Data Sheet
Linear Field Sensors
KMY20, KMY21, KMZ20

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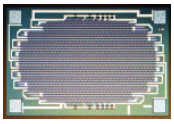
FEATURES

- output proportional to magnetic field strength with very high sensitivity
- very small hysteresis
- large operating temperature range, from -40°C up to +150 °C
- highly reliable
- with / without internal magnet

APPLICATIONS

- detection of very weak magnetic fields, like earth magnetic field, or field generated by small magnetic particles
- detection of objects that distort non-local magnetic fields
- revolution measurement on ferro-magnetic gears
- contactless switch / displacement sensor

DIES & PACKAGES



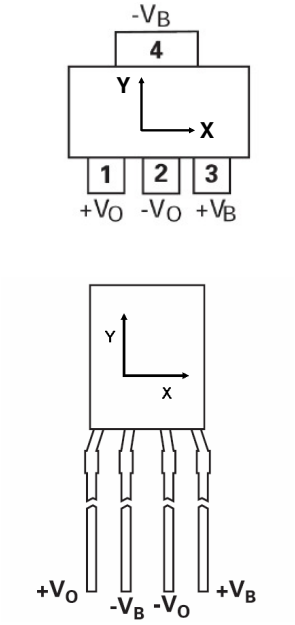
dies **MR174B, MRHB**

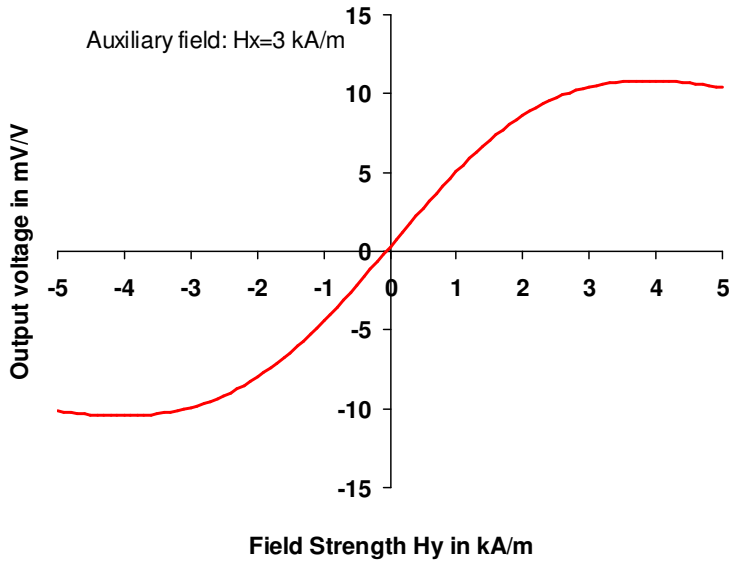
KMY20M

E-Line

KMZ20M

KMY20 / KMZ20M





The **KMY** and **KMZ** sensors are highly sensitive magnetic field sensors which utilize the anisotropic magnetoresistance effect. The **KMY20** and **KMZ20** sensors contain a Weatstone bridge.

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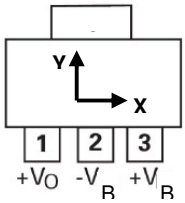
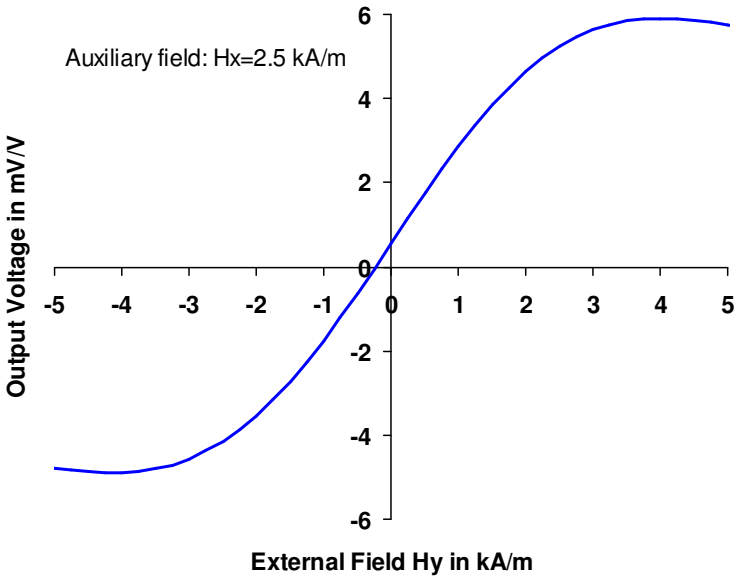
KMY21

In contrast to the KMY20 sensor products, the **KMY21M** consists of a half bridge, making the sensor well suited for dynamic measurements.



It contains an internal magnet, which provides an auxiliary filed of approx. 2.5 kA/m.



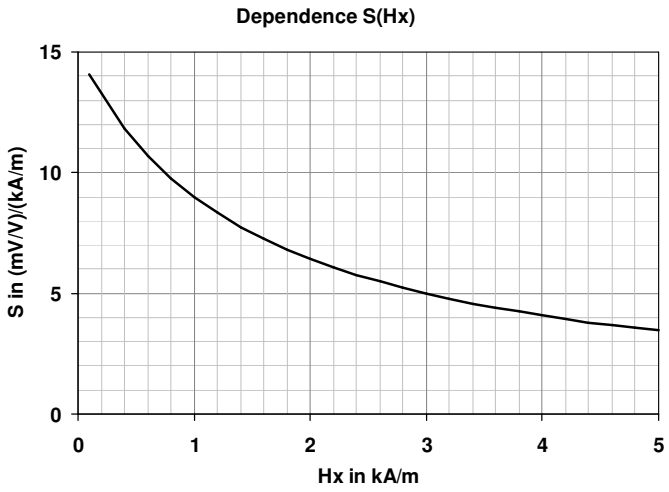
GENERAL DESCRIPTION

Due to it's featured properties - high sensitivity and almost no hysteresis – the **KMY** / **KMZ** sensors are used in a wide range of applications, like magnetic field measurement, revolution counters, proximity detecting, position measurement.

An uniaxial linear magnetic field in y-direction will generate a linear output within the specified magnetic field range. The sensor is available in two types: the **KMY20 M** and **KMZ20 M** sensor types contain intrinsic magnets which provide an auxiliary magnetic field at the sensor die which prevents magnetic domains from flipping irregularly.

If the **dies MR174B** and **MRHB** or the **KMY20 S** are used, the auxiliary field has to be provided by the user. The dependance of the sensitivity with auxiliary field strength is depicted in the figure.

Auxiliary field strengths below Hx<1.5 kA/m are not recommended, as small disturbances may flip the magnetization domains. Sometimes, the magnetic conditions in the application may provide enough Hx bias field stabilization.



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CHARACTERISTIC VALUES

PARAMETER	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT
Operating Limits						
max. supply voltage	$V_{cc,max}$				10	V
max. current	$I_{cc,max}$	SOT223			9	mA
		E-Line			9	mA
operating temperature	T_{op}	SOT223, E-Line	-40		+150	°C
storage temperature	T_{st}	SOT223, E-Line	-40		+150	°C
General Sensor Specifications						
TC of amplitude	*TCSV*	Condition A, C	-0.36	-0.32	-0.28	%/K
TC of resistance	*TCBR*	Condition A, C	+0.27	+0.32	+0.37	%/K
TC of offset	*TCVoff*	Condition A, C	-4	0	+4	µV/V/K

Sensor Specifications KMY20, KMZ20 (T=25 °C, Hx=3 kA/m)						
PARAMETER	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT
Supply voltage	V_{cc}	Condition A, B		5		V
Bridge resistance	R_b	Condition A, B	1200	1700	2200	Ω
Output signal range	$\Delta V_0/V_{cc}$	Condition A, B	16	20	24	mV/V
Offset voltage	V_{off}/V_{cc}	Condition A, B	-1	0	+1	mV/V
Sensitivity	S	Condition A, B	3.7	4.7	5.7	mV/V/kA/m
Hysteresis	V_H/V_{cc}	Condition A, B	-	-	50	µV/V

Sensor Specifications KMY21M (T=25 °C, Hx=2.5 kA/m)						
PARAMETER	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT
Supply voltage	V_{cc}	Condition A, B		5		V
Bridge resistance	R_b	Condition A, B	1100	1500	1900	Ω
Output signal range	$\Delta V_0/V_{cc}$	Condition A, B	8	9.5	12	mV/V
Offset voltage	V_{off}/V_{cc}	Condition A, B	48	50	52	%Vcc
Sensitivity	S	Condition A, B	2.05	2.50	3.10	mV/V/kA/m
Hysteresis	V_H/V_{cc}	Condition A, B	-	-	50	µV/V

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.

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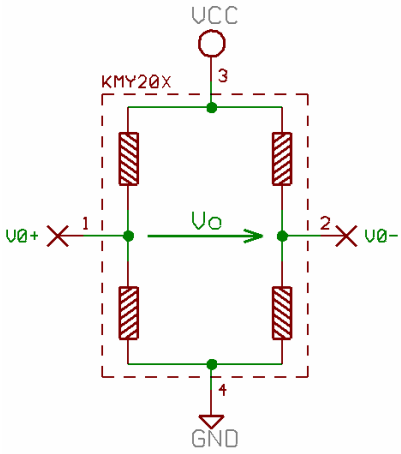
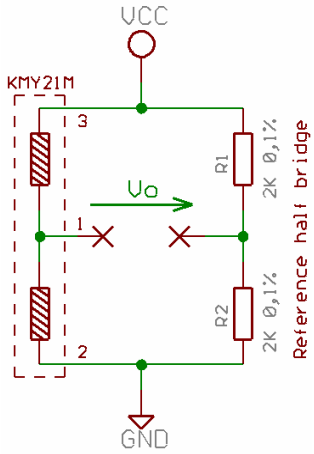
MEASUREMENT CONDITIONS

PARAMETER	SYMBOL	UNIT	CONDITION
Condition A: Set Up Conditions			
Ambient temperature	T	℃	23±5
Supply voltage	V_{cc}	V	5
Output voltage	V_O	mV	$V_O=(V_{0+} - V_{0-})$
	V_O/V_{cc}	mV/V	output voltages are also given independently on supply voltage: example: $Vo/Vcc=(V_{0+} - V_{0-})/Vcc$
			measure MR half bridge against reference half bridge
Reference half bridge			2* 2 kΩ 0.1%
for full bridge sensors (KMY20S, KMY20M, KMZ20S, KMZ20M) 			**for half bridge sensors (KMY21M)**  *The output voltage of the MR half bridge is measured against a reference half bridge*
Condition B: Sensor Specifications (T=23±5 ℃, Hx=3.0±0.5 kA/m)			
Output voltage range	$\Delta V_O/V_{cc}$	mV/V	$H_y = -7 \ldots +7\ kA/m;\ \Delta V_O = \left(V_{O,\max} - V_{O,\min}\right)$
Offset voltage	V_{off}/V_{cc}	mV/V	$H_y = 0;\ V_{off} = V_O\left(H_y\right)$
Sensitivity	S	(mV/V)/(kA/m)	$H_y = 1kA/m;\ S := \frac{V_0\left(+H_y\right) - V_0\left(-H_y\right)}{2 \cdot V_{cc}}$
Hysteresis	V_H/V_{cc}	µV/V	Hy in kA/m $(V_0(H_y = 0; H_y = -1 \rightarrow +1) - V_0(H_y = 0; H_y = +1 \rightarrow -1))/V_{cc}$

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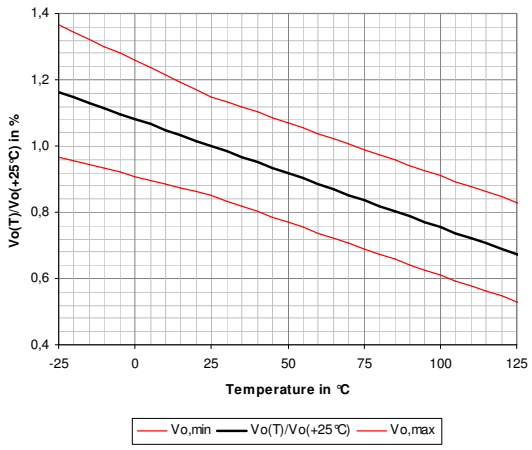
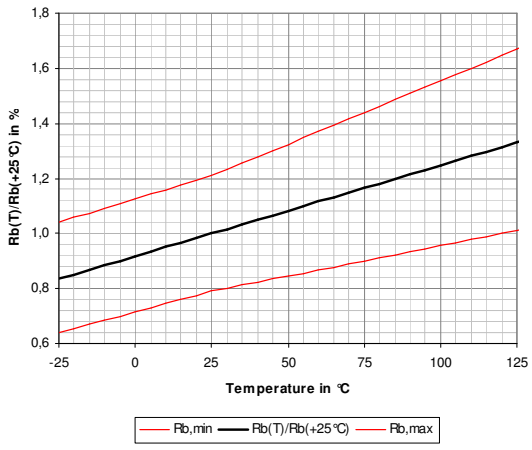
PARAMETER	SYMBOL	UNIT	CONDITION
C. Sensor Specifications (T=-25℃, +125℃)			
Ambient temperatures	T	℃	T_1=-25 ℃, T_0=+25 ℃, T_2=+125 ℃
TC of amplitude	*TCSV*	%/K	$TCV = \frac{1}{(T_2 - T_1)} \cdot \frac{\Delta V_0 / V_{cc}(T_2) - \Delta V_0 / V_{cc}(T_1)}{\Delta V_0 / V_{cc}(T_1)} \cdot 100\%$
TC of resistance	*TCBR*	%/K	$TCR = \frac{1}{(T_2 - T_1)} \cdot \frac{R(T_2) - R(T_1)}{R(T_1)} \cdot 100\%$
TC of offset	*TCVoff*	(µV/V)/K	$TCVoff = \frac{Voff(T_2) - Voff(T_1)}{(T_2 - T_1)}$

TEMPERATURE DEPENDENCIES



signal amplitude related to room temperature value



bridge resistance related to room temperature value

LEGAL DISCLAIMER

This product is not designed for use in life support appliances, devices or systems where malfunction of this product can reasonably be expected to result in personal injury. HL Planartechnik GmbH customers using or selling this product for use in such applications do so at their own risk and agree to fully indemnify HL Planartechnik GmbH for any damages resulting from such improper use or sale.

This data sheet contains target specifications for product development which my be subject to changes without notice.

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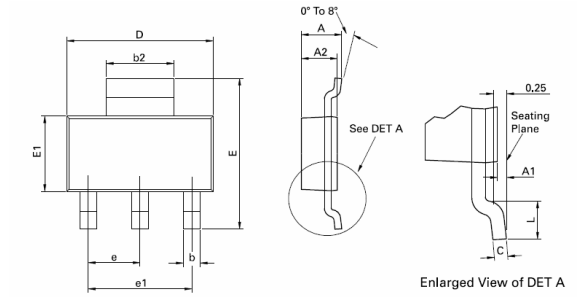
PACKAGES

DIE LAYOUT

Die layout and dimensions on request.

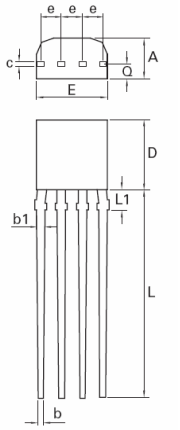
SOT223



DIM	Millimeters		Inches		DIM	Millimeters		Inches	
	Min	Max	Min	Max		Min	Max	Min	Max
A	-	1.80	-	0.071	e	2.30 BSC		0.0905 BSC	
A1	0.02	0.10	0.0008	0.004	e1	4.60 BSC		0.181 BSC	
b	0.66	0.84	0.026	0.033	E	6.70	7.30	0.264	0.287
b2	2.90	3.10	0.114	0.122	E1	3.30	3.70	0.130	0.146
C	0.23	0.33	0.009	0.013	L	0.90	-	0.355	-
D	6.30	6.70	0.248	0.264	-	-	-	-	-

Note: Controlling dimensions are in millimeters. Approximate dimensions are provided in inches

E-LINE 4 PIN



Dim	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	2.4	2.8	0.094	0.110
b	0.35	0.48	0.0138	0.0189
b1	0.45	0.6	0.0178	0.024
c	0.25	0.35	0.0098	0.0138
D	4.0	4.4	0.157	0.173
E	3.8	4.4	0.150	0.173
e	1.25 NOM		0.049 NOM	
Q	0.8	1.1	0.031	0.043
L	12.0	14.0	0.472	0.551
L1	1.1	1.3	0.043	0.051

Note: Controlling dimensions are in millimeters. Approximate dimensions are provided in inches

ORDERING

DEVICE	DIE	PACKAGE	INTERNAL MAGNET	PART NUMBER
MR174B	full bridge	wafer	n/a	G-MRCH-002
MRHB	half bridge	wafer	n/a	G-MRCH-009
KMY 20 S	full bridge	SOT-223	NO	G-MRCO-006
KMY 20 M	full bridge	SOT-223	YES	G-MRCO-001
KMY 21 M	half bridge	SOT-223	YES	G-MRCO-011
KMZ 20 S	full bridge	E-Line	NO	G-MRCO-007
KMZ 20 M	full bridge	E-Line	YES	G-MRCO-003

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