

KMZ41

Magnetic field sensor

Rev. 05 — 27 November 2006 Product data sheet

1. Product profile

1.1 General description

The KMZ41 is a sensitive magnetic field sensor, employing the magneto-resistive effect of thin film permalloy. The sensor contains two galvanic separated Wheatstone bridges, which enclose an angle of 45 degrees.

A rotating magnetic field strength > 40 kA/m (recommended field strength > 100 kA/m) in the surface parallel to the chip (x-y plane) will deliver two independent sinusoidal output signals, one following a cos(2α) and the second following a sin(2α) function.

The sensor can be operated at any frequency between DC and 1 MHz.

Application notes *AN00023* (contactless angle measurement using KMZ41 and UZZ9000) and *AN00004* (contactless angle measurement using KMZ41 and UZZ9001) are available.

1.2 Features

- Accurate and reliable angle measurement
- Mechanical robustness, contactless principle
- Wear-free operation
- Accuracy independent on mechanical tolerances
- Extended temperature range

1.3 Quick reference data

Table 1. Quick reference data

T_{amb} = 25 °C and H_{ext} = 100 kA/m, V_{CC} = 5 V unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{CC}	supply voltage		[1]	-	5	9	V
V_{peak}	peak voltage	see Figure 2	[1]	70	78	86	mV
V_{offset}	offset voltage	per supply voltage; see Figure 2	[1]	–2	-	+2	mV/V
R_{bridge}	bridge resistance		[1][2]	2.0	2.5	3.0	kΩ

[1] Applicable for bridge 1 and bridge 2.

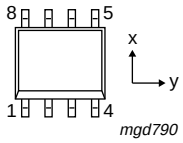
[2] Bridge resistance between pin 4 to pin 8, pin 3 to pin 7, pin 5 to pin 1 and pin 6 to pin 2.

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2. Pinning information

Table 2. Pinning

Pin	Symbol	Description	Simplified outline
1	ON1	output voltage bridge 1	
2	ON2	output voltage bridge 2	
3	V_{CC2}	supply voltage bridge 2	
4	V_{CC1}	supply voltage bridge 1	
5	OP1	output voltage bridge 1	
6	OP2	output voltage bridge 2	
7	GND2	supply voltage bridge 2	
8	GND1	supply voltage bridge 1	



3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
KMZ41	SO8	plastic small outline package; 8 leads; body width 3.9 mm	SOT96-1

4. Circuit diagram

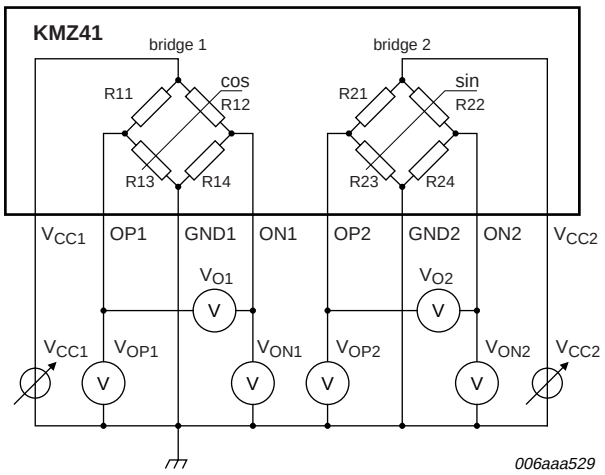


Fig 1. Device and test circuit diagram

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5. Limiting values

Table 4. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Max	Unit
V_{CC}	supply voltage		[1]	-	9	V
H_{ext}	external magnetic field strength			40	-	kA/m
T_{amb}	ambient temperature			–40	+150	°C
T_{stg}	storage temperature			–65	+150	°C

[1] Applicable for bridge 1 and bridge 2.

6. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Typ	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient		155	K/W

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7. Characteristics

Table 6. Characteristics

T_{amb} = 25 °C and H_{ext} = 100 kA/m, V_{CC} = 5 V unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{CC}	supply voltage		[1]	-	5	9	V
V_{peak}	peak voltage	see Figure 2	[1]	70	78	86	mV
TCV_{peak}	temperature coefficient of peak voltage	T_{amb} = –40 °C to +150 °C	[1][2]	–0.38	–0.41	–0.44	%/K
R_{bridge}	bridge resistance		[1][3]	2.0	2.5	3.0	kΩ
TCR_{bridge}	temperature coefficient of bridge resistance	T_{amb} = –40 °C to +150 °C	[1][4]	0.31	0.33	0.35	%/K
V_{offset}	offset voltage	per supply voltage; see Figure 2	[1]	–2	-	+2	mV/V
TCV_{offset}	temperature coefficient of offset voltage	per supply voltage; T_{amb} = –40 °C to +150 °C; see Figure 2	[1][5]	–2	-	+2	(μV/V)/K
FH	hysteresis of output voltage	see Figure 3	[1][6]	0	0.01	0.04	%FS
k	amplitude synchronism		[7]	99	100	101	%
TCk	temperature coefficient of amplitude synchronism	T_{amb} = –40 °C to +150 °C	[8]	–0.005	0	+0.005	%/K
Δα	angular inaccuracy		[9]	0	0.1	0.25	deg

[1] Applicable for bridge 1 and bridge 2.

[2] $$TCV_{peak} = 100 \times \frac{V_{peak}(at\ 150\ °C) - V_{peak}(at\ -40\ °C)}{V_{peak}(at\ 25\ °C) \times (150\ °C - (-40\ °C))}$$

[3] Bridge resistance between pin 4 to pin 8, pin 3 to pin 7, pin 5 to pin 1 and pin 6 to pin 2.

[4] $$TCR_{bridge} = 100 \times \frac{R_{bridge}(at\ 150\ °C) - R_{bridge}(at\ -40\ °C)}{R_{bridge}(at\ 25\ °C) \times (150\ °C - (-40\ °C))}$$

[5] $$TCV_{offset} = \frac{V_{offset}(at\ 150\ °C) - V_{offset}(at\ -40\ °C)}{150\ °C - (-40\ °C)}$$

[6] $$FH_1 = 100 \times \left| \frac{V_{O1}(67.5°)135° \rightarrow 45° - V_{O1}(67.5°)45° \rightarrow 135°}{2 \times V_{peak1}} \right|$$

$$FH_2 = 100 \times \left| \frac{V_{O2}(22.5°)90° \rightarrow 0° - V_{O2}(22.5°)0° \rightarrow 90°}{2 \times V_{peak2}} \right|$$

[7] $$k = 100 \times \frac{V_{peak1}}{V_{peak2}}$$

[8] $$TCk = 100 \times \frac{k(at\ 150\ °C) - k(at\ -40\ °C)}{k(at\ 25\ °C) \times (150\ °C - (-40\ °C))}$$

[9] $\Delta\alpha = |\alpha_{real} - \alpha_{meas}|$; V_{offset} = 0 V; inaccuracy of angular measurement due to deviations from ideal sinusoidal characteristics, calculated from the third and fifth harmonies of the spectrum of V_O.

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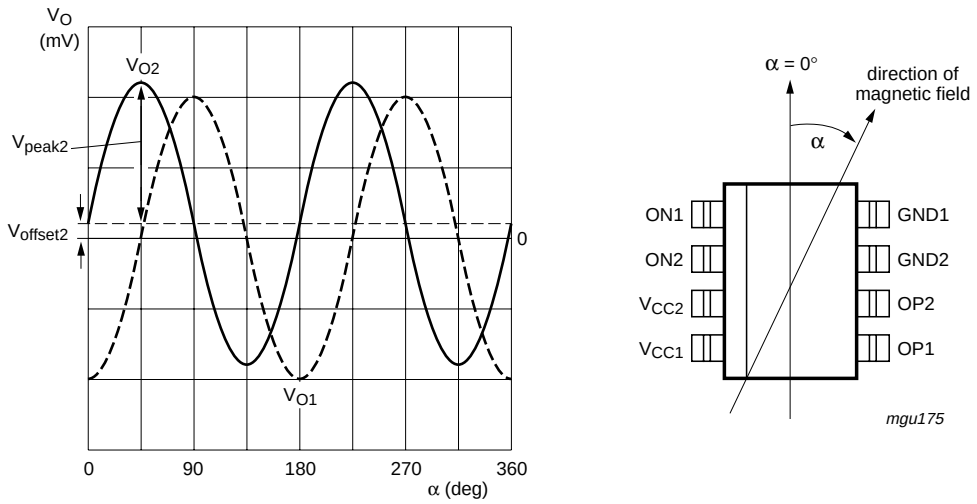


Fig 2. Output signals related to the direction of the magnetic field

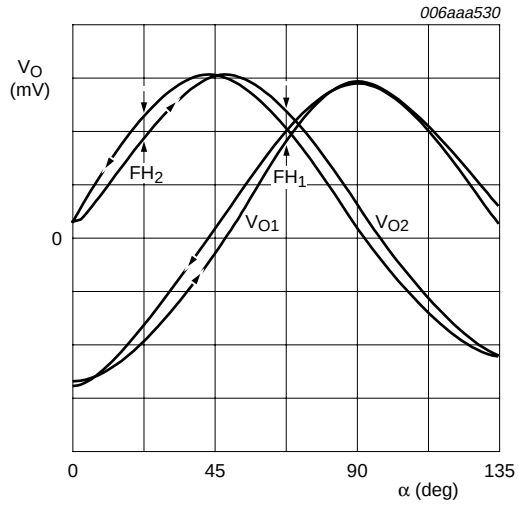
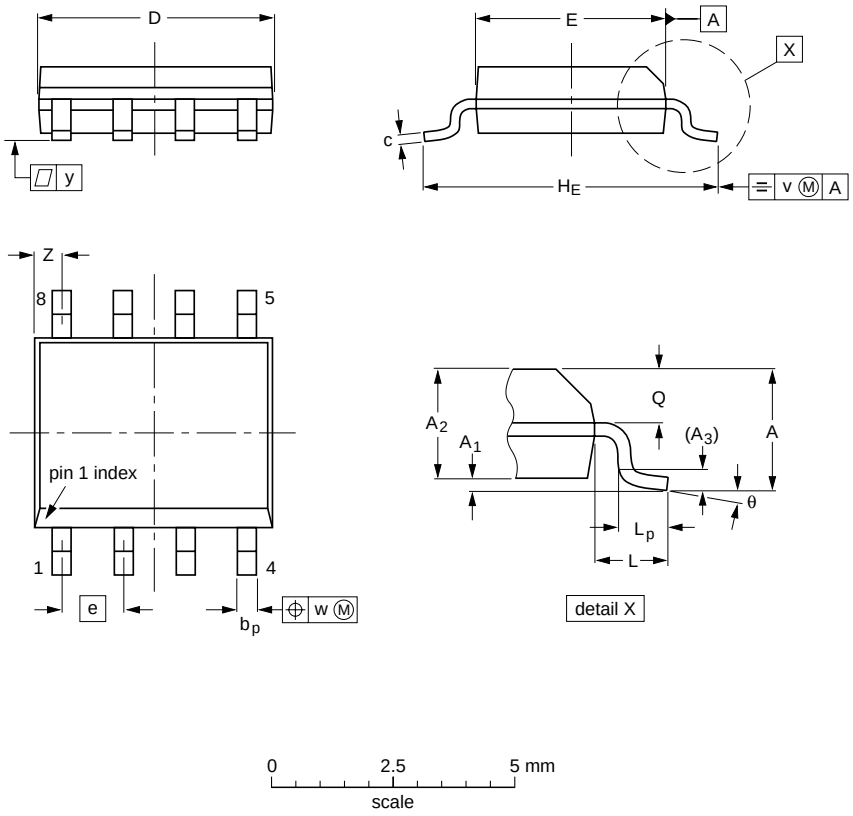


Fig 3. Definition of hysteresis

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8. 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	0.05	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 (0.006 inch) maximum per side are not included.
2. Plastic or metal protrusions of 0.25 mm (0.01 inch) maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT96-1	076E03	MS-012				~~99-12-27~~ 03-02-18

Fig 4. Package outline SOT96-1 (SO8/MS-012)

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9. Packing information

Table 7. Packing methods

The indicated -xxx are the last three digits of the 12NC ordering code.[1]

Type number	Package	Description	Packing quantity
			2500
KMZ41	SOT96-1	8 mm pitch, 12 mm tape and reel	-118

[1] 12NC ordering code: 9340 372 10118. For further information and the availability of packing methods, see Section 12.

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10. Revision history

Table 8. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
KMZ41_5	20061127	Product data sheet	-	KMZ41_4
Modifications:	• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors. • Legal texts have been adapted to the new company name where appropriate. • Section 1.1 “General description”: amended • Section 1.2 “Features”: added • Table 1 “Quick reference data”: V_{peak} peak voltage added • Table 1: R_{bridge} bridge resistance Table note 2 added • Table 2 “Pinning”: amended • Section 3 “Ordering information”: added • Figure 1 “Device and test circuit diagram”: amended • Table 4 “Limiting values”: H_{ext} external magnetic field strength added • Table 4: T_{bridge} bridge operating temperature redefined to T_{amb} ambient temperature • Table 6 “Characteristics”: $H_{rotation}$ redefined to H_{ext} external magnetic field strength • Figure 3 “Definition of hysteresis”: added • Section 9 “Packing information”: added			
KMZ41_4	20000418	Preliminary specification	-	KMZ41_3

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11.1 Data sheet status

Document status[1][2]	Product status[3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nxp.com.

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