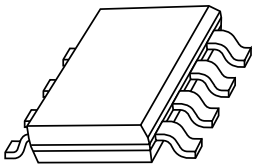
DATA SHEET



KMZ43
Magnetic field sensor

Objective specification

2000 Aug 24

Philips
Semiconductors

PHILIPS

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(2α) and the second a function of +sin(2α), 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.

(1) The KMZ41 delivers a +sin(2α) and a –cos(2α) signal.

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

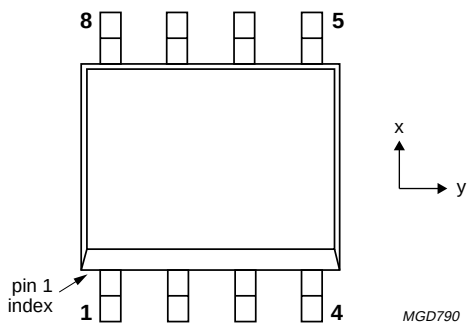


Fig.1 Simplified outline SOT96-1.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	MIN.	TYP.	MAX.	UNIT
V_{CC1}	operating voltage	–	5	9	V
V_{CC2}	operating voltage	–	5	9	V
S	sensitivity (a_2 = 0°, a_1 = 135°)	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

CIRCUIT DIAGRAM

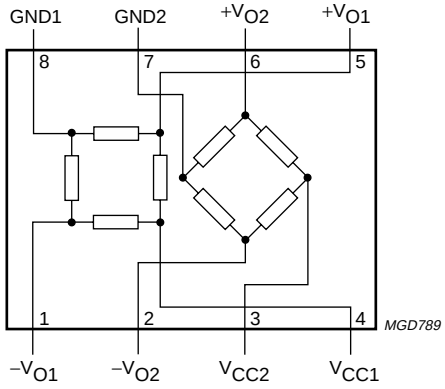


Fig.2 Simplified circuit diagram.

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
$R_{th\ j\text{-}a}$	thermal resistance from junction to ambient	in free air	155	K/W

CHARACTERISTICS

T_{amb} = 25 °C and $H_{rotation}$ = 25 kA/m, V_{CC1} = 5 V; V_{CC2} = 5 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 a = 0° (bridge 2) a = 135° (bridge 1)	2.1	2.3	2.5	mV/°
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_{amb} = –40 to +150 °C; note 3	–0.27	–0.29	–0.31	%/K
R_{bridge}	bridge resistance	note 4	3.2	3.7	4.2	kΩ
TCR_{bridge}	temperature coefficient of bridge resistance	T_{amb} = –40 to +150 °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
TCV_{offset}	temperature coefficient of offset voltage per supply voltage	T_{amb} = –40 to +150 °C; note 6; see Fig.3	–1	0	+1	(µV/V)/K
FH	hysteresis of output voltage	note 7	–	0	0.02	%FS
ω	operating angular velocity		0	–	1 MHz	°/s
k	amplitude synchronism	note 8	99.5	100	100.5	%
TCk	temperature coefficient of amplitude synchronism	T_{amb} = –40 to +150 °C; note 9	–0.002	0	–0.002	%/K
Δα	angular inaccuracy	note 10	–	0	0.1	deg

Notes

1. Sensitivity changes with angle due to sinusoidal output.
2. $V_{peak} = |(V_{out\ max} - V_{offset})|$.
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. $$FH_1 = 100 \left| \frac{V_{O1(67.5°)135° \Rightarrow 45°} - V_{O1(67.5°)45° \Rightarrow 135°}}{2 \times V_{peak1}} \right|$$

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

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

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

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

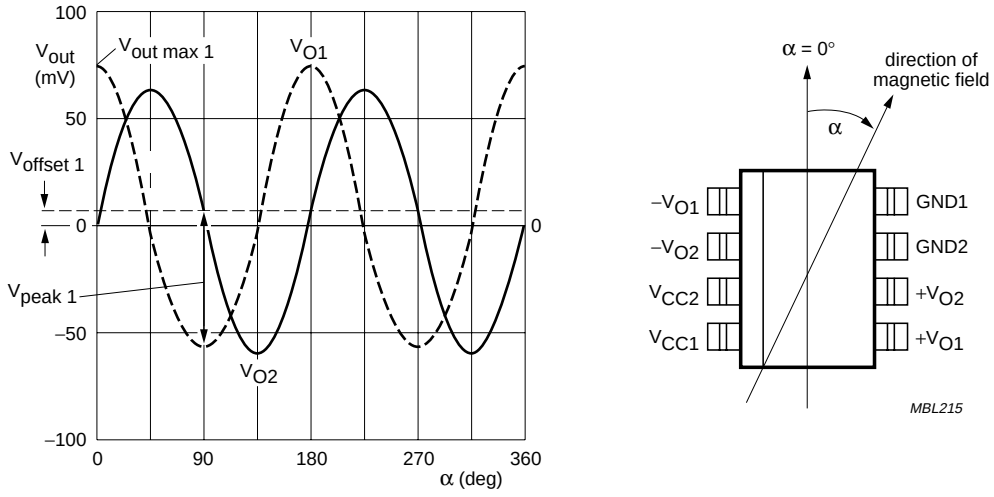
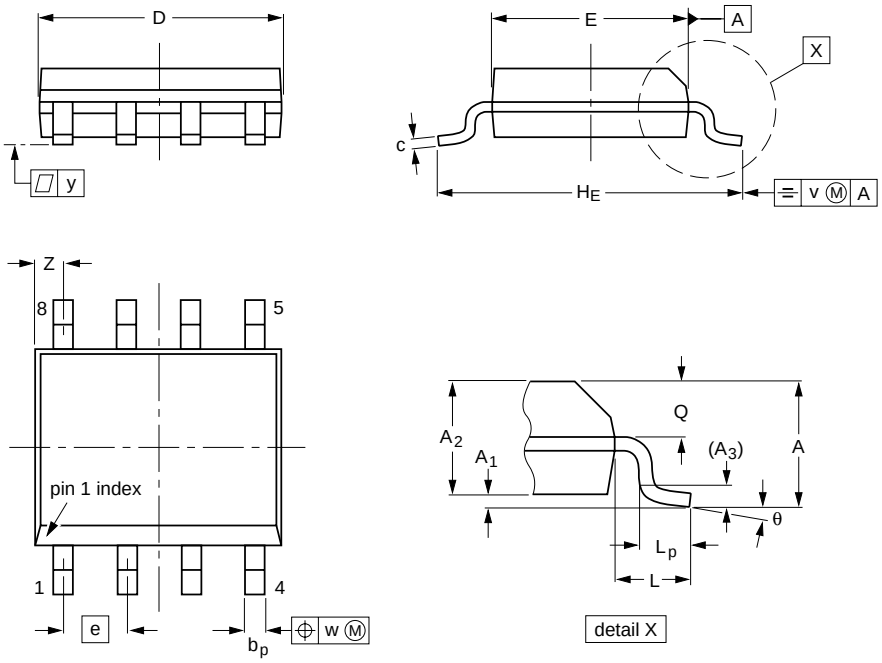


Fig.3 Output signals related to the direction of the magnetic field.

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^o 0^o
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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Philips Semiconductors – a worldwide company

Argentina: see South America

Australia: 3 Figtree Drive, HOMEBUSH, NSW 2140,
Tel. +61 2 9704 8141, Fax. +61 2 9704 8139

Austria: Computerstr. 6, A-1101 WIEN, P.O. Box 213,
Tel. +43 1 60 101 1248, Fax. +43 1 60 101 1210

Belarus: Hotel Minsk Business Center, Bld. 3, r. 1211, Volodarski Str. 6,
220050 MINSK, Tel. +375 172 20 0733, Fax. +375 172 20 0773

Belgium: see The Netherlands

Brazil: see South America

Bulgaria: Philips Bulgaria Ltd., Energoproject, 15th floor,
51 James Bourchier Blvd., 1407 SOFIA,
Tel. +359 2 68 9211, Fax. +359 2 68 9102

Canada: PHILIPS SEMICONDUCTORS/COMPONENTS,
Tel. +1 800 234 7381, Fax. +1 800 943 0087

China/Hong Kong: 501 Hong Kong Industrial Technology Centre,
72 Tat Chee Avenue, Kowloon Tong, HONG KONG,
Tel. +852 2319 7888, Fax. +852 2319 7700

Colombia: see South America

Czech Republic: see Austria

Denmark: Sydhavnsgade 23, 1780 COPENHAGEN V,
Tel. +45 33 29 3333, Fax. +45 33 29 3905

Finland: Sinikalliontie 3, FIN-02630 ESPOO,
Tel. +358 9 615 800, Fax. +358 9 6158 0920

France: 51 Rue Carnot, BP317, 92156 SURESNES Cedex,
Tel. +33 1 4099 6161, Fax. +33 1 4099 6427

Germany: Hammerbrookstraße 69, D-20097 HAMBURG,
Tel. +49 40 2353 60, Fax. +49 40 2353 6300

Hungary: see Austria

India: Philips INDIA Ltd, Band Box Building, 2nd floor,
254-D, Dr. Annie Besant Road, Worli, MUMBAI 400 025,
Tel. +91 22 493 8541, Fax. +91 22 493 0966

Indonesia: PT Philips Development Corporation, Semiconductors Division,
Gedung Philips, Jl. Buncit Raya Kav.99-100, JAKARTA 12510,
Tel. +62 21 794 0040 ext. 2501, Fax. +62 21 794 0080

Ireland: Newstead, Clonskeagh, DUBLIN 14,
Tel. +353 1 7640 000, Fax. +353 1 7640 200

Israel: RAPAC Electronics, 7 Kehilat Saloniki St, PO Box 18053,
TEL AVIV 61180, Tel. +972 3 645 0444, Fax. +972 3 649 1007

Italy: PHILIPS SEMICONDUCTORS, Via Casati, 23 - 20052 MONZA (MI),
Tel. +39 039 203 6838, Fax +39 039 203 6800

Japan: Philips Bldg 13-37, Kohnan 2-chome, Minato-ku,
TOKYO 108-8507, Tel. +81 3 3740 5130, Fax. +81 3 3740 5057

Korea: Philips House, 260-199 Itaewon-dong, Yongsan-ku, SEOUL,
Tel. +82 2 709 1412, Fax. +82 2 709 1415

Malaysia: No. 76 Jalan Universiti, 46200 PETALING JAYA, SELANGOR,
Tel. +60 3 750 5214, Fax. +60 3 757 4880

Mexico: 5900 Gateway East, Suite 200, EL PASO, TEXAS 79905,
Tel. +9-5 800 234 7381, Fax +9-5 800 943 0087

Middle East: see Italy

Netherlands: Postbus 90050, 5600 PB EINDHOVEN, Bldg. VB,
Tel. +31 40 27 82785, Fax. +31 40 27 88399

New Zealand: 2 Wagener Place, C.P.O. Box 1041, AUCKLAND,
Tel. +64 9 849 4160, Fax. +64 9 849 7811

Norway: Box 1, Manglerud 0612, OSLO,
Tel. +47 22 74 8000, Fax. +47 22 74 8341

Pakistan: see Singapore

Philippines: Philips Semiconductors Philippines Inc.,
106 Valero St. Salcedo Village, P.O. Box 2108 MCC, MAKATI,
Metro MANILA, Tel. +63 2 816 6380, Fax. +63 2 817 3474

Poland: Al.Jerozolimskie 195 B, 02-222 WARSAW,
Tel. +48 22 5710 000, Fax. +48 22 5710 001

Portugal: see Spain

Romania: see Italy

Russia: Philips Russia, Ul. Usatcheva 35A, 119048 MOSCOW,
Tel. +7 095 755 6918, Fax. +7 095 755 6919

Singapore: Lorong 1, Toa Payoh, SINGAPORE 319762,
Tel. +65 350 2538, Fax. +65 251 6500

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South Africa: S.A. PHILIPS Pty Ltd., 195-215 Main Road Martindale,
2092 JOHANNESBURG, P.O. Box 58088 Newville 2114,
Tel. +27 11 471 5401, Fax. +27 11 471 5398

South America: Al. Vicente Pinzon, 173, 6th floor,
04547-130 SÃO PAULO, SP, Brazil,
Tel. +55 11 821 2333, Fax. +55 11 821 2382

Spain: Balmes 22, 08007 BARCELONA,
Tel. +34 93 301 6312, Fax. +34 93 301 4107

Sweden: Kottbygatan 7, Akalla, S-16485 STOCKHOLM,
Tel. +46 8 5985 2000, Fax. +46 8 5985 2745

Switzerland: Allmendstrasse 140, CH-8027 ZÜRICH,
Tel. +41 1 488 2741 Fax. +41 1 488 3263

Taiwan: Philips Semiconductors, 5F, No. 96, Chien Kuo N. Rd., Sec. 1,
TAIPEI, Taiwan Tel. +886 2 2134 2451, Fax. +886 2 2134 2874

Thailand: PHILIPS ELECTRONICS (THAILAND) Ltd.,
60/14 MOO 11, Bangna Trad Road KM. 3, Bagna, BANGKOK 10260,
Tel. +66 2 361 7910, Fax. +66 2 398 3447

Turkey: Yukari Dudullu, Org. San. Blg., 2.Cad. Nr. 28 81260 Umraniye,
ISTANBUL, Tel. +90 216 522 1500, Fax. +90 216 522 1813

Ukraine: PHILIPS UKRAINE, 4 Patrice Lumumba str., Building B, Floor 7,
252042 KIEV, Tel. +380 44 264 2776, Fax. +380 44 268 0461

United Kingdom: Philips Semiconductors Ltd., 276 Bath Road, Hayes,
MIDDLESEX UB3 5BX, Tel. +44 208 730 5000, Fax. +44 208 754 8421

United States: 811 East Arques Avenue, SUNNYVALE, CA 94088-3409,
Tel. +1 800 234 7381, Fax. +1 800 943 0087

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Tel. +381 11 3341 299, Fax.+381 11 3342 553

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