

## General Description

TMR1309 is a digital omnipolar magnetic switch that integrates TMR and CMOS technology in order to provide a magnetically triggered digital switch with high sensitivity, high speed, and ultra-low power consumption. It is designed for use in applications that are both power-critical and performance-demanding. It contains a push-pull half-bridge TMR magnetic sensor and CMOS signal processing circuitry within the same package, including an on-chip TMR voltage generator for precise magnetic sensing, a TMR voltage amplifier and comparator plus Schmitt trigger to provide switching hysteresis for noise rejection, and CMOS push-pull output. An internal band gap regulator is used to provide a temperature compensated supply voltage for internal circuits, permitting a wide range of supply voltages. The TMR1309 draws only 1.5 $\mu$ A resulting in ultra-low power operation. It has fast response, accurate switching points, excellent thermal stability, and immunity to stray field interference. It is available in the SOT23-3 package.

## Features and Benefits

- Tunneling Magnetoresistance (TMR) Technology
- Ultra Low Power Consumption at 1.5 $\mu$ A
- High Frequency Response > 1kHz
- Operation with North or South Pole
- Very Low Switching Points for Ultra High Sensitivity
- Compatible with a Wide Range of Supply Voltages
- Excellent Thermal Stability
- High Tolerance to External Magnetic Field Interference

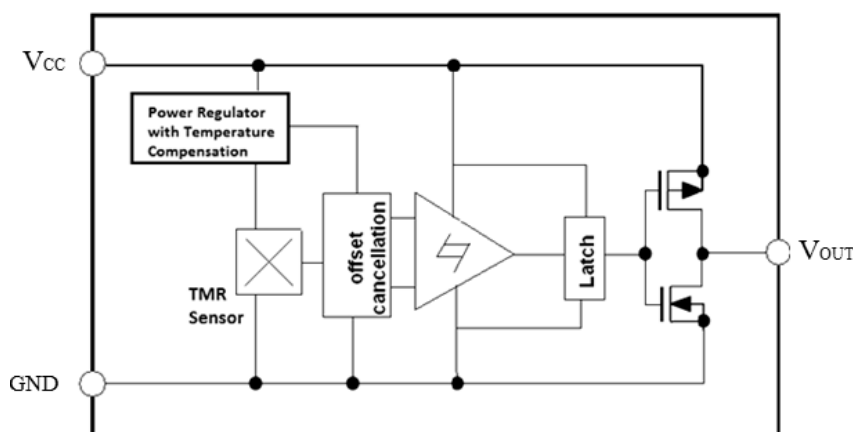
## Applications

- Proximity Switches
- Position and Speed Sensing
- Open/close switch for portable devices

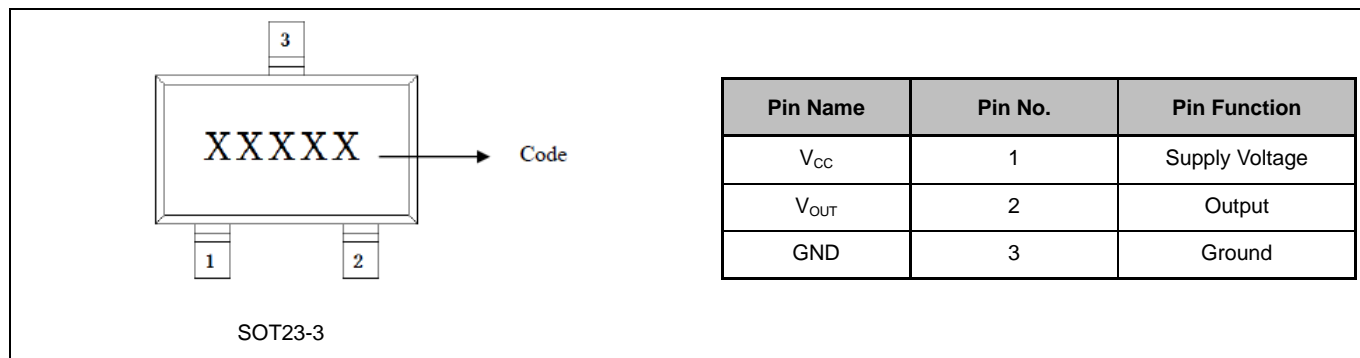


TMR1309S

## Block Diagram



## Pin Configuration



## Absolute Maximum Ratings

Parameter	Symbol	Limit	Unit
Supply Voltage	V <sub>CC</sub>	7	V
Reverse Supply Voltage	V <sub>RCC</sub>	0.3	V
Output Current	I <sub>OUTSINK</sub>	9	mA
Magnetic Flux Density	B	2800	G
ESD level(HBM)	V <sub>ESD</sub>	2	kV
Operating Ambient Temperature	T <sub>A</sub>	-40 ~125	°C
Storage Temperature	T <sub>stg</sub>	-50 ~ 150	°C

## Electrical Characteristics (V<sub>CC</sub>=3.0V, T<sub>A</sub>=25°C)

Parameter	Symbol	Conditions	Min	Typ.	Max	Unit
Supply Voltage	V <sub>CC</sub>	Operating	1.5	3.0	5.5	V
Output High Voltage	V <sub>OH</sub>		V <sub>CC</sub> -0.3		V <sub>CC</sub>	V
Output Low Voltage	V <sub>OL</sub>		0		0.2	V
Supply Current	I <sub>CC</sub>	Output Open		1.5	2.0	μA
Response Frequency	F			1000		Hz

**Note:** a 100nF capacitor is connected between V<sub>CC</sub> and GND during all tests in the above table.

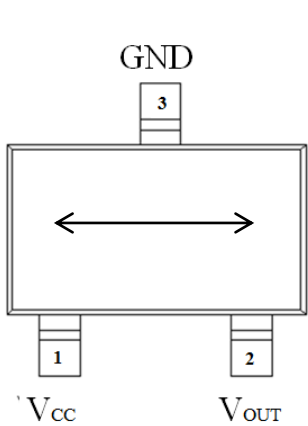
## Magnetic Characteristics (V<sub>CC</sub> = 3.0V, T<sub>A</sub> = 25°C)

Parameters	Symbol	Min	Typ.	Max	Units
Operate Point	B <sub>OPS</sub>	2.2		3.4	G
	B <sub>OPN</sub>	-3.4		-2.2	G
Release Point	B <sub>RPS</sub>	1.0			G
	B <sub>RPN</sub>			-1.0	G
Hysteresis	B <sub>H</sub>	0.1			G

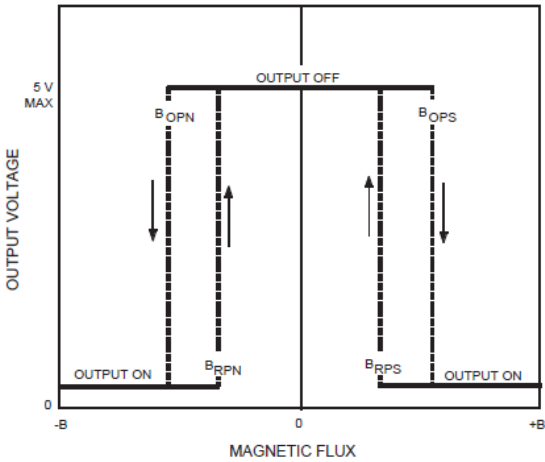
Output Behavior vs. Magnetic Pole

Parameter	Test Conditions	Output
South Pole	$B > B_{OPS}$	Low (On)
	$0 < B < B_{RPS}$	High (Off)
North Pole	$B < B_{OPN}$	Low (On)
	$0 > B > B_{RPN}$	High (Off)

**Note:** when power is turned on under zero magnetic field, the output is “High”.



Sensing Direction of Magnetic Field

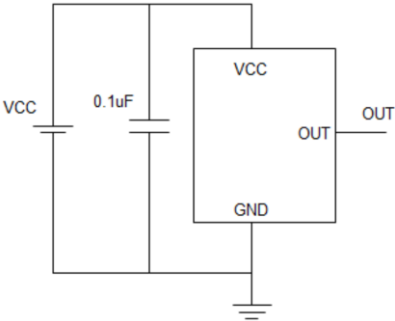


Magnetic Flux

Application Information

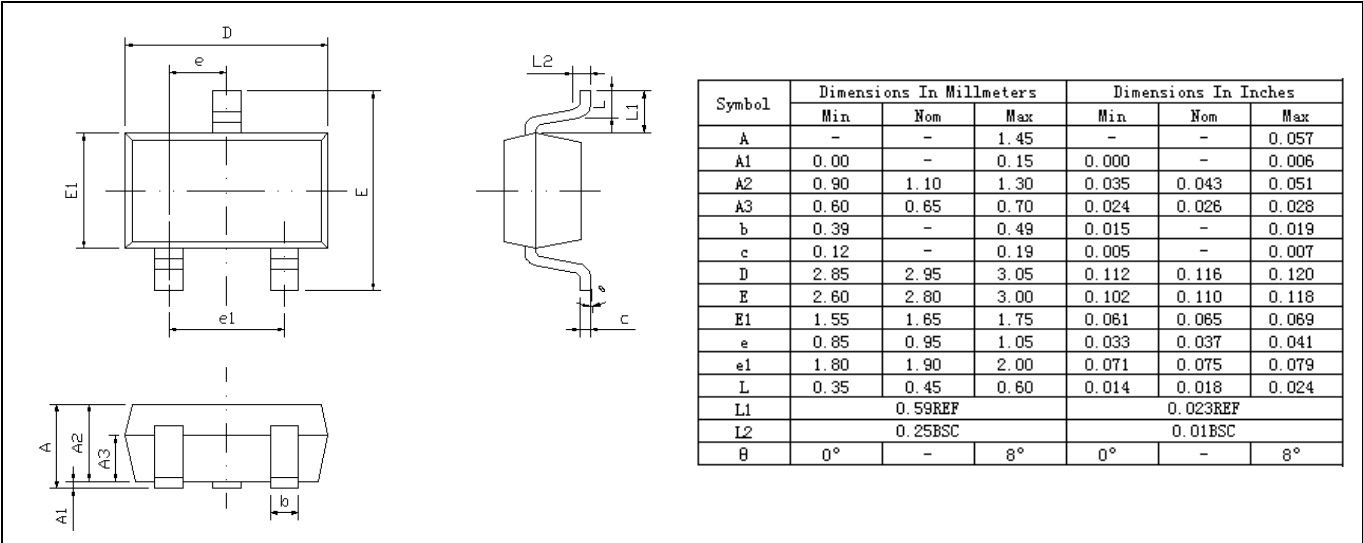
The output of the TMR1309 switches low (turns on) when a magnetic field to the sensing axis exceeds the operate point threshold,  $B_{OP}$ . When the magnetic field is reduced below the release point,  $B_{RP}$ , the device output switches high (turns off). The difference between the  $B_{OP}$  and  $B_{RP}$  is the hysteresis  $B_H$  of the device.

It is strongly recommended that an external bypass capacitor be connected in close proximity to the device between the supply and ground pins to reduce noise. The recommended value for the external bypass capacitor is 0.1 $\mu$ F.

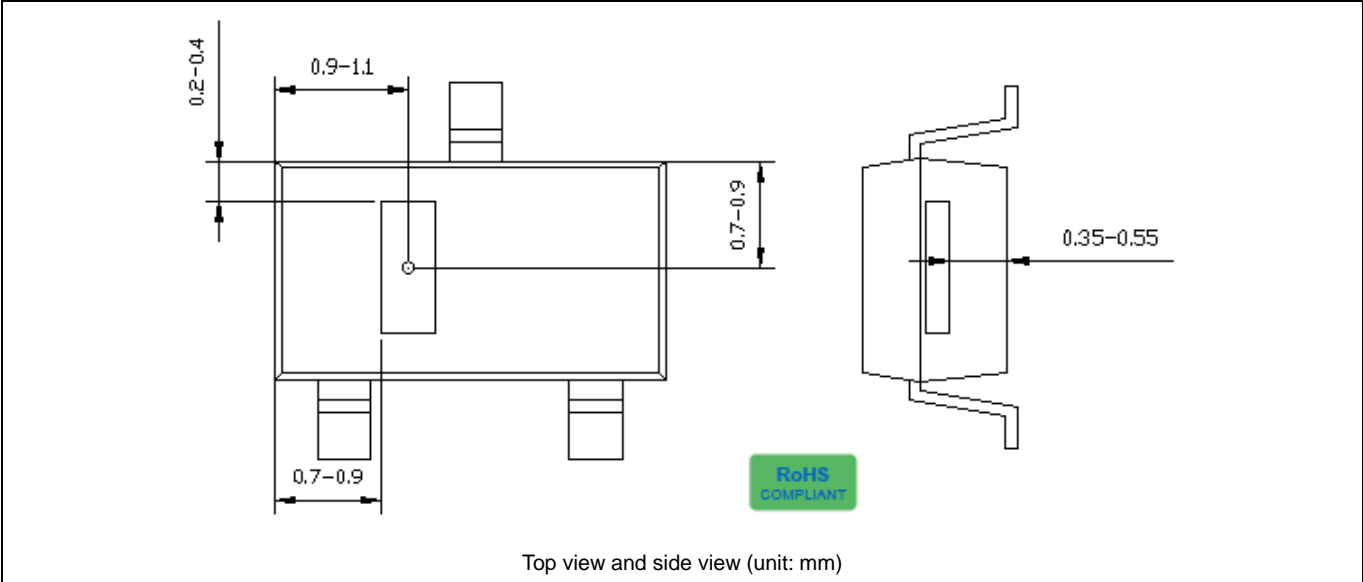


Package Information

SOT23-3 package drawing



TMR Sensor Position





**American Electronic Components Inc.,**

Address: 1101 Lafayette Street, Elkhart, Indiana 46516, United States of America.

Web: [www.aecensors.com](http://www.aecensors.com)

Email: [sales@aecensors.com](mailto:sales@aecensors.com)

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