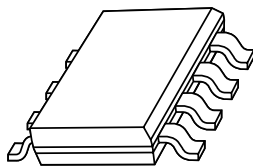


DATA SHEET



KMZ41 Magnetic field sensor

Preliminary specification
Supersedes data of 1998 Mar 26

2000 Apr 18

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.

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

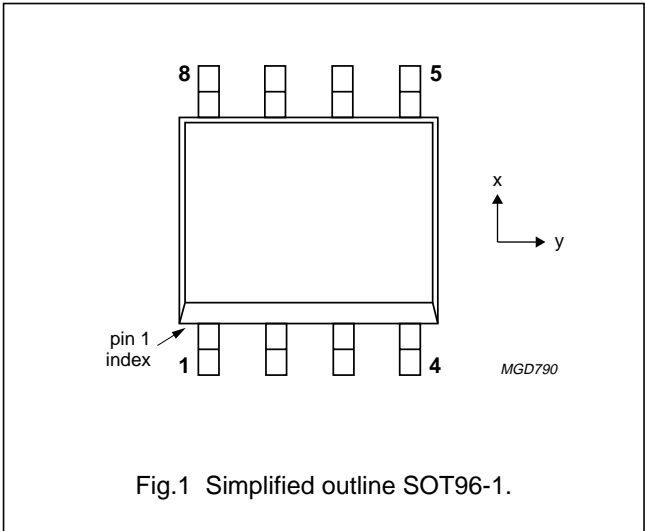


Fig.1 Simplified outline SOT96-1.

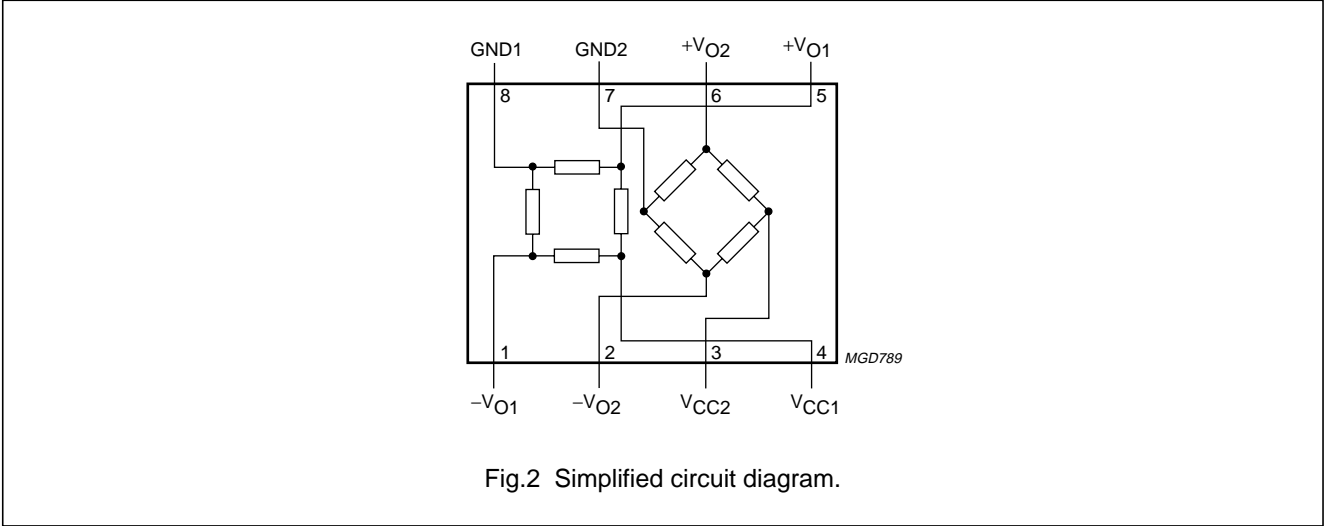
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MIN.	TYP.	MAX.	UNIT
V_{CC1}	bridge supply voltage	–	5	9	V
V_{CC2}	bridge supply voltage	–	5	9	V
S	sensitivity ($\alpha_1 = 45^\circ$; $\alpha_2 = 0^\circ$)	2.44	2.72	3.00	mV/°
R_{bridge}	bridge resistance	2	2.5	3	k Ω
$V_{offset1}$	offset voltage	–2	–	+2	mV/V
$V_{offset2}$	offset voltage	–2	–	+2	mV/V

Magnetic field sensor

KMZ41

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-a}	thermal resistance from junction to ambient	155	K/W

Magnetic field sensor

KMZ41

CHARACTERISTICS

$T_{\text{amb}} = 25\text{ }^{\circ}\text{C}$; $H_{\text{rotation}} = 100\text{ kA/m}$; $V_{\text{CC1}} = 5\text{ V}$; $V_{\text{CC2}} = 5\text{ V}$ 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; $\alpha = 0^{\circ}$ (bridge 2); $\alpha = 45^{\circ}$ (bridge 1)	2.44	2.72	3.00	mV/ $^{\circ}$
$V_{\text{peak 1}}$	peak voltage	note 2; see Fig.4	70	78	86	mV
$V_{\text{peak 2}}$	peak voltage	note 2; see Fig.4	70	78	86	mV
TCV_{peak}	temperature coefficient of peak voltage	$T_{\text{amb}} = -40\text{ to }+150\text{ }^{\circ}\text{C}$; note 3	–0.25	–0.31	–0.37	%/K
R_{bridge}	bridge resistance	note 4	2	2.5	3	k Ω
$\text{TCR}_{\text{bridge}}$	temperature coefficient of bridge resistance	$T_{\text{bridge}} = -40\text{ to }+150\text{ }^{\circ}\text{C}$ note 5	0.3	0.32	0.34	%/K
V_{offset}	offset voltage	see Fig.4	–2	–	+2	mV/V
$\text{TCV}_{\text{offset}}$	temperature coefficient of offset voltage	$T_{\text{bridge}} = -40\text{ to }+150\text{ }^{\circ}\text{C}$ note 6; see Fig.4	–2	–	+2	$\frac{\mu\text{V/V}}{\text{K}}$
ΔV_{offset}	maximum change of offset voltage within temperature range	$T_{\text{amb}} = -40\text{ to }+100\text{ }^{\circ}\text{C}$; note 7; see Fig.3	–0.2	0	+0.14	mV/V
		$T_{\text{amb}} = -40\text{ to }+150\text{ }^{\circ}\text{C}$; 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	$^{\circ}/\text{s}$
k	amplitude synchronism	note 10	99.5	100	100.5	%
TCk	temperature coefficient of amplitude synchronism	$T_{\text{amb}} = -40\text{ to }+150\text{ }^{\circ}\text{C}$ 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.

$$2. V_{\text{peak}} = |V_{\text{out max}} - V_{\text{offset}}|.$$

$$3. \text{TCV}_{\text{peak}} = 100 \frac{V_{\text{peak}(T_2)} - V_{\text{peak}(T_1)}}{V_{\text{peak}(T_1)} (T_2 - T_1)} \quad \text{Where } T_1 = -40^{\circ}\text{C}; T_2 = 150^{\circ}\text{C}.$$

4. Bridge resistance between pins 8 and 4, pins 7 and 3, pins 5 and 1, pins 6 and 2.

$$5. \text{TCR}_{\text{bridge}} = 100 \frac{R_{\text{bridge}(T_2)} - R_{\text{bridge}(T_1)}}{R_{\text{bridge}(T_1)} (T_2 - T_1)} \quad \text{Where } T_1 = -40^{\circ}\text{C}; T_2 = 150^{\circ}\text{C}.$$

$$6. \text{TCV}_{\text{offset}} = \frac{V_{\text{offset}(T_2)} - V_{\text{offset}(T_1)}}{(T_2 - T_1)} \quad \text{Where } T_1 = -40^{\circ}\text{C}; T_2 = 150^{\circ}\text{C}.$$

$$7. \Delta V_{\text{offset}} = (V_{\text{offset}}(T) - V_{\text{offset}}(T = 25\text{ }^{\circ}\text{C})).$$

Magnetic field sensor

KMZ41

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

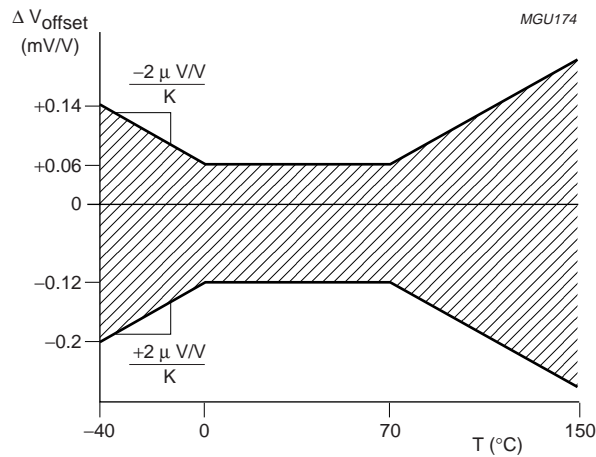
$$FH_2 = 100 \left| \frac{V_{O2(22.5^\circ)90^\circ \Rightarrow 0^\circ} - V_{O2(22.5^\circ)0^\circ \Rightarrow 90^\circ}}{2 \times V_{\text{peak2}}} \right|$$

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

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

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

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



(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.

Magnetic field sensor

KMZ41

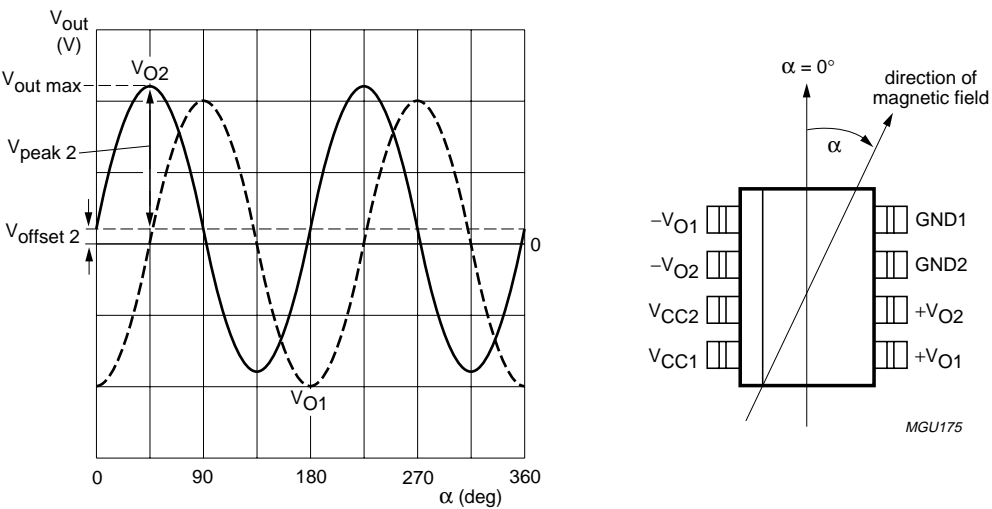


Fig.4 Output signals related to the direction of the magnetic field.

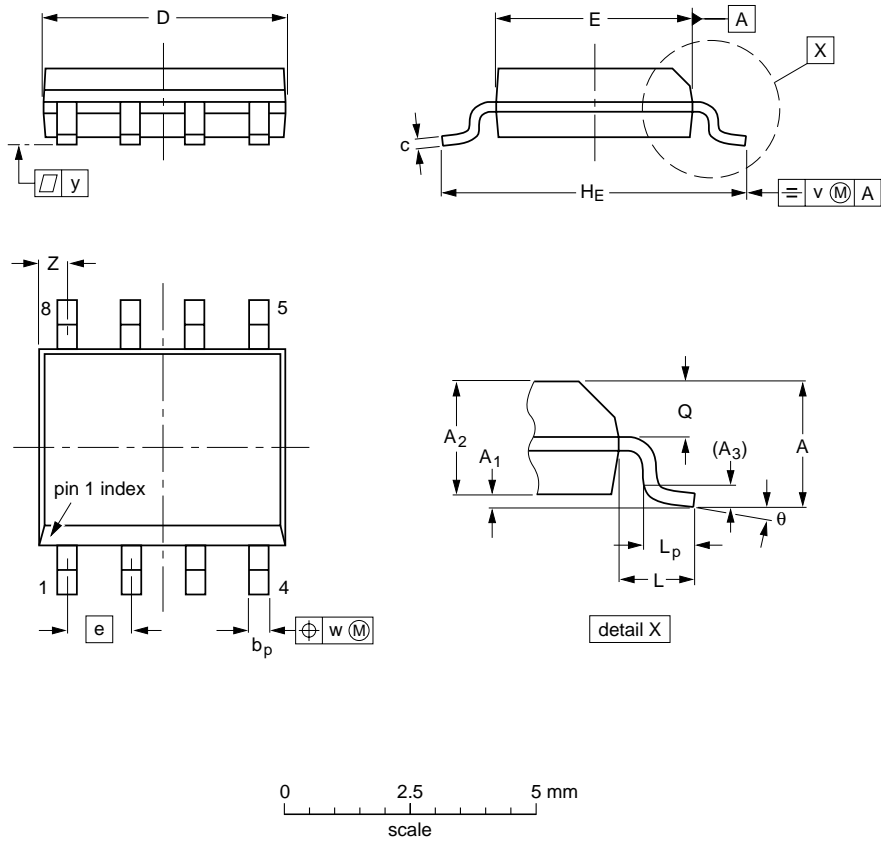
Magnetic field sensor

KMZ41

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

Magnetic field sensor

KMZ41

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

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Magnetic field sensor

KMZ41

NOTES

Magnetic field sensor

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NOTES

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