

DATA SHEET

KMZ51 Magnetic field sensor

Objective specification
File under Discrete Semiconductors, SC17

1996 Nov 15

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

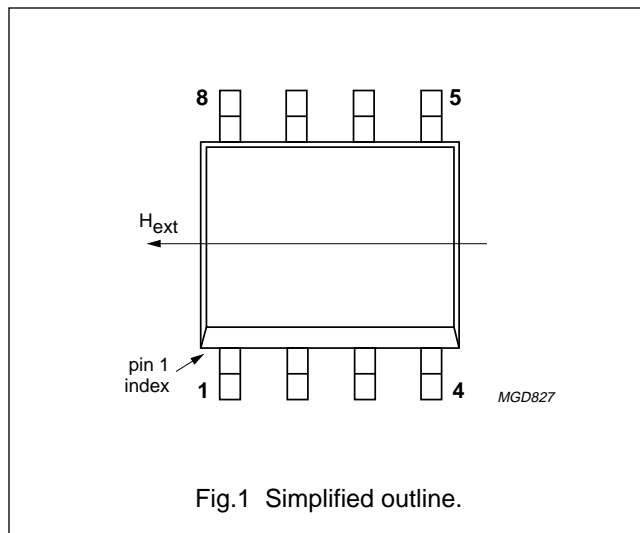


Fig.1 Simplified outline.

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

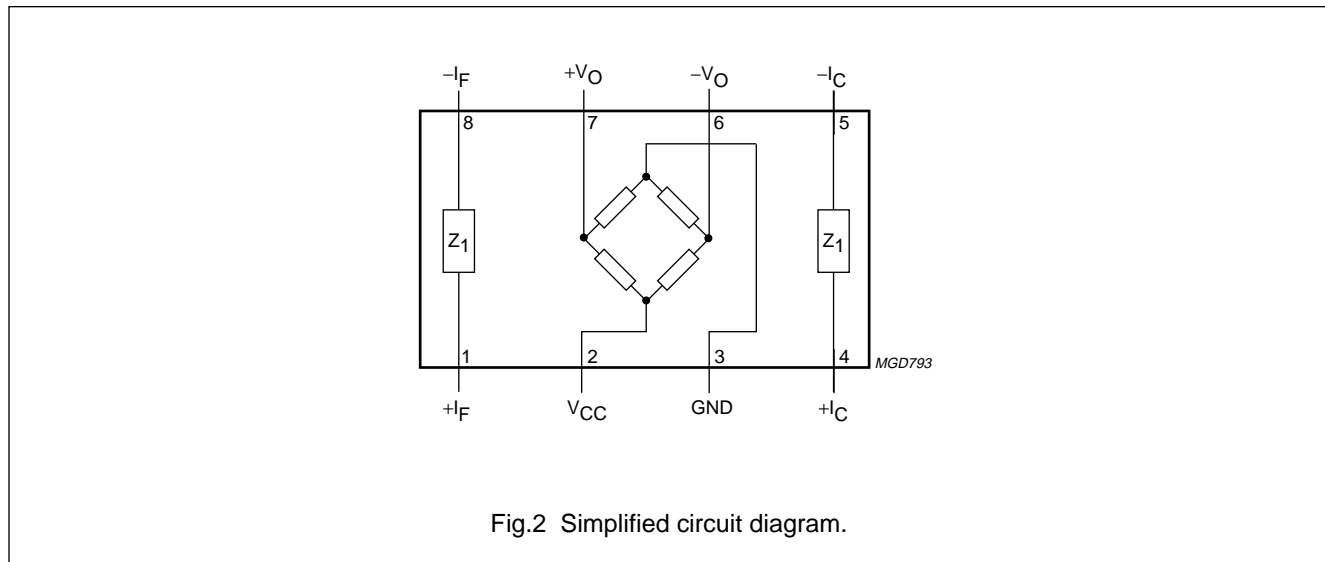
Notes

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".

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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
$R_{th j-a}$	thermal resistance from junction to ambient	155	K/W

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CHARACTERISTICS $T_{amb} = 25\text{ °C}$ 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	$V_{CC} = 5\text{ V};$ $T_{amb} = -25\text{ to }+125\text{ °C}$	–	–0.4	–	%/K μ
		$I_{CC} = 3\text{ mA};$ $T_{amb} = -25\text{ to }+125\text{ °C}$	–	–0.1	–	%/K
R_{bridge}	bridge resistance	resistance pins 2 to 3	1	–	3	k Ω
TCR_{bridge}	temperature coefficient of bridge resistance	$T_{bridge} = -25\text{ to }+125\text{ °C}$	–	0.3	–	%/K
V_{offset}	offset voltage		–1.5	–	+1.5	mV/V
TCV_{offset}	temperature coefficient of offset voltage	$T_{bridge} = -25\text{ to }+125\text{ °C}$	–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	–	–	M Ω
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

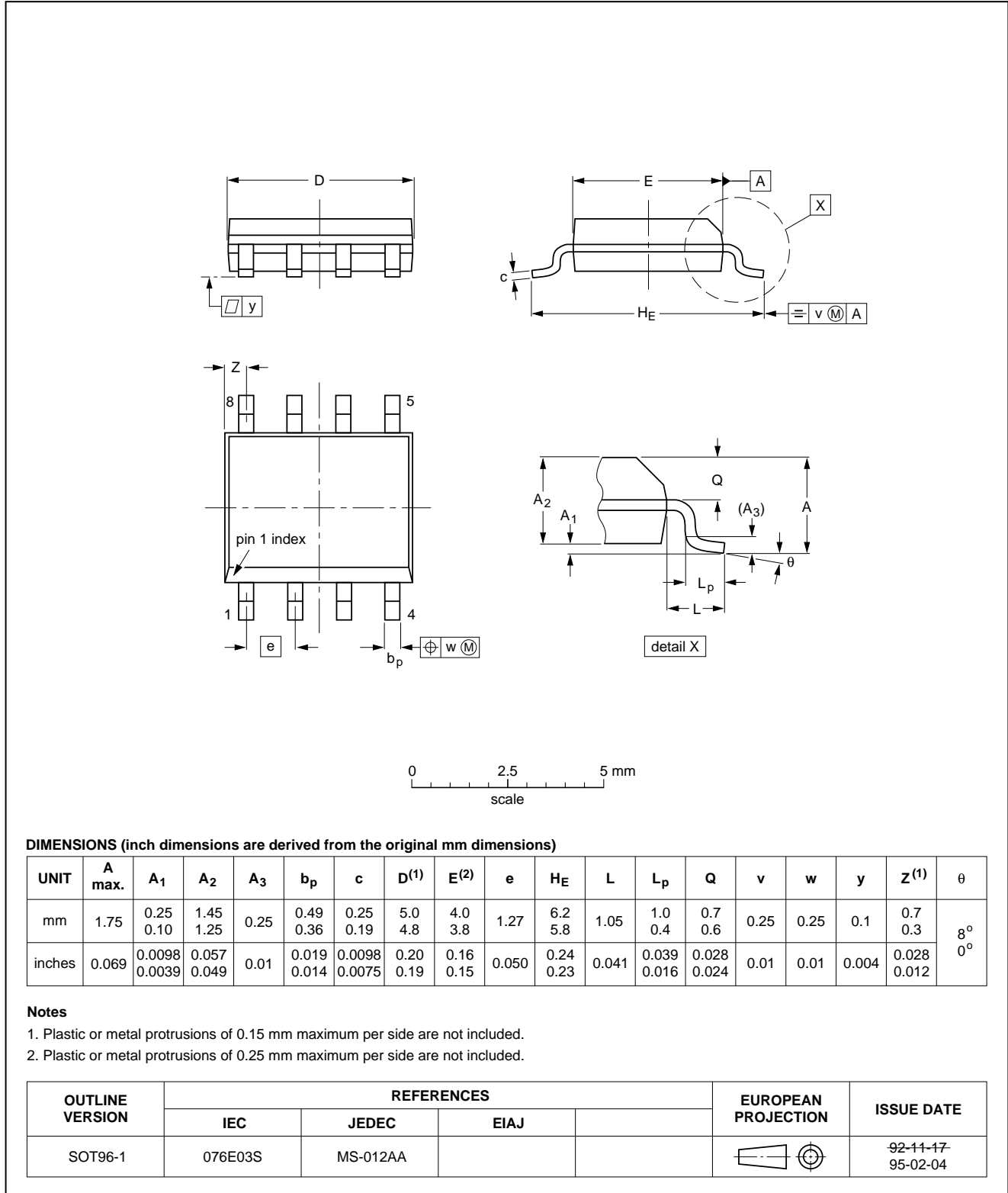
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PACKAGE OUTLINE

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

SOT96-1



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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

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips for any damages resulting from such improper use or sale.

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