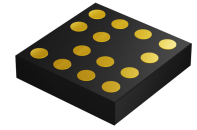


Three-Axis Digital Magnetometer

Features

- 3-axis Hall Effect Magnetometer
- Low Profile and Small Footprint
- Wide supply Voltage
- Independent IOs Supply and Supply Voltage Compatible
- Low Power Consumption
- I2C/SPI Digital Output Interface
- High Resolution
- User Selectable Operation Modes: Power-down, Burst, Single Measurement, Wake-up on Change, External Trigger Measurement.
- One programmable Interrupt Generator for DRDY or Trig Function
- DRDY Function for Measurement Data Ready
- Built-in Oscillator for Internal Clock Source
- Power on Reset Circuit
- Embedded Temperature Sensor to Compensate Sensor Temperature Effect
- Embedded Self-Test to built-in Internal Magnetic Field Generator



Package: BGA-14
1.6x1.6x0.81 mm
(LxWxH max value in mm)

Applications

- Electronic Compass
- Navigation Systems
- Frequency Charger
- Smartphones
- Tablet PC
- UPS Systems
- Weld Systems
- Solar Devices
- Wind Turbines

Key Specifications

- BGA-14 Package: 1.6x1.6x0.81mm
- Resolution: 16-bit
- Full Scale: ± 48 Gauss
- Operating Supply Voltage:
 - Analog power Supply: +2.2V to +3.6V
 - Digital interface Supply: +1.65V to Analog Supply Voltage
- Current Consumption:
 - Power-down 2uA typ. (3uA Max.)
 - Average Power Consumption at 10Hz Repetition Rate: 280uA typ.
- Operating Temperatures: -40 °C to +85 °C

Three-Axis Digital Magnetometer

Description

The GSDM110 is a three-axis magnetometer that provides excellent temperature stability and high resolution. Based on Hall-effect technology, the device has a full-scale of ± 48 Gauss.

Packaged in a 1.6x1.6x0.81 mm ball grid array (BGA), this device has an outstanding operating temperature range of -40°C to $+85^{\circ}\text{C}$. The self-test function with internal magnetic source allows users to check the functioning of the sensor. The on-board non-volatile memory is able to store calibration data on-chip.

The device may be configured to generate interrupt signals by the inertial DARY events and the timing of interrupt generators is programmable by end users on the fly. With on-board temperature sensor, the device allows temperature to be read out via I2C/SPI protocol in a digital format.

GSDM110 incorporates magnetic sensors for detecting terrestrial magnetism in the X-axis, Y-axis, and Z-axis, a sensor driving circuit, signal amplifier chain, and an arithmetic circuit for processing the signal from each sensor.

Mechanical Characteristics

($T = 25^{\circ}\text{C}$ unless otherwise specified, $V_{DD} = 3.0\text{V}$, $V_{DD_IO} = 3.0\text{V}$ and $T = 25^{\circ}\text{C}$)

Parameter	Remark	Min.	Typ.	Max.	Unit
Full Range	Each Axis		± 48		Gauss
Non Linearity	± 48 Gauss		0.1		% of FS
Sensitivity	X/Y Axis		667		LSBs/Gauss
	Z Axis		400		LSBs/Gauss
Magnetic Resolution	X/Y Axis		1.5		mG/LSB
	Z Axis		2.5		mG/LSB
T_{CONV}	Conversion time ^{Note1} : From IDLE to Data Ready	1		128	ms
T_{STBY}	From IDLE to STBY		250		us
T_{ACTIVE}	From STBY to ACTIVE		8		us
$T_{INTERVAL}$	Time in between 2 conversions(burst mode or wake-up on change) ^{Note2}	20		5000	ms

Note:

- Standby current corresponds to the current consumed in the digital, where not the main oscillator is running which is used for analog sequencing, but only the low-power oscillator. This standby current is present in Burst mode and WOC mode; whenever the ASIC is counting down to start a new conversion.
- Idle current is the current that is drawn by the ASIC in the IDLE mode, where it can only receive new commands on the communication bus, but all other blocks are disabled. The analog is disconnected, and only the digital IO part allows clocking of a few vital gates.

Three-Axis Digital Magnetometer

Electrical Characteristics

($T = 25^{\circ}\text{C}$ unless otherwise specified, $V_{DD} = 2.2\text{V to } 3.6\text{V}$, $V_{DD_IO} = 1.65\text{V to } V_{DD}$)

Parameter	Remark	Min	Nom	Max	Unit
V_{DD}	Analog Supply Voltage	2.2	3	3.6	V
V_{IO}	Digital I _O Supply	1.71	1.8	V_{DD}	V
I_{DD_CONV}	Conversion Current		2.35	2.6	mA
I_{DD_STBY}	Standby Current(1)		40		μA
I_{DD_IDLE}	Idle Current(2)		2	3	μA
I_{DD_NOM}	Nominal Current (Data-rate = 10Hz, TCONV = 4ms)		280	320	μA

Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Power Supply Voltage	V_{DD}	2.2	3.6	V
I/O Pins Supply Voltage	V_{DD_IO}	1.71	V_{DD}	V
Operating Temperature Range	T_{OP}	-40	85	$^{\circ}\text{C}$
Storage Temperature Range	T_{ST}	-50	125	$^{\circ}\text{C}$
Electrostatic Discharge Protection: Human Body Model	ESD_HBM		2	KV
Electrostatic Discharge Protection: Machine Model	ESD_MM		N/A	V
Electrostatic Discharge Protection: Charged Device Model	ESD_CMD		750	V

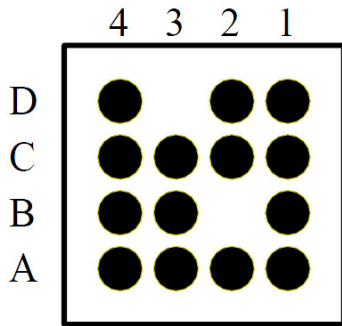
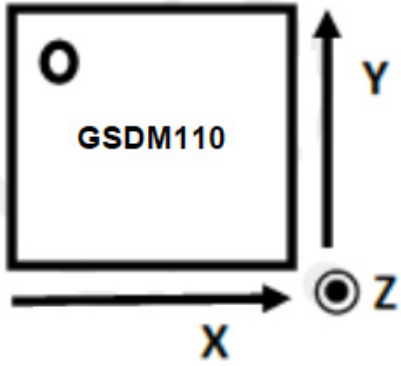
Note:

Stresses above those listed as “Absolute maximum ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device under these conditions is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability.

Recommended Operating Conditions

Parameter	Remark	Symbol	Min.	Typ.	Max.	Unit
Operating Temperature		T_A	-40	25	85	$^{\circ}\text{C}$
Power Supply Voltage	V_{DD} Pin Voltage	V_{DD}	2.2	3	3.6	V
	V_{DD_IO} Pin Voltage	V_{DD_IO}	1.65	1.8	V_{DD}	V

Pin Configuration



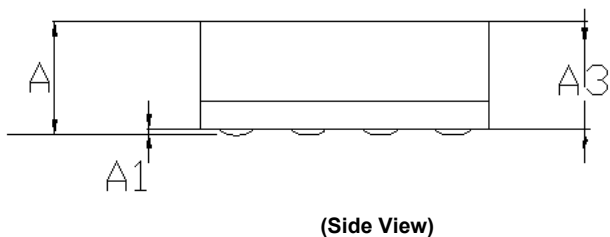
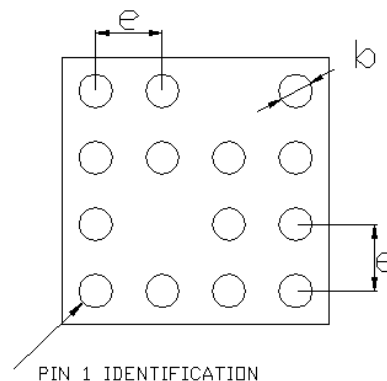
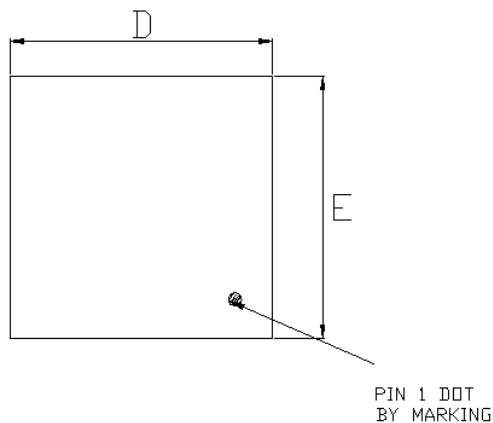
TOP VIEW	4	3	2	1
D	NC	NC	A1	A0
C	VDDIO	INT/TRIG	NC	VSS
B	MISO	NC	NC	VDD
A	SDA/MOSI	SCL/SCLK	CS	INT

Three-Axis Digital Magnetometer

Pin Description

BGA Pin No.	Name	I/O	Power Supply System	Type	Function
A1	INT/TRIG	I/O	V _{DD_IO}	CMOS	INT mode: Data ready output pin. "H" active, Informs measurement ended and data is ready to be read. TRIG mode: external trigger pulse input pin. Enable only in external trigger mode.
A2	CS	I	V _{DD_IO}	CMOS	I2C/SPI mode selection(1:I2C mode enable;0:SPI mode enable)
A3	SCL/SCLK	I/O	V _{DD_IO}	CMOS	SCL: control data clock input pin Input: Schmidt trigger SCLK: serial clock input pin when the SPI mode is selected.
A4	SDA/MOSI	I/O	V _{DD_IO}	CMOS	SDA: control data input/output pin Input: Schmidt trigger; MOSI: serial data input pin when the SPI mode is selected. Output: Open drain
B1	VDD	-	-	Power	Analog power supply pin
B2	NC	-	-	-	Not connected
B3	NC	-	-	-	Not connected
B4	MISO	-	-	-	Serial data output pin when the 4-wire SPI mode is selected.
C1	VSS	-	-	Power	Ground pin
C2	NC	-	-	-	Not connected
C3	INT/TRIG	I/O	V _{DD_IO}	CMOS	INT mode: Data ready output pin. "H" active, Informs measurement ended and data is ready to be read. TRIG mode: external trigger pulse input pin. Enable only in external trigger mode.
C4	VDD_IO	-	-	Power	Digital interface positive power supply pin
D1	A0	I	V _{DD}	CMOS	When the I2C mode is selected,A0 is slave address 0 input pin.0:connect to VSS;1:connect to VDD
D2	A1	I	V _{DD}	CMOS	When the I2C mode is selected,A1 is slave address 1 input pin. 0:connect to VSS;1:connect to VDD
D3	NC	-	-	-	Not connected
D4	NC	-	-	-	Not connected

Mechanical Data and Package Dimensions: Flip-BGA package



COMMON DIMENSIONS (MM)			
PACKAGE	BGA-14 PIN		
REF.	MIN.	NOM.	MAX.
A	0.79	0.84	0.89
A1	0.10	0.13	0.15
A3	0.71 REF.		
D	1.50	1.60	1.70
E	1.50	1.60	1.70
b	D 0.20 REF.		
e	0.4 BSC		