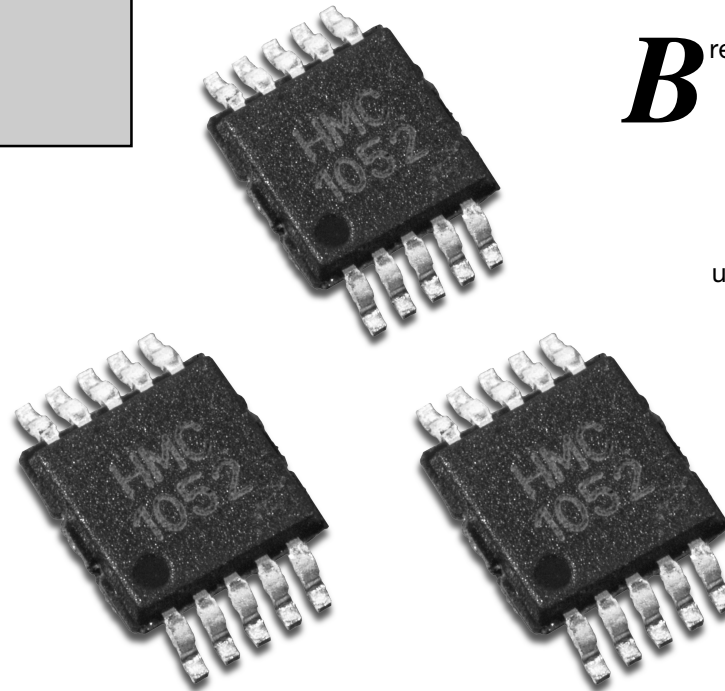


# Two-Axis Magnetic Sensors

## HMC1052

**B**reakthrough design contains a compact, high performance two-axis magnetoresistive sensors on a single chip. Advantages of this patented design include perfectly orthogonal two-axis sensing, ultra small size and low power in a 10-pin miniature surface mount package.



### APPLICATIONS

- Compassing
- Navigation Systems
- Attitude Reference
- Traffic Detection
- Medical Devices
- Position Sensing

## FEATURES AND BENEFITS

<b>Low Power</b>	Supply voltage could be as low as 1.8V.
<b>Small Package</b>	Available in a 10-pin miniature surface mount package (MSOP) with total mounting envelope of 3mm x 3mm x 1mm.
<b>High Performance</b>	Sensitivity of 1mV/V/Oe with a wide field range up to +/- 6 Oe.
<b>High Accuracy</b>	Nearly perfect orthogonal two-axis sensing (Error < 0.01°) and matched sensitivity on both axis eliminates errors in compassing applications.
<b>On-Chip Coils</b>	Patented on-chip set/reset straps reduces the effects of temperature drift, non-linearity errors and loss of signal output due to the presence of high magnetic fields.

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## HMC1052

## SENSOR PRODUCTS

### BASIC DEVICE OPERATION

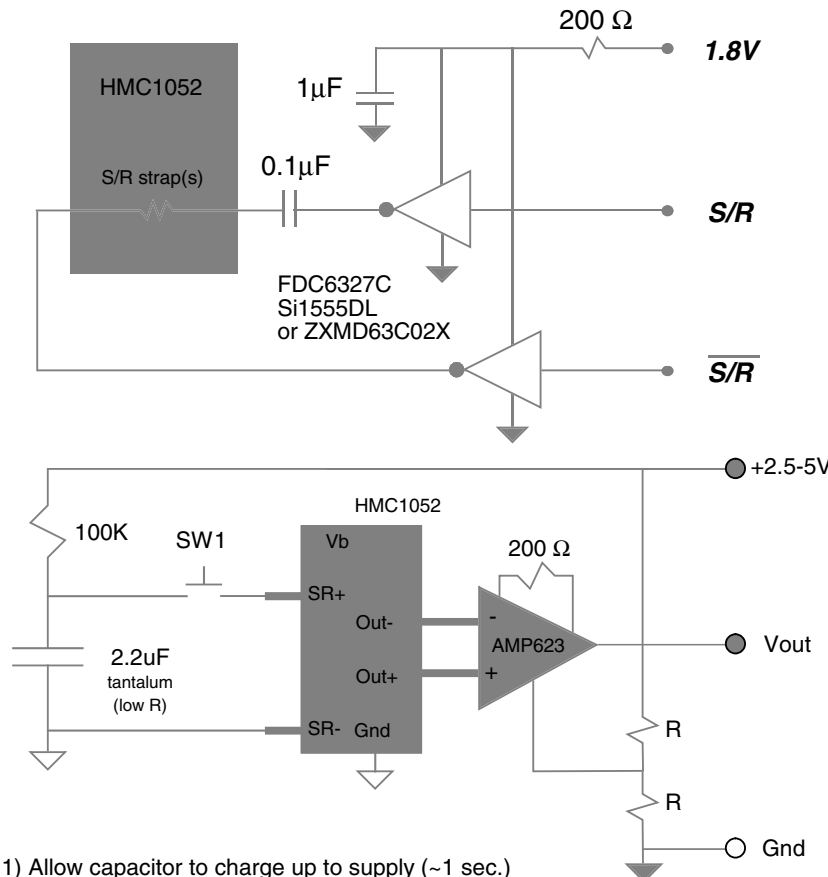
HMC1052 is a two-axis linear magnetic field sensor. Like the other Honeywell HMC10xx devices, each sensor is a resistive Wheatstone bridge formed by a magneto-resistive metal film. When a power supply is connected to the bridge, the sensor converts any ambient or applied magnetic field in the sensitive direction to a voltage output. This device contains two magnetic field sensors with sensitive directions perpendicular to each other; Sensor A and Sensor B coexist on a single silicon chip with nearly perfect orthogonality and matching characteristics. This patented design offers several advantages including small chip size, low operating voltage and eliminates orthogonality errors caused by two chips.

In addition to the Wheatstone bridges, HMC1052 has two on-chip magnetically coupled straps – the OFFSET strap and the SET/RESET strap. Sensor A and Sensor B share

the same OFFSET strap and the SET/RESET strap. These two straps provide localized magnetic fields to sensitive and insensitive directions for Sensor A and Sensor B, respectively. The SET/RESET strap can be used to ensure high accuracy and to flip the polarity of the output response. The OFFSET strap can be used to calibrate the sensor or to offset any undesired stray field. For more information on OFFSET and SET/RESET straps, please refer to Honeywell data sheet “1- and 2-Axis Magnetic Sensors”.

In the standard MSOP 10-pin package, these two sensors can be powered independently for low power consumption. However, there is no access to OFFSET strap in this package. For applications that requires the OFFSET strap, an alternative package can be assessed and implemented.

### LOW VOLTAGE SET/RESET CIRCUIT.



- 1) Allow capacitor to charge up to supply (~1 sec.)
- 2) Momentarily close switch SW1. This creates a >0.5A SET pulse.
- 3) Wait 1msec for settling, then measure output (Out+ - Out-)

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## HMC1052 PRELIMINARY SPECIFICATIONS

Characteristic	Conditions*	Min	Typ	Max	Unit
Bridge Supply	Vbridge referenced to GND	1.8	2.5	20	Volts
Bridge Resistance	Bridge current = 1mA		1000		$\Omega$
Operating Temperature	Ambient	-40		125	$^{\circ}\text{C}$
Storage Temperature	Ambient, unbiased	-55		150	$^{\circ}\text{C}$
Field Range	Full scale (FS) — total applied field	-6		+6	gauss
Linearity Error	Best fit straight line $\pm 1$ gauss $\pm 3$ gauss $\pm 6$ gauss		0.05 0.4 1.6		%FS
Hysteresis Error	3 sweeps across $\pm 3$ gauss		0.1		%FS
Repeatability Error	3 sweeps across $\pm 3$ gauss		0.1		%FS
Bridge Offset	Offset = (OUT+) - (OUT-) Field=0 gauss after Set pulse		$\pm 1$		mV/V
Sensitivity	Set/Rest Current = 0.5A		1.0		mV/V/gauss
Bandwidth	Magnetic signal (lower limit = DC)		5		MHz
OFFSET Strap $\Omega$	Measured from OFFSET+ to OFFSET-		15		$\Omega$
OFFSET Strap $\Omega$ Tempco	$T_A = -40$ to $125^{\circ}\text{C}$		3900		ppm/ $^{\circ}\text{C}$
OFFSET Strap Constant	DC Current Field applied in sensitive direction		10		mA/gauss
Set/Reset Strap $\Omega$	Measured from S/R+ to S/R-		4		$\Omega$
Set/Reset Current	0.1% duty cycle, or less, 2 $\mu\text{S}$ Current Pulse		0.5		Amp
Set/Reset Strap $\Omega$ Tempco	$T_A = -40$ to $125^{\circ}\text{C}$		3700		ppm/ $^{\circ}\text{C}$
Disturbing Field	Sensitivity starts to degrade. Use S/R pulse to restore sensitivity.	20			gauss
Sensitivity Tempco	$T_A = -40$ to $125^{\circ}\text{C}$		-3000		ppm/ $^{\circ}\text{C}$
Bridge Offset Tempco	$T_A = -40$ to $125^{\circ}\text{C}$		$\pm 500$		ppm/ $^{\circ}\text{C}$
Bridge $\Omega$ Tempco	Vbridge=5V, $T_A = -40$ to $125^{\circ}\text{C}$		2500		ppm/ $^{\circ}\text{C}$
Sensitivity Ratio of X,Y Sensors	$T_A = -40$ to $125^{\circ}\text{C}$	99	101	103	%
X,Y sensor Orthogonality	Sensitive direction in X and Y sensors			0.01	degree
Max. Exposed Field	No perming effect on zero reading			10000	gauss

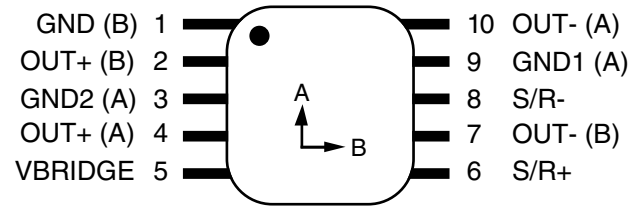
\* Tested at  $25^{\circ}\text{C}$  except stated otherwise

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## HMC1052

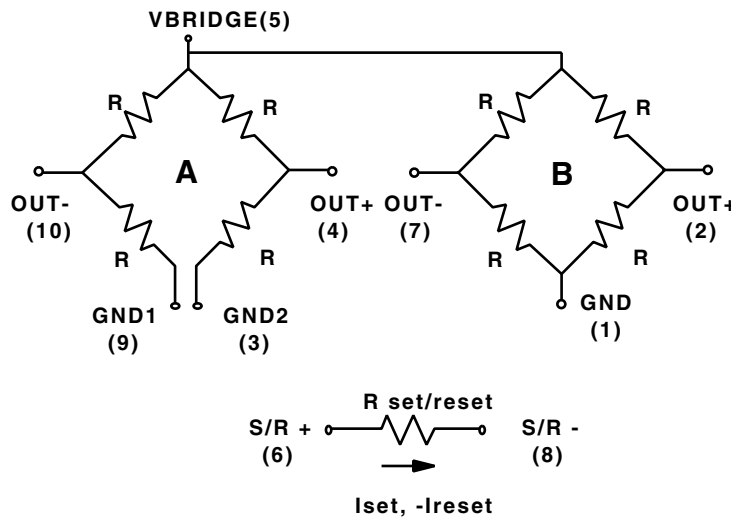
## SENSOR PRODUCTS

### PINOUT DRAWINGS

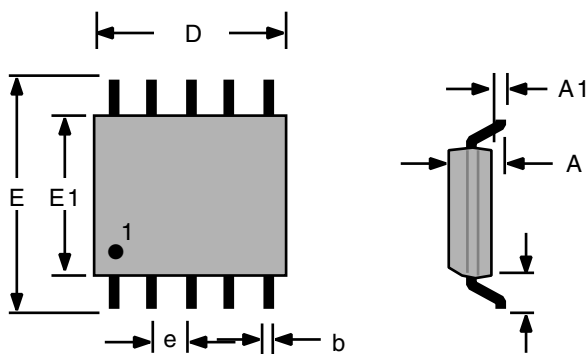


Arrow indicates direction of applied field that generates a positive output voltage after an Iset.

### MR SENSOR CIRCUIT



### PACKAGE DRAWING 10-PIN MSOP



Symbol	Millimeters		Inches x 10E-3	
	Min	Max	Min	Max
A	-	1.10		43
A1	0.05	0.15	2.0	5.9
b	0.15	0.30	5.9	11.8
D	2.90	3.10	114	122
E1	2.90	3.10	114	122
e	0.50 BSC		2.0 BSC	
E	4.75	5.05	187	199
L1	0.95 BSC		37.4	

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