

MMS1X1H Ultra-Low Power TMR Bipolar Switch

Features and Benefits

- Tunneling Magnetoresistance (TMR) Technology
- Ultra Low Power Consumption at 1.5 μ A
- High Frequency Response up to 1kHz
- Bipolar Latching Operation
- Low Operate Points for High Sensitivity
- Compatible with a Wide Range of Supply Voltages
- Excellent Thermal Stability
- High Tolerance to External Magnetic Field Interference

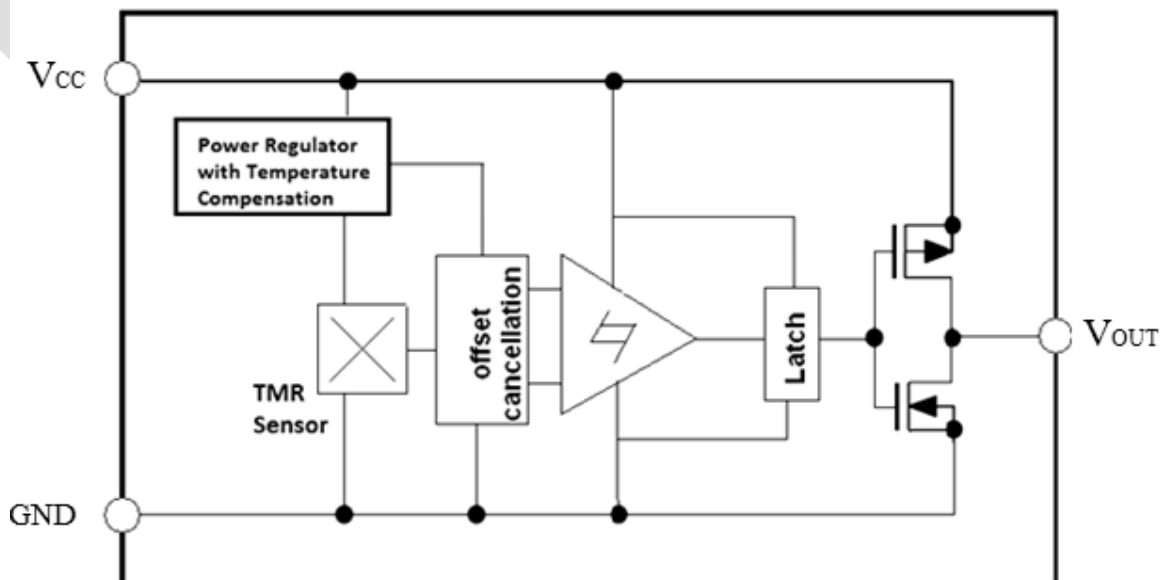
Applications

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

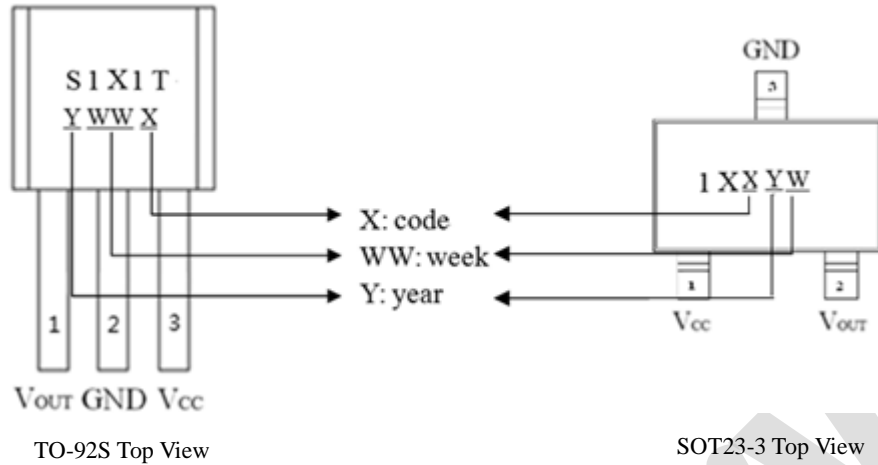
General Description

The MMS1X1H 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 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 MMS1X1H draws only 1.5 μ A resulting in ultra-low power operation, additionally 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 MMS1X1HS), or TO-92S (P/N MMS1X1HT).

Block Diagram



Pin Configuration



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	1.8	3.0	5.5	V
Output High Voltage	V _{OH}		2.7		3	V
Output Low Voltage	V _{OL}		0		0.2	V
Supply Current	I _{CC}	Output Open		1.5		μA
Response Frequency	F			25 ~1000 ¹		Hz

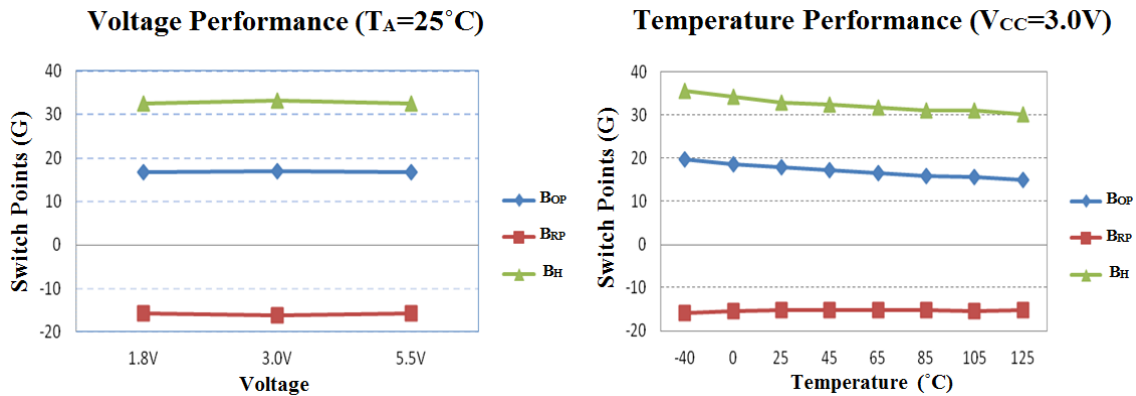
Note: a 100nF capacitor is connected between V_{CC} and GND during all tests in the above table.

1. Please contact MultiDimension if a specific rating of response frequency is required by your applications.

Magnetic Characteristics ($V_{CC} = 3.0V, T_A = 25^\circ C$)

Parameters	Symbol	Min	Typ.	Max	Units
Operate Point	B_{OP}		17		G
Release Point	B_{RP}		-17		G
Hysteresis	B_H		34		G

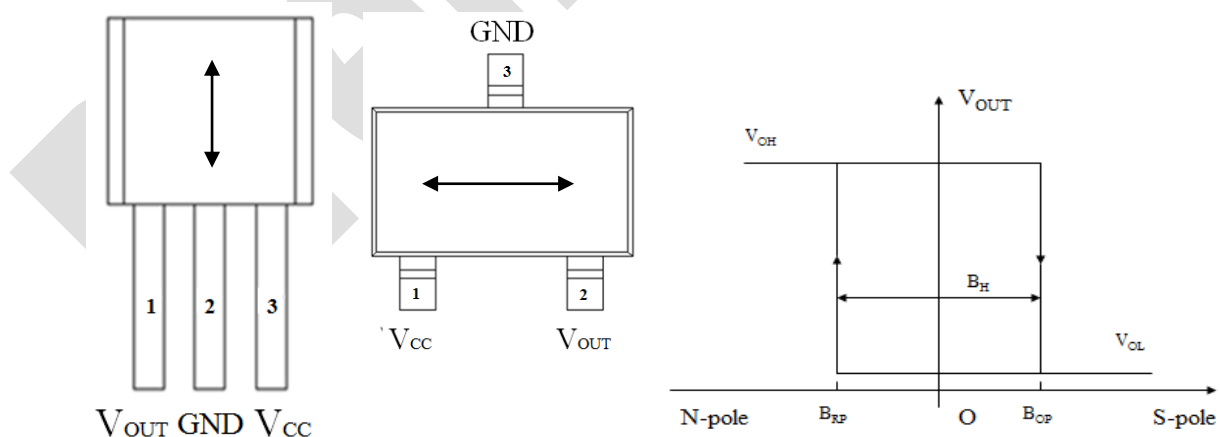
Voltage and Temperature Characteristics



Output Behavior vs. Magnetic Pole

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

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



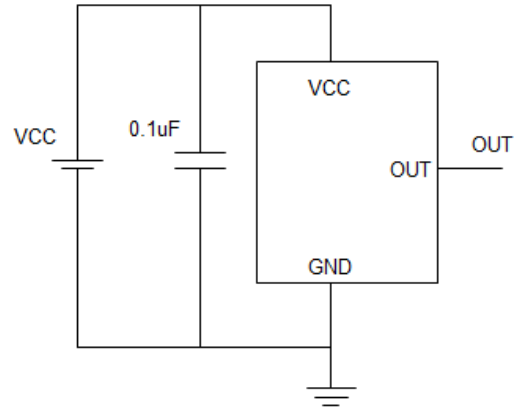
Sensing Direction of Magnetic Field

Magnetic Flux

Application Information

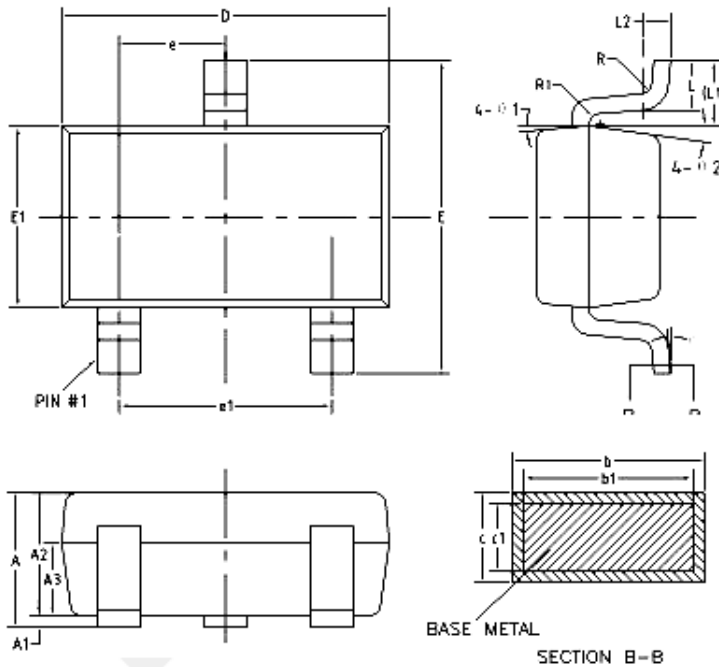
The output of the MMS1X1H switches low (turns on) when a magnetic field parallel to the TMR sensor exceeds the operate point threshold, B_{OP} . When the magnetic field is reduced below the release point, B_{RP} , the device output goes high (turns off). The difference between the magnetic operate point 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 $0.1\mu\text{F}$.



Package Information

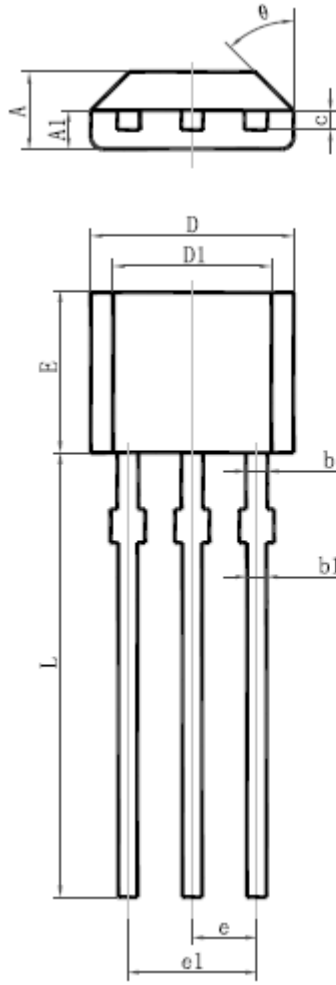
SOT23-3 package drawing:



COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

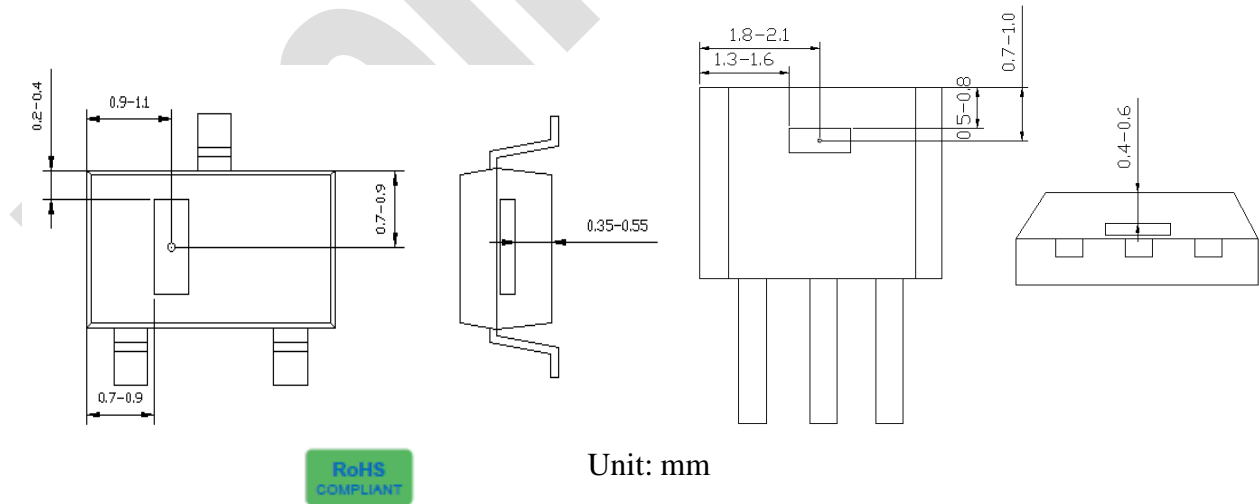
SYMBOL	MIN	NOM	MAX
A	—	—	1.45
A1	0	—	0.15
A2	0.90	1.10	1.30
A3	0.60	0.65	0.70
b	0.39	—	0.49
b1	0.38	0.40	0.45
c	0.12	—	0.19
c1	0.11	0.13	0.15
D	2.85	2.95	3.05
E	2.60	2.80	3.00
E1	1.55	1.65	1.75
e	0.85	0.95	1.05
e1	1.80	1.90	2.00
L	0.35	0.45	0.60
L1	0.59REF		
L2	0.25BSC		
R	0.05	—	—
R1	0.05	—	0.20
∅	0'	—	8'
∅ 1	8'	10'	12'
∅ 2	8'	10'	12'

TO-92S package drawing:



Symbol	Dimensions In Millimeters	
	Min	Max
A	1.420	1.620
A1	0.660	0.860
b	0.420	0.550
b1	0.360	0.480
c	0.360	0.510
D	3.900	4.100
D1	2.970	3.270
E	3.050	3.250
e	1.270 TYP	
e1	2.440	2.640
L	15.100	15.500
θ	45° TYP	

TMR Sensor Position



Unit: mm

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