

## MMS2X1H Ultra-Low Power TMR Omnipolar Switch

### Features and Benefits

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

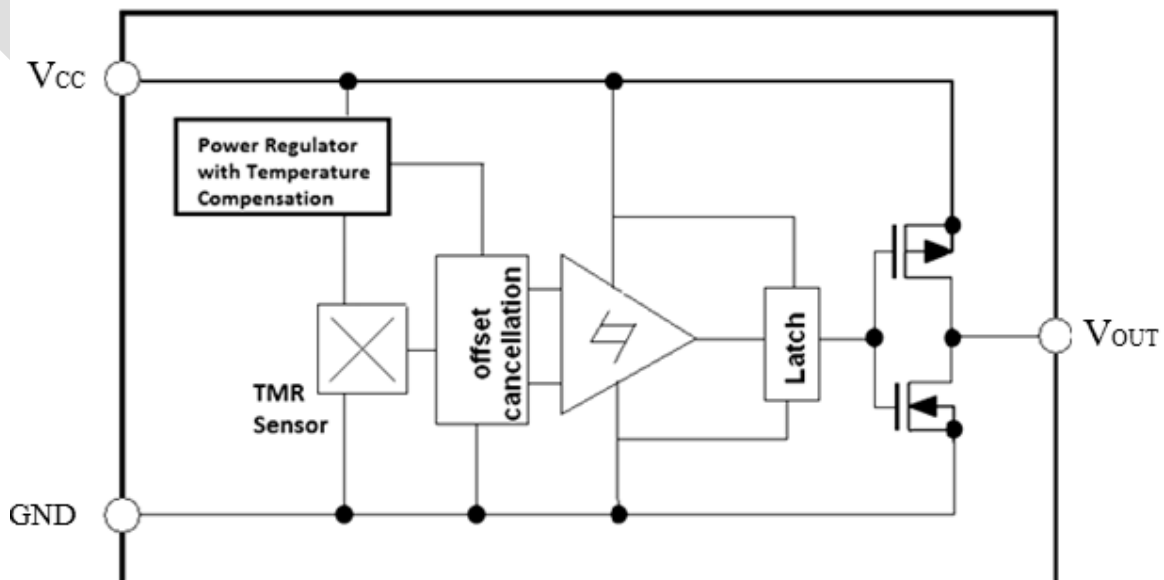
### Applications

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

### General Description

The MMS2X1H 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 MMS2X1H draws only 1.5 $\mu$ 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 MMS2X1HS), or TO-92S (P/N MMS2X1HT).

### Block Diagram

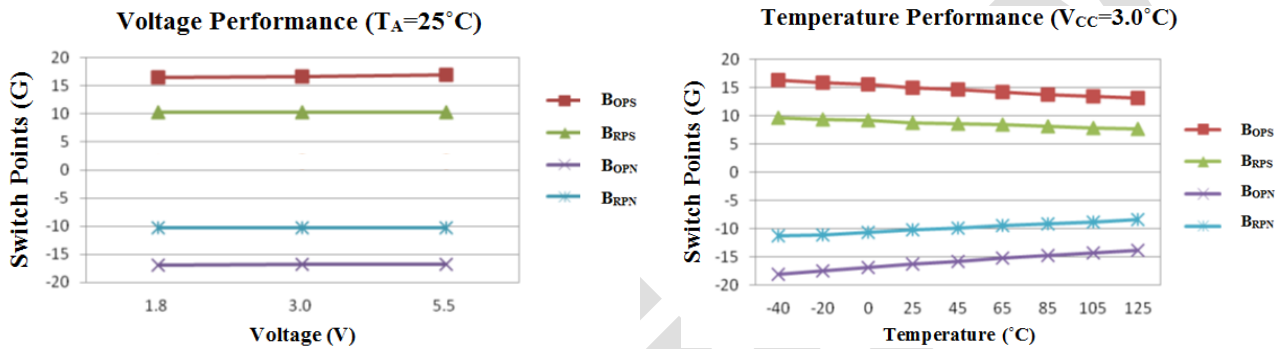




## Magnetic Characteristics ( $V_{CC} = 3.0V, T_A = 25^\circ C$ )

Parameters	Symbol	Min	Typ.	Max	Units
Operate Point	$B_{OPS}$		17		G
	$B_{OPN}$		-17		G
Release Point	$B_{RPS}$		10		G
	$B_{RPN}$		-10		G
Hysteresis	$B_H$		7		G

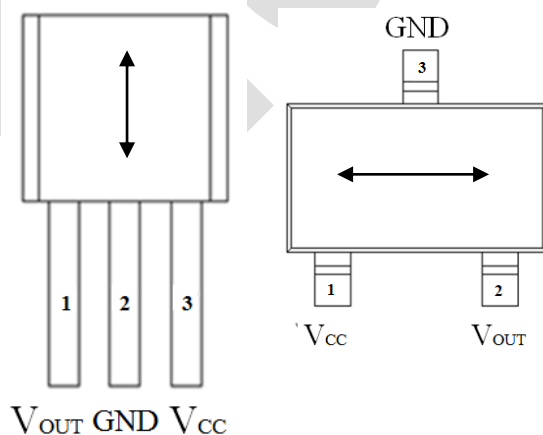
## Voltage and Temperature Characteristics



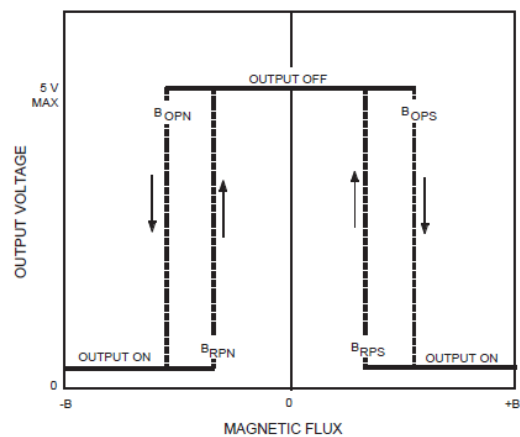
## Output Behavior vs. Magnetic Pole

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

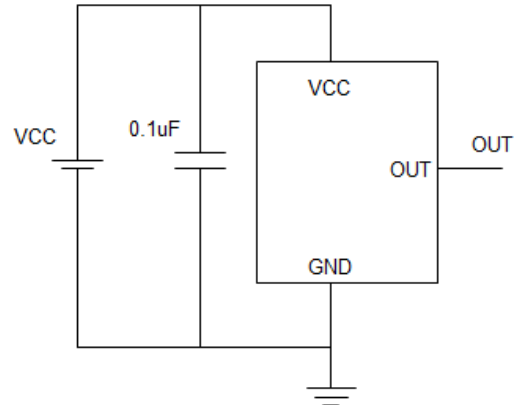


Magnetic Flux

## Application Information

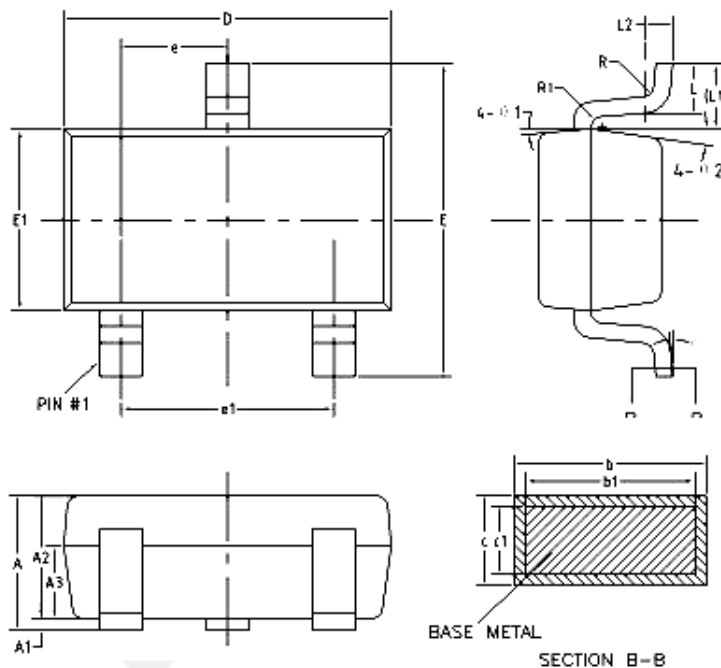
The output of the MMS2X1H switches low (turns on) when a magnetic field parallel to the TMR sensor exceeds the operate point threshold,  $B_{OP}$ . When the magnetic field is reduced below the release point,  $B_{RP}$ , the device output goes high (turns off). The difference between the magnetic operate 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

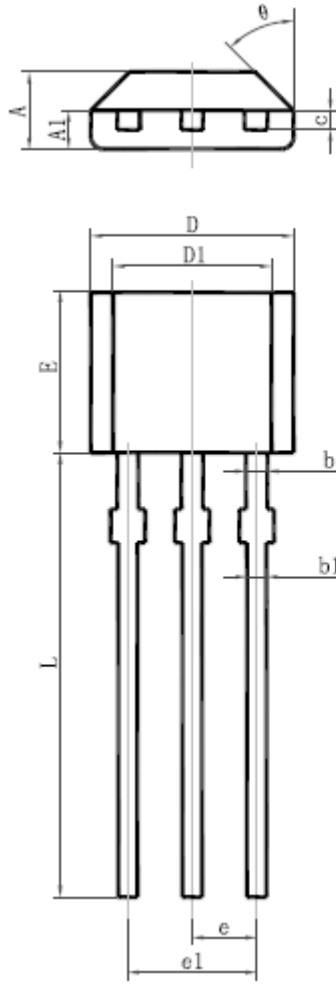
SOT23-3 package drawing:



COMMON DIMENSIONS  
(UNITS OF MEASURE=MILLIMETER)

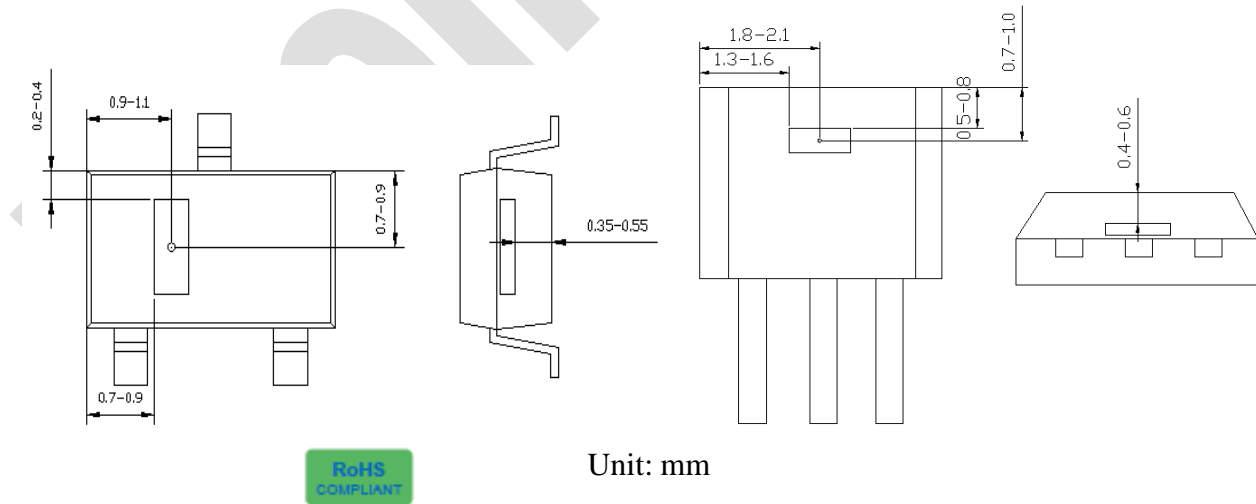
SYMBOL	MIN	NOM	MAX
A	—	—	1.45
A1	0	—	0.15
A2	0.90	1.10	1.30
A3	0.60	0.65	0.70
b	0.39	—	0.49
b1	0.38	0.40	0.45
c	0.12	—	0.19
c1	0.11	0.13	0.15
D	2.85	2.95	3.05
E	2.60	2.80	3.00
E1	1.55	1.65	1.75
e	0.85	0.95	1.05
e1	1.80	1.90	2.00
L	0.35	0.45	0.60
L1	0.59REF		
L2	0.25BSC		
R	0.05	—	—
R1	0.05	—	0.20
∅	0'	—	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
$\theta$	45° TYP	

## TMR Sensor Position



Unit: mm

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