# IST8601S
# 2D TMR sensor

# Preliminary
# Datasheet

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## 1. General Description

IST8601S is a 2-axis analog TMR sensor in 4.85 × 6.0 × 1.60 $mm^3$ SO-8 package. The device integrates two Wheatstone bridge structures oriented orthogonally, enabling accurate measurement of magnetic field strength and angular position.

The SO-8 package provides robust handling and simplified PCB assembly, making the IST8601S well suited for mass production and system integration. Typical applications include linear and angular position sensing, current sensing, and magnetic switch functions.

**Features**

- 2-axis TMR sensor with orthogonal Wheatstone bridges
- Analog differential voltage outputs (X and Y channels)
- High sensitivity with low hysteresis
- Wide operating temperature range: –40 °C to 85 °C
- Low power consumption
- Standard SO-8 package for easy PCB assembly

**Applications**

- Angular position detection
- Linear displacement sensing
- Current sensing (with external magnetic core)
- Magnetic switch and proximity detection
- Endpoint detection in cylinders and actuators
- Reference field monitoring

# 2. Package Dimensions, Pin Configurations, and Application Circuit

## 2.1. Pin Configurations and Sensing Directions

IST8601S is available in an SO-8 package. The device provides differential analog outputs for the X- and Y-axis Wheatstone bridges. Figure 1 shows the pinout diagram (top view).

Table 1. Pin Definition

| Pin[*1] | Name | Function |
|---|---|---|
| 1 | $VDD_{X2}$ | Supply voltage for X2 sensor |
| 2 | $VDD_{Y}$ | Supply voltage for Y sensor |
| 3 | GND | Ground |
| 4 | $VDD_{X1}$ | Supply voltage for X1 sensor |
| 5 | $VOX_{n}$ | Negative output of X |
| 6 | $VOY_{n}$ | Negative output of Y |
| 7 | $VOY_{p}$ | Positive output of Y |
| 8 | $VOX_{p}$ | Positive output of X |

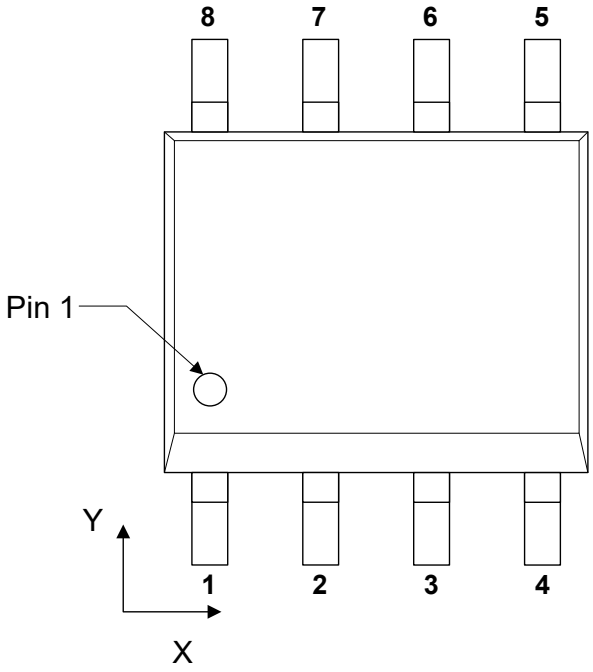


Figure 1. IST8601S pin configuration and sensing directions (top view)

## 2.2. Package Dimensions

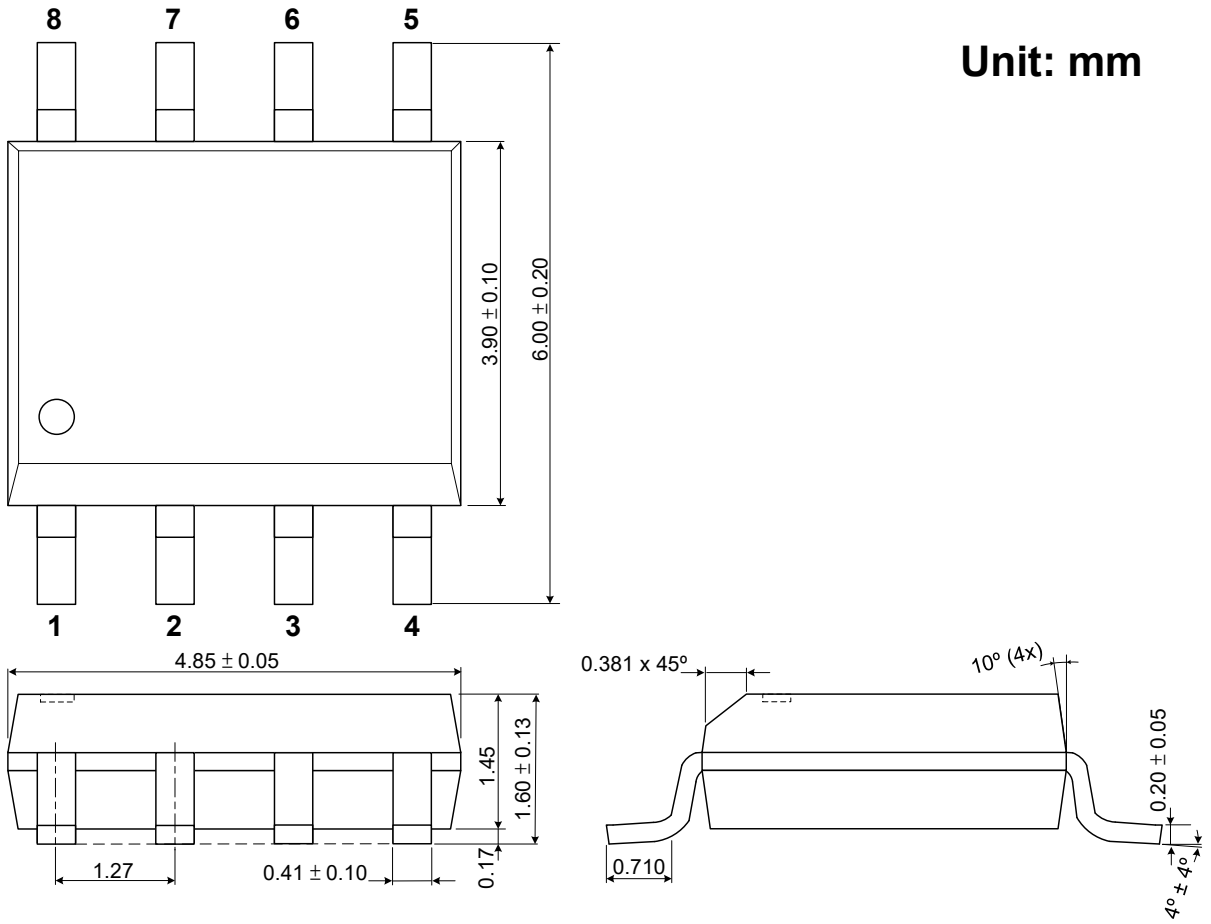


Figure 2. IST8601S package outline (dimensions in mm)

### 2.3. Application Circuit

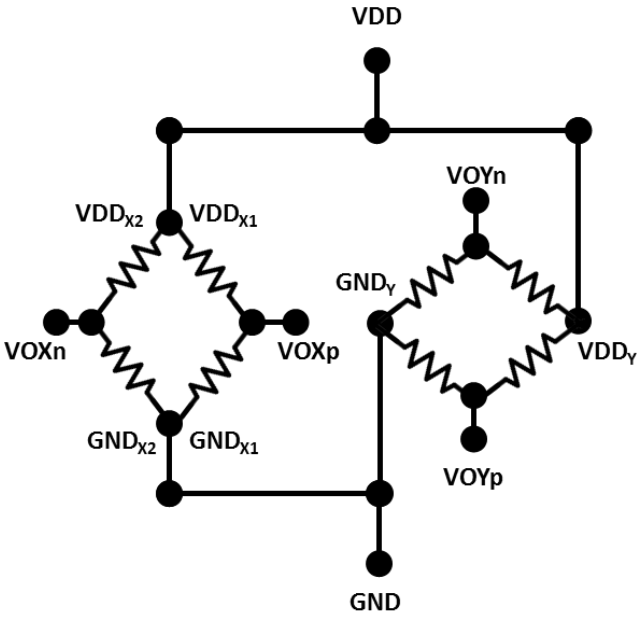


Figure 3. Typical application circuit of IST8601SS

## 3. Specifications

### 3.1. Absolute Maximum Ratings

| Parameter | Symbol | Limits | Unit |
|---|---|---|---|
| Storage Temperature | TSTG | -40 to 125 | °C |
| Supply Voltage | VDD | -10.0 to 10.0 | V |
| Electrostatic Discharge Voltage*[1] | VESD_HBM | 250 | V |
| Reflow Classification | JESD22-A113 with 260 ˚C Peak Temperature | | |

1. Human Body Model (HBM)

### 3.2. Recommended Operating Conditions

| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Supply Voltage | VDD | ±3.3 | ±5 | ±10 | V |
| Dynamic range (linear mode) | $DR_L$ | -20 | | +20 | mT |
| Dynamic range (saturation mode) | $DR_S$ | | 30 – 50 | | mT |
| | | | -50 – -30 | | |
| Operating Temperature | TA | -20 | | 85 | °C |

### 3.3. Electrical Specifications

(Operating conditions: TA = 25ºC; VDD = 5V.)

| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Offset voltage per VDD | $V_{off}$ | -5.0 | -- | 5.0 | mV/V |
| Bridge resistance | Rb | 120 | 140 | 160 | kΩ |
| Sensor resistance [1)] | Rs | 60 | 70 | 80 | kΩ |
| Sensitivity | $S_{Lin}$ | 7.2 | 7.6 | 8.0 | mV/V/mT |
| Temperature coefficient of sensitivity | $TC_S$ | -0.19 | | -0.13 | %/°C |
| Temperature coefficient of offset | $TC_{Offset}$ | -5.0 | -0.47 | 5.0 | μV/V/°C |
| Linearity | L | 0.6 | 0.8 | 1.0 | %FS |
| Hysteresis (±10 mT) | $H_s$ | | 0.152 | | mV/V |

[1)] It is recommended that the X-bridge and the Y-bridge are connected in parallel so that the final sensor resistance is half of the bridge resistance.

### 3.4. Magnetic Specifications

(Operating conditions: TA = 25ºC; VDD = 5 V)

| Parameter | Symbol | Min. | Typ. | Max | Unit |
|---|---|---|---|---|---|
| Linear range | $B_{lin}$ | | ±20 | | mT |
| Saturation rage | $B_{sat}$ | | 30 – 50 | | mT |
| | | | -50 – -30 | | |
| Hysteresis | $H_s$ | | 0.02 | | mT |
| Saturation field | $B_{sat}$ | -30 | | 30 | mT |
| Magnetic shock | $H_{MS}$ | -70 | | 70 | mT |
| Recover field | $H_{Re}$ | 9 | | 16 | mT |

### 3.5. Typical performance graphs

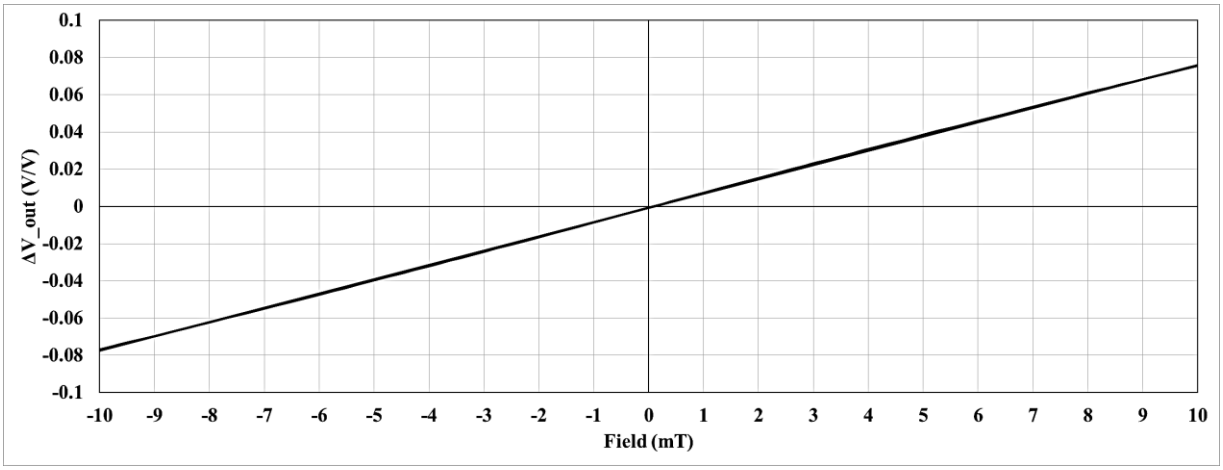


Figure 4. The typical output signal during recommend field range of ±10mT

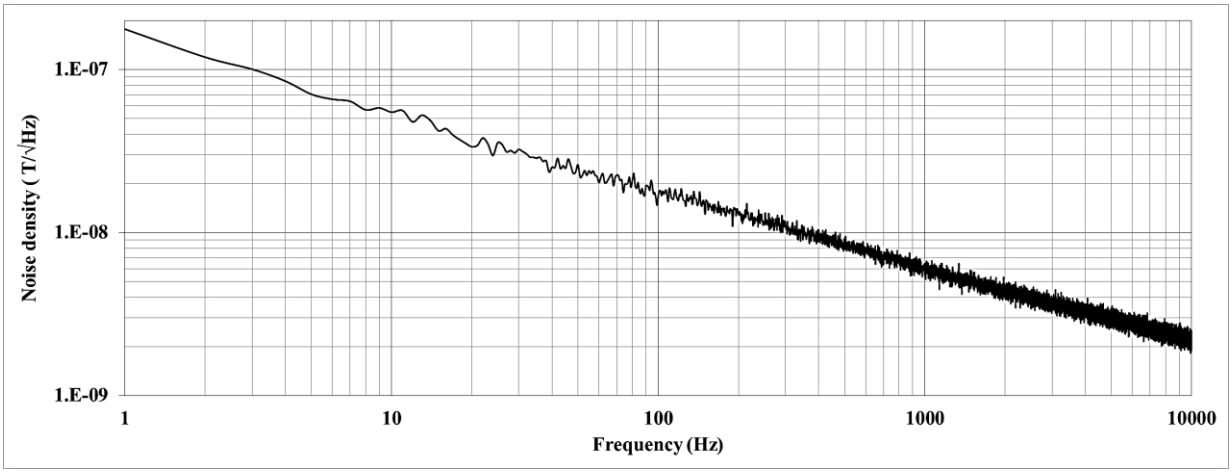


Figure 5. The Noise spectrum of IST8601S

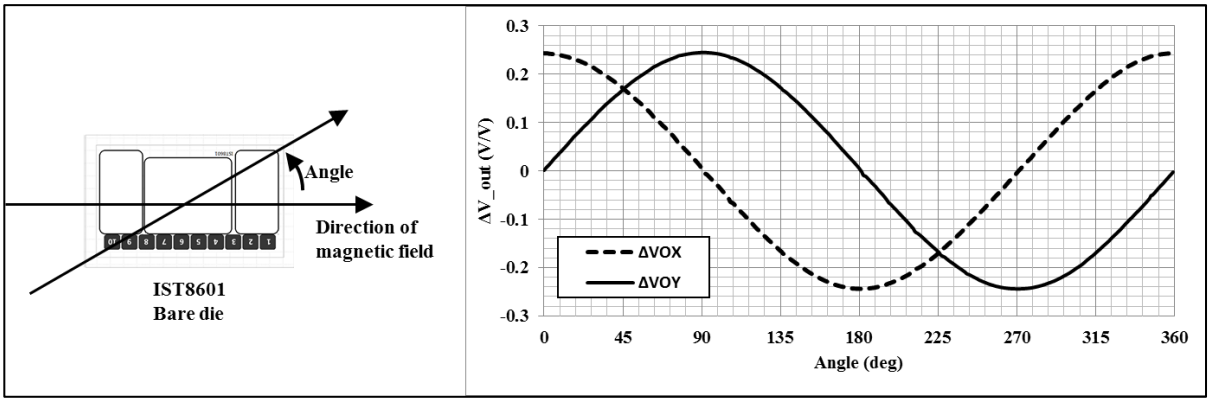


Figure 6. The output signals for the application of angle detection.

# 4. Ordering Information

For more information on iSentek's magnetic sensors, please send an email to sales@isentek.com or visit our website at www.isentek.com.

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

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