

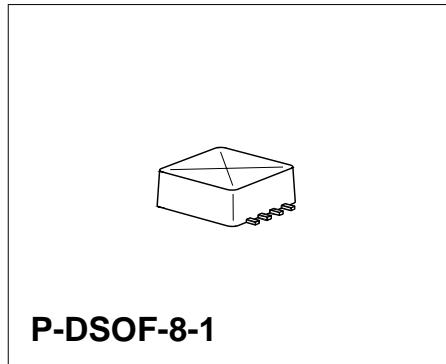
Surface Mount Piezoresistive Silicon Absolute Pressure Sensor

**KP 202-A/AK
KP 203-A/AK
KP 205-A**

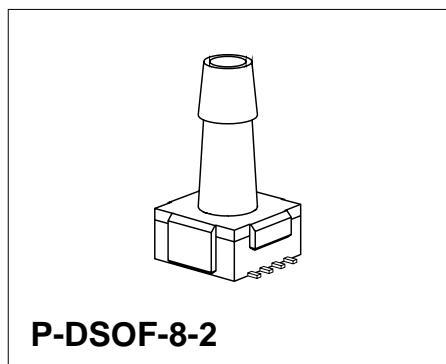
Preliminary

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



P-DSOF-8-1

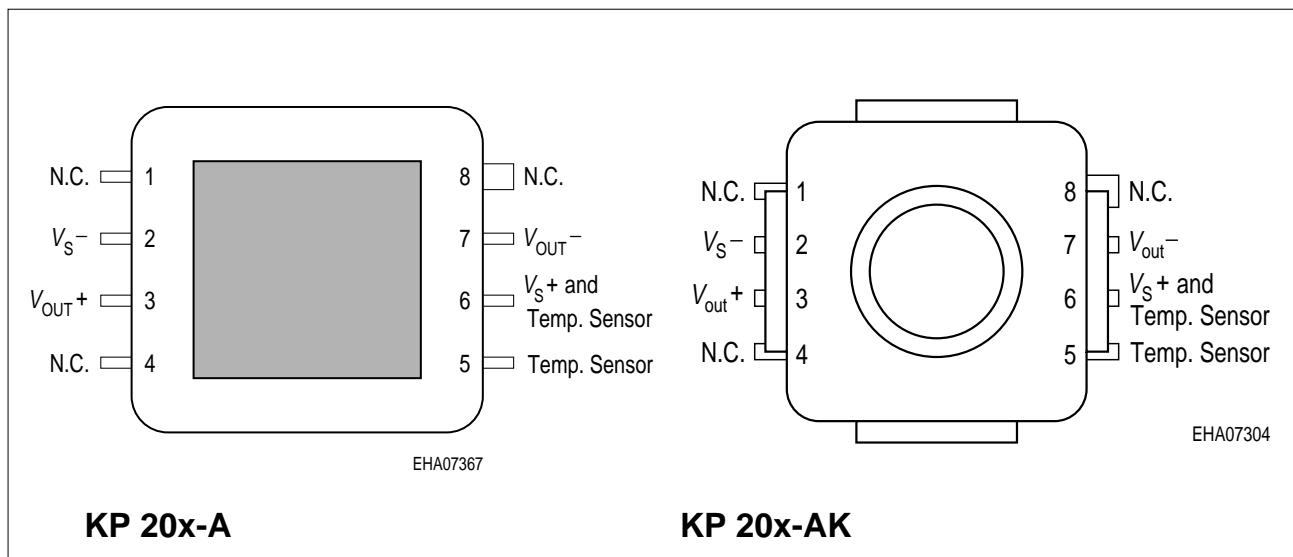


P-DSOF-8-2

Type	Marking	Ordering Code	Pressure Range	Package
KP 202-A	KP 202-A	on request	0 ... 60 kPa (0.6 bar)	P-DSOF-8-1
KP 202-AK			0 ... 60 kPa (0.6 bar)	P-DSOF-8-2
KP 203-A	KP 203-A	on request	0 ... 160 kPa (1.6 bar)	P-DSOF-8-1
KP 203-AK			0 ... 160 kPa (1.6 bar)	P-DSOF-8-2
KP 205-A	KP 205-A	Q62705-K353	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

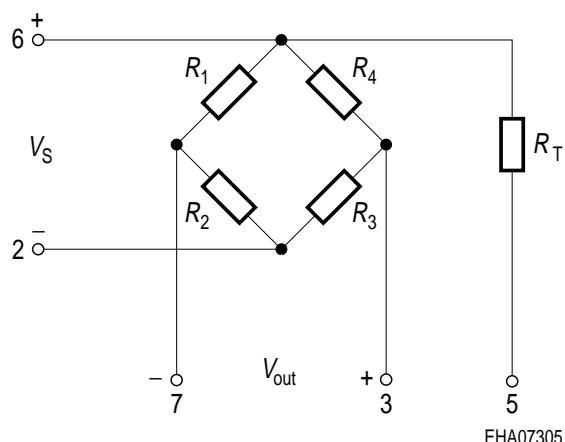
Four piezoresistors form a bridge circuit, providing a very accurate and linear output voltage, directly proportional to the applied pressure.

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

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.

Absolute Maximum Ratings

Parameter	Symbol	Limit Values		Unit
Supply voltage	V_S MAX	12		V
Overpressure ¹⁾	p_{MAX}	250		kPa
Burst Pressure KP 202-A, KP 202-AK KP 203-A, KP 203-AK KP 205-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 $T_A = 25$ °C and $V_S = 5$ V unless otherwise specified

Parameter	Symbol	Limit Values			Unit
		min.	typ.	max.	
Pressure Range KP 202-A, KP 202-AK KP 203-A, KP 203-AK KP 205-A	P_N	0 0 0	– – –	60 160 1000	kPa
Bridge Resistance	R_B	4	6	8	kΩ
Sensitivity KP 202-A, KP 202-AK KP 203-A, KP 203-AK KP 205-A	s	0.24 0.11 0.036	0.44 0.20 0.052	0.74 0.30 0.080	mV/V × kPa
Full Scale Span ($p = p_N$, $V_S = 5$ V) KP 202-A, KP 202-AK KP 203-A, KP 203-AK KP 205-A	V_{FIN}	72 88 180	132 160 260	222 240 400	mV
Offset signal $p = p_0$	V_O	– 25	–	+ 25	mV

Electrical Characteristics (cont'd)

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

Parameter	Symbol	Limit Values			Unit
		min.	typ.	max.	
Linearity error (best fit straight line) $p = p_0 \dots p_N$	F_L	—	± 0.3	—	% V_{FIN}
Pressure Hysteresis	P_H	—	± 0.1	—	% V_{FIN}

Temperature Characteristics

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

Parameter	Symbol	Limit Values			Unit
		min.	typ.	max.	
Temperature Coefficient of Span ¹⁾	$TC_{V\text{FIN}}$	—	-0.17	—	% K ⁻¹
Temperature Coefficient of Offset ¹⁾ KP 202-A, KP 202-AK KP 203-A, KP 203-AK KP 205-A	TC_{V0}	—	± 0.01	—	% K ⁻¹
Temperature Coefficient of Bridge Resistance ²⁾	TC_{RB}	—	$+0.26$	—	% K ⁻¹
Temperature Hysteresis of Span ³⁾ KP 202-A, KP 202-AK KP 203-A, KP 203-AK KP 205-A	$TH_{V\text{FIN}}$	—	± 0.4	—	% K ⁻¹
Temperature Hysteresis of Offset ³⁾ KP 202-A, KP 202-AK KP 203-A, KP 203-AK KP 205-A	TH_{V0}	—	± 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 $25^\circ\text{C} \rightarrow 125^\circ\text{C} \rightarrow 25^\circ\text{C}$ relative to V_{FIN} (25°C)

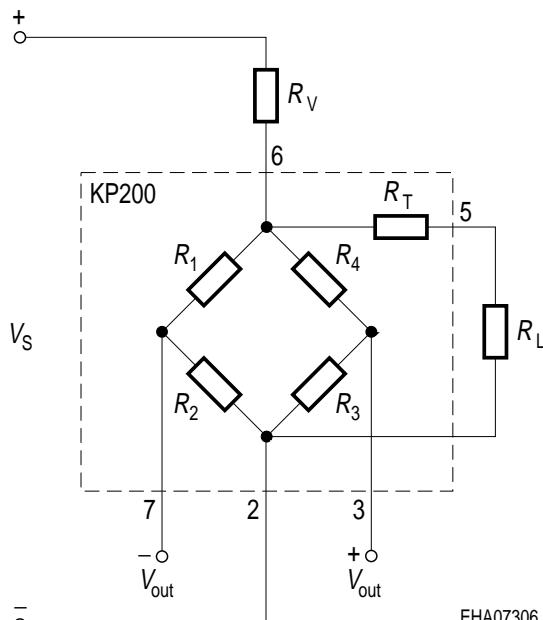
Temperature Compensation

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°C to 40°C (see figure below).

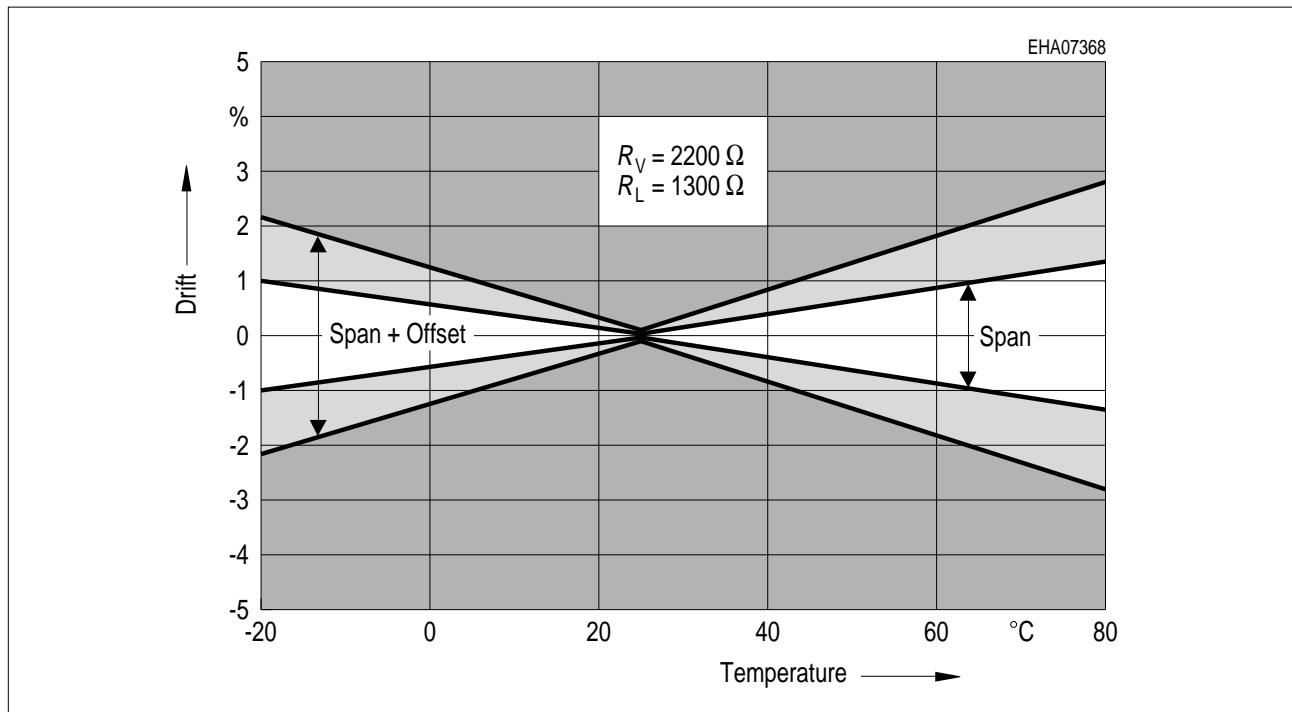
A better temperature compensation is possible by measurement of the temperature coefficients of the sensor. In this case R_V is optimized as described in Siemens databook 03.97 pages 45-46 (or website: <http://www.siemens.de/semiconductor>).

Alternatively an ASIC can be used for calibration and compensation.



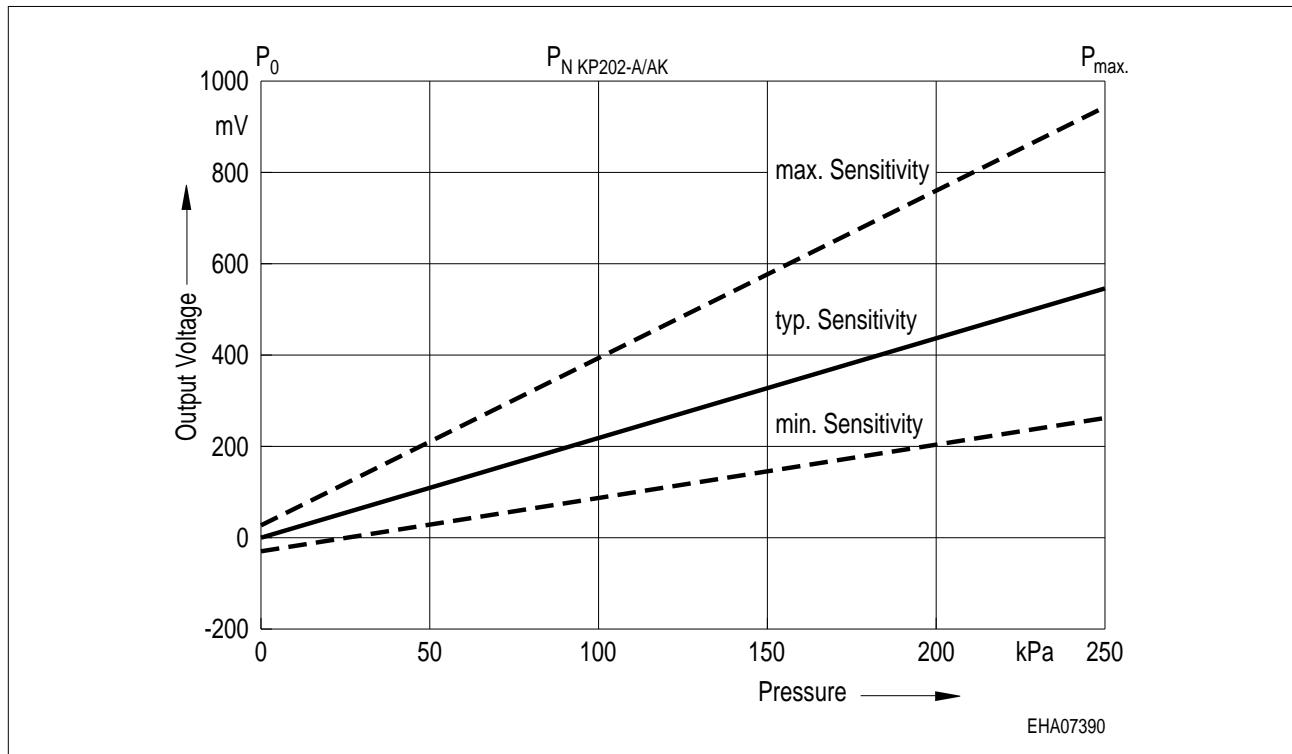
Electrical Circuit for Temperature Compensation

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

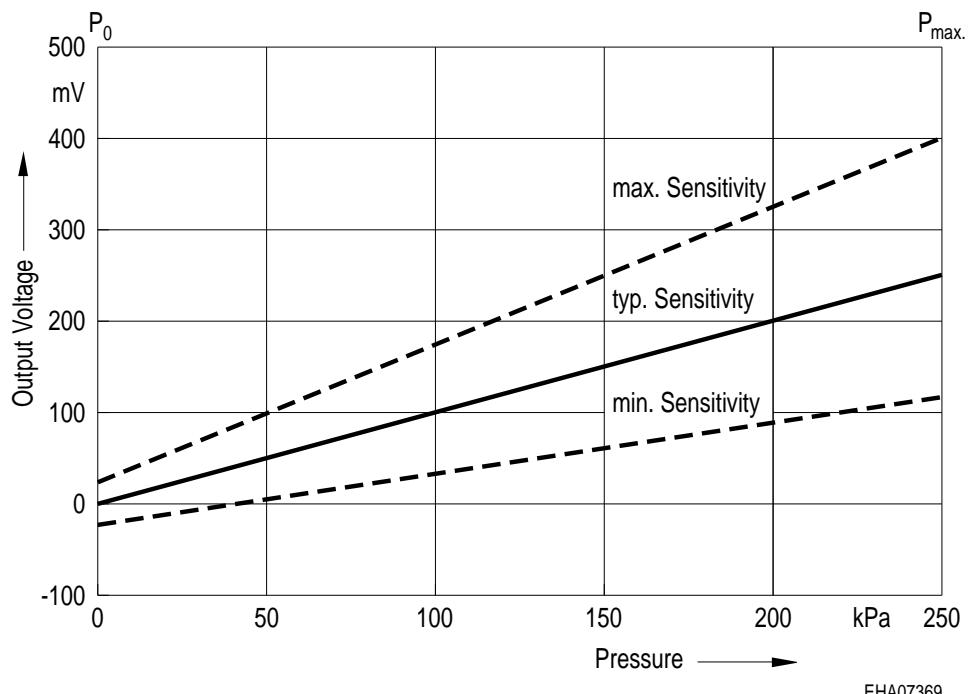


Error Band of Typical Signal Drift after Temperature Compensation Using Fixed Values for R_V and R_L

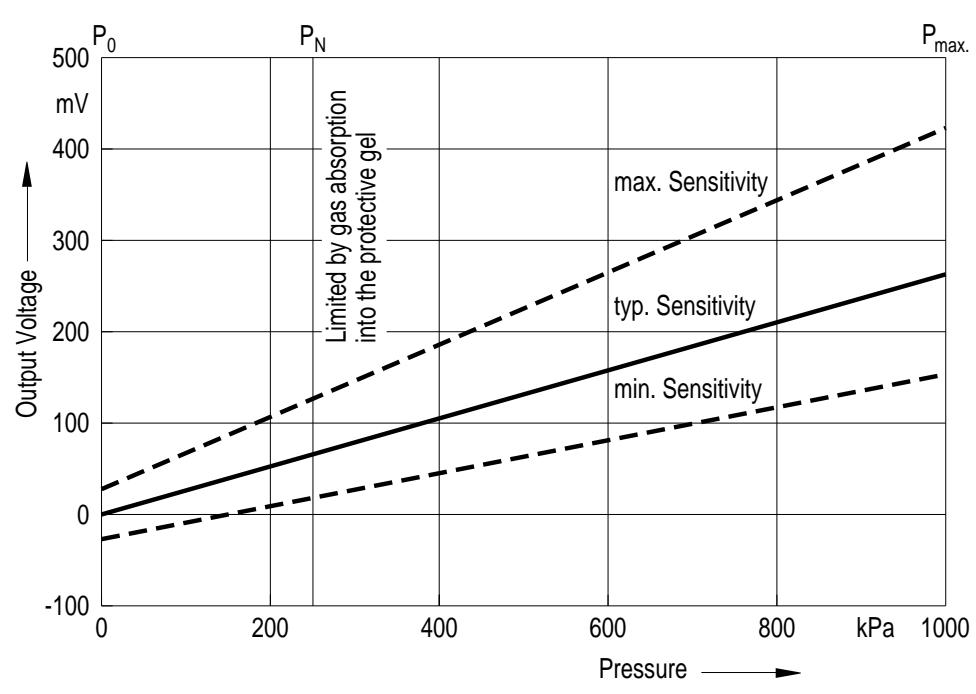
Using fixed resistor $R_V = 2200 \Omega$ and $R_L = 1300 \Omega$. Graph shows typical results for compensated span + offset signals.



Output Voltage for Nominal and Maximal Pressure Range KP 202-A, KP 202-AK



Output Voltage for Nominal and Maximal Pressure Range KP 203-A, KP 203-AK

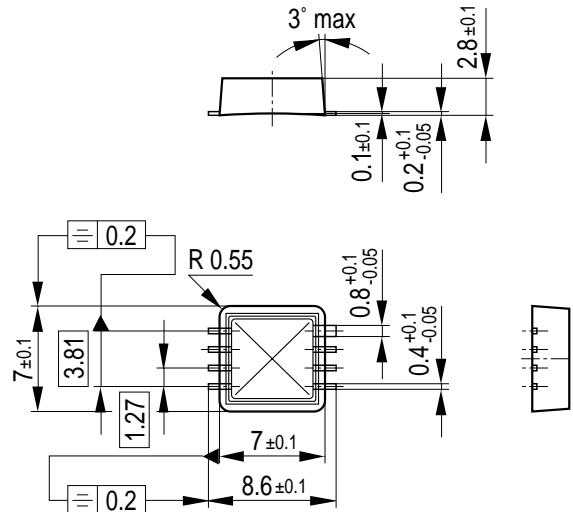


Output Voltage for Nominal and Maximal Pressure Range KP 205-A

Package Outlines

P-DSOF-8-1

(Plastic Dual Small Outline Flat Package)



GM/X05998

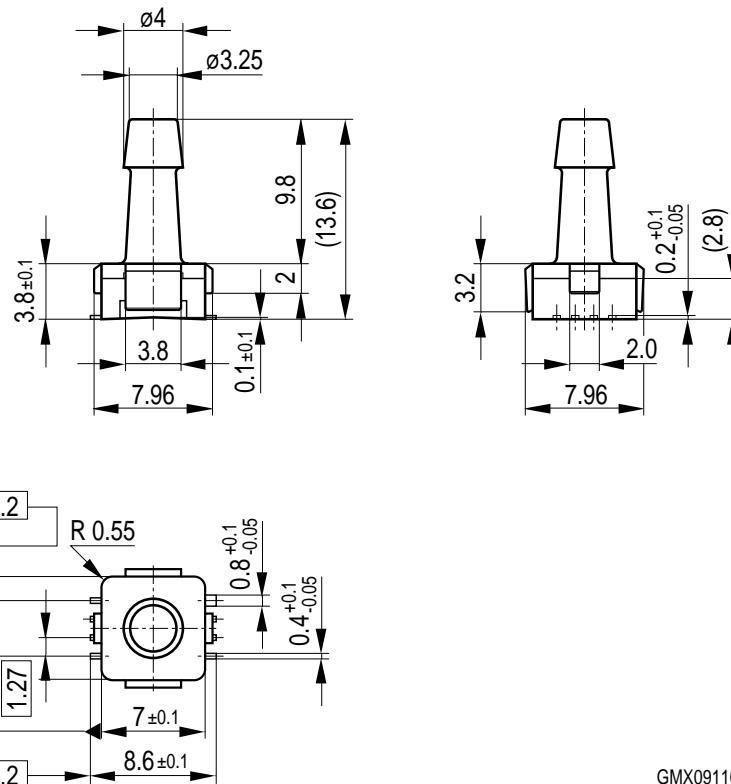
The package is made of a thermoplastic housing and copper leadframe with NiPdAu finish. The chip is glued into the premolded plastic package using silicone glue, gold-wire bonded and covered with a protective gel.

For the products KP 20x-AK a cap is mounted on the housing.

P-DSOF-8-2

(Plastic Dual Small Outline Flat Package)

Subject to change



GMX09110

Sorts of Packing

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

Dimensions in mm