

Unipolar Magnetic Field Response Linear Hall Sensor

1. Features

- Analog output linear Hall sensor
- Unipolar magnetic field response, wide output range
- Fast power-on start < 1us
- Single current source output
- Low noise output, no output filtering required
- Operating temperature range from -40°C to 105°C
- SOT23-3L PKG

2. Applications

- Keyboard applications
- Linear triggers
- Open/close detection
- Gaming buttons

3. Description

The SC4015 is a linear Hall effect sensor chip whose output voltage is proportional to the supply voltage and the magnetic field strength it senses.

The zero-field output voltage (no magnetic field) of the SC4015 is typically 66% of the supply voltage, with a typical sensitivity of 3.9mV/Gs at a 5.0V supply voltage and 2.0mV/Gs at a 3.3V supply voltage.

The chip typically operates at 3.3V or 5.0V, with a maximum voltage of 25V. It supports an operating temperature range of -40°C to 105°C, making it suitable for commercial, consumer, and industrial applications.

This product comes in a 3-pin SOT-23-3L package; the package material is lead-free with 100% matte tin frame plating.



Fig.1 SOT23-3L Package Outline

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4. Terminal Configuration

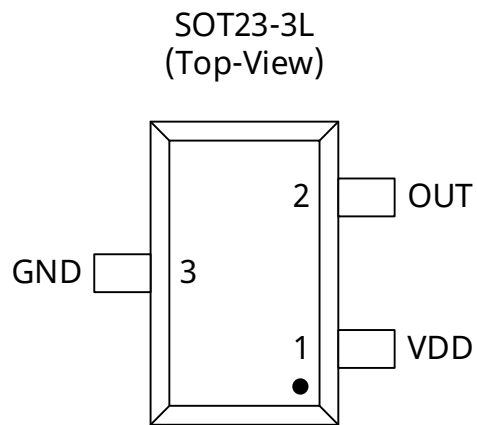


Fig.2 SOT23-3L(Left) Pin Description

Name	SOT23-3L	TO-92S	Description
VDD	1	1	Power supply
OUT	2	2	Output
GND	3	3	Ground

5. Ordering Information

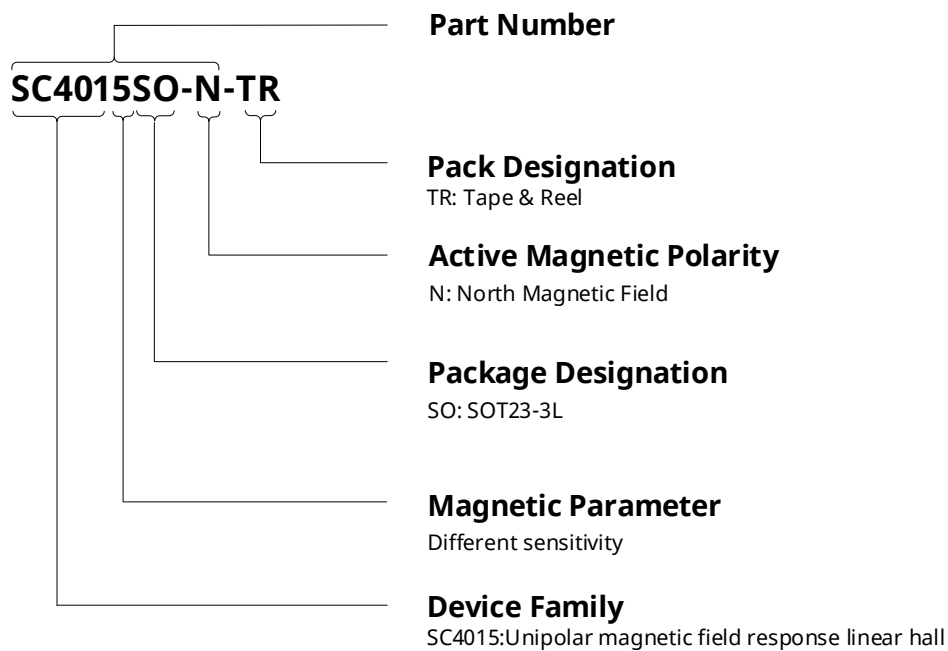
Ordering Information	Sens(mV/Gs) ⁽¹⁾	Ambient, T _A (°C)	Package	Packing	Quantity
SC4015SO-N-TR ⁽²⁾	2.0	-40~105	SOT23-3L	TR	3000

Note:

(1) This sensitivity data is available under 3.3v application conditions

(2) TR: Tape & Reel;

Order information format description



6. Absolute Maximum Ratings

Symbol	Parameter	Notes	Min.	Max.	Units
V_{CC}	Power End Withstand Voltage	$B=0mT, T_A=25^{\circ}C$	-0.3	25.0	V
V_{OUT}	Output Withstand Voltage	$B=0mT, T_A=25^{\circ}C$	-0.3	25.0	V
I_{CC}	Supply Current	$B=0mT, T_A=25^{\circ}C$	-	15	mA
I_{OUT}	Current Output	$B=0mT, T_A=25^{\circ}C$	-	2	mA
T_A	Operating Temperature Range		-40	105	$^{\circ}C$
T_J	Storage Temperature Range		-50	165	$^{\circ}C$
T_{STG}	Maximum Junction Temperature		-65	165	$^{\circ}C$

Note :

Stresses above those listed here may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

7. ESD Protection

Symbol	Parameter	Test conditions	Min.	Max.	Units
V_{ESD_HBM}	HBM	Refer to ANSI/ESDA/JEDEC JS-001 standard ⁽¹⁾	-4	+4	kV
V_{ESD_CDM}	CDM	Refer to ANSI/ESDA/JEDEC JS-002 standard ⁽²⁾	-750	+750	V

Note :

(1) JEDEC document JEP155 states that 4000V HBM allows safe manufacturing using standard ESD control processes.

(2) JEDEC document JEP157 states that 740V CDM allows safe manufacturing using standard ESD control processes.

8. Thermal characteristics

Symbol	Parameter	Test conditions	Value ⁽¹⁾	Units
$R_{\theta JA}$	SOT23-3L	Single-layer PCBS, JEDEC 2s2p and 1s0p are defined in JESD 51-7 and JESD 51-3	313	$^{\circ}C/W$

Note :

(1) The maximum operating voltage must meet the requirements of power consumption and junction temperature, refer to thermal characteristics

9. Operating Characteristics

($T_A = -40^{\circ}\text{C} \sim 105^{\circ}\text{C}$, $V_{DD} = 2.5\text{V} \sim 5.5\text{V}$, unless otherwise noted)

Symbol	Parameter	Test Condition	Min	TYP	MAX	Unit
V_{CC}	Operating Voltage	$T_J < T_{J(\text{Max})}$	2.2	5.0	5.5	V
I_{CC}	Operating Current	$V_{CC} = 5.0\text{V}$, $T_A = 25^{\circ}\text{C}$	-	2.5	6.0	mA
R_L	Output load resistance	OUT to GND	4	-	-	k Ω
$V_{\text{OUT(H)}}$	Output Voltage Range	$V_{CC} = 5\text{V}$, $T_A = 25^{\circ}\text{C}$, $B = 1000\text{Gs}$	4.0	4.3	-	V
		$V_{CC} = 3.3\text{V}$, $T_A = 25^{\circ}\text{C}$, $B = 1000\text{Gs}$	2.3	2.6	-	V
$V_{\text{OUT(L)}}$		$V_{CC} = 5\text{V}$, $T_A = 25^{\circ}\text{C}$, $B = -1000\text{Gs}$	0.75	0.8	0.95	V
		$V_{CC} = 3.3\text{V}$, $T_A = 25^{\circ}\text{C}$, $B = -1000\text{Gs}$	0.75	0.8	0.95	V
$V_{\text{OUT(Q)}}$	Static Output Voltage	$V_{CC} = 5\text{V}$, $B = 0\text{Gs}$, $T_A = 25^{\circ}\text{C}$	-	3.15	-	V
		$V_{CC} = 3.3\text{V}$, $B = 0\text{Gs}$, $T_A = 25^{\circ}\text{C}$	-	2.2	-	V
S	Sensitivity	$V_{CC} = 5\text{V}$, $T_A = 25^{\circ}\text{C}$	3.5	3.9	4.3	mV/Gs
		$V_{CC} = 3.3\text{V}$, $T_A = 25^{\circ}\text{C}$	1.8	2.0	2.2	mV/Gs
T_{RESP}	Response time	Delay the output signal reaching 90%	-	1	-	μs
T_{PO}	Power-on time		-	-	0.8	μs

10. Block Diagram

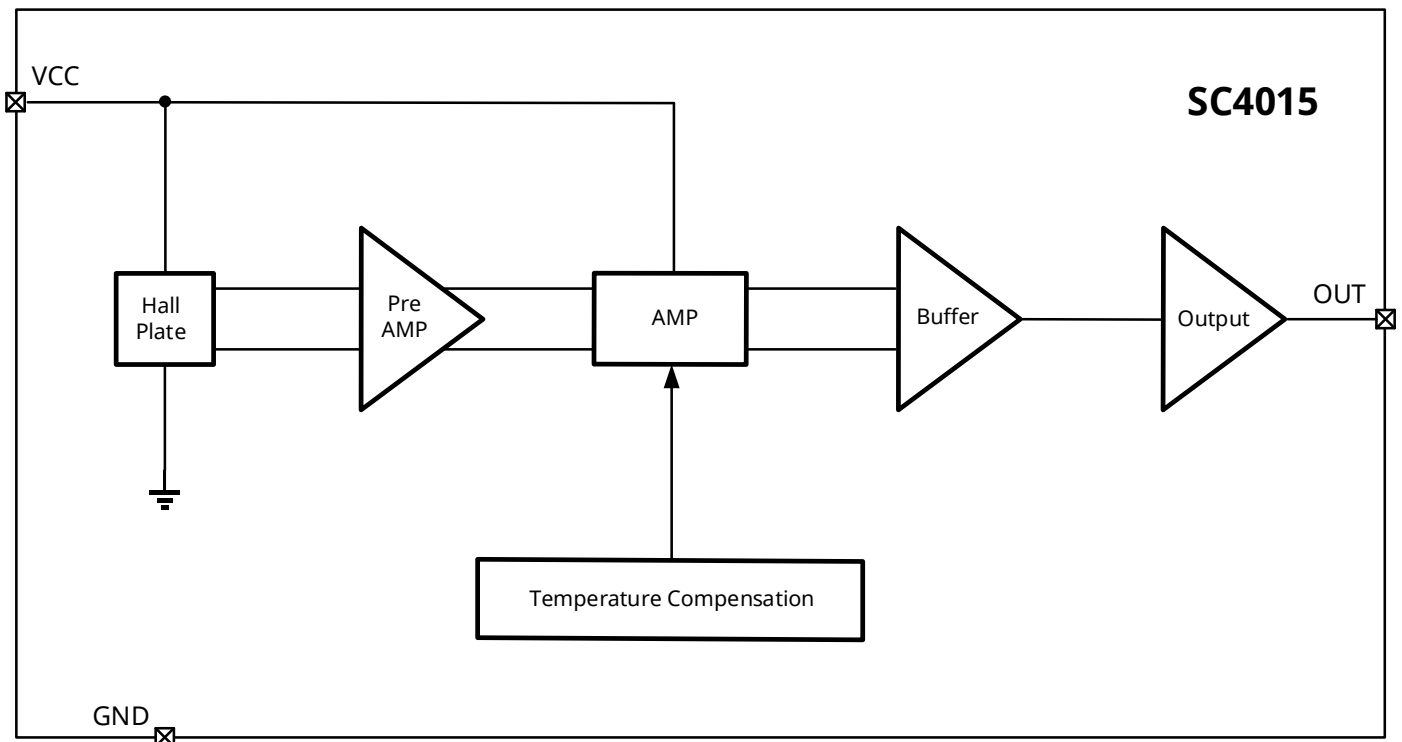


Fig.3 Block Diagram

11. Function Description

Magnetic Field Direction Definition: SOT23-3L(SO) package, the magnetic field S pole is defined as a negative magnetic field on the marking.

Quiescent Output Voltage (V_{OUTQ}): Quiescent Output Voltage indicates the output voltage of the IC when there is no magnetic field.

Sensitivity(S)

$$Sens = [VOUT(B1) - VOUT(B2)] / (B1 - B2)$$

When the South Pole magnetic field perpendicular to the chip tagged side approaches, the output voltage increases proportionally, until it reaches supply voltage. Conversely, when the North Pole magnetic field perpendicular to the chip tagged side approaches, the output voltage decreases proportionally, until it reaches ground level. Sensitivity is defined as the specific value of the output voltage variation and the magnetic field variation, commonly in mV/Gs or mV/mT.

12. Typical Application

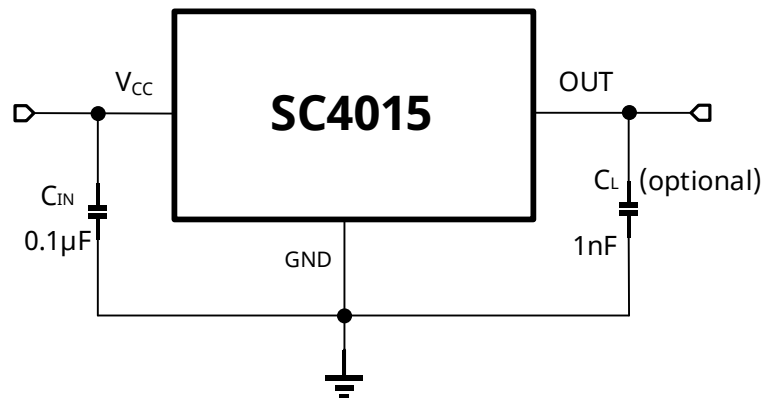


Fig.4 Typical Application Circuit

When the power supply voltage is 5V, the static (zero field strength) output voltage of the chip V_Q is usually around 3.15V, and when the power supply voltage is 3.3V, V_Q is usually around 2.1V. For the SO package, when the N-pole magnetic field perpendicular to the screen surface of the chip increases, the output voltage of the chip increases proportionally. In contrast, when the S-electrode acts on the screen surface of the chip, the output voltage drops synchronously in the same proportion. The maximum output voltage of the chip at room temperature is V_{CC}-0.7V, and the minimum output voltage is 0.8V, where the linear range is 0.8V-4.2V.

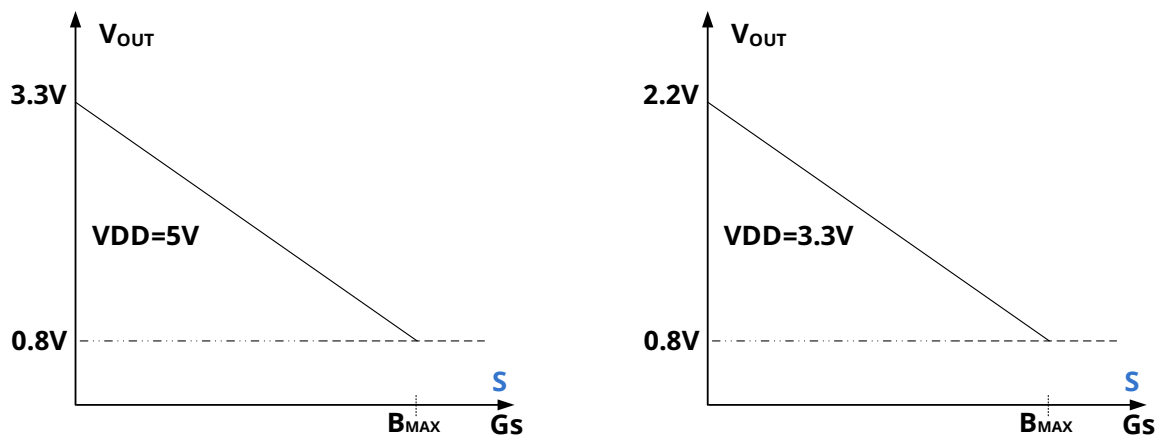
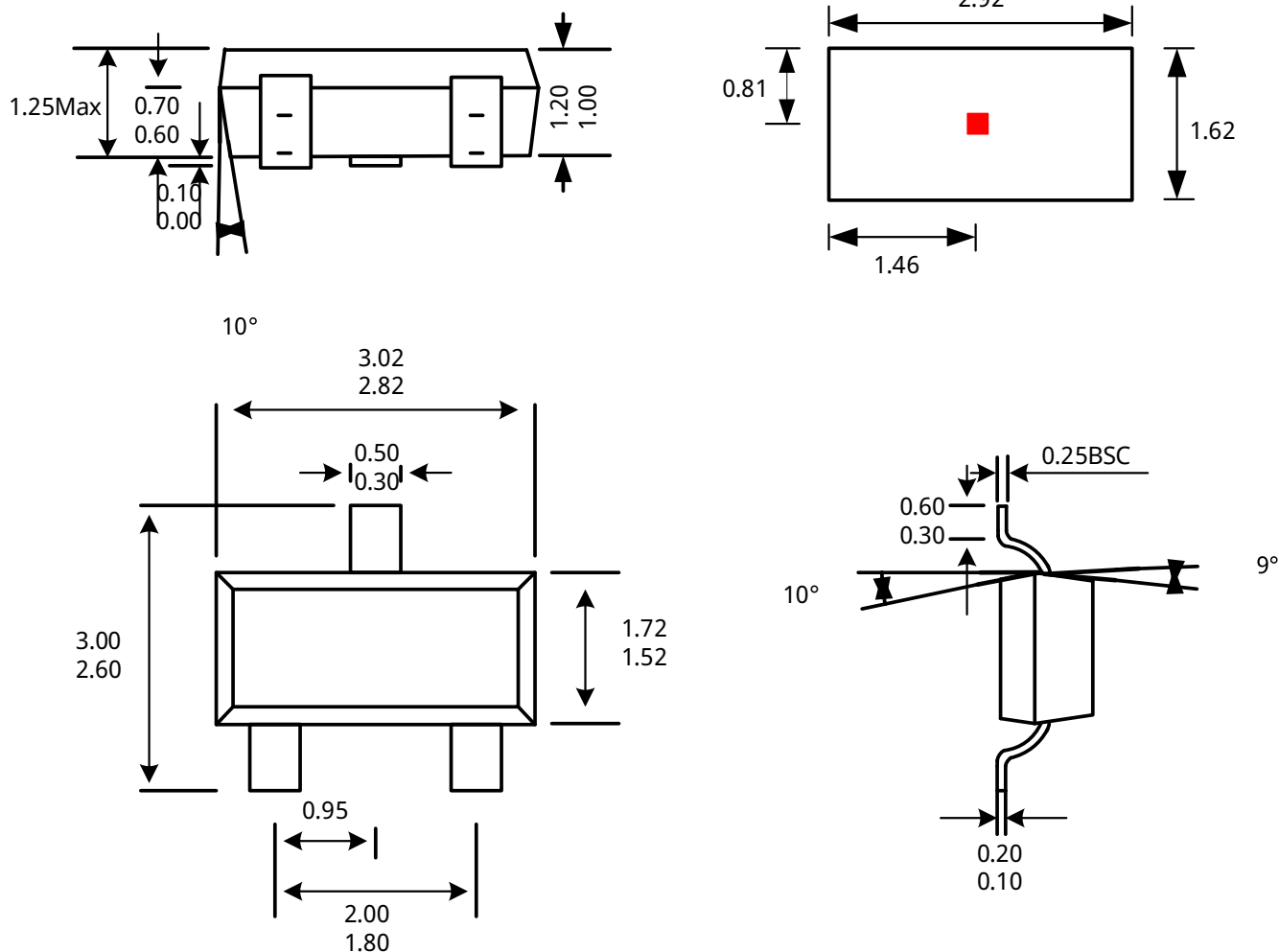


Fig.5 Output function

13. Package Information “SOT23-3L(SO)”

3-PIN
SOT23-3L
Package

Unit: mm



Notes:

1. Exact body and lead configuration at vendor's option within limits shown.
2. Height does not include mold gate flash.

Where no tolerance is specified, dimension is nominal.

14. Revision History

Revision	Date	Description
Rev.0.1	2024-07-25	Preliminary datasheet
Rev.A1.0	2024-11-27	Unified datasheet format