IST8601
2D TMR sensor

Preliminary
Datasheet

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1. General Description

iSentek IST8601 is a 0.79 × 0.53× 0.26 mm^3 2-axis analog TMR sensor die. The sensor contains two Wheatstone bridges with an orthogonal sensing direction. IST8601 is capable of operating not only in magnetic field strength sensing but also in angle detection applications.

IST8601 is available as a bare die on an undiced wafer or in any package for mass customization.

Features

- Based on the Tunnel magneto resistive (TMR) effect
- Contains two Wheatstone bridges
- Temperature range -40 ℃ to 85 ℃

Advantages

- Multiple application scenarios
- High sensitivity
- Large measurement range
- Low hysteresis
- Low power consumption

Applications

- Endpoint detection in cylinders
- Reference monitoring
- Magnetic switches
- Absolute linear and rotatory motion detections
- Angular sensor
- Current sensor

2. Configuration and application circuit

2.1. Pinning and sensing direction

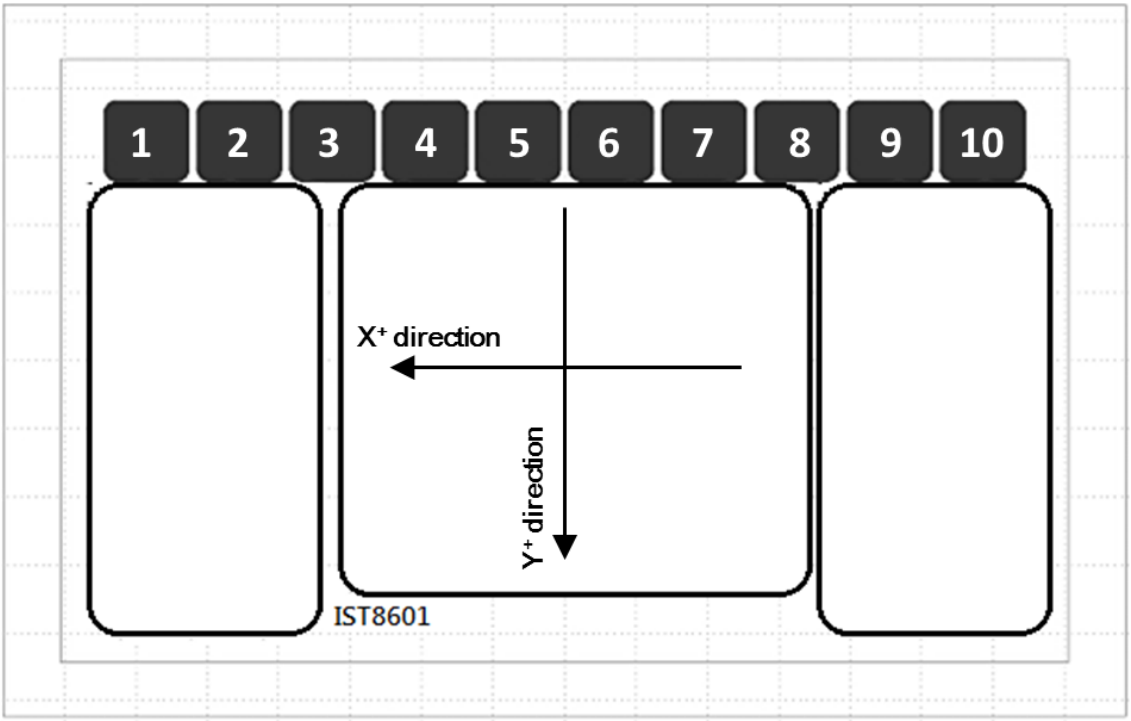

Figure 1. IST8601 with sensing directions from the pad-side view

Pin definition table

Pad	Symbol	Parameter
1	GND_{X2}	Ground of X2 sensor
2	VDD_{X2}	Power of X2 sensor
3	VOX_n	Negative output of X
4	VOY_n	Negative output of Y
5	GND_Y	Ground of Y sensor
6	VOY_+	Positive output of Y
7	VDD_Y	Power of Y sensor
8	VOX_p	Positive output of X
9	VDD_{X1}	Power of X1 sensor
10	GND_{X1}	Ground of X1 sensor

2.2. Dimension

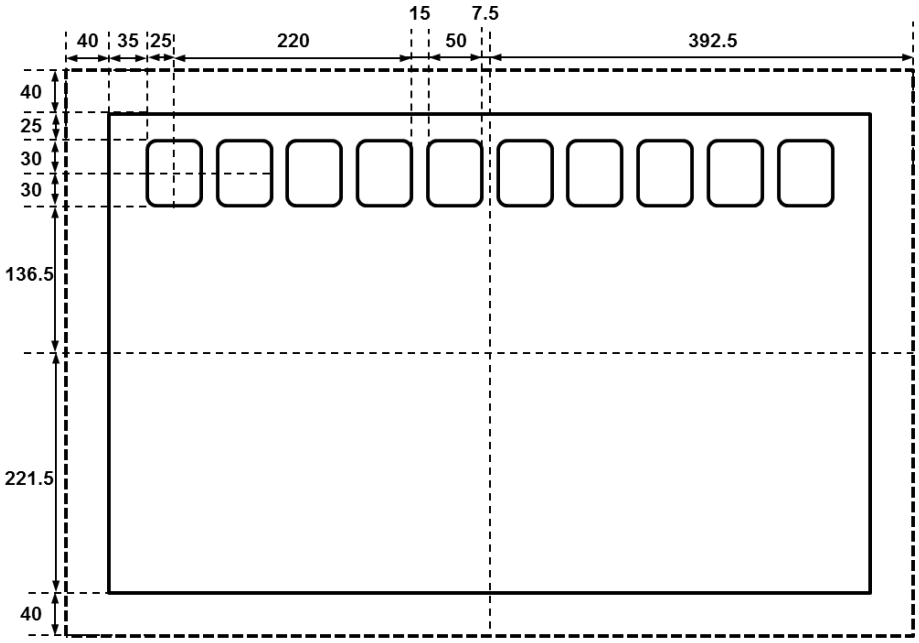

Figure 2. Dimensions of bare die (Unit: μm)

2.3. Application circuit of IST8601

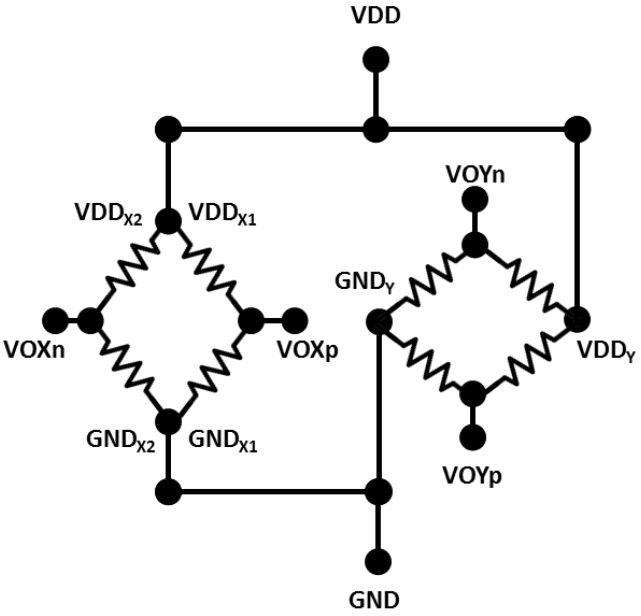

Figure 3. The application circuit of IST8601 for 2-D field sensing

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 = +25 ℃; 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 = +25 ℃; 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

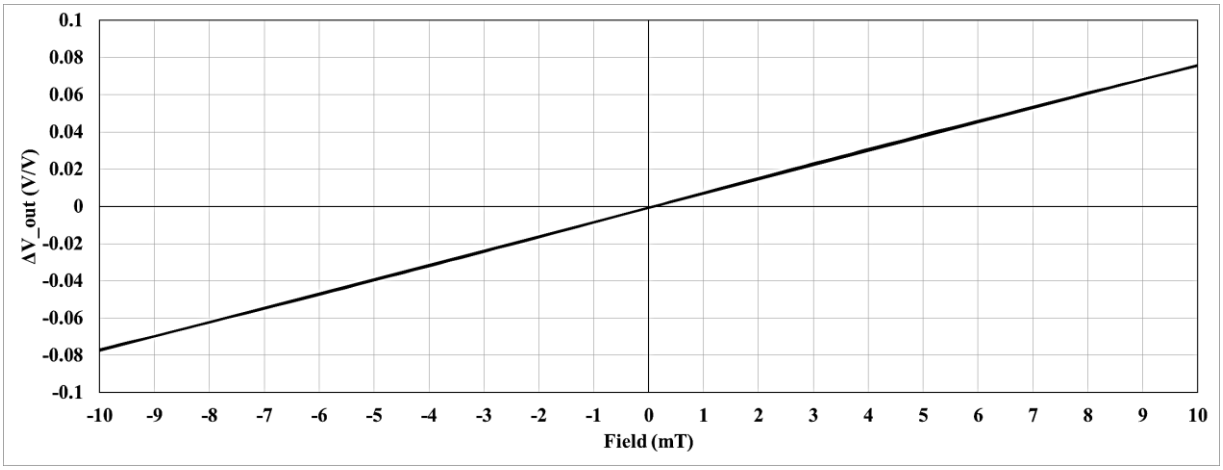

Figure 4. The typical output signal during recommend field range of ±10mT

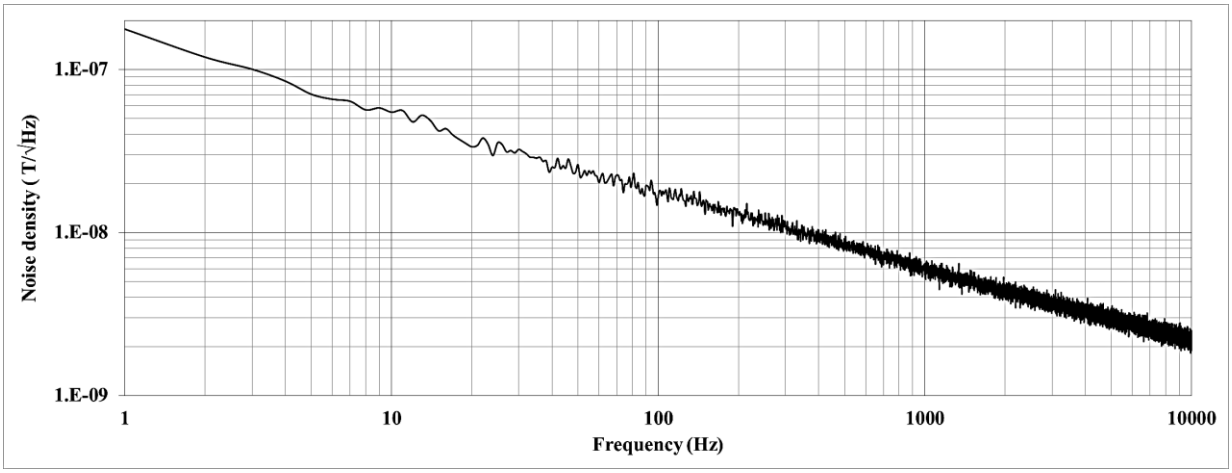

Figure 5. The Noise spectrum of IST8601

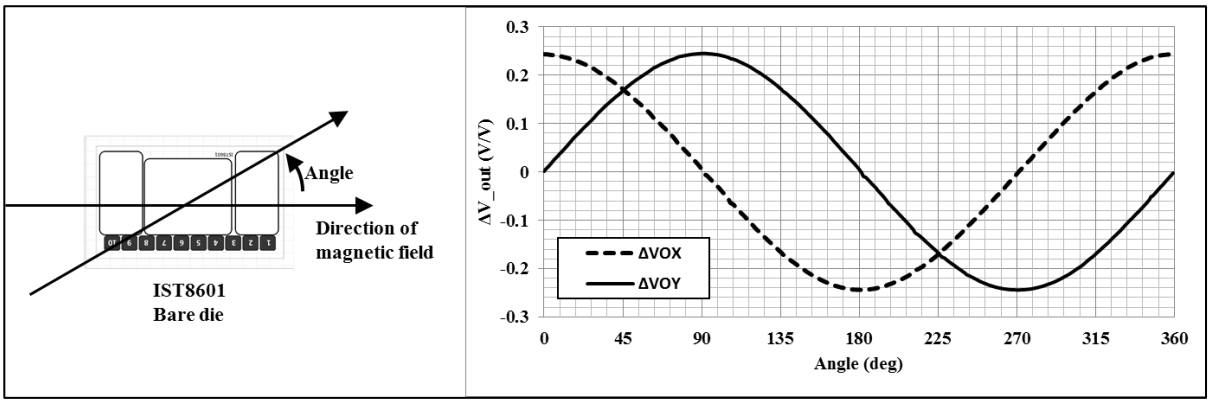

Figure 6. The output signals for the application of angle detection.

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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