

Features

- Solid-State Reliability much better than reed switch
- Omnipolar, output switches with absolute value of North or South pole from magnet
- Operation from 3.5V to 24V
- High sensitivity for direct reed switch replacement applications

Description

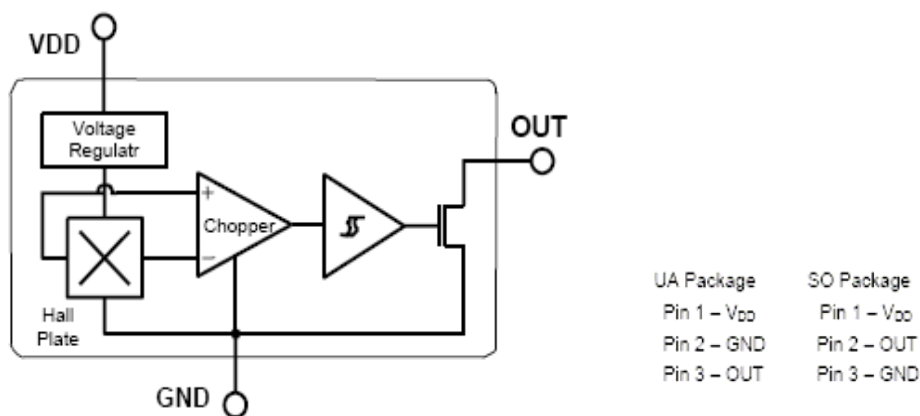
The DH45L Omnipolar Hall effect sensor IC is fabricated from mixed signal CMOS technology. It incorporates advanced chopper-stabilization techniques to provide accurate and stable magnetic switch points.

The output transistor of the DH45L will be latched on (BOP) in the presence of a sufficiently strong South or North magnetic field facing the marked side of the package. The output will be latched off (BRP) in the absence of a magnetic field.

Applications

- Solid state switch
- Speed detection
- Interrupter
- Magnet proximity sensor for reed switch replacement

Functional Block Diagram



Ordering Information

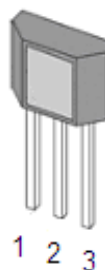
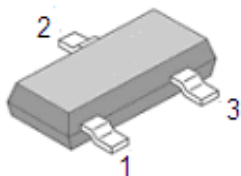
Part No.	Temperature Code	Package Code
DH45L	E (-40°C to 85°C)	SO(SOT-3L)
DH45L	E (-40°C to 85°C)	UA (TO-92)

Glossary of Terms

MilliTesla (mT),	Gauss	Units of magnetic flux density: 1mT = 10 Gauss
RoHS	REStriction of Hazardous Substances	
ESD	Electro-Static Discharge	
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 ($V_{OUT} = \text{high}$)	

Pin Definitions and Descriptions

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





Absolute Maximum Ratings

Parameter	Symbol	Value	Units
Supply Voltage(operating)	V _{DD}	28	V
Supply Current	I _{DD}	5	mA
Output Voltage	V _{OUT}	28	V
Output Current	I _{OUT}	10	mA
Operating Temperature Range	T _A	-40 to 150	°C
Storage Temperature Rang	T _S	-50 to 165	°C
ESD Sensitivity		4000	V

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

DC Electrical Characteristics

DC Operating Parameters: T_A = 25°C, V_{DD}=5V

Parameter	Symbol	TES Conditions	Min	Typ	Max	Units
Supply Voltage	VDD	Operating	3.5		24	V
Supply Current	IDD	B < B _{RP}			5	mA
Output Saturation Voltage	VDSon	I _{OUT} = 20mA, B > B _{OP}			0.5	V
Output Leakage Current	IOFF	B < B _{RP} V _{OUT} = 24V		1	10	μA
Output Rise Time	tr	RL = 1kΩ, CL = 20pF		0.25		μs
Output Fall Time	tf	RL = 1kΩ, CL = 20pF		0.25		μs
Maximum Switching Frequency	FSW	---		10		KHz
Package Thermal Resistance	RTH	Single layer (1S) Jedec board		301		°C/W

Magnetic Characteristics

Operating Parameters: T_A = 25°C, V_{DD}=5V_{DC}.

PARAMETER	Symbol	Min	Type	Max	Units
Operating Point	Bop	-	+/-40	+/-60	Gs
Release Point	Brp	+/-10	+/-25	-	Gs
Hysteresis	Bhys	-	15	-	Gs

ESD Protection

Human Body Model (HBM) tESs according to: Mil. Std. 883F method 3015.7

Parameter	Symbol	Limit Values		Unit	Notes
		Min	Max		
ESD Voltage	V _{ESD}	±2	±4	kV	

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 0.1 μ F 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 ($VCC / R1 \leq 50\text{mA}$)
- the resulting device supply voltage VDD has to be higher than VDD min ($VDD = VCC - R1 * I_{DD}$)
- the resistor has to withstand the power dissipated in reverse voltage condition ($PD = VCC^2 / R1$)

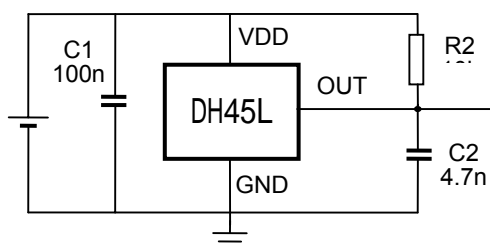
When using a diode, a reverse current cannot flow and the voltage drop is almost constant ($\approx 0.7\text{V}$).

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

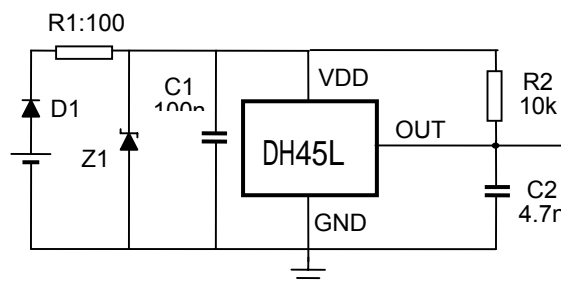
When a weak power supply is used or when the device is intended to be used in noisy environment, it is recommended that figure 13.3 from the Application Information section is used.

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 VDD. The diode D1 provides additional reverse voltage protection.

Typical Three-Wire Application Circuit



Automotive and Severe Environment Protection Circuit



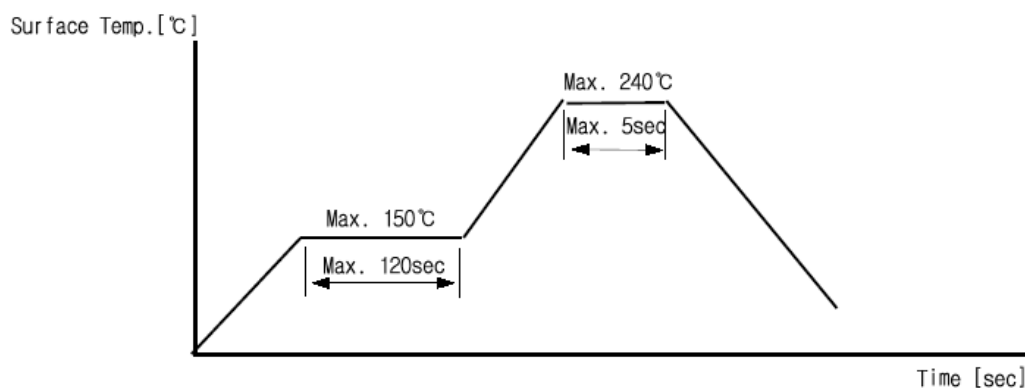
CMOS Hall IC Technology

The chopper stabilized amplifier uses switched capacitor techniques to eliminate the amplifier offset voltage, which, in bipolar devices, is a major source of temperature sensitive drift. CMOS makes this advanced technique possible. The CMOS chip is also much smaller than a bipolar chip, allowing very sophisticated circuitry to be placed in less space. The small chip size also contributes to lower physical stress and less power consumption.

Installation Comments

Consider temperature coefficients of Hall IC and magnetics, as well as air gap and life time variations. Observe temperature limits during wave soldering. Typical IR solder-reflow profile:

- No Rapid Heating and Cooling.
- Recommended Preheating for max. 2minutes at 150°C
- Recommended Reflowing for max. 5seconds at 240°C



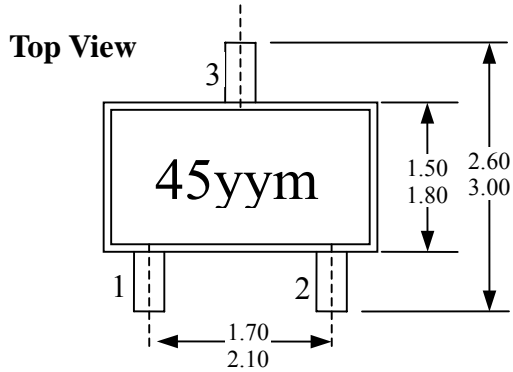
ESD Precautions

Electronic semiconductor products are sensitive to Electro Static Discharge (ESD). Always observe Electro Static Discharge control procedures whenever handling semiconductor products.



Package Information

SOT-23 Package Physical Characteristics

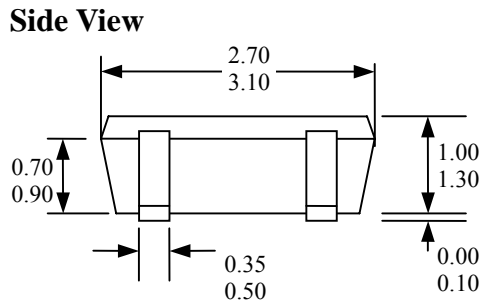


Notes:

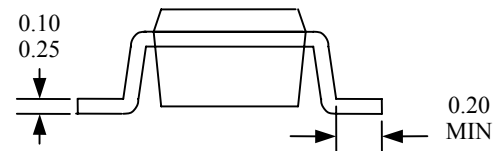
- 1). PINOUT: Pin 1 VDD
Pin 2 Output
Pin 3 GND
- 2). All dimensions are in millimeters ;

Marking:

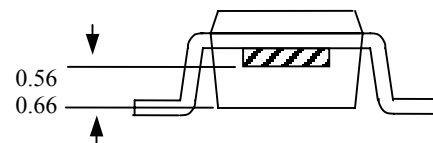
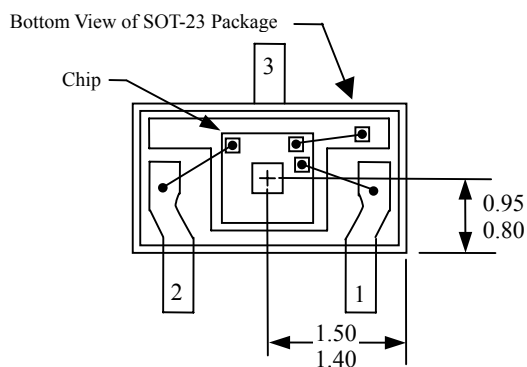
45-- Code of Device
yy -- last 2 digit of year ;
m -- "A"-“Z”, Production Lot ;



End View

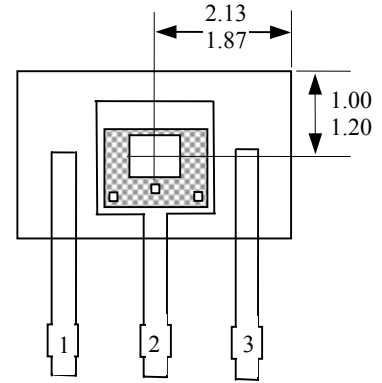
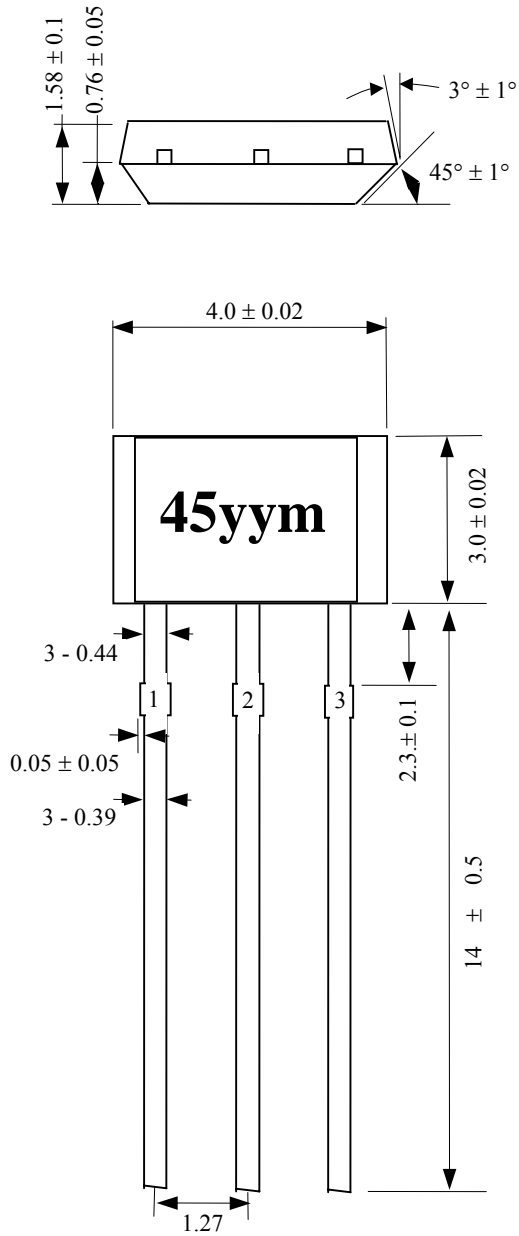


SOT-23 Package Hall Location

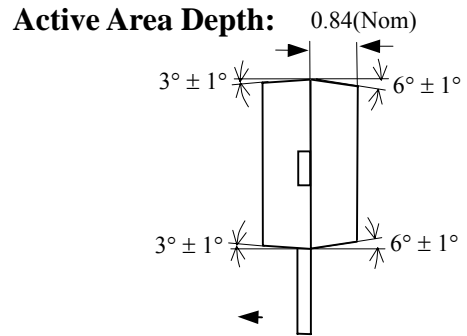




TO-92 Package Physical Characteristics



Sensor Location



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