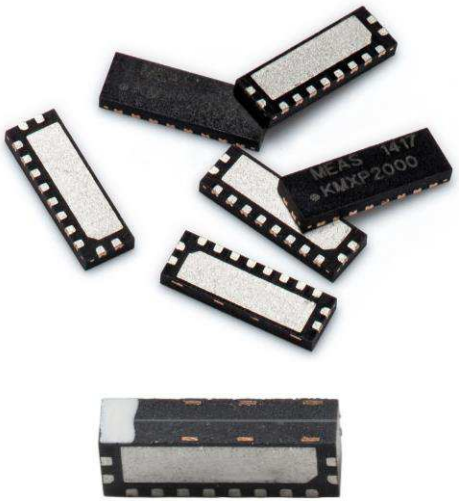


RoHS

KMXP SERIES

Anisotropic Magneto-Resistive (AMR) Linear Position Sensors

Position sensors play an increasingly important role in many industrial, robotic and medical applications. Advanced applications in harsh environments need sensors that perform well, even when exposed to oil, dirt and dust.

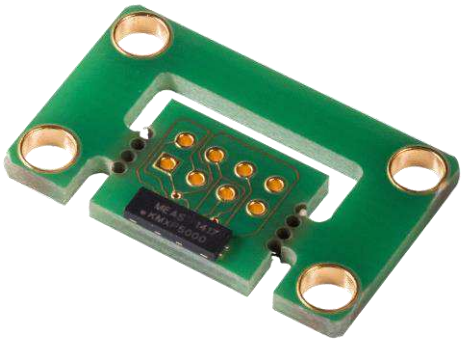
The TE Connectivity KMXP position sensor is the right choice to meet those needs thanks to its Magneto Resistive technology and available form factors. The KMXP sensor provides greater precision than commonly used Hall sensors and is designed to provide reliable and accurate measurements in harsh environments including high temperatures.

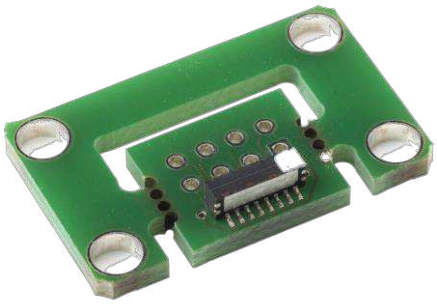
The sensor measuring principle is based on the anisotropic magneto resistance effect (AMR effect).

The sensors are offered in two different DFN packages for multiple orientation options. These packages can be easily integrated to almost any automated assembly process.

FEATURES

- High Resolution and high precision – Magneto Resistive (MR) sensor with contactless measurement which provides accuracy of 10-50 µm in ranges between 1 – 5 mm.
- Easy Assembly – DFN package ideal for any PCB assembly processes.
- Tape & Reel packaging for easy integration
- Design Freedom – Perpendicular or flat soldering versions and a small sensor wall thickness for large application air gaps.
- Superior Performance – Up to 150°C, EMC proof in any dirty environment and insensitive to dirt, oil or dust.





APPLICATIONS

Contactless linear or angular position measurement in applications like:

- Industrial machinery like sawing or drilling equipment
- Medical high precision mechanical controls like bed control, advanced prosthesis steering, precision catheters, X-ray equipment, or syringe pumps
- Robotics in industrial automation

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MEASUREMENT PRINCIPLE

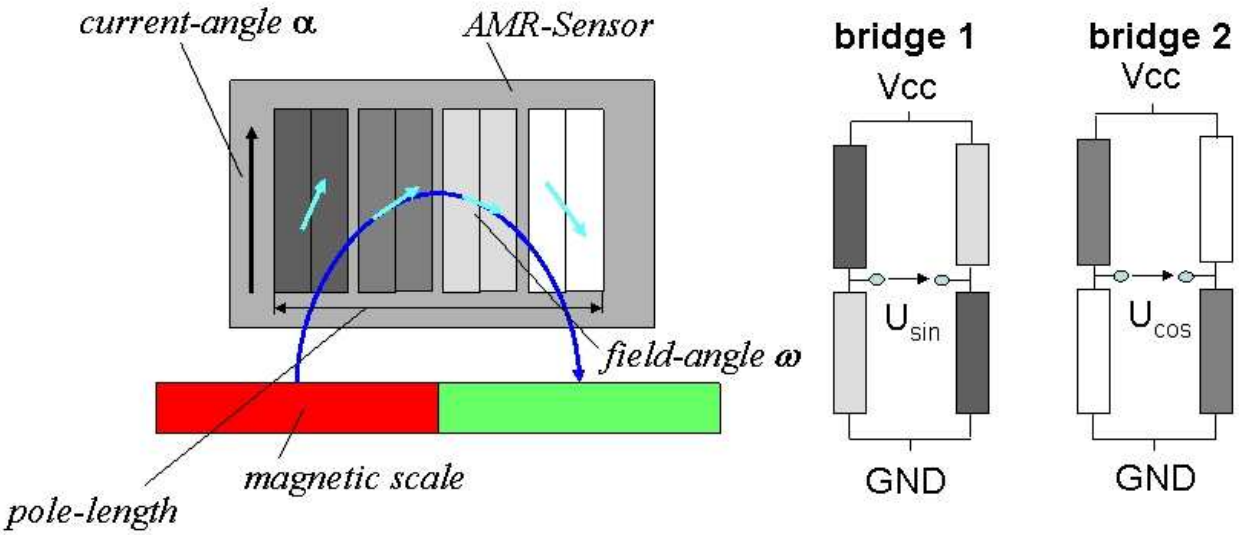


Figure 1: principle function of the sensor

The KMXP sensors consist of two magneto resistive Wheatstone bridges, whose resistors are placed in a such way that the characteristic magnetic field distribution of a magnetic scale with matching pole pitch produces a sine and a cosine signal output when the sensor is moved along the scale.

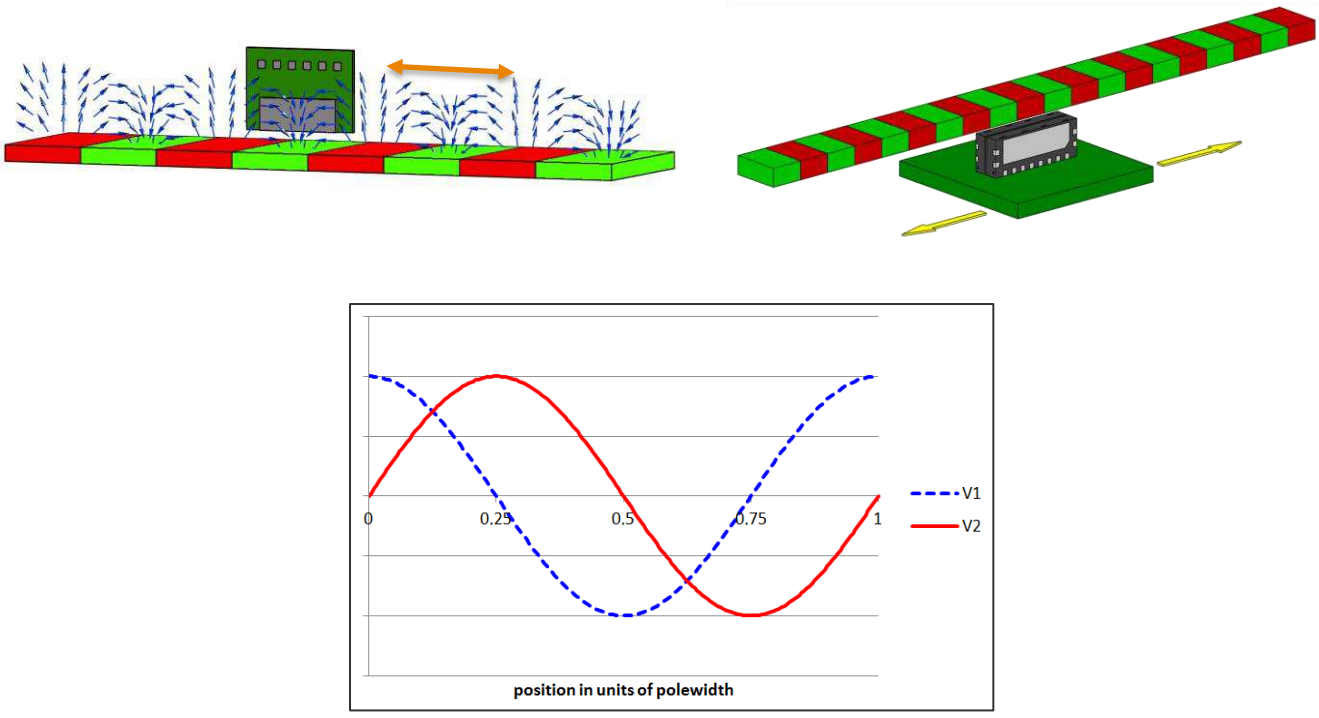


Figure 2: typical application of a PCB mounted KMXP sensor moving relative to a magnetic pole and the corresponding output signal voltage depending on sensor position

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PERFORMANCE SPECIFICATIONS

PARAMETER	SYMBOL	COND.	TYPE	MIN	TYP	MAX	UNIT
1. Operating Limits							
Max. supply voltage	$V_{cc,max}$		all			**10**	V
Max. current (both bridges)	$I_{cc,max}$		KMXP100x KMXP200x/500x			**5** **10**	mA
Operating temperature	T_{op}		all	**-40**		**+150**	°C
Storage temperature	T_{st}		all	**-40**		**+150**	°C
2. Sensor Specifications (T=25 °C)							
Supply voltage	V_{cc}		all		**5**		V
Pole pitch 1)	p		KMXP100x KMXP200x KMXP500x		**1000** **2000** **5000**		µm
Air gap package front – magnetic scale 2)	D		KMXP100x KMXP200x KMXP500x	**0.1** **0.2** **0.5**	**0.4** **0.8** **2**	**0.8** **1.8** **4**	mm
Resistance (both bridges)	R_b		KMXP100x KMXP200x/500x	**2000** **1000**	**3000** **1500**	**4000** **2000**	Ω
Output signal range	$\Delta V_n/V_{cc}$	A, B	all	**18**	**22**	**26**	mV/V
Offset voltage	$V_{n\ off}$	A, B	all	**-1**	**0**	**+1**	mV/V
3. Sensor Specifications							
TC of amplitude	TCSV	A, C	All		**-0.35**		%/K
TC of resistance	TCBR	A, C	All		**+0.35**		%/K
TC of offset	TCVoff	A, C	all	**-4**	**0**	**+4**	µV/V/K

n = 1;2 (bridge number); Stress above one or more of the limiting values may cause permanent damage to the device. Exposure to limiting values for extended periods may affect device reliability.

1) Other pole pitches on request

2) Typical values for conventional magnetic scales. Air gap for maximum accuracy depends on the used scale.

MEASUREMENT SET UP CONDITIONS

PARAMETER	SYMBOL	UNIT	CONDITION
A. Set Up Conditions			
Ambient temperature	T	°C	T = 25 °C (unless otherwise noted)
Supply voltage	V_{cc}	V	Vcc = 5 V
Applied magnetic field	H	kA/m	H > 10 kA/m
B. Sensor Specifications (T=25 °C, 360° turn , H=25 kA/m , Vo_{max}>0, Vo_{min}<0)			
Output signal range	$\Delta V_n / V_{cc}$	mV/V	$\Delta V_n / V_{cc} = (V_{n\ max} - V_{n\ min}) / V_{cc}$
Signal offset	$V_{off\ n}$	mV/V	$V_{off\ n} = (V_{n\ max} + V_{n\ min}) / V_{cc}$
C. Sensor Specifications (T=-25°C, +125°C)			

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Ambient temperatures	T	°C	T_1 = -25 °C, T_0 = +25 °C, T_2 = +125 °C
TC of amplitude	*TCSV*	%/K	$TCV = \frac{1}{(T_2 - T_1)} \cdot \frac{\frac{\Delta V_n}{V_{cc}}(T_2) - \frac{\Delta V_n}{V_{cc}}(T_1)}{\frac{\Delta V_n}{V_{cc}}(T_1)} \cdot 100\%$
TC of resistance	*TCBR*	%/K	$TCR = \frac{1}{(T_2 - T_1)} \cdot \frac{R_n(T_2) - R_n(T_1)}{R_n(T_1)} \cdot 100\%$
TC of offset	*TCVoff*	µV/(VK)	$TCVoff_n = \frac{Voff_n(T_2) - Voff_n(T_1)}{(T_2 - T_1)}$

n = 1;2 (bridge number)

BLOCK DIAGRAM

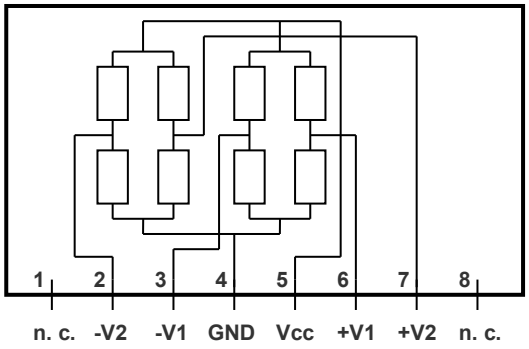


Figure 3a: KMXP1000 / KMXP2000

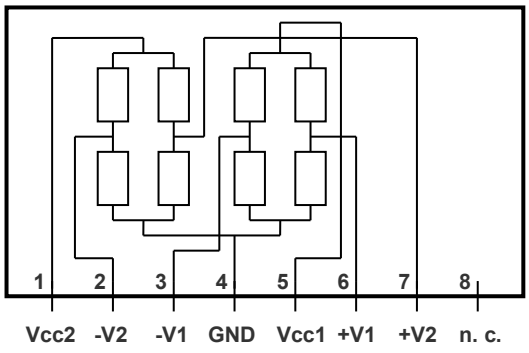


Figure 3b: KMXP5000

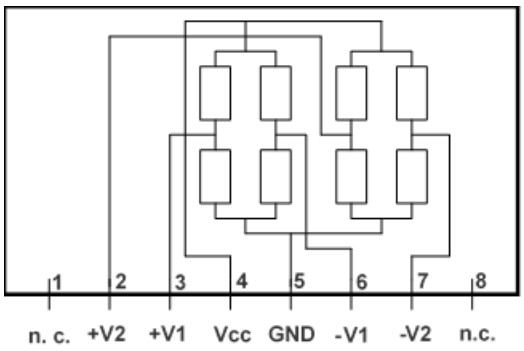


Figure 3c: KMXP1002 / KMXP2002

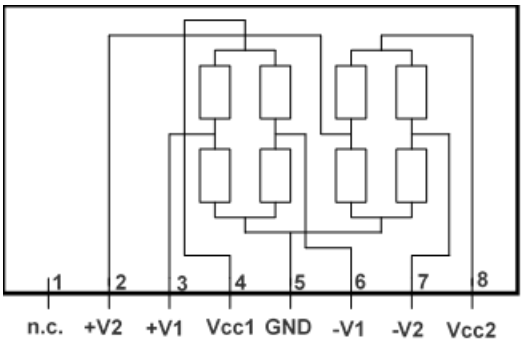


Figure 3d: KMXP5002

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EXAMPLE OF PRINTED CIRCUIT BOARD ASSEMBLY

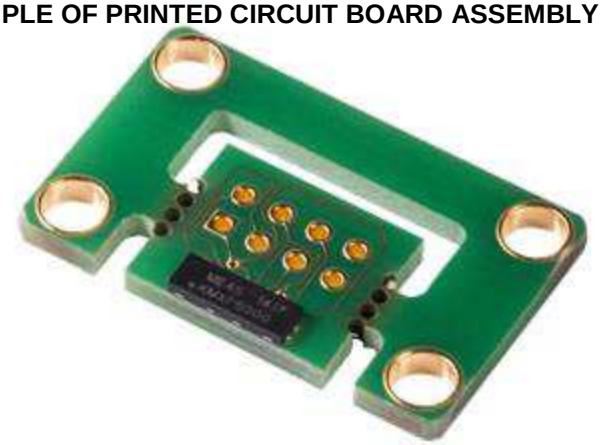


Figure 4a: Flat mounted KMXP on a PCB

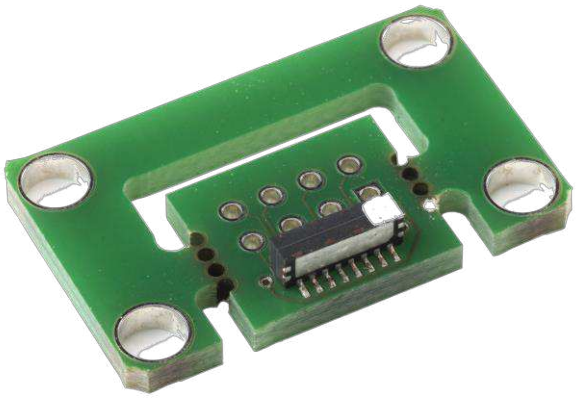


Figure 4b: Perpendicular mounted KMXP on a PCB

PIN ASSIGNMENT

The pin assignment is pin compatible for all KMXP$_N$000 types and allows a common PCB layout for all types:

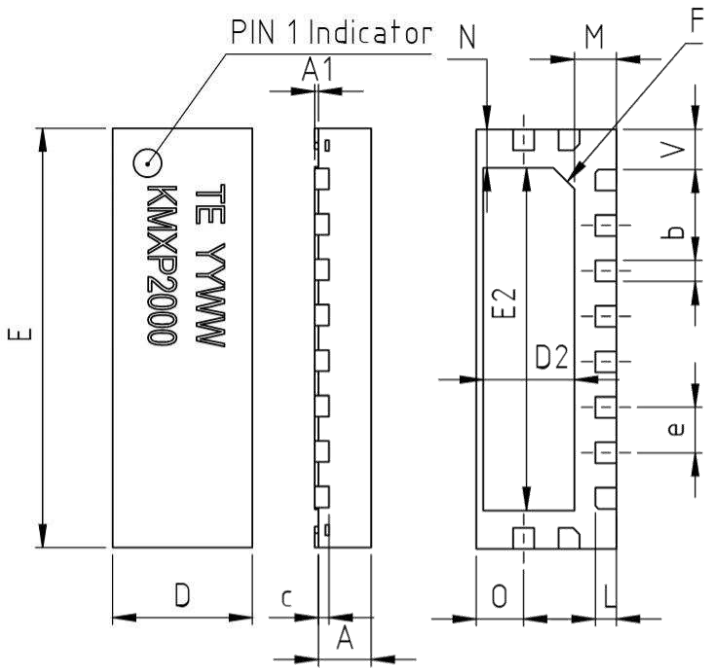
Pin	1	2	3	4	5	6	7	8	9	10	11	12
KMXP5000	V_{CC2}	$-V_2$	$-V_1$	GND	V_{CC1}	$+V_1$	$+V_2$	N/C	N/C	N/C	N/C	N/C
KMXP2000	N/C	$-V_2$	$-V_1$	GND	V_{CC}	$+V_1$	$+V_2$	N/C	N/C	N/C	N/C	N/C
KMXP1000	N/C	$-V_2$	$-V_1$	GND	V_{CC}	$+V_1$	$+V_2$	N/C	N/C	N/C	N/C	N/C

The pin assignment is pin compatible for all KMXP$_N$002 types and allows a common PCB layout for all types:

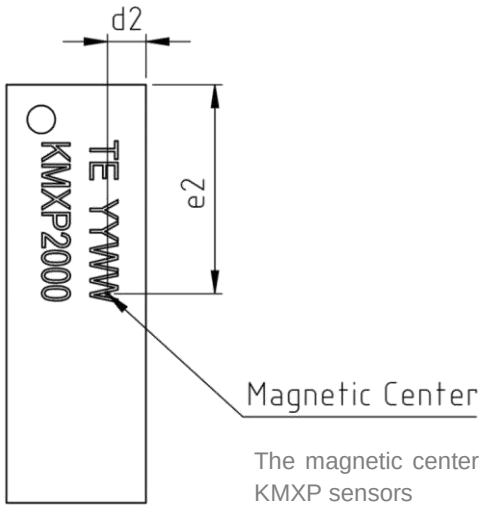
Pin	1	2	3	4	5	6	7	8	9 -16
KMXP5002	N/C	$+V_2$	$+V_1$	V_{CC1}	GND	$-V_1$	$-V_2$	V_{CC2}	N/C
KMXP2002	N/C	$+V_2$	$+V_1$	V_{CC}	GND	-V1	-V2	N/C	N/C
KMXP1002	N/C	$+V_2$	$+V_1$	V_{CC}	GND	-V1	-V2	N/C	N/C

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PHYSICAL DIMENSIONS FOR KMXPN000



DIMENSION MM			
REF.	MIN.	NOM.	MAX.
A	0.70	0.75	0.80
A1	--	--	0.05
b	--	0.30	--
c	--	0.20	--
D	1.90	2.00	2.10
D2	1.20	1.30	1.40
d2	--	0.55	--
E	5.90	6.00	6.10
E2	4.80	4.90	5.00
e	--	0.65	--
e2	--	3.00	--
F	0.3 x 45°		
L	0.25	0.30	0.35
M	--	0.60	--
N	--	0.55	--
O	--	0.675	--
V	--	0.575	--



The magnetic center point is the same for all KMXP sensors

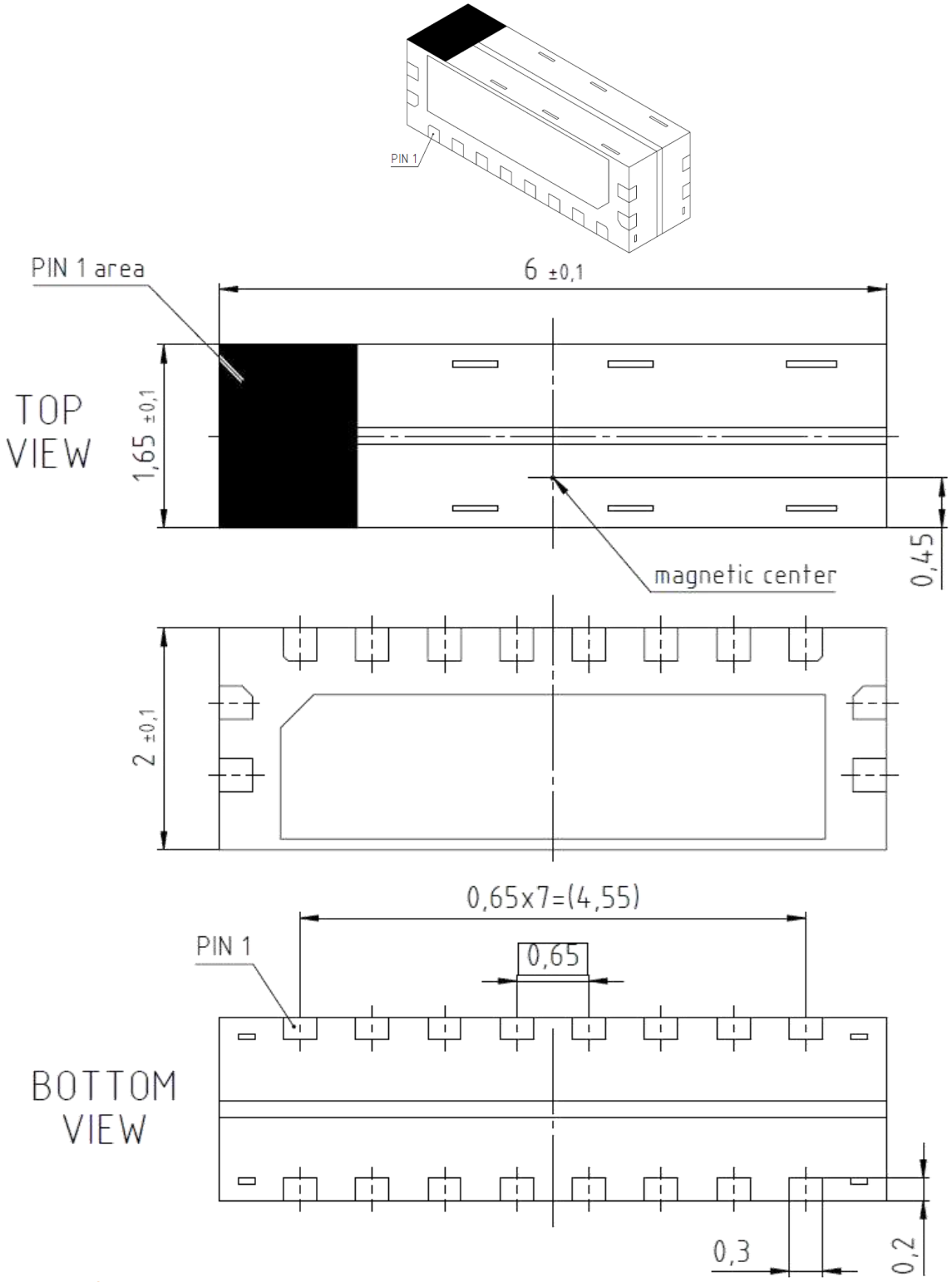
Fig. 5: Physical dimensions of sensor package

Quality information

This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard Q101 - Failure mechanism-based stress test for discrete semiconductor.

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PHYSICAL DIMENSIONS FOR KMXPN002



Quality information

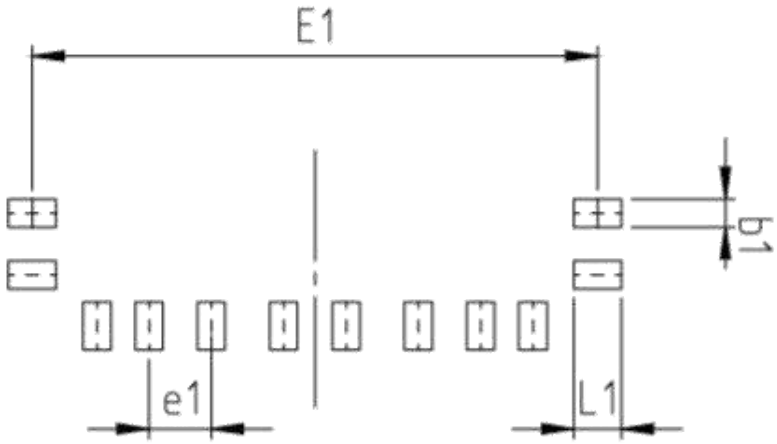
This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard Q101 - Failure mechanism-based stress test for discrete semiconductor.

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Recommended Land Pattern

KMXP$_N$000

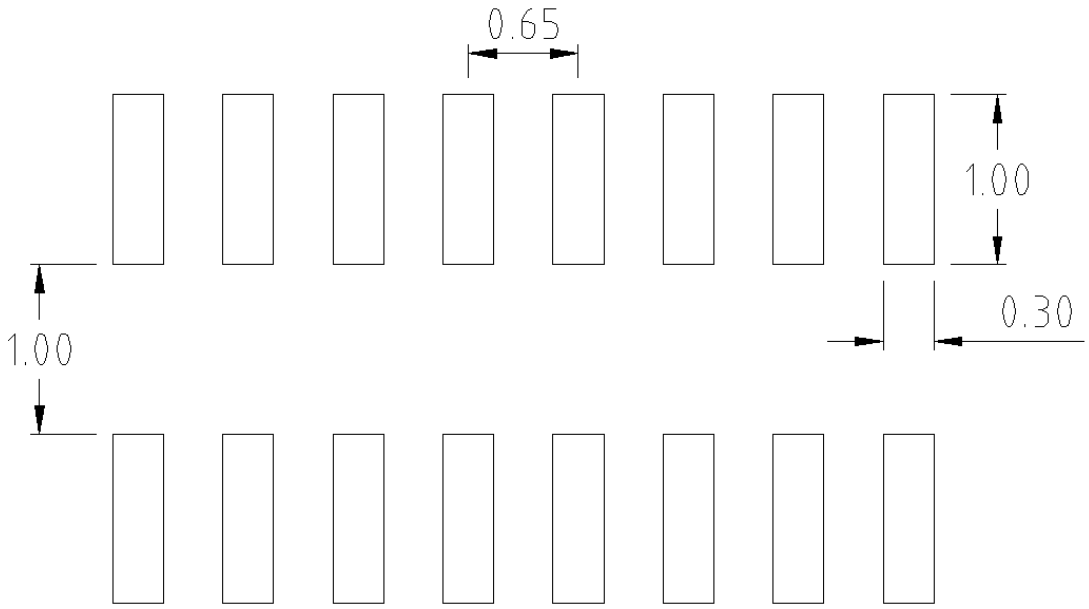
Package: 12L TDFN 6 x 2



DIMENSION MM			
REF.	MIN.	NOM.	MAX.
b1	--	0.30	--
e1	--	0.65	--
E1	--	5.90	-
L1	--	0.50	--

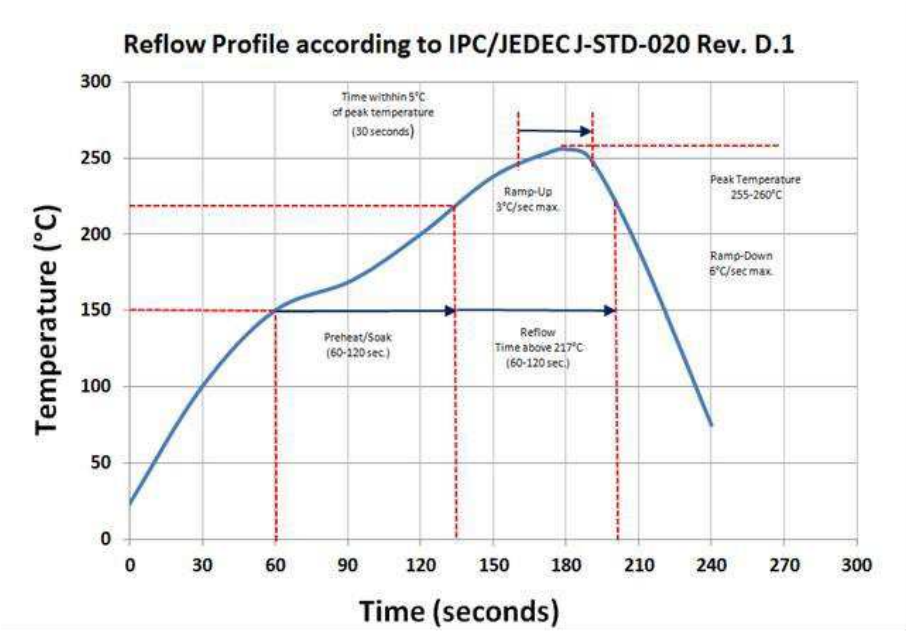
KMXP$_N$002

Package: 16L PDFN 6 x 1.65



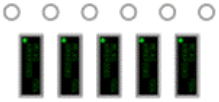
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Solder Profile



Moisture Sensitivity Level for KMXP$_N$000: MSL1 @ 260°C
Moisture Sensitivity Level for KMXP$_N$002: MSL1 @ 260°C

Tape and Reel Packaging Information

Description	Reel size	Units/reel	Pin 1 orientation	Note
KMXP1000 **KMXP2000** **KMXP5000**	7”	1,000	Top-left of sprocket hole side	
KMXP1002 **KMXP2002** **KMXP5002**	7”	500	Left of sprocket hole side	

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APPLICATION EXAMPLE

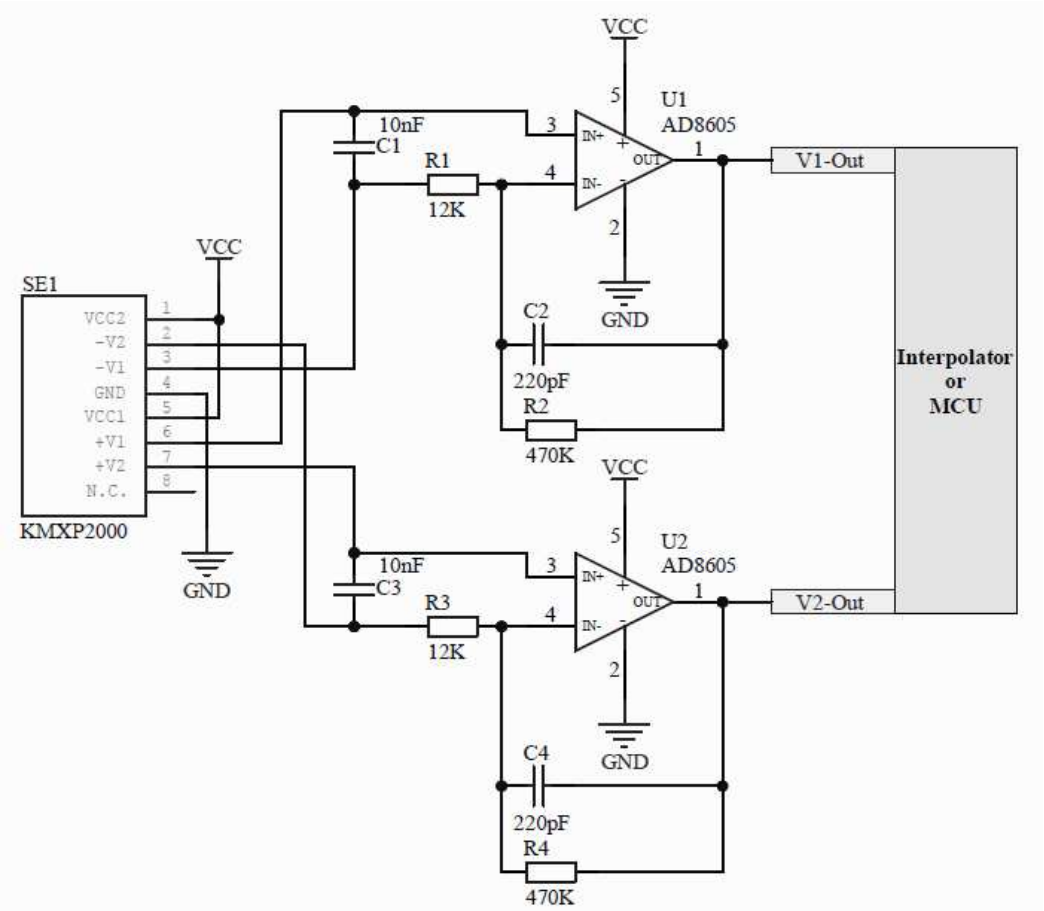


Fig. 6: Exemplary hardware configuration for the usage with a conventional microcontroller using an Analog Devices AD8605 amplifier for the preprocessing of the sensor signals.

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Ordering Information

Description	Pole Pitch	Part Number
KMXP1000 MLS 1MM PITCH DFN	1 mm	G-MRCO-051
KMXP2000 MLS 2MM PITCH DFN	2 mm	G-MRCO-050
KMXP5000 MLS 5MM PITCH DFN	5 mm	G-MRCO-052
KMXP1002 1MM PITCH VERTICAL	1 mm	G-MRCO-055
KMXP2002 2MM PITCH VERTICAL	2 mm	G-MRCO-056
KMXP5002 5MM PITCH VERTICAL	5 mm	G-MRCO-057

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