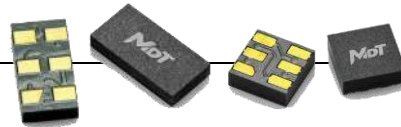


# TMR40xx Series

## TMR Geartooth Sensor



### DESCRIPTION

The TMR40xx series of geartooth sensor adopts a unique push-pull Wheatstone bridge design. This design includes a single-channel or dual-channel Wheatstone full bridge composed of four or eight unshielded high-sensitivity tunneling magnetoresistance (TMR) sensing elements. The Wheatstone bridge provides a differential voltage output along the gradient of the applied magnetic field along the sensor's sensing direction.

The dual-channel Wheatstone full bridge generates two orthogonal sine/cosine voltage output signals to measure the position of the gear rotation and detect the direction of rotation. The high-sensitivity performance of the TMR40xx series enables detection of small magnetic field changes, and its output signal has good temperature stability.

TMR40xx series provides multiple configuration of TMR sensing element spacing: 0.25mm, 0.4mm, 0.5mm, 0.6mm, 0.75mm, 0.8mm, 1.0mm, 1.2mm, 1.4mm, 1.6mm, 2.0mm, and 3.0mm. It is available in two compact LGA packages with dimensions of 3mm×3mm×0.9mm and 3mm×6mm×0.9mm.

### FEATURES AND BENEFITS

- Tunneling magnetoresistance (TMR) technology
- High saturation field allows operation in large DC magnetic field
- High sensitivity to magnetic gradient
- Compatible to small pitch gear measurement
- Sine/cosine signal output with accurate phase difference
- Excellent resistance to external magnetic field interference
- Wide air gap tolerance
- DC (zero speed) operation
- Excellent thermal stability
- Compact package

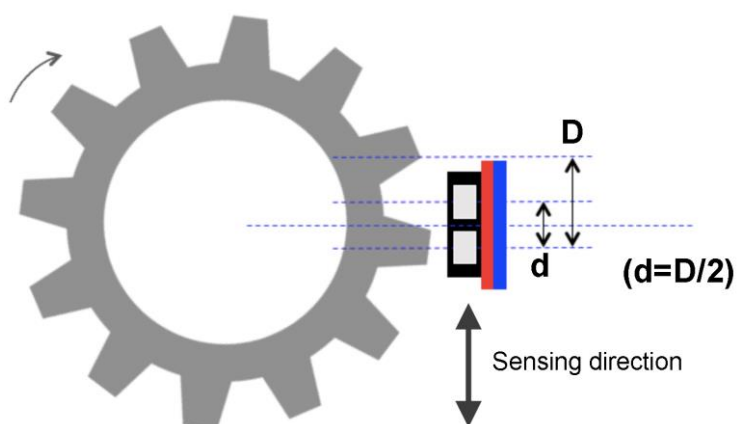
# TMR40xx Series

TMR Geartooth Sensor

## APPLICATIONS

- Gear speed and direction measurement
- Linear and angular speed sensing
- Linear displacement sensing
- Angular displacement sensing
- Magnetic scale
- Magnetic encoder

## APPLICATION SCHEMATICS



## SELECTION GUIDE

Part Number	Bridge Channel	TMR Element Spacing d (mm)	Gear Pitch D (mm)	Package (mm)
TMR4001	Single	0.25	0.5	LGA6L (3×3×0.9)
TMR4002	Single	0.5	1.0	LGA6L (3×3×0.9)
TMR4003	Single	0.75	1.5	LGA6L (3×3×0.9)
TMR4004	Dual	0.5	1.0	LGA6L (3×3×0.9)
TMR4005	Dual	1	2.0	LGA6L (3×3×0.9)
TMR4006	Dual	2	4.0	LGA6L (3×6×0.9)
TMR4007	Dual	3	6.0	LGA6L (3×6×0.9)
TMR4011	Dual	0.4	0.8	LGA6L (3×3×0.9)
TMR4012	Dual	0.6	1.2	LGA6L (3×3×0.9)
TMR4013	Dual	0.8	1.6	LGA6L (3×3×0.9)
TMR4015	Dual	1.2	2.4	LGA6L (3×6×0.9)
TMR4016	Dual	1.4	2.8	LGA6L (3×6×0.9)
TMR4017	Dual	1.6	3.2	LGA6L (3×6×0.9)

## ABSOLUTE MAXIMUM RATINGS

Parameters	Symbol	Min.	Max.	Unit
Supply voltage	V <sub>CC</sub>	-	7	V
Reverse supply voltage	V <sub>RCC</sub>	-	-7	V
External magnetic field	H	-	1500	Oe <sup>(1)</sup>
ESD performance (HBM)	V <sub>ESD</sub>	-	4000	V
Operating ambient temperature	T <sub>A</sub>	-40	125	°C
Storage ambient temperature	T <sub>STG</sub>	-50	150	°C

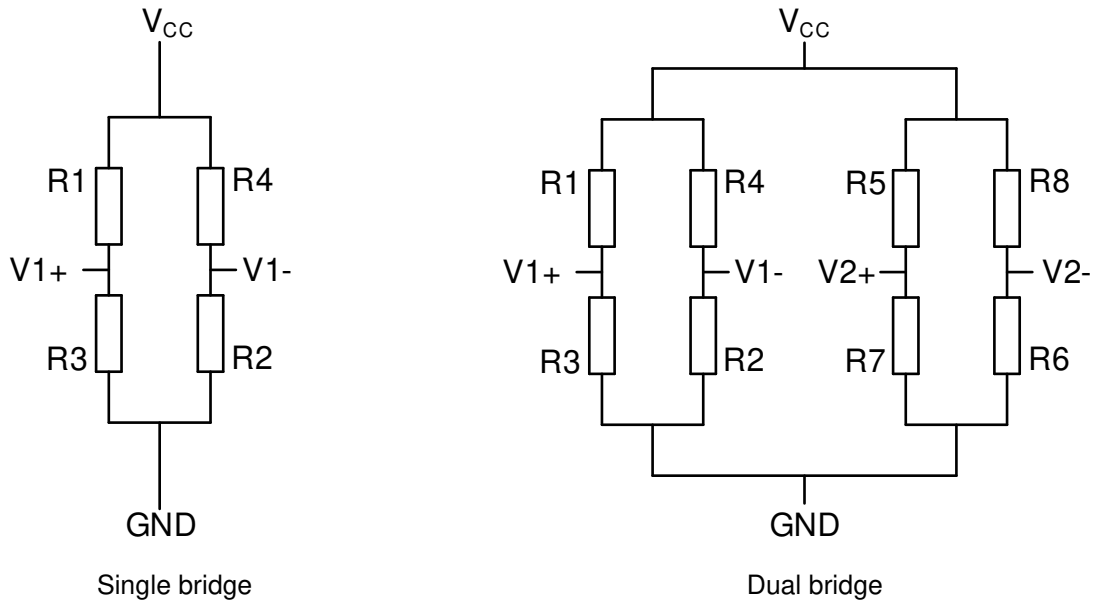
## ELECTRICAL AND MAGNETIC SPECIFICATIONS V<sub>CC</sub> = 3.0 V, T<sub>A</sub> = 25 °C, differential output

Parameter	Symbol	Condition	Min	Typ.	Max	Unit
Supply voltage	V <sub>CC</sub>	operating	-	3	7	V
Bridge resistance <sup>(2)</sup>	Single bridge	H=0 Oe		9		kΩ
	Dual bridge			4.5		
Saturation magnetic field <sup>(3)</sup>	H <sub>SAT</sub>			±70		Oe
Non-linearity of resistance	NONL <sub>R</sub>	fit in ±15 Oe		5		%FS
Offset	TMR4001 ~ TMR4005	V <sub>OFFSET</sub>		-20	20	mV/V
	TMR4006 ~ TMR4017			-35	35	mV/V
Hysteresis	Hys	sweep in ±200 Oe		1		%FS
Typical differential output	V <sub>OUT_TYP</sub>			650		mV/V
Resistance temperature coefficient	TCR	H=0 Oe		-0.10		%/°C
Sensitivity temperature coefficient	TCS			-0.18		%/°C

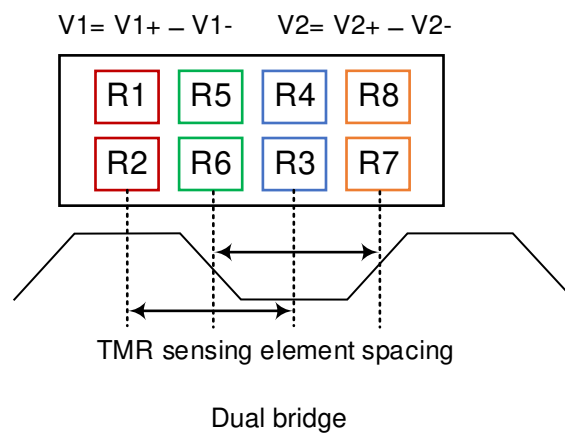
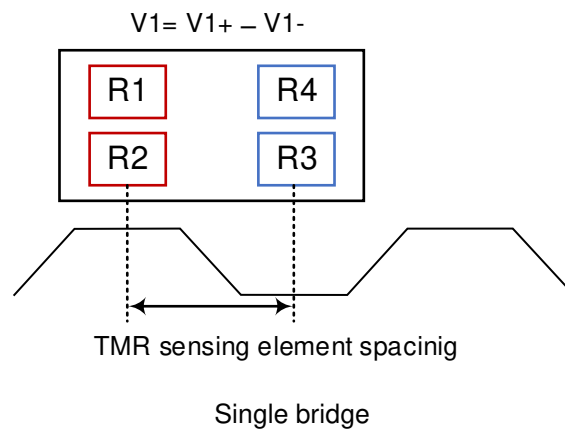
### Notes:

- (1) 1 Oe (Oersted) = 1 Gauss in air = 0.1 milliTesla = 79.8 A/m
- (2) Bridge resistance (resistance between V<sub>CC</sub> and GND) is can be custom designed. Please contact MultiDimension Technology for details.
- (3) Sensor may saturate beyond the range of this magnetic field. Saturation magnetic field can be custom designed. Please contact MultiDimension Technology for details.

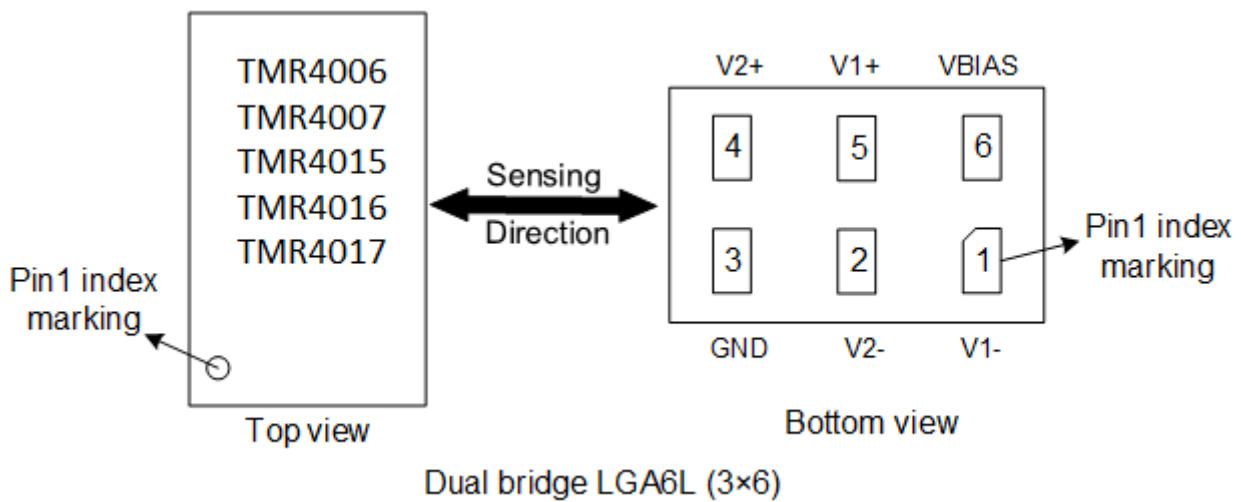
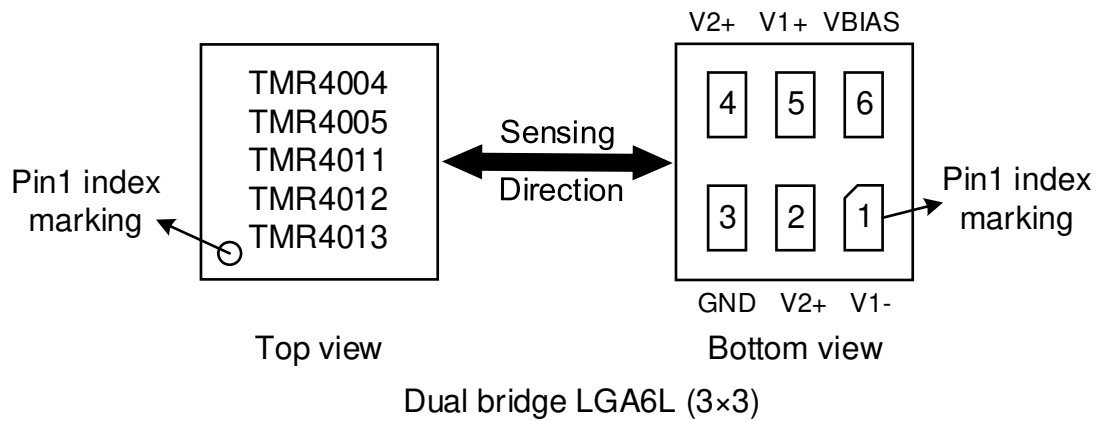
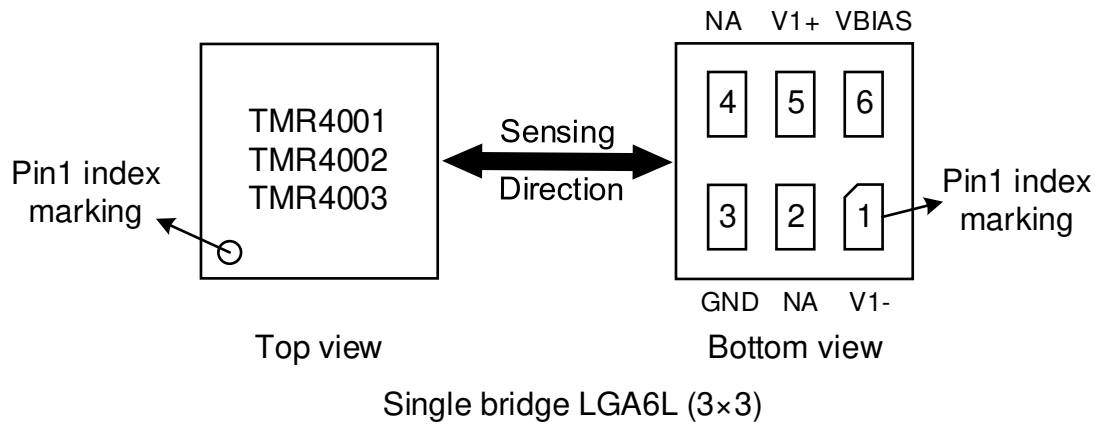
## FUNCTIONAL BLOCK DIAGRAM



## TMR SENSING ELEMENT SPACING SCHEMATICS



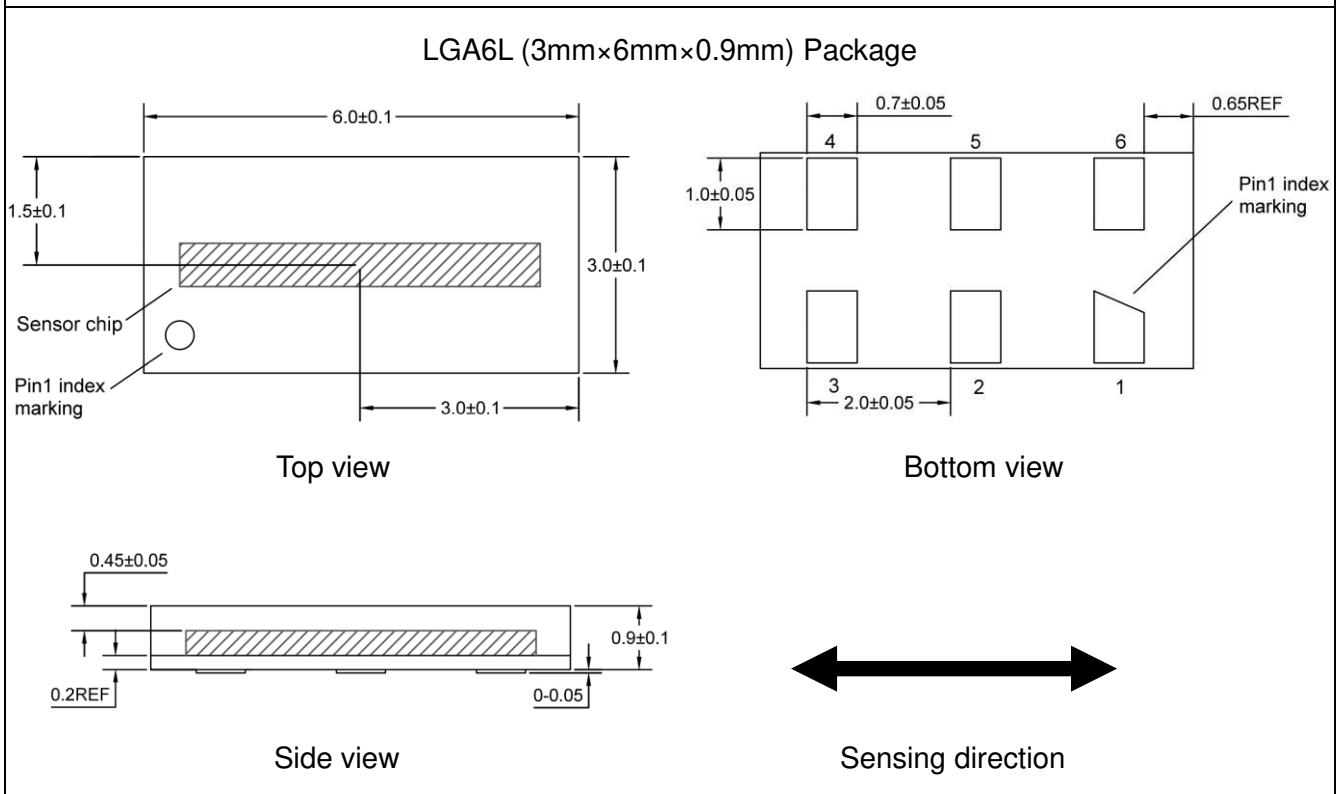
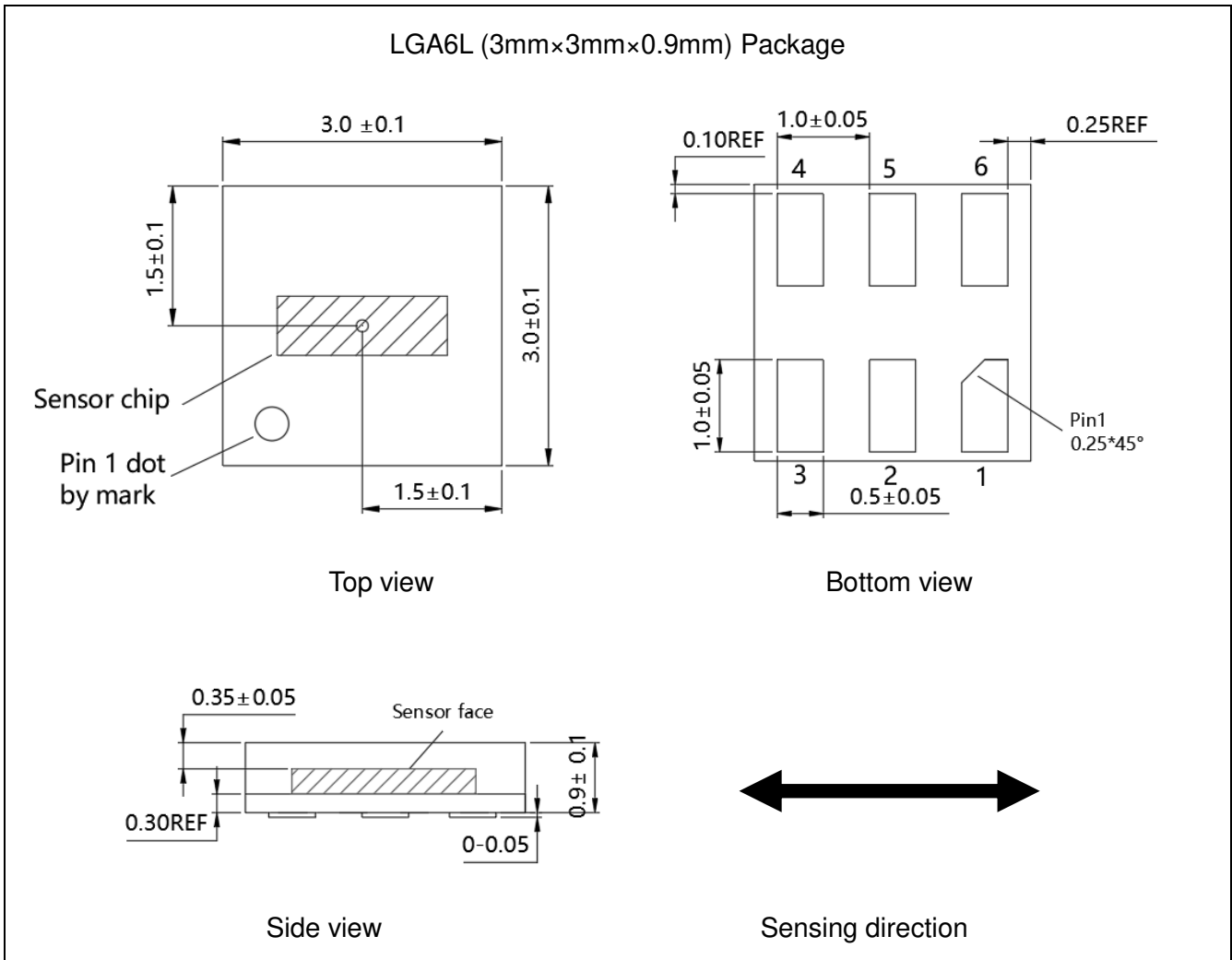
## PIN CONFIGURATION AND SENSING DIRECTION



# TMR40xx Series

TMR Geartooth Sensor

## DIMENSIONS AND ACTIVE AREA POSITIONING



# TMR40xx Series

TMR Geartooth Sensor



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