# IST8307
# 3D Magnetometer

# Datasheet

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# 1 General Description

iSentek IST8307 is a 3-axis digital magnetometer. It is an integrated chip with 3-axis magnetic sensors and control ASIC. IST8307 provides an $I^2C$ digital output with fast mode up to 400kHz. The high output data rate, low noise, ultra-low hysteresis features and excellent temperature drift performance make it a perfect candidate for high accuracy applications.

**Features**

- Single chip 3-axis magnetic sensor
- $I^2C$ slave, Fast Mode up to 400kHz
- Compact form factor, 1.6x1.6x1.0$mm^3$, 12-pin BGA package
- Wide dynamic range of ±1600 uT (x, y-axis) and ±2500 uT (z-axis)
- 14 bits data output
- High output data rate of maximum 200Hz
- Ultra-low hysteresis (<0.1%FS)
- Ultra-low sensitivity temperature drift (±0.016 %/ $^oK$)
- Ultra-low offset temperature drift (0.024 uT/ $^oK$)
- High precision temperature compensation
- Built-in self-test function
- Software and algorithm support available (Tilt & cross-axis compensation)

**Applications**

Quadcopter/Drone Applications
Augmented Reality Applications
Virtual Reality Applications
Location Based Services
Navigation Applications
Industrial Applications
Magnetometry
IOT devices
Heading
Gaming

# 2 Block Diagram, Package Dimension and Application Circuit

## 2.1 Block diagram

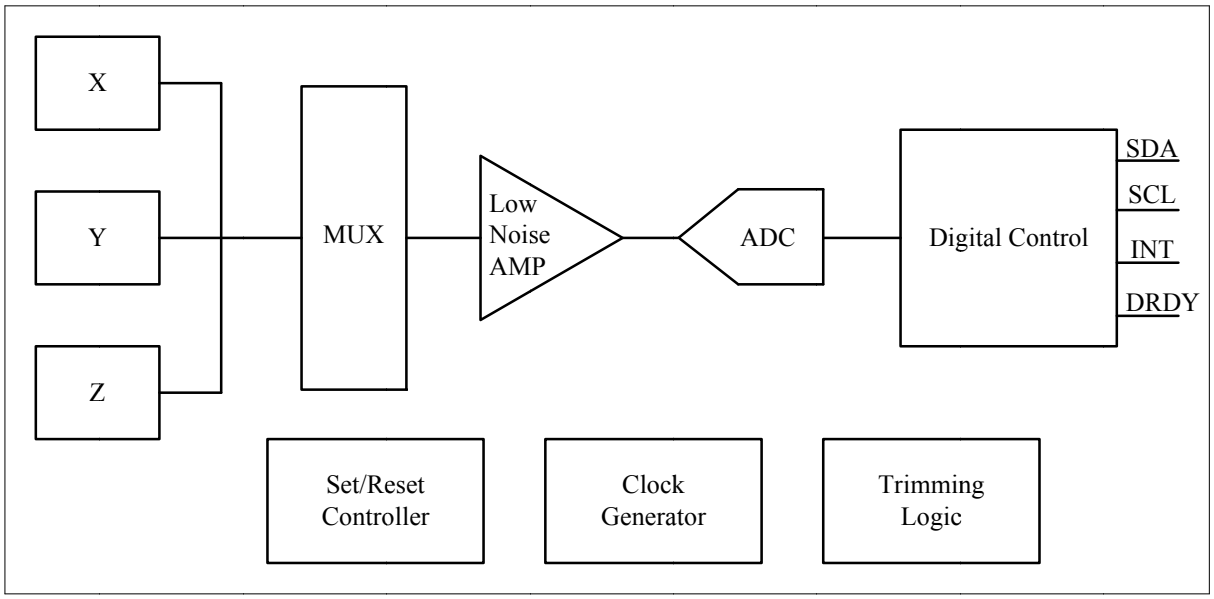
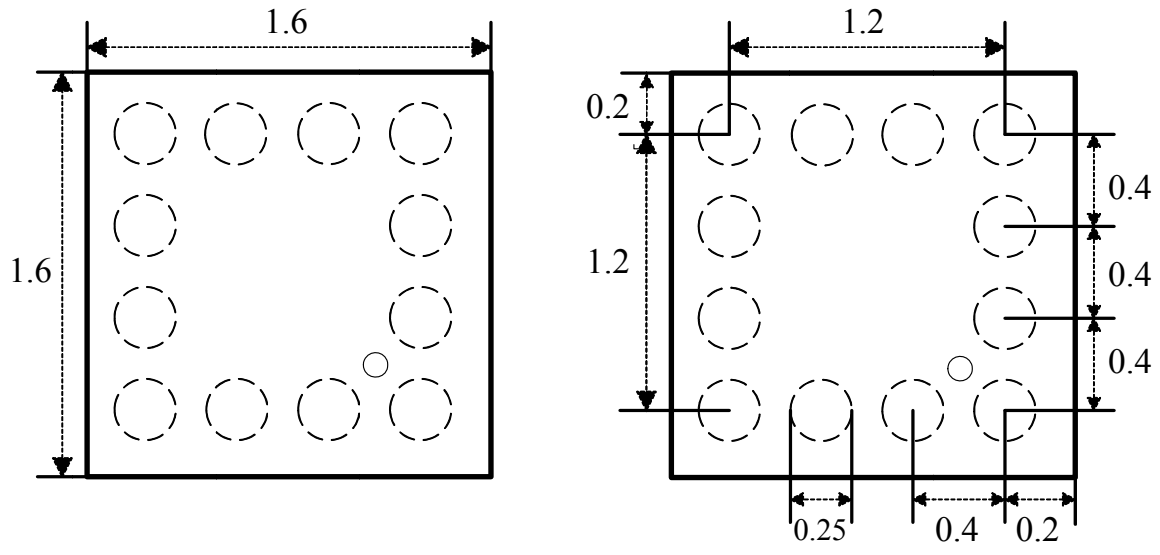


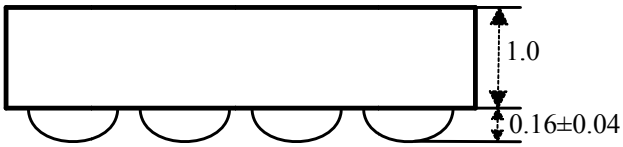

Figure 1. Block Diagram

## 2.2 Package Dimensions and Pin Description

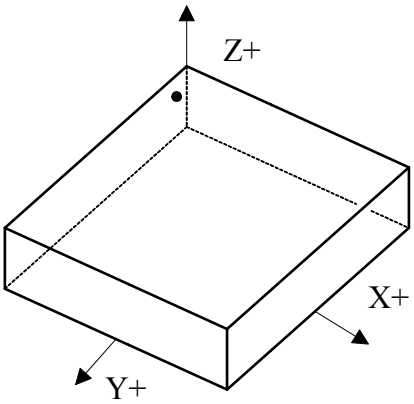
IST8307 BGA Top View



# IST8307 BGA Side View




# IST8307 3D Top View




Unit: mm

Tolerance: ±0.1mm

| Pin | Name | Function |
|---|---|---|
| 1 | DRDY | Data ready indication, output pin only |
| 2 | NC | Not use |
| 3 | SCL | $I^2C$ serial clock |
| 4 | SDA | $I^2C$ serial data |
| 5 | VPP | Test pin, floating connection is suggested |
| 6 | DVDD | Digital supply voltage, 1.72~3.6V |
| 7 | RSTN | Reset pin, resets registers by setting it to “Low”. Internally pulled to “High” for floating connection. MCU connection is suggested (but not necessary). |
| 8 | C1 | Set/Reset function, 4.7uF |
| 9 | CAD1 | $I^2C$ slave address |
| 10 | CAD0 | $I^2C$ slave address |
| 11 | VSS | GND |
| 12 | AVDD | Analog supply voltage, 1.72~3.6V |

*please refer to Figure 2.

## 2.3 Application Circuit

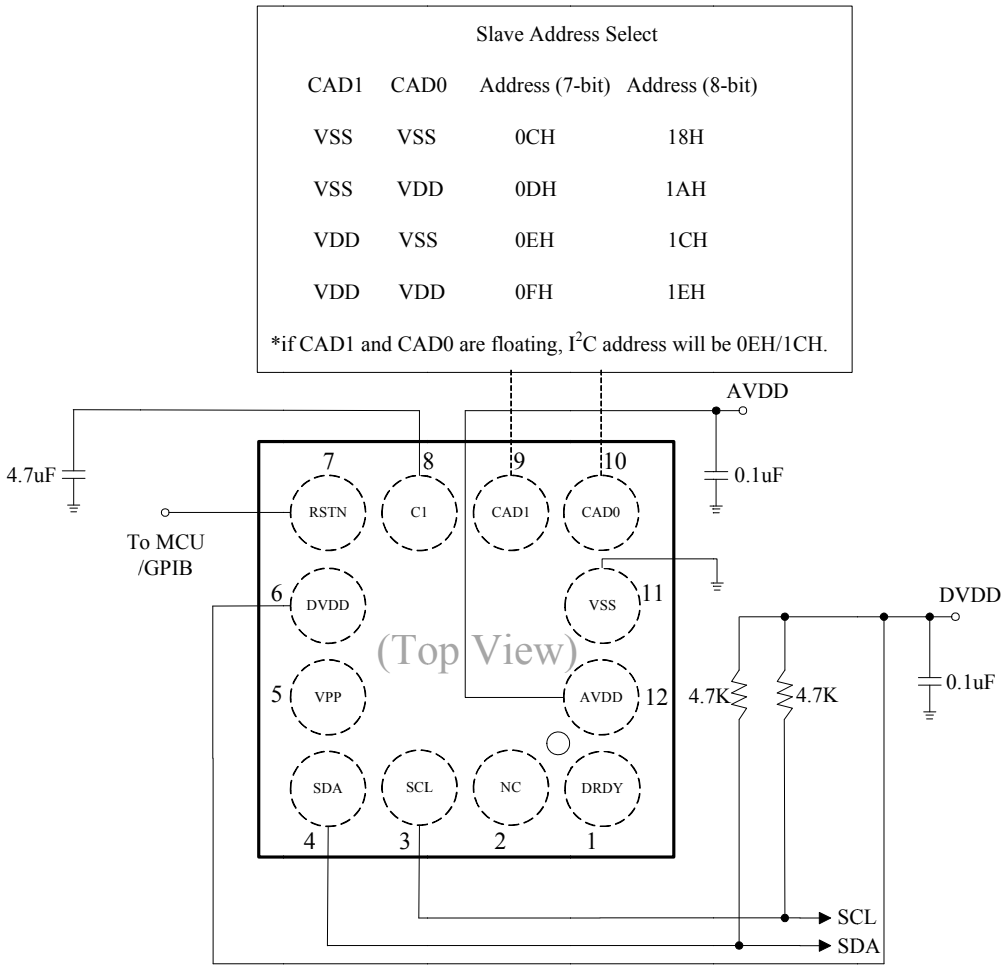



Figure 2. Application Circuit

# 3 Electrical Specifications

## 3.1 Absolute Maximum Rating

| Parameter | Symbol | Limits | Unit |
|---|---|---|---|
| Storage Temperature | TSTG | -40 to +125 | °C |
| Operating Temperature | TA | -40 to +85 | °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 | -350 to 350 | V |
| Reflow Classification | JESD22-A113 with 260 °C Peak Temperature | | |

1. Human Body Model (HBM)
2. Machine Model (MM)

## 3.2 Recommended Operating Conditions

| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Operating Temperature | TA | -40 | | +85 | °C |
| Analog Supply Voltage | AVDD | 1.72 | 2.8 | 3.6 | V |
| Digital Supply Voltage | DVDD | 1.72 | 1.8 | 3.6 | V |

## 3.3 Electrical Specifications

(Operating conditions: TA=+25℃; AVDD=2.8V; DVDD=1.8V; 0.1μF ceramic capacitors **tied closely** to AVDD/DVDD and GND respectively.)

| Parameter | Symbol | Conditions | Min. | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Operating Current | IDD3A | Full operation, at | | | | uA |
| | | 1 sps | | 20 | | |
| | | 8 sps | | 72 | | |
| | | 10 sps | | 80 | | |
| | | 20 sps | | 140 | | |
| | | 50 sps | | 320 | | |
| | | 100 sps | | 600 | | |
| | | 200 sps | | 1200 | | |
| Standby Current | ISTB | | | 10 | | uA |

| | | | | | | |
|---|---|---|---|---|---|---|
| Output Data Rate (ODR) | ODR | | 1 | | 200 | Hz |
| 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 |

### 3.4 Magnetic Sensor Specifications

(Operating conditions: Ta=+25℃; AVDD=2.8V; DVDD=1.8V; 4.7μF ceramic capacitors **tied closely** to C1 and GND respectively. )

| Parameter | Symbol | Condition | Min. | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Dynamic Range | MDR_XY | TA=25 °C | | ±1600 | | uT |
| | MDR_Z | TA=25 °C | | ±2500 | | |
| Linearity | LIN | X-axis | | 1 | 1.5 | %FS |
| | | Y, Z-axis | | 0.1 | 0.5 | |
| Resolution | RESO | | | 0.3 | | uT/LSB |
| Sensitivity | SEN | | | 3.3 | | LSB/uT |
| Zero Gauss Offset | ZGD | RMS value | | ±0.3 | | uT |
| Hysteresis | HS | | | 0.1 | | %FS |
| Sensitivity Temperature Drift | TD_S | -40 ~ 85 °C | | ±0.016 | | %/ °K |
| Zero-B Offset Temperature Drift | TD_O | -40 ~ 85 °C | | 0.024 | | uT/ °K |

## 4 Ordering Information

| Order Number | Package Type | Packaging | Marking Information |
|---|---|---|---|
| IST8307 | BGA – 12 pin | Tape and Reel: 3k pieces per reel | XAB + 02<br>X: Last number of the year<br>AB: Week of the year<br>02: Product code of IST8307 |

For more information on iSentek's Magnetic Sensors, please contact us by phone at +86-132-6706-8686 (China), +86-755-3337-0168 (China) or +886-2-2698-3306 ext:110 (Taiwan); via e-mail: sales@isentek.com or visit us online at www.isentek.com.

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US Patent 9,297,863, Taiwanese Patents I437249, I420128 and I463160 apply to our magnetic sensor technology described.