MTR611

MR Angular Position Sensor

Feature

- Based on MR technology
- High sensitivity
- Wide voltage range up to 12V
- Wide operating temperature range -40~125°C
- RoHs Compliant 2011/65/EU

Application:

- High accuracy angular position sensing
- Rotary speed and direction detection
- Non-contact angle detection

Product Description

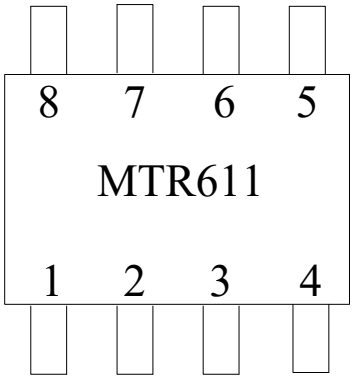
The MTR611 is a magnetic field sensor IC based on Magneto-Resistance (MR) technology. It creates an analog output voltage that varies with the direction of the magnetic flux passing over the sensor surface. It contains dual whetstones bridges operating in saturation mode and generating quadrature (sine 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.

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.

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

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

Pin Definition



Number	Name	Description
1	B-	Negative output bridge B
2	A-	Negative output bridge A
3	NC	Not connected
4	Vs	Common bridge supply voltage
5	B+	Positive output bridge B
6	A+	Positive output bridge A
7	NC	Not connected
8	Gnd	Common ground

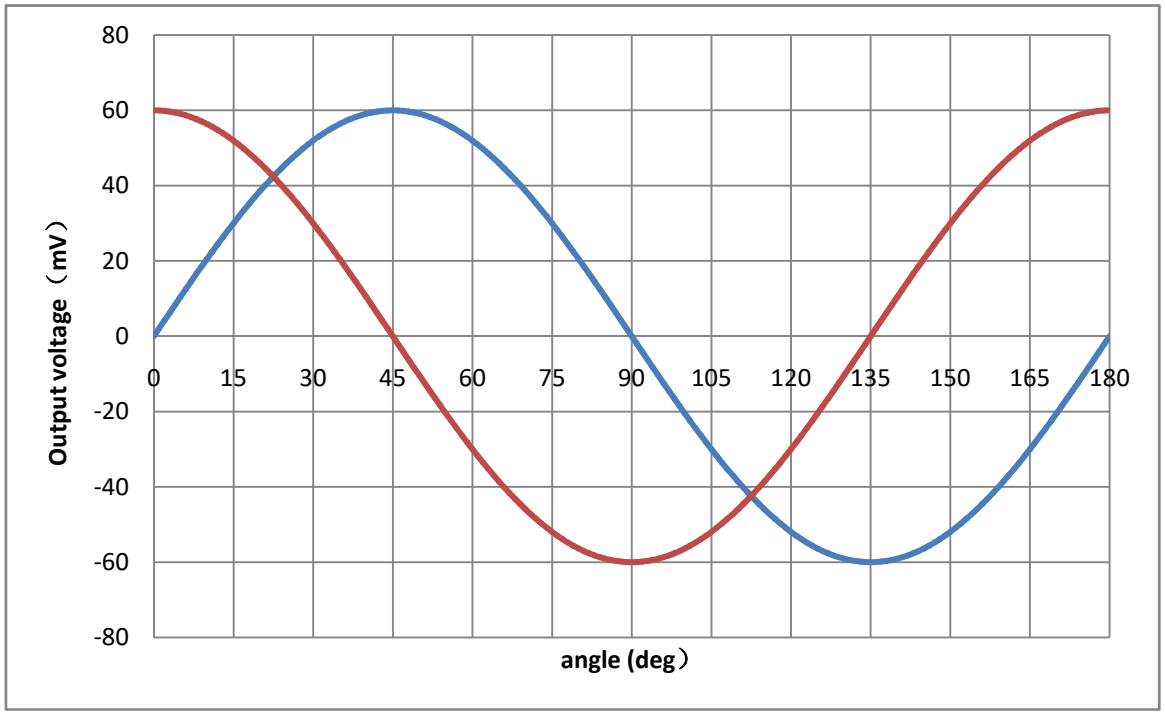


Figure 1. Typical transfer curve of MTR611 at room temperature. The magnet is rotating in the clockwise direction from a top-down view. Bridge A output = red curve; Bridge B output = blue curve.

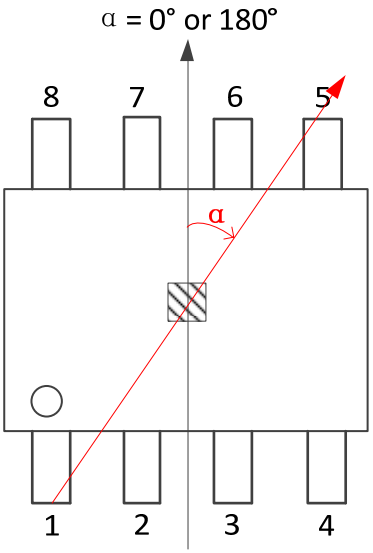


Figure 2. Diagram showing magnetic field rotation direction and the definition of zero degree point

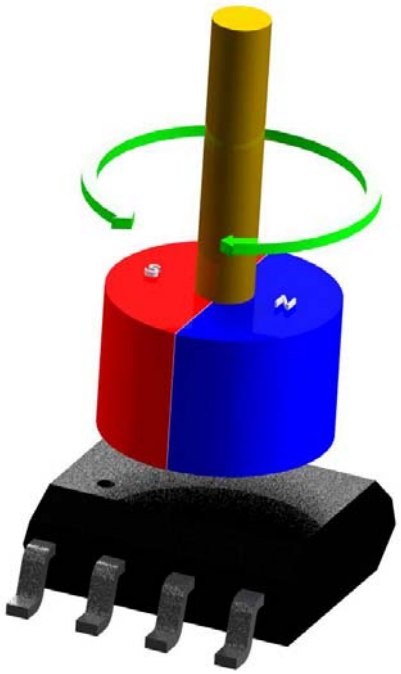
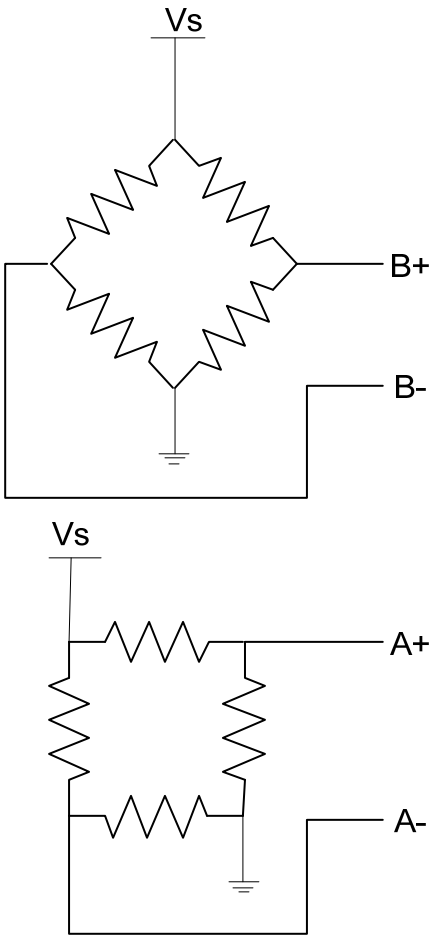


Figure 3. Typical arrangement of MTR611 and magnet

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.

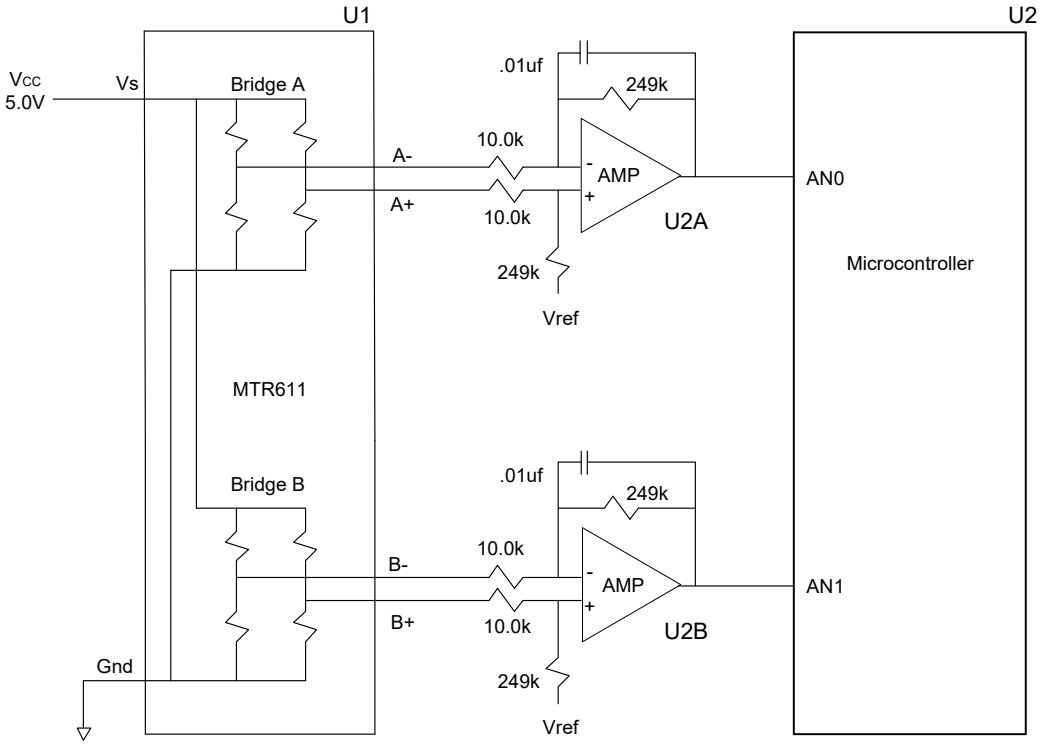
Symbol	Parameters	Min	Max	Unit
V_S	Supply Voltage	−12	12	V
Pd	Power Dissipation	-	200	mW
T_A	Operating Temperature	−40	125	°C
B	Magnetic flux	200	10000	Gauss

Electrical and Magnetic Characteristics

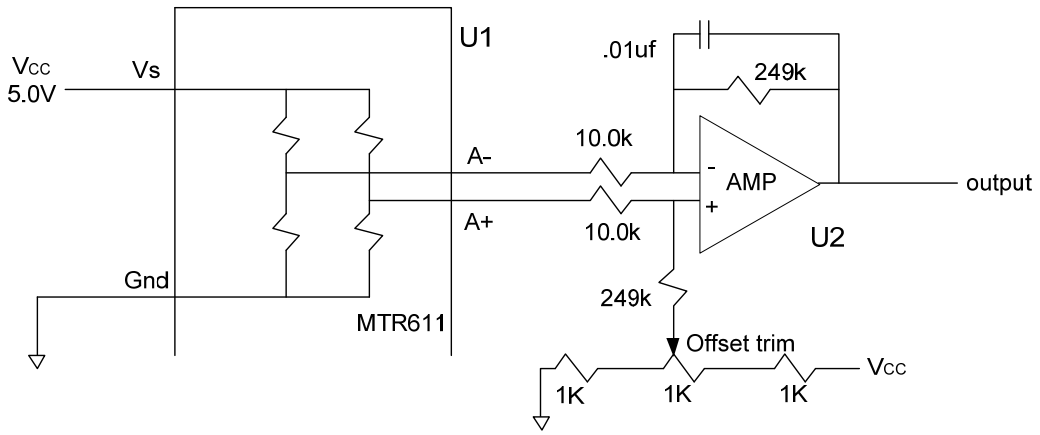
At V_S=5.0V and T_A=25°C (Unless other specified)

Symbol	**Parameters**	**Test Conditions**	**Min**	**Typ**	**Max**	**Units**
V_S	Supply voltage		-	5	12	V
R_{out}	Bridge Resistance		0.8	1.0	1.2	kOhm
Is	Supply Current		-	5.0	6.25	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		−1.5	-	1.5	mV/V
K	Synchronism	(VampA/VampB)*100	97	-	103	%
OE	Orthogonality Error		−1.0	-	1.0	°
TCA	Temperature Coefficient for Output Amplitude		-	−3300	-	ppm/°C
TCR	Temperature Coefficient for Bridge Resistance		-	2800	-	ppm/°C
Vampd	Output Amplitude Temperature Drift	T_A=−40°C – 125°C	−45	-	33	%
Vosd	Offset Voltage Temperature Drift	T_A=−40°C – 125°C	−300	-	300	uV/V

Application Circuit



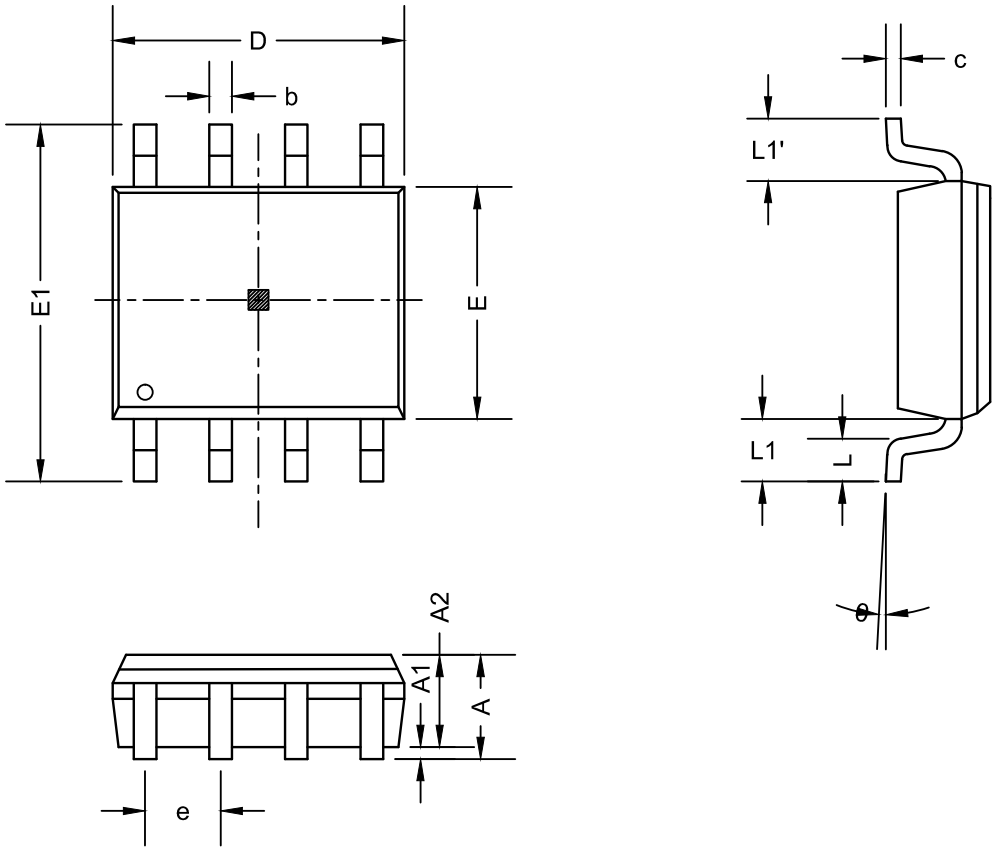
Fingure1. MTR611 Followed by Differential-to-Single-End Amplification Circuit



Fingure2. MTR611 with Optional Offset Trimming Circuit

Package Information

MTR611 (SOP8)



Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	1.595	1.775	0.063	0.070
A1	0.050	0.150	0.002	0.006
A2	1.350	1.550	0.053	0.061
b	0.375	0.425	0.015	0.017
c	0.170	0.250	0.007	0.010
D	4.700	5.100	0.185	0.200
E	3.875	3.925	0.153	0.155
E1	5.800	6.200	0.228	0.244
e	1.270(BSC)		0.050(BSC)	
L	0.615	0.765	0.024	0.030
L1	1.040REF		0.041REF	
L1-L1’	-	0.120	-	0.005
θ	0˚	8˚	0˚	8˚