# IST8306
# 3D Magnetometer

# Datasheet

# Table of Contents

# 1 General Description

iSentek IST8306 is a 3-axis digital magnetometer with 0.8 × 0.8 × 0.53 $mm^3$, 4-pin WLCSP-BGA package. It is an integrated chip with 3-axis magnetic sensors, digital control logic, built-in temperature compensation circuit and self-test function. IST8306 provides an $I^2C$ digital output with fast mode up to 400 kHz. The high output data rate, ultra-low noise, ultra-low hysteresis and excellent output stability over working temperature range make it a perfect product for high applications requiring high outstanding accuracy.

**Features**

- Monolithic 3-axis magnetic sensor
- Ultra-compact package size of 0.8 × 0.8 × 0.53 $mm^3$, 4-pin WLCSP-BGA package
- $I^2C$ slave, Fast Mode up to 400 kHz
- Wide dynamic range of ±3000 uT for each axis
- Maximum 200Hz output data rate
- Ultra-low hysteresis (~0.1 %FS)
- Low suspend current of 0.5uA
- Wide operating temperature range
- High precision temperature compensation
- Built-in self-test function
- Built-in noise suppression filter
- Software and algorithm support available (For tilt compensation, soft/hard-iron calibration)

**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

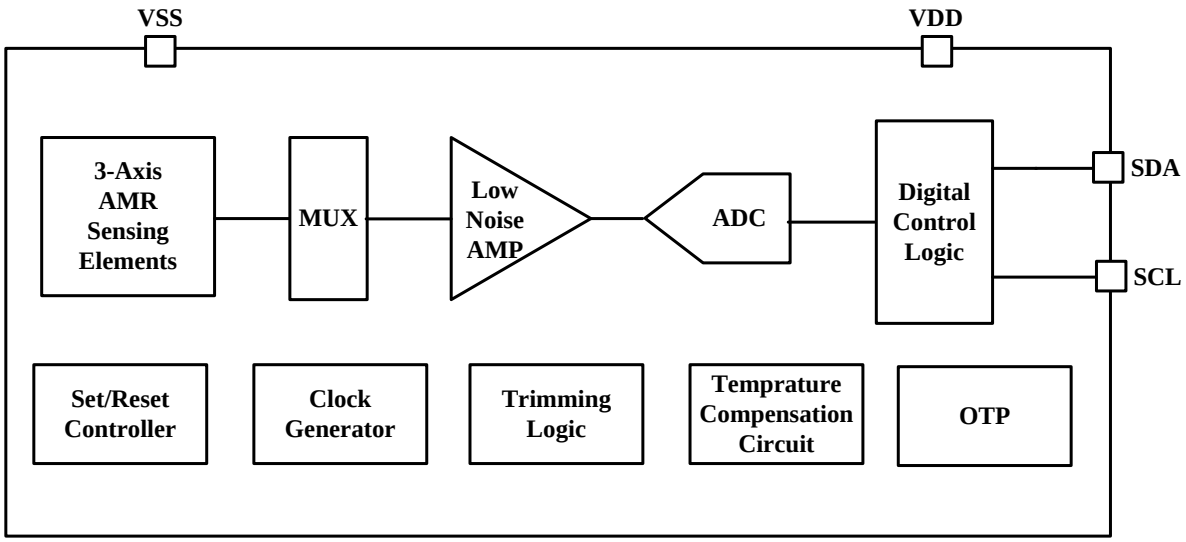



Figure 1. Block Diagram

## 2.2 Package Dimensions and Magnetic Field Directions

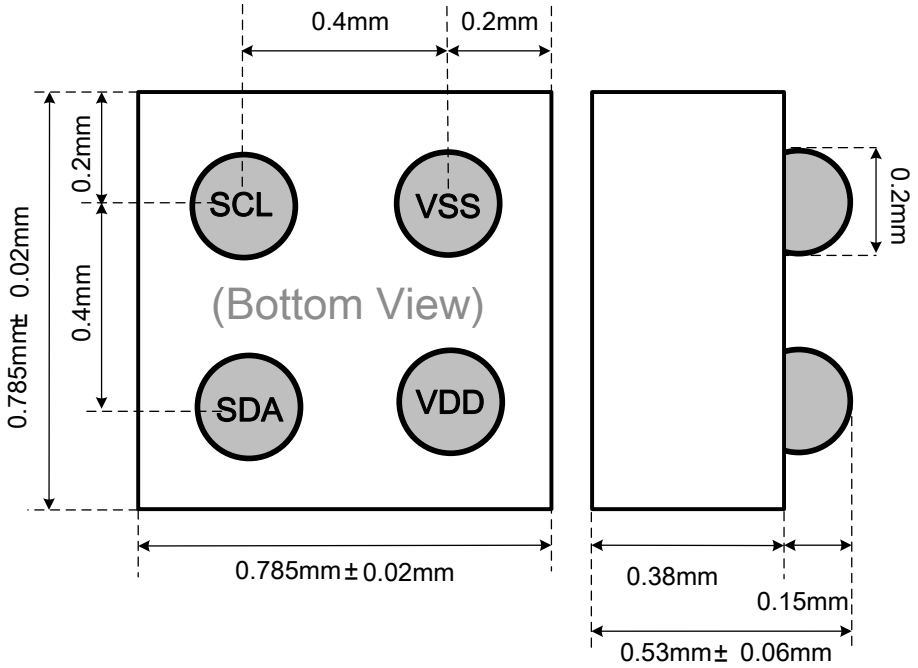



Figure 2. Package Dimensions

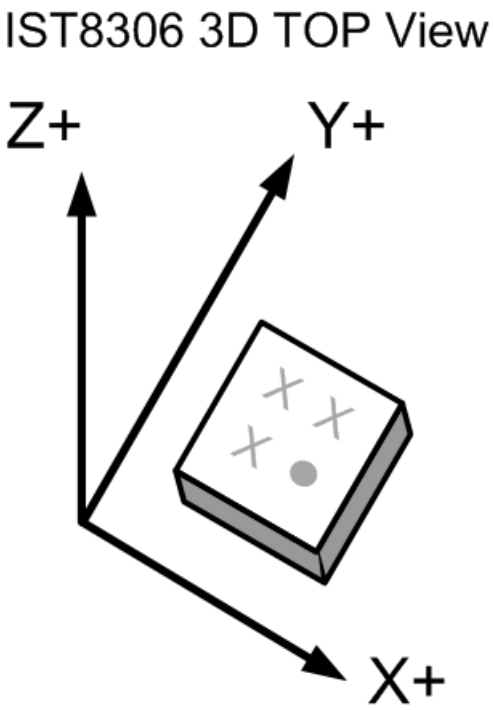



Figure 3.Magnetic Field Directions

## 2.3 Pin Configurations and Functions

| Pin No | Pin Name | I/O type | Function |
|---|---|---|---|
| 1 | VSS | Supply | Ground |
| 2 | VDD | Supply | Power supply voltage, 1.65~1.95V |
| 3 | SDA | I/O | $I^2C$ data |
| 4 | SCL | I | $I^2C$ clock |

## 2.4 Application Circuit

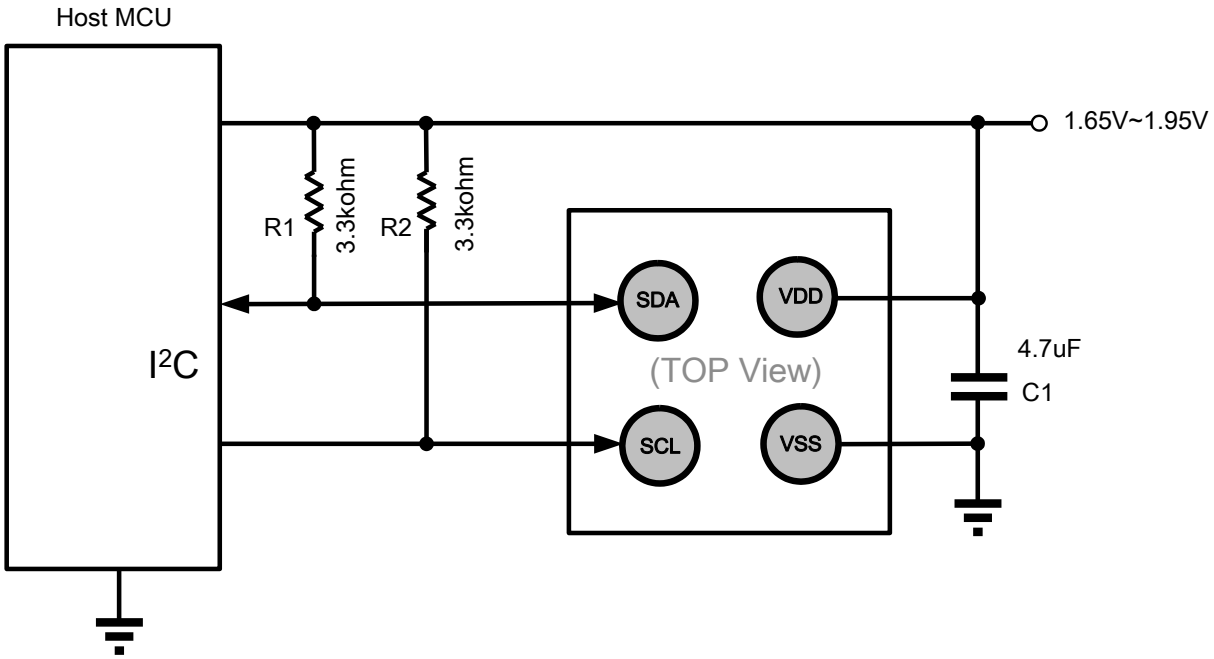



Figure 4. Application Circuit

# 3 Electrical Specifications

## 3.1 Absolute Maximum Ratings

| Parameter | Symbol | Limits | Unit |
|---|---|---|---|
| Storage Temperature | TSTG | -40 to +150 | ºC |
| Supply Voltage | VDD | -0.3 to +1.98 | V |
| Electrostatic Discharge Voltage*[1] | VESD_HBM | -4000 to 4000 | V |
| Electrostatic Discharge Voltage*[2] | VESD_MM | -400 to 400 | V |
| Electrostatic Discharge Voltage*[3] | VESD_CDM | -800 to 800 | V |
| Reflow Classification | JESD22-A113 with 260 ºC 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 | -20 | | +85 | ºC |
| Supply Voltage | VDD | 1.65 | 1.8 | 1.95 | V |

### 3.3 Electrical Specifications

(Operating conditions: TA=+25℃; VDD=1.8V; 4.7μF ceramic capacitors tied to between VDD & VSS pin with maximum allowed line width and 5mm distance.)

| Parameter | Symbol | Conditions | Min. | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Operating Current | IDD3A | with OSR*[1]=32 setting,<br>10 sps<br>50 sps<br>100 sps | | <br>0.25<br>1.2<br>2.3 | | mA |
| Suspend Current | ISPD | | | 0.5 | | uA |
| Output Data Rate (ODR) | ODR | | | 200*[2] | | Hz |
| Input Low Voltage | VIL | | 0 | | VDD *30% | V |
| Input High Voltage | VIH | | VDD *70% | | VDD | V |
| Output Low Voltage | VOL | IOL= +4 mA | 0 | | VDD *20% | V |
| Output High Voltage | VOH | IOH= -100 uA (Except SCL and SDA) | VDD *80% | | VDD | V |

1. Register OSRCNTL(0x41) controls OSR setting.
2. 200Hz ODR can be achieved with OSR≦16.

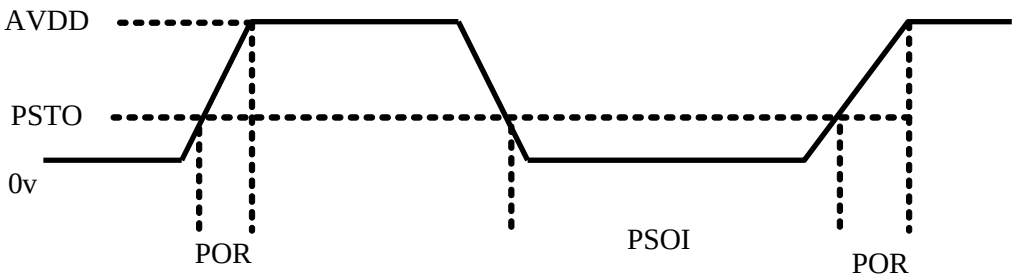
### 3.4 Magnetic Sensor Specifications

(Operating conditions: TA=+25℃; VDD=1.8V; 4.7μF ceramic capacitors tied to between VDD & VSS pin with maximum allowed line width and 5mm distance.)

| Parameter | Condition | Min. | Typ. | Max | Unit |
|---|---|---|---|---|---|
| Dynamic Range (Each Axis) | Total Applied Field | | ±3000 | | uT |
| Linearity | ±200 uT Range | | 0.1 | | %FS |
| | ±3000 uT Range | | 1.5 | | |

| | | | | | |
|---|---|---|---|---|---|
| Resolution | | | 0.3 | | uT/LSB |
| Sensitivity | | | 3.3 | | LSB/uT |
| Hysteresis | | | 0.1 | | %FS |
| RMS Noise | | | 0.8 | | uT |

### 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 VDD voltage, it resets all internal circuits and initializes all registers. After reset, IST8306 transits to Stand-By mode.

## 4 Ordering Information

| Order Number | Package Type | Packaging |
|---|---|---|
| IST8306 | WLCSP – 4 pin | Tape and Reel:<br>5k pieces per reel |

For more information on iSentek's Magnetic Sensors, please contact us by phone at +86-156-22888-337 (China) or +886-2-2698-3306 ext:114 (Taiwan); via e-mail: sales@isentek.com or visit us online at www.isentek.com.

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The sensing technology of IST8306 is protected by US Patent 9,970,997, CN Patent CN106125020A.