# TMR1252

TMR Z-Axis Bipolar Switch

## General Description

TMR1252 is a digital bipolar 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 TMR1252draws 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 TMR1252S) or the TO-92S package (P/N TMR1252T).

## Features and Benefits

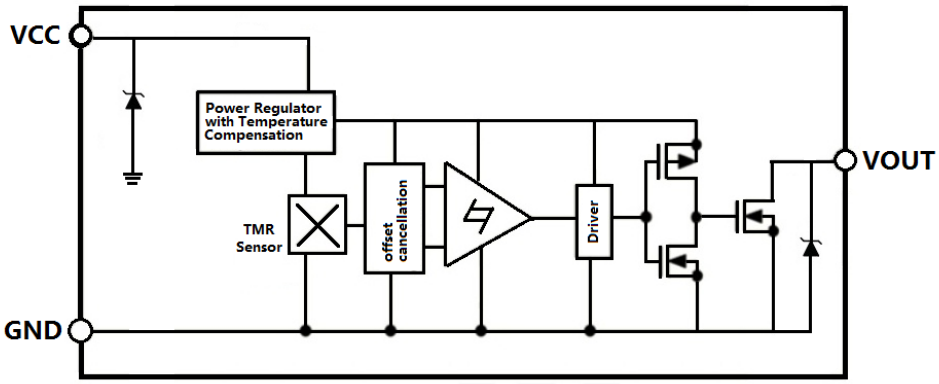
- Tunneling Magnetoresistance (TMR) Technology
- Ultra Low Power Consumption <0.6mA
- High Frequency Response ≥100KHz
- Bipolar Latching Operation
- Z-axis sensing direction compatible with Hall Effect
- Low Switching Points for High Sensitivity
- High Supply Voltage of 40V and 30V Reverse Voltage
- Open Drain Output
- Excellent Thermal Stability
- High Tolerance to External Magnetic Field Interference

TMR1252S(Left), TMR1252T(Right)

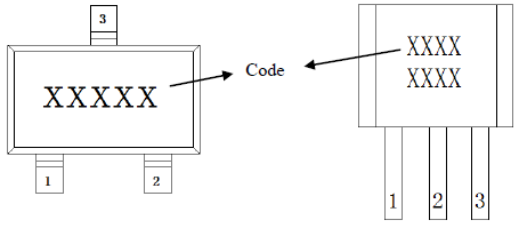
## Applications

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

## Block Diagram




## Pin Configuration




SOT23-3 TO-92S

| Pin Name | Pin No. | | Pin Function |
|---|---|---|---|
| | TO-92S | SOT23-3 | |
| $V_{CC}$ | 1 | 1 | Supply Voltage |
| GND | 2 | 3 | Ground |
| $V_{OUT}$ | 3 | 2 | Output |

## Absolute Maximum Ratings

| Parameter | Symbol | Limit | Unit |
|---|---|---|---|
| Supply Voltage | $V_{CC}$ | 40 | V |
| Reverse Supply Voltage | $V_{RCC}$ | 30 | V |
| Output Current | $I_{OUTSINK}$ | 25 | mA |
| Magnetic Flux Density | B | 4000 | G |
| ESD level(HBM) | $V_{ESD}$ | 4 | kV |
| Operating Ambient Temperature | $T_A$ | -40 ~125 | °C |
| Storage Temperature | $T_{stg}$ | -50 ~ 150 | °C |

## Electrical Characteristics ($V_{CC}$=24V, $T_A$=25°C)

| Parameter | Symbol | Conditions | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Supply Voltage | $V_{CC}$ | Operating | 3 | 24 | 40 | V |
| Output Stress Voltage | $V_{stress}$ | | | | 40 | V |
| Output leak Current | Ileak | OUT=H, $V_{CC}$=24V Vout=24V | | 26 | | uA |
| Output Resistance of Turn off | $R_{off}$ | OUT=H | | 10 | | MΩ |
| Output Low Voltage | VOL | OUT=L, VCC=24V Isink=25mA | | | 0.3 | V |
| Output Resistance of Turn on | $R_{on}$ | OUT=L | | | 10 | Ω |
| Supply Current | ICC | Output Open | 0.4 | 0.5 | 0.6 | mA |
| Response Frequency | F | | | | 100 | KHz |

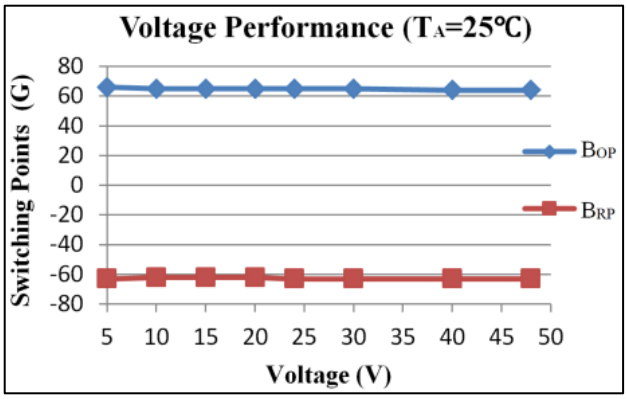
**Note:** a 1kOhm pull-up resistor is connected between $V_{CC}$ and $V_{OUT}$, and a 100nF capacitor is connected between $V_{CC}$ and GND during all tests in the above table.

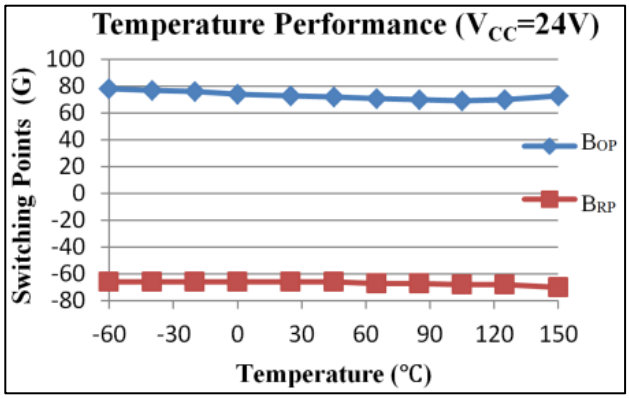
## Magnetic Characteristics ($V_{CC}$ = 24V, $T_A$ = 25°C)

| Parameters | Symbol | Min | Typ. | Max | Units |
|---|---|---|---|---|---|
| Operate Point | $B_{OP}$ | 30 | 60 | 90 | G |
| Release Point | $B_{RP}$ | -90 | -60 | -30 | G |
| Hysteresis | $B_H$ | | 120 | | 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

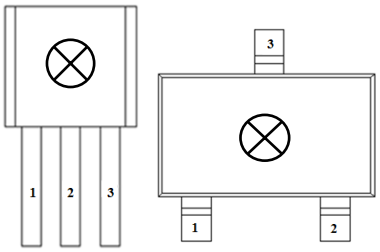


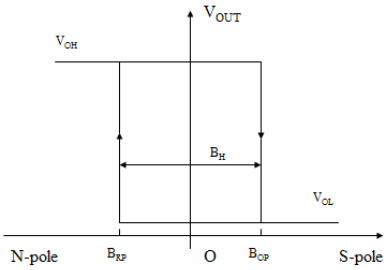

## Output Behavior vs. Magnetic Pole

| Parameter | Test Conditions | Output |
|---|---|---|
| South Pole | B > $B_{OP}$ | Low (On) |
| North Pole | B < $B_{OP}$ | High (Off) |

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



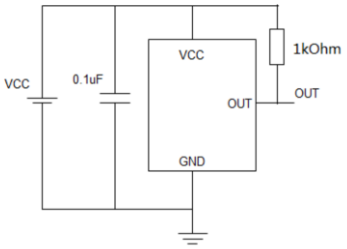

Sensing Direction of Magnetic Field




Magnetic Flux

## Application Information

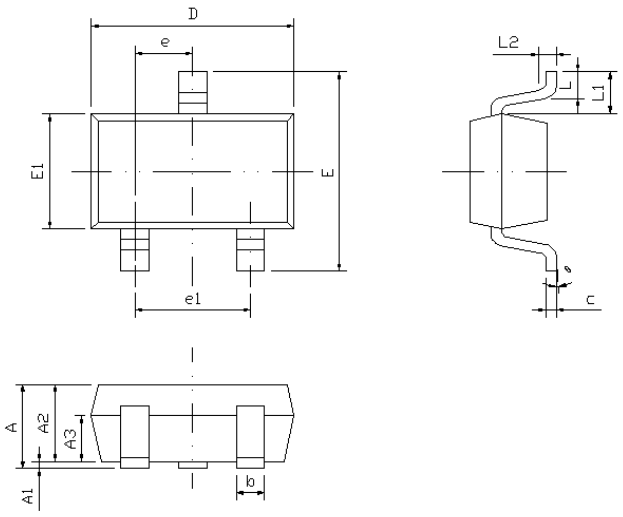
The output of the TMR1252 switches low (turns on) when a magnetic field to the sensing axis exceeds the operate point threshold, $B_{OP}$. When the magnetic field is reduced below the release point, $B_{RP}$, the device output switches high (turns off). The difference between the $B_{OP}$ and $B_{RP}$ 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 0.1μF.

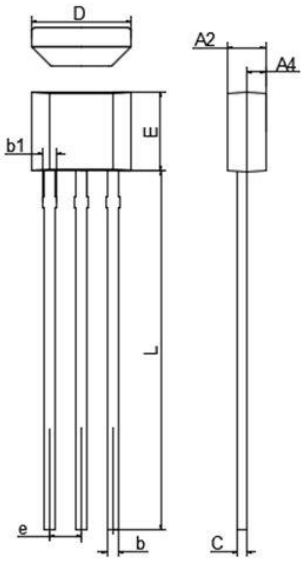
## Package Information

SOT23-3 package drawing



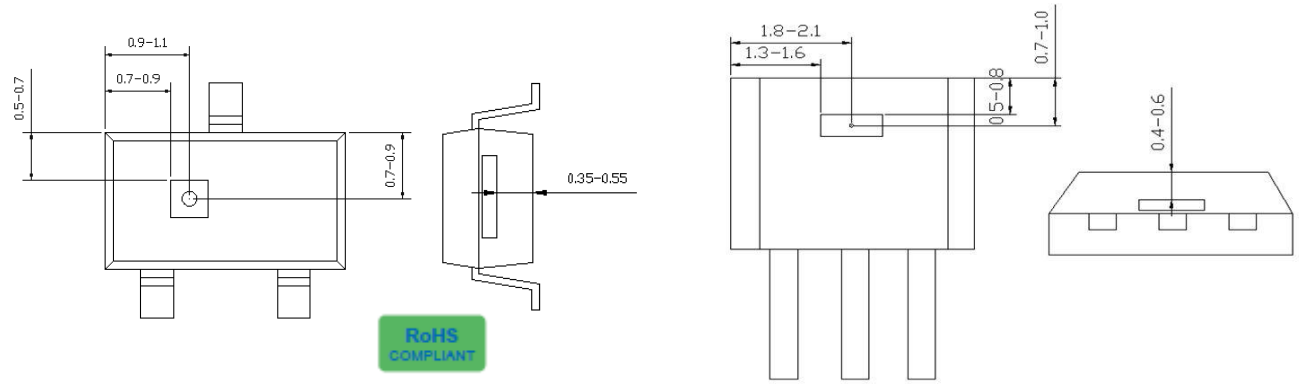

| Symbol | Dimensions In Millmeters | | | Dimensions In Inches | | |
|---|---|---|---|---|---|---|
| | Min | Nom | Max | Min | Nom | Max |
| A | - | - | 1.45 | - | - | 0.057 |
| A1 | 0.00 | - | 0.15 | 0.000 | - | 0.006 |
| A2 | 0.90 | 1.10 | 1.30 | 0.035 | 0.043 | 0.051 |
| A3 | 0.60 | 0.65 | 0.70 | 0.024 | 0.026 | 0.028 |
| b | 0.39 | - | 0.49 | 0.015 | - | 0.019 |
| c | 0.12 | - | 0.19 | 0.005 | - | 0.007 |
| D | 2.85 | 2.95 | 3.05 | 0.112 | 0.116 | 0.120 |
| E | 2.60 | 2.80 | 3.00 | 0.102 | 0.110 | 0.118 |
| E1 | 1.55 | 1.65 | 1.75 | 0.061 | 0.065 | 0.069 |
| e | 0.85 | 0.95 | 1.05 | 0.033 | 0.037 | 0.041 |
| e1 | 1.80 | 1.90 | 2.00 | 0.071 | 0.075 | 0.079 |
| L | 0.35 | 0.45 | 0.60 | 0.014 | 0.018 | 0.024 |
| L1 | 0.59REF | | | 0.023REF | | |
| L2 | 0.25BSC | | | 0.01BSC | | |
| θ | 0° | - | 8° | 0° | - | 8° |

TO-92S package drawing




| Symbol | Dimensions In Millmeters | | | Dimensions In Inches | | |
|---|---|---|---|---|---|---|
| | Min | Nom | Max | Min | Nom | Max |
| A2 | 1.40 | 1.50 | 1.60 | 0.055 | 0.059 | 0.063 |
| A4 | 0.75 TYP | | | 0.030 TYP | | |
| b | 0.34 | 0.39 | 0.42 | 0.013 | 0.015 | 0.017 |
| b1 | 0.40 | 0.46 | 0.50 | 0.016 | 0.018 | 0.020 |
| C | 0.37 | 0.40 | 0.42 | 0.015 | 0.016 | 0.017 |
| D | 3.90 | 4.10 | 4.20 | 0.154 | 0.161 | 0.165 |
| E | 2.90 | 3.05 | 3.30 | 0.114 | 0.120 | 0.130 |
| e | 1.27 TYP | | | 0.050 TYP | | |
| L | 14.00 | 14.50 | 15.00 | 0.551 | 0.571 | 0.590 |

## TMR Sensor Position




Top view and side view (unit: mm)

**MultiDimension Technology Co., Ltd.**
Address:No.7 Guangdong Road, Zhangjiagang Free Trade Zone, Jiangsu, 215634, China
Web: www.dowaytech.com/en
Email: info@dowaytech.com