SH251 Micro-power High Sensitivity Omni-polar Hall Effect Switch

SH251 is a micro-power high sensitivity omni-polar Hall switch designed in advanced CMOS technology. The following are integrated on a single silicon chip: awake/sleep timing controller, Hall voltage generator, offset canceller, chopper stabilized small-signal amplifier, Schmitt trigger, CMOS output. Superior high-temperature performance is made possible through a dynamic offset cancellation that utilizes chopper-stabilization. Since SH251 is special made for low operation voltage (1.65V~) and micro-power (5μA typ.), it is suitable for battery-powered applications.

Features

- 1.65 to 3.5V for battery-powered application
- High sensitivity (3mT typ.)
- Stable temperature characteristics
- Low power consumption (5μA typ.)
- High ESD protection (HBM > ±4kV min)
- CMOS output
- Small size (QFN2020-3)

Typical Applications

- Solid-state switch
- Lid close sensor for battery powered devices
- Water meter
- Floating meter

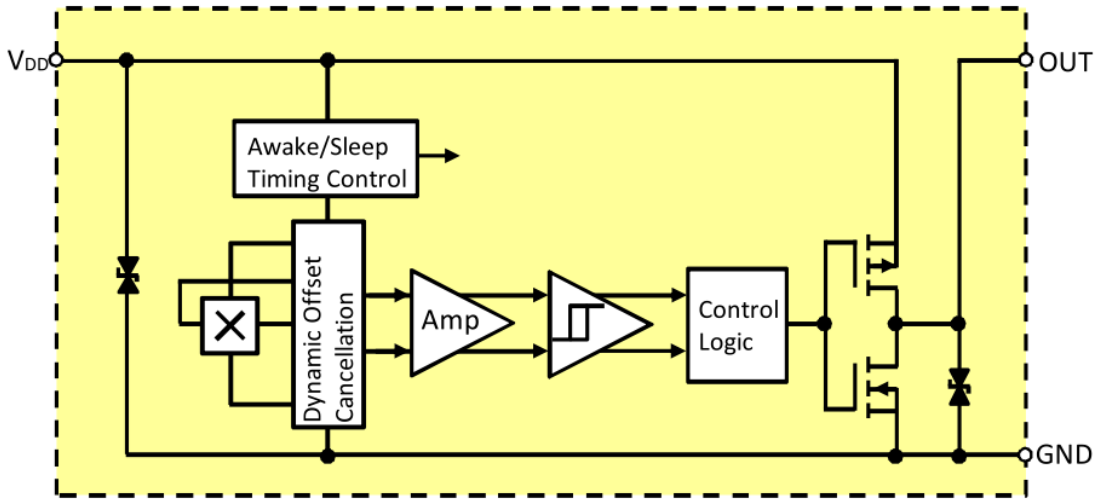
Ordering Information

Model No.	Part No.	Temperature	Package	—	Packing
SH251EUA	SH251	E	UA		
SH251EST-TR	SH251	E	ST	—	TR
SH251ESQ-TR	SH251	E	SQ	—	TR

Legend:

Temperature Code:	E (-40℃～85℃)
Package Code:	UA (TO92S), ST (TSOT23), SQ (QFN2020-3)
Packing Code:	Brank (Balk, 500pcs/Bag), TR (Tape & Reel, 3,000pcs/Reel)

Functional Diagram



Absolute Maximum Ratings (T_A=25℃)

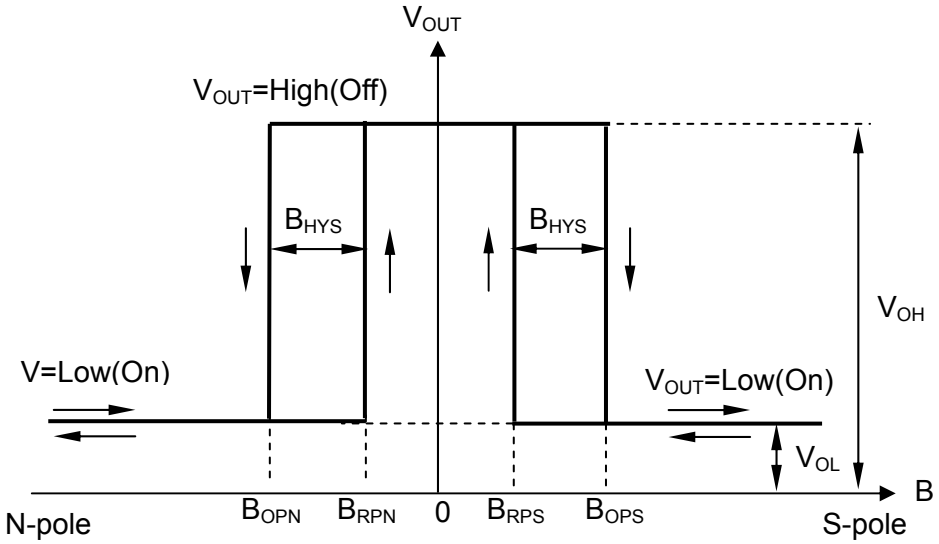
Parameter	Symbol	Value Min	Value Max	Unit
Supply Voltage	V_{DD}	-0.3	4.5	V
Output Voltage	V_{OUT}	-0.3	4.5	V
Output Current	I_{SINK}	-	1	mA
Operating Temperature Range (E)	T_A	-40	85	℃
Storage Temperature Range	T_S	-65	150	℃
Maximum Junction Temperature	T_J		150	℃
Power Dissipation (UA/ST/SQ)	P_D		606/400/230	mW

Electrical Characteristics (T_A=25℃, V_{DD}=1.8V)

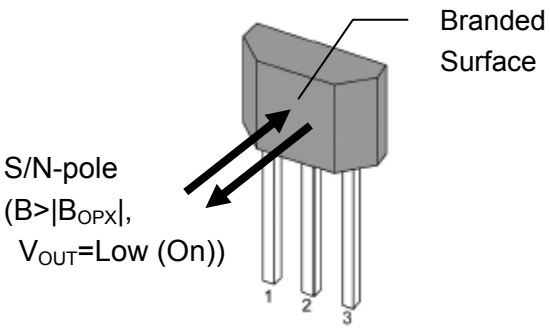
Parameter	Test Condition	Symbol	Value Min	Value Typ	Value Max	Unit
Supply Voltage		V_{DD}	1.65	-	3.5	V
Consumption Current	Awake Mode	I_{DD}	-	1.4	3	mA
	Sleep Mode	I_{DD}		3.6	7	μA
	Average	I_{DD}	-	5	10	μA
Output High Voltage	I_{OUT}=-0.5mA (Sink)	V_{OH}	V_{DD} -0.2	-	-	V
Output Low Voltage	I_{OUT} =0.5mA (Source)	V_{OL}	-	-	0.2	V
Awake Mode Time		t_{AW}	-	40	80	μs
Sleep Mode Time		t_{SL}	-	40	80	ms
Electro-Static Discharge	HBM		4	-	-	kV

Magnetic Characteristics (T_A=25℃, V_{DD}=1.8V)

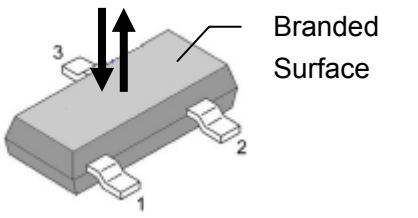
Parameter	Test Condition	Symbol	Value Min	Value Typ	Value Max	Unit
Operate Point	S pole to branded side	B_{OPS}		3	5.5	mT
	N pole to branded side	B_{OPN}	-5.5	-3	-	mT
Release Point	S pole to branded side	B_{RPS}	1	2	-	mT
	N pole to branded side	B_{RPN}	-	-2	-1	mT
Hysteresis	$\lvert B_{OPX} - B_{RPX} \rvert$	B_{HYS}	-	1	-	mT



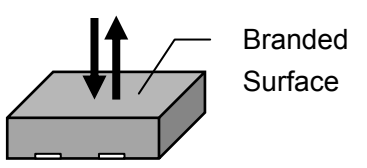
Switching Characteristics



UA-package

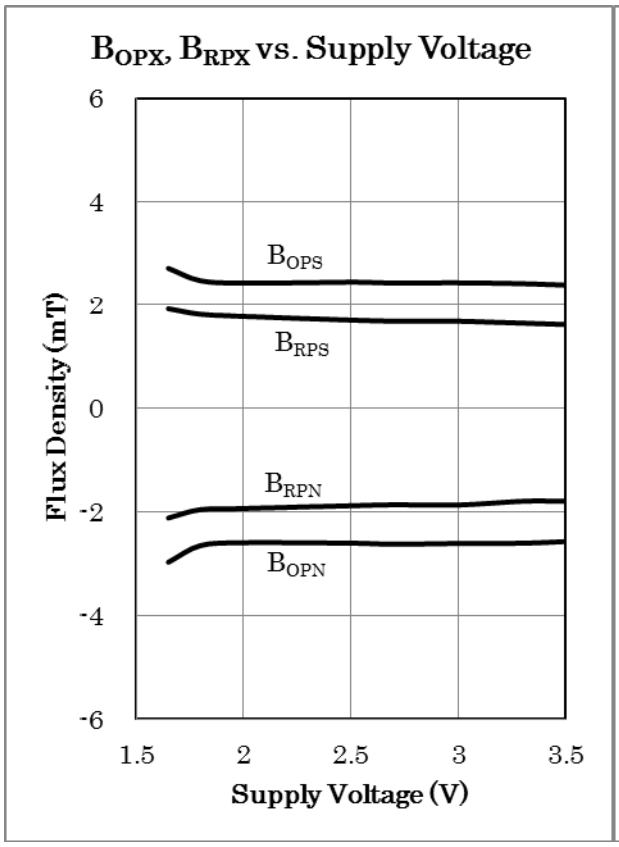


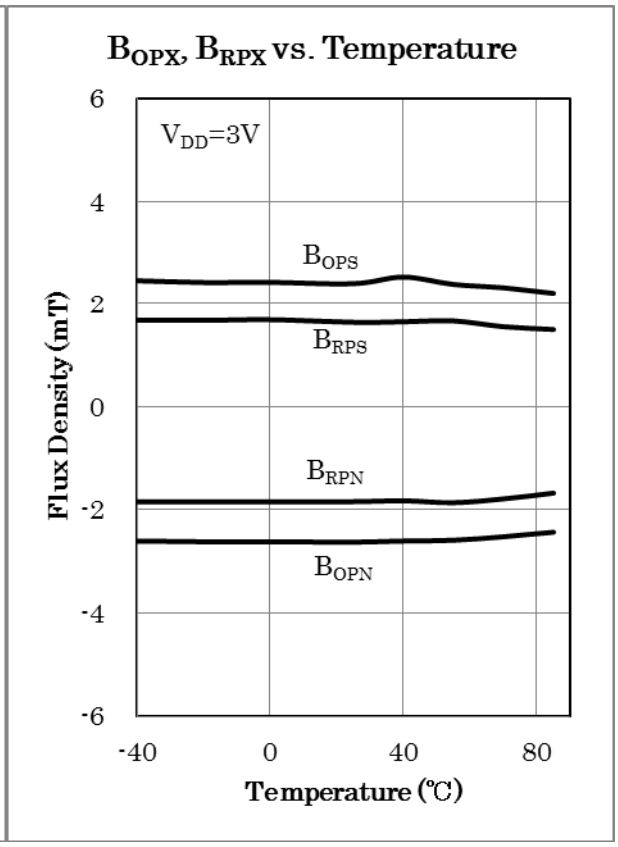
ST-package

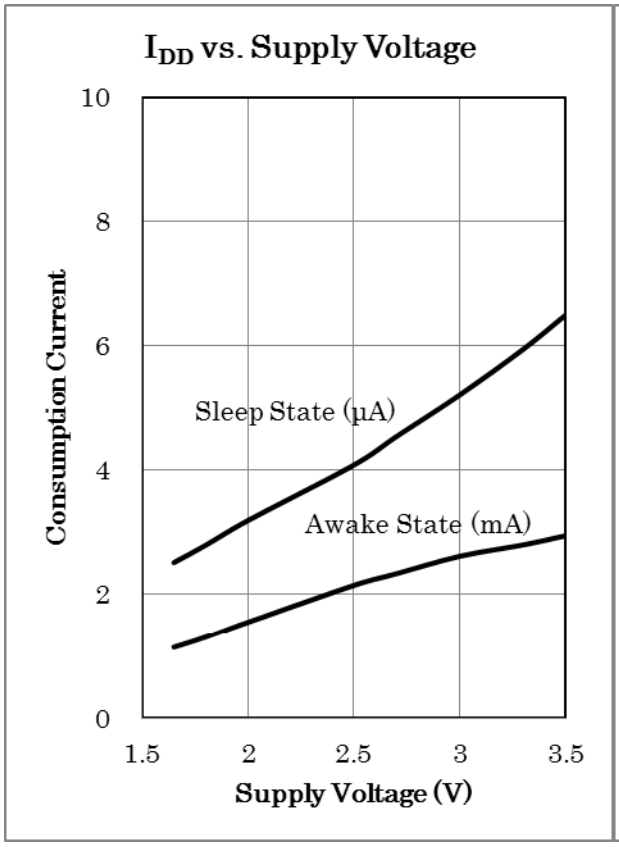


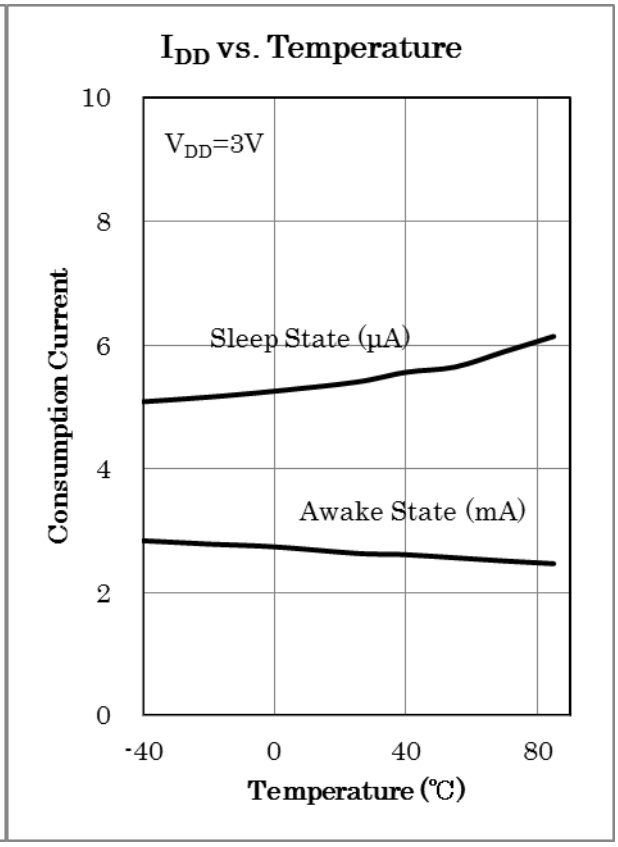
SQ-package

Performance Graphs



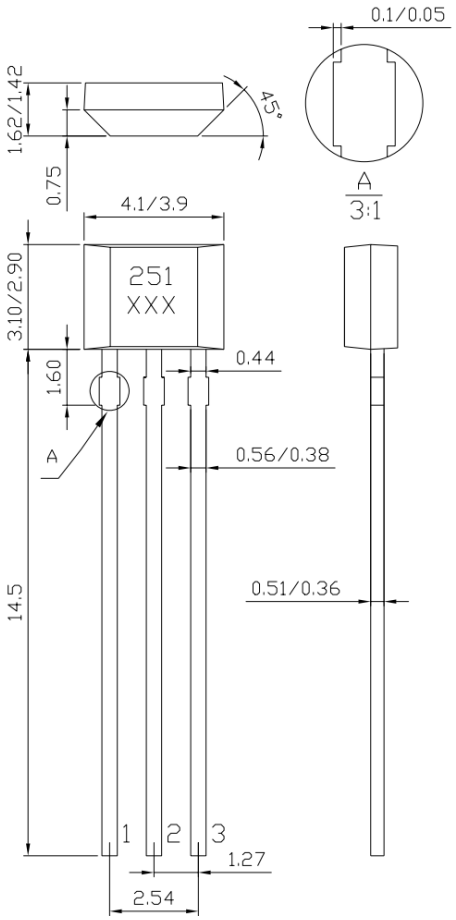




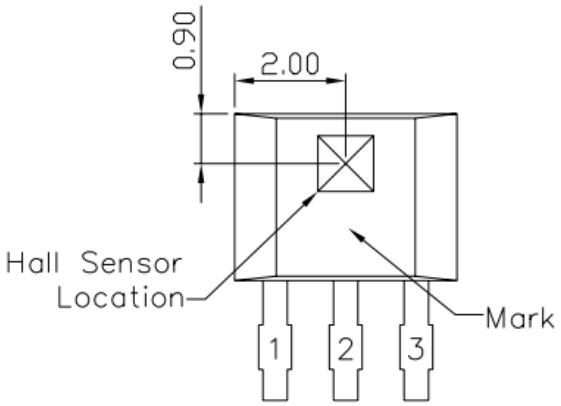


Sensor Location, Package Dimension and Marking

UA-package: TO92S



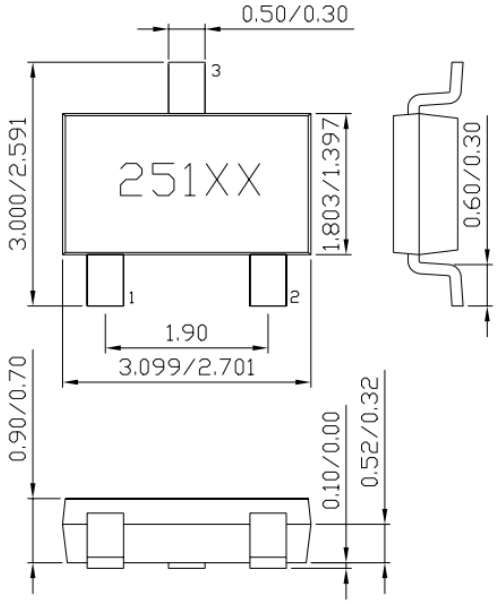
Hall sensor location



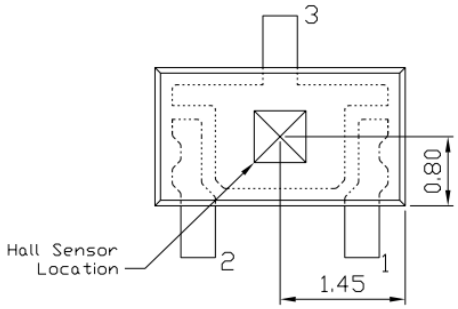
NOTES:

1. Controlling dimension: mm
2. Leads must be free of flash and plating voids.
3. Do not bend leads within 1 mm of lead to package interface.
4. PINOUT:
   Pin 1 V_{DD}
   Pin 2 GND
   Pin 3 Output

ST-package: TSOT23
(Top View)



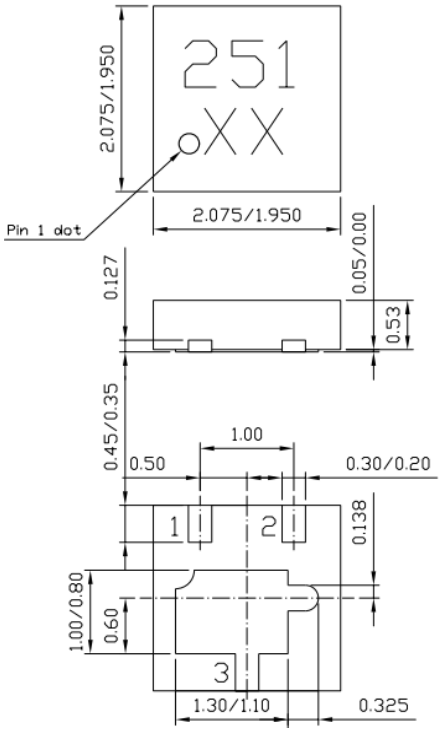
Hall sensor location
(Bottom view)



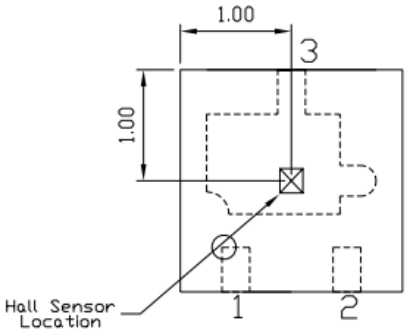
NOTES:

1. PINOUT:
   Pin 1 V_{DD}
   Pin 2 Output
   Pin 3 GND
2. Controlling dimension: mm;

SQ-package: QFN2020-3
(Top View)



Hall sensor location
(Top View)



NOTES:

1. PINOUT:
   Pin 1 V_{DD}
   Pin 2 Output
   Pin 3 GND
2. Controlling dimension: mm;
3. Chip must be in PKG. center.