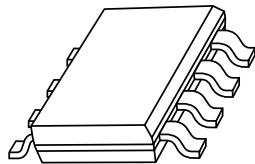


DATA SHEET



KMZ43 Magnetic field sensor

Objective specification

2000 Aug 24

Magnetic field sensor

KMZ43

DESCRIPTION

The KMZ43 is a sensitive magnetic field sensor, employing the magnetoresistive effect of thin-film permalloy. The sensor contains two galvanic separated Wheatstone bridges, with a relative angular displacement of 45°.

A rotating magnetic field in the x-y plane will produce two independent sinusoidal output signals, one a function of $+\cos(2\alpha)$ and the second a function of $+\sin(2\alpha)$, α being the angle between sensor and field direction (see Fig.3). Unlike the KMZ41⁽¹⁾, which needs a saturation field strength of 100 kA/m, the KMZ43 is suited to high precision angle measurement applications under low field conditions (saturation field strength 25 kA/m).

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

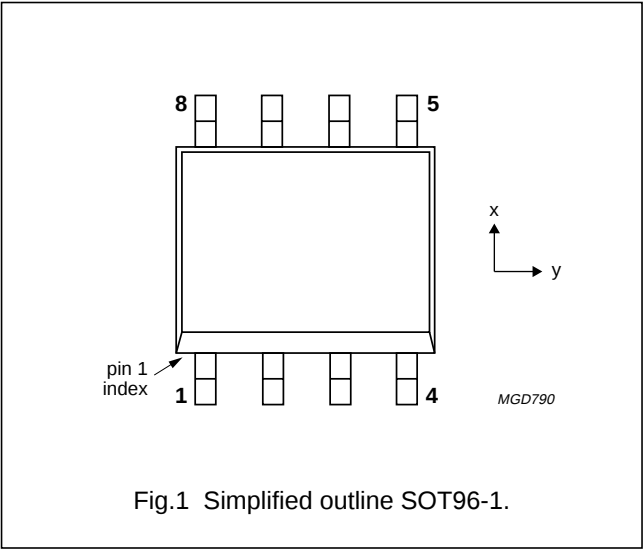


Fig.1 Simplified outline SOT96-1.

(1) The KMZ41 delivers a $+\sin(2\alpha)$ and a $-\cos(2\alpha)$ signal.

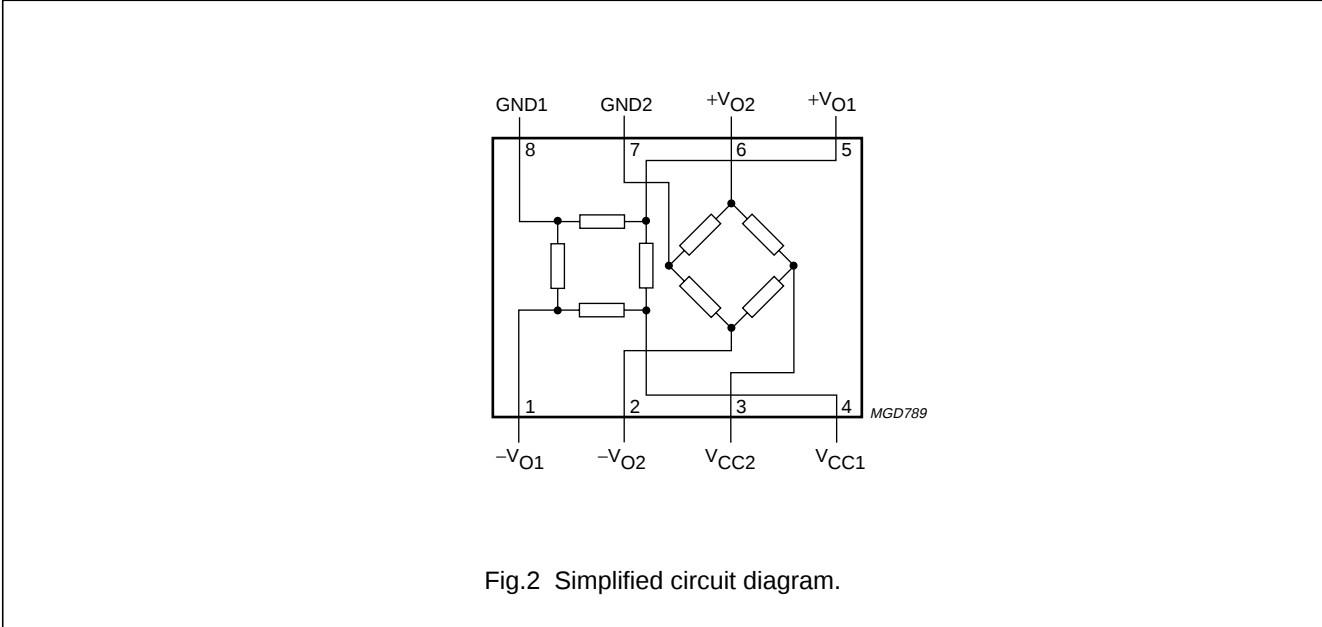
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MIN.	TYP.	MAX.	UNIT
V_{CC1}	operating voltage	–	5	9	V
V_{CC2}	operating voltage	–	5	9	V
S	sensitivity ($a_2 = 0^\circ$, $a_1 = 135^\circ$)	2.1	2.3	2.5	mV/°
$V_{offset1}$	offset voltage per supply voltage	–2	–	+2	mV/V
$V_{offset1}$	offset voltage per supply voltage	–2	–	+2	mV/V
R_{bridge}	bridge resistance	3.2	3.7	4.2	kΩ

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CIRCUIT DIAGRAM



LIMITING VALUES

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

SYMBOL	PARAMETER	MIN.	MAX.	UNIT
V _{CC1}	operating voltage	–	9	V
V _{CC2}	operating voltage	–	9	V
P _{tot}	total power dissipation	–	45	mW
T _{stg}	storage temperature range	–65	+150	°C
T _{amb}	operating temperature range	–40	+150	°C

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
R _{th j-a}	thermal resistance from junction to ambient	in free air	155	K/W

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CHARACTERISTICS

$T_{\text{amb}} = 25\text{ }^{\circ}\text{C}$ and $H_{\text{rotation}} = 25\text{ kA/m}$, $V_{\text{CC1}} = 5\text{ V}$; $V_{\text{CC2}} = 5\text{ V}$ unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{CC}	bridge supply voltage		–	5	9	V
S	sensitivity	open circuit; note 1 $\alpha = 0^{\circ}$ (bridge 2) $\alpha = 135^{\circ}$ (bridge 1)	2.1	2.3	2.5	mV/ $^{\circ}$
V_{peak1}	peak voltage	note 2; see Fig.3	60	66	72	mV
V_{peak2}	peak voltage	note 2; see Fig.3	60	66	72	mV
TCV_{peak}	temperature coefficient of peak voltage	$T_{\text{amb}} = -40\text{ to }+150\text{ }^{\circ}\text{C}$; note 3	–0.27	–0.29	–0.31	%/K
R_{bridge}	bridge resistance	note 4	3.2	3.7	4.2	k Ω
$\text{TCR}_{\text{bridge}}$	temperature coefficient of bridge resistance	$T_{\text{amb}} = -40\text{ to }+150\text{ }^{\circ}\text{C}$; note 5	0.29	0.31	0.34	%/K
V_{offset}	offset voltage per supply voltage	see Fig.3	–2	0	+2	mV/V
$\text{TCV}_{\text{offset}}$	temperature coefficient of offset voltage per supply voltage	$T_{\text{amb}} = -40\text{ to }+150\text{ }^{\circ}\text{C}$; note 6; see Fig.3	–1	0	+1	($\mu\text{V/V}$)/K
FH	hysteresis of output voltage	note 7	–	0	0.02	%FS
ω	operating angular velocity		0	–	1 MHz	$^{\circ}/\text{s}$
k	amplitude synchronism	note 8	99.5	100	100.5	%
TCk	temperature coefficient of amplitude synchronism	$T_{\text{amb}} = -40\text{ to }+150\text{ }^{\circ}\text{C}$; note 9	–0.002	0	–0.002	%/K
$\Delta\alpha$	angular inaccuracy	note 10	–	0	0.1	deg

Notes

1. Sensitivity changes with angle due to sinusoidal output.

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

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

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

Magnetic field sensor

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$$7. \quad FH_1 = 100 \left| \frac{V_{O1(67.5^\circ)135^\circ \Rightarrow 45^\circ} - V_{O1(67.5^\circ)45^\circ \Rightarrow 135^\circ}}{2 \times V_{\text{peak1}}} \right|$$

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

$$8. \quad k = \frac{V_{\text{peak1}}}{V_{\text{peak2}}} \cdot 100.$$

$$9. \quad TCK = 100 \frac{(k_{T2} - k_{T1})}{k_{T1}(T_2 - T_1)} \quad \text{Where } T_1 = -40^\circ\text{C}; T_2 = 150^\circ\text{C}.$$

$$10. \quad \Delta\alpha = |\alpha_{\text{real}} - \alpha_{\text{measured}}| \text{ without offset voltage influences.}$$

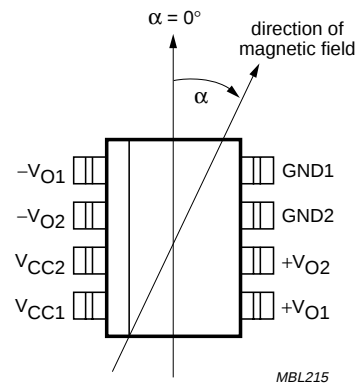
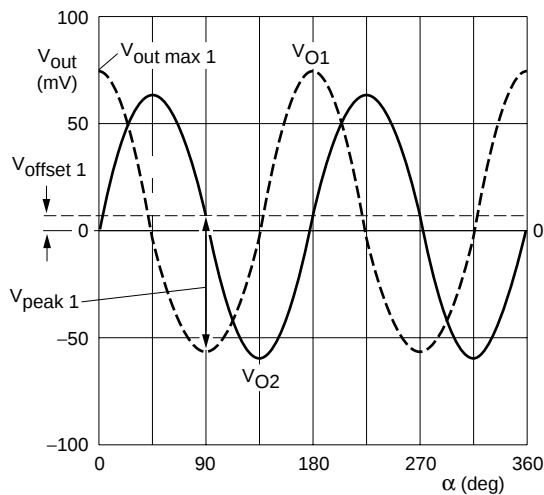


Fig.3 Output signals related to the direction of the magnetic field.

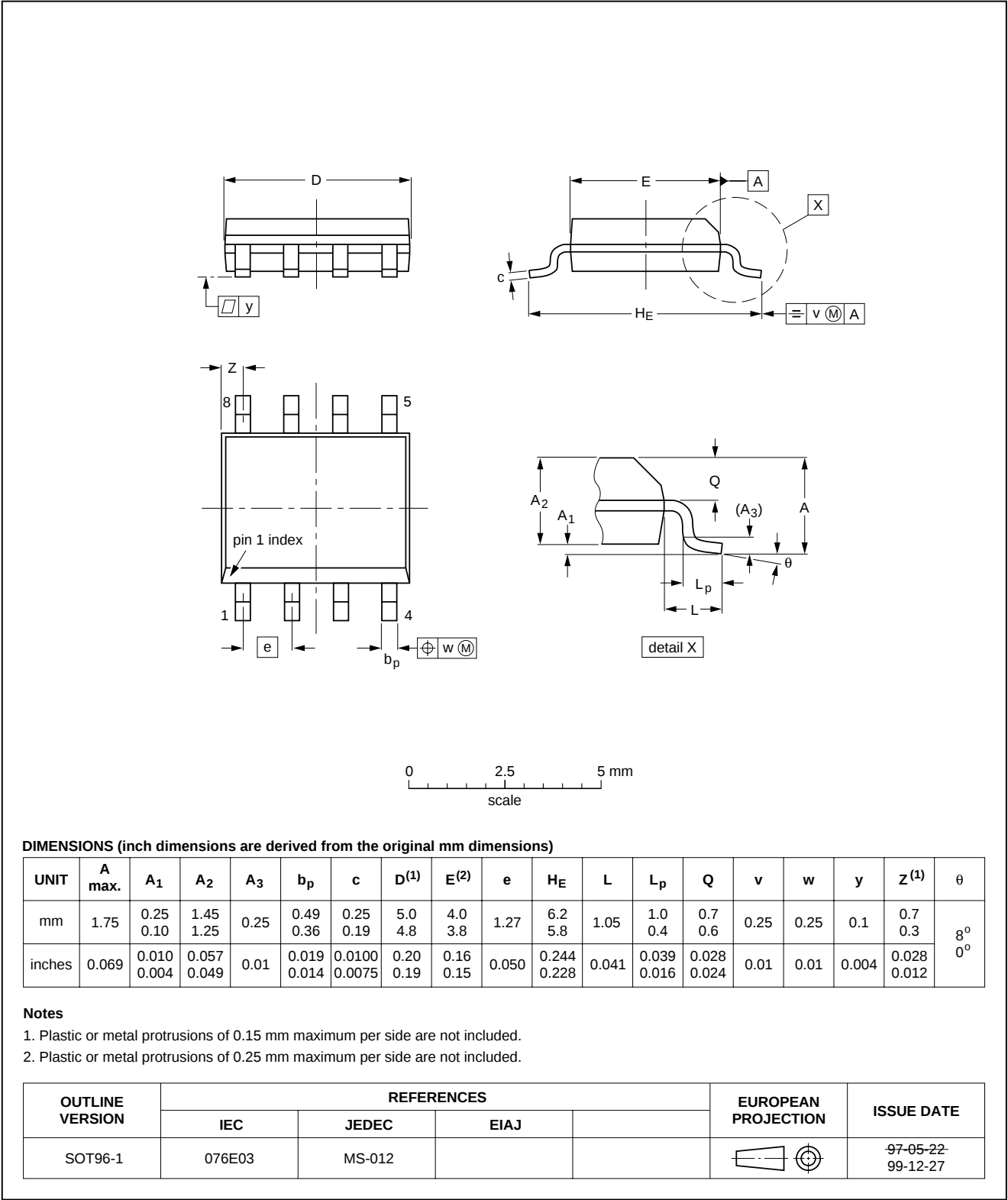
Magnetic field sensor

KMZ43

PACKAGE OUTLINE

SO8: plastic small outline package; 8 leads; body width 3.9 mm

SOT96-1



Magnetic field sensor

KMZ43

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.

DEFINITIONS

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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