

## General Description

TMR1157 is a digital unipolar 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 full-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 a 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 up to 40V. The TMR1157 draws only 0.6mA resulting in 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 (P/N TMR1157S) or the TO-92S package (P/N TMR1157T).

## Features and Benefits

- Tunneling Magnetoresistance (TMR) Technology
- Low Power Consumption(<0.6mA)
- High Frequency Response(>1kHz)
- Unipolar Latching Operation
- Z-axis sensing direction compatible with Hall Effect
- High Supply Voltage of 40V and 30V Reverse Voltage
- Open Drain Output
- Excellent Thermal Stability
- High Tolerance to External Magnetic Field Interference

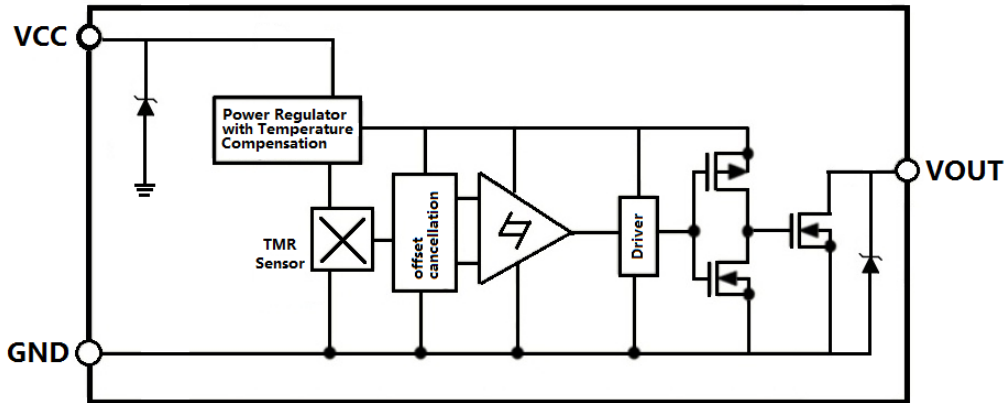
## Applications

- Utility Meters including Water, Gas, and Heat Meters
- Solid State Switches
- Position and Speed Sensing
- Motor and Fan Control
- Power Window



TMR1157S(Left), TMR1157T(Right)

### Block Diagram



### Pin Configuration

SOT23-3

TO-92S

Pin Name	Pin No.		Pin Function
	TO-92S	SOT23-3	
V <sub>CC</sub>	1	1	Supply Voltage
Gnd	2	3	Ground
V <sub>OUT</sub>	3	2	Output

### Absolute Maximum Ratings

Parameter	Symbol	Limit	Unit
Supply Voltage	V <sub>CC</sub>	40	V
Reverse Supply Voltage	V <sub>RCC</sub>	30	V
Output Current	I <sub>OUTSINK</sub>	25	mA
Magnetic Flux Density	B	4000	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>=24V, T<sub>A</sub>=25°C)

Parameter	Symbol	Conditions	Min	Typ.	Max	Unit
Supply Voltage	V <sub>CC</sub>	Operating	3	24	40	V
Output Stress Voltage	V <sub>stress</sub>				40	V
Output leak Current	I <sub>leak</sub>	OUT=H, V <sub>CC</sub> =24V, V <sub>out</sub> =24V		26		μA
Output Resistance of Turn off	R <sub>off</sub>	OUT=H		10		MΩ
Output Low Voltage	V <sub>OL</sub>	OUT=L, V <sub>CC</sub> =24V, I <sub>sink</sub> =25mA			0.3	V
Output Resistance of Turn on	R <sub>on</sub>	OUT=L			10	Ω
Supply Current	I <sub>CC</sub>	Output Open	0.4	0.5	0.6	mA
Response Frequency	F			1	100	KHz

**Note:** a 1kOhm pull-up resistor is connected between V<sub>CC</sub> and V<sub>OUT</sub>, and a 100nF capacitor is connected between V<sub>CC</sub> and GND during all

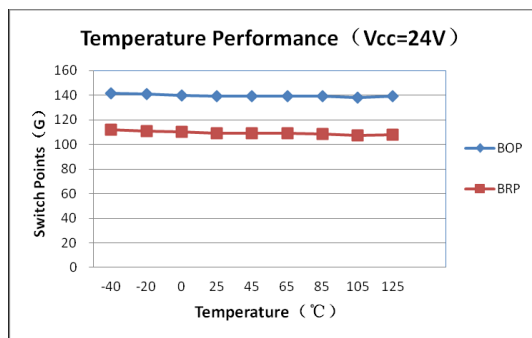
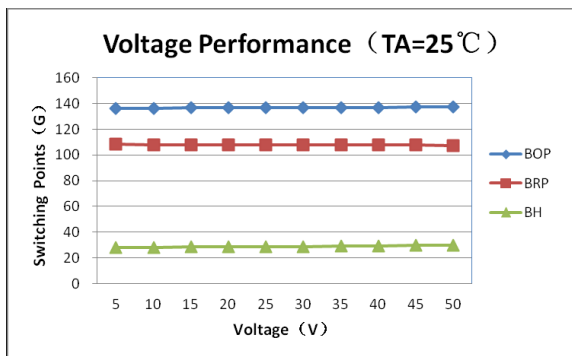
tests in the above table.

### Magnetic Characteristics ( $V_{CC} = 24V, T_A = 25^{\circ}C$ )

Parameters	Symbol	Min	Typ.	Max	Units
Operate Point	$B_{OP}$		140		G
Release Point	$B_{RP}$		110		G
Hysteresis	$B_H$		30		G

**Note:** a 1kOhm pull-up resistor is connected between  $V_{CC}$  and  $V_{OUT}$ , and a 100nF capacitor is connected between  $V_{CC}$  and GND during all tests in the above table.

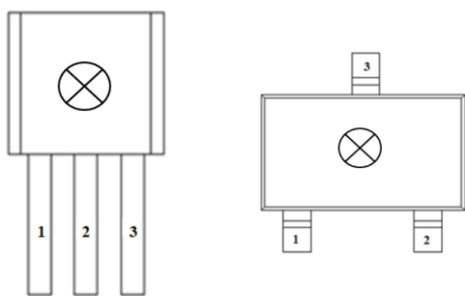
### Voltage and Temperature Characteristics



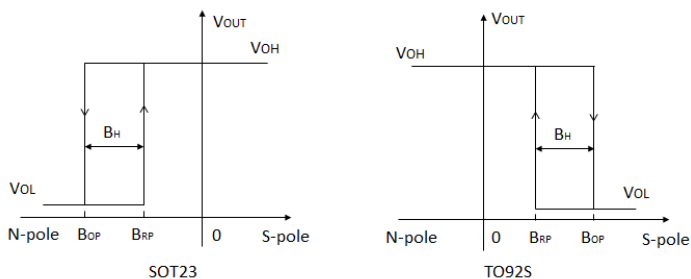
### Output Behavior vs. Magnetic Pole

Parameter	Test Conditions	Output
South Pole applicable to TO92S	$B > B_{OP}$	Low (On)
South Pole applicable to TO92S	$B < B_{OP}$	High (Off)
North Pole applicable to SOT23	$B > B_{OP}$	Low (On)
North Pole applicable to SOT23	$B < B_{OP}$	High (Off)

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



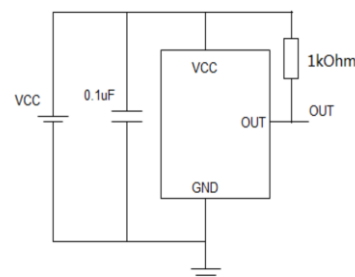
Sensing Direction of Magnetic Field(Z-Axis)



Magnetic Flux

### Application Information

The output of the TMR1157 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



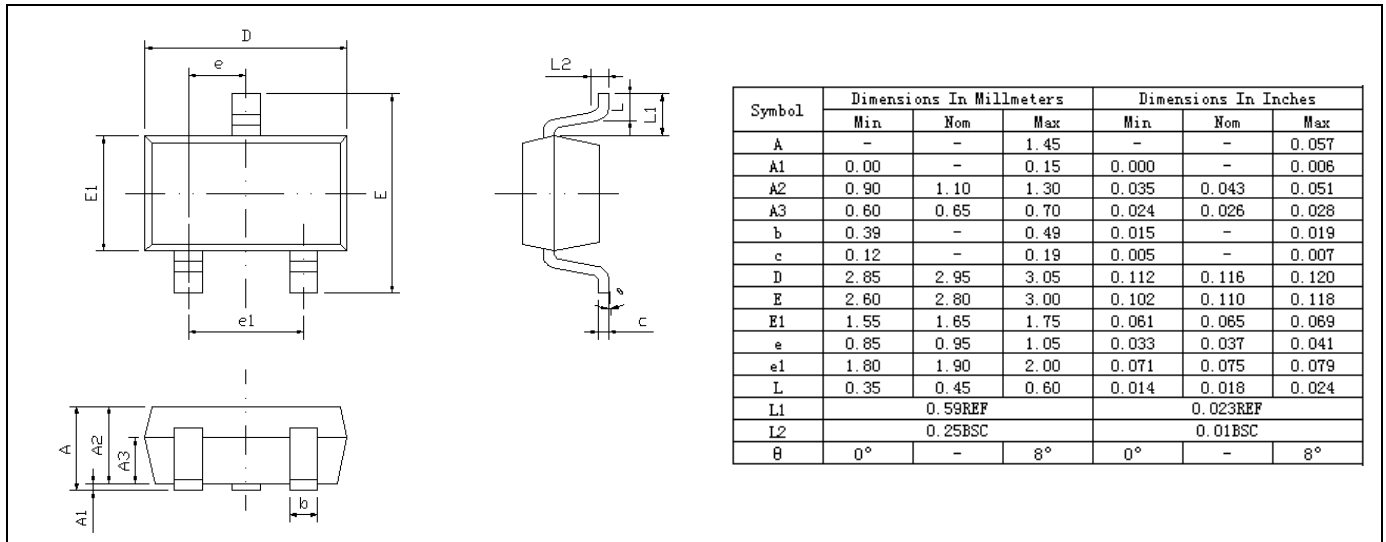
difference between the  $B_{OP}$  and  $B_{RP}$  is the hysteresis  $B_H$  of the device.

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.

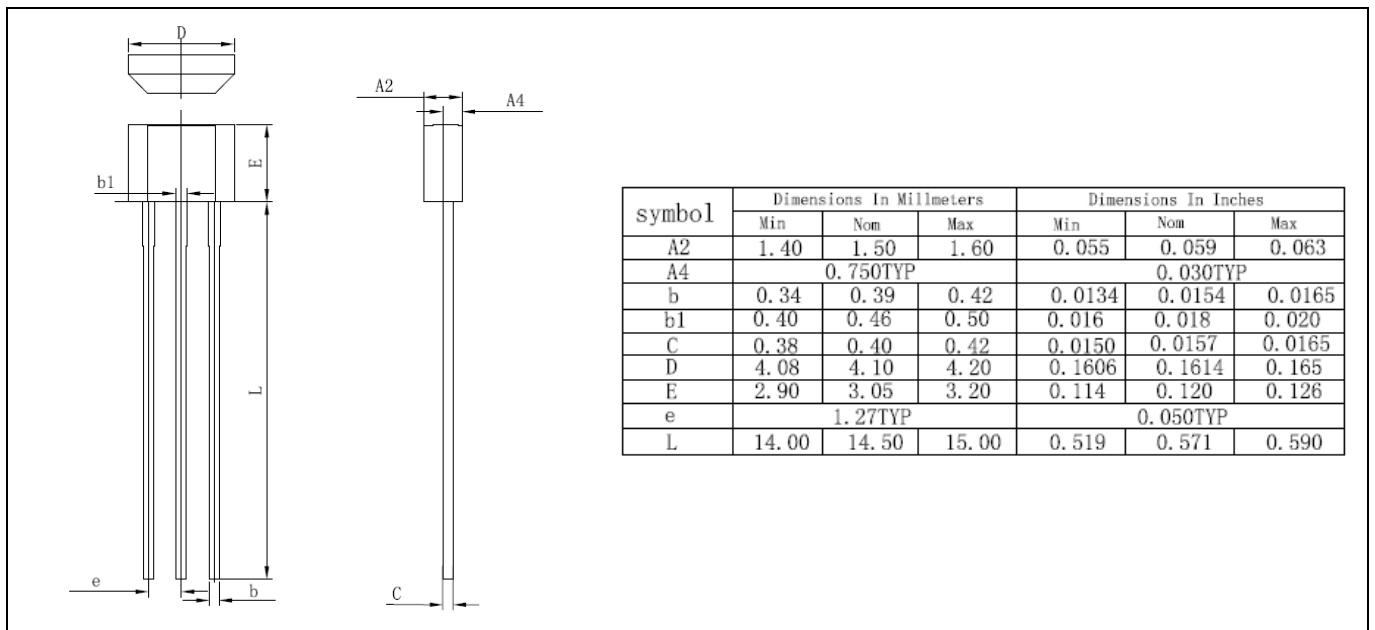
The recommended value for the external bypass capacitor is 0.1 $\mu$ F.

### Package Information

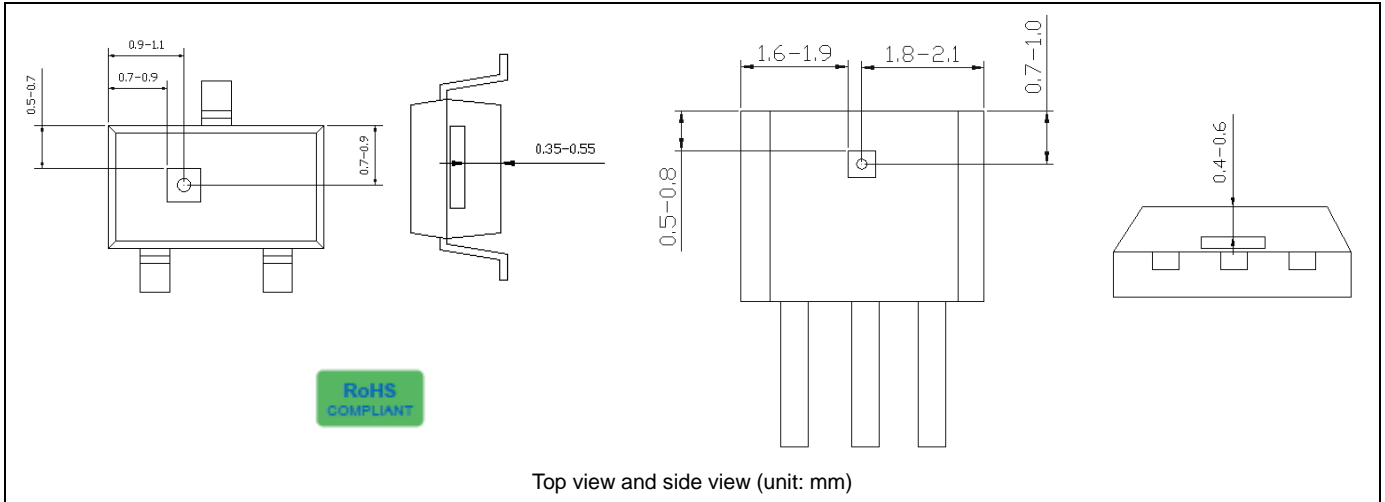
SOT23-3 package drawing



TO-92S package drawing



### TMR Sensor Position



**MultiDimension Technology Co., Ltd.**

Address: No.7 Guangdong Road, Zhangjiagang Free Trade Zone, Jiangsu, 215634, China

Web: [www.dowaytech.com/en](http://www.dowaytech.com/en)

Email: [info@dowaytech.com](mailto:info@dowaytech.com)

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