

# TMR1340B

## MicroAmpere High Frequency Response Omnipolar Magnetic Switch Sensor

### Description

TMR1340B is an omnipolar magnetic switch integrated the tunnel magnetoresistance (TMR) magnetic sensor and open-drain circuitry, which is able to detect the change of magnetic field and output high and low voltage signals for high accuracy position detection.

Unlike Hall/AMR sensors, TMR sensors with extremely high resistance values allows TMR1340B to achieve the supply current as low as 1.5  $\mu\text{A}$  while operating in the full-time power supply mode, and maintaining the response frequency of the magnetic signal is 1 kHz. Therefore, TMR1340B can provide true continuous detection of magnetic field signals, avoiding sampling errors from the traditional time-sharing power supply mode.

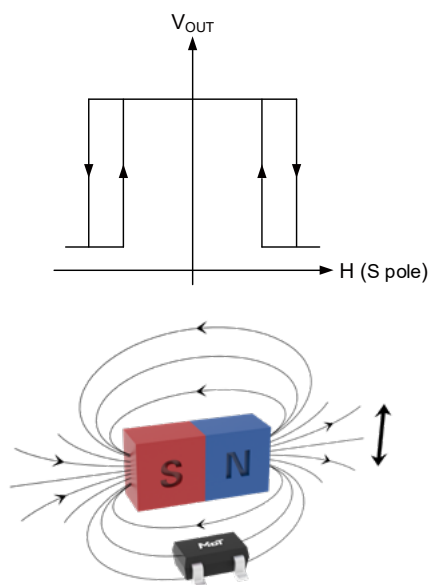
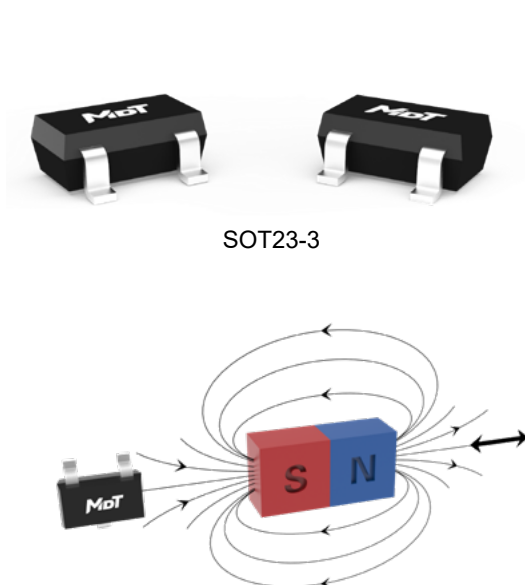
TMR1340B allows a wide range of operating supply voltages from 1.8 V to 5.5 V with excellent temperature characteristics, and can meet the requirements of most applications. TMR1340B is available in compact SOT23-3 packages.

### Features and Benefits

- Tunneling magnetoresistance (TMR) technology
- Low power consumption: supply current 1.5  $\mu\text{A}$
- High frequency response: typ. 1 kHz
- Omnipolar operation
- Wide range supply voltages: 1.8 V to 5.5 V
- Open-drain push-pull 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
- Linear and rotation position sensing



## Selection Guide

Part Number	Supply Current	Response Frequency	Operating Ambient Temperature	Operating Point	Release Point	Package	Packing Form
TMR1340BS	1.5 $\mu$ A	1 kHz	-40°C to 125°C	$\pm 14$ Gs	$\pm 10$ Gs	SOT23-3	Tape & Reel
Note: Please contact MultiDimension Technology local sales for customizing operating and release points.							

## Catalogue

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## 1. Functional Block Diagram

TMR1340B 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.

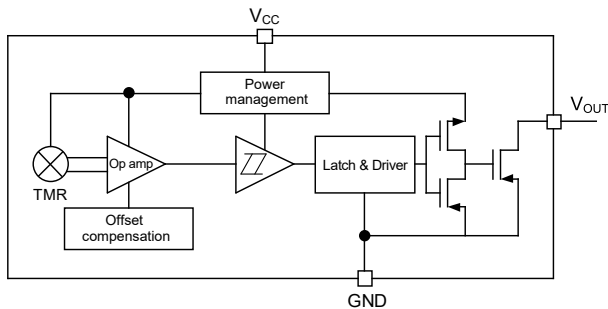


Figure 1. Block diagram

## 2. Switching Characteristics

The Figure 2 shows the sensing direction is parallel to the silkscreen surface of the package as shown by the arrow.

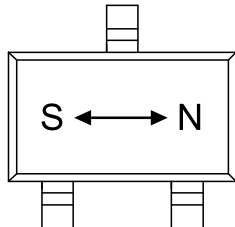


Figure 2. Sensing direction

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.

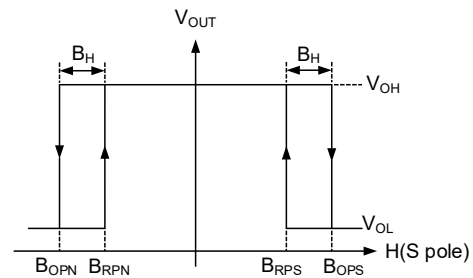


Figure 3. Switching characteristics

## 3. Pin Configuration

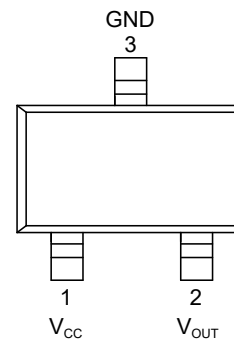


Figure 4. Pin configuration

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

## 4. Absolute Maximum Ratings

Parameters	Symbol	Min.	Max.	Unit
Supply voltage	$V_{CC}$	-0.3	7	V
Output current	$I_{SINK}$	-	20	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

Note:  $I_{SINK}$  is the current flowing through the pin of sensor, when the output is turned on.

## 5. Electrical Specifications

$V_{CC} = 3\text{ V}$ ,  $T_A = 25\text{ °C}$

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply voltage	$V_{CC}$	operating	1.8	3.0	5.5	V
Output stress voltage	$V_{stress}$	-	-	-	5.5	V
Output leak current	$I_{leak}$	OUT = H	-	-	1	μA
On resistance of output	$R_{ON}$	OUT = L	-	0.75	1	Ω
Off resistance of output	$R_{OFF}$	OUT = H	-	10	-	MΩ
Output low voltage	$V_{OL}$	OP status	0	-	0.1	V
Supply current	$I_{CC}$	output open	-	1.5	-	μA
Response frequency	F	-	0 to 1000			Hz

Note: A 0.1 μF capacitor is connected between  $V_{CC}$  and GND, and 1 kΩ pull-up resistor is connected between  $V_{CC}$  and  $V_{OUT}$

## 6. Magnetic Specifications

$V_{CC} = 3\text{ V}$ ,  $T_A = 25\text{ °C}$ , a 0.1 μF capacitor is connected between  $V_{CC}$  and GND

Parameter	Symbol	Min.	Typ.	Max.	Unit
Operate point	$B_{OPS}$	10	14	25	Gs
	$B_{OPN}$	-25	-14	-10	Gs
Release point	$B_{RPS}$	5	10	20	Gs
	$B_{RPN}$	-20	-10	-5	Gs
Hysteresis	$B_H$	2	4	13	Gs

## 7. Typical Supply Voltage Characteristics

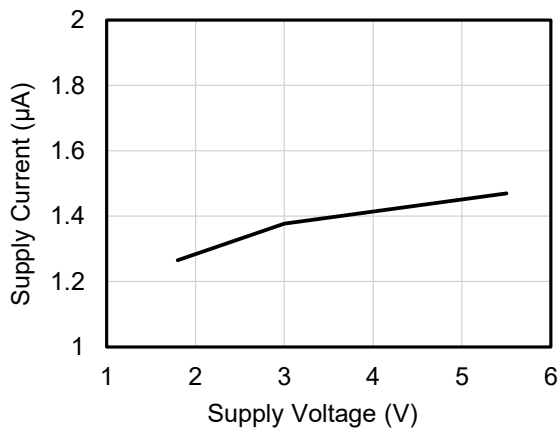


Figure 5. Supply current versus supply voltage ( $T_A=25^\circ\text{C}$ )

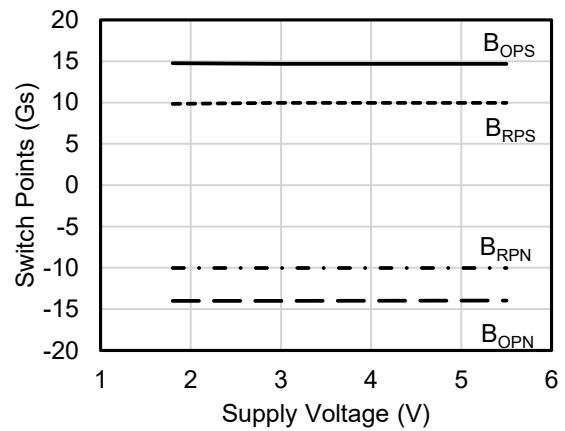


Figure 6. Switch points versus supply voltage ( $T_A=25^\circ\text{C}$ )

## 8. Typical Temperature Characteristics

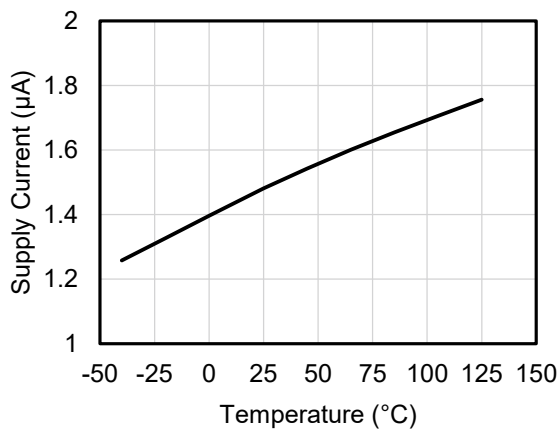


Figure 7. Supply current versus temperature ( $V_{CC} = 3\text{ V}$ )

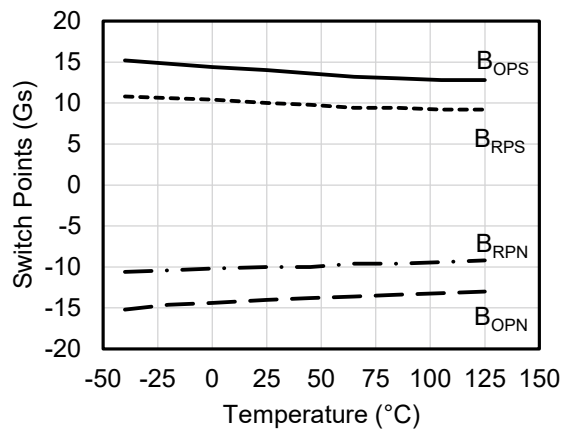


Figure 8. Switch points versus temperature ( $V_{CC} = 3\text{ V}$ )

## 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 9, the typical value is 0.1  $\mu\text{F}$ .

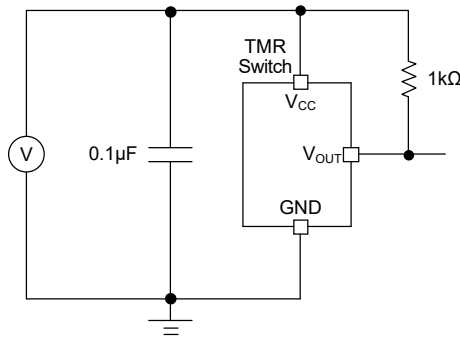


Figure 9. Application circuit diagram

The TMR1340B sensor chips are not suitable for driving power loads. The general method of use is utilizing the output voltage of  $V_{\text{OUT}}$  pin as a signal to input the MCU or drive a triode or MOS as shown in Figure 10.

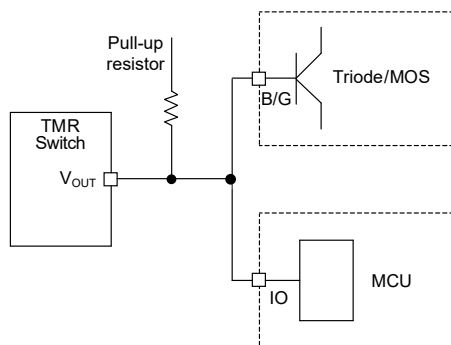


Figure 10. Application diagram for driving power load

Common failure conditions:

- The supply voltage exceeds the limit of absolute maximum ratings
- Absence of matching filter capacitor to power supply when the power supply is unstable, which can cause the product to restart repeatedly
- Using switch output  $V_{\text{OUT}}$  to control high-power relays, etc., and cause  $I_{\text{SINK}}$  exceeding the limit of absolute maximum ratings
- The external magnetic field exceeds the limit of absolute maximum ratings
- Operating in a humid environment for a long time, causing vapor penetration and increased power consumption
- Overheating when soldering
- Over bending of pins

## 10. Dimensions

### SOT23-3 Package

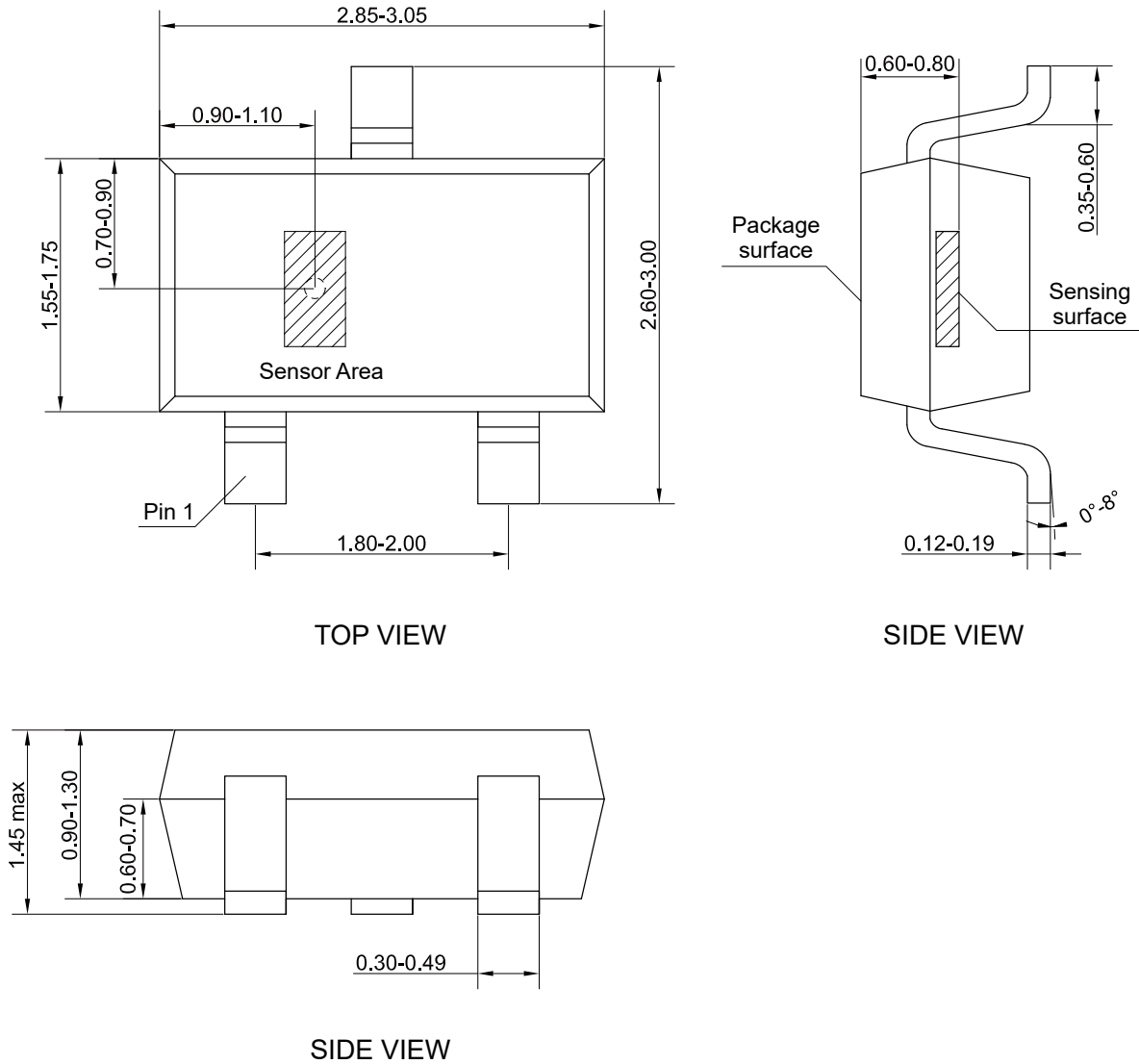


Figure 11. Package outline of SOT23-3 (unit: mm)

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