P4248

Low Power, Omnipolar, Hall Switch

Data Sheet Rev. 1.1

1. General

Descriptions

P4248 is a Hall-effect sensor integrated circuit of omni-polar switch type. It includes a hall plate, an amplifier with dynamic offset cancellation, a voltage regulator for operation with supply voltage from 1.8V to 5.5V, a sleep/awake control logic for low power consumption, schmitt trigger comparator, and a push-pull output. The offset cancellation reduces the offset voltage normally caused by device over molding, temperature dependencies, and thermal stress. The device is a temperature stable, stress-resistant sensor

P4248 detects magnetic field which is perpendicular to the package in an arbitrary direction. When the magnetic increases higher than B_{OP}, the voltage of OUT goes low; when the magnetic decreases lower than B_{RP}, OUT becomes high. When combined with a magnet, it becomes a non-contact switch with low current consumption, high sensitivity and reliability.

The device is delivered in a Small Outline Transistor (SOT23-3L) for surface mount process and in a Plastic Single In Line (TO92S) for through hole mount. The device is also delivered in small size SOT553 which package size is 1.6mm×1.2mm×0.6mm. All packages are RoHS compliant and Halogen Free.

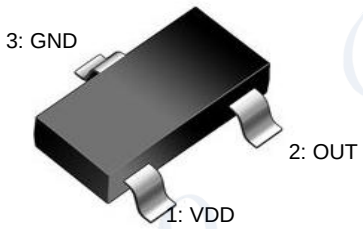
Features

- ☐ High sensitivity: B_{OP}=+/-30 Gauss, B_{RP}=+/-20Gauss
- ☐1.8~5.5V operating supply voltage
- ☐ 5uA operating current at 1.8V
- ☐ Ambient temp range:-40C~85C
- ☐ >4KV ESD capability
- ☐ Push-pull output
- ☐ RoHS compliant 2011/65/EU and Halogen Free
- ☐Package: SOT23-3L/TO92S/SOT553

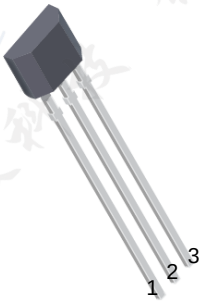
Typical Applications

- ☐ Solid-state switch
- ☐ Position detection
- ☐ Speed detection
- ☐ Proximity detection

Package and Pin Description



SO(SOT23-3L) package



UA(TO92S) package

ST(SOT553) package

Figure1. Package figure (not to scale)

Table 1(a)： SOT23 Pin Description

SOT23 pin No.	Name	Description
1	VDD	Power supply
2	OUT	Output
3	GND	Ground

Table 1(b)：TO92S Pin Description

TO92S PIN NO.	Name	Description
1	VDD	Power supply
3	OUT	Output
2	GND	Ground

Table 1(C)：DFN6L Pin Description

SOT553 PIN NO.	Name	Description
1	NC	Floating
2	GND	Ground
3	NC	Floating
4	VDD	Power supply
5	OUT	Output

Note: The NC pins can be floating or connected to GND

2. Ordering information

Table 2：Ordering information

No.	1	2	3	4	5		6~7
ON	**P**	**4**	**2**	**4**	**8**	**-**	**ST**
Description	Part No.						Deliver type UA: TO92S SO: SOT23-3L ST: SOT553

2. Block Diagram

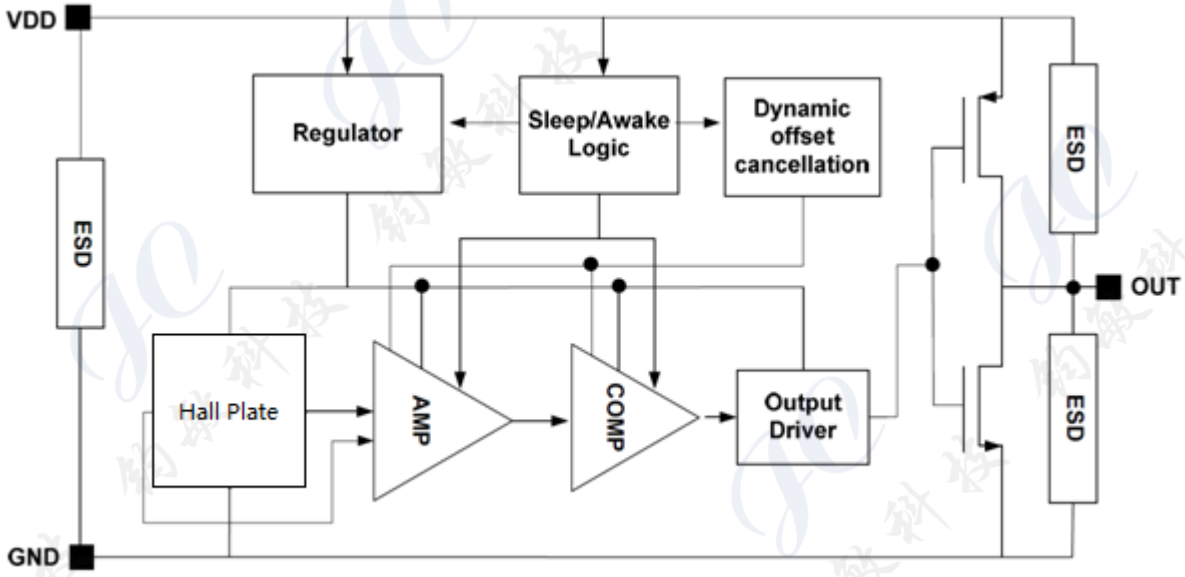


Figure 2: Functional Block Diagram

3. Function Description and Diagram of Operating

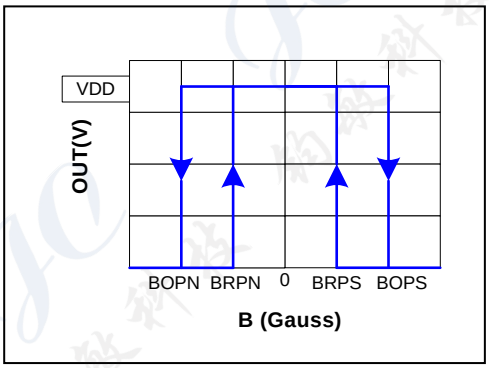


Figure 3: OUT VS Magnetic Field

Diagram of operating to detect the magnetic

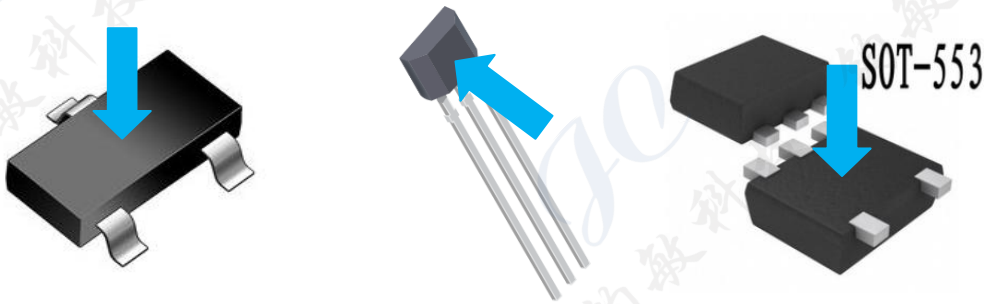


Figure 4: Magnetic detection diragram

4. Absolute Maximum Rating (Note1)

Table3: Absolute maximum rating (Ta=25C)

Symbol	Parameter	Min	Max	Unit
V_{dd}	Supply Voltage	-0.3	6.5	V
I_{dd}	Supply Current	-	50	mA
V_{out}	Output Voltage	-0.3	6.5	V
I_{out}	Output Current	-	1	mA
B	Magnetic Flux Density	Not limited		Gauss
T_S	Storage Temp	-40	125	°C

Note 1: Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. "Absolute Maximum Ratings" for extended period may affect device reliability.

5. Electrical Characteristics

Table 4: Electrical Characteristics（VDD=1.8V, Ta=25°C unless otherwise specified）

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
V_{dd}	Supply voltage		1.8		5.5	V
Ta	Ambient temperature range		-40		85	°C
I_{dd}	Operating current		-	5.0	10.0	uA
V_{ol}	Output low voltage	|B|>|Bop|, Iout=0.5mA	-	-	0.2	V
V_{oh}	Output high voltage	|B|<|Brp|, Iout=0.5mA	VDD-0.2	-	-	V
I_{off}	Output leakage current	VDD=5.5V, |B|<|Brp|	-	0.1	10	uA
T_{PO}	Power on time				100	uS
ESD		HBM		4		KV
R_{th}	Thermal resistance	SOT23-3L package		301		°C/W
T_{aw}	Awake time			40	80	uS
T_{sl}	Sleep time			40	80	mS
D.C.	Duty cycle			0.1		%

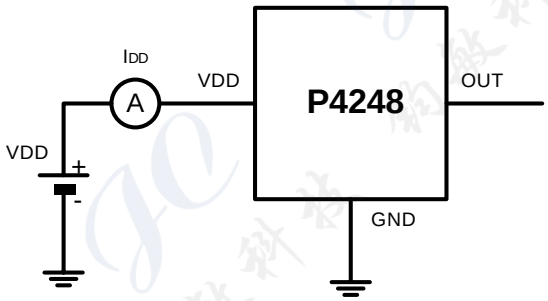
6. Magnetic Characteristic

Table5: Magnetic Characteristic（VDD=1.8V）

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
B_{op}	Operating point	Ta=25°C	+/-20	+/-30	+/-50	Gauss
B_{rp}	Release point		+/-10	+/-20	+/-40	Gauss
B_{hy}	Hysteresis，|Bop-Brp|		-	10	-	Gauss

7. Test Diagram

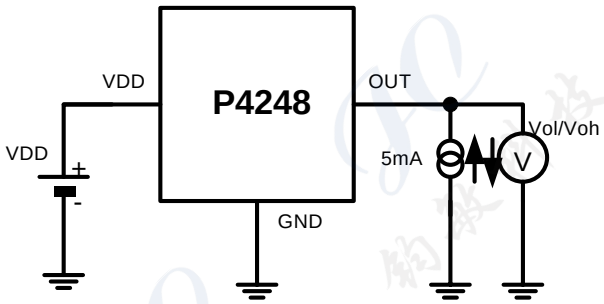
Supply Current



Note1- The supply current IDD represents the static supply current. Out is left open when measurement

Figure 5: Test diagram of Idd

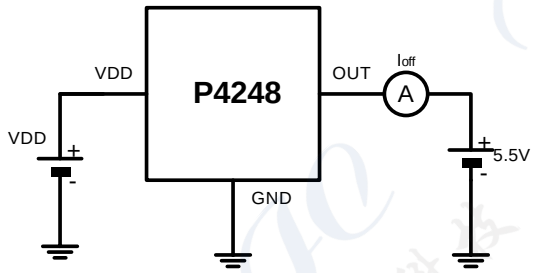
Output Saturation Voltage



Note1-Vol, |B|>30Gauss, 0.5mA Iout is pushed into OUT pin.
Note2- Voh, |B|=0Gauss, 0.5mA Iout is pulled from OUT pin

Figure 6: Test diagram of Vol/Voh

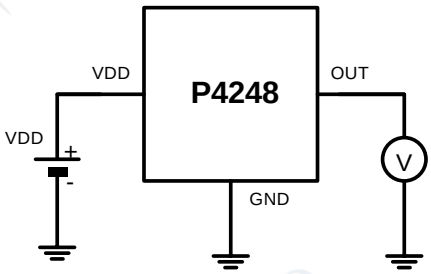
Output Leakage Current



Note1- The device is put under magnetic field with B<Brp

Figure 7: Test diagram of Ioff

Magnetic Thresholds



Note1- Bop is determined by putting the device under magnetic field swept from Brpmin up to Bopmax until the output is switch on
Note2- Brp is determined by putting the device under magnetic field swept from Bopmax down to Brpmin until the output is switch off

Figure 8: Test diagram of magnetic thresholds

8. Typical Application

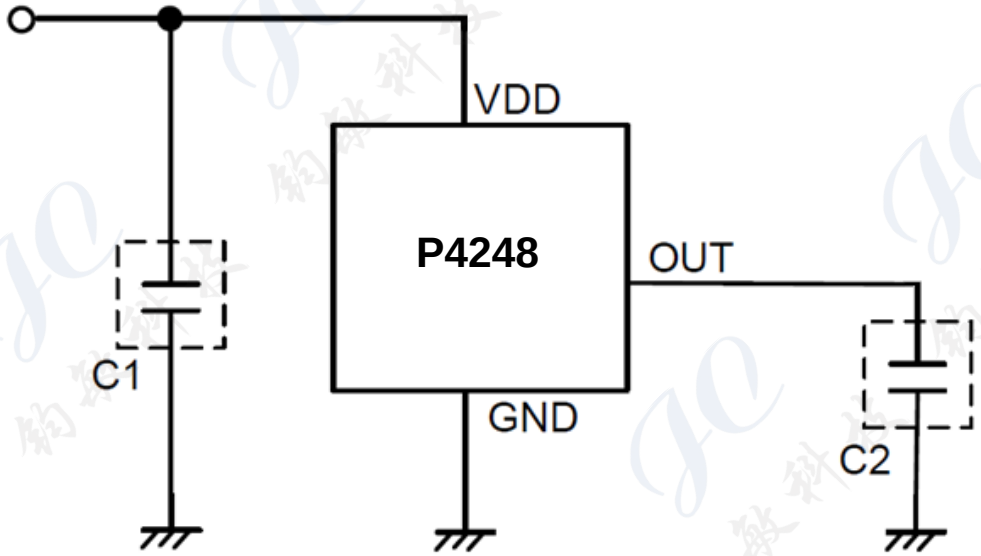
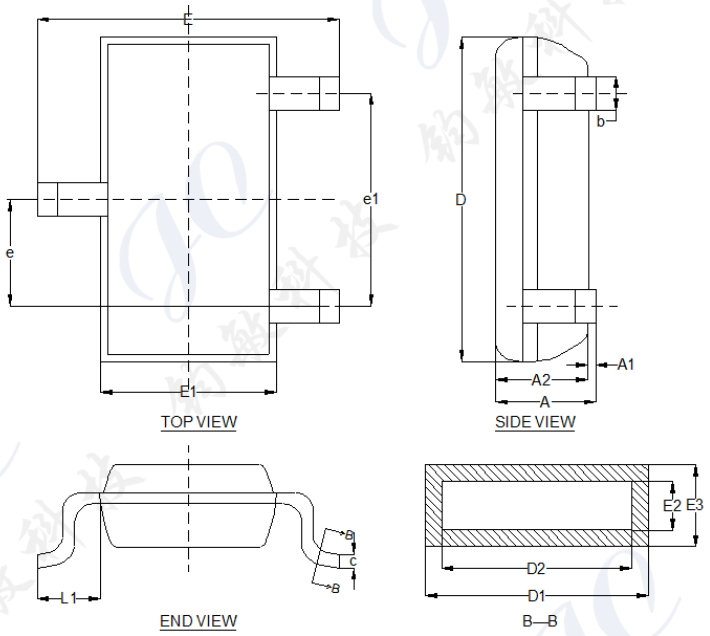


Figure 9: Typical Application Circuit

Note:
1. C1 is optional. Recommended value is 100nF to 1uF.
2. C2 is optional. Recommended value is 1nF to 100nF.

10. Package Information

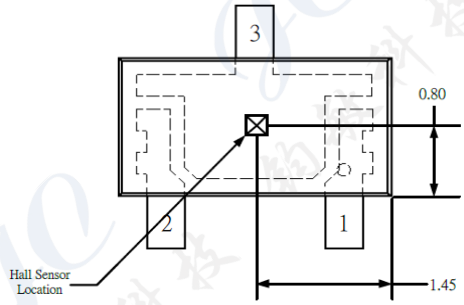
10.1 SOT23-3L(SO) Package size



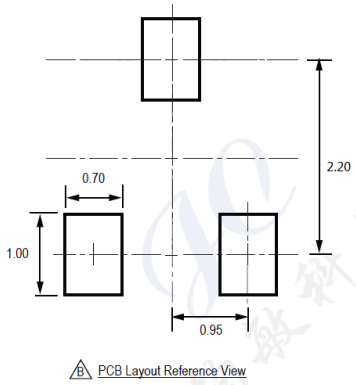
Symbol	millimeters		
	Min	Typ	Max
A	-	-	1.100
A1	0.025	0.075	0.100
A2	0.850	0.880	0.900
c	0.080	-	0.200
D		0.290BSC	
D1	0.300	-	0.450
D2	0.250	0.350	0.400
E		2.780BSC	
E1		1.600BSC	
E2	0.120	0.127	0.150
E3	0.150	-	0.200
e		0.950BSC	
e1		1.900BSC	
L1		0.600REF	
b	0.300	-	0.450

Note：1. Dimensions are not to scale

Figure 10: Package size of SO package



Hall device location of SO package



Recommended PCB layout information

10.2 TO92S (UA) Package size(Unit: mm)

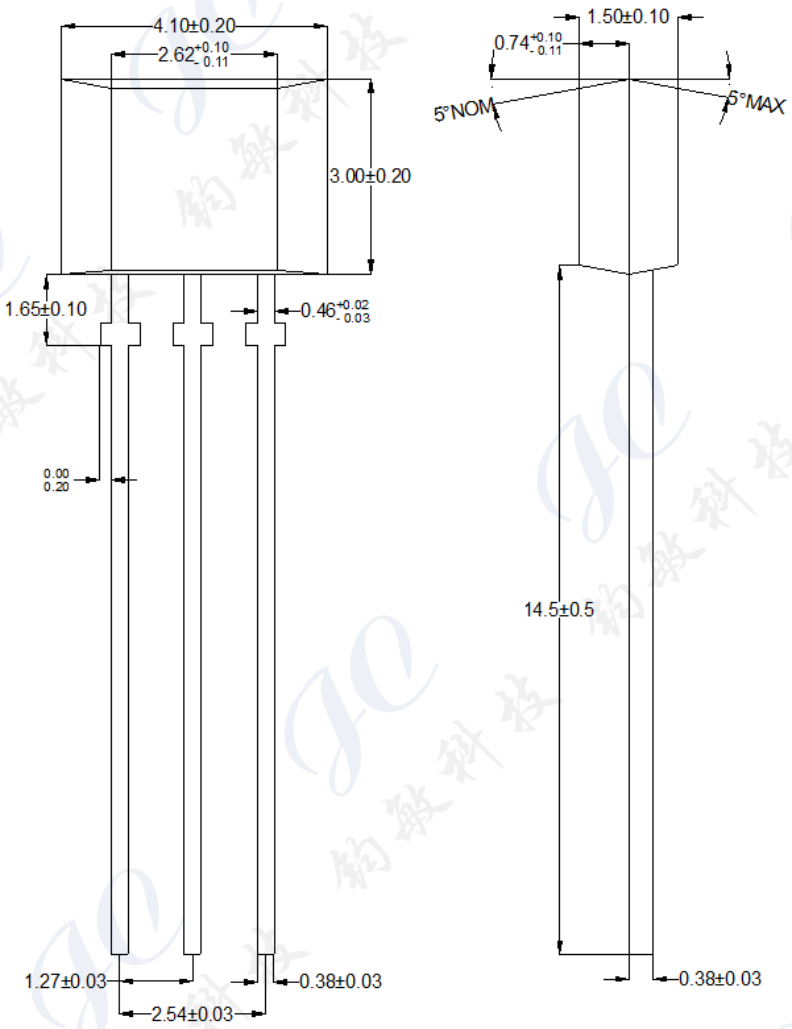


Figure 11: Package size of UA package

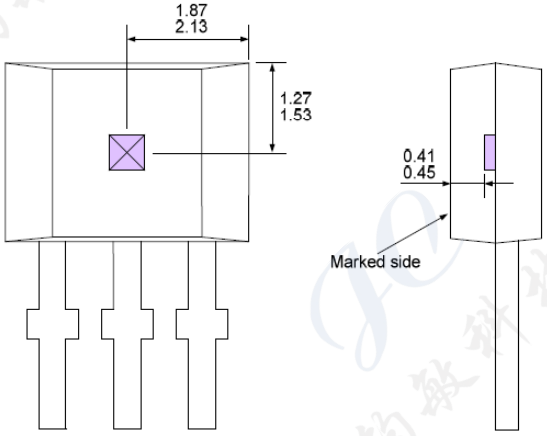
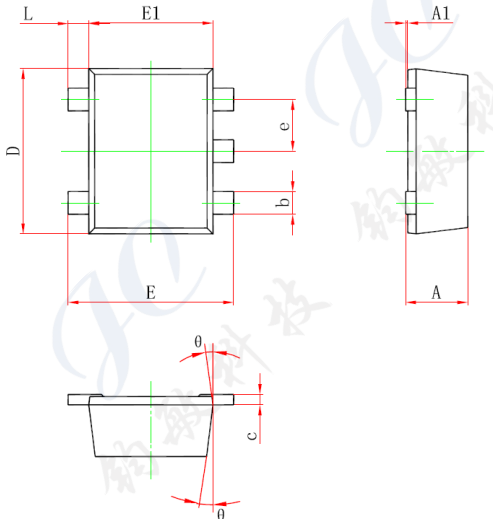


Figure 12: Hall device location of UA package

10.3 **SOT553 (ST) Package size(Unit: mm)**



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.525	0.600	0.021	0.024
A1	0.000	0.050	0.000	0.002
e	0.450	0.550	0.018	0.022
c	0.090	0.160	0.004	0.006
D	1.500	1.700	0.059	0.067
b	0.170	0.270	0.007	0.011
E1	1.100	1.300	0.043	0.051
E	1.500	1.700	0.059	0.067
L	0.100	0.300	0.004	0.012
θ	7 °REF.		7 °REF.	

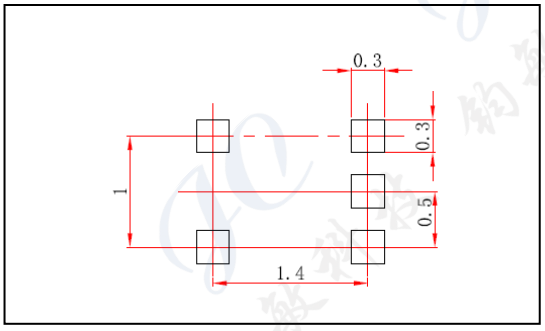


Figure 13: Package size of ST package

Sensor location

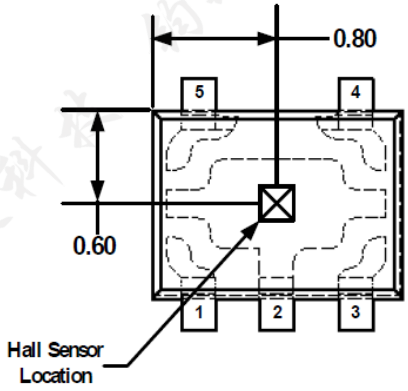


Figure 14: ST sensor location

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