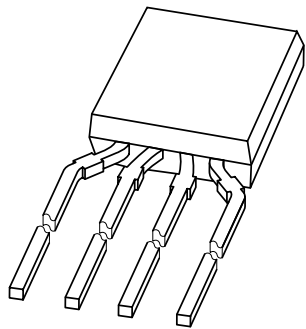


# DATA SHEET



## **KMZ10A1** Magnetic field sensor

Product specification  
Supersedes data of 1996 Nov 14  
File under Discrete Semiconductors, SC17

1998 Apr 06

# Magnetic field sensor

# KMZ10A1

## DESCRIPTION

The KMZ10A1 is an extremely sensitive magnetic field sensor, employing the magnetoresistive effect of thin-film permalloy. Its properties enable this sensor to be used in a wide range of applications such as navigation, current and earth magnetic field measurement etc. The special arrangement of the sensing chip allows the construction of coils for switching the auxiliary field ( $H_x$ ) along the length axis of the sensor. The sensor can be operated at any frequency between DC and 1 MHz.

## PINNING

| PIN | SYMBOL          | DESCRIPTION    |
|-----|-----------------|----------------|
| 1   | +V <sub>O</sub> | output voltage |
| 2   | GND             | ground         |
| 3   | -V <sub>O</sub> | output voltage |
| 4   | V <sub>CC</sub> | supply voltage |

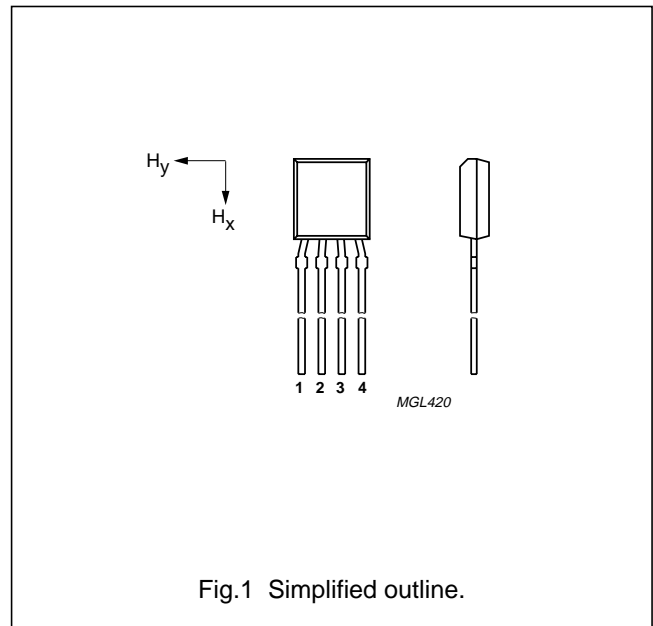


Fig.1 Simplified outline.

## QUICK REFERENCE DATA

| SYMBOL              | PARAMETER                                   | MIN. | TYP. | MAX. | UNIT                |
|---------------------|---|------|------|------|---------------------|
| V <sub>CC</sub>     | DC supply voltage                           | -    | 5    | -    | V                   |
| H <sub>y</sub>      | magnetic field strength                     | -0.5 | -    | +0.5 | kA/m                |
| H <sub>x</sub>      | auxiliary field                             | -    | 0.5  | -    | kA/m                |
| S                   | sensitivity                                 | -    | 14   | -    | $\frac{mV/V}{kA/m}$ |
| S <sub>s</sub>      | sensitivity (with switched H <sub>x</sub> ) | -    | 22   | -    | $\frac{mV/V}{kA/m}$ |
| R <sub>bridge</sub> | bridge resistance                           | 0.85 | -    | 1.75 | kΩ                  |
| V <sub>offset</sub> | offset voltage                              | -1.5 | -    | +1.5 | mV/V                |

## CIRCUIT DIAGRAM

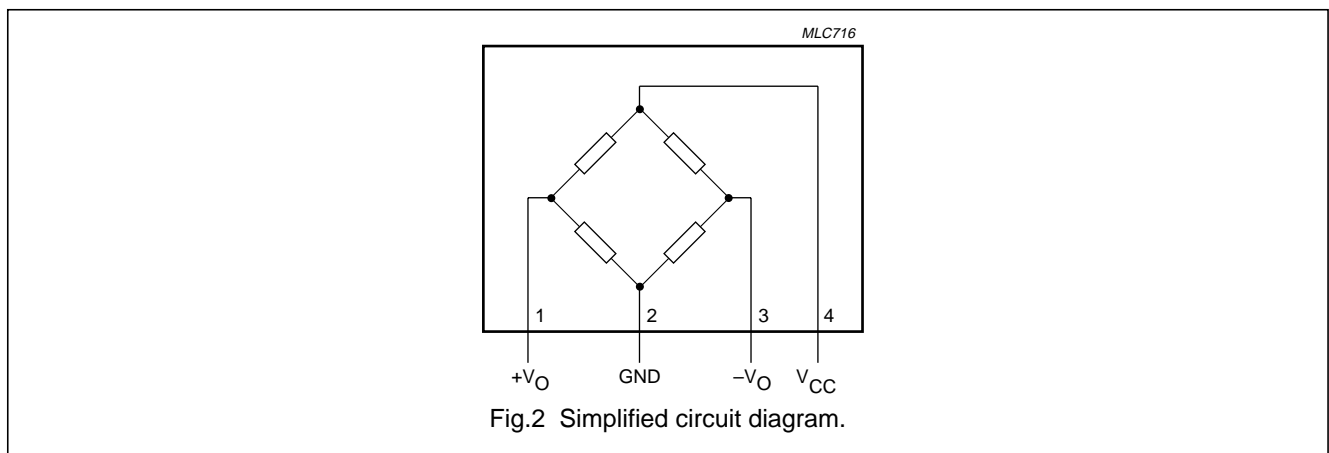


Fig.2 Simplified circuit diagram.

Magnetic field sensor

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**LIMITING VALUES**

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

| SYMBOL       | PARAMETER                    | CONDITIONS                      | MIN. | MAX. | UNIT |
|--------------|------------------------------|---------------------------------|------|------|------|
| $V_{CC}$     | DC supply voltage            |                                 | –    | 9    | V    |
| $P_{tot}$    | total power dissipation      | up to $T_{amb} = 132\text{ °C}$ | –    | 100  | mW   |
| $T_{stg}$    | storage temperature          |                                 | –65  | +150 | °C   |
| $T_{bridge}$ | bridge operating temperature |                                 | –40  | +150 | °C   |

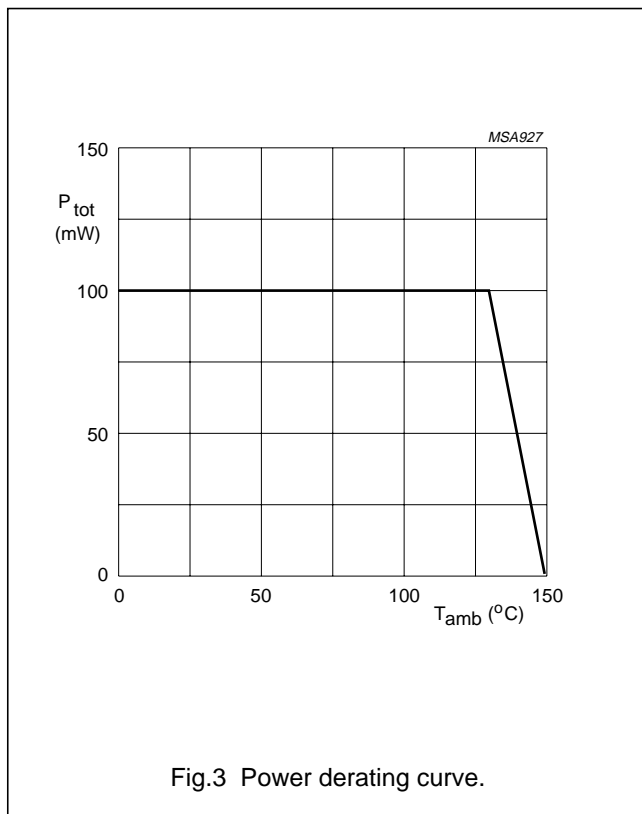


Fig.3 Power derating curve.

## Magnetic field sensor

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## THERMAL CHARACTERISTICS

| SYMBOL        | PARAMETER                                   | VALUE | UNIT |
|---------------|---|-------|------|
| $R_{th\ j-a}$ | thermal resistance from junction to ambient | 180   | K/W  |

## CHARACTERISTICS

$T_{amb} = 25\text{ °C}$  and  $H_x = 0.5\text{ kA/m}$  unless otherwise specified; see notes 1 and 2.

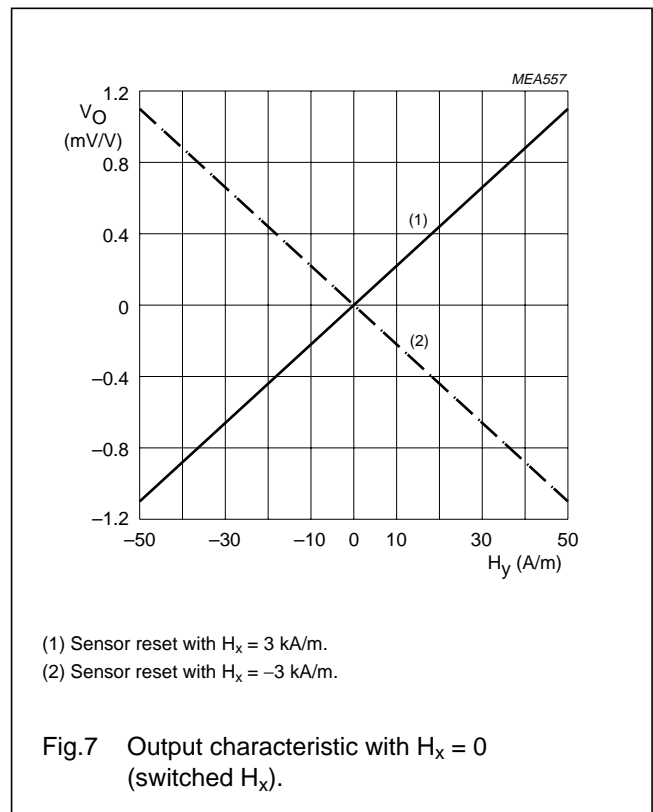
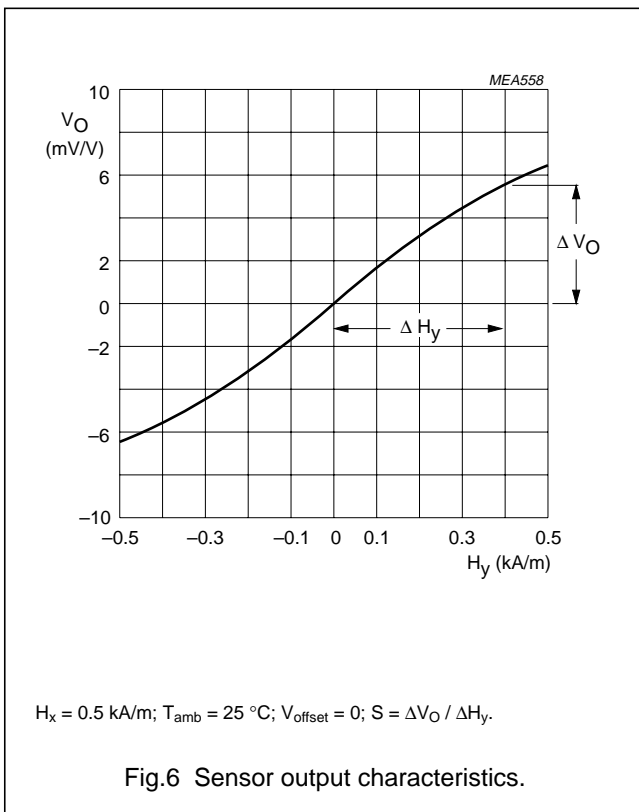
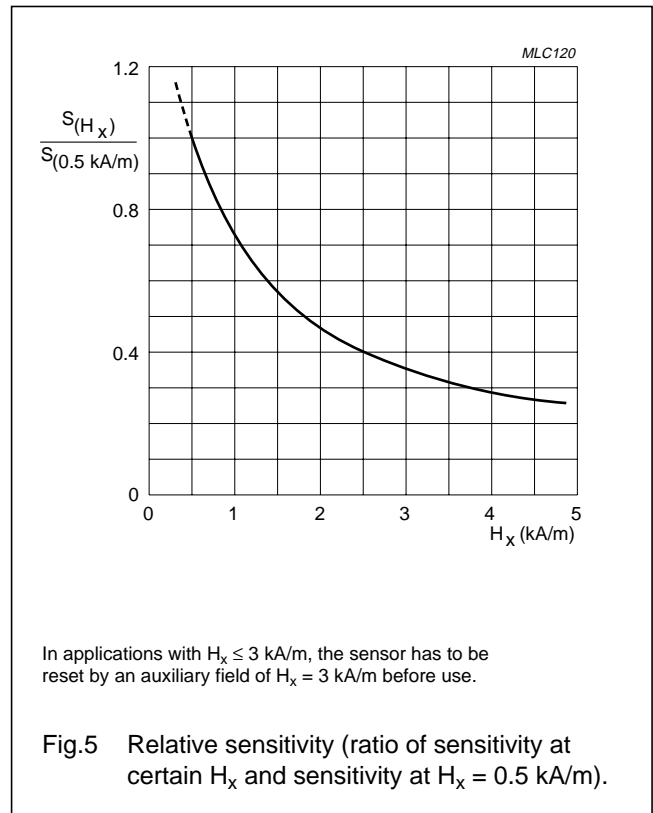
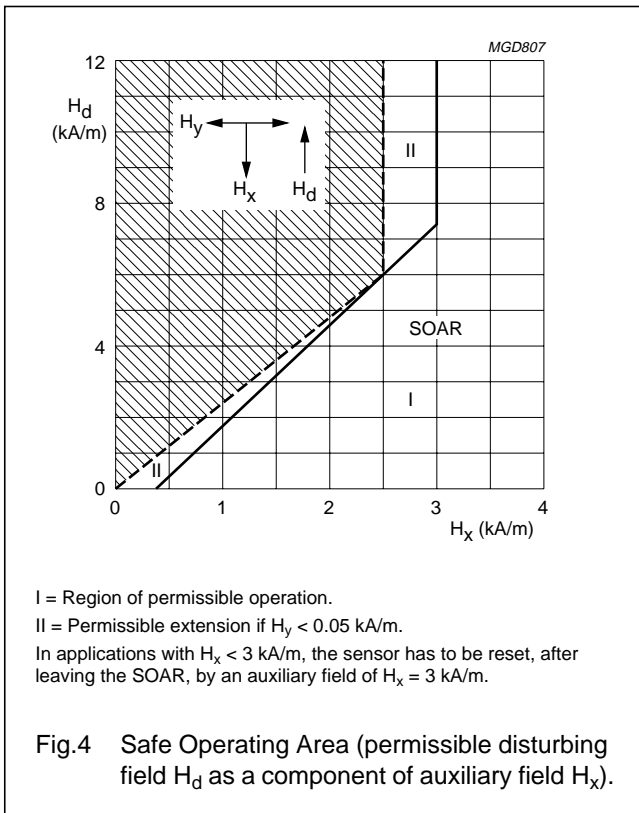
| SYMBOL   | PARAMETER  | CONDITIONS   | MIN.  | TYP.  | MAX.  | UNIT                |
|--|--|--|-------|-------|-------|---------------------|
| $V_{CC}$   | DC supply voltage  |  | –     | 5     | –     | V                   |
| $H_y$  | operating range  | note 2   | –0.5  | –     | +0.5  | kA/m                |
| S  | sensitivity  | open circuit;<br>notes 2 and 3                                     | 11    | –     | 17    | $\frac{mV/V}{kA/m}$ |
| $TCV_O$  | temperature coefficient of output voltage at constant supply voltage | $V_{CC} = 5\text{ V};$<br>$T_{amb} = -25\text{ to }+125\text{ °C}$ | –     | –0.4  | –     | %/K                 |
| $V_{CV_O}$   | temperature coefficient of output voltage at constant supply current | $I_B = 3\text{ mA};$<br>$T_{amb} = -25\text{ to }+125\text{ °C}$   | –     | –0.15 | –     | %/K                 |
| $R_{bridge}$   | bridge resistance  |  | 0.85  | –     | 1.75  | k $\Omega$          |
| $TCR_{bridge}$   | temperature coefficient of bridge resistance                         | $T_j = -25\text{ to }+125\text{ °C}$                               | –     | 0.25  | –     | %/K                 |
| $V_{offset}$   | offset voltage   |  | –1.5  | –     | +1.5  | mV/V                |
| $TCV_{offset}$   | offset voltage drift   | $T_{bridge} = -25\text{ to }+125\text{ °C}$                        | –6    | –     | +6    | $\frac{\mu V/V}{K}$ |
| FL   | linearity deviation of output voltage                                | $H_y = 0\text{ to } \pm 0.25\text{ kA/m}^{-1}$                     | –     | –     | 0.8   | %·FS                |
|  |  | $H_y = 0\text{ to } \pm 0.4\text{ kA/m}^{-1}$                      | –     | –     | 2.5   | %·FS                |
|  |  | $H_y = 0\text{ to } \pm 0.5\text{ kA/m}^{-1}$                      | –     | –     | 4.0   | %·FS                |
| FH   | hysteresis of output voltage   |  | –     | –     | 0.5   | %·FS                |
| f  | operating frequency  |  | 0     | –     | 1     | MHz                 |
| <b>Characteristics with <math>H_x = 0</math> (switched <math>H_x</math>, see note 4); <math>V_{CC} = 5\text{ V}</math></b> |  |  |       |       |       |                     |
| $H_y$  | operating range  | note 2   | –0.05 | –     | +0.05 | kA/m                |
| $S_s$  | sensitivity  | slope between $H_y = 0$<br>and $H_y = 40\text{ A/m}$               | 14    | –     | 27    | $\frac{mV/V}{kA/m}$ |

## Notes

1. Before first operation or after operation outside the SOAR (Fig.4) the sensor has to be reset by application of an auxiliary field  $H_x = 3\text{ kA/m}$ .
2. No disturbing field ( $H_d$ ) allowed; for stable operation under disturbing conditions see Fig.4 (SOAR) and see Fig.5 for decrease of sensitivity.
3. Sensitivity measured as  $\Delta V_O/\Delta H_y$  between  $H_y = 0$  and  $H_y = 0.4\text{ kA/m}$ .
4. See application information.

Magnetic field sensor

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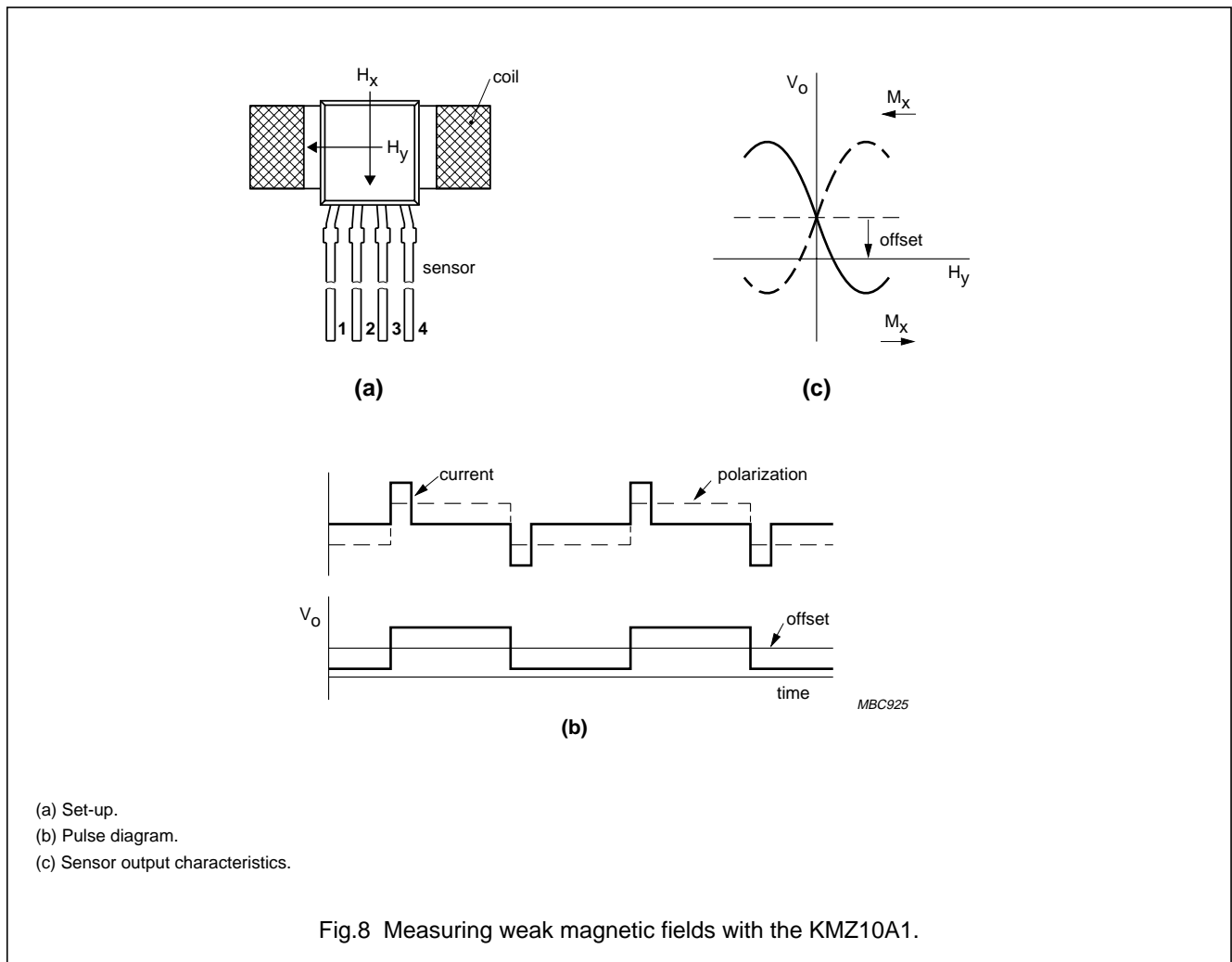


# Magnetic field sensor

# KMZ10A1

## APPLICATION INFORMATION

A problem with measuring weak magnetic fields is that precision is limited by drift in both the sensor and amplifier offset. In these instances, it is possible to take advantage of the 'flipping' characteristics of the KMZ10 series to generate an output that is independent of offset. The sensor, located in a coil connected to a current pulse generator producing magnetic field pulses periodically reversed by alternate positive and negative going current pulses, is continually flipped from its normal to its reversed polarity and back again. The polarity of the offset however, remains unchanged, so the offset itself can be eliminated by passing the output signal through a filter circuit.



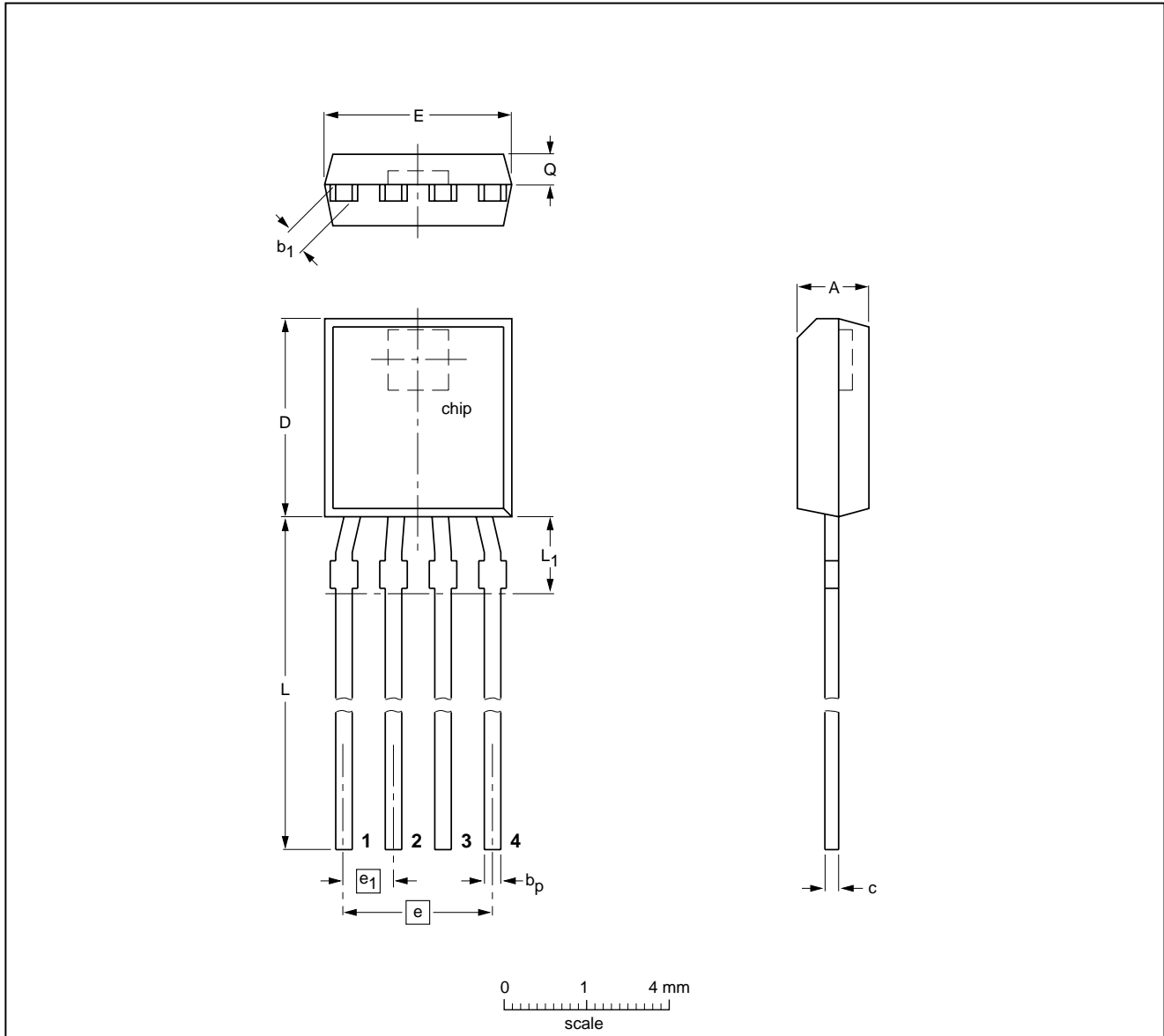
Magnetic field sensor

KMZ10A1

PACKAGE OUTLINE

Plastic single-ended flat package; 4 in-line leads

SOT195



DIMENSIONS (mm are the original dimensions)

| UNIT | A          | b <sub>p</sub> | b <sub>1</sub> | c            | D          | E          | e    | e <sub>1</sub> | L            | L <sub>1</sub> <sup>(1)</sup><br>max. | Q          |
|------|------------|----------------|----------------|--------------|------------|------------|------|----------------|--------------|---------------------------------------|------------|
| mm   | 1.8<br>1.6 | 0.48<br>0.40   | 0.7<br>0.5     | 0.45<br>0.39 | 5.2<br>5.0 | 4.8<br>4.4 | 3.75 | 1.25           | 14.5<br>12.7 | 2                                     | 0.8<br>0.7 |

Notes

1. Terminal dimensions within this zone are uncontrolled to allow for flow of plastic and terminal irregularities.

| OUTLINE<br>VERSION | REFERENCES |       |      |  | EUROPEAN<br>PROJECTION | ISSUE DATE |
|--------------------|------------|-------|------|--|------------------------|------------|
|                    | IEC        | JEDEC | EIAJ |  |                        |            |
| SOT195             |            |       |      |  |                        | 97-06-02   |

## Magnetic field sensor

KMZ10A1

**DEFINITIONS**

| <b>Data Sheet Status</b>  |   |
|---|---|
| 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.                                |
| <b>Limiting values</b>  |   |
| 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. |   |
| <b>Application information</b>  |   |
| Where application information is given, it is advisory and does not form part of the specification.   |   |

**LIFE SUPPORT APPLICATIONS**

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Magnetic field sensor

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**NOTES**

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**NOTES**

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**NOTES**

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