

IST8801

Digital Linear Hall Sensor

Datasheet

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1 General Description

iSentek IST8801 is a digital linear hall sensor to measure magnetic flux intensity. It is an integrated chip with magnetic sensors and control ASIC with 16-bit ADC output. IST8801 provides an I²C digital output with fast mode up to 400 kHz. Wide dynamic range operation, high resolution and compact form factor features make it the best candidate for handheld, wearable and IoT devices.

Features

- Single chip linear hall sensor with digital output
- Compact form factor, 1.33 x 1.33 x 0.53mm³, 9-pin WLCSP-BGA package
- I²C slave, Fast Mode up to 400kHz
- High dynamic range of maximum $\pm 40.96\text{mT}$
- High resolution of maximum 0.3125 uT/LSB (16-bit setting with 10.24mT dynamic range)
- High output data rate of maximum 500Hz
- 8~16-bit adjustable data output
- Operation Temperature -40~85°C
- Built-in oscillator for internal clock source
- Power on Reset circuit

Applications

Magnetometer for external magnet detection

Lid opening angle detection

Displacement detection

VCM modules

2 Block Diagram, Package Dimension, Magnetic Field Direction and Application Circuit

2.1 Block diagram

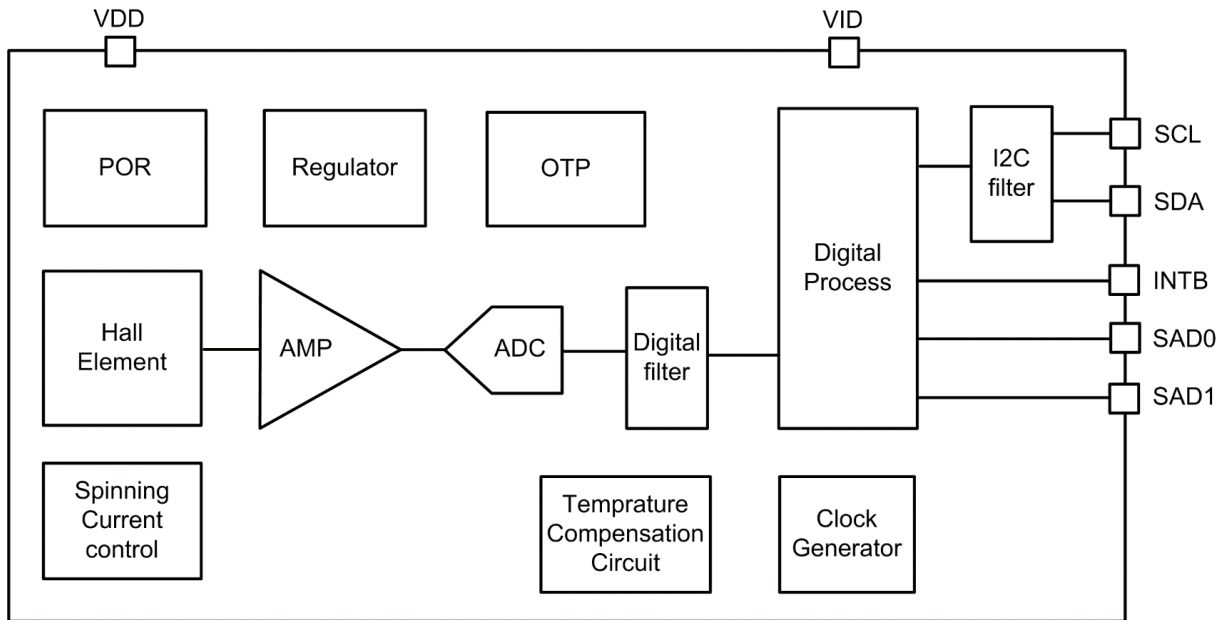


Figure 1. Block Diagram

2.2 Package Dimensions and Hall Element Locations

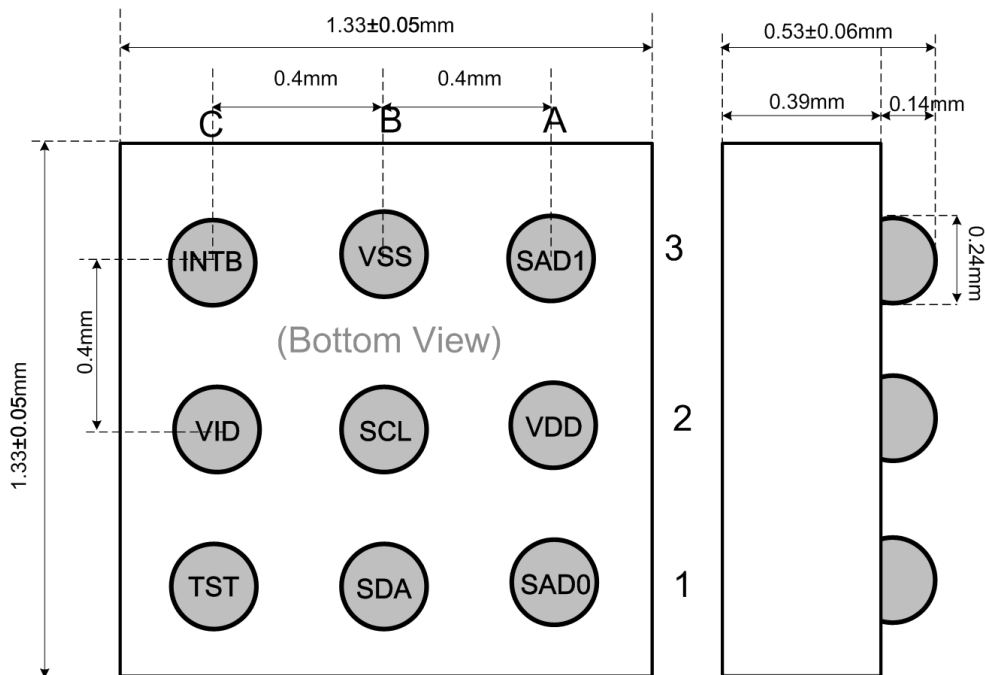


Figure 2. Package Dimensions

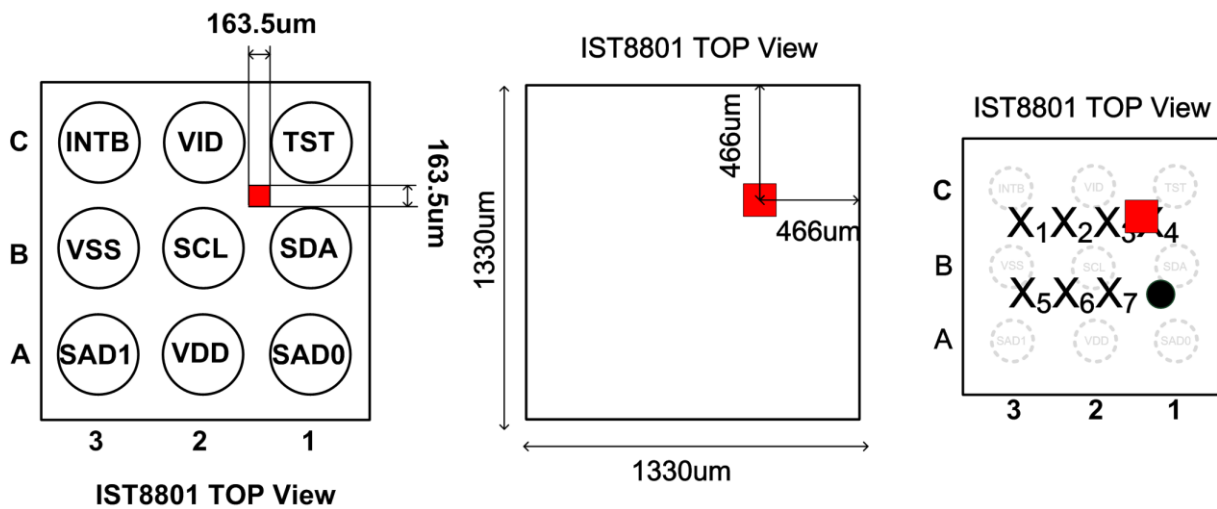


Figure 3. Hall Element Locations

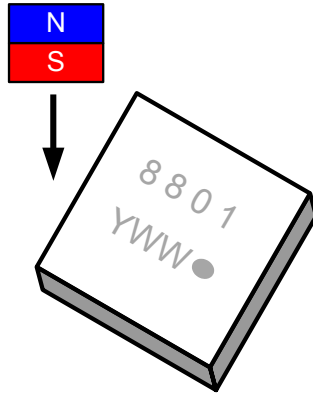
2.3 Pin Configurations and Functions

Pin No	Pin Name	I/O type	Function
A1	SAD0	I	I ² C slave address selection, connect to GND or VDD. Internally pull-low when floating
A2	VDD	Supply	Power supply voltage: 1.8~3.6V
A3	SAD1	I	I ² C slave address selection, connect to GND or VDD. Internally pull-low when floating.
B1	SDA	I/O	I ² C data, should be connected to VID with 1.5k Ohm resistor
B2	SCL	I	I ² C clock, should be connected to VID with 1.5k Ohm resistor
B3	VSS	Supply	Should be connected to Ground
C1	TST	I/O	Keep it floating or connect it to VDD/GND* ¹
C2	VID	Supply	Digital power supply voltage: 1.65~VDD.
C3	INTB	O	When detected magnetic flux density meets specific threshold level, INTB become low level unless user clear it manually via PERSINT[0]. Internally pull-high when floating.

*¹ TSTCNTL register (0x76H) need to be set to 0x04H when TST pin is connected to VDD/GND.

2.4 Magnetic Field Direction

The measurement data increases as the magnetic flux density increases in the arrow directions



2.5 Application Circuit

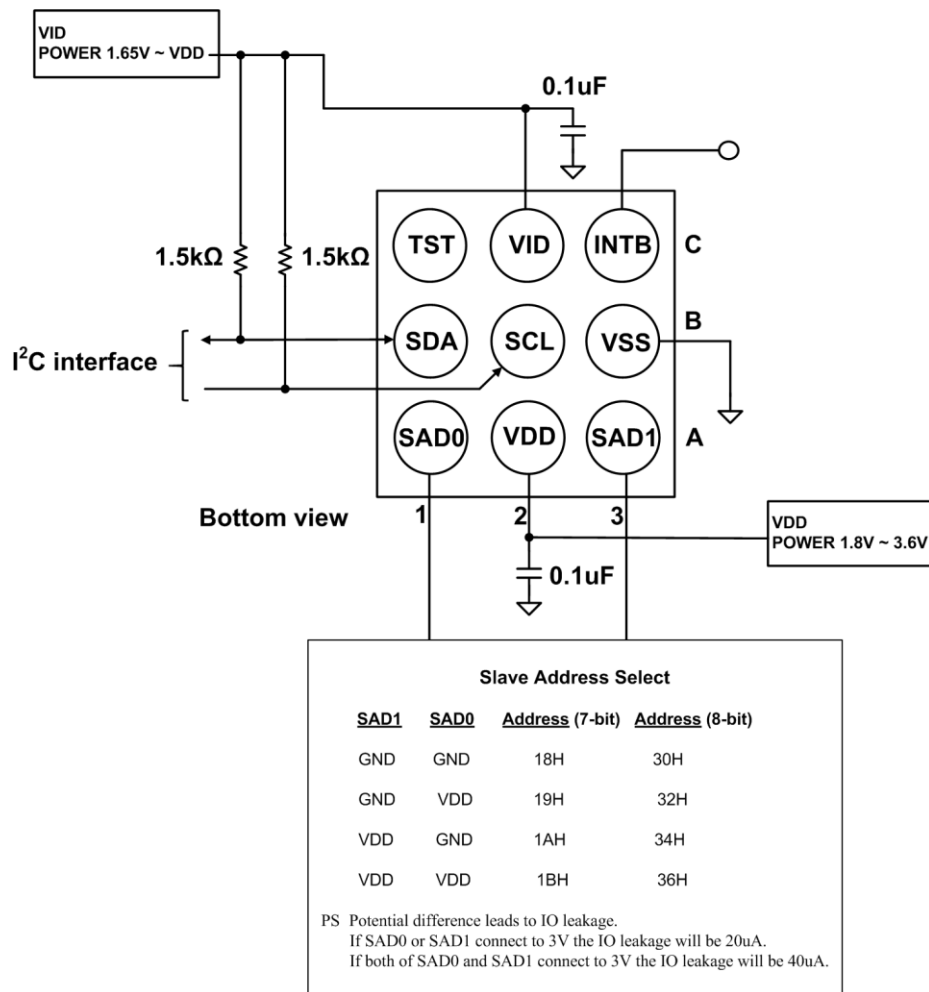


Figure 4. Application Circuit

3 Electrical Specifications

3.1 Absolute Maximum Ratings

Parameter	Symbol	Limits	Unit
Storage Temperature	TSTG	-40 to +150	°C
Power Supply Voltage (VDD)	VDD	-0.3 to +3.8	V
Power Supply Voltage (VID)	VID	-0.3 to +3.8	V
Digital Input Voltage	VIN	-0.3 to VDD+0.3	V
Electrostatic Discharge Voltage* ¹	VESD_HBM	-2000 to 2000	V
Electrostatic Discharge Voltage* ³	VESD_CDM	-1000 to 1000	V
Reflow Classification	JESD22-A113 with 260°C Peak Temperature		

If the device is used in conditions exceeding these limits, it may be permanently failed. Device’s performance cannot be guaranteed when exceeding these limits.

1. Human Body Model (HBM)
2. Charge Device Model (CDM)

3.2 Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit
Operating Temperature	TA	-40		+85	°C
Power Supply Voltage (VDD)	VDD	1.8	3.3	3.6	V
Power Supply Voltage (VID)	VID	1.65	1.8	3.6	V

3.3 Electrical Specifications

Operating conditions: TA = +25°C ; VDD = 3.0V; VID = 3.0V or 1.8V; CAD0 = GND ; CAD1 = GND

Parameter	Symbol	Conditions	Min.	Typ.	Max	Unit
Current Consumption	IDD	50 sample per second ^{1*1}		180		uA
		500 sample per second ^{1*1}		600		
		50 sample per second ^{1*2}		450		
		500 sample per second ^{1*2}		3300		
Suspend Current	ISUP			2		uA
Stand-by Mode Current	ISTB			100		uA

Output Data Rate	ODR				500	Hz
Input Low Voltage (For SCL, SDA)	VIL		0		VID *30%	V
Input High Voltage (For SCL, SDA)	VIH		VID *70%			V
Output Low Voltage	VOL	IOL= +4mA	0		VID *20%	V
Output High Voltage	VOH	IOH= -100uA (Except SCL and SDA)	VID *80%		VID	V

*1 Current consumption in Continuous Measurement Mode, OSR = 4

*1 Current consumption in Continuous Measurement Mode, OSR = 32

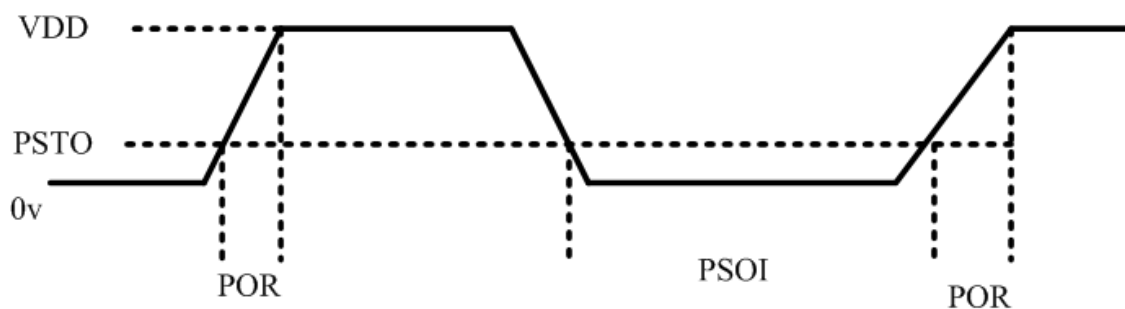
3.4 Magnetic Sensor Specifications

Operating conditions: TA=+25°C; VDD= 3.0V; VID=1.8V.

Parameter	Symbol	Condition	Low	Mid.	High	Unit
Dynamic Range *1	DR		±10.24	±20.48	±40.96	mT
Resolution *1	RES	16-bit setting *1	0.3125	0.625	1.25	uT/LSB

*1CNTL2(0x0D) controls dynamic range setting and resolution setting.

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=0.1volt
 PSOI: min=30ms
 POR: max:50ms

When POR circuit detects the rise of VDD voltage, it resets all internal circuits and initializes all registers. After reset, IST8801 transits to Stand-By Mode.

4 Ordering Information

Order Number	Package Type	Packaging
IST8801	WLCSP – 9 pins	Tape and Reel: 3k 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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