

IST8315

3D Magnetometer

Datasheet

(Brief)

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1 General Description

iSentek IST8315 is a 3-axis digital magnetometer with 1.6x1.6x1.2mm³, 12-pin BGA package. It is an integrated chip with 3-axis magnetic sensors, digital control logic, built-in temperature compensation circuit and self-test function. IST8315 provides an I²C digital output with fast mode up to 400kHz. The ultra-high output data rate, ultra-low noise, ultra-low hysteresis and excellent temperature drift performance features make it a perfect candidate for high speed, high accuracy applications.

Features

- Single chip 3-axis magnetic sensor
- 1.6x1.6x1.2mm³, 12-pin BGA package
- I²C slave, Fast Mode up to 400kHz
- 14-bit data output
- Built-in FIFO with 32 depths for each axis
- Ultra-high output data rate with maximum value of 1000Hz
- Dynamic range of $\pm 1000\mu\text{T}$.
- Ultra-low hysteresis ($<0.1\%FS$)
- Ultra-low sensitivity temperature drift ($\pm 0.025\%/^{\circ}\text{C}$)
- Ultra-low offset temperature drift ($0.016\mu\text{T}/^{\circ}\text{C}$)
- High precision temperature compensation
- Wide operating temperature range
- Built-in self-test function
- Built-in noise suppression filter
- Software and algorithm support available (For tilt compensation, soft/hard-iron calibration)

Applications

Augmented/Virtual Reality Applications

Quadcopter/Drone Applications

Navigation Applications

Industrial Applications

Magnetometry

IOT devices

Heading

Gaming

2 Block Diagram, Package Dimension and Application Circuit

2.1 Block diagram

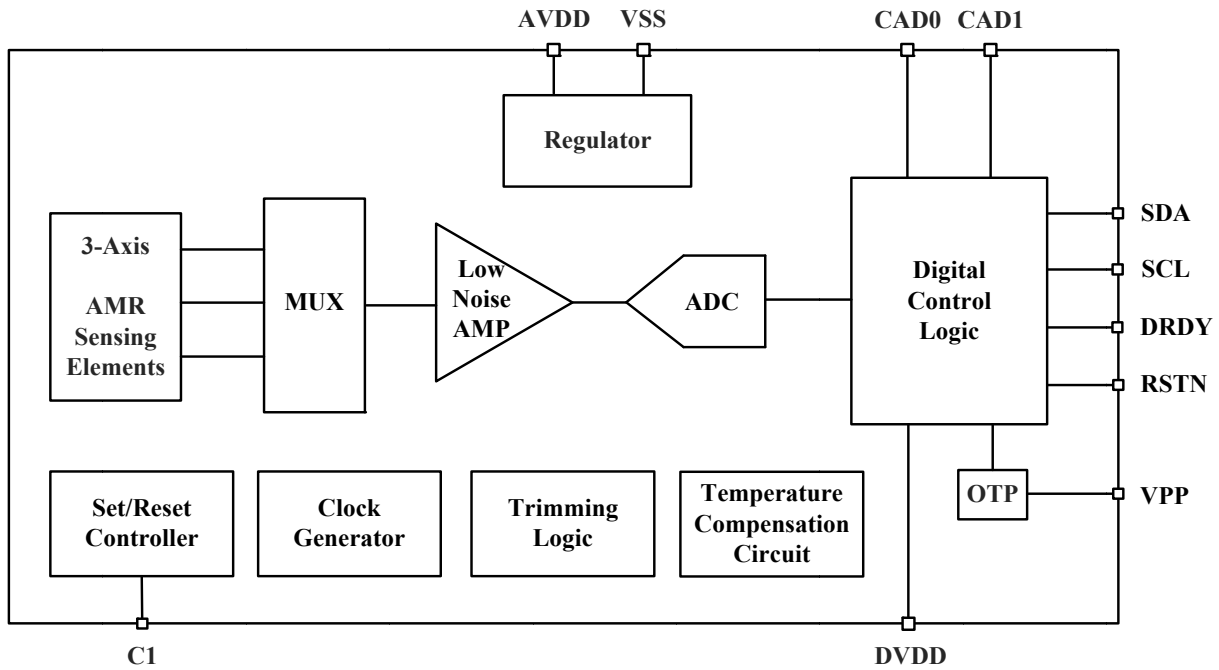
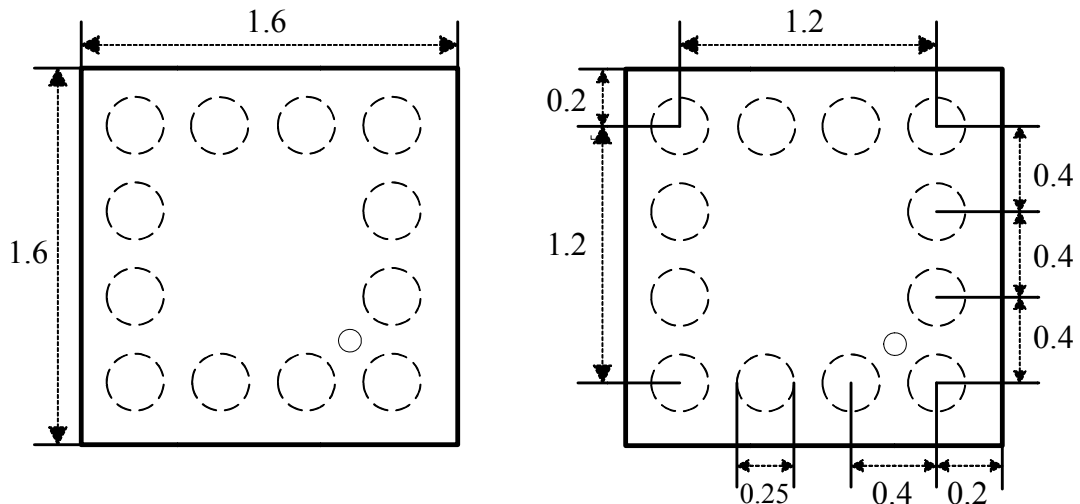


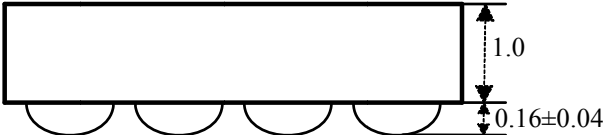
Figure 1. Block Diagram

2.2 Package Dimensions

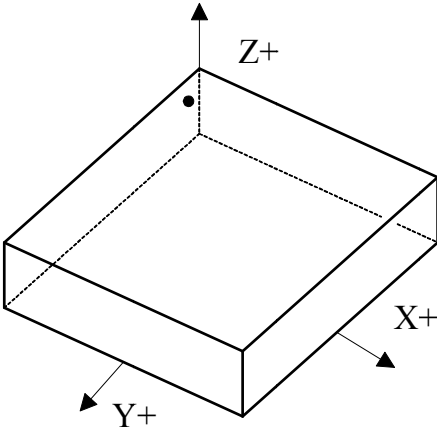
IST8315 BGA Top View (Looking Through)



IST8315 BGA Side View



IST8315 BGA 3D Top View



Unit: mm
Tolerance: ±0.1mm

2.3 Application Circuits and Pin Descriptions

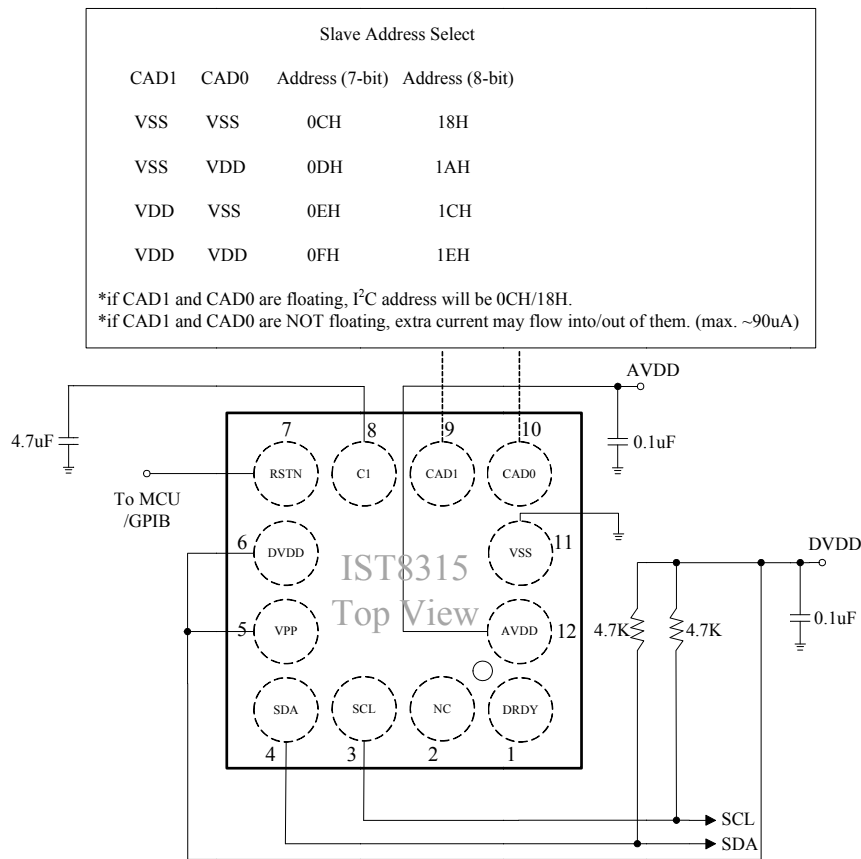


Figure 2. IST8315 Application Circuit

Pin ^{*1}	Name	Function
1	DRDY	Data ready
2	NC	Not use
3	SCL	I ² C serial clock
4	SDA	I ² C serial data
5	VPP	Test pin, connect to DVDD or keep floating ^{*2}
6	DVDD	Digital supply voltage, 1.72~3.6V
7	RSTN	Reset
8	C1	Set/Reset function
9	CAD1	I ² C slave address select, internally pulled to “high” by default
10	CAD0	I ² C slave address select, internally pulled to “low” by default
11	VSS	GND
12	AVDD	Analog supply voltage, 2.4~3.6V

^{*1} Please refer to Figure 2 on page 7.

^{*2} Please keep CAD1 floating if VPP is floating.

3 Electrical Specifications

3.1 Absolute Maximum Ratings

Parameter	Symbol	Limits	Unit
Storage Temperature	TSTG	-40 to +150	°C
Analog Supply Voltage	AVDD	-0.5 to +3.6	V
Digital Supply Voltage	DVDD	-0.5 to +3.6	V
Digital Input Voltage	VIN	-0.3 to DVDD+0.3	V
Electrostatic Discharge Voltage* ¹	VESD_HBM	-4000 to 4000	V
Electrostatic Discharge Voltage* ²	VESD_MM	-300 to 300	V
Electrostatic Discharge Voltage* ³	VESD_CDM	-700 to 700	V
Reflow Classification	JESD22-A113 with 260 °C Peak Temperature		

- 1. Human Body Model (HBM)
- 2. Machine Model (MM)
- 3. Charge Device Model (CDM)

3.2 Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit
Operating Temperature	TA	-40		+85	°C
Analog Supply Voltage	AVDD	2.4	3.3	3.6	V
Digital Supply Voltage	DVDD	1.72	1.8	3.6	V

3.3 Electrical Specifications

(Operating conditions: TA=+25°C; AVDD=2.5V; DVDD=1.8V; 4.7µF ceramic capacitors tied to C1 pin with maximum allowed line width and 5mm distance.)

Parameter	Symbol	Conditions	Min.	Typ.	Max	Unit
Operating Current	IDD3A	Full operation with OSR* ¹ =1 setting, at				uA
		10 sps		100		
		20 sps		200		
		50 sps		400		
		100 sps		750		
		200 sps		1450		
		333 sps		2350		
		500 sps		3450		
1000 sps		6900				
Suspend Current	ISPD			2		uA
Output Data Rate (ODR)	ODR				1000* ²	Hz
Over Sampling Rate* ¹	OSR		1		32	
Input Low Voltage	VIL		0		DVDD *30%	V
Input High Voltage	VIH		DVDD *70%		DVDD	V
Output Low Voltage	VOL	IOL= +4 mA	0		DVDD *20%	V
Output High Voltage	VOH	IOH= -100 uA (Except SCL and SDA)	DVDD *80%		DVDD	V

1. Register OSRCNTL(0x41) controls OSR setting.
2. 1000Hz ODR can be achieved with OSR = 1.

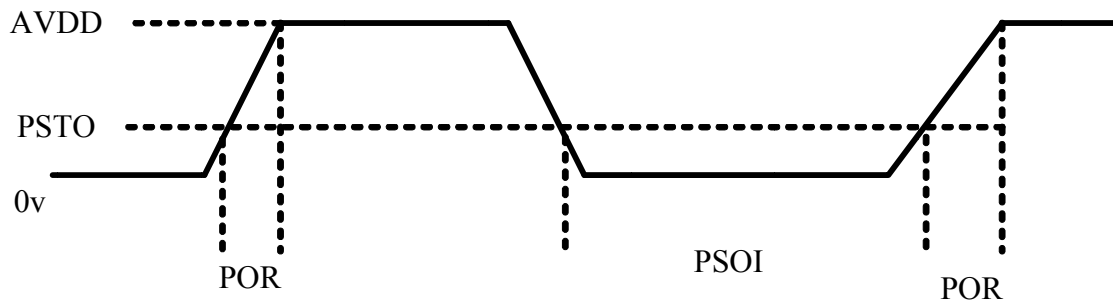
3.4 Magnetic Sensor Specifications

(Operating conditions: Ta=+25°C; AVDD=2.5V; DVDD=1.8V; 4.7µF ceramic capacitors tied to C1 pin with maximum allowed line width and 5mm distance.)

Parameter	Symbol	Condition	Min.	Typ.	Max	Unit
Dynamic Range	DR	TA=25 °C		±1000		uT
Linearity	LIN			0.5		%FS
Resolution	RES			0.3		uT/LSB
Sensitivity	SEN			3.3		LSB/uT
Zero Gauss Offset	ZGD			±0.3		uT

Hysteresis	HS			0.1		%FS
Sensitivity Temperature Drift	TD_S	-40 ~ 85 °C		±0.025		%/°C
Zero-B Offset Temperature Drift	TD_O	-40 ~ 85 °C		0.016		uT/°C

3.5 Power On Reset (POR) Specifications



PSTO: Power Supply Turn Off voltage
 PSOI: Power Supply Turn Off Interval
 POR: Power On Reset

PSTO: max=0.7volt
 PSOI: min=10ms
 POR: max:50ms

When POR circuit detects the rise of AVDD voltage, it resets all internal circuits and initializes all registers. After reset, IST8315 transits to Stand-By mode.

4 Ordering Information

Order Number	Package Type	Packaging	Marking Information
IST8315	BGA – 12 pin	Tape and Reel: 3k pieces per reel	X ₁ X ₂ X ₃ 15● X ₁ : Last number of the year X ₂ X ₃ : Week number 15: Product code

For more information on iSentek’s Magnetic Sensors, please contact us by phone at +86-132-6706-8686 (China), +86-755-2991-0201 (China) or +886-2-2698-3306 ext:110 (Taiwan); via e-mail: sales@isentek.com or visit us online at www.isentek.com.

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

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US Patent 9297863, 9562953B2 Taiwanese Patents I437249, I420128, I463160 and I565958 apply to our magnetic sensor technology described.