

1 Description

The RedRock 110 Series is an analog magnetic sensor, ideal for use in medical, industrial, automotive, and consumer applications. Based on patented Tunneling Magnetoresistance (TMR) technology, the RR110 Series excels even in low magnetic fields and with large air gaps. The RR110 Series offers high sensitivity in a small footprint package.



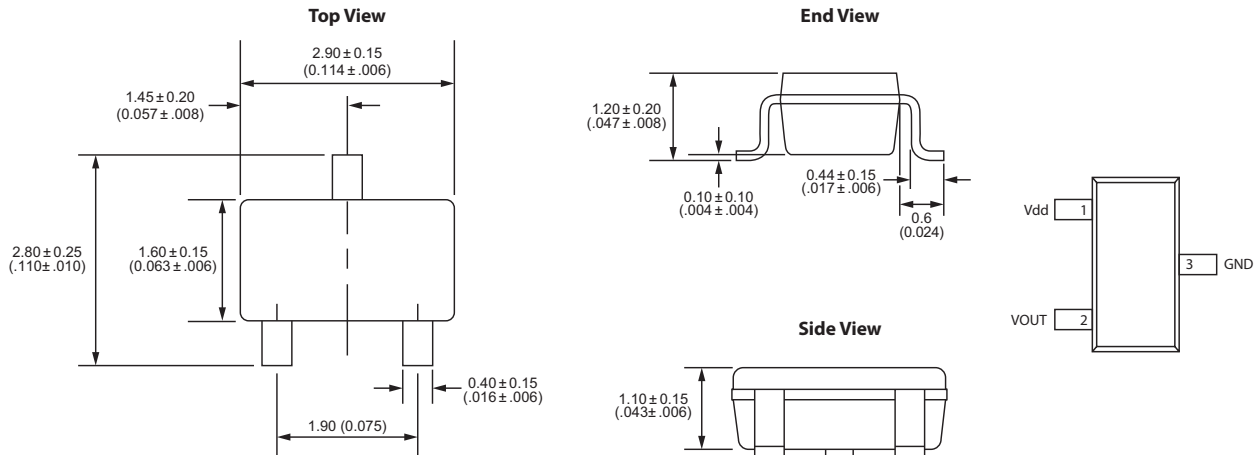
2 Features

- ▶ High sensitivity
- ▶ Stable temperature performance
- ▶ Resistant to mechanical stress
- ▶ REACH Compliant
- ▶ RoHS Compliant **Pb**

3 Applications

- ▶ Door or lid closure detection
- ▶ Smart phones, tablets and laptops
- ▶ Proximity detection
- ▶ Position sensing
- ▶ Water, electric and gas meters
- ▶ Fluid level detection

4 Dimensions *Millimeters (Inches)*



5 Device Nomenclature

Ordering Information

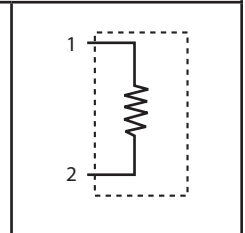
Part Number	RR110-A X 1 1-00
Model Number	
Magnetoresistance (kΩ)	A: 65kΩ @ 0 G, 20kΩ @ 100 G
Temp Rating (°C)	1 - Industrial (-40~+85)
Feature	1 - Default Value
Package	0 - SOT-23
Special Feature	0 - N/A
Magnetic Polarity	1 = Unipolar

6 Specifications

Parameters ¹	Units	Min	Typ	Max
OPERATING CHARACTERISTICS²				
Resistance @ 0 Gauss	kΩ	45	55	65
Resistance @ 100 Gauss	kΩ	20	26	33
Response Time	ns		600	
Temperature Coefficient of Resistance (at 0 field) ²	Ω/°C		-35	
ELECTRICAL CHARACTERISTICS				
Supply Voltage	V _{dd}	1.2	5	12
Operating Current ⁴	μA		1	400
ABSOLUTE RATINGS				
Operating Temperature	°C	-40		85
Storage Temperature	°C	-55		150
Soldering Temperature (3 cycles of 1 min.)	°C			260
Operating Magnetic Field	G			100
ESD Level (HBM) ³	V			See Note 3
Supply Current	mA			1
Flux Density	T			1

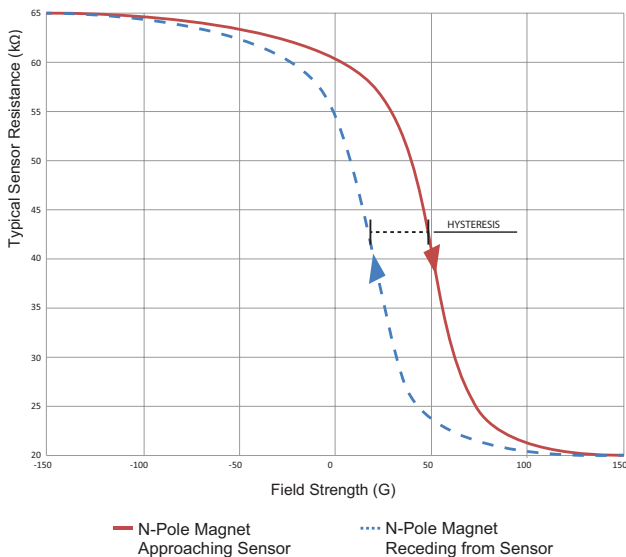
Notes:

1. Contact factory for more information on additional product offerings.
2. All characteristics as measured at 25°C
3. **ESD PRECAUTIONS MUST BE USED WHEN HANDLING.**
4. The RR110 may be operated at lower currents to reduce power consumption, or at higher currents for greater voltage output, as long as the limits noted in the electrical characteristics are not exceeded.

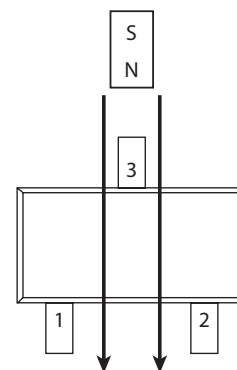


7 Magnetic Sensitivity Transfer Curve

The magnetic sensitivity transfer curve illustrates the characteristic behavior of an analog TMR sensor's resistance change as the strength of an applied magnetic field changes. The magnet approach curve (red line) shows the change in resistance as the strength of an applied magnetic field increases. The magnet recede curve (blue dashed line) shows the change in resistance as the strength of an applied magnetic field decreases. Alternatively, you can think of the resistance going down the red slope as a magnet approaches the sensor, and going up the blue dashed slope as the magnet moves further away from the sensor.



8 Sensor Polarity Diagram



9 TMR Sensor & Switch Packaging

Standard packaging is Tape & Reel containing 3,000 pieces. Below is a chart of Tape & Reel dimensions for standard TMR products.

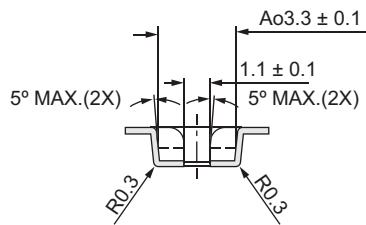
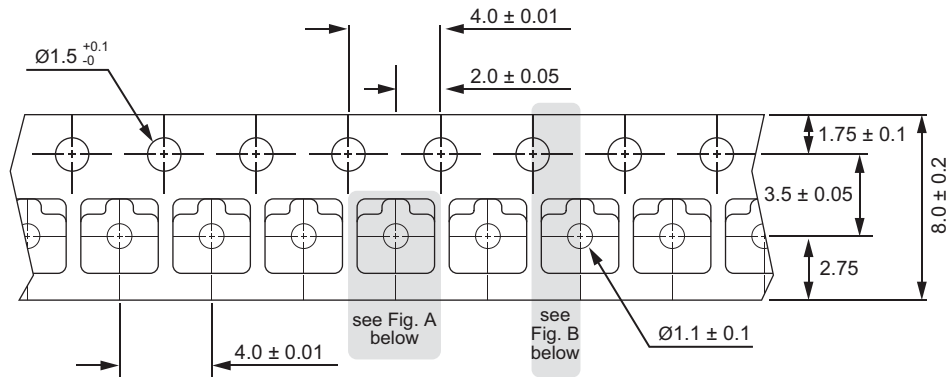


Fig. A

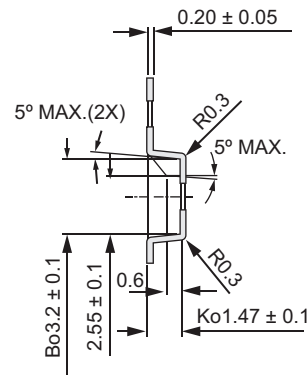
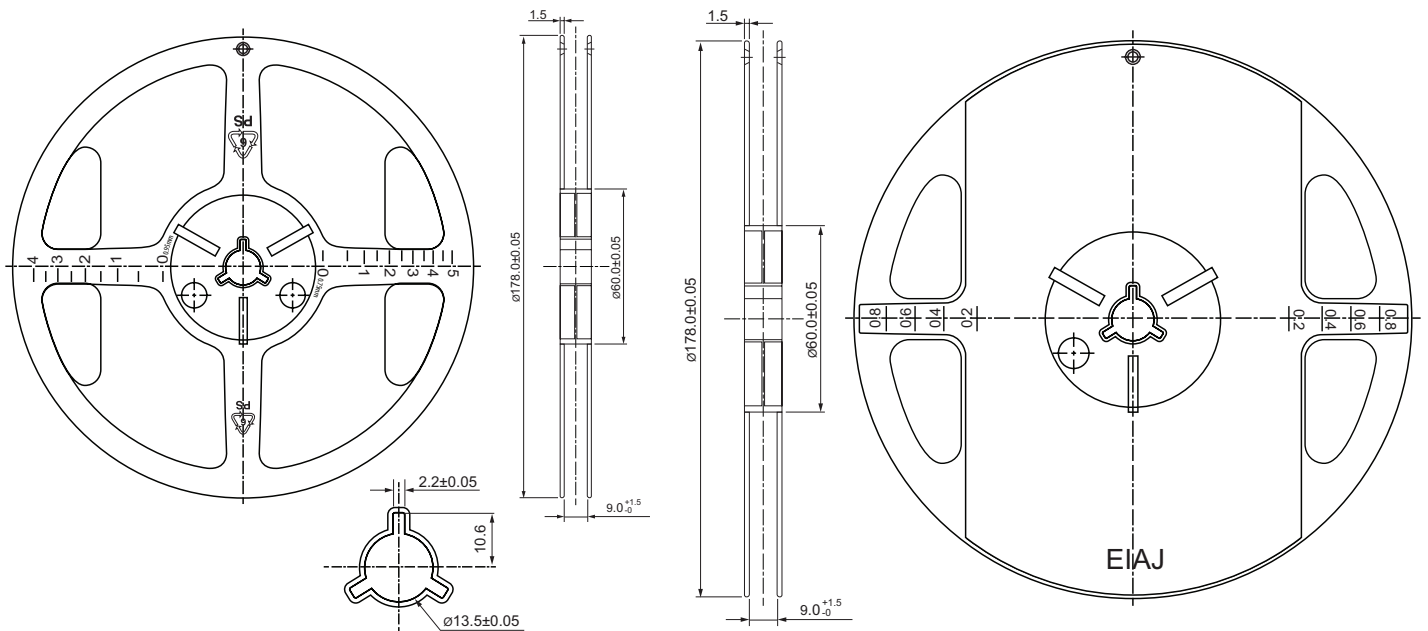
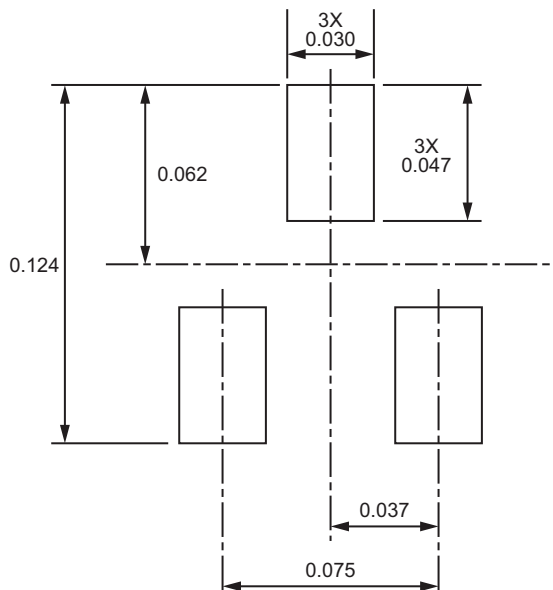


Fig. B



10 Suggested Solder Pad Layout

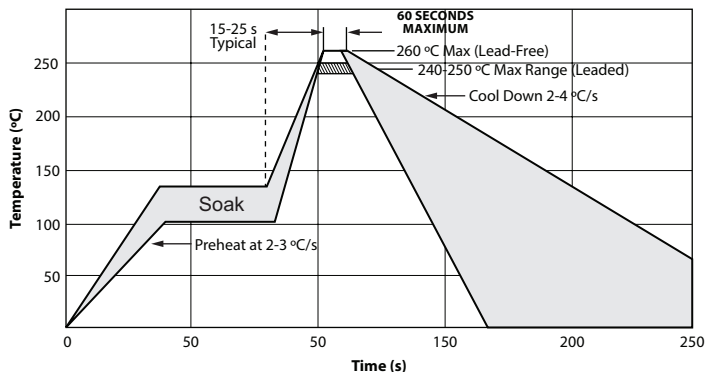


(Units in mm)

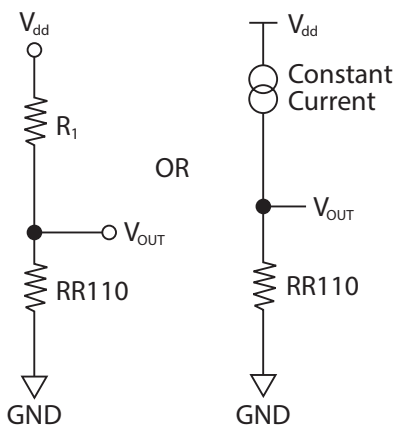
Notes:

1. Fully compatible with standard no-lead solder profile, 260 °C for 1 minute max (3 cycles max)
2. Profile shown as example. Users are advised to develop their own board-level profile
3. Temperature tolerance: +0 °C, as measured at any point on the package or leads
4. MSL rating of 1 compatible with J-STD-020 or equivalent.

11 Suggested Reflow Profile



12 Application Circuits



RR110 Magnetoresistance Application Circuit

The RR110 can be configured with a constant voltage source and a fixed resistor to create a voltage divider circuit. Alternatively, a constant current source eliminates the need for a fixed resistor.

13 Glossary of Terms

Hysteresis: Hysteresis refers to the difference between two points of interest for a particular device. For digital sensors and switches, it represents the difference between the operate sensitivity and the release sensitivity, expressed either as an absolute value ($B_{OP} - B_{RP}$) or the % difference $(B_{OP} - B_{RP})/B_{OP}$. For an analog sensor, the hysteresis is the difference between the “magnet approach curve” and the “magnet recede curve.”

Magnet Approach Curve: The magnet approach curve is the characteristic change in resistance of an analog TMR sensor as an applied magnetic field approaches the sensor, typically plotted as a function of the magnetic field strength.

Magnet Recede Curve: The magnet recede curve is the characteristic change in resistance of an analog TMR sensor as an applied magnetic field recedes from the sensor, typically plotted as a function of the magnetic field strength.

Magnetoresistance: Magnetoresistance is a phenomenon wherein the electrical resistance of certain materials changes when exposed to an externally-applied magnetic field.

Magnetic Transfer Curve: The magnetic transfer curve defines the characteristic behavior of an analog TMR sensor by combining both the magnet approach curve and the magnet receive curve together.

Magnetic Tunnel Junction: A magnetic tunnel junction is a thin film structure consisting of two magnetic layers separated by a thin insulator. Because the insulating layer is thin enough (typically a few nanometers), electrons can tunnel from one magnetic layer into the other.

Operate Sensitivity: The operate sensitivity defines the upper limit of the strength of an applied magnetic field that a digital TMR sensor or switch must operate.

Operate Time: The operate time is the difference, in time, between the application of a magnetic field and the output response of the device. In an analog sensor, the response is a change in output resistance. In a digital sensor, the response is a change in state of the electrical output.

Release Sensitivity: The release sensitivity defines the lower limit of the strength of an applied magnetic field that a digital TMR sensor or switch must release.

Release Time: The release time is the difference, in time, between the removal of an applied magnetic field and the output response of the device. In an analog sensor, the response is a change in output resistance. In a digital sensor, the response is a change in state of the electrical output.

Tunnel Magnetoresistance (TMR): Tunnel Magnetoresistance is the magnetoresistive effect that occurs in a magnetic tunnel junction.