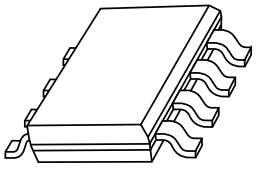
DATA SHEET



KMZ51
Magnetic field sensor

Product specification
Supersedes data of 1996 Nov 15
File under Discrete Semiconductors, SC17

1998 Mar 24

Philips
Semiconductors

PHILIPS

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 conductors. The integrated compensation conductor allows magnetic field measurement with current feedback loops to generate an output that is independent of drift in sensitivity. With the integrated set/reset conductor the orientation of sensitivity may be set or changed (flipped). A short current pulse on this conductor is needed 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 will become 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

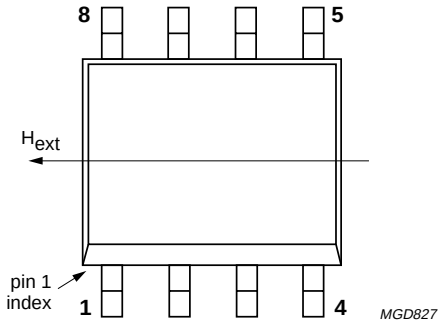


Fig.1 Simplified outline.

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	A/m/mA
R_{flip}	flip coil resistance	1	3	5	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. Compensation conductor will generate a field $H_{comp} = A_{comp} \cdot I_{comp}$ additional to the external field H_{ext}. Sensor output will become zero if $H_{ext} = -H_{comp}$.
2. Average power consumption in flip conductor, defined by current, pulse duration and pulse repetition rate may not exceed the specified limit, see “Limiting values”.

CIRCUIT DIAGRAM

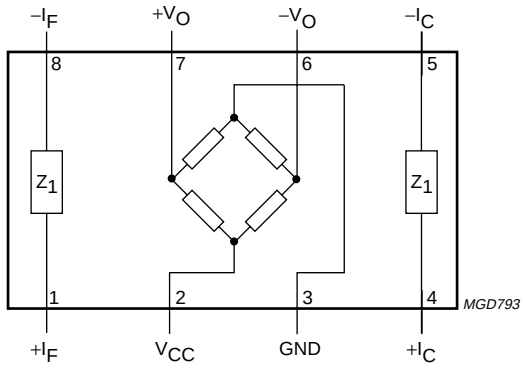


Fig.2 Simplified circuit diagram.

LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134).

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 conductor - Wheatstone bridge; compensation conductor - bridge; flip conductor - compensation conductor	–	60	V

THERMAL CHARACTERISTICS

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

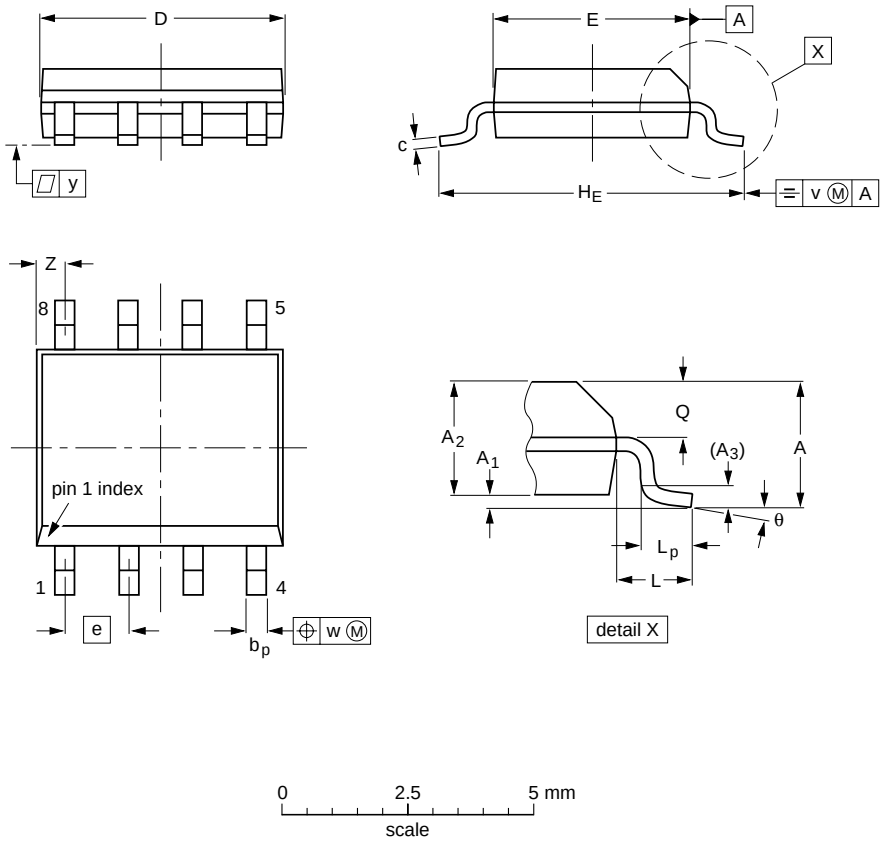
CHARACTERISTICS

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	–	$\frac{mV/V}{kA/m}$
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	–	+1.5	mV/V
TCV_{offset}	temperature coefficient of offset voltage	T_{bridge} = –25 to +125 °C	–3	–	+3	$\frac{\mu V/V}{K}$
FH	hysteresis of output voltage		–	–	2	%FS
R_{comp}	resistance of compensation conductor	resistance pins 4 to 5	100	170	300	Ω
A_{comp}	field factor of compensation conductor		19	22	25	A/m/mA
R_{flip}	resistance of set/reset conductor	resistance pins 1 to 8	1	3	5	Ω
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, 2 to 4	1	–	–	MΩ
V_{isol}	voltage between isolated systems	voltage pins 1 to 2, 1 to 4, 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	076E03S	MS-012AA				~~95-02-04~~ 97-05-22

DEFINITIONS

Data Sheet Status	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
Limiting values	
Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). 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.	
Application information	
Where application information is given, it is advisory and does not form part of the specification.	

LIFE SUPPORT APPLICATIONS

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