

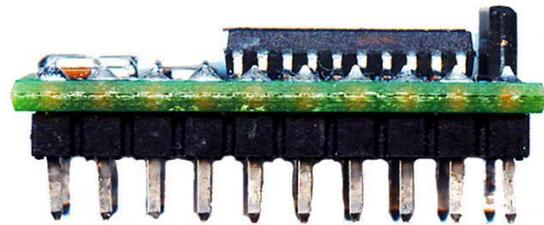
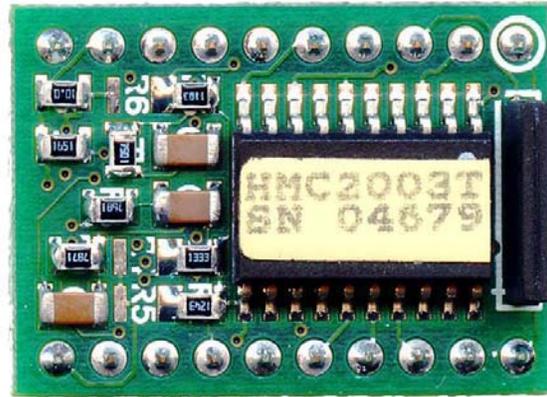
# THREE-AXIS MAGNETIC SENSOR HYBRID

## Features

- DIP-20 Footprint (1" by 0.75")
- 3-axis Capability
- Solid-State Design
- 40 micro-gauss to  $\pm 2$  gauss Dynamic Range
- Analog Output at 1 Volt per gauss
- $-40^{\circ}$  to  $85^{\circ}\text{C}$  Operating Temperature Range
- Onboard +2.5 Volt Reference
- 6 to 15 volt DC Single Supply Operation
- Low Magnetic Material Content

## General Description

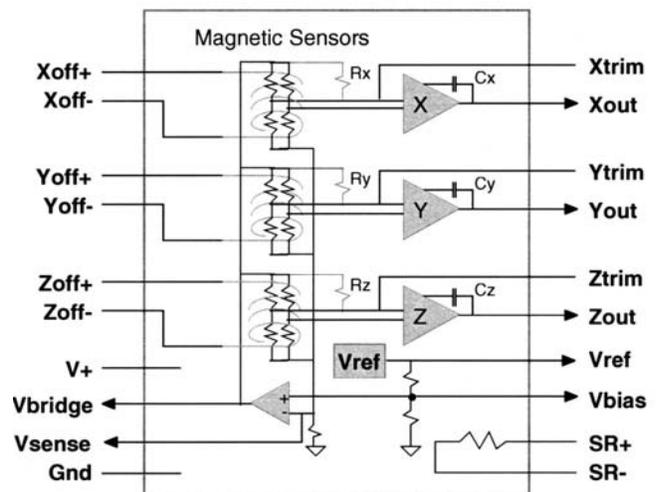
The Honeywell HMC2003 is a three-axis magnetic sensor hybrid assembly used to measure low magnetic field strengths. Honeywell's most sensitive magnetoresistive sensors (HMC1001, HMC1002) are utilized to provide the reliability and accuracy of this magnetometer design. The HMC2003 interface is all analog with critical nodes brought out to the pin interface for maximum user flexibility. The internal excitation current source reduces temperature errors and regulates the sensor bridge voltages. Three precision low-noise instrumentation amplifiers with 1kHz low pass filters provide repeatable measurements while rejecting unwanted noise.



## APPLICATIONS

- Precision Compassing
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BLOCK DIAGRAM



**SPECIFICATIONS**

Characteristics	Conditions <sup>(1)</sup>	Min	Typ	Max	Units <sup>(2)</sup>
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**Magnetic Field**

Sensitivity		0.98	1	1.02	V/gauss
Null Field Output		2.3	2.5	2.7	V
Resolution			40		μgauss
Field Range	Maximum Magnetic Flux Density	-2		2	gauss
Output Voltage	Each Magnetometer Axis Output	0.5		4.5	
Bandwidth			1		kHz

**Errors**

Linearity Error	±1 gauss Applied Field Sweep		0.5	2	%FS
	±2 gauss Applied Field Sweep		1	2	
Hysteresis Error	3 Sweeps across ±2 gauss		0.05	0.1	%FS
Repeatability Error	3 Sweeps across ±2 gauss		0.05	0.1	%FS
Power Supply Effect	PS Varied from 6 to 15V With ±1 gauss Applied Field Sweep			0.1	%FS

**Offset Strap**

Resistance				10.5	ohms
Sensitivity		46.5	47.5	48.5	mA/gauss
Current				200	mA

**Set/Reset Strap**

Resistance			4.5	6	ohms
Current	2msec pulse, 1% duty cycle	3.0	3.2	5	amps

**Tempcos**

Field Sensitivity			-600		ppm/°C
Null Field	Set/Reset Not Used		±400		ppm/°C
	Set/Reset Used		±100		

**Environments**

Temperature	Operating	-40	-	+85	°C
	Storage	-55	-	+125	°C
Shock			100		g
Vibration			2.2		g rms

**Electrical**

Supply Voltage <sup>(3)</sup>		6		15	VDC
Supply Current				20	mA

(1) Unless otherwise stated, test conditions are as follows: Power Supply = 12VDC, Ambient Temp = 25°C, Set/Reset switching is active

(2) Units: 1 gauss = 1 Oersted (in air) = 79.58 A/m = 10E5 gamma

(3) Transient protection circuitry should be added across V+ and Gnd if an unregulated power supply is used.

## General Description

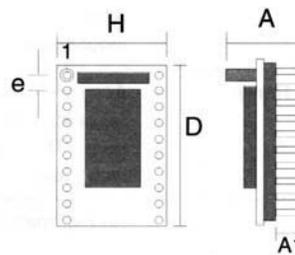
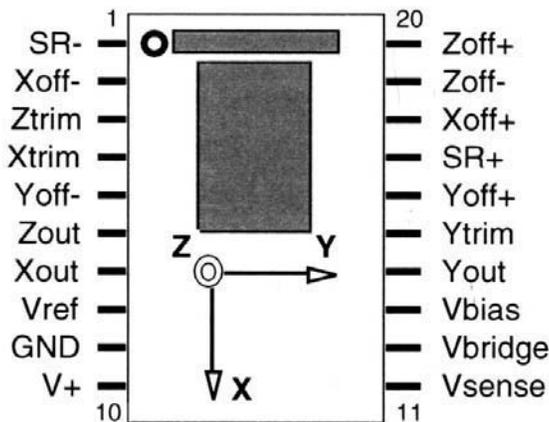
Honeywell's three axis magnetic sensor hybrid uses three permalloy magnetoresistive sensors and custom interface electronics to measure the strength and direction of a magnetic field. These sensors are sensitive to magnetic fields along the length, width, and height (x, y, z axis) of the 20-pin dual-in-line hybrid. Fields can be detected less than 40 microgauss and up to  $\pm 2$  gauss. Analog outputs are available for each x, y, z, axis from the hybrid. With the sensitivity and linearity of this hybrid, changes can be detected in the earth's magnetic field to provide compass headings or attitude sensing. The high bandwidth of this hybrid allows for anomaly detection of vehicles, planes, and other ferrous objects at high speeds.

The hybrid is packaged on a small printed circuit board (1 in. x 0.75 in.) and has an on-chip voltage reference that operates from a single 6 to 15V supply. The hybrid is ideal for applications that require two- or three-axis magnetic sensing and have tight size constraints and/or have their own electronics and only need a magnetic transducer front-end. Note that the hybrid's resistor values will vary, or an absence of some resistor components, is likely due to individual factory calibration.

Integrated with the sensor bridge circuits, are magnetically coupled straps that replace the need for external coils and provide various modes of operation. The Honeywell patented field offset straps (Xoff+ and Xoff-, etc.) can be used electrically to apply a magnetic field to the bridge to buck, or offset an applied field. This technique can be used to cancel unwanted ambient magnetic fields or in a closed loop field nulling measurement circuit. The offset straps nominally provide a 1 gauss field along the sensitive axis per 48mA of offset current through it.

Magnetic sensors can be affected by high momentary magnetic fields that may lead to output signal degradation. In order to eliminate this effect, and maximize the signal output, a magnetic switching technique can be applied to the bridge using set/reset pins (SR+ and SR-) that eliminates the effect of past magnetic history. Refer to the application notes that provide information on set/reset circuits and operation.

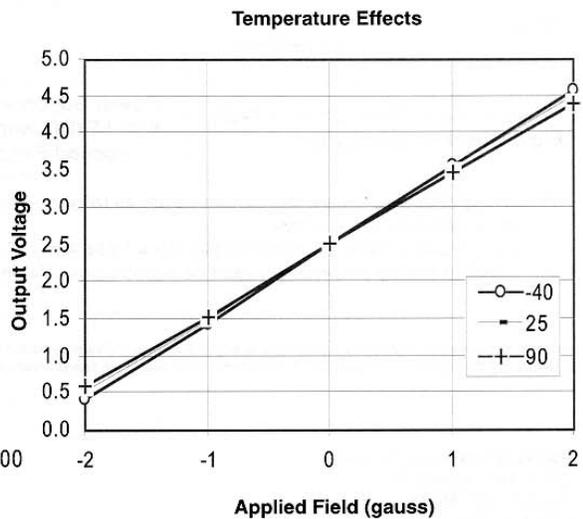
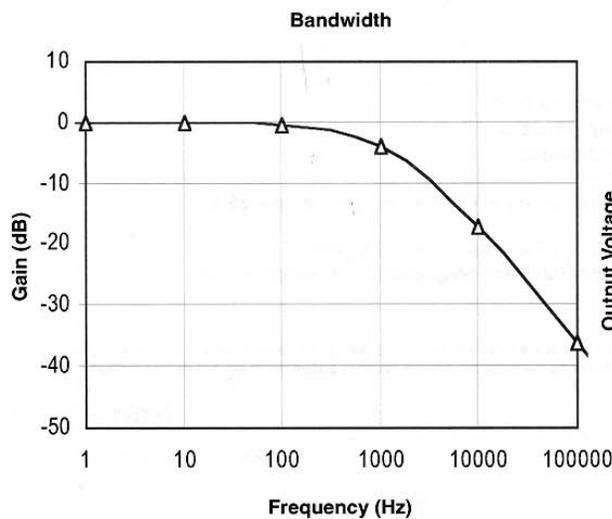
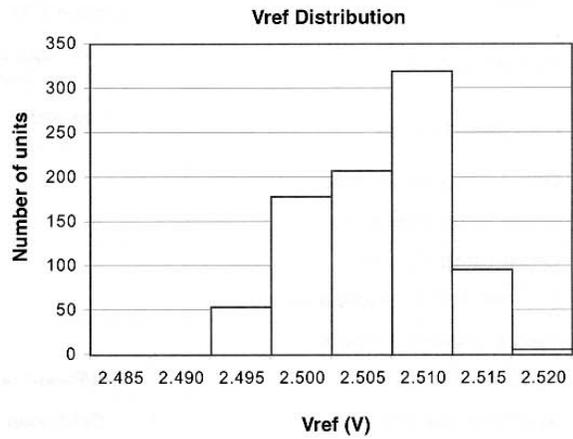
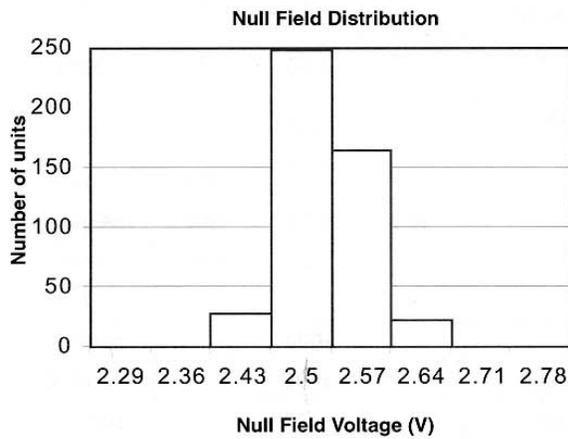
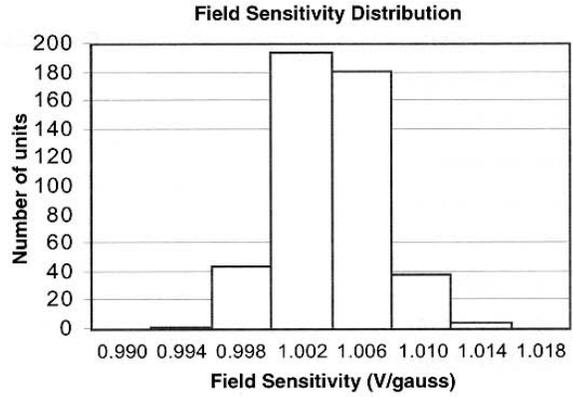
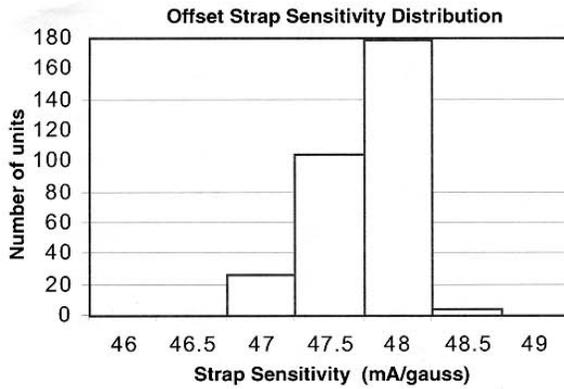
## Pinout Diagram and Package Drawing



Symbol	Millimeters		Inches	
	Min	Max	Min	Max
A	11.43	12.45	0.45	0.49
A1	4.06	5.08	0.16	0.20
D	25.91	26.92	1.02	1.06
e	2.41	2.67	0.095	0.105
H	18.03	19.05	0.71	0.75

## Ordering Information

Ordering Number	Product
HMC2003	Three-Axis Magnetic Sensor Hybrid



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