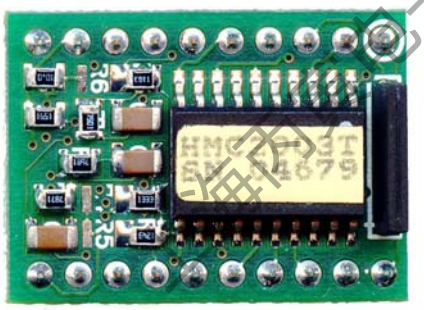
3-Axis Magnetic Sensor Hybrid HMC2003

The Honeywell HMC2003 is a high sensitivity, three-axis magnetic sensor hybrid assembly used to measure low magnetic field strengths. Honeywell's most sensitive magneto-resistive sensors (HMC1001 and HMC1002) are utilized to provide the reliability and precision of this magnetometer design.



The HMC2003 interface is all analog with critical nodes brought out to the pin interfaces for maximum user flexibility. The internal excitation current source and selected gain and offset resistors, reduces temperature errors plus gain and offset drift. Three precision low-noise instrumentation amplifiers with 1kHz low pass filters provide accurate measurements while rejecting unwanted noise. A RS-232 development kit version is available that includes a windows compatible demo program, interface cable, AC adapter, and carrying case.

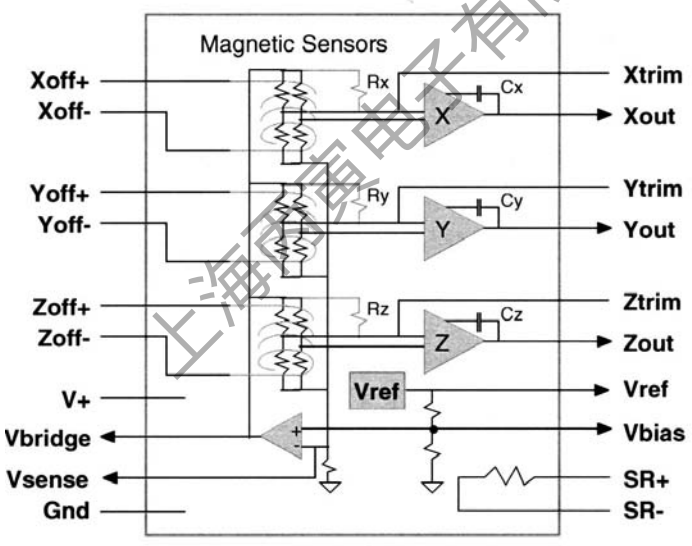
Applications include: Precision Compassing, Navigation Systems, Attitude Reference, Traffic Detection, Proximity Detection and Medical Devices

Honeywell continues to maintain product excellence and performance by introducing innovative solid-state magnetic sensor solutions. These are highly reliable, top performance products that are delivered when promised. Honeywell's magnetic sensor solutions provide real solutions you can count on.

FEATURES

- 20-pin Wide DIP Footprint (1" by 0.75")
- Precision 3-axis Capability
- Factory Calibrated Analog Outputs
- 40 micro-gauss to ±2 gauss Dynamic Range
- Analog Output at 1 Volt/gauss (2.5V @ 0 gauss)
- Onboard +2.5 Volt Reference
- +6 to +15 Volt DC Single Supply Operation
- Very Low Magnetic Material Content
- -40° to 85°C Operating Temperature Range

BLOCK DIAGRAM



SPECIFICATIONS

Characteristics	Conditions	Min	Typ	Max	Units
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 ±2 gauss Applied Field Sweep		0.5 1	2 2	%FS
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 Set/Reset Used		±400 ±100		ppm/°C
Environments					
Temperature	Operating Storage	-40 -55	- -	+85 +125	°C °C
Shock			100		g
Vibration			2.2		g rms
Electrical					
Supply Voltage(3)		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

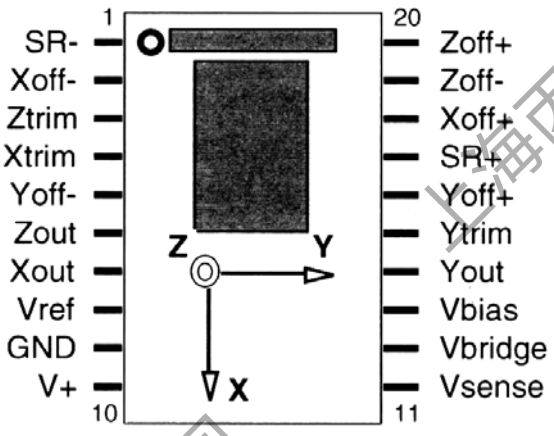
Honeywell's three axis magnetic sensor hybrid uses three permalloy magneto-resistive sensors and custom interface electronics to measure the strength and direction of an incident magnetic field. These sensors are sensitive to magnetic fields along the length, width, and height (X, Y, Z axis) of the 20-pin dual-in-line hybrid. Fields can be detected less than 40 microgauss and up to ±2 gauss. Analog outputs are available for each X, Y and 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.

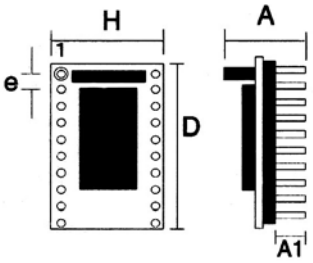
The hybrid is packaged on a small printed circuit board (1" by 0.75") and has an on-chip +2.5 voltage reference that operates from a single 6 to 15V supply. The hybrid is ideal for applications that require two- or three-axis magnetic sensing and have size constraints and need a magnetic transducer (magnetometer) front-end. Note that the hybrid's resistor values will vary, or an abscense of some resistor components, is likely due to individual factory calibration.

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

The HMC2003's 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

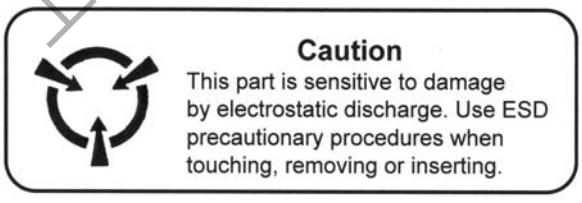




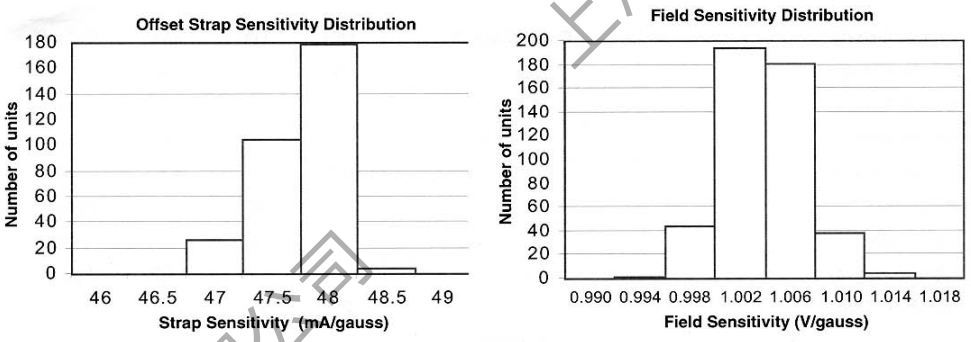
Symbol	Millimeters		Inches	
	Min	Max	Min	Max
A	10.92	11.94	0.43	0.47
A1	2.92	3.42	0.115	0.135
D	25.91	27.30	1.02	1.075
e	2.41	2.67	0.095	0.105
H	18.03	19.69	0.71	0.775

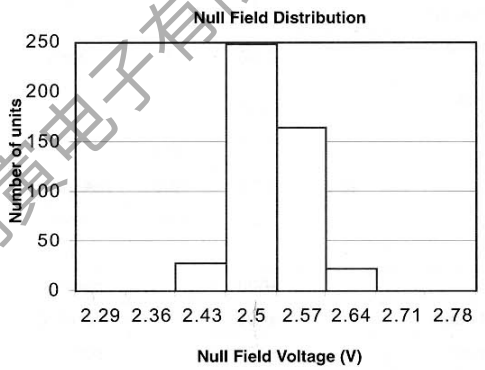
ORDER INFORMATION

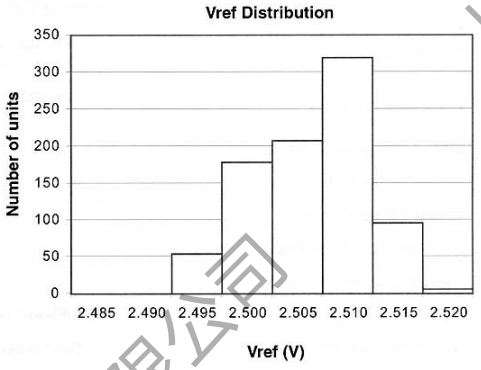
Ordering Number	Product
HMC2003	Three-Axis Magnetic Sensor Hybrid

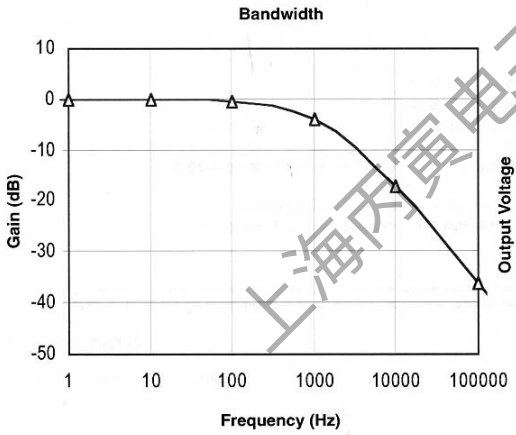


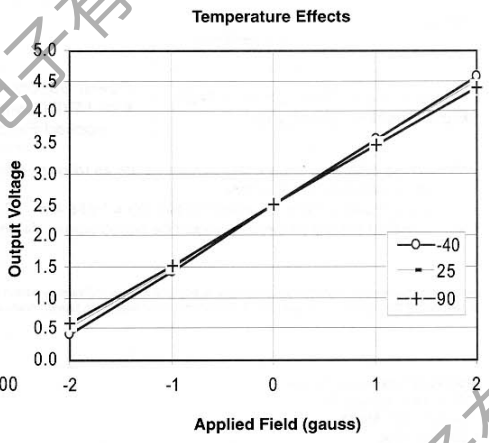
CAUTION: ESDS CAT. 1B











FIND OUT MORE

For more information on Honeywell's Magnetic Sensors visit us online at www.magneticsensors.com or contact us at 800-323-8295 (763-954-2474 internationally).

The application circuits herein constitute typical usage and interface of Honeywell product. Honeywell does not warranty or assume liability of customer-designed circuits derived from this description or depiction.

Honeywell reserves the right to make changes to improve reliability, function or design. Honeywell does not assume any liability arising out of the application or use of any product or circuit described herein; neither does it convey any license under its patent rights nor the rights of others.

U.S. Patents 4,441,072, 4,533,872, 4,569,742, 4,681,812, 4,847,584 and 6,529,114 apply to the technology described

Honeywell
12001 Highway 55
Plymouth, MN 55441
Tel: 800-323-8295
www.honeywell.com/magneticsensors

Form #900151 Rev F
September 2006
©2006 Honeywell International Inc.