TMR1362

Nano-Ampere TMR Omnipolar Switch

General Description

The TMR1362 is a 200nA ultra-low power magnetic switch sensor. It 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 ultra-low power consumption. It integrates a push-pull half-bridge TMR magnetic sensor and CMOS signal processing circuitry within the same package. Designed for use in applications that are both power-critical and performance-demanding, this device includes an on-chip TMR voltage generator for precise magnetic sensing, TMR voltage amplifier and comparator, a Schmitt trigger to provide switching hysteresis for noise rejection, and CMOS push-pull output. An internal band gap regulator is used to provide temperature compensated supply voltage for internal circuits, and it allows a wide range of operating supply voltages. The TMR1362 features ultra-low power consumption at 200nA with a fast internal switching frequency at 50Hz. Other important features include accurate switching points, excellent thermal stability, and a wide range of supply voltages. It is available in two packaging form factors: SOT23-3 (P/N TMR1362S), or TO-92S (P/N TMR1362T).

Features and Benefits

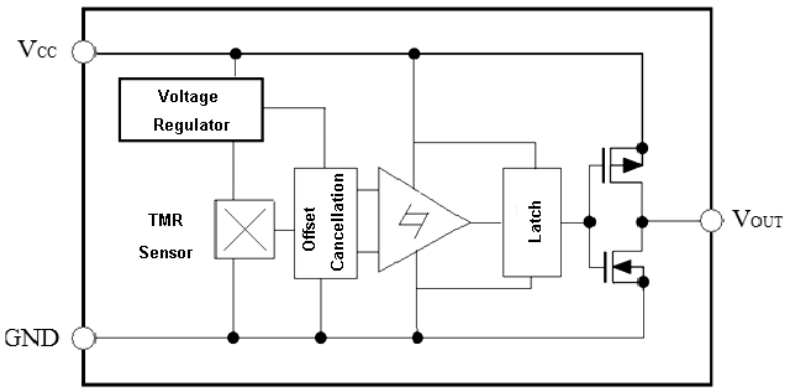
- Tunneling Magnetoresistance (TMR) Technology
- Nano-Ampere Ultra-low Power Consumption at 200nA
- Fast Internal Switching Frequency at 50Hz
- Omnipolar Operation with High Sensitivity
- Operating Temperature Range from -40°C to 125°C
- Wide Range of Supply Voltages from 1.8V to 5.5V
- CMOS Output

TMR1362S (Left), TMR1362T (Right)

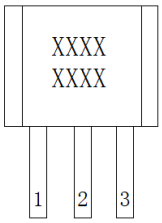
Applications

- Utility Meters including Water, Gas, and Heat Meters
- Proximity Switches
- Speed Sensing
- Rotary and Linear Position Sensing

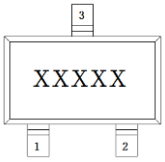
Block Diagram



Pin Configuration



TO-92S



SOT23-3

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

Absolute Maximum Ratings

Characteristic	Symbol	Rating	Units
Supply Voltage	V_{CC}	7	V
Reverse Supply Voltage	V_{RCC}	0.3	V
Output Current	$I_{OUTSINK}$	9	mA
Magnetic Flux Density	B	4000	G
ESD Level (HBM)	V_{ESD}	4	kV
Operating Ambient Temperature	T_A	-40～125	℃
Storage Temperature	T_{stg}	-50～150	℃

Electrical Characteristics (V_{CC}=3.0V, T_A=25°C)

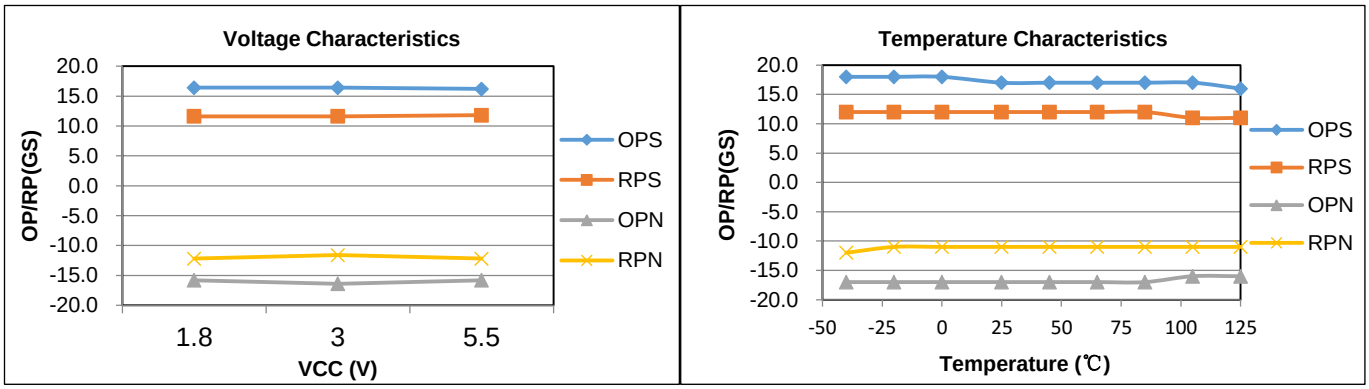
Characteristic	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Supply Voltage	V_{CC}	Operating	1.8	3.0	5.5	V
Output High Voltage	V_{OH}		V_{CC}-0.3		V_{CC}	V
Output Low Voltage	V_{OL}		0		0.2	V
Supply Current	I_{CC}	Output open		200		nA
Switching Frequency	F			50		Hz

Note: A 0.1μF capacitor is connected between VCC and GND during all tests in the table above.

Magnetic Characteristics (V_{CC} = 3.0V, T_A = 25°C)

Characteristic	Symbol	Min.	Typ.	Max.	Units
Operate Point	B_{OPS}		17		G
	B_{OPN}		-17		G
Release Point	B_{RPS}		12		G
	B_{RPN}		-12		G
Hysteresis	B_H		5		G

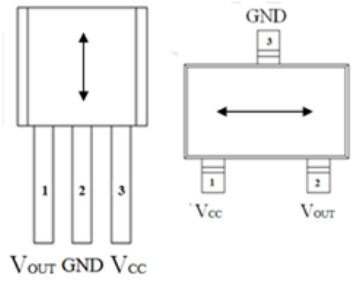
Voltage and Temperature Characteristics



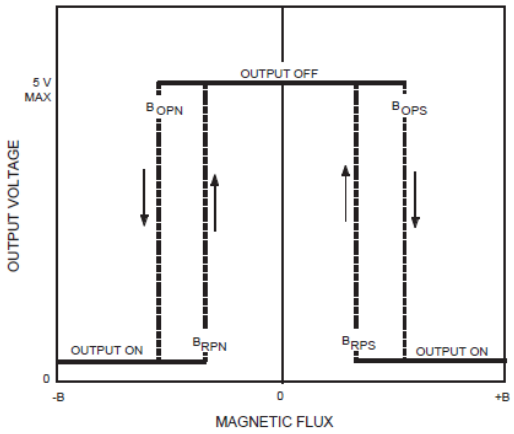
Output Behavior vs. Magnetic Polarity

Magnetic Polarity	Test Conditions	Output
South	B > B_{OPS}	Low (On)
	0<B< B_{RPS}	High (Off)
North	B < B_{OPN}	Low (On)
	0>B> B_{RPN}	High (Off)

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



Sensing Direction

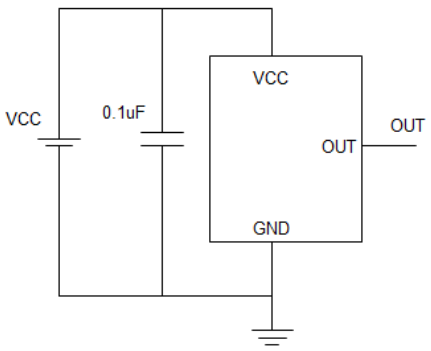


Switching Behavior of TMR1362

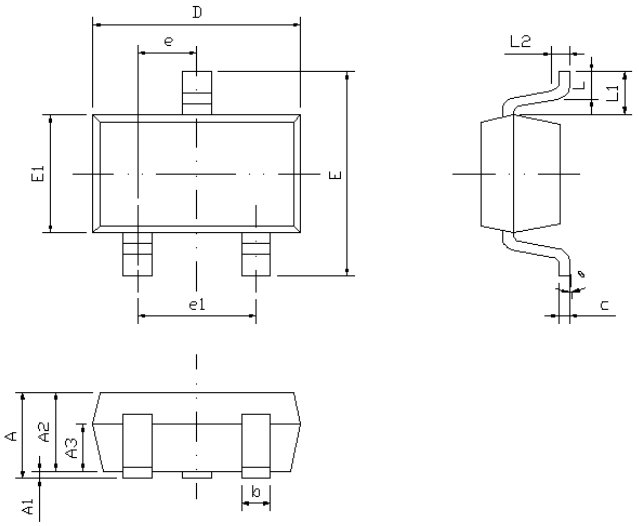
Application Information

The output of the TMR1362 switches low (turns on) when a magnetic field parallel to the TMR sensor exceeds the operate point threshold, B_{OP}. When the magnetic field is reduced below the release point, B_{RP}, the device output goes high (turns off). The difference between the magnetic operate point and release point 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 to reduce noise. The typical value of the external capacitor is 0.1μF.

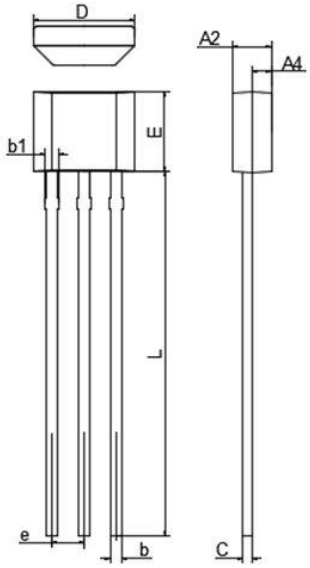


Package Information



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°

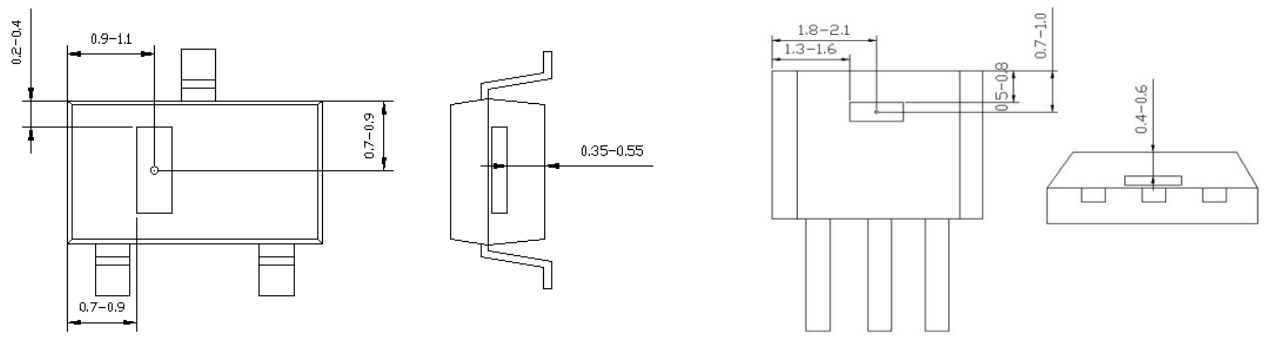
SOT23-3 Package



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

TO-92S Package

TMR Sensor Position



RoHS COMPLIANT

Top and side view（unit: mm）

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