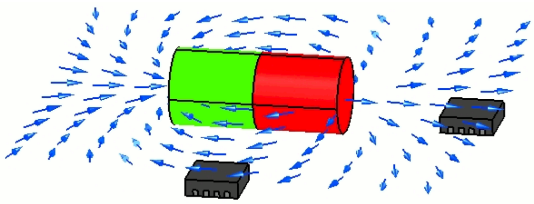
MS32 Switching Sensor



- **AMR Switching-Sensor**
- **TDFN Outline 2.5x2.5x0.8 mm^3**
- **Temperature Compensated Switching Point**
- **Low Power Consumption**

DESCRIPTION

The MS32 is a magnetic field sensor which is built in the form of a Wheatstone bridge. Each of its four resistors is made from *Permalloy,* a material that shows the *anisotropic magnetoresistance effect*. An unidirectional magnetic field in the surface parallel to the chip (x-y plane) along the y-axis will deliver a field dependent output signal. A **magnetic switching point**, which is almost **independent on temperature** is typically set to Hs=1.85 kA/m. In addition, the characteristic curve is linear over a wide magnetic field range. Thus, the new MS32 simplifies the adaption of the sensor to different mechanical and magnetical environments. The sensor die is packaged in a modern TDFN package.

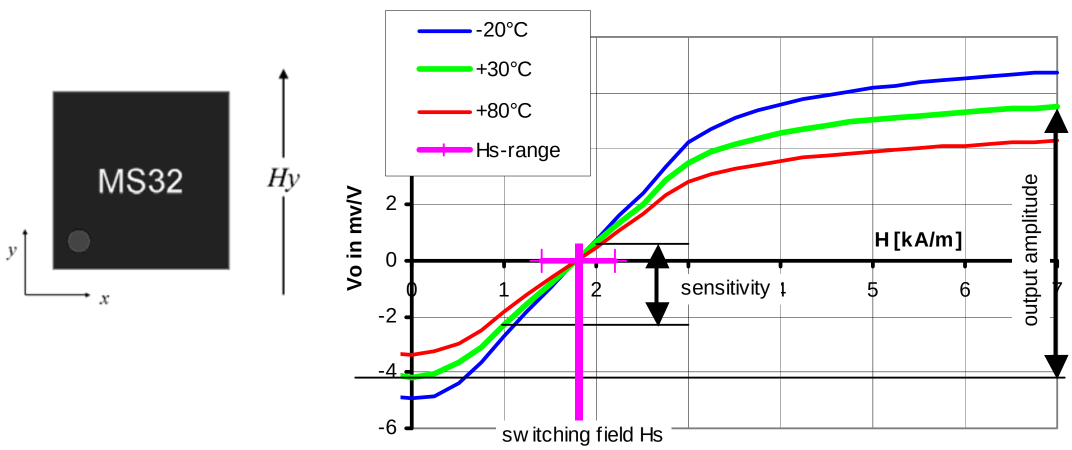


Figure 1: Characteristic curves for MS32 at different ambient temperatures (-20°C, +30°C, +80°C)

FEATURES

- Sensor Based on Solid State Magnetoresistance Effect
- Unipolar Signal Output
- Linear Field Response
- High Sensitivity, Low Hysteresis
- Temperature Compensated Switching Point
- Low Power Consumption Due to High Bridge Resistance
- Supply Voltage up to 30 V Allowed
- Small TDFN Package

APPLICATIONS

Contactless Position (Presence, Open/Close) Detection In :

- Industrial
- Consumer
- Automotive

Applications, like:

- Small Stroke Pneumatic Cylinders
- Cover Positions of Notebooks and Mobiles
- Doors, etc.

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CHARACTERISTIC VALUES

Parameter	Condition	Symbol	Min	Typ	Max	Unit
Mechanical dimensions						
Length		X		2.5		mm
Width		Y		2.5		mm
Height		Z		0.75		mm
Pad size				0.25 x 0.30		mm^2
Operating limits						
Max. supply voltage		$V_{CC, MAX}$			30	V
Operating temperature		T_{OP}	-25		+85	°C
Storage temperature		T_{ST}	-25		+125	°C

Parameter	Condition	Symbol	Min	Typ	Max	Unit
Sensor specification (V_{CC} = 5 V, T = 30 °C)						
Supply voltage		V_{CC}		5	30	kA/m
Resistance		R_B	10300	11500		Ω
Offset		V_{OFF}/V_{CC}		-4	-1.5	mV/V
Sensitivity	1)	S	2	3		(mV/V)/(kA/m)
Output amplitude	2)	V_{MAX}	8			deg
Hysteresis (@ V_0=0) 3)		Hyst.			0.9	deg
Sensor specification (T = -25 °C; +85°C; Conditions A & B) 6)						
TC of amplitude		TCSV	-0.36	-0.32	-0.28	%/K
TC of bridge resistance		TCBR	+0.27	+0.32	+0.37	%/K
Switching field 5)	4)	Hs	1.40	1.85	2.30	kA/m

All parameters are measured on wafer level.
1) average gradient in the range 1.0 - 2.0 kA/m
2) difference between output voltage/supply voltage measured at H = 7 kA/m and H = 0 kA/m
3) hysteresis [in kA/m] = hysteresis [in mV/V] /S
4) switching voltage = 0 mV/V
5) switching field = magnetic field at switching voltage
6) values at –25°C can be determined by linear extrapolation from +30°C- and +85°C-values.

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MEASUREMENT CONDITIONS

Parameter	Symbol	Unit	Condition
A. Set Up Conditions			
ambient temperature	T	°C	T = 23 +/- 5 °C (unless otherwise noted)
supply voltage	V_{CC}	V	V_{CC} = 5 V
applied magnetic field	H_Y	kA/m	H_Y = -7 .. +7 kA/m; along y-direction; $\|H_X\|$ < 100 A/m Pre-magnetization along x-direction with H_X >= 3 kA/m
B. Parameter Definitions (T= -25 °C, +85 °C) see characteristic values 6)			
ambient temperatures	T	°C	T_1 = -25 , T_0 = +30 , T_2 = +85 °C
TC of amplitude	TCSV	%/K	$TCV = \frac{1}{(T_2 - T_1)} \cdot \frac{V_a(T_2) - V_a(T_1)}{V_a(T_1)} \cdot 100\%$
TC of resistance	TCBR	%/K	$TCR = \frac{1}{(T_2 - T_1)} \cdot \frac{R(T_2) - R(T_1)}{R(T_1)} \cdot 100\%$
TC of offset	TCV_{OFF}	µV/(VK)	$TCVoff = \frac{Voff(T_2) - Voff(T_1)}{(T_2 - T_1)}$

BLOCK DIAGRAM

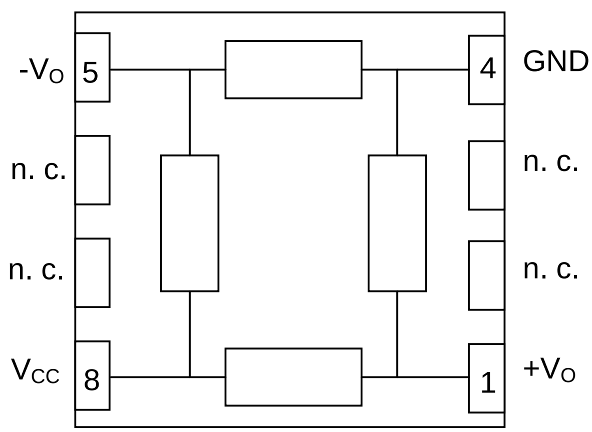

Figure 1: internal and external connections (TDFN, Chip)

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SENSOR OUTLINE

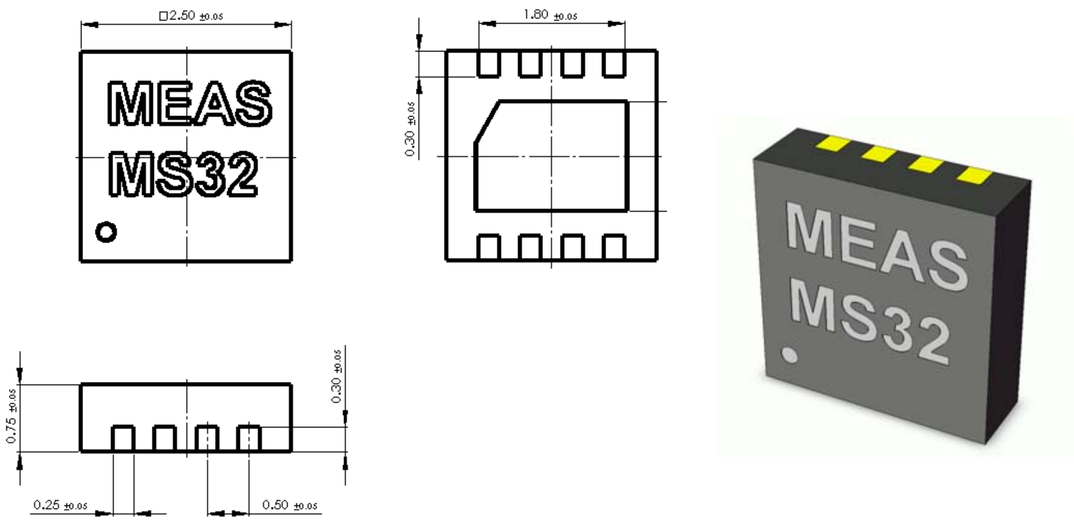


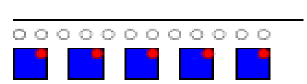
Figure 2: TDFN-outline

Pin assignment:

Pin	Symbol	Function
1	$+V_O$	positive output bridge
2	n. c.	not connected
3	n. c.	not connected
4	GND	ground
5	$-V_O$	negative output bridge
6	n. c.	not connected
7	n. c.	not connected
8	V_{CC}	supply voltage bridge

The bottom plate is designated to be a heat sink. It has no electrical connection to any pin.
The sensitive area is positioned in the center of the package.

TAPE AND REEL PACKAGING INFORMATION

Description	Size/Quantity	Note
Reel	7"	
Units/reel	3,000	MOQ
Pin 1 orientation on tape	Top-right of sprocket hole side	

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ORDERING INFORMATION

DEVICE	PACKAGE	PART NUMBER
Chip MS32 1)	wafer undiced	G-MRCH-022
MS32G 2)	TDFN 2.5 x 2.5	G-MRCH-017

1) MOQ is 1 wafer
2) MOQ is 1 reel

NORTH AMERICA

Measurement Specialties, Inc.
1000 Lucas Way
Hampton, VA 23666
Sales and Customer Service
Tel: +1-800-745-8008 or
+1-757-766-1500
Fax: +1-757-766-4297
enduser@meas-spec.com

EUROPE

MEAS Deutschland GmbH
HL Planartechnik
Hauert 13
44227 Dortmund
Sales and Customer Service
Tel: +49 (0)231 / 9740-0
Fax: +49 (0)231 / 9740-20
info.de@meas-spec.com

ASIA

Measurement Specialties
(China), Ltd.
F1.6-4D, Tian An
Development Compound
Shenzhen, China 518048
Sales and Customer
Service
Tel: +86 755 8330 1004
Fax: +86 755 8330 6797
sale.china@meas-spec.com