

# **IST8315**

# **3D Magnetometer**

# **Brief Datasheet**

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## 1 General Description

iSenteK IST8315 is a 3-axis digital magnetometer with 1.6x1.6x1.2mm<sup>3</sup>, 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 I<sup>2</sup>C 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
- 1.6x1.6x1.2mm<sup>3</sup>, 12-pin BGA package
- I<sup>2</sup>C 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

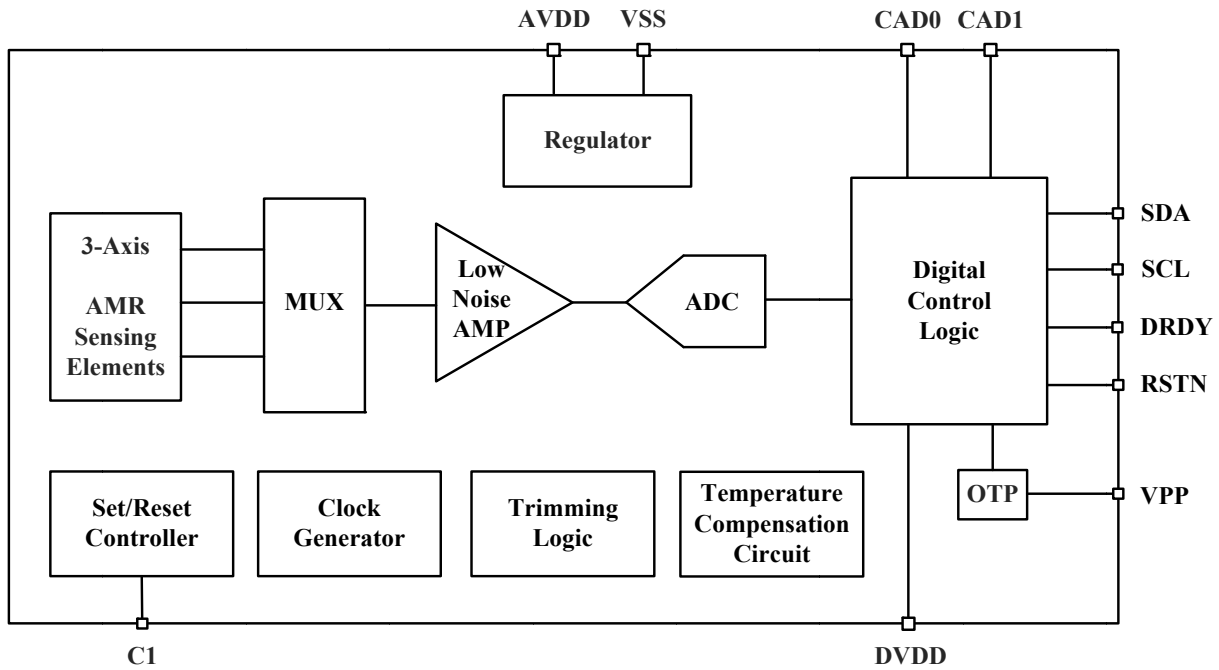
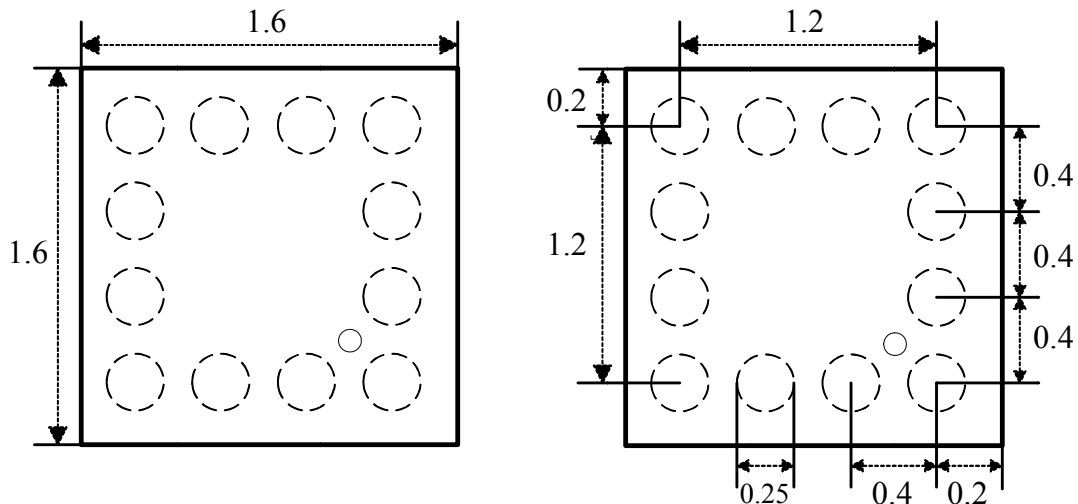


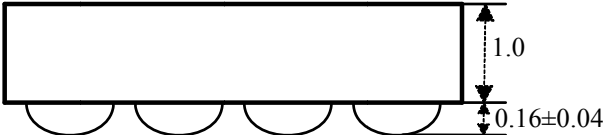
Figure 1. Block Diagram

### 2.2 Package Dimensions

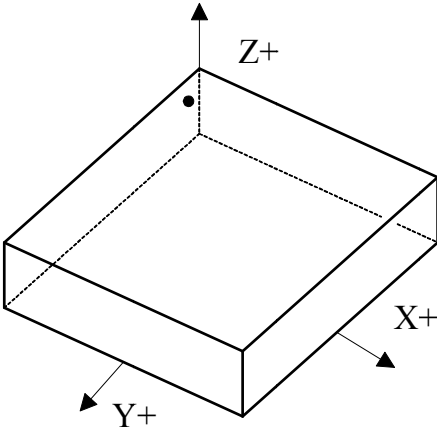
#### IST8315 BGA Top View (Looking Through)



IST8315 BGA Side View



IST8315 BGA 3D Top View



Unit: mm  
Tolerance: ±0.1mm

### 2.3 Application Circuits and Pin Descriptions

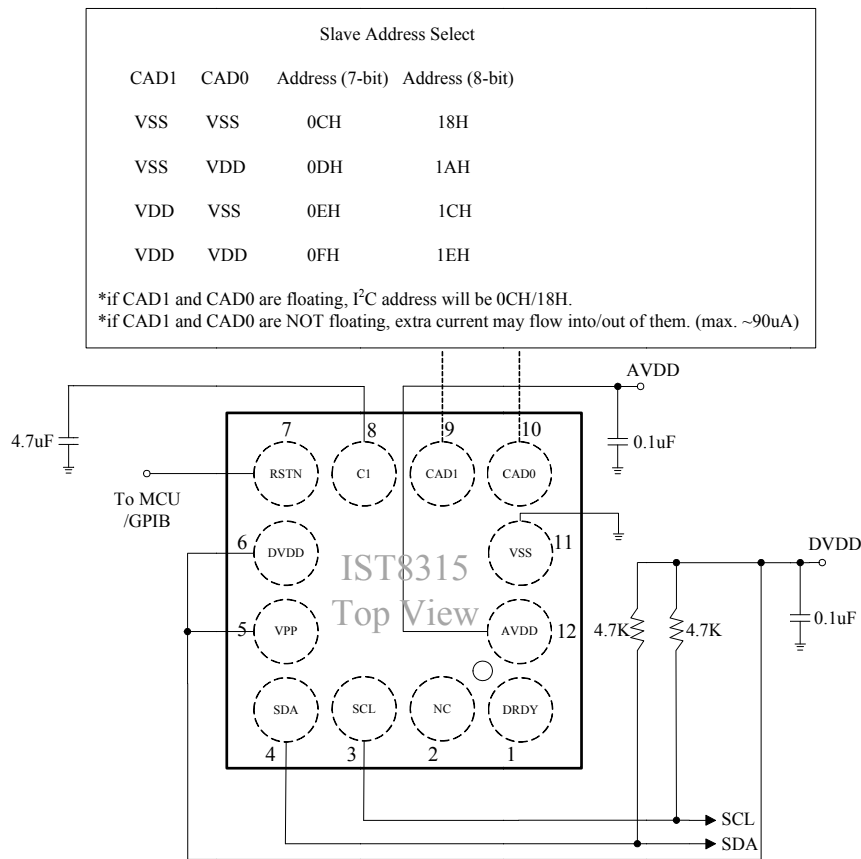


Figure 2. IST8315 Application Circuit

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

<sup>\*1</sup> Please refer to Figure 2 on page 7.

<sup>\*2</sup> 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* <sup>1</sup> | VESD_HBM                                 | -4000 to 4000    | V    |
| Electrostatic Discharge Voltage* <sup>2</sup> | VESD_MM                                  | -300 to 300      | V    |
| Electrostatic Discharge Voltage* <sup>3</sup> | 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* <sup>1</sup> =1 setting, at |              |      |                    |      |
|                                  |        | 10 sps   |              | 100  |                    | uA   |
|                                  |        | 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* <sup>2</sup> | Hz   |
| Over Sampling Rate* <sup>1</sup> | OSR    |  | 1            |      | 32                 |      |
| Input Low Voltage                | VIL    |  | 0            |      | DVDD<br>*30%       | V    |
| Input High Voltage               | VIH    |  | DVDD<br>*70% |      | DVDD               | V    |
| Output Low Voltage               | VOL    | IOL= +4 mA   | 0            |      | DVDD<br>*20%       | V    |
| Output High Voltage              | VOH    | IOH= -100 uA<br>(Except SCL and SDA)                 | DVDD<br>*80% |      | DVDD               | V    |

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

### 3.4 Magnetic Sensor Specifications

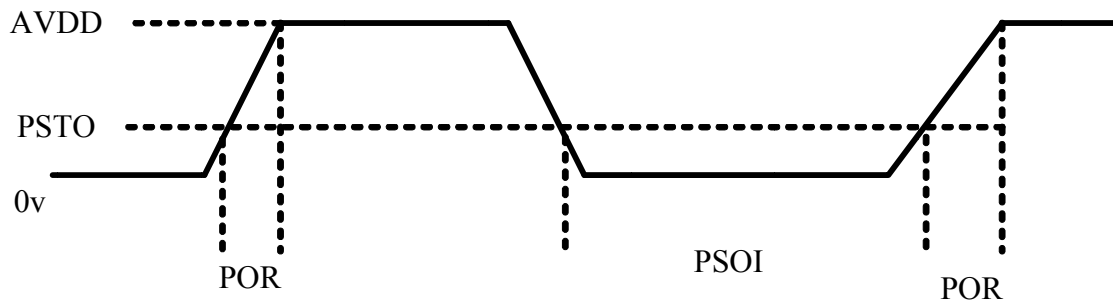
(Operating conditions: Ta=+25°C; AVDD=2.5V; DVDD=1.8V; 4.7µF ceramic capacitors tied to C1 pin with maximum allowed line width and 5mm distance.)

| 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<br>Temperature Drift   | TD_S | -40 ~ 85 °C |  | ±0.025 |  | %/°C  |
| Zero-B Offset<br>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 | $X_1X_2X_3$<br>15●<br>X <sub>1</sub> : Last number of the year<br>X <sub>2</sub> X <sub>3</sub> : Week number<br>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](mailto:sales@isentek.com) or visit us online at [www.isentek.com](http://www.isentek.com).

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