Web Site: www.parallax.com
Forums: forums.parallax.com
Sales: sales@parallax.com
Technical: support@parallax.com

Office: (916) 624-8333
Fax: (916) 624-8003
Sales: (888) 512-1024
Tech Support: (888) 997-8267

# Compass Module 3-Axis HMC5883L (#29133)

The Compass Module 3-Axis HMC5883L is a low-field magnetic sensing device with a digital interface. The compass module converts any magnetic field to a differential voltage output on 3 axes. This voltage shift is the raw digital output value, which can then be used to calculate headings or sense magnetic fields coming from different directions. The module is designed for use with a large variety of microcontrollers with different voltage requirements.

Features

- 3-Axis magneto-resistive sensor
- 1 to 2 degree compass heading accuracy
- Wide magnetic field range (+/-8 gauss)
- Fast 160 Hz maximum output rate
- Precision in-axis sensitivity and linearity
- Measures Earth's magnetic field, from milli-gauss to 8 gauss

Key Specifications

- Power Requirements: 2.7 to 6.5 VDC
- Communication Interface: I²C (up to 400 kHz)
- Operating temperature: -22 to +185 °F (-30 to +85 °C)
- Dimensions: 0.73 x .65 in (1.8 x 1.7 cm)
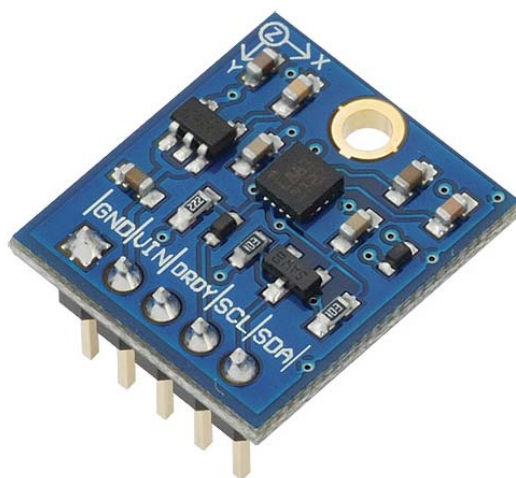
Application Ideas

- Auto and personal navigation
- UAV systems
- Robotic navigation
- Location-based services (LBS)

Resources and Downloads

Check for the latest version of this document, free software, and example programs from the Compass Module 3-Axis HMC5883L product page. Go to www.parallax.com and search for part number 29133.

Quick-Start Guide

The following is a very basic procedure to get started initializing and reading values from the Compass Module. This module is equipped with 4.7 kΩ pull-up resistors on the SDA line and a 2.2K resistor on the SCL line. There is no need for any external hardware to operate. The schematic is available from the 29133 product page at www.parallax.com.

1. With main power off, make the proper connections between the compass module and a microcontroller as shown above. The voltage connected to the VIN pin should be the same as the voltage powering the microcontroller communicating with the device.

2. Power on the device and load the BASIC Stamp or Propeller microcontroller sample code provided on the 29133 product page.
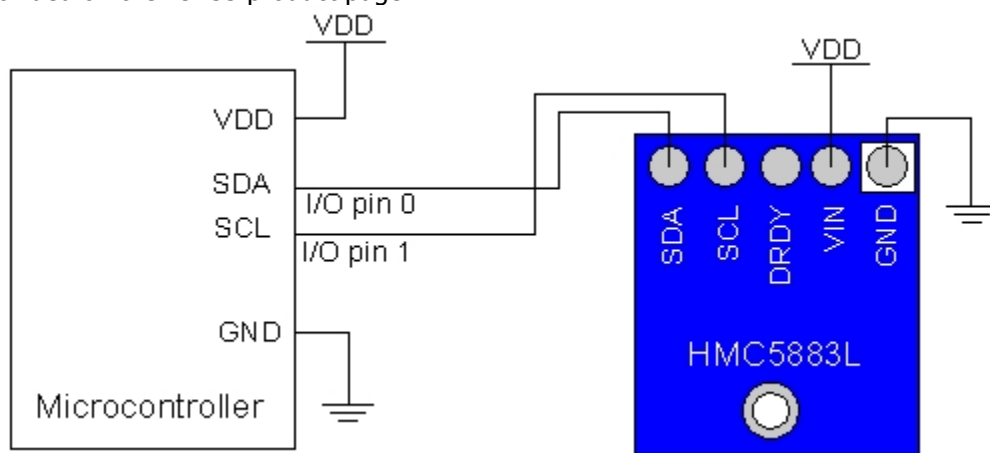

Note: For other microcontrollers first, setup the module for continues output mode by writing (0x3C) 0x00 to the MODE register (0x02). Once running in continues mode set a pointer to OUTPUT_X_MSB by writing (0x3C) 0x03 to the device. Now the compass module will output raw data from OUTPUT_X_MSB - OUTPUT_Y_LSB. The compass will automatically index through these registers; there is no need to set pointers for each of these registers. The last step would be to read from each of the six output registers, 8 bits of data per register. For more details on these modes and registers please see the datasheet on the 29133 product page at www.parallax.com.

Precautions

- This module is VERY sensitive to ferrous material, metal objects, magnets and power supplies, etc. Any of these items in close range may affect performance. If you're experiencing adverse results, check your environment for anything that may influence magnetic fields. It is recommended to connect the unit with wires, keeping it away from a breadboard.

- Without tilt compensation the device will need to be level for accurate headings. For tilt compensation, you will need an accelerometer. See the application notes available on the 29133 product page for details on tilt compensation.

Pin Descriptions

Pin	Name	Type	Function
1	GND	G	Ground
2	VIN	P	Supply Voltage – 2.7 to 6.5 VDC (module is regulated to 2.5VDC)
3	DRDY	I	Data Ready, interrupt. (internally pulled high, see datasheet for details)
4	SCL	I	I²C Clock (Pulled high on module, Clock 160Hz Default)
5	SDA	IO	I²C Data (Pulled high on module)
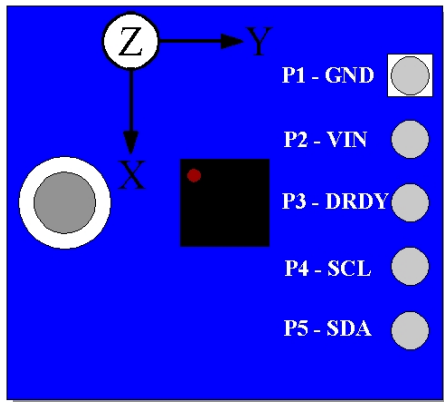
Module Dimensions
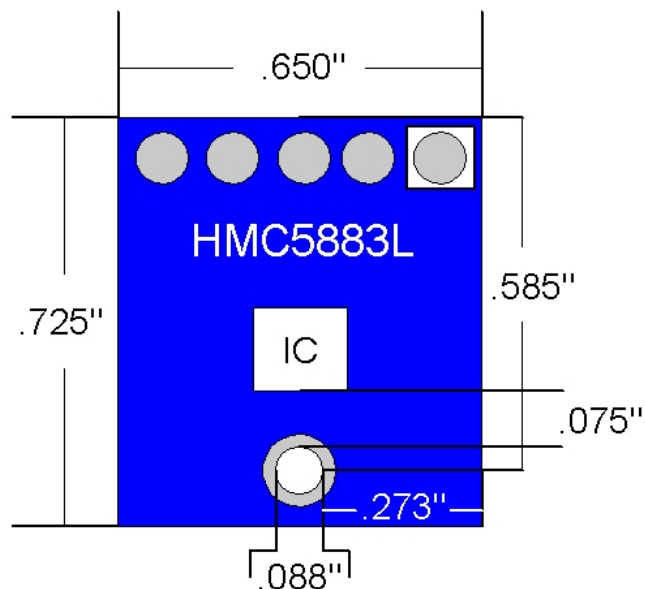
Device Information

The following information is taken from the HMC5883L datasheet; please refer to it for complete details. It is available for download from the 29133 product page at www.parallax.com.

Specifications

Characteristics	Conditions	Min	Typ	Max	Units
Average Current Draw	Idle Mode Measurement Mode	- -	2 100	- -	µA
Field Range	Full Scale (FS) – Total applied field (Typical)	-8		+8	gauss
Mag Dynamic Range	3-bit gain control	±1		±8	gauss
Resolution	VDD=3.0V, GN=2		5		milli-gauss
Linearity	±2.0 gauss input range			0.1	±% FS
Hysteresis	±2.0 gauss input range		±25		Ppm
Cross-Axis Sensitivity	Test Conditions: Cross field =0.5 gauss, Happlied = ±3 gauss		±0.2%		%FS/gauss
Output Rate (ODR)	Continuous Measurement Mode Single Measurement Mode	0.75		75 160	Hz Hz
Measurement Period	From receiving command to data- ready		6		ms
Turn-on Time	Ready for I²C commands		200		µs
Gain Tolerance	All gain/dynamic range settings		±5		%
I²C Address	7-bit address 8-bit read address 8-bit write address		0X1E 0X3D 0X3C		hex hex hex
I²C Rate	Controlled by I²C Master			400	kHz
I²C Hysteresis	Hysteresis of Schmitt trigger inputs on SCL & SDA – Fall (VDDIO=1.8V) Rise (VDDIO=1.8V)		0.2*VDDIO 0.8*VDDIO		Volts Volts

Communication Protocol

The compass module communicates via a two-wire I²C bus system as a slave device. It supports standard and fast modes, 100 kHz and 400 kHz, but does not support a high-speed mode. No external pull-up resistors are required to support these standard and fast speed modes (4.7 kΩ pull-up resistors are built into module). *See page 8 in the datasheet for I²C communication details.

Modes of Operation

The Compass Module has several modes that can be accessed from the I²C bus, whose primary purpose is power management. All the modes are controlled by the Mode Register. The following section describing modes, was taken from the Honeywell HMC5883L datasheet.
*See page 9 in the datasheet for more details.

Continuous-Measurement Mode

During continuous-measurement mode, the device continuously makes measurements, at user selectable rate, and places measured data in data output registers. All registers maintain values while in continuous-measurement mode and I²C bus is enabled for use by other devices on the network.

Single-Measurement Mode

This is the default power-up mode. During single-measurement mode, the device makes a single measurement and places the measured data in data output registers. All registers maintain values while in single-measurement mode. The I²C bus is enabled for use by other devices on the network while in single-measurement mode.

Idle Mode

During this mode the device is accessible through the I²C bus, but major sources of power consumption are disabled, such as, but not limited to, the ADC, the amplifier, and the sensor bias current. All registers maintain values while in idle mode. The I²C bus is enabled for use by other devices on the network while in idle mode.

Register List

This device is controlled and configured via a number of on-chip registers, The table below lists the registers and their access. All address locations are 8 bits. For a detailed description of these registers please access the datasheet on our Product Page.

Address Location	Register Name	Access
00	Configuration A	Read/Write
01	Configuration B	Read/Write
02	Mode	Read/Write
03	Data Output X MSB	Read
04	Data Output X LSB	Read
05	Data Output Z MSB	Read
06	Data Output Z LSB	Read
07	Data Output Y MSB	Read
08	Data Output Y LSB	Read
09	Status	Read
10	Identification A	Read
11	Identification B	Read
12	Identification C	Read

Example Code

Example code is available for download from the 29133 product page at www.parallax.com.

BASIC Stamp® 2

The HMC5883L_demo.bs2 program reads raw X,Y,Z values from the Compass Module using the default I²C interface, and displays the values in the BASIC Stamp Editor's Debug Terminal. The software is a free download from www.parallax.com/basicstampsoftware.

Propeller™ P8X32A

The HMC5883L_demo.spin program reads raw X,Y,Z values from the Compass module using the default I²C interface, and displays the values in a serial terminal. This demo also shows the compass heading given by specifying a compass point (north, south, east, or west), a number of degrees, and then another compass point. For example, N23E is a heading. It calls FullDuplexSerial.spin, library object of the Propeller Tool software, which is available from www.parallax.com/Propeller.

The picture below is an example of this type of heading display.
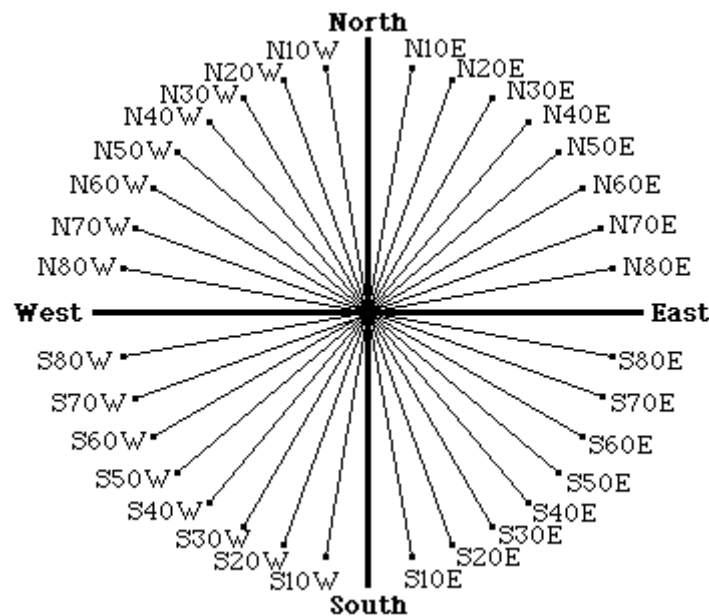
Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[Parallax](#):
  [29133](#)