Data Sheet

KMZ10A
Magnetic field sensor

Product specification
Supersedes data of 1996 Nov 08
File under Discrete Semiconductors, SC17

1998 Mar 24
**Magnetic field sensor KMZ10A**

**DESCRIPTION**
The KMZ10A 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 for navigation, current and field measurement, revolution counters, angular or linear position measurement and proximity detectors, etc.

**PINNING**

<table>
<thead>
<tr>
<th>PIN</th>
<th>SYMBOL</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+V_D</td>
<td>output voltage</td>
</tr>
<tr>
<td>2</td>
<td>GND</td>
<td>ground</td>
</tr>
<tr>
<td>3</td>
<td>−V_D</td>
<td>output voltage</td>
</tr>
<tr>
<td>4</td>
<td>V_CC</td>
<td>supply voltage</td>
</tr>
</tbody>
</table>

**QUICK REFERENCE DATA**

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>PARAMETER</th>
<th>MIN.</th>
<th>TYP.</th>
<th>MAX.</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>V_CC</td>
<td>bridge supply voltage</td>
<td>−</td>
<td>5</td>
<td>−</td>
<td>V</td>
</tr>
<tr>
<td>T_bridge</td>
<td>bridge operating temperature</td>
<td>−40</td>
<td>−</td>
<td>+150</td>
<td>°C</td>
</tr>
<tr>
<td>H_y</td>
<td>magnetic field strength</td>
<td>−0.5</td>
<td>−</td>
<td>+0.5</td>
<td>kA/m</td>
</tr>
<tr>
<td>H_x</td>
<td>auxiliary field</td>
<td>−</td>
<td>0.5</td>
<td>−</td>
<td>kA/m</td>
</tr>
<tr>
<td>S</td>
<td>sensitivity</td>
<td>−</td>
<td>16</td>
<td>−</td>
<td>mV/V</td>
</tr>
<tr>
<td>R_bridge</td>
<td>bridge resistance</td>
<td>0.8</td>
<td>−</td>
<td>1.6</td>
<td>kΩ</td>
</tr>
<tr>
<td>V_offset</td>
<td>offset voltage</td>
<td>−1.5</td>
<td>−</td>
<td>+1.5</td>
<td>mV/V</td>
</tr>
</tbody>
</table>

**CIRCUIT DIAGRAM**
LIMITING VALUES
In accordance with the Absolute Maximum Rating System (IEC 134).

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>PARAMETER</th>
<th>CONDITIONS</th>
<th>MIN.</th>
<th>MAX.</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{CC}$</td>
<td>bridge supply voltage</td>
<td></td>
<td>$-$</td>
<td>9</td>
<td>V</td>
</tr>
<tr>
<td>$P_{tot}$</td>
<td>total power dissipation</td>
<td>up to $T_{amb} = 134 , ^\circ C$</td>
<td>$-$</td>
<td>90</td>
<td>mW</td>
</tr>
<tr>
<td>$T_{stg}$</td>
<td>storage temperature</td>
<td>note 1</td>
<td>$-65$</td>
<td>$+150$</td>
<td>$^\circ C$</td>
</tr>
<tr>
<td>$T_{bridge}$</td>
<td>bridge operating temperature</td>
<td></td>
<td>$-40$</td>
<td>$+150$</td>
<td>$^\circ C$</td>
</tr>
</tbody>
</table>

**Note**

1. Maximum operating temperature of the thin-film permalloy.

Fig.3  Power derating curve.
Magnetic field sensor  

KMZ10A

THERMAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>PARAMETER</th>
<th>VALUE</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$R_{th,j-a}$</td>
<td>thermal resistance from junction to ambient</td>
<td>180</td>
<td>K/W</td>
</tr>
</tbody>
</table>

CHARACTERISTICS

$T_{amb} = 25 \, ^\circ C; \ H_x = 0.5 \, kA/m; \ notes \ 1 \ and \ 2; \ V_{CC} = 5 \, V \ unless \ otherwise \ specified.$

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>PARAMETER</th>
<th>CONDITIONS</th>
<th>MIN.</th>
<th>TYP.</th>
<th>MAX.</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$H_y$</td>
<td>magnetic field strength</td>
<td>notes 2 and 3</td>
<td>−0.5</td>
<td>−</td>
<td>+0.5</td>
<td>kA/m</td>
</tr>
<tr>
<td>$S$</td>
<td>sensitivity</td>
<td></td>
<td>13</td>
<td>−</td>
<td>19</td>
<td>mV/V</td>
</tr>
<tr>
<td>$TCV_O$</td>
<td>temperature coefficient of output voltage</td>
<td>$V_{CC} = 5 , V; \ T_{amb} = -25 , to \ +125 , ^\circ C$</td>
<td>−</td>
<td>−0.4</td>
<td>−</td>
<td>%/K</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_{CC} = 3 , mA; \ T_{amb} = -25 , to \ +125 , ^\circ C$</td>
<td>−</td>
<td>−0.15</td>
<td>−</td>
<td>%/K</td>
</tr>
<tr>
<td>$R_{bridge}$</td>
<td>bridge resistance</td>
<td></td>
<td>0.8</td>
<td>−</td>
<td>1.6</td>
<td>kΩ</td>
</tr>
<tr>
<td>$TCR_{bridge}$</td>
<td>temperature coefficient of bridge resistance</td>
<td>$T_{bridge} = -25 , to \ +125 , ^\circ C$</td>
<td>−</td>
<td>0.25</td>
<td>−</td>
<td>%/K</td>
</tr>
<tr>
<td>$V_{offset}$</td>
<td>offset voltage</td>
<td></td>
<td>−1.5</td>
<td>−</td>
<td>+1.5</td>
<td>mV/V</td>
</tr>
<tr>
<td>$TCV_{offset}$</td>
<td>offset voltage drift</td>
<td>$T_{bridge} = -25 , to \ +125 , ^\circ C$</td>
<td>−6</td>
<td>−</td>
<td>+6</td>
<td>µV/V/K</td>
</tr>
<tr>
<td>$FL$</td>
<td>linearity deviation of output voltage</td>
<td>$H_y = 0 , to \ \pm 0.25 , kA/m$</td>
<td>−</td>
<td>−</td>
<td>0.8</td>
<td>%/FS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$H_y = 0 , to \ \pm 0.4 , kA/m$</td>
<td>−</td>
<td>−</td>
<td>2.5</td>
<td>%/FS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$H_y = 0 , to \ \pm 0.5 , kA/m$</td>
<td>−</td>
<td>−</td>
<td>4.0</td>
<td>%/FS</td>
</tr>
<tr>
<td>$FH$</td>
<td>hysteresis of output voltage</td>
<td></td>
<td>−</td>
<td>−</td>
<td>0.5</td>
<td>%/FS</td>
</tr>
<tr>
<td>$f$</td>
<td>operating frequency</td>
<td></td>
<td>0</td>
<td>−</td>
<td>1</td>
<td>MHz</td>
</tr>
</tbody>
</table>

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 $H_x = 3 \, kA/m$.
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. $S = \frac{(V_O \ at \ H_y = 0.4 \, kA/m) - (V_O \ at \ H_y = 0)}{0.4 \times V_{CC}}$. 

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Fig.4 Safe Operating Area (permissible disturbing field $H_d$ as a component of auxiliary field $H_x$).

In applications with $H_x < 3 \text{kA/m}$, the sensor has to be reset, after leaving the SOAR, by an auxiliary field of $H_x = 3 \text{kA/m}$.

I = Region of permissible operation.
II = Permissible extension if $H_y < 0.15 \text{A/m}$.

Fig.5 Relative sensitivity (ratio of sensitivity at certain $H_x$ and sensitivity at $H_x = 0.5 \text{kA/m}$).

In applications with $H_x \leq 3 \text{kA/m}$, the sensor has to be reset by an auxiliary field of $H_x = 3 \text{kA/m}$ before using.

Fig.6 Sensor output characteristics.

$H_x = 0.5 \text{kA/m}$; $T_{\text{amb}} = 25 \degree \text{C}$; $V_{\text{offset}} = 0$. 

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**PACKAGE OUTLINE**

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

**DIMENSIONS (mm are the original dimensions)**

<table>
<thead>
<tr>
<th>UNIT</th>
<th>A</th>
<th>b_p</th>
<th>b_1</th>
<th>c</th>
<th>D</th>
<th>E</th>
<th>e</th>
<th>e_1</th>
<th>L</th>
<th>L_1(1) max.</th>
<th>Q</th>
</tr>
</thead>
<tbody>
<tr>
<td>mm</td>
<td>1.8</td>
<td>0.48</td>
<td>0.7</td>
<td>0.45</td>
<td>5.2</td>
<td>4.8</td>
<td>3.75</td>
<td>1.25</td>
<td>14.5</td>
<td>12.7</td>
<td>2</td>
</tr>
<tr>
<td>1.6</td>
<td>0.40</td>
<td>0.5</td>
<td>0.39</td>
<td>5.0</td>
<td>4.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.8</td>
</tr>
</tbody>
</table>

**Notes**

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

**OUTLINE VERSION**

<table>
<thead>
<tr>
<th>REFERENCES</th>
<th>EUROPEAN PROJECTION</th>
<th>ISSUE DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEC</td>
<td>JEDEC</td>
<td>EIAJ</td>
</tr>
<tr>
<td>SOT195</td>
<td></td>
<td>97-06-02</td>
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</table>
DEFINITIONS

<table>
<thead>
<tr>
<th>Data Sheet Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective specification</td>
<td>This data sheet contains target or goal specifications for product development.</td>
</tr>
<tr>
<td>Preliminary specification</td>
<td>This data sheet contains preliminary data; supplementary data may be published later.</td>
</tr>
<tr>
<td>Product specification</td>
<td>This data sheet contains final product specifications.</td>
</tr>
</tbody>
</table>

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

Application information is given, it is advisory and does not form part of the specification.

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