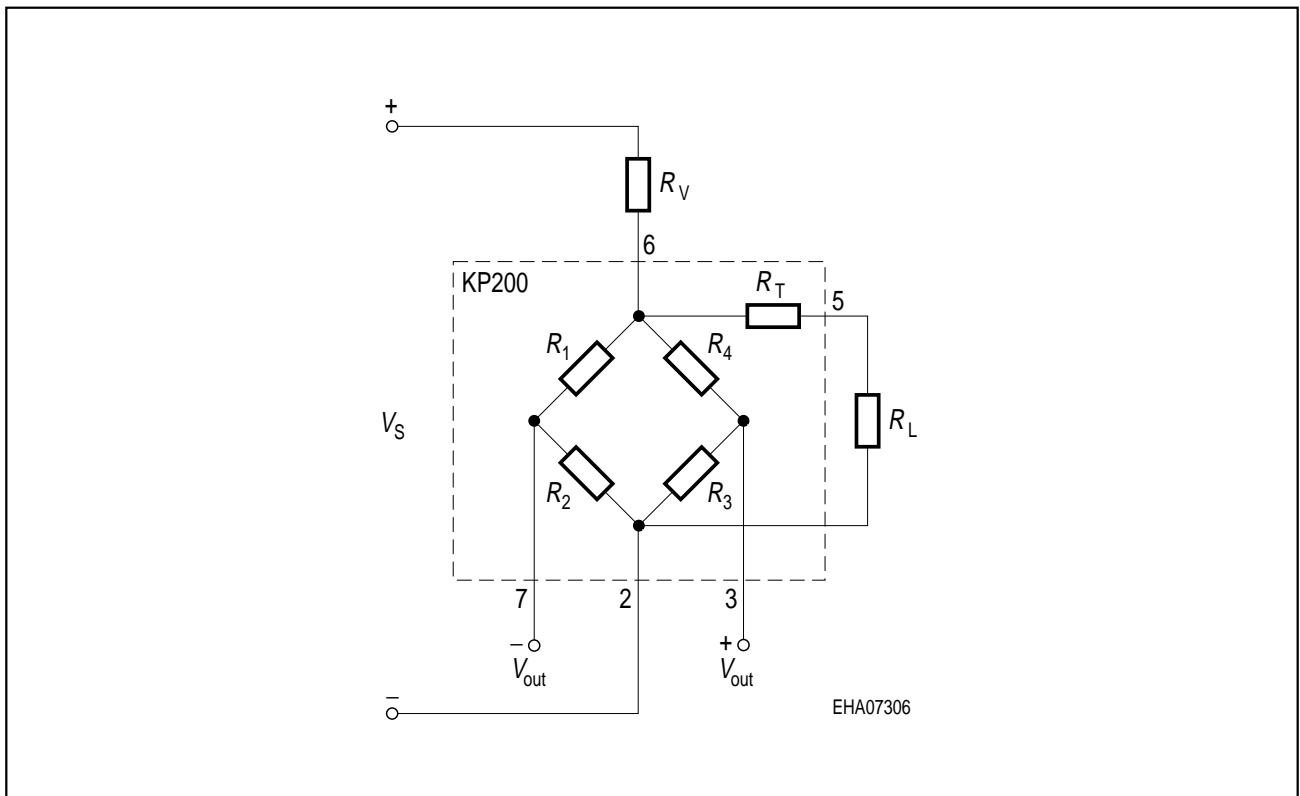
Temperature Compensation

Cost-effective temperature compensation can be achieved using standard ohmic resistors in combination with the built in temperature sensor.

With fixed values for R_V and R_L a temperature compensation error of the output signal (span plus offset) of typical less than $\pm 1\%$ is achieved in the range $10\text{ }^\circ\text{C}$ to $40\text{ }^\circ\text{C}$ (see figure below).

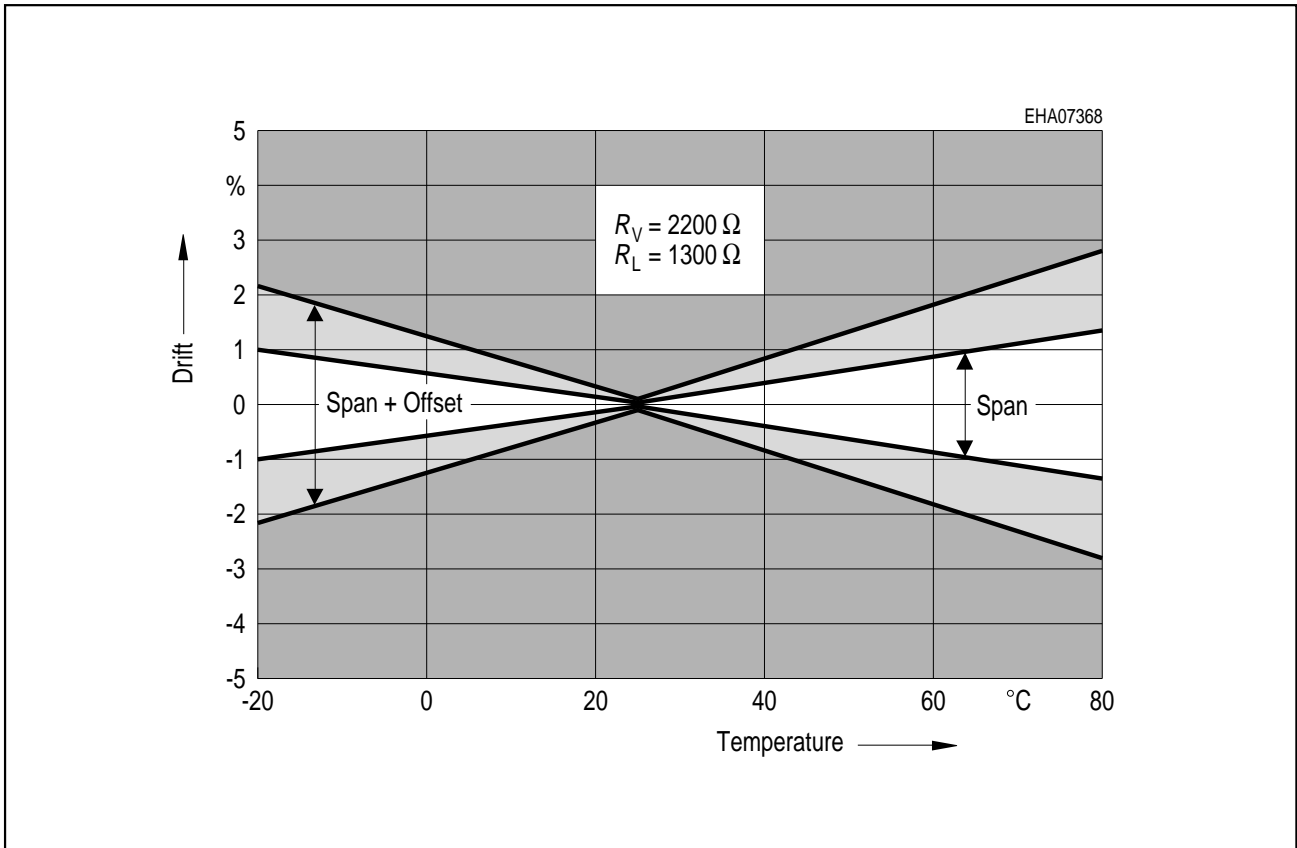
A better temperature compensation is possible by measurement of the temperature coefficients of the sensor. In this case R_V is optimized as described in Siemens databook 03.97 pages 45-46 (or website: <http://www.siemens.de/semiconductor>).

Alternatively an ASIC can be used for calibration and compensation.



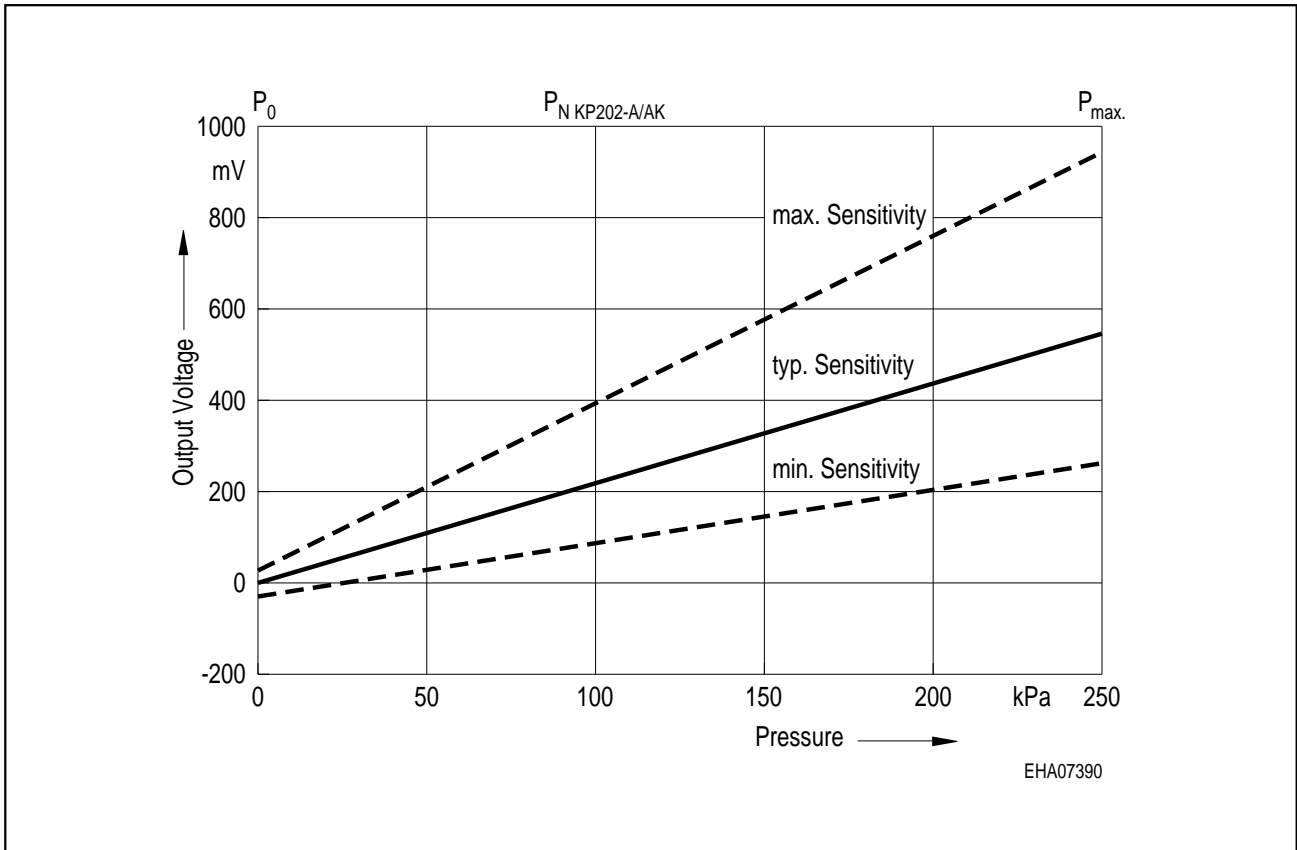
Electrical Circuit for Temperature Compensation

Broken line denotes sensor assembly. R_V and R_L need to be added externally.

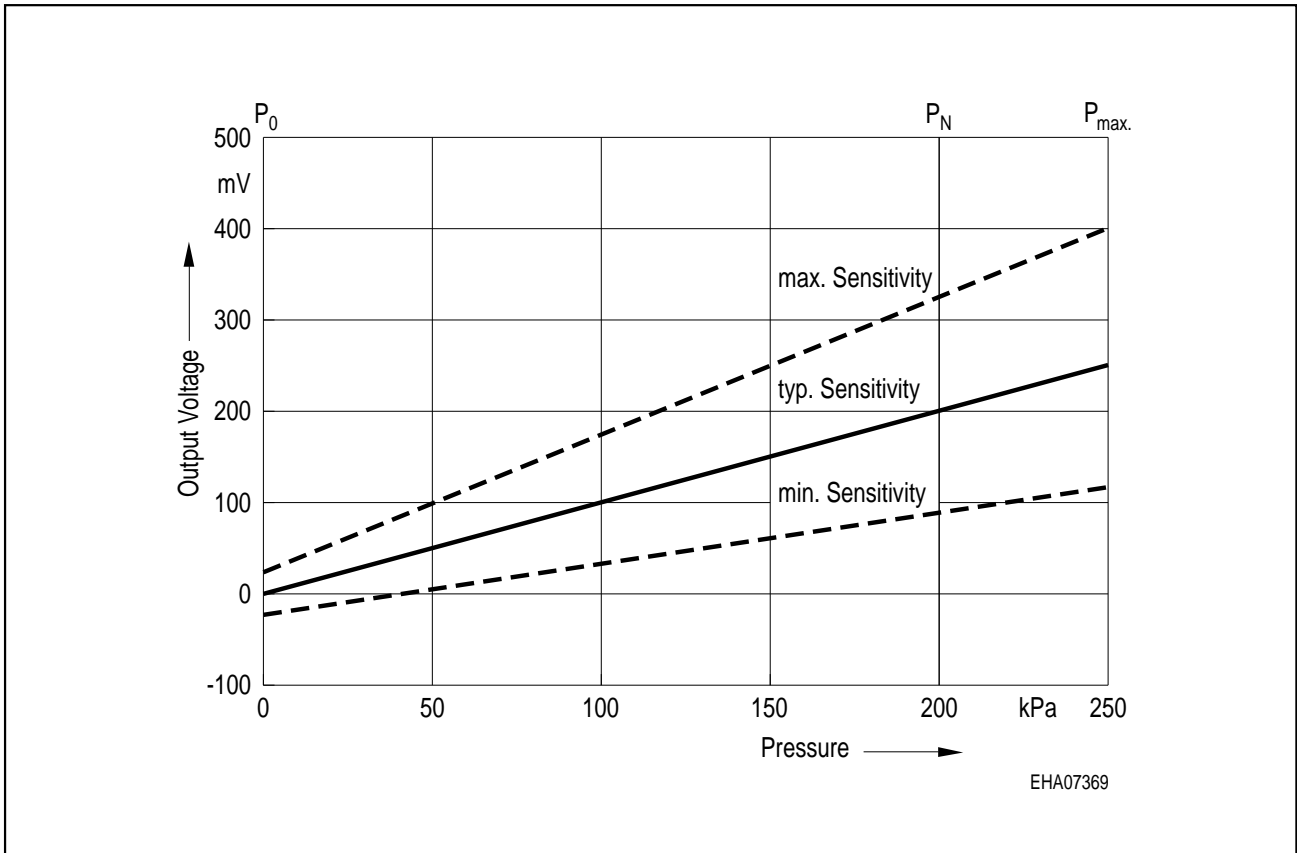


Error Band of Typical Signal Drift after Temperature Compensation Using Fixed Values for R_V and R_L

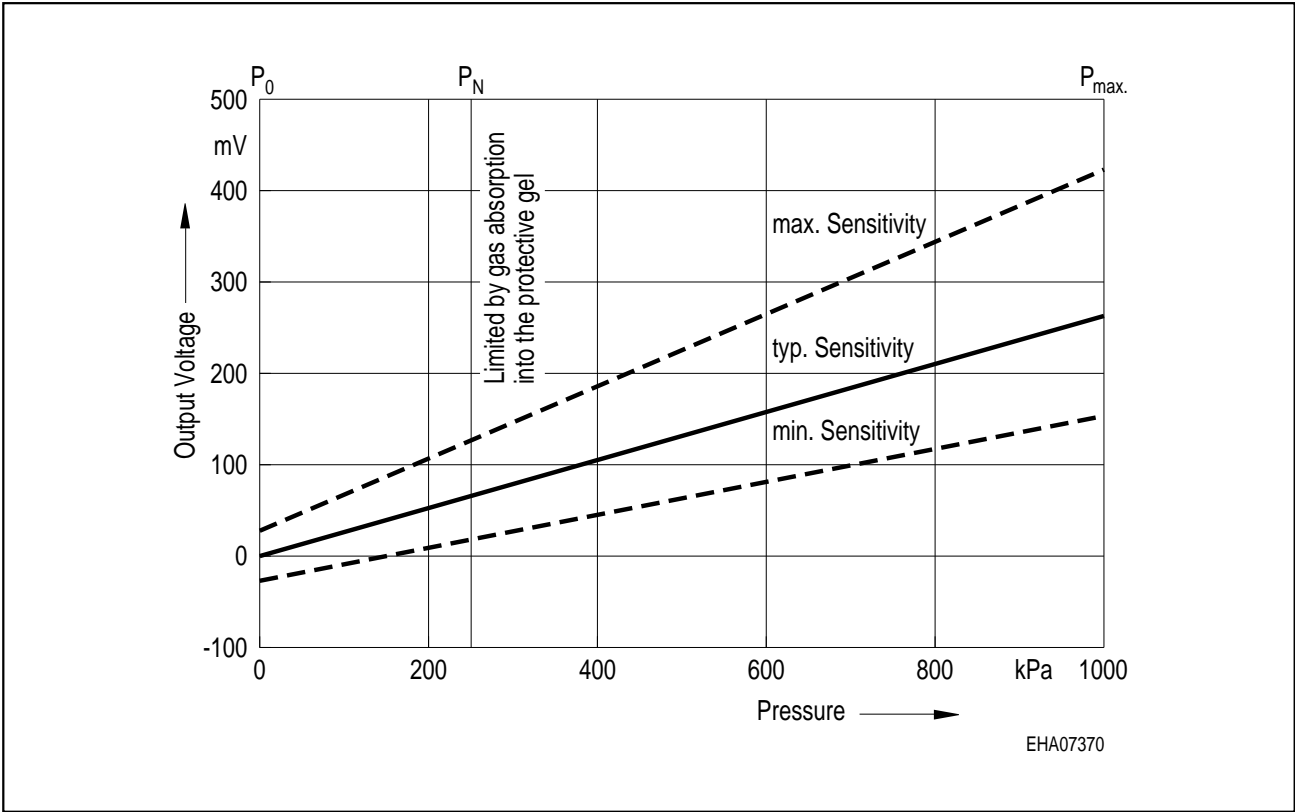
Using fixed resistor $R_V = 2200 \Omega$ and $R_L = 1300 \Omega$. Graph shows typical results for compensated span + offset signals.



Output Voltage for Nominal and Maximal Pressure Range KP202-A, KP202-AK



Output Voltage for Nominal and Maximal Pressure Range KP203-A, KP203-AK

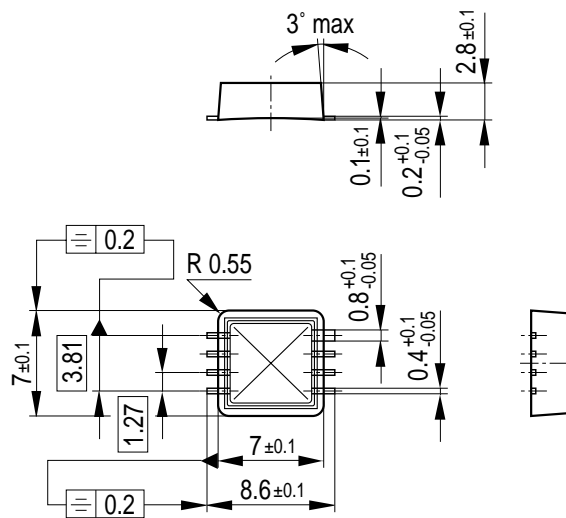


Output Voltage for Nominal and Maximal Pressure Range KP205-A

Package Outlines

P-DSOF-8-1

(Plastic Dual Small Outline Flat Package)



GMX05998

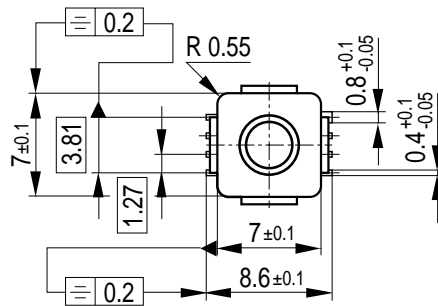
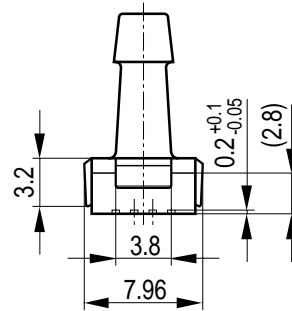
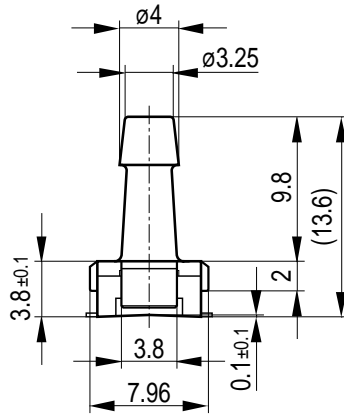
The package is made of a thermoplast housing and copper leadframe with NiPdAu finish. The chip is glued into the premolded plastic package using silicone glue, gold-wire bonded and covered with a protective gel.

For the products KP20x-AK a cap is mounted on the housing.

P-DSOF-8-2

(Plastic Dual Small Outline Flat Package)

Subject to change



GMX09110

Exterior Packaging

Package outlines for tubes, trays etc. are contained in our Data Book "Package Information".

Dimensions in mm