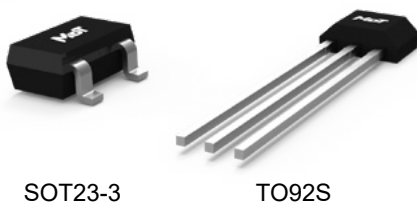


# TMR1383

## High-Voltage TMR Omnipolar Switch

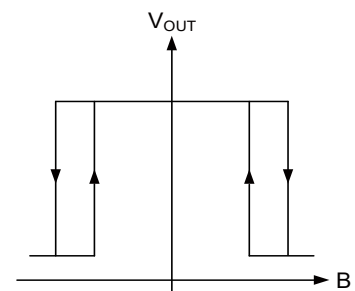
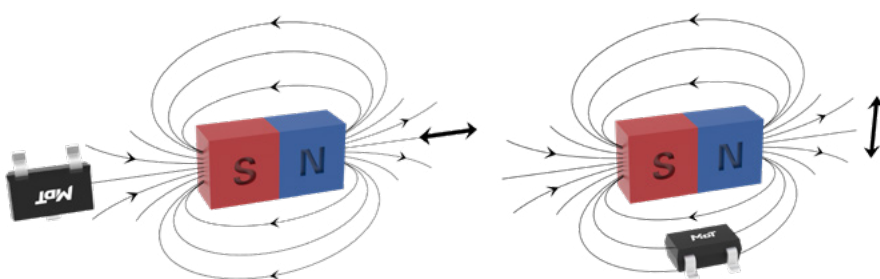
### Description

TMR1383 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 low power consumption. It is designed for use in applications that are both power-critical and performance-demanding. It contains a push-pull TMR sensor bridge 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 an open-drain 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 from 3 V up to 40 V. The TMR1383 draws only 0.6 mA 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 two compact SOT23-3 and TO92S packages.



SOT23-3

TO92S



### Features and Benefits

- Tunneling magnetoresistance (TMR) technology
- Low power consumption < 0.6 mA
- High frequency response  $\geq 100$  kHz
- Omnipolar operation
- In-plane X-Axis sensing
- High supply voltages of 40 V and 30 V reverse voltage
- Open-drain output
- High sensitivity
- Excellent temperature stability
- High tolerance to external magnetic field interference
- RoHS & REACH compliant

### Applications

- Utility meters: water, gas, and heat meters
- Proximity switches
- Speed sensing
- Position sensing
- Motor and fan control
- Power window

## Selection Guide

Part Number	Supply Current	Response Frequency	Operating Ambient Temperature	Operating Point	Release Point	Package	Packing Form
TMR1383S	0.5 mA	100 kHz	-40 °C to 125 °C	±26 Gs	±19 Gs	SOT23-3	Tape & Reel
TMR1383T	0.5 mA	100 kHz	-40 °C to 125 °C	±26 Gs	±19 Gs	TO92S	ESD Bag

Note: Please contact MultiDimension Technology local sales for customizing operating and release points.

## Catalogue

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## 1. Functional Block Diagram

TMR1383 series switch chips are composed of TMR sensors and signal processing circuits. The TMR sensor detects external magnetic field, generates an analog voltage signal, and outputs a logical switch level after processing by the circuits as shown in Figure 1.

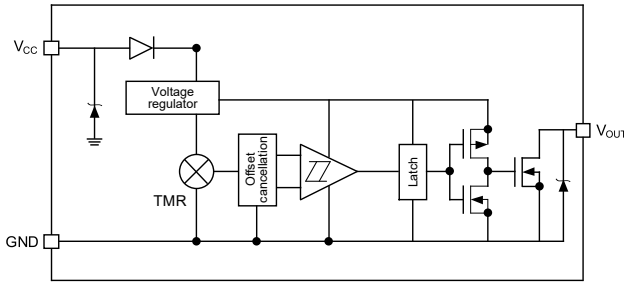


Figure 1. Block diagram

## 2. Switching Characteristics

The TMR1383 sensing axis is parallel to the package top-marking surface; the sensing axis is defined from the N pole toward the S pole, as indicated by the arrow in the figure below.

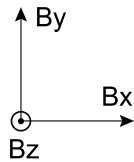


Figure 2-1. Definition of axis

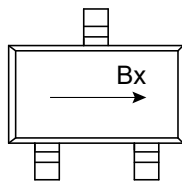


Figure 2-2. Axial diagram (SOT23-3 top view)

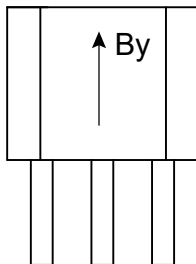


Figure 2-3. Axial diagram (TO92S side view)

The output is “High”, when power is on at zero magnetic field.  $B$  is the external magnetic field along the sensing direction,  $B_{OPS}$  ( $B_{OPN}$ ) is the operating point,  $B_{RPS}$  ( $B_{RPN}$ ) is the release point, and hysteresis  $B_H$  is define as the difference between  $B_{OPS}$  and  $B_{RPS}$  ( $B_{OPN}$  and  $B_{RPN}$ ).

The sensor outputs a low level, when the magnetic field along the sensing axis exceeds the operate point  $B_{OPS}$  ( $B_{OPN}$ ), and the device outputs a high level, when the magnetic field is reduced below the release point  $B_{RPS}$  ( $B_{RPN}$ ) as shown in Figure 3.

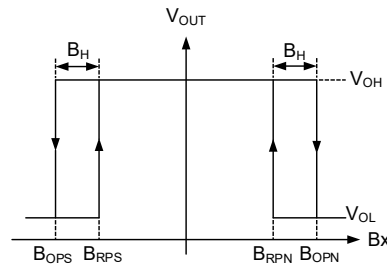


Figure 3-1. Switching characteristics (SOT23-3)

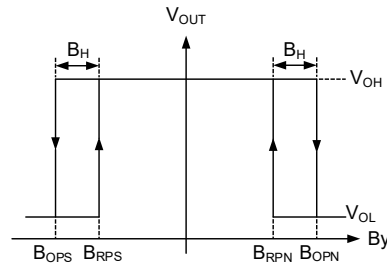


Figure 3-2. Switching characteristics (TO92S)

## 3. Pin Configuration

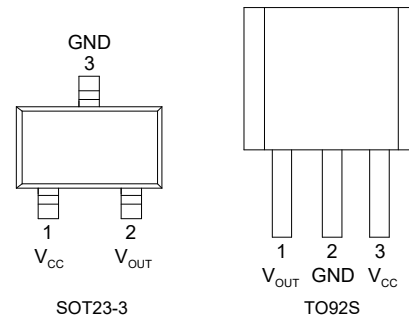


Figure 4. Pin configuration

Pin Number		Name	Function
SOT23-3	TO92S		
1	3	$V_{CC}$	Power supply
2	1	$V_{OUT}$	Output
3	2	GND	Ground

## 4. Absolute Maximum Ratings

Parameters	Symbol	Min.	Max.	Unit
Supply voltage	$V_{CC}$	-	40	V
Reverse supply voltage	$V_{RCC}$	-	30	V
Output current	$I_{SINK}$	-	25	mA
Magnetic flux density	B	-	4000	Gs
ESD performance (HBM)	$V_{ESD}$	-	4	kV
Operating ambient temperature	$T_A$	-40	125	°C
Storage ambient temperature	$T_{STG}$	-50	150	°C

## 5. Electrical Specifications

$V_{CC} = 24\text{ V}$ ,  $T_A = 25\text{ °C}$

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply voltage	$V_{CC}$	Operating	3	24	40	V
Output stress voltage	$V_{stress}$	-	-	-	40	V
Output leak current	$I_{leak}$	OUT = H, $V_{CC} = 24\text{ V}$ , $V_{OUT} = 24\text{ V}$	-	3	-	$\mu\text{A}$
Off resistance of output	$R_{OFF}$	OUT = H	-	10	-	M $\Omega$
Output low voltage	$V_{OL}$	OUT = L, $V_{CC} = 24\text{ V}$ , $I_{SINK} = 25\text{ mA}$	-	-	0.3	V
On resistance of output	$R_{ON}$	OUT = L	-	-	10	$\Omega$
Supply current	$I_{CC}$	Output Open	0.4	0.5	0.6	mA
Response frequency	F	-	0 to 100			kHz

Note: A 1 k $\Omega$  pull-up resistor is connected between  $V_{CC}$  and  $V_{OUT}$ , and a 0.1  $\mu\text{F}$  capacitor is connected between  $V_{CC}$  and GND during all tests in the table above.

## 6. Magnetic Specifications

$V_{CC} = 24\text{ V}$ ,  $T_A = 25\text{ °C}$

Parameter	Symbol	Min.	Typ.	Max.	Unit
Operate point	$B_{OPS}$	-36	-26	-18	Gs
	$B_{OPN}$	18	26	36	Gs
Release point	$B_{RPS}$	-32	-19	-8	Gs
	$B_{RPN}$	8	19	32	Gs
Hysteresis	$B_H$	3	7	13	Gs

## 7. Typical Supply Voltage Characteristics

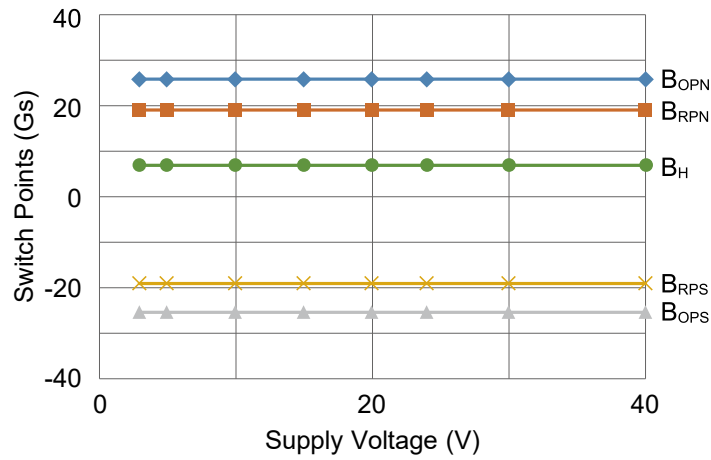


Figure 5. Switch points versus supply voltage (T<sub>A</sub> = 25°C)

## 8. Typical Temperature Characteristics

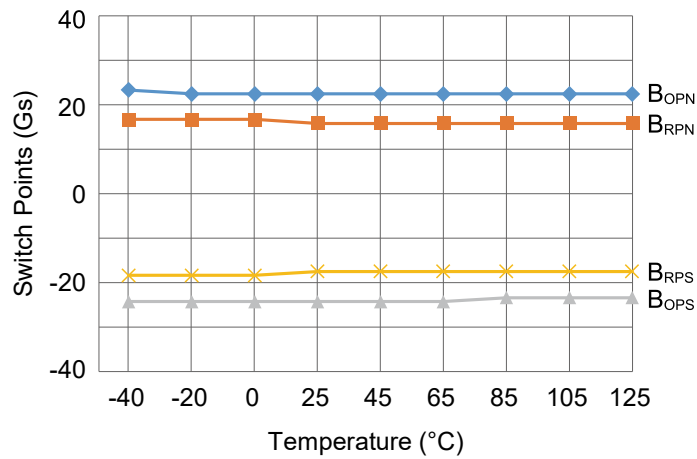


Figure 6. Switch points versus temperature (V<sub>CC</sub> = 24 V)

## 9. Application Information

It is recommended to add a filter capacitor between the sensor power supply and ground (close to the sensor) to reduce external noise. As shown in Figure 7, the typical value is 0.1  $\mu\text{F}$ .

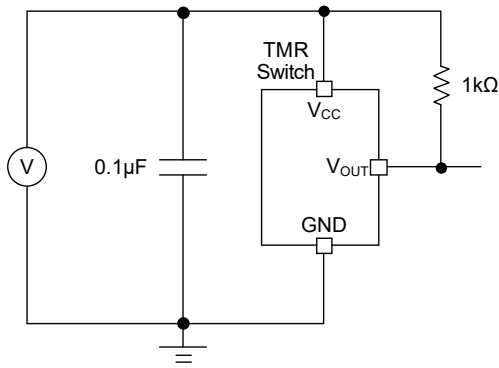


Figure 7. Application circuit diagram

Common failure conditions:

- The device is exposed to conditions exceeding any absolute maximum rating.
- The external circuit does not include properly matched supply-pin decoupling/filter capacitors.
- The device's  $V_{\text{OUT}}$  pin is used to directly drive power devices (e.g., relays), causing the output current to exceed the "Absolute Maximum Ratings".
- The device operates in a humid environment for an extended period.
- The maximum soldering temperature exceeds 260°C, or exposure above 250°C lasts longer than 10s.
- The device is exposed to temperatures above the maximum operating temperature while the external magnetic field exceeds 20 Gs.
- The device is exposed to an ultrasonic environment.
- Excessive deformation of the device leads/pins.
- Applying a voltage to the  $V_{\text{OUT}}$  pin, or powering the device through the  $V_{\text{OUT}}$  pin.

10. Dimensions  
SOT23-3 Package

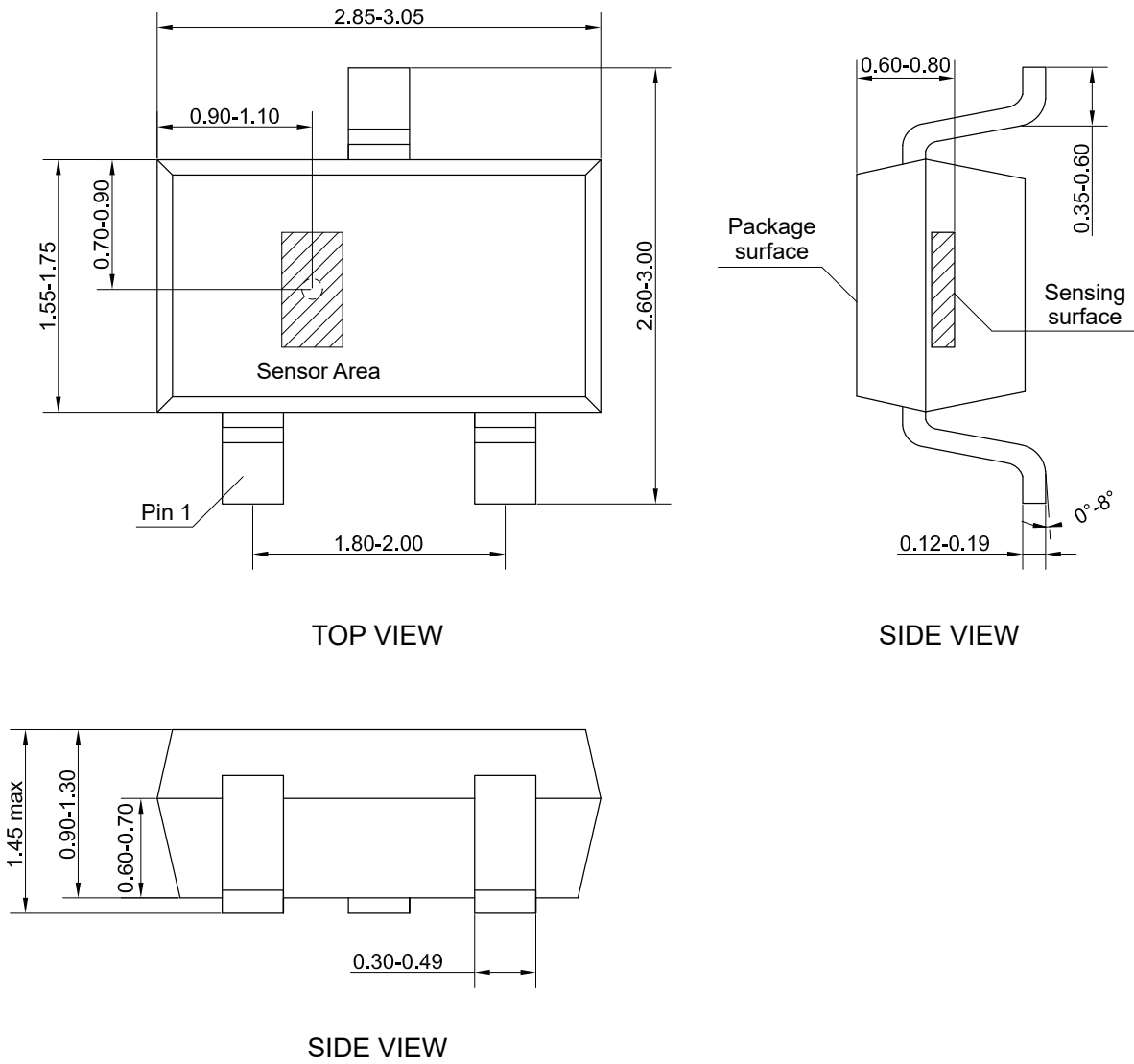


Figure 8. Package outline of SOT23-3 (unit: mm)

TO92S Package

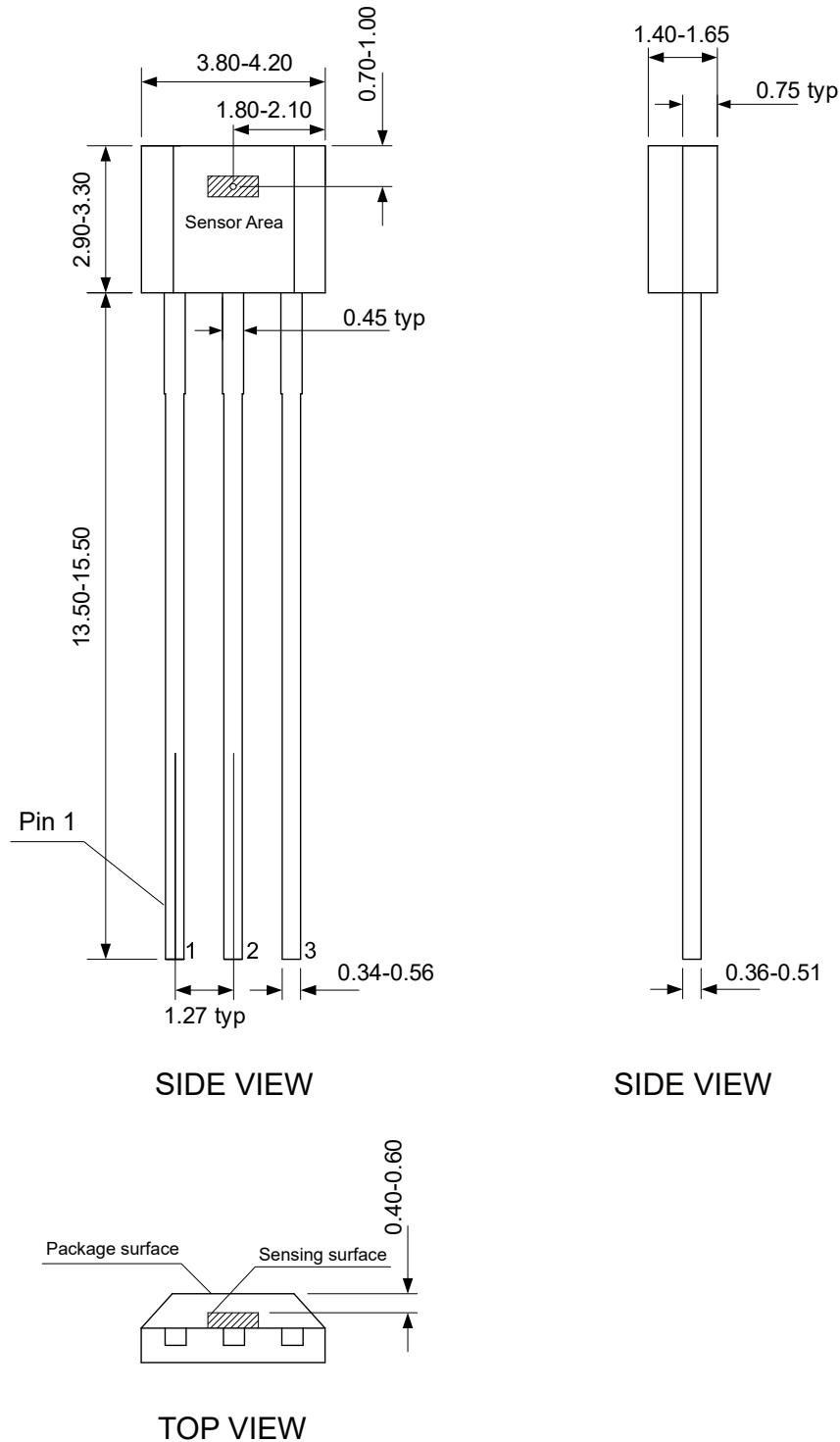


Figure 9. Package outline of TO92S (unit: mm)

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