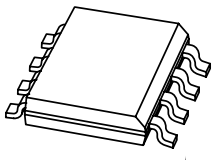
DATA SHEET



KMZ51
Magnetic field sensor

Product specification
Supersedes data 1998 Mar 24

2000 Jun 13

Philips
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Magnetic field sensor KMZ51

FEATURES

- High sensitivity
- Integrated compensation coil
- Integrated set/reset coil.

APPLICATIONS

- Navigation
- Current and earth magnetic field measurement
- Traffic detection.

DESCRIPTION

The KMZ51 is an extremely sensitive magnetic field sensor, employing the magnetoresistive effect of thin-film permalloy. The sensor contains one magnetoresistive Wheatstone bridge and integrated compensation and set/reset coils. The integrated compensation coil allows magnetic field measurement with current feedback loops to generate an output that is independent of drift in sensitivity. The orientation of sensitivity may be set or changed (flipped) by means of the integrated set/reset coil. A short current pulse should be applied to the compensation coil to recover (set) the sensor after exposure to strong disturbing magnetic fields. A negative current pulse will reset the sensor to reversed sensitivity. By use of periodically alternated flipping pulses and a lock-in amplifier, output is made independent of sensor and amplifier offset.

PINNING

PIN	SYMBOL	DESCRIPTION
1	$+I_{flip}$	flip coil
2	V_{CC}	bridge supply voltage
3	GND	ground
4	$+I_{comp}$	compensation coil
5	$-I_{comp}$	compensation coil
6	$-V_O$	bridge output voltage
7	$+V_O$	bridge output voltage
8	$-I_{flip}$	flip coil

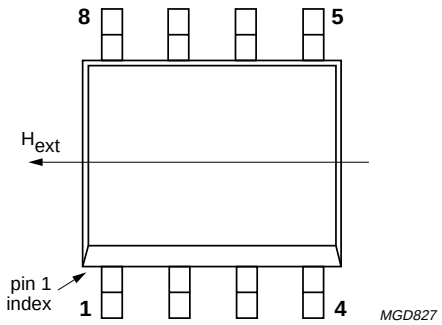


Fig.1 Simplified outline.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	MIN.	TYP.	MAX.	UNIT
V_{CC}	bridge supply voltage	–	5	8	V
S	sensitivity (uncompensated)	12	16	–	$\frac{mV/V}{kA/m}$
V_{offset}	offset voltage	–1.5	–	+1.5	mV/V
R_{bridge}	bridge resistance	1	–	3	kΩ
R_{comp}	compensation coil resistance	100	170	300	Ω
A_{comp}	compensation coil field factor; note 1	19	22	25	$\frac{A/m}{mA}$

SYMBOL	PARAMETER	MIN.	TYP.	MAX.	UNIT
R_{flip}	flip coil resistance	1	2	3	Ω
$I_{flip\ (min)}$	minimum recommended flipping current; note 2	800	1000	1200	mA
$t_{flip\ (min)}$	minimum flip pulse duration; note 2	1	3	100	μs

Notes

1. The compensation coil generates a field $H_{comp} = A_{comp} \times I_{comp}$ in addition to the external field H_{ext}. Sensor output will become zero if $H_{ext} = -H_{comp}$.
2. Average power consumption of the flipping coil, defined by current, pulse duration and pulse repetition rate may not exceed the specified limit, see Chapter “Limiting values”.

CIRCUIT DIAGRAM

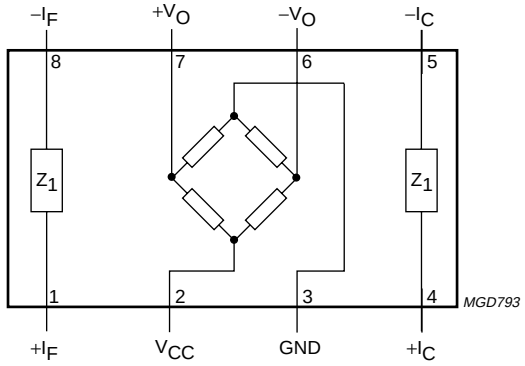


Fig.2 Simplified circuit diagram.

LIMITING VALUES

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

SYMBOL	PARAMETER	MIN.	MAX.	UNIT
V_{CC}	bridge supply voltage	–	9	V
P_{tot}	total power dissipation	–	130	mW
T_{stg}	storage temperature	−65	+150	°C
T_{bridge}	bridge operating temperature	−40	+125	°C
I_{comp}	maximum compensation current	–	15	mA
$I_{flip\ (max)}$	maximum flipping current	–	1500	mA
$P_{flip\ (max)}$	maximum flipping power dissipation	–	50	mW
V_{isol}	voltage between isolated systems: flip coil and Wheatstone bridge; compensation coil and Wheatstone bridge; flip coil and compensation coil	–	60	V

THERMAL CHARACTERISTICS

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

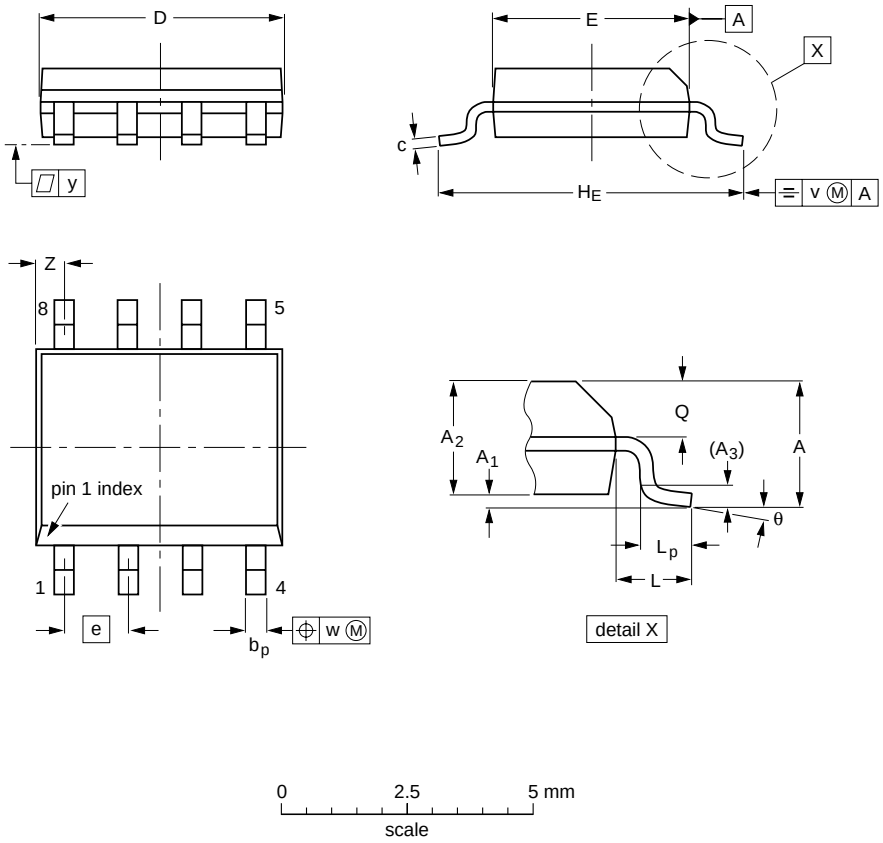
CHARACTERISTICS

T_{amb} = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{CC}	bridge supply voltage		–	5	8	V
H_y	operating range in sensitive direction		–0.2	–	+0.2	kA/m
H_x	operating range perpendicular to sensitive direction		–0.2	–	+0.2	kA/m
S	sensitivity	open circuit	12	16	–	$\frac{mV/V}{kA/m}$
TCS	temperature coefficient of sensitivity	T_s = –25 to +125 °C	–	0.31	–	%/K
TCV_O	temperature coefficient of output voltage	V_{CC} = 5 V; T_{amb} = –25 to +125 °C	–	–0.4	–	%/K
		I_{CC} 3 mA; T_{amb} = –25 to +125 °C	–	–0.1	–	%/K
R_{bridge}	bridge resistance	resistance pins 2 to 3	1	–	3	kΩ
TCR_{bridge}	temperature coefficient of bridge resistance	T_{bridge} = –25 to +125 °C	–	0.3	–	%/K
V_{offset}	offset voltage		–1.5	0	+1.5	mV/V
TCV_{offset}	temperature coefficient of offset voltage	T_{bridge} = –25 to +125 °C	–3	0	+3	$\frac{\mu V/V}{K}$
FH	hysteresis of output voltage		–	–	2	%FS
R_{comp}	resistance of compensation coil	resistance pins 4 to 5	100	170	300	Ω
A_{comp}	field factor of compensation coil		19	22	25	$\frac{A/m}{mA}$
R_{flip}	resistance of set/reset conductor	resistance pins 1 to 8	1	2	3	Ω
TCR_{flip}	temperature coefficient of resistance of set/reset coil	T_{flip} = –25 to +125 °C	–	0.39	–	%/K
I_{flip}	recommended flipping current for stable operation		±800	±1000	±1200	mA
t_{flip}	flip pulse duration		1	3	100	µs
R_{isol}	isolating resistance	resistance pins 1 to 2, 1 to 4 and 2 to 4	1	–	–	mΩ
V_{isol}	voltage between isolated systems	voltage pins 1 to 2, 1 to 4 and 2 to 4	–	–	50	V
f	operating frequency		0	–	1	MHz

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.

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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