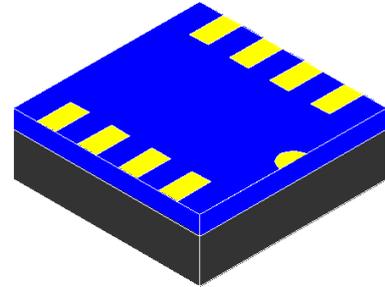


## MMA243F TMR Angle Sensor

### Features and Benefits

- Tunneling Magnetoresistance (TMR) Technology
- Large Output Signal Without Amplification
- Compatible with Wide Range of Supply Voltages
- High Resistance for Low Power Consumption
- Wide Airgap Tolerance
- Excellent Thermal Stability
- Very Low Hysteresis
- Ultrasmall Package



### Applications

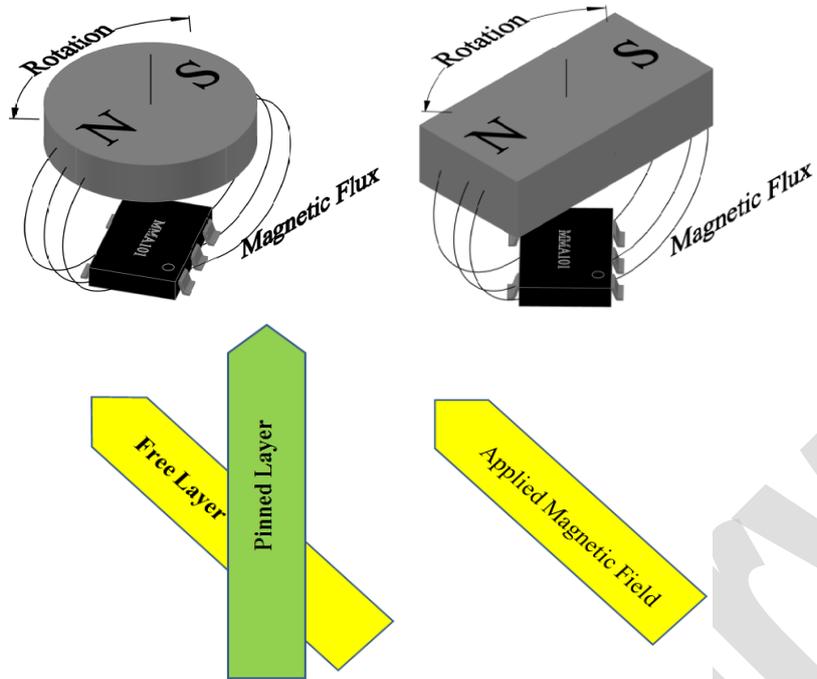
- Rotary Position Sensors
- Rotary Encoders
- Contactless Potentiometers
- Valve Position Sensors
- Knob Position Sensors

### General Description

The output voltage of the MMA243F TMR angle sensor is proportional to the sine or cosine of the angle of a magnetic field applied parallel to the surface of the sensor, which can be provided by a small magnet positioned above the device. The MMA243F includes two Wheatstone bridges, which can be configured to output sine and cosine functions respectively. Each bridge includes four TMR sensor elements in a push-pull arrangement to produce a best-in-class peak-to-peak signal as large as 80% of the supply voltage, eliminating the need for amplification in many applications. Additionally, the unique TMR Wheatstone bridge technology accurately compensates the output against changes in ambient temperature. This sensor is assembled in an ultra small LGA8 package of 3.0 mm × 3.0 mm × 0.75 mm.

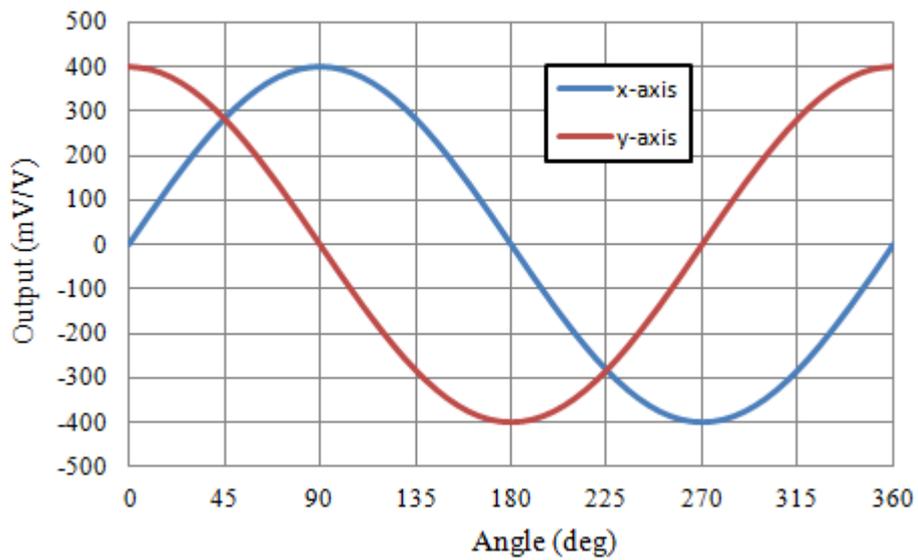
### Operation

A small magnet, placed above the MMA243F, can be used to provide a magnetic field in any desired orientation parallel to the plane of the MMA243F package. The magnetic field is detected by TMR sensors in the MMA243F that are composed of two magnetic layers. One layer of the TMR sensors is a “pinned layer” that is not affected by the magnetic field, and the other is “free layer,” which has a magnetization that aligns parallel to the applied magnetic field. Because the TMR effect produces a resistance that is proportional to the sine or cosine of the relative difference between the free and pinned layer magnetization orientations, the sensor output voltage is sinusoidally dependent on the angle of the applied magnetic field, thereby providing a measure of the orientation of the magnet.

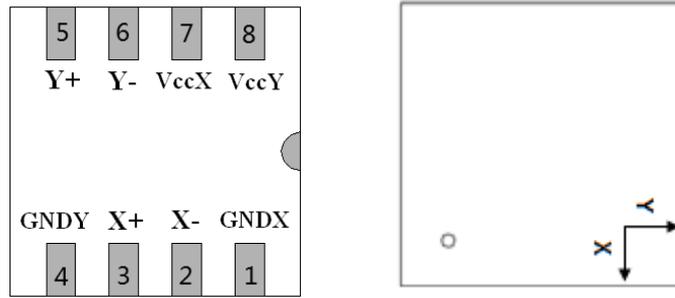


The following chart show a typical sensor output as a function of the angle of the applied magnetic field using a 6 mm diameter, 2.5 mm thick magnet and a 1 V supply.

Voltage output vs. Angle



## Pinout



(Top view)

Pin#	Pin Name	Function
1	GNDX	Ground(direction X)
2	X-	Analog Differential Output2(direction X)
3	X+	Analog Differential Output1(direction X)
4	GNDY	Ground(direction Y)
5	Y+	Analog Differential Output1(direction Y)
6	Y-	Analog Differential Output2(direction Y)
7	VccX	Supply Voltage(direction X)
8	VccY	Supply Voltage(direction Y)

## Absolute Maximum Ratings

Parameter	Symbol	Limit	Unit
Supply Voltage	V <sub>CC</sub>	6	V
Storage Temperature	T <sub>stg</sub>	-50 ~ 150	°C
Magnetic Field	B	2000	Oe <sup>1</sup>
ESD Level		4	kV

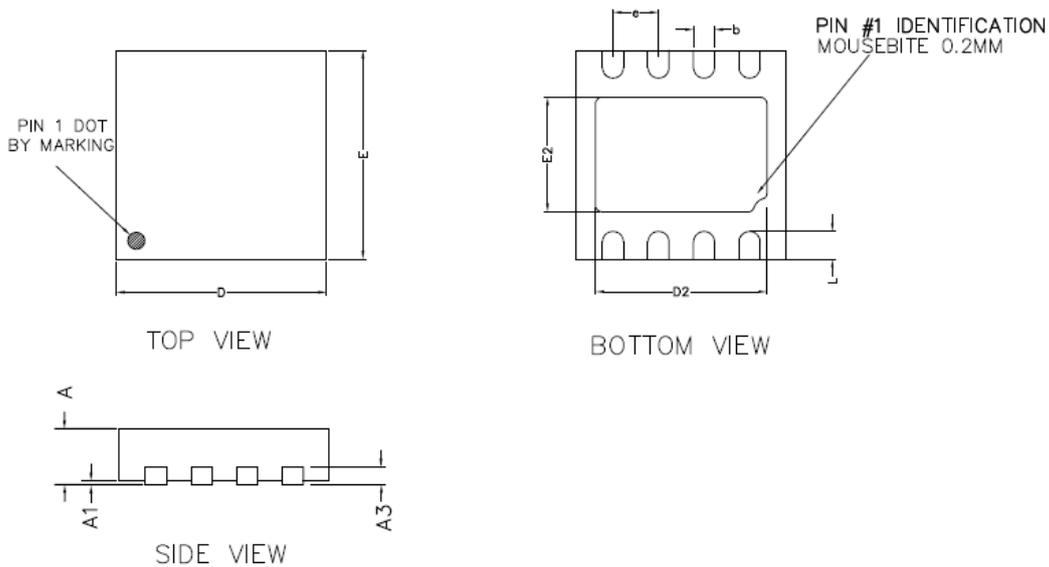
## Specification (Differential Output)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Supply Voltage	V <sub>CC</sub>	T <sub>A</sub> = 25 °C		1	5	V
Supply Current	I <sub>CC</sub>	T <sub>A</sub> = 25 °C		14		μA
Resistance	R	T <sub>A</sub> = 25 °C		70 <sup>2</sup>		kOhm
Output Range	VO	T <sub>A</sub> = 25 °C		800		mV/V
Offset Voltage <sup>3</sup>	VOQ	T <sub>A</sub> = 25 °C		± 5		mV/V
TCOV <sup>4</sup>		Operating		-0.1		%/°C
Magnetic Field	B	Operating	60		400	Oe <sup>1</sup>
Angular Error	E	Operating		1		Degree
Operation Temperature	T <sub>A</sub>	Operating	-40		125	°C

Notes:

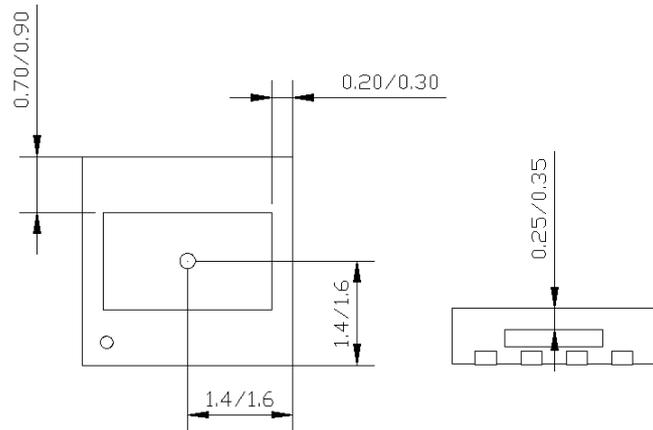
- (1) 1 Oe (Oersted) = 1 Gauss in air = 0.1 millitesla = 79.8 A/m.
- (2) Custom sensor resistance may be available upon request. Please contact MultiDimension Technology for more details.
- (3) Offset voltage is output voltage when angle = 0 degrees.
- (4) TCOV is the percent change in voltage output signal over temperature with a constant supply voltage.

## Package Information



COMMON DIMENSIONS(MM)			
PKG.	W: VERY VERY THIN		
REF.	MIN.	NOM.	MAX
A	0.70	0.75	0.80
A1	0.00	-	0.05
A3	0.2 REF.		
D	2.95	3.00	3.05
E	2.95	3.00	3.05
b	0.25	0.30	0.35
L	0.30	0.40	0.50
D2	2.30	2.45	2.55
E2	1.50	1.65	1.75
e	0.65 BSC		

## TMR Sensor Position



Unit: mm



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