MTR611

Magnetic Angle Position Sensor

Features and Benefits

- Based on AMR Sensing Technology
- Contactless Angle Measurement
- Wide Voltage Range up to 12V
- Wide Operation Temperature Range from -40℃ ~125℃
- RoHS Compliant 2011/65/EU

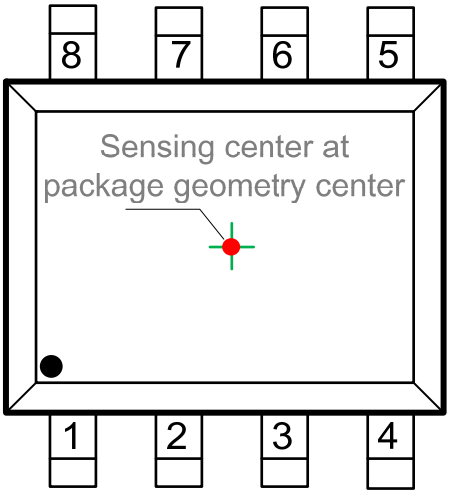
Applications

- High Accuracy Angular Position Sensing
- Rotary Speed and Direction Detection
- Contactless Angle Detection
- Motor Control
- Robotics Control

General Description

The MTR611 is a magnetic field sensor IC based on advanced Anisotropic Magneto Resistor (AMR) technology. It creates an analog output voltage that varies with the direction of the magnetic flux passing over the sensor surface. It contains dual whetstones bridges operating in saturation mode and generating quadrature (sine and cosine) signals to perform angular measurement up to 180 degrees. It can operate under a wide supply voltage range and a wide temperature range. Combined with appropriate signal conditioning circuit, MTR611 is ideal for use in position sensing, rotary speed and direction detection systems.

Pin Definition



Num.	Name	Description
1	B-	Negative output of Bridge B
2	A-	Negative output of Bridge A
3	NC	Not Connected
4	Vs	Bridge Supply Voltage
5	B+	Positive Output Bridge B
6	A+	Positive Output Bridge A
7	NC	Not Connected
8	Gnd	Ground

Figure 1 and 2 shows the basic operation of the sensor. When an external magnetic field rotates clockwise, output A and B produce cosine and sine waveforms respectively, as also shown in the expressions below.

$$V_{outA}(\alpha) = \frac{V_{amp}}{2}\cos(2\alpha)$$

$$V_{outB}(\alpha) = \frac{V_{amp}}{2}\sin(2\alpha)$$

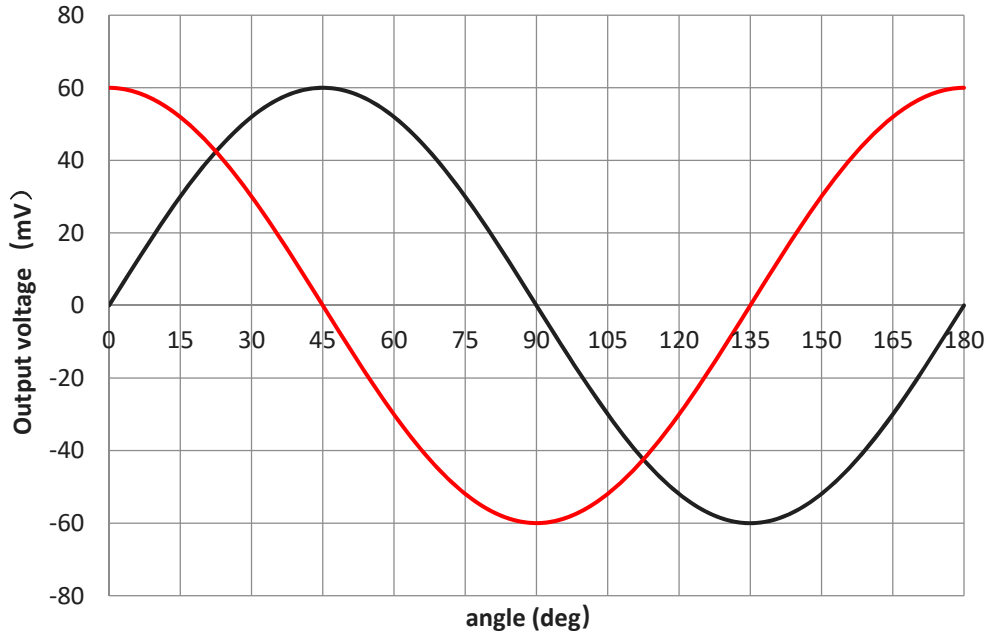


Figure 1: Typical Transfer Curve of MTR611 at room Temperature and the Magnet is Rotating in the Clockwise Direction from a Top-down View. (Bridge A Output=Red curve; Bridge B Output=Black Curve)

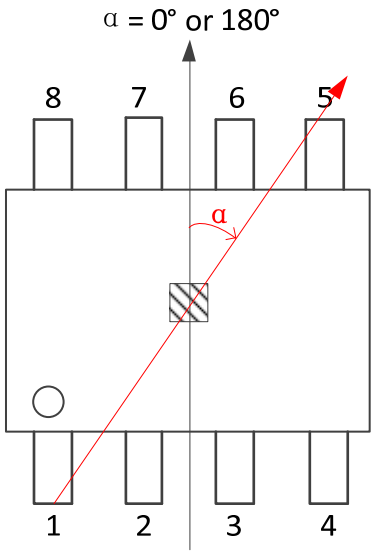


Figure 2: Magnetic Field Rotation Direction and the Definition of Zero Degree Position

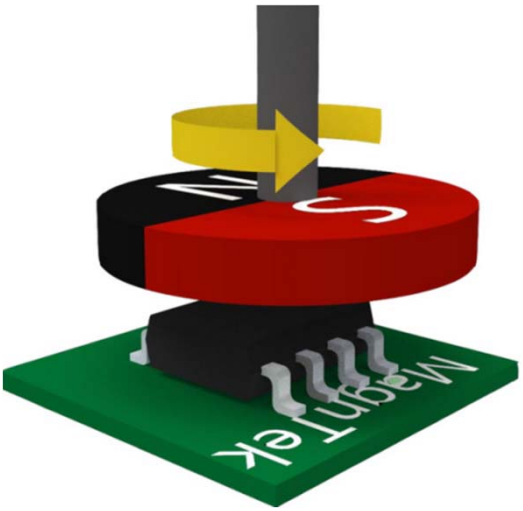


Figure 3: Typical Arrangement of MTR611 and Magnet

Block Diagram

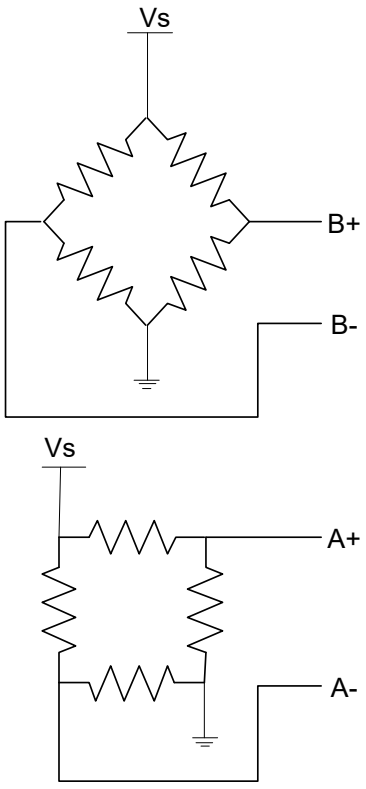


Figure 4: Block Diagram

Absolute Maximum Rating

Absolute maximum ratings are limiting values to be applied individually, and beyond which the serviceability of the circuit may be impaired. Functional operability is not necessarily implied. Exposure to absolute maximum rating conditions for an extended period of time may affect device reliability. Absolute maximum ratings: all voltages listed are referenced to GND.

Symbol	Paramters	Min.	Max.	Unit
Vs	Supply Voltage	-12	12	V
Pd	Power Dissipation		200	mW
T_A	Operation Temperature	-40	125	℃
B	Magnetic Flux	200	10000	Guass
ESD (HBM)	Electro-Static Discharge		±1000	V

Electrical and Magnetic Characteristics

At Vs=5.0V and T_A=25℃ (Unless other specified)

Symbol	Parameter	Conditions/Notes	Min.	Typ.	Max.	Unit
Vs	Supply Voltage	-		5.0	12.0	V
R_{OUT}	Bridge Resistance		0.8	1.0	1.2	KΩ
Is	Supply Current		-	5.0	-	mA
S	Sensitivity	S=Vamp*π/180	1.66	2.00	2.36	mV/°
Vamp	Output Amplitude (peak to peak)		95	115	135	mV
Vos	Offset Voltage		-2.0	-	2.0	mV/V
K	Synchronism	(VampA/VampB)*100	97	-	103	%
OE	Orthogonality Error		-1.0	-	1.0	°
TCA	Temperature Coefficient for Output Amplitude			-3300		ppm/℃
TCR	Temperature Coefficient for Bridge Resistance			2800		ppm/℃
Vampd	Output Amplitude Temperature Drift	T_A=-40℃~125℃	-45		33	%
Vosd	Offset Voltage Temperature Drift	T_A=-40℃~125℃	-300		300	uV/V

Application Circuit

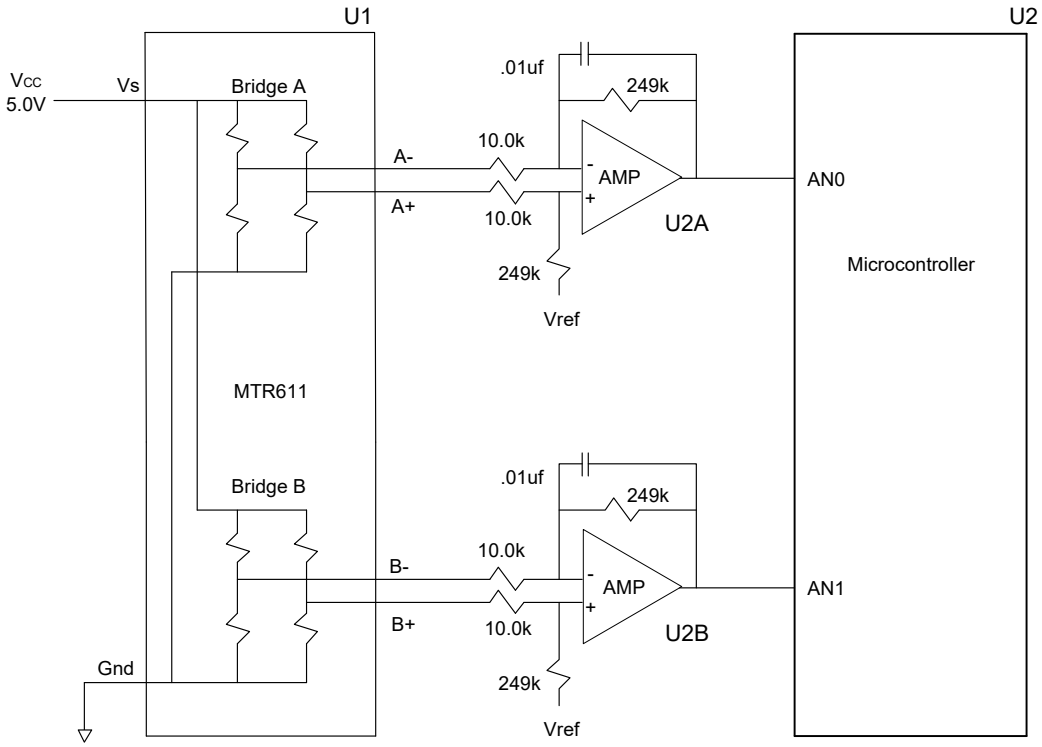


Figure 5: MTR611 Followed by Differential-to-Single-End Amplification Circuit

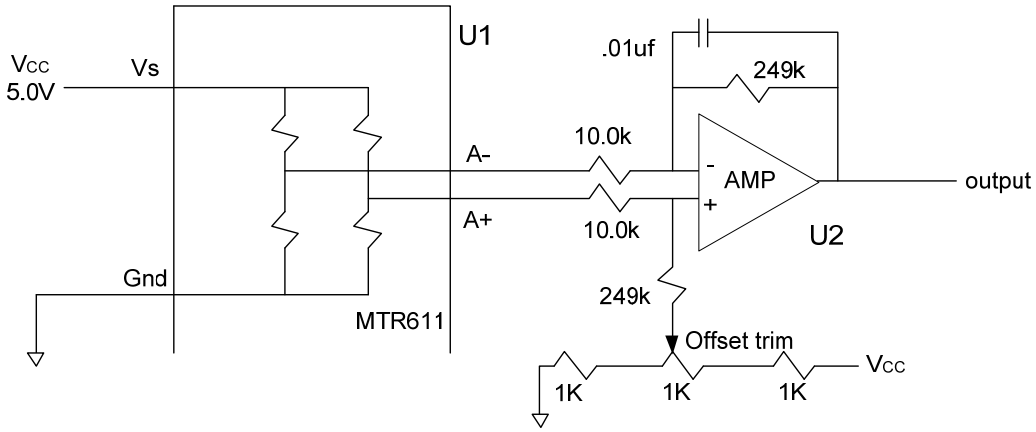
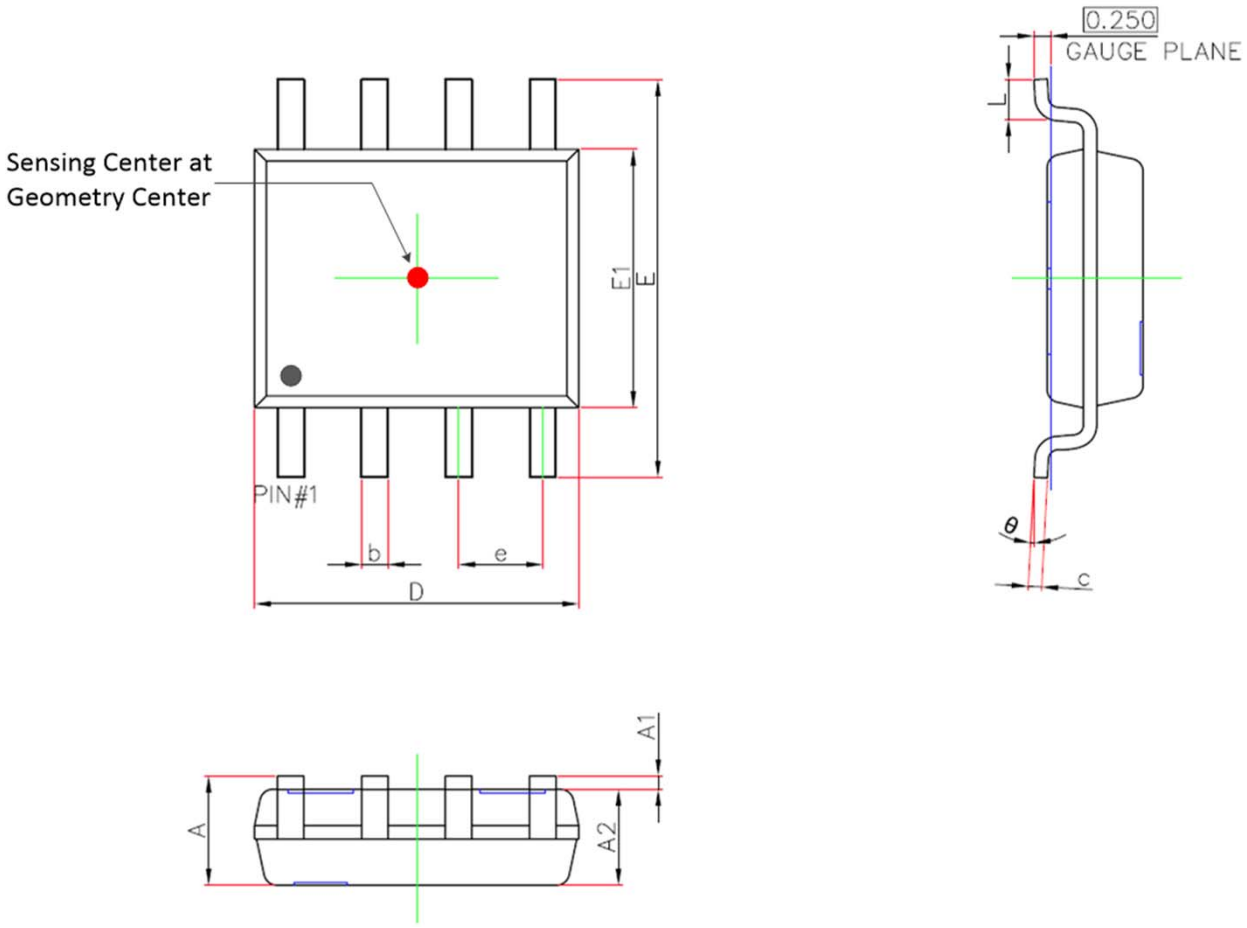


Figure 6: MTR611 with Optional Offset Trimming Circuits

Package Information (SOP-8)



Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min.	Max.	Min.	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	4.700	5.100	0.185	0.201
E	5.800	6.200	0.228	0.244
E1	3.800	4.000	0.150	0.157
e	1.270(BSC)		0.050(BSC)	
L	0.400	0.800	0.016	0.031
θ	0°	8°	0°	8°