

**COMPASSING, MAGNETOMETRY AND DEAD  
RECKONING SOLUTIONS**

**Sensing Earth's magnetic field**

## Honeywell delivers real sensor solutions you can count on

Honeywell's Magnetic Sensors are among the most sensitive and reliable low-field sensors in the industry. Our magnetic sensors are designed to accurately detect the direction and magnitude of external magnetic fields for compassing and magnetometry applications. From discrete sensors for low-cost, high volume applications, to high performance solid-state compasses and magnetometers, Honeywell magnetic sensor products operate on nearly any platform.

Honeywell combines the time-tested reliability of these products with new and innovative solid-state magnetic sensor solutions. Our integrated circuits and sensors are ruggedly designed to function optimally in a wide variety of environments and products.

Honeywell products are developed and manufactured following Six Sigma principles, which means we do more than just supply products for your needs—we understand customer needs and aim to exceed expectations. Plus, all our products are backed by Honeywell, a global leader in sensor manufacturing, technology and quality.





## Honeywell magnetic sensors utilize world class technology

Attributes of Honeywell's magnetic sensors designed with Anisotropic Magnetoresistive (AMR) technology provides significant advantages over traditional sensors. They are extremely sensitive, low field, solid state magnetic sensors designed to measure direction and magnitude of Earth's magnetic fields, from 27 micro-gauss to 6 gauss (0.6 milli-Tesla).

Our magnetoresistive sensors are sensitive enough to determine the change in magnetic fields due to the presence of nearby ferromagnetic objects. With a bandwidth up to 5MHz, our sensors detect vehicles and other ferrous objects, even at high speeds.

Honeywell recently added a new line of dead reckoning products to its Magnetic Sensors family. These new products provide accurate navigation in challenging environments and offer solutions where GPS is not available. The advanced dead reckoning technology further strengthens our position as a leader in personal navigation electronics technology for GPS applications.

Honeywell's magnetic sensor-based products are excellent solutions in many applications other than simple magnetic field compassing, such as platform leveling or proximity detection.

Applications include:

- Compassing
  - Automotive, GPS and dead reckoning, mobile phones, PDAs, & watches, irrigation systems

- Attitude reference
  - Aircraft systems, UAVs, magnetic field detection
- Dead reckoning
  - Backup for GPS receivers
- Position sensing
  - Valve controls, measuring equipment, displacement sensing
- Vehicle detection
  - Parking meters, RR signaling devices, electronic traffic signals
- Security
  - Metal detectors, magnetic anomaly detectors
- Others
  - Medical, current sensors, non-contact switches



Honeywell's magnetoresistive sensors are able to sense Earth's magnetic field (~0.6 gauss) and provide the sensitivity for enhanced accuracy and performance. Honeywell offers 1-, 2- and 3- axis magnetic sensors for low field linear applications and small size.

## Features and benefits of HMC components

**Sensitivity:** If the sensitivity is defined as 1.0 mV/V/gauss, in the presence of a 1 gauss magnetic field with 3 volts applied to the sensor, the output of the sensor will be 3 mV. If in the presence of only 0.5 gauss magnetic field, the output of the sensor would be 1.5 mV.

**Solid state:** These small devices reduce board assembly costs; improve reliability and ruggedness compared to wire bound fluxgates.

**Cost effective:** Specifically designed to be an affordable solution for high volume OEM applications.

**On-chip coils:** Patented on-chip set/reset straps reduce effects of temperature drift, non-linearity errors and loss of signal output due to the presence of high magnetic fields. Patented on-chip offset straps may be used to eliminate the effects of hard iron distortion, and to implement a closed loop magnetometer circuit for high performance applications.

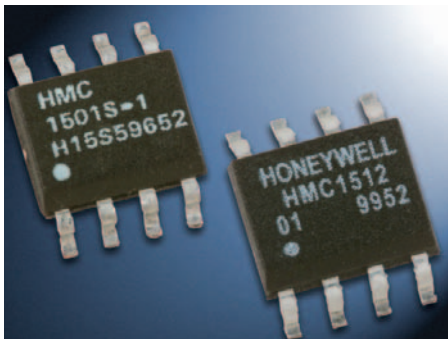
### Honeywell's Magnetoresistive Components Application Matrix

#### DESIGN CRITERIA FOR HMC COMPONENTS

Application	Size (Small/Smaller/Smallest)	Price (Low/Lower/Lowest)	Performance (Good / Better / Best)
General Compassing	HMC1022/1042, 1052	HMC1022/1042/1052	HMC1052/1022,1042/1002
Compassing- Automotive			HMC1052/1042/1022
Compassing- Hand Held, GPS			HMC1052/1022/1042
Attitude Reference	HMC1002/1022/1042	HMC1002/1022/1042	HMC1042/1022/1002
Metal Detectors	HMC1021S/1041Z/1042, 1052	HMC1021S, 1041Z/1042/1052	HMC1021S, 1041Z, 1052/1042
Vehicle/Traffic Detection	HMC1021S/1041Z/1052	HMC1041Z/1021S/1052	HMC1052 /1041Z, 1021S/1001
Current Sensing	HMC1021S/1042/1052		
Vertical (Z- axis) Sensing	HMC1001, 1021Z, 1051Z/ 1041Z	HMC1001/1051ZL, 1051Z/ 1021Z, 1041Z	HMC1051Z, 1051ZL/1021Z, 1041Z/1001
Position Sensing	HMC1501, 1512	HMC1512/1501	HMC1501,1512

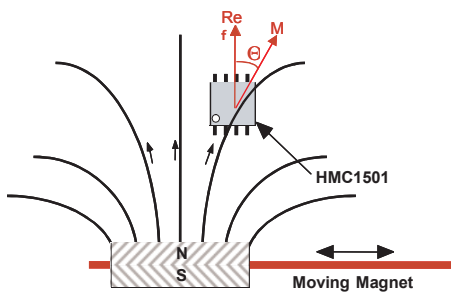
# Magnetic Position Sensors

## HMC1501 / HMC1512



### Linear, Angular, Rotary Displacement Sensors HMC1501 / HMC1512

The HMC15XX family of saturated mode magneto-resistive sensors are non-contact sensors capable of measuring the angular direction of a magnetic field with resolution beyond 0.07°. The sensors measure only field direction to avoid insensitivities to temperature, shock, and vibration and magnetic-source gap variations. Unlike encoder devices, these sen-



sors know the exact position and do not require indexing. Rare Earth magnets such as Neodymium or samarium cobalt types can be substituted with cost-effective Alnico or ceramic type magnets in typical applications such as linear displacement, angular displacement, motor control, and valve position.

MR position sensors measure the angle direction of a magnetic field vs. the strength and direction of a magnetic field.

- Non-contact, power on position sensor
- Low power ~ 5mW
- Insensitive to field strength variations in magnet
- Wide range of span possible
- No moving parts
- Linear, angular and rotary applications
- Cost advantages of using inexpensive magnets sensor will operate with a 80 Gauss field

### Features and benefits

#### Angular range:

HMC1501 - Angular range of  $\pm 45^\circ$  with  $< 0.07^\circ$  resolution.  
HMC1512 - Angular range of  $\pm 90^\circ$  with  $< 0.05^\circ$  resolution.

#### Speed:

These saturated mode sensors retain a DC to 5MHz frequency response with a minimum of 80 gauss magnetic field applied.

#### Size:

SOIC-8 surface mount packages

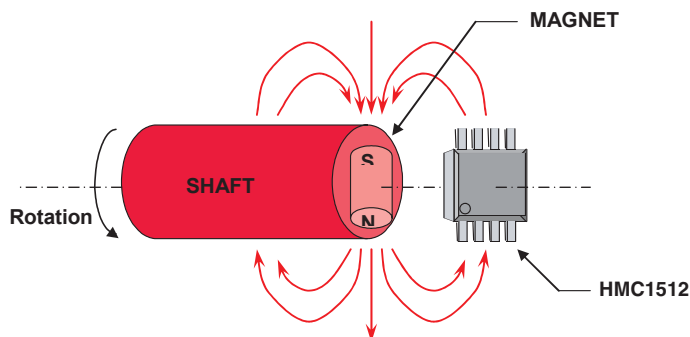
#### Signal output:

Full scale output range of 120mV when provided with a 5V supply

*Available in Tape and Reel*

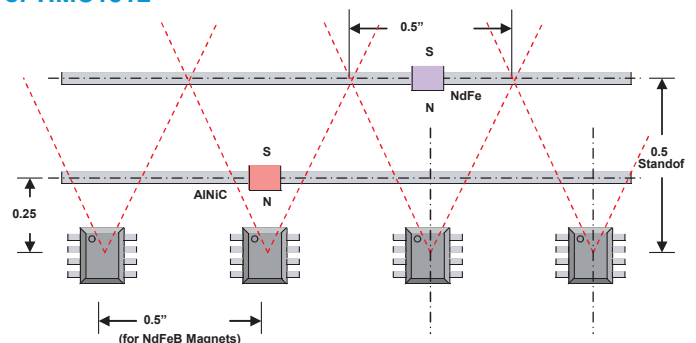
For more information about Honeywell's Position Sensors visit our website at [www.magneticsensors.com/datasheets.html](http://www.magneticsensors.com/datasheets.html) and see application note AN211.

### Shaft Position Detection



+/- 90 Degrees with a single HMC1512  
Full 360 Degree Sensing with an Additional Hall Sensor

### Linear Position Sensor Using Multiple HMC1501 or HMC1512



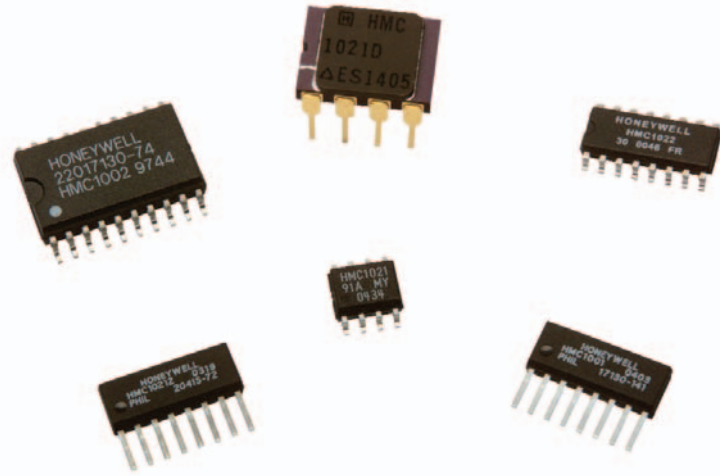
# Low Field Linear 1- and 2- Axis Magnetic Sensors HMC1001 / HMC1002 / HMC1021S / HMC1021Z / HMC1021D / HMC1022

The HMC100X and HMC102X magnetic sensors families are our legacy products that emphasize performance over size. Configured as a four-element wheatstone bridge, these magnetoresistive sensors convert magnetic fields to a differential output voltage, capable of sensing magnetic fields as low as 27  $\mu$ gauss. These MRs offer a small, low cost, high sensitivity and high reliability solution for low field magnetic sensing.

The Honeywell HMC100X family of magnetoresistive sensors offers extreme sensitivity and reliability for high performance applications. They are an ideal solution for linear, low-field magnetic sensing due to its capabilities to convert magnetic field strengths into a differential output voltage, and sensing magnetic fields as low as 27  $\mu$ gauss.

The HMC102X family of magnetoresistive sensors converts magnetic fields to a linear representation of output voltage, offering a cost effective solution for automotive and hand-held compassing applications. These sensors offer a smaller, low cost, high sensitivity and high reliability solution for magnetic field strength sensing.

Included in the HMC102X family is a high temperature magnetic sensor, the HMC1021D. The advantages of the HMC1021D include high-temperature operation, low magnetic field detection range, and a non-magnetic package. Capable of sensing magnetic field strength and direction down to 85 micro-gauss, this sensor offers a compact and highly reliable solution for low field magnetic sensing.

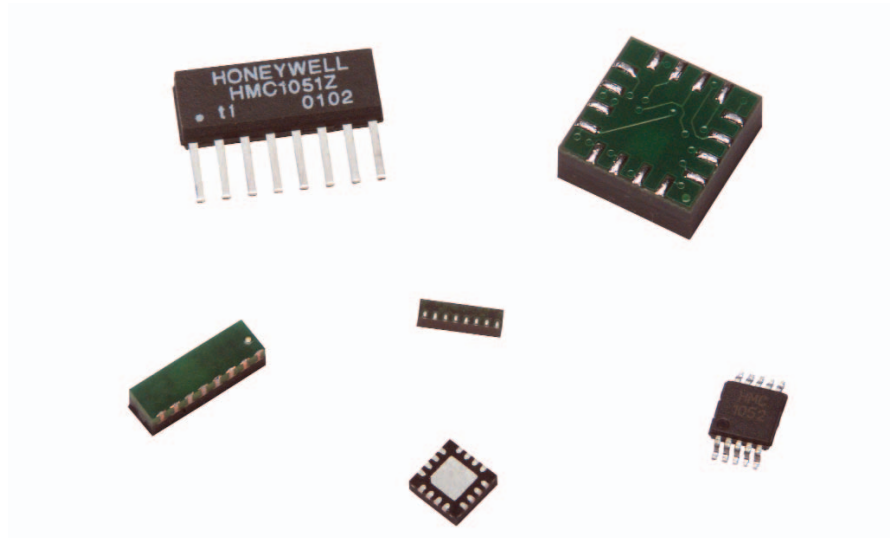


## Honeywell's Magnetoresistive Components Specification Matrix

	HMC100X	HMC102X	HMC104X	HMC105X	Units
Sensitivity	3.2	1.0	1.0	1.0	mV/V/Gauss
Field Range	$\pm 2$	$\pm 6$	$\pm 6$	$\pm 6$	Gauss
Field Resolution	27	85	120	120	$\mu$ Gauss
Linearity ( $\pm 1$ G)	0.1	0.05	0.17	0.05	% FS
Supply Voltage (typ.)	5 - 12	5 - 25	2 - 25	1.8 - 25	Volts
Set/Reset Current	3.0	0.5	0.5	0.5	Amps
Offset Strap Coil Constant	51	4.6	10	10	mA/gauss
Orthogonal Axis Alignment	1.5	1	<0.01	<0.01	Degree
Cross Axis Effect	0.5	0.3	0.3	3	%
Size	12.7 x 7.3 x 2.5	10 x 3.9 x 1.5	3 x 3 x 0.8	3 x 3 x 0.8	mm
Board Area (2 Axis)	128	60	10	10 - 15	mm <sup>2</sup>

# Small Size 1-, 2- and 3- Axis Magnetic Sensors

## HMC1041Z / HMC1042 / HMC1051Z / HMC 1051ZL / HMC1052 / HMC1052L / HMC1053



Our newest magnetic sensors, the HMC104X and HMC105X family of magnetoresistive sensors are the ideal solutions for applications requiring ultra small sensors. These sensors offer a compact and highly reliable solution for low field magnetic sensing.

Honeywell's ultra small magnetic sensors are optimized for low-cost and include several miniature package configurations; one axis (HMC1041Z, HMC1051Z, HMC1051ZL), two axis (HMC1042, HMC1052, HMC1052L), and three-axis (HMC1053). The advantages of these patented chips include orthogonal precision two-axis sensing (HMC1042 and HMC1052) in miniature surface mount packages. Each of the magneto-resistive sensors are configured as a four-element wheatstone bridge to convert magnetic fields to differential output voltages, plus patented on-die straps for offset and set/reset functions.

The newest addition to Honeywell Magnetic Sensors is the HMC1041Z, a Z-axis, surface mount sensor designed for low field magnetic sensing. The sub-miniature size and low-height (1.05 mm) makes this sensor ideal for highly integrated, portable products like wireless phones, GPS receivers, and watches. The HMC1042 is a high performance, 2 axis sensor in a 3 x 3 x 0.8mm LCC package.

The HMC105X family also features a three-axis Compass Sensor Set, HMC1055, which combines the popular HMC1051Z one-axis, and the HMC1052 two-axis magnetoresistive sensors plus a two-axis MEMSIC accelerometer in a single kit.

For more information visit our website at [www.magneticsensors.com](http://www.magneticsensors.com).

# Three-Axis Magnetometers

## HMC2003 / HMR2300 / HMR2300R



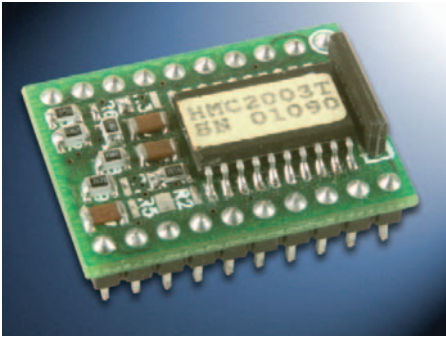
Honeywell magnetometers provide an excellent means of measuring both magnetic field intensity and direction.

Honeywell magnetometers use our proven Anisotropic Magnetoresistive (AMR) sensors to measure both magnetic field intensity and direction. These solutions offer both static and alternating field measurements up to 5MHz and permit magnetometer designs emphasizing advantages of small size, high sensitivity,

fast response, small size, low cost, and reliability over other magnetometer alternatives.

Magnetometer applications include process control, laboratory instrumentation, anomaly detection, traffic and vehicle detection, security systems, compassing, magnetic ink recognition, current sensing, and motion detection.





### HMC2003 Three-Axis Analog Magnetometer

The HMC2003 is a complete, three-axis magnetometer with analog output in a 20-pin hybrid DIP package. With Honeywell's sensitive HMC1001 and HMC1002 MR sensors, and precision instrumentation amplifiers, it measures x, y and z-axis magnetic fields. In addition, Honeywell's patented on-chip offset and set/reset straps are accessible for consistent and advanced processing applications.

#### Features and benefits

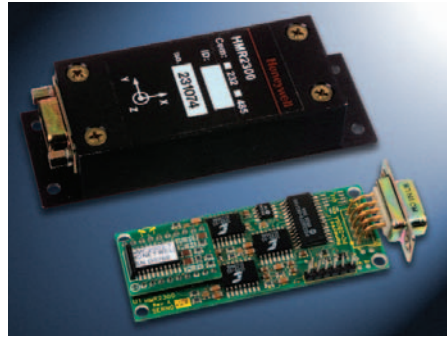
**Small size:** DIP-20 footprint (1 in. x 75 in.) allows easy insertion into system-level boards, reducing development costs.

**Solid state:** All components are solid state and DC operated, improving reliability, EMI performance, and ruggedness compared to fluxgate sensors.

**Dynamic range:** Accurately measures field from 40 microgauss to  $\pm 2$  gauss with factory calibrated 1V/gauss outputs.

**Low noise:** Instrumentation amplifiers with 1kHz low pass filters rejects unwanted noise.

**Internal voltage reference:** An externally accessible +2.5V (zero gauss) reference improves measurement accuracy and stability. An on-board excitation current source reduces temperature errors for consistent performance.



### HMR2300 Smart Digital Magnetometer

With extremely low magnetic field sensitivity ( $<70$  micro-gauss,  $<7$  nano-Tesla) capability and a user configurable command set, the HMR2300 solves a variety of problems in custom applications. Honeywell's three-axis smart digital magnetometer detects the strength and direction of the external magnetic field and interfaces with computer/controller digital ports. Three independent magnetic sensors are oriented orthogonally to sense the x, y and z-axis magnitudes of the magnetic field. The bridge outputs are then converted to a 16-bit digital value using an internal A/D converter.

#### Features and benefits

**Field range:**  $\pm 2$  Gauss

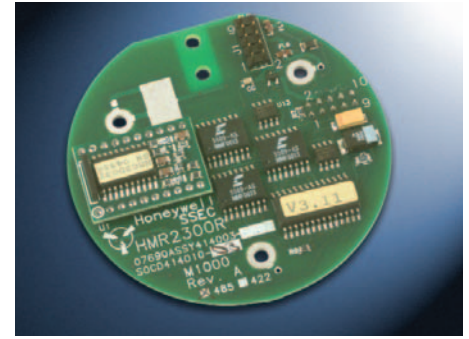
**Flexible:** Microcontroller-based sensor system with RS232 or RS485 interfaces.

**Simple to use:** Just plug and play

**Field resolution:**  $<70$   $\mu$ Gauss

**Accuracy over  $\pm 1$  Gauss:**  $<0.5\%$  FS output rate selectable: 10 to 154 Samples/Sec.

**Demo Kits** - A Development Kit is available which includes one magnetometer module in an aluminum enclosure, cabling with power supply, Windows™ demonstration software for a remote PC, and a user's guide.



### HMR2300R Three Axis Strapdown Magnetometer

The HMR2300R detects the direction and strength of Earth's magnetic field and communicates the x, y and z components directly via serial bus. Due to Honeywell's round strapdown design as opposed to a gimbaled fluxvalve, it has no moving parts to damage or wear out during severe flight conditions. The HMR2300R offers an ideal replacement for flux valve sensors in avionics systems. Also includes 55 bytes of EE prom locations available for data storage.

#### Features and benefits

**Flexibility:** RS422 or RS485 interface choices

**Accuracy:**  $<70$  micro-gauss resolution

# Integrated Compassing Solutions

Our extensive experience in fabricating magnetoresistive sensors allows us to develop electronic compass modules that are suited land, sea and airborne applications. Honeywell offers a complete line of HMR compass modules from the basic HMR3100 two-axis electronic compass to the HMR3600 with  $\pm 80$  degrees of tilt compensation. Our HMR compass modules offer high accuracy compassing solutions.

Applications include land or maritime navigation, GPS receivers, laser rangefinders, robotic vehicles, antenna alignment, camera control and other personal, vehicle, and aircraft platforms.

Development kit versions are offered for each HMR compass product for evaluation and demonstration needs.

## Hard Iron & Soft Iron Calibration

Each compass product includes hard iron calibration routines to compensate for distortion due to nearby ferrous objects and stray fields, such as vehicles. Hard iron calibration is compensation for magnetic distortion due to permanent magnets or D.C. electromagnetic effects. Soft iron calibration is compensation for magnetic distortion due to induced magnetism in nearby ferrous metals. Common ferrous metals include; iron, steel, nickel and cobalt. Metals such as aluminum, titanium and brass cause no interference.

\*Gyro Stabilization eliminates errors in magnetic heading caused by transient magnetic disturbances. Compass module software automatically blends gyro and compass data together.

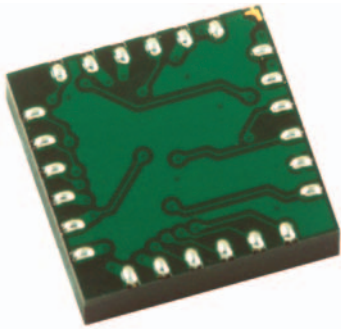
## 2-Axis vs. 3-Axis Compass Solutions

Electronic compass solutions solve for magnetic heading by measuring the earth's horizontal magnetic field. By keeping the two-axis modules approximately level, maximum heading accuracy is achieved. For applications where compass modules will not be level, a three-axis, tilt compensated compassing solution is recommended. These three-axis compass modules perform an "electronic gimbal" function by adding the third magnetic axis and a tilt sensor for a gravity vector reference. Tilt sensors are made of either fluidic sensors or MEMS accelerometers. Quality of the tilt measurement contributes to precision compass outputs. For specialized compass solutions, Honeywell offers the HMC line of linear-mode magnetic field sensor devices to create two and three-axis compass designs.

For more information or application notes, visit our website at [www.magneticsensors.com](http://www.magneticsensors.com).

# Digital Compass Solutions

## HMC6352 / HMC6343 / HMC6052

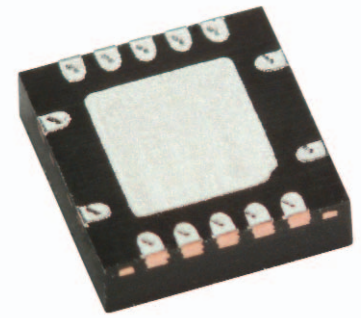


### HMC6352 Digital Compass Solution

The Honeywell HMC6352 digital compass solution is the first true “compass in a package”. This 6.5mm by 6.5mm by 1.5mm multi-chip LCC module uses an I2C serial interface supply heading data to host processors. The HMC6352 is a miniature chip-scale module that can drop-in to your platforms for the ultimate in electronic functionality. Containing the complete 2-axis sensors, analog, and digital electronics; the HMC6352 also contains all the firmware for heading computation and calibration for minimal designer effort. The combination of the complete compass solution in a small, low-cost package makes the HMC6352 ideal for consumer electronics with quick to market emphasis.

#### Applications

- Consumer electronics
- Hand held devices (cell phones, PDAs, watches, handheld GPS)
- Compassing
- Integration with GPS
- Dead reckoning
- Vehicle telematics
- Satellite dish antenna positioning



### HMC6052 Integrated Compass Sensor

The Honeywell HMC6052 integrated compass sensor combines a two-axis magnetoresistive sensor with instrumentation amplifier, voltage reference, and set strap driver circuits in a chip-scale package. The product is offered in a 14-pin surface mount 3.5mm by 3.5mm LCC package. Two channels of amplified sensor signals with a set switch function allow compass system designers to have a compact, easy to implement solution.

#### Applications

- Compassing
- Antenna positioning
- Dead reckoning
- Magnetometry

#### Features and benefits

**Integration:** Two-axis magnetic sensor with analog signal conditioning

**Size:** HMC6052 comes in a 3.5 x 3.5 x 0.8mm 14-pin LCC package

**Power:** 2.5 to 3.6 volt supply voltage for battery operation

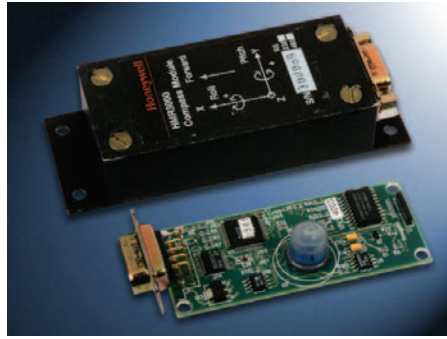
**Performance:** High accuracy capability and fast settling time

### HMC6343 Digital Compass Solution

The Honeywell HMC6343 digital compass circuit is three-axis magnetic and three-axis accelerometer compassing solution with tilt compensation. This 9.0mm by 9.0mm by 1.5mm multi-chip module has a UART interface plus command compatibility with the HMR3300/3400 compass solutions. The HMC6343 contains all sensors, micro-controller, and analog support circuits; plus all the firmware for heading computation and hard-iron calibration.

#### Applications

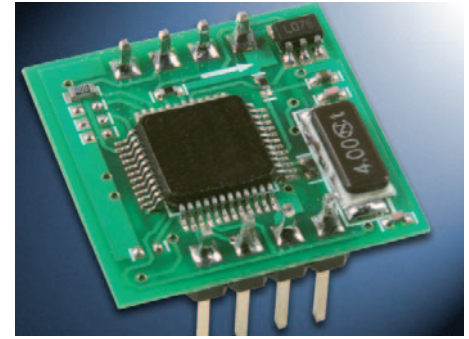
- GPS Receivers
- Optical Sighting Gear
- Antenna Positioning
- Hand Held Devices
- OEM Compassing/Pointing



### HMR3000 Digital Compass Solution

The HMR3000 is an electronic compass module that provides heading, pitch and roll output for attitude reference systems. Honeywell's solid state magnetoresistive sensors make this strapdown compass both rugged and reliable. The HMR3000 achieves a response time up to 20 Hertz allows faster updates compared to gimbaled fluxgates.

An optional development kit is available for the HMR3000 with power supply, serial port cable and PC demo software.



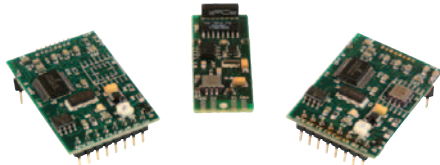
### HMR3100 Digital Compass Solution

The Honeywell HMR3100 is a low cost, two-axis electronic compassing solution used to derive heading output which uses Honeywell's magnetoresistive sensors. The HMR3100 communicates through binary data and ASCII characters at four selectable baud rates: 2400, 4800, 9600, or 19200. This compass solution is easily integrated into systems using a simple USART interface.

A development kit is available, which includes additional plug-in circuit board with RS232 output, cabling with power supply and demonstration software.

## Honeywell's Compassing Solutions Matrix

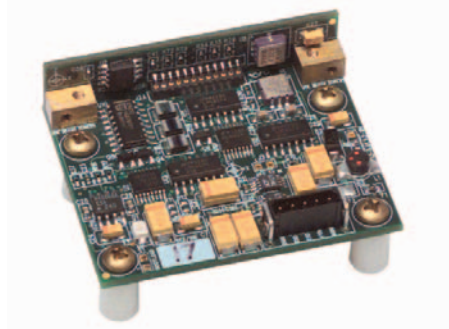
	2 Axis			3 Axis with Tilt Compensation		
	HMC6352	HMR3100	HMR3200	HMR3300	HMR3400	HMR3000
Accuracy (At Level)	± 2.5°	± 5°	± 1°	± 1°	± 1°	± 0.5°
Size	6.5x6.5x1.5mm	19x19x4.5mm	1"x1.45"x0.4"	1"x1.45"x0.4"	0.6"x1.5"	1.5"x4.2"x0.88"
Tilt Range	NA	NA	NA	± 60°	± 60°	± 40°
Resolution	0.5°	0.5°	0.1°	0.1°	0.1°	0.1°
Repeatability	± 1°	± 3°	± 0.2°	± 0.4°	± 0.4°	± 0.3°
Interface	I2C	USART 9600	UART/SPI	UART/SPI	UART/SPI	RS232/485
Power	2.7 to 5.2 V	3 to 5 VDC	6 to 15 VDC	6 to 15 VDC	5 VDC, 25mA	6 to 15 VDC
Temp Range	-20° to 70°C	0° to 70°C	-40° to 85°C	-40° to 85°C	-40° to 85°C	-20° to 70°C
Hard Iron Cal	Y	Y	Y	Y	Y	Y
Soft Iron Cal	N	N	N	N	N	N
Gyro Stabilized*	N	N	N	N	N	N
World Magnetic Model	N	N	N	N	N	N



### HMR3200 / HMR3300 / HMR3400 Digital Compass Solutions

The Honeywell HMR3200, HMR3300 and HMR3400 compass solutions are compact printed circuit boards that plug into platforms with a UART interface and communicate data in ASCII format. The HMR3200 provides a horizontal or vertical oriented electronic compasses using two-axis magnetic field sensing. The HMR3300 is a three-axis, tilt compensated electronic compass that adds a two-axis accelerometer for enhanced performance up to a  $\pm 60^\circ$  tilt range. The HMR3400 is a reduced size version of the HMR3300 offering lower power consumption and increased miniaturization. Response time for the HMR3200 is 15Hz and the HMR3300/HMR3400 is 8Hz.

Development kits are available for each of these products, which include a plug-in circuit board with an RS232 output.



### TruePoint™ Digital Compass Solution, HMR3500

The Honeywell TruePoint™ electronic compass is a 3 axis digital compass module with azimuth accuracy of 1 degree with 0.1 degree resolution and 0.5 degree repeatability, tilt range of  $\pm 80^\circ$ . TruePoint™ includes closed loop magnetometers, world magnetic model for declination, configurable mounting orientation, hard and soft iron compensation. Update rates to 25 Hz for pitch, roll and heading.

A development kit is available, which includes DB9 data and power cable, RS232 interface, Windows® CompassHost test software, and manual with software protocol message descriptions.



### μPOINT® Gyro-Stabilized Digital Compass Solution, HMR3600

The Honeywell μPOINT® is a gyro-stabilized digital magnetic compass that combines the latest gyro technology with advanced digital magnetic compass hardware and software. μPOINT® features a MEMS silicon rate gyro built into the z-axis. The benefit of gyro stabilization is the ability to overcome magnetic transient disturbances. μPOINT® includes closed loop magnetometers, hard and soft iron compensation, world magnetic model for declination (variation), and high mechanical shock tolerance.

A development kit is available, which includes DB-9 serial data and power cable, user manual, Windows® host test program with data recording and graphic data display, direct RS232 interface and alternate connector attachment boards and brass base plate with mounting screws and strain relief.

sation

HMR3500 TruePoint™	HMR3600 μPOINT®
$\pm 1^\circ$	$\pm 0.5^\circ$
2"x1.5"x0.5"	1"x1.04"x0.54"
$\pm 80^\circ$	$\pm 80^\circ$
0.1°	0.1°
TBD	TBD
RS232	RS232
5V to 12V Nom.	5 VDC $\pm 5\%$
0° to 70°C	-40° to 85°C
Y	Y
Y	Y
N	Y
Y	Y

# Dead Reckoning Modules

## DRM<sup>®</sup> - 3 / DRMcore<sup>™</sup> / GyroDRM<sup>™</sup>

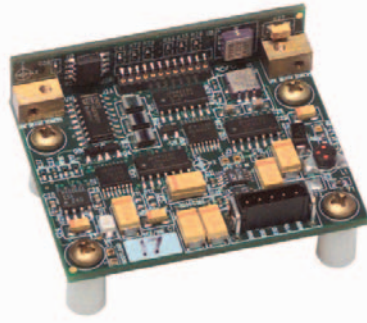
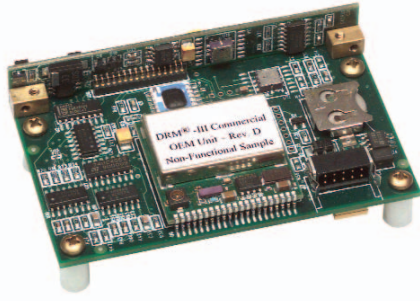


Honeywell has added a new line of dead reckoning modules to its Magnetic Sensors product family. These new products provide accurate navigation in challenging environments and offer solutions where GPS is not available or reliable. The products are provided as components for integration with other equipment such as RF data links and map displays.

The Dead Reckoning Module (DRM<sup>®</sup>) is a miniature, self-contained, electronic navigation unit that provides the user's position relative to an initialization point. The DRM<sup>®</sup> is the first commercially available practical implementation of drift-free dead reckoning navigation system for use by personnel on foot. It is specifically designed to supplement GPS receivers during signal outages. You still know where personnel are located even when GPS is blocked by nearby buildings, heavy foliage, or even inside many structures.

The DRM<sup>®</sup> products contain options including a tilt-compensated magnetic compass, electronic pedometer and barometric altimeter to provide a continuous deduced position. A microprocessor performs dead reckoning calculations and includes a Kalman filter to combine the dead reckoning data with GPS data when it is available. The filter and other proprietary algorithms use GPS data to calibrate dead reckoning sensors for typical dead reckoning accuracy of 2% to 5% of distance traveled, entirely without GPS. Options for the system integrator include a selection of voltage input ranges, CMOS or RS232 interface, data logging, and special software functions. In addition to horizontal position data, compass azimuth, tilt (pitch and roll), and barometric altitude are available.

Calibration after integration with other electronics during product manufacturing is required. These devices are intended for use by personnel on foot, and are not for use on vehicles.



### DRM®- 3 Dead Reckoning Module for Personnel Positioning

A practical replacement for compass and pace counting for navigation on foot. The DRM®-3 is a miniature, self-contained electronic navigation unit that provides the user's position relative to an initialization point. DRM®-3 works where GPS is inaccurate or unavailable. Applications for: military, public safety, police and fire, forestry, medical patients, utility workers and more.

A development kit is available, which includes 12 channel GPS receiver, antenna, digital compass, pedometer, and altimeter, housing with belt clip, power switch, and rechargeable battery, Windows® based test and demonstration software, and user manual.

### DRMcore™ Dead Reckoning Module for Personnel Positioning

The DRMcore™ contains the core functions of a DRM®. It includes the same navigation algorithms and Kalman filter as the DRM®- 3. Functions provided include 2-dimensional horizontal navigation, and compass azimuth. DRMcore™ does not include an altimeter or GPS receiver on the circuit module, but will accept external GPS position input, derived from a user's GPS receiver. Customer can specify mounting orientation.

### GyroDRM™ Gyro-Stabilized Dead Reckoning Module

Provides inertially-aided dead reckoning navigation for personnel on foot. GyroDRM™ is a robust personal navigation product that uses advanced silicon gyro technology to deliver significantly reduced effects of magnetic distur-

bances on position accuracy. GyroDRM™ includes all the capabilities of DRM®-3. Applications for the military, RF field mapping, urban mapping and more.

A development kit is available, which includes a plastic housing with belt clip, Windows® host test program, user manual, GPS active antenna, computer interface, event marker switch, AC power adapter, li-ion battery charger, and base-ball cap with hook & loop for GPS antenna.

### VNU™ Vehicle Navigation Unit

The VNU™ provides advanced dead reckoning for land vehicles. The VNU™ offers system integrators a complete navigation subsystem ready for application on many types of wheeled land vehicles operating where GPS alone is inadequate. The integrated GPS/Dead Reckoning system includes a digital compass, a triad of silicon MEMS (Micro Electromechanical Systems) accelerometers, a barometric altimeter, a silicon MEMS rate gyro, an odometer sensor interface, and a GPS receiver integrated together in a unified electronics package. Applications for public transportation, hazardous material transport, police and fire vehicles and more.

## Dead Reckoning Matrix

	DRM®-3	DRMcore™	GyroDRM™	VNU™
Dead Reckoning Capability	Y	Y	Y	Y
GPS Receiver	Y	N	Y	Y
Gyro Stabilization	N	N	Y	Y
Altimeter	Y	N	Y	Y
Data Logging	Y	N	N	N
Water Proof Housing Option	Y	N	N	N

## Reduction of Hazardous Substances (RoHS) Compliance

Visit our website at [www.magneticsensors.com](http://www.magneticsensors.com) for the latest updates on RoHS compliance.

## Export Classification Compliance Number (ECCN) Matrix

ECCN #	Product Name
6A996	HMC1001, HMC1002, HMC2003, HMR2300, HMR2300r
EAR99	HMC1021D, HMC1021S, HMC1021Z, HMC1022, HMC1023, HMC1041Z, HMC1042, HMC1051Z, HMC1052, HMC1052L, HMC1053, HMC1055, HMC1501, HMC1512, HMC6052, HMC6352, HMC6353, HMR3000, HMR3100, HMR3200, HMR3300
7A994	HMR3500 (TruePoint™ Compass), DRM@ 3, GyroDRM™
TBD	HMR3600 (μPOINT® Gyro Stabilized Compass)

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U.S. Patents 4,441,072, 4,533,872, 4,569,742, 4,681,812, 4,847,584, 5,583,776, 6,529,114, 6,813,582, and 6,842,991 apply to the technology described. Other patents pending.

## Find out more

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

Ask us about Honeywell's additional advanced sensor solutions:

- High Accuracy Precision Barometers
- Precision Pressure Transducers (Including ruggedized and explosion proof models)

## Aerospace

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