MULTI DIMENSION
Sensing the Future

TMR1304

TMR Omnipolar Switch

General Description

TMR1304 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 is designed for use in applications that are both power-critical and performance-demanding. It contains a push-pull half-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. The TMR1304 draws only 1.5 μA resulting in ultra-low power operation. It has fast response, accurate switching points, excellent thermal stability, and immunity to stray field interference. It is available in two packaging form factors:SOT23-3 (P/N TMR1304S), or TO-92S(P/N TMR1304T).

Features and Benefits

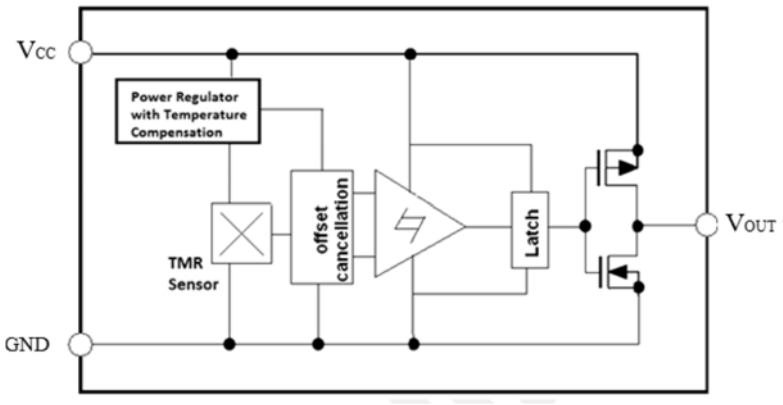
- Tunneling Magnetoresistance (TMR) Technology
- Ultra Low Power Consumption at 1.5uA
- High Frequency Response > 1kHz
- Operation with North or South Pole
- Low Switching Points for High Sensitivity
- Compatible with a Wide Range of Supply Voltages
- Excellent Thermal Stability
- High Tolerance to External Magnetic Field Interference

TMR1304S(Left), TMR1304T(Right)

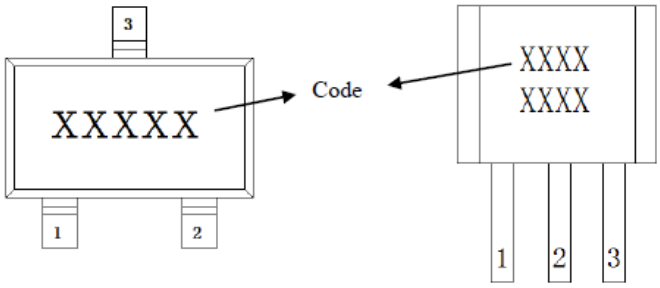
Applications

- Utility Meters including Water, Gas, and Heat Meters
- Proximity Switches
- Position and Speed Sensing
- Motor and Fan Control

Block Diagram



Pin Configuration



SOT23-3 TO-92S

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

Parameter	Symbol	Limit	Unit
Supply Voltage	V_{CC}	7	V
Reverse Supply Voltage	V_{RCC}	0.3	V
Output Current	$I_{OUTSINK}$	9	mA
Magnetic Flux Density	B	2800	G
ESD level(HBM)	V_{ESD}	2	kV
Operating Ambient Temperature	T_A	-40 ~125	°C
Storage Temperature	T_{stg}	-50 ~ 150	°C

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

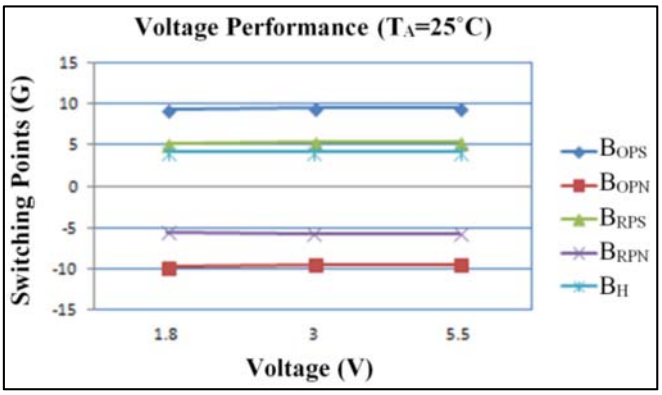
Parameter	Symbol	Conditions	Min	Typ.	Max	Unit
Supply Voltage	V_{CC}	Operating	1.5	3.0	5.5	V
Output High Voltage	V_{OH}		Vcc-0.3		Vcc	V
Output Low Voltage	V_{OL}		0		0.2	V
Supply Current	I_{CC}	Output Open		1.5		μA
Response Frequency	F			1000		Hz

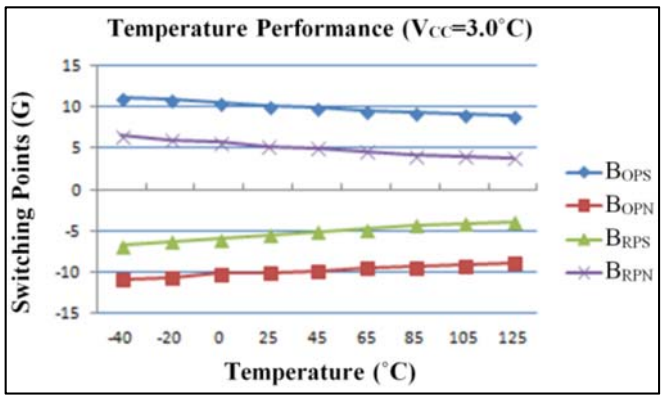
Note: a 100nF capacitor is connected between V_{CC} and GND during all tests in the above table.

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

Parameters	Symbol	Min	Typ.	Max	Units
Operate Point	B_{OPS}		10		G
	B_{OPN}		-10		G
Release Point	B_{RPS}		5		G
	B_{RPN}		-5		G
Hysteresis	B_H		5		G

Voltage and Temperature Characteristics

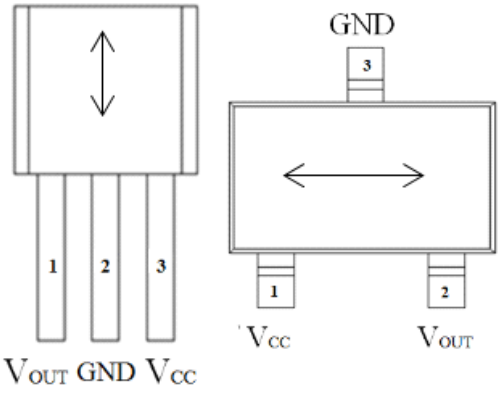




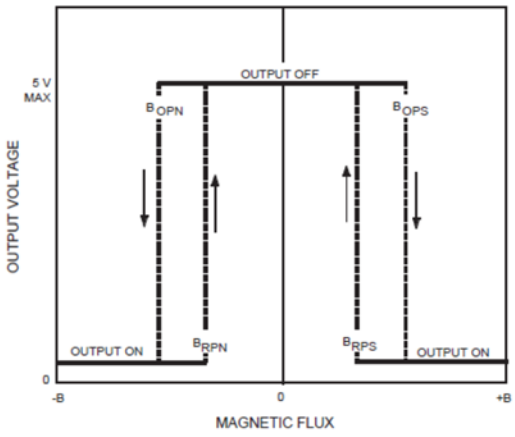
Output Behavior vs. Magnetic Pole

Parameter	Test Conditions	Output
South Pole	B > B_{OPS}	Low (On)
	0< B < B_{RPS}	High (Off)
North Pole	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 of Magnetic Field

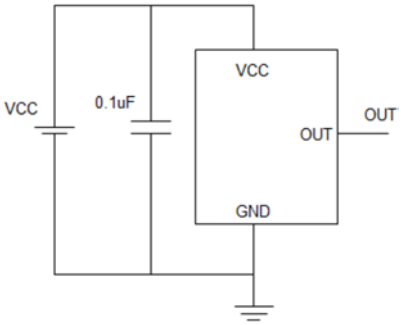


Magnetic Flux

Application Information

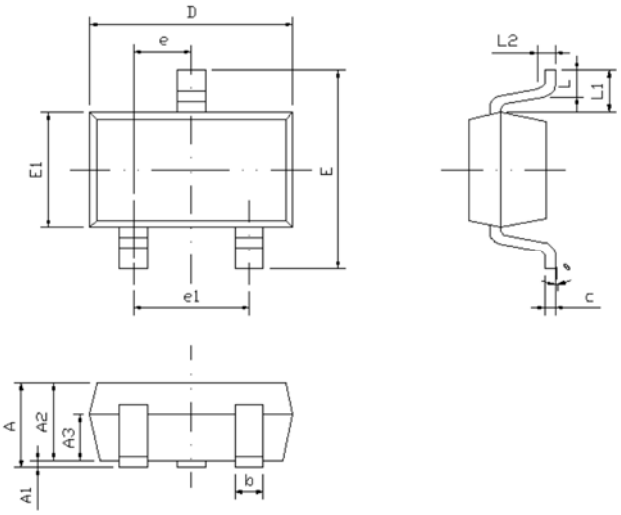
The output of the TMR1304 switches low (turns on) when a magnetic field to the sensing axis exceeds the operate point threshold, B_{OP}. When the magnetic field is reduced below the release point, B_{RP}, the device output switches high (turns off). The difference between the B_{OP} and B_{RP} is the 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 0.1 μ F.



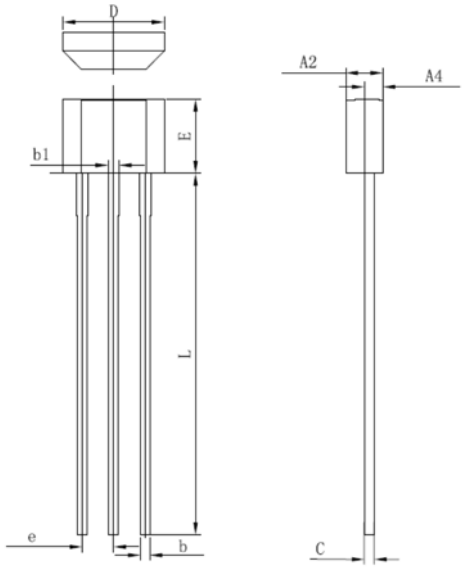
Package Information

SOT23-3 package drawing



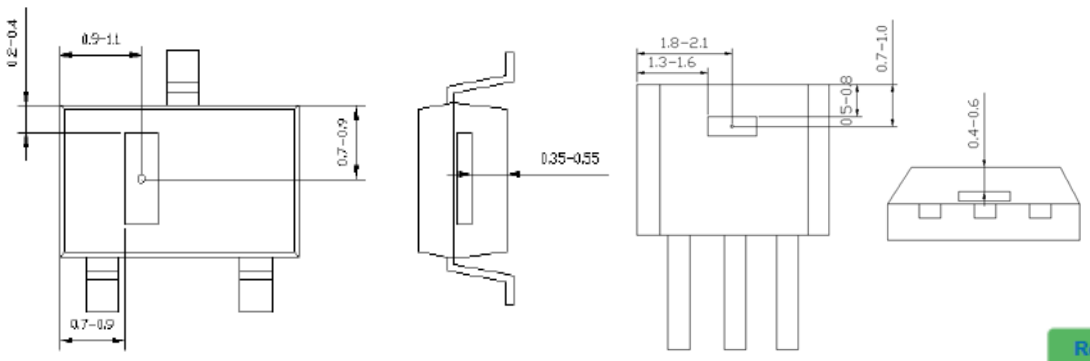
Symbol	Dimensions In Millmeters			Dimensions In Inches		
	Min	Nom	Max	Min	Nom	Max
A	-	-	1.45	-	-	0.057
A1	0.00	-	0.15	0.000	-	0.006
A2	0.90	1.10	1.30	0.035	0.043	0.051
A3	0.60	0.65	0.70	0.024	0.026	0.028
b	0.39	-	0.49	0.015	-	0.019
c	0.12	-	0.19	0.005	-	0.007
D	2.85	2.95	3.05	0.112	0.116	0.120
E	2.60	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	0.750TYP			0.030TYP		
b	0.34	0.39	0.42	0.0134	0.0154	0.0165
b1	0.40	0.46	0.50	0.016	0.018	0.020
C	0.38	0.40	0.42	0.0150	0.0157	0.0165
D	4.08	4.10	4.20	0.1606	0.1614	0.165
E	2.90	3.05	3.20	0.114	0.120	0.126
e	1.27TYP			0.050TYP		
L	14.00	14.50	15.00	0.519	0.571	0.590

TMR Sensor Position



Top view and side view (unit: mm)

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