DUAL MAGNETIC FIELD SENSOR

DESCRIPTION

This device is a special tangential field difference sensor with two AMR (Anisotropic Magneto-Resistive) bridges for field movement measurements or field comparative measurements.

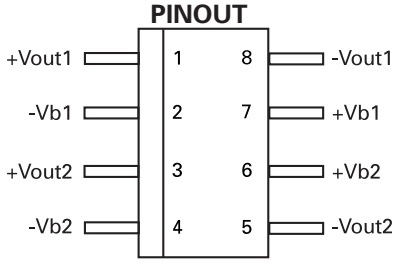
The ZMX40M contains two extremely sensitive magnetic sensor chips, mounted parallel to each other in an SM8 package, employing the magneto-resistive effect of thin film permalloy. It allows the measurement of magnetic fields or the detection of magnetic parts. The sensors each consist of a chip covered with thin film permalloy stripes which form a Wheatstone bridge, whose output voltage is proportional to the magnetic field component Hy. A field Hx, which is perpendicular to Hy, is necessary to suppress the hysteresis and to bias the sensors into the linear region. This field Hx is provided by an internal permanent magnet.

The chips are mounted in the package 3mm apart. If a magnet travels horizontally above the sensor, each chip will give an output which will peak as the magnet passes above it and the two peaks will be spatially separated by 3mm.

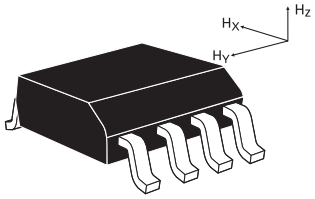
FEATURES

- Output voltage proportional to magnetic field Hy across each chip
- Both chips are in the same orientation and chip centres are 3mm apart in Y direction
- Magnetic fields vertical to the chip level Hz are not effective
- Disturbing fields Hx up to 30 kA/m are allowed
- Extremely small chip distance from the top side of package for accurate measurement
- Internal magnet each chip for creation of auxiliary field Hx

PINOUT



Top View



When the two peaks are the same amplitude, the magnet must be mid-way between the two chips. Therefore this double sensor can be used to measure position of, for example, a wheel tooth very accurately for automotive and machine-tool applications. With calibration to allow for the tolerances on the bridge outputs being slightly different, the ZMX40M has been used in machine tool applications to resolve distances down to 30µm. By comparing the two outputs and adding some hysteresis, a large-geometry magnetic tape reader (for example for a magnetic tape ruler) can be made. By combining both bridge outputs a current sensor can be also made by adding an external current loop over or under the ZMX40M. This loop is outside the package and therefore provides excellent galvanic isolation.

APPLICATIONS

- Linear position measurement for process control, door interlocks, proximity detectors and precision machine tools
- H-field movement measurement for a magnetic tape recognition
- High voltage isolated current measurement up to many amps range by using a suitable current loop over or under the IC
- Detection of rotating magnets in the presence of a disturbing field by comparisons of maximum values of individual sensors

DEVICE MARKING

- ZMX40M

CONNECTION DIAGRAM

AMR chip 1: supply voltage between +Vb1 and -Vb1 output voltage of bridge between $+V_{out}1$ and $-V_{out}1$

AMR chip 2: supply voltage between +Vb2 and -Vb2 output voltage of bridge between $+V_{out}2$ and $-V_{out}2$

ISSUE 1 - MARCH 2004

ZMX40M

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	LIMIT	UNIT
Supply voltage for each sensor chip (1,2)	V_B	12	V
Total power dissipation	P_{TOT}	240	mW
Operating temperature range	T_{amb}	-25 to +125	°C
Storage temperature range	T_{stg}	-25 to +125	°C

ELECTRICAL CHARACTERISTICS (at T_{amb}=25°C and H_X=3 kA/m unless otherwise stated)

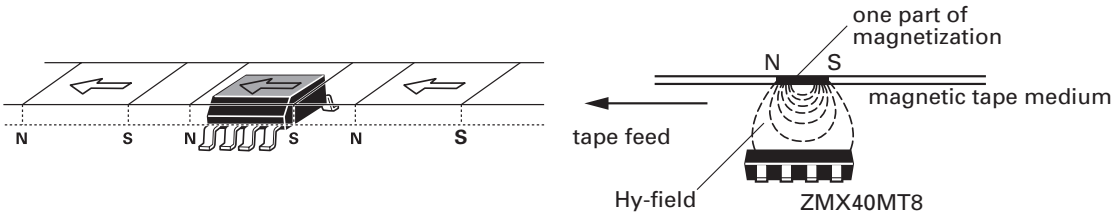
PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	TEST CONDITIONS
Bridge resistance	R_{br}	1.4	-	2.2	kΩ	
Output voltage range	V_O/V_B	12	-	24	mV/V	
Open circuit sensitivity	S	3.0	-	5.0	(mV/V)/ (kA/m)	V_B=const.
Hysteresis of output voltage	V_{OH}/V_B	-	-	50	µV/V	
Offset voltage	V_{off}/V_B	-1.5	-	+1.5	mV/V	
Operating frequency	f_{max}	0	-	1	MHz	
Temp. coeff. of offset voltage	TCV_{off}	-3	-	+3	(µV/V)/K	T_{amb}= -25 to +125°C
Temp. coeff. of bridge resistance	TCR_{br}	+0.25	+0.3	+0.35	%/K	T_{amb}= -25 to +125°C
Temp. coeff. of open circuit sensitivity V_B=5V	TCS_V	-0.25	-0.3	-0.35	%/K	T_{amb}= -25 to +125°C
Temp. coeff. of open circuit sensitivity I_B=3mA	TCS_I	-	-0.1	-	%/K	T_{amb}= -25 to +125°C

ORDERING INFORMATION

DEVICE	REEL SIZE	TAPE WIDTH	QUANTITY PER REEL
ZMX40MT8TA	7″	12mm	1000 units
ZMX40MT8TC	13″	12mm	4000 units

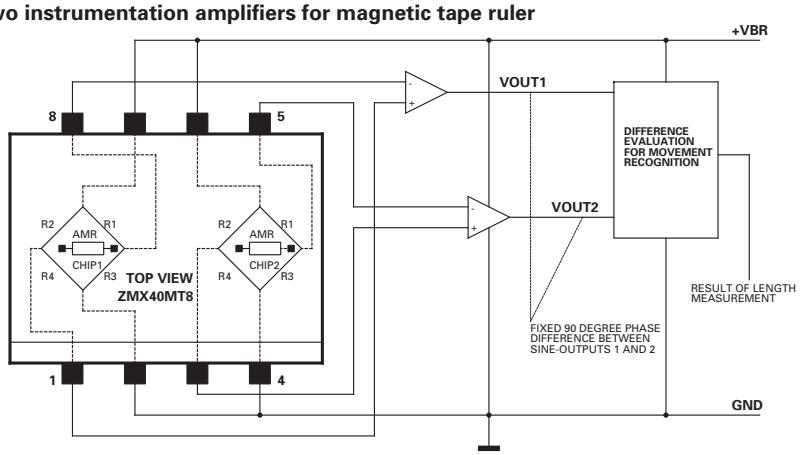
TYPICAL APPLICATIONS

Magnetic tape scanning (field movement measurement for magnetic tape ruler):

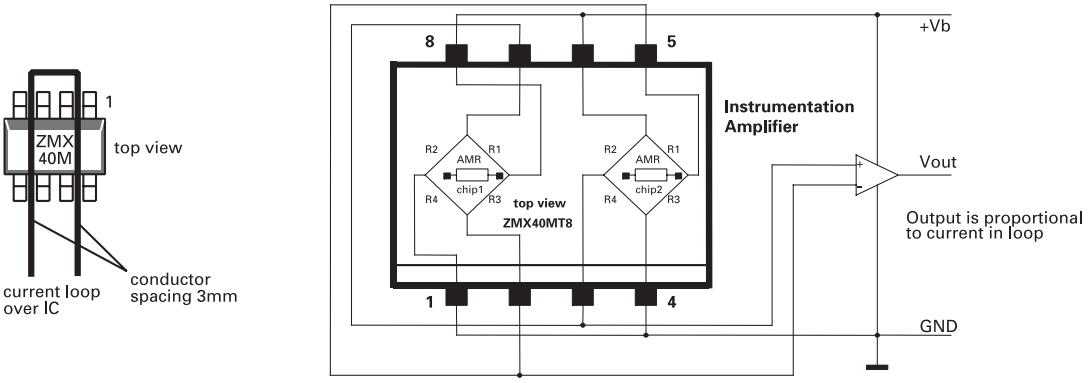


The changing voltage peaks in both AMR bridges are used for the tape movement measurement.

ZMX40M plus two instrumentation amplifiers for magnetic tape ruler



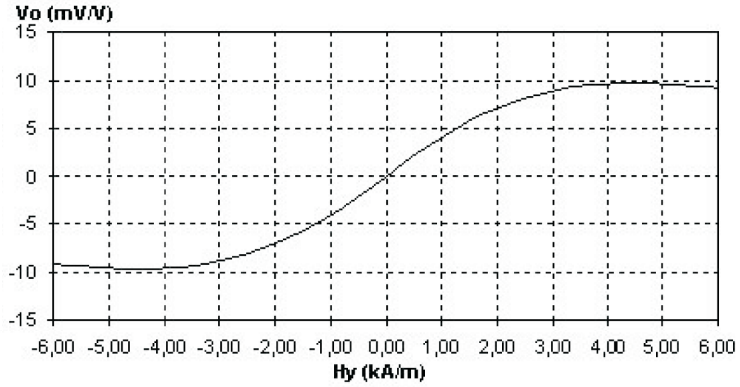
Current sensor (by combining both bridge outputs and a high isolation voltage)



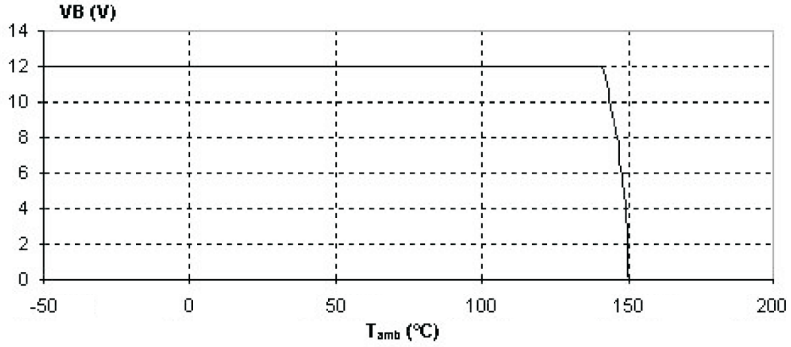
This double chip solution with the current loop conductor guarantees good rejection of external fields and a high isolation voltage.

ISSUE 1 - MARCH 2004

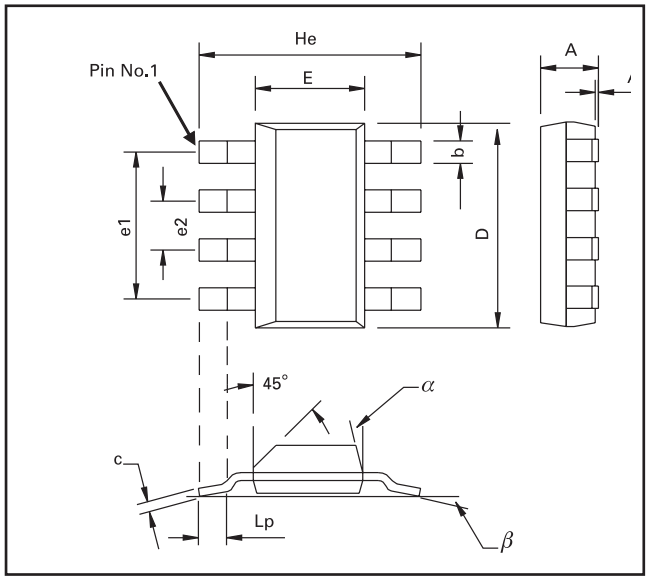
Sensor output characteristic
ZMX40M
Vo = f(Hy) typ.



Supply voltage (maximum) derating curve
ZMX40M
$V_{bmax} = f(T_{amb})$



PACKAGE OUTLINE



PACKAGE DIMENSIONS

DIM	Millimeters			Inches			DIM	Millimeters			Inches		
	Min	Max	Typ.	Min	Max	Typ.		Min	Max	Typ.	Min	Max	Typ.
A	-	1.7	-	-	0.067	-	e1	-	-	4.59	-	-	0.1807
A1	0.02	0.1	-	0.008	0.004	-	e2	-	-	1.53	-	-	0.0602
b	-	-	0.7	-	-	0.0275	He	6.7	7.3	-	0.264	0.287	-
c	0.24	0.32	-	0.009	0.013	-	Lp	0.9	-	-	0.035	-	-
D	6.3	6.7	-	0.248	0.264	-	α	-	15°	-	-	15°	-

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ISSUE 1 - MARCH 2004

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