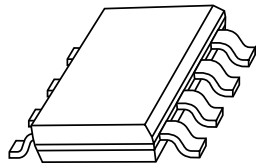


DATA SHEET



KMZ50 Magnetic field sensor

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

1998 Mar 24

Magnetic field sensor

KMZ50

FEATURES

- High sensitivity
- Integrated set/reset coil.

APPLICATIONS

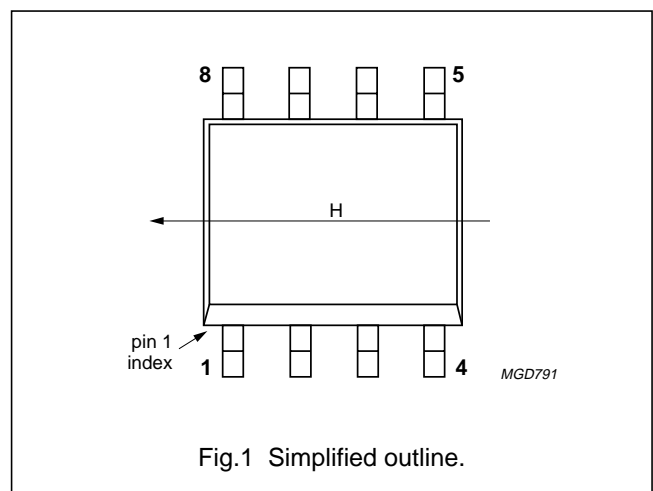
- Navigation
- Current and earth magnetic field measurement
- Traffic detection.

DESCRIPTION

The KMZ50 is an extremely sensitive magnetic field sensor, employing the magnetoresistive effect of thin-film permalloy. The sensor contains one magnetoresistive Wheatstone bridge and integrated set/reset conductors. 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 | n.c. | not connected |
| 5 | n.c. | not connected |
| 6 | -V _O | bridge output voltage |
| 7 | +V _O | bridge output voltage |
| 8 | -I _{flip} | flip coil |



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 _{flip} | flip coil resistance | 1 | 3 | 5 | Ω |
| I _{flip (min)} | minimum recommended flipping current; note 1 | 800 | 1000 | 1200 | mA |
| t _{flip (min)} | minimum flip pulse duration; note 1 | 1 | 3 | 100 | μs |

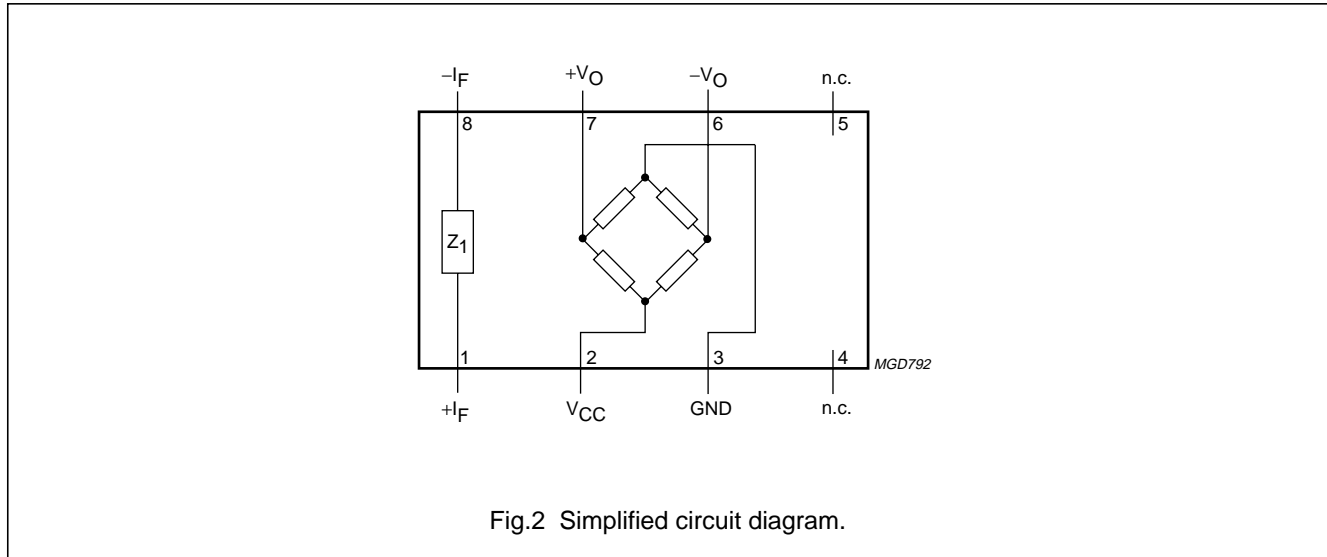
Note

1. Average power consumption in flip conductor, defined by current, pulse duration and pulse repetition rate may not exceed the specified limit, see "Limiting values".

Magnetic field sensor

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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 |
| $I_{flip(max)}$ | maximum flipping current | – | 1500 | mA |
| $P_{flip(max)}$ | maximum flipping power dissipation | – | 50 | mW |
| V_{isol} | voltage between isolated systems: flip conductor - Wheatstone bridge | – | 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 |
| | | $I_{CC} = 3\text{ mA};$ $T_{amb} = -25\text{ to }+125\text{ °C}$ | – | –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_{flip} | resistance of set/reset conductor | resistance pins 1 to 8 | 1 | 3 | 5 | Ω |
| I_{flip} | recommended flipping current for stable operation | current pins 1 to 8 | ± 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 |

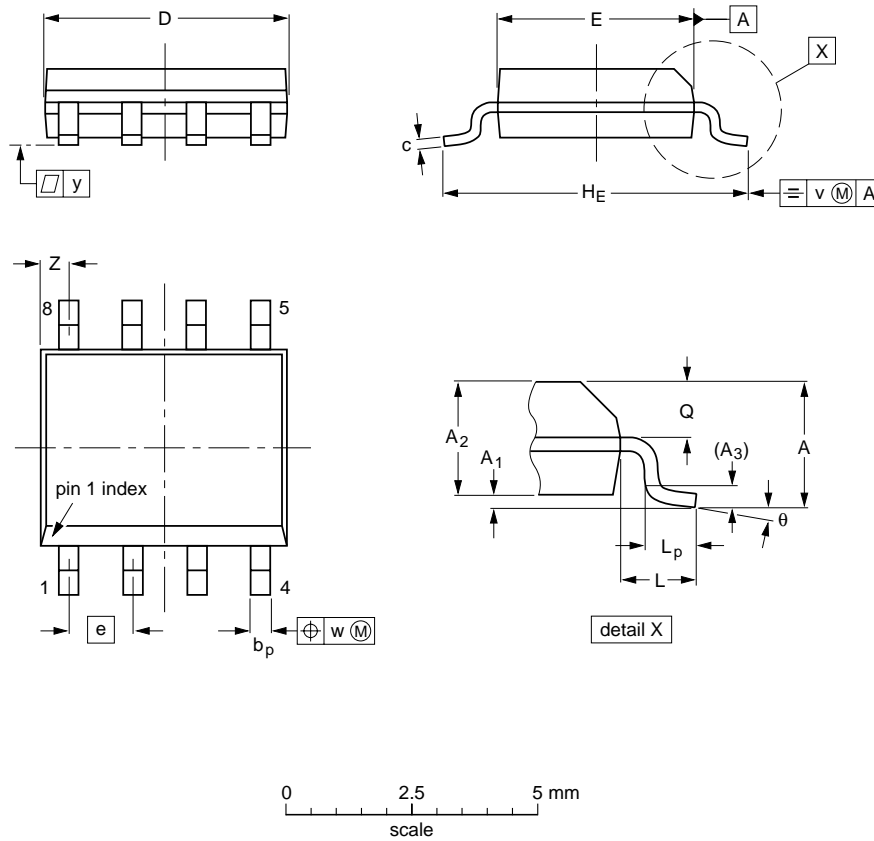
Magnetic field sensor

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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° 0° |
| 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 |

Magnetic field sensor

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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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