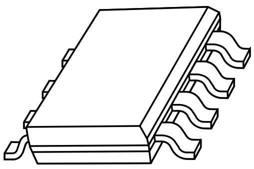
DATA SHEET



KMZ41
Magnetic field sensor

Preliminary specification
Supersedes data of 1998 Mar 26

2000 Apr 18

Philips Semiconductors

PHILIPS

Magnetic field sensor KMZ41

DESCRIPTION

The KMZ41 is a sensitive magnetic field sensor, employing the magnetoresistive effect of thin-film permalloy. The sensor contains two galvanic separated Wheatstone bridges. Its properties enable this sensor to be used in angle measurement applications under strong field conditions. A rotating magnetic field strength > 40 kA/m (recommended field strength > 100 kA/m) in the x-y plane will deliver a sinusoidal output signal. The sensor can be operated at any frequency between DC and 1 MHz.

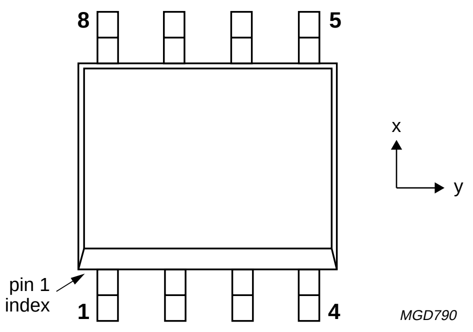


Fig.1 Simplified outline SOT96-1.

PINNING

PIN	SYMBOL	DESCRIPTION
1	$-V_{O1}$	output voltage bridge 1
2	$-V_{O2}$	output voltage bridge 2
3	V_{CC2}	supply voltage bridge 2
4	V_{CC1}	supply voltage bridge 1
5	$+V_{O1}$	output voltage bridge 1
6	$+V_{O2}$	output voltage bridge 2
7	GND2	ground 2
8	GND1	ground 1

QUICK REFERENCE DATA

SYMBOL	PARAMETER	MIN.	TYP.	MAX.	UNIT
V_{CC1}	bridge supply voltage	–	5	9	V
V_{CC2}	bridge supply voltage	–	5	9	V
S	sensitivity (α_1 = 45°; α_2 = 0°)	2.44	2.72	3.00	mV/°
R_{bridge}	bridge resistance	2	2.5	3	kΩ
$V_{offset1}$	offset voltage	–2	–	+2	mV/V
$V_{offset2}$	offset voltage	–2	–	+2	mV/V

CIRCUIT DIAGRAM

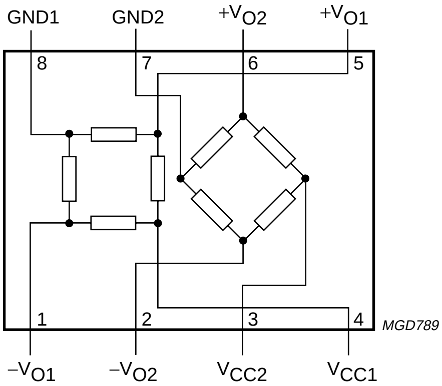


Fig.2 Simplified circuit diagram.

LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 60134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CC}	bridge supply voltage		–	9	V
P_{tot}	total power dissipation		–	90	mW
T_{stg}	storage temperature		–65	+150	°C
T_{bridge}	bridge operating temperature		–40	+150	°C

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	VALUE	UNIT
$R_{th\ j\text{-}a}$	thermal resistance from junction to ambient	155	K/W

CHARACTERISTICS

T_{amb} = 25 °C; $H_{rotation}$ = 100 kA/m; V_{CC1} = 5 V; V_{CC2} = 5 V unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{CC1}	bridge supply voltage		–	5	9	V
V_{CC2}	bridge supply voltage		–	5	9	V
S	sensitivity	open circuit, note 1; α = 0° (bridge 2); α = 45° (bridge 1)	2.44	2.72	3.00	mV/°
$V_{peak\ 1}$	peak voltage	note 2; see Fig.4	70	78	86	mV
$V_{peak\ 2}$	peak voltage	note 2; see Fig.4	70	78	86	mV
TCV_{peak}	temperature coefficient of peak voltage	T_{amb} = –40 to +150 °C; note 3	–0.25	–0.31	–0.37	%/K
R_{bridge}	bridge resistance	note 4	2	2.5	3	kΩ
TCR_{bridge}	temperature coefficient of bridge resistance	T_{bridge} = –40 to +150 °C note 5	0.3	0.32	0.34	%/K
V_{offset}	offset voltage	see Fig.4	–2	–	+2	mV/V
TCV_{offset}	temperature coefficient of offset voltage	T_{bridge} = –40 to +150 °C note 6; see Fig.4	–2	–	+2	$\frac{\mu V/V}{K}$
ΔV_{offset}	maximum change of offset voltage within temperature range	T_{amb} = –40 to +100 °C; note 7; see Fig.3	–0.2	0	+0.14	mV/V
		T_{amb} = –40 to +150 °C; note 7; see Fig.3	–0.28	0	+0.22	mV/V
FH	hysteresis of output voltage	note 8	0	0.01	0.04	%FS
ω	amplitude angular velocity	note 9	0	25000	t.b.f	°/s
k	amplitude synchronism	note 10	99.5	100	100.5	%
TCk	temperature coefficient of amplitude synchronism	T_{amb} = –40 to +150 °C note 11	–0.002	0	0.002	%/K
$\Delta\alpha$	angular inaccuracy	note 12	0	0.1	0.25	deg

Notes

1. Sensitivity changes with angle due to sinusoidal output.
2. $V_{peak} = \left|(V_{out\ max} - V_{offset})\right|$.
3. $TCV_{peak} = 100 \frac{V_{peak(T_2)} - V_{peak(T_1)}}{V_{peak(T1)}(T_2 - T_1)}$ Where $T_1 = -40°C$; $T_2 = 150°C$.
4. Bridge resistance between pins 8 and 4, pins 7 and 3, pins 5 and 1, pins 6 and 2.
5. $TCR_{bridge} = 100 \frac{R_{bridge(T_2)} - R_{bridge(T_1)}}{R_{bridge(T_1)}(T_2 - T_1)}$ Where $T_1 = -40°C$; $T_2 = 150°C$.
6. $TCV_{offset} = \frac{V_{offset(T_2)} - V_{offset(T_1)}}{(T_2 - T_1)}$ Where $T_1 = -40°C$; $T_2 = 150°C$.
7. $\Delta V_{offset} = (V_{offset}(T) - V_{offset}(T = 25\ °C))$.

8. $$FH_1 = 100\left|\frac{V_{O1(67.5°)135° \Rightarrow 45°} - V_{O1(67.5°)45° \Rightarrow 135°}}{2 \times V_{peak1}}\right|$$

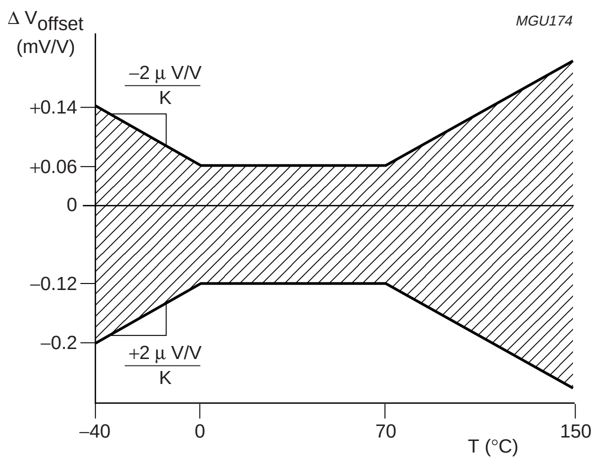
$$FH_2 = 100\left|\frac{V_{O2(22.5°)90° \Rightarrow 0°} - V_{O2(22.5°)0° \Rightarrow 90°}}{2 \times V_{peak2}}\right|$$

9. No change in V_O; no distortion of sinusoidal output; tested up to 25000 °/s maximum.

10. $k = \frac{V_{peak1}}{V_{peak2}} \cdot 100$.

11. $TCk = 100\frac{(k_{T2} - k_{T1})}{k_{T1}(T_2 - T_1)}$ Where $T_1 = -40°C$; $T_2 = 150°C$.

12. $\Delta\alpha = |\alpha_{real} - \alpha_{measured}|$ without offset voltage influences.



(1) 0 = initial offset voltage per supply voltage.

(2) Typical drift of the offset voltage per supply voltage remains inside shaded area of graph.

Fig.3 Supply voltage offset voltage as a function of temperature.

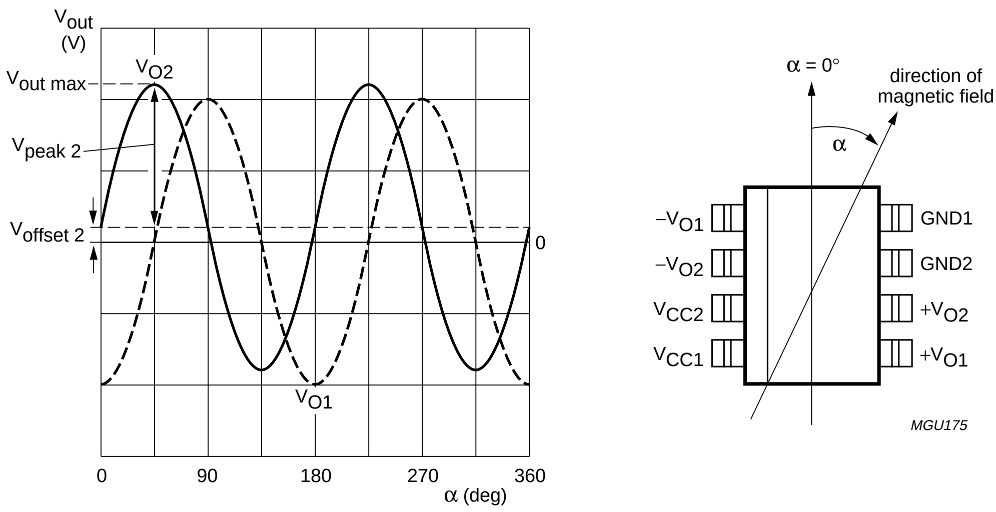
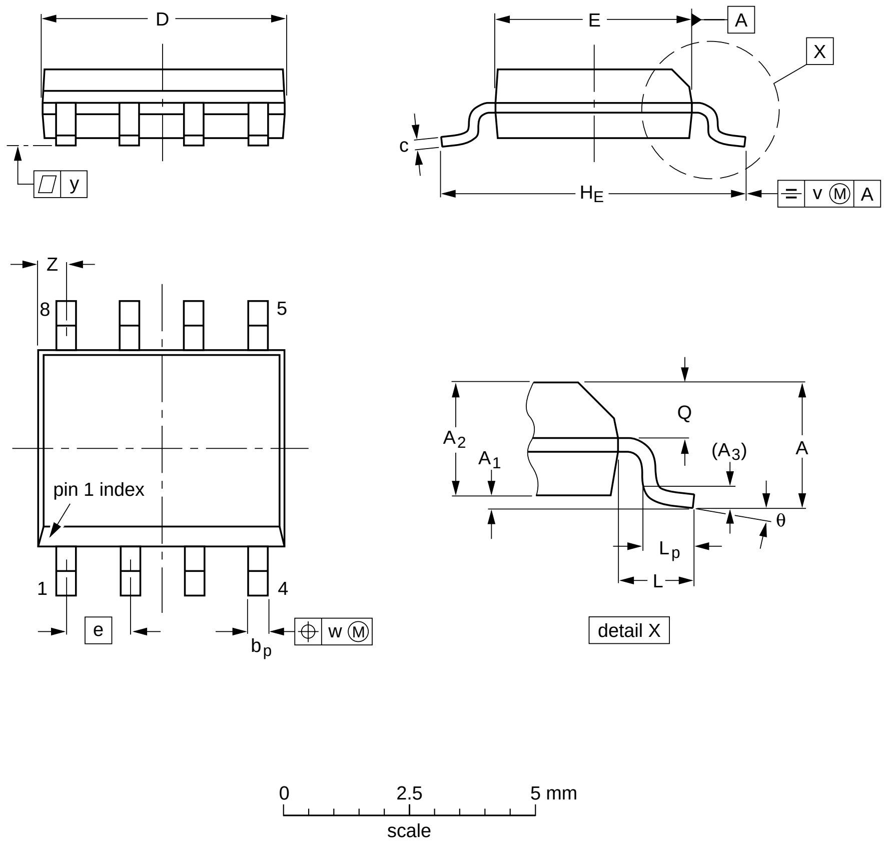


Fig.4 Output signals related to the direction of the magnetic field.

PACKAGE OUTLINE

SO8: plastic small outline package; 8 leads; body width 3.9 mm **SOT96-1**



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	D(1)	E(2)	e	H_E	L	L_p	Q	v	w	y	Z(1)	θ
mm	1.75	0.25 0.10	1.45 1.25	0.25	0.49 0.36	0.25 0.19	5.0 4.8	4.0 3.8	1.27	6.2 5.8	1.05	1.0 0.4	0.7 0.6	0.25	0.25	0.1	0.7 0.3	8° 0°
inches	0.069	0.010 0.004	0.057 0.049	0.01	0.019 0.014	0.0100 0.0075	0.20 0.19	0.16 0.15	0.050	0.244 0.228	0.041	0.039 0.016	0.028 0.024	0.01	0.01	0.004	0.028 0.012	

Notes

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT96-1	076E03	MS-012				~~97-05-22~~ 99-12-27

DATA SHEET STATUS

DATA SHEET STATUS	PRODUCT STATUS	DEFINITIONS (1)
Objective specification	Development	This data sheet contains the design target or goal specifications for product development. Specification may change in any manner without notice.
Preliminary specification	Qualification	This data sheet contains preliminary data, and supplementary data will be published at a later date. Philips Semiconductors reserves the right to make changes at any time without notice in order to improve design and supply the best possible product.
Product specification	Production	This data sheet contains final specifications. Philips Semiconductors reserves the right to make changes at any time without notice in order to improve design and supply the best possible product.

Note

1. Please consult the most recently issued data sheet before initiating or completing a design.

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Short-form specification — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

Limiting values definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

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