

# TMR1340B

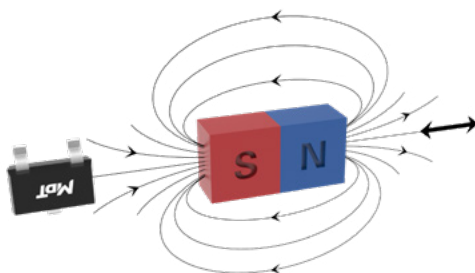
## MicroAmpere High Frequency Response Omnipolar Magnetic Switch Sensor

### 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  $\mu$ 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.

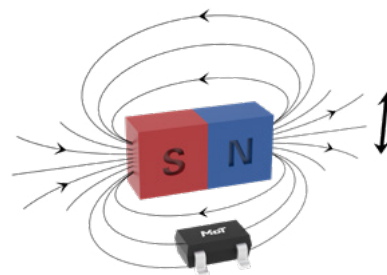
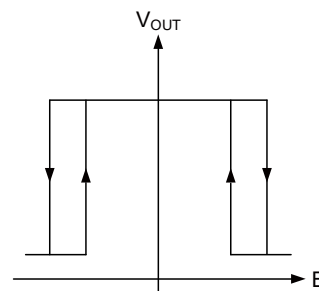


### Features and Benefits

- Tunneling magnetoresistance (TMR) technology
- Low power consumption: supply current 1.5  $\mu$ 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.

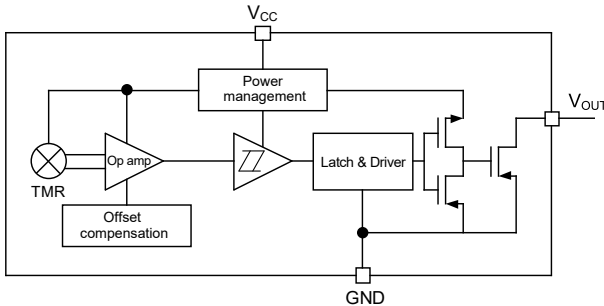


Figure 1. Block diagram

## 2. Switching Characteristics

TMR1340B 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.

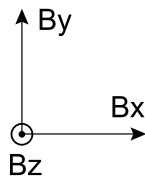


Figure 2-1. Definition of axis

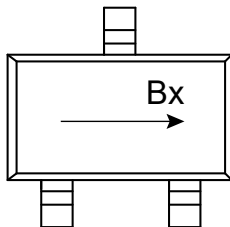


Figure 2-2. Axial diagram (SOT23-3 top view)

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.

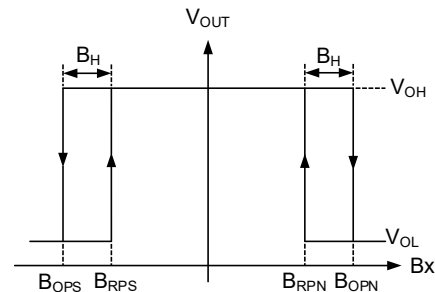


Figure 3. Switching characteristics

## 3. Pin Configuration

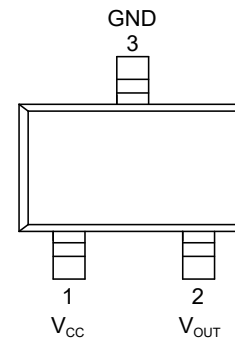


Figure 4. Pin configuration

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	$B_{OPS}$	-25	-14	-10	Gs
	$B_{OPN}$	10	14	25	Gs
Release point	$B_{RPS}$	-20	-10	-5	Gs
	$B_{RPN}$	5	10	20	Gs
Hysteresis	$B_H$	2	4	13	Gs

## 7. Typical Supply Voltage Characteristics

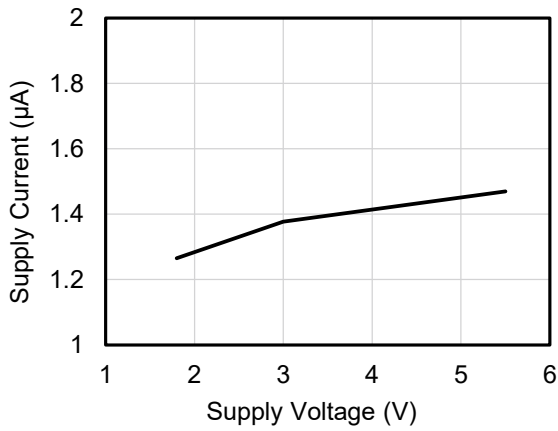


Figure 5. Supply current versus supply voltage ( $T_A=25^\circ\text{C}$ )

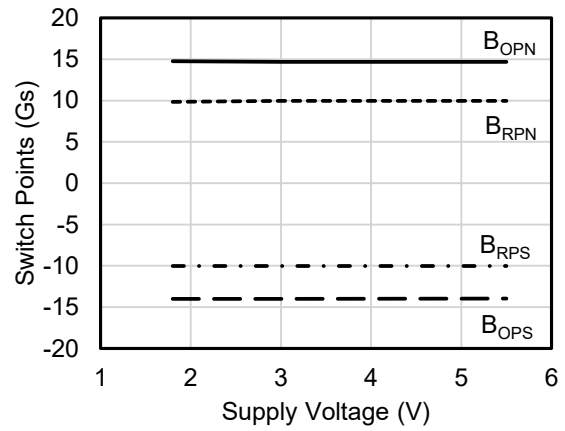


Figure 6. Switch points versus supply voltage ( $T_A=25^\circ\text{C}$ )

## 8. Typical Temperature Characteristics

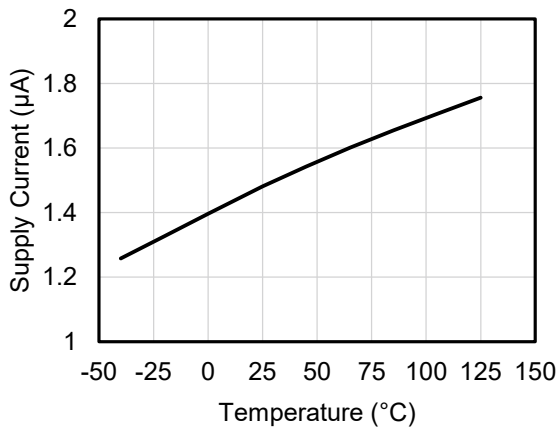


Figure 7. Supply current versus temperature ( $V_{CC} = 3\text{ V}$ )

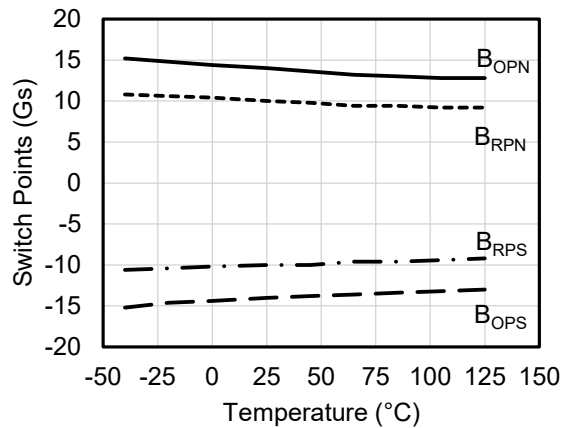


Figure 8. Switch points versus temperature ( $V_{CC} = 3\text{ V}$ )

## 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  $\mu\text{F}$ .

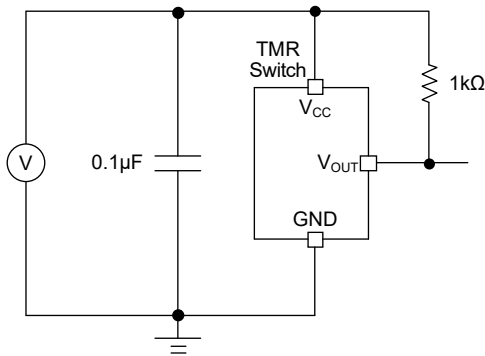


Figure 9. Application circuit diagram

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.

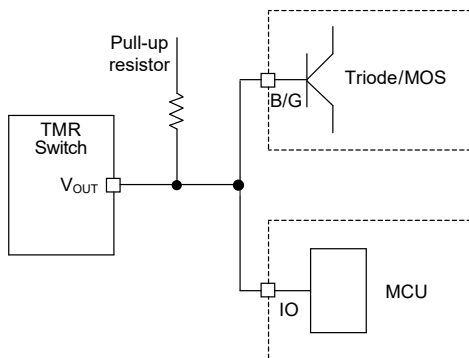


Figure 10. Application diagram for driving power load

Common failure conditions:

- The 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

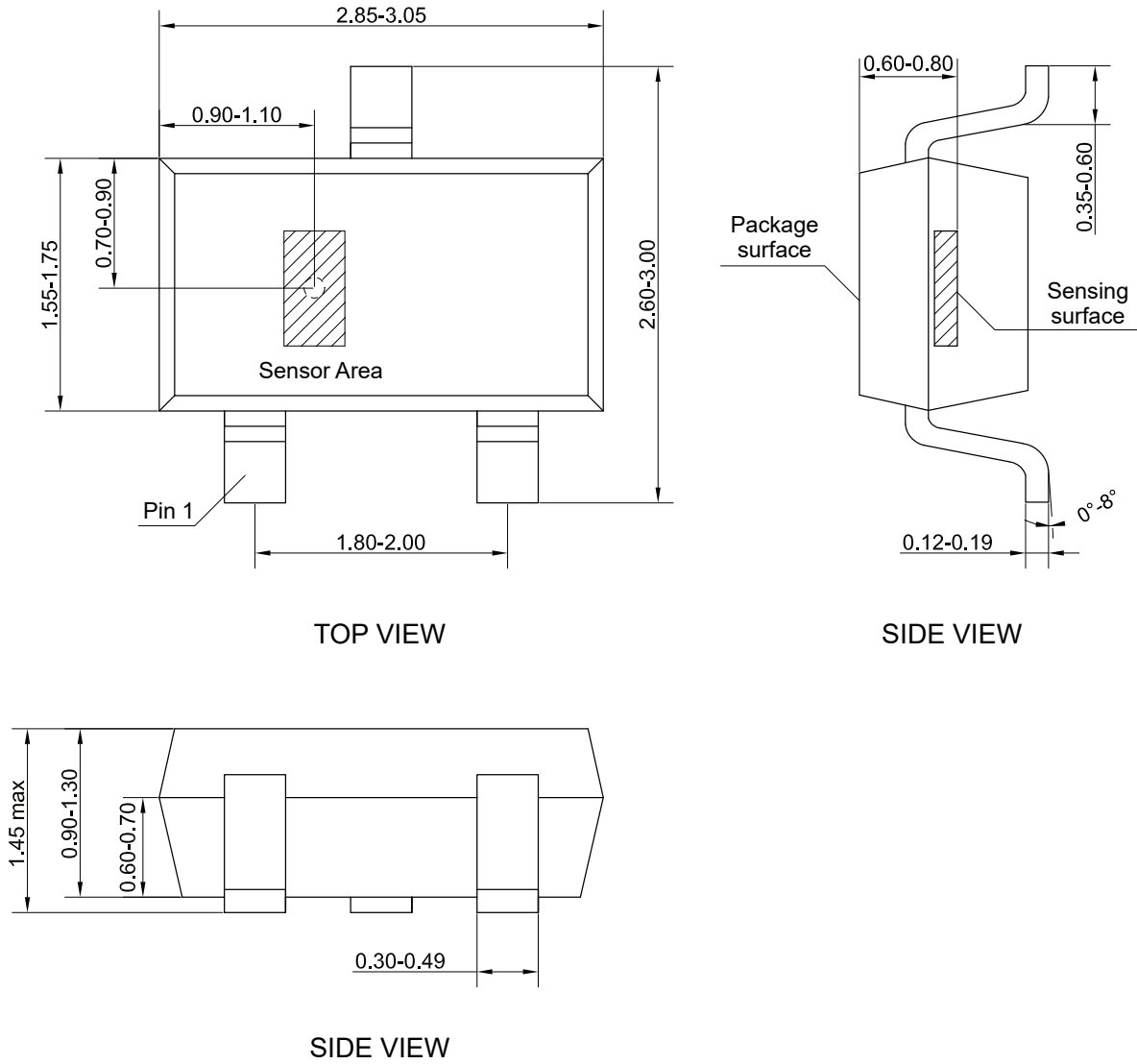


Figure 11. Package outline of SOT23-3 (unit: mm)

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