Packages

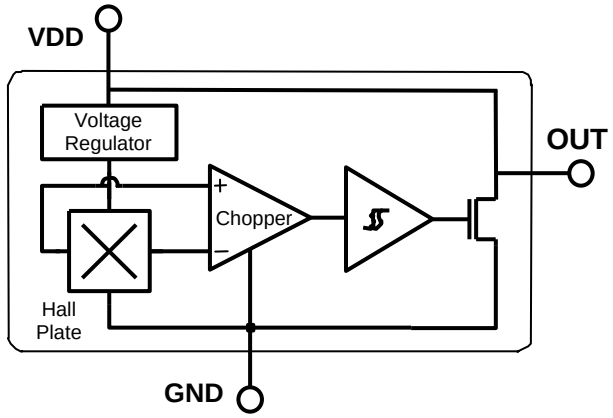
3 pin SOT23 (suffix SO)

3 pin SIP (suffix UA)

Features and Benefits

- Wide operating voltage range from 2.5V to 24V
- Medium sensitivity
- CMOS technology
- Chopper-stabilized amplifier stage
- Superior temperature stability
- Insensitive to physical stress
- Open drain output
- Low current consumption
- Small Size-SOT23 3L or SIP 3L
  both RoHS Compliant packages

Functional Block Diagram



SIP Package	SOT Package
Pin 1 – V_{DD}	Pin 1 – V_{DD}
Pin 2 – GND	Pin 2 – OUT
Pin 3 – OUT	Pin 3 – GND

Application Examples

- Automotive, Consumer and Industrial
- Solid-state switch
- Interrupter
- Speed detection
- Angular position detection
- Linear position detection
- Proximity detection

General Description

The SS109 is a unipolar Hall effect sensor IC fabricated from mixed signal CMOS technology. The device integrates a voltage regulator, Hall sensor with dynamic offset cancellation system, Schmitt trigger and an open-drain output driver, all in a single package.

It incorporates advanced chopper stabilization techniques to provide accurate and stable magnetic switch points. There are many applications for this HED – Hall Electronic Device - in addition to those listed above.

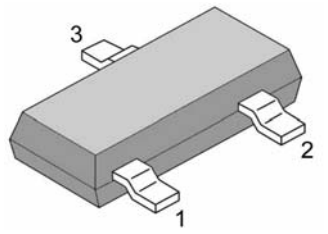
Thanks to its wide operating voltage range and extended choice of temperature range, it is quite suitable for use in automotive, industrial and consumer applications.

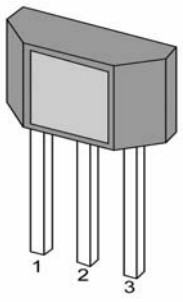
The device is delivered in a Small Outline Transistor (SOT) or in a Plastic Single In Line (SIP 3L flat). Both 3-lead packages are RoHS compliant.

Glossary of Terms

MilliTesla (mT), Gauss	Units of magnetic flux density: 1mT = 10 Gauss
RoHS	Restriction of Hazardous Substances
SOT	Small Outline Transistor (SOT package) - also referred with the package code "SO"
ESD	Electro-Static Discharge
BLDC	Brush-Less Direct-Current
Operating Point (B_{OP})	Magnetic flux density applied on the branded side of the package which turns the output driver ON ($V_{OUT} = V_{DSon}$)
Release Point (B_{RP})	Magnetic flux density applied on the branded side of the package which turns the output driver OFF (V_{OUT} = high)

Pin Definitions and Descriptions





SOT Pin №	SIP Pin №	Name	Type	Function
1	1	VDD	Supply	Supply Voltage pin
2	3	OUT	Output	Open Drain Output pin
3	2	GND	Ground	Ground pin

Table 1: Pin definitions and descriptions

Absolute Maximum Ratings

Parameter	Symbol	Value	Units
Supply Voltage	V_{DD}	28	V
Supply Current	I_{DD}	50	mA
Output Voltage	V_{OUT}	28	V
Output Current	I_{OUT}	50	mA
Storage Temperature Range	T_S	-50 to 150	°C
Maximum Junction Temperature	T_J	165	°C

Table 2: Absolute maximum ratings

Operating Temperature Range	Symbol	Value	Units
Temperature Suffix "E"	T_A	-40 to 85	°C
Temperature Suffix "K"	T_A	-40 to 125	°C
Temperature Suffix "L"	T_A	-40 to 150	°C

Exceeding the absolute maximum ratings may cause permanent damage. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

General Electrical Specifications

DC Operating Parameters T_A = 25℃, V_{DD}= 2.5V to 24V (unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Supply Voltage	V_{DD}	Operating	2.2		24	V
Supply Current	I_{DD}	$B < B_{RP}$			5	mA
Output Saturation Voltage	V_{DSon}	I_{OUT} = 20mA, $B > B_{OP}$			0.5	V
Output Leakage Current	I_{OFF}	$B < B_{RP}$ V_{OUT} = 24V		1	10	μA
Output Rise Time	t_r	R_L = 1kΩ, C_L = 20pF		0.25		μs
Output Fall Time	t_f	R_L = 1kΩ, C_L = 20pF		0.25		μs
Maximum Switching Frequency	F_{SW}	---		10		KHz
Package Thermal Resistance	R_{TH}	Single layer (1S) Jedec board		301		°C/W

Table 3: Electrical Specifications

Note: The output of SS109 will be switched after the supply voltage is over 2.2V, but the magnetic characteristics won't be normal until the supply is over 2.5V.

Magnetic Specifications

DC Operating Parameters V_{DD} = 2.5V to 24V (unless otherwise specified)

SS109

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Operating Point	B_{OP}	E spec., T_A = 85°C	-150	-120	-90	G
Release Point	B_{RP}		-120	-80	-40	G
Hysteresis	B_{HYST}		30	40	50	G
Operating Point	B_{OP}	K spec., T_A = 125°C	-160	-120	-85	G
Release Point	B_{RP}		-130	-80	-35	G
Hysteresis	B_{HYST}		30	40	50	G
Operating Point	B_{OP}	L spec., T_A = 150°C	-170	-120	-80	G
Release Point	B_{RP}		-140	-80	-30	G
Hysteresis	B_{HYST}		30	40	50	G

Table 4: Magnetic Specifications

Output Behavior versus Magnetic Pole

DC Operating Parameters T_A = -40℃ to 150℃, V_{DD} = 2.5V to 24V (unless otherwise specified)

Parameter	Test Conditions	OUT
South pole (SOT)	$B > B_{OP}$	Low
North pole (TO)	$B > B_{OP}$	Low
Null or weak magnetic field	$B = 0$ or $B < B_{RP}$	High

Table5:Output behavior versus magnetic pole

Application Information

It is strongly recommended that an external bypass capacitor be connected (in close proximity to the Hall sensor) between the supply (VDD Pin) and ground (GND Pin) of the device to reduce both external noise and noise generated by the chopper stabilization technique. As is shown in the two figures in next page, a 0.1μF capacitor is typical.

For reverse voltage protection, it is recommended to connect a resistor or a diode in series with the VDD pin. When using a resistor, three points are important:

- the resistor has to limit the reverse current to 50mA maximum (V_{CC} / R1 ≤ 50mA)
- the resulting device supply voltage V_{DD} has to be higher than V_{DD} min ($V_{DD} = V_{CC} – R1*I_{DD}$)
- the resistor has to withstand the power dissipated in reverse voltage condition ($P_D = V_{CC}^2/R1$)

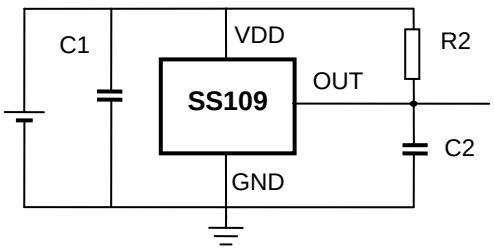
When using a diode, a reverse current cannot flow and the voltage drop is almost constant (≈0.7V).

Therefore, a 100Ω/0.25W resistor for 5V application and a diode for higher supply voltage are recommended. Both solutions provide the required reverse voltage protection.

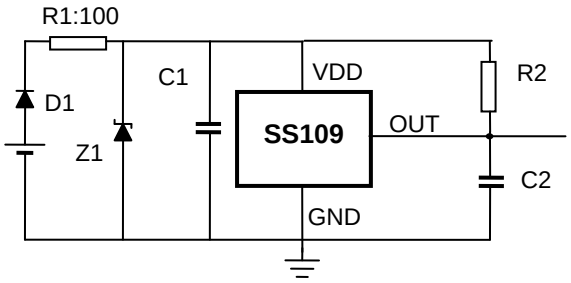
When a weak power supply is used or when the device is intended to be used in noisy environment, it is recommended that the figure 13.3 from the Application Information section is used.

The low-pass filter formed by R1 and C1 and the Zener diode Z1 bypass the disturbances or voltage spikes occurring on the device supply voltage V_{DD}. The diode D1 provides additional reverse voltage protection.

Typical Three-Wire Application Circuit



Automotive and Severe Environment Protection Circuit



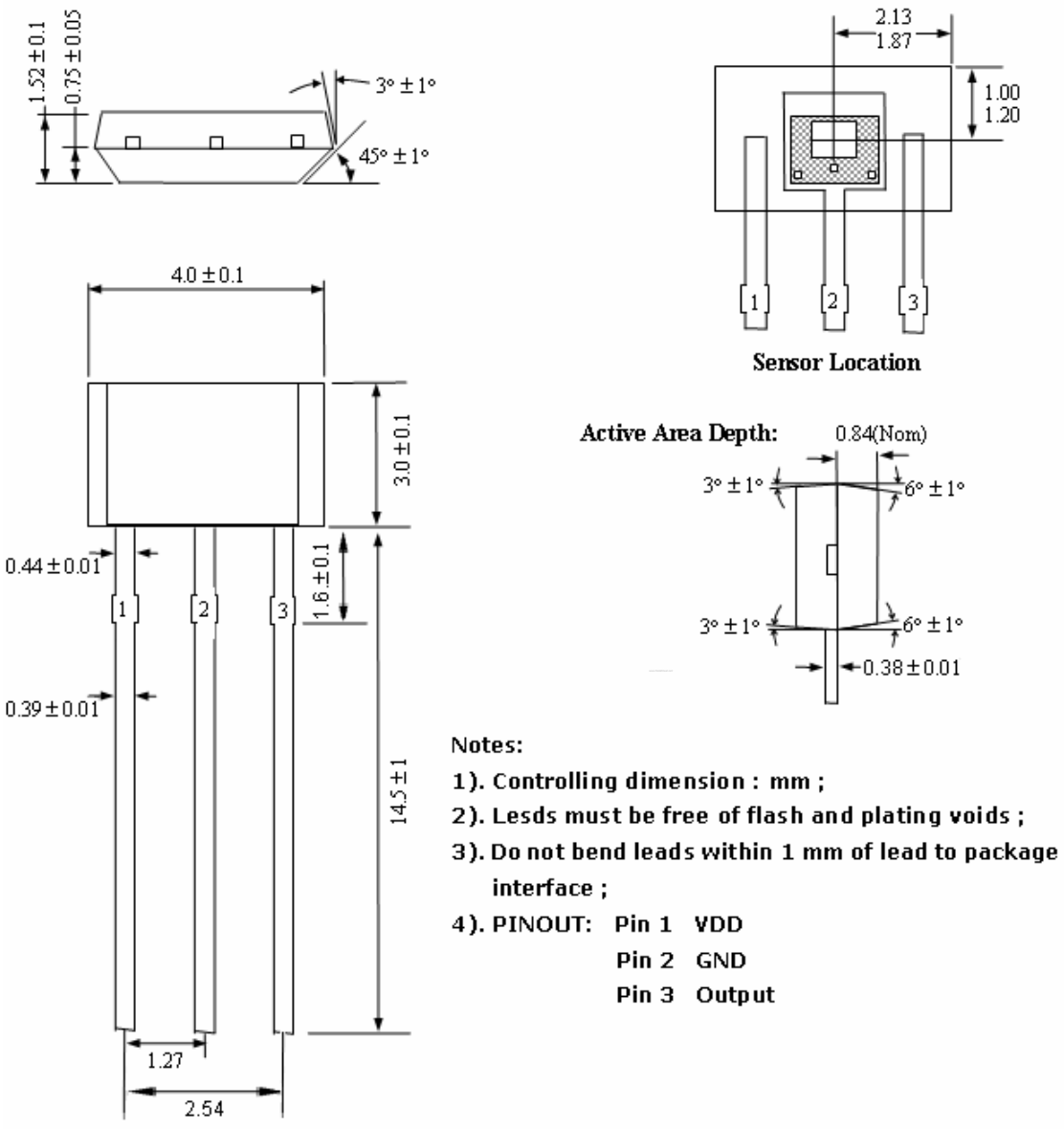
ESD Precautions

Electronic semiconductor products are sensitive to Electro Static Discharge (ESD).

Always observe Electro Static Discharge control procedures whenever handling semiconductor products.

Package Information

Package A, 3-Pin SIP:



Notes:

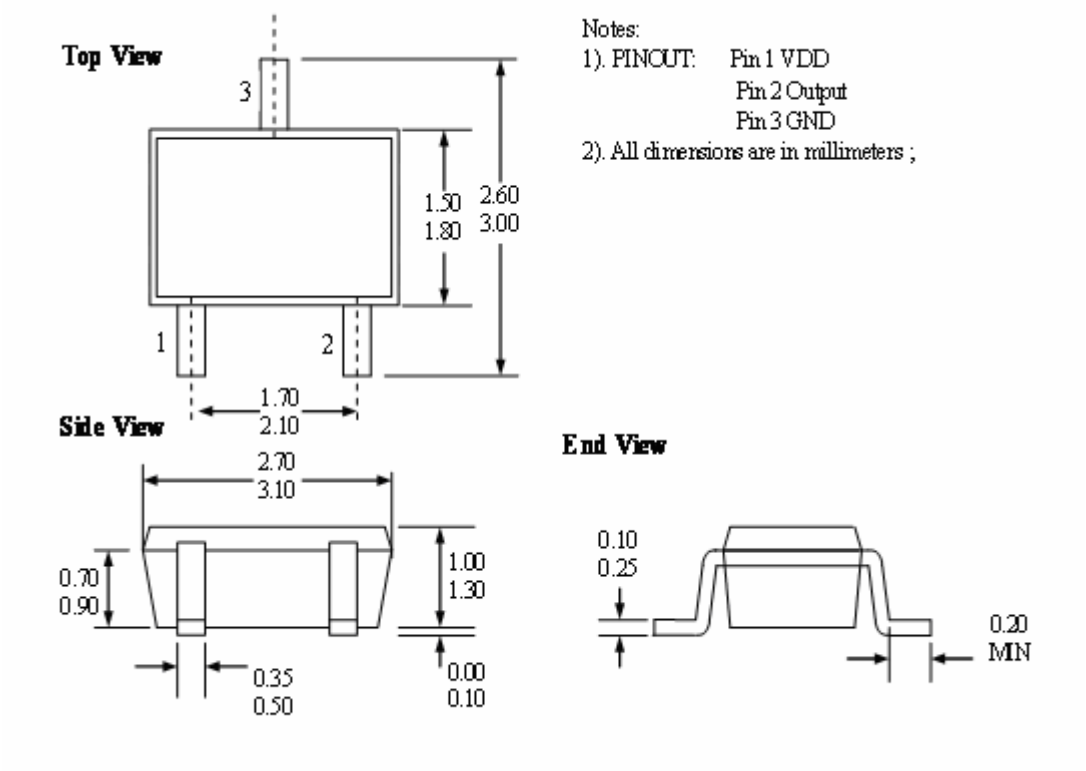
1). Controlling dimension : mm ;

2). Lesds 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 VDD
Pin 2 GND
Pin 3 Output

Package AT, 3-Pin SOT-23:



Ordering Information

Part No.	Pb-free	Temperature Code	Package Code	Packing
SS109ESOT	YES	-40°C to 85°C	SOT-23	7-in. reel, 3000 pieces/reel
SS109EUA	YES	-40°C to 85°C	TO-92	Bulk, 1000 pieces/bag
SS109KSOT	YES	-40°C to 125°C	SOT-23	7-in. reel, 3000 pieces/reel
SS109KUA	YES	-40°C to 125°C	TO-92	Bulk, 1000 pieces/bag
SS109LSOT	YES	-40°C to 150°C	SOT-23	7-in. reel, 3000 pieces/reel
SS109LUA	YES	-40°C to 150°C	TO-92	Bulk, 1000 pieces/bag