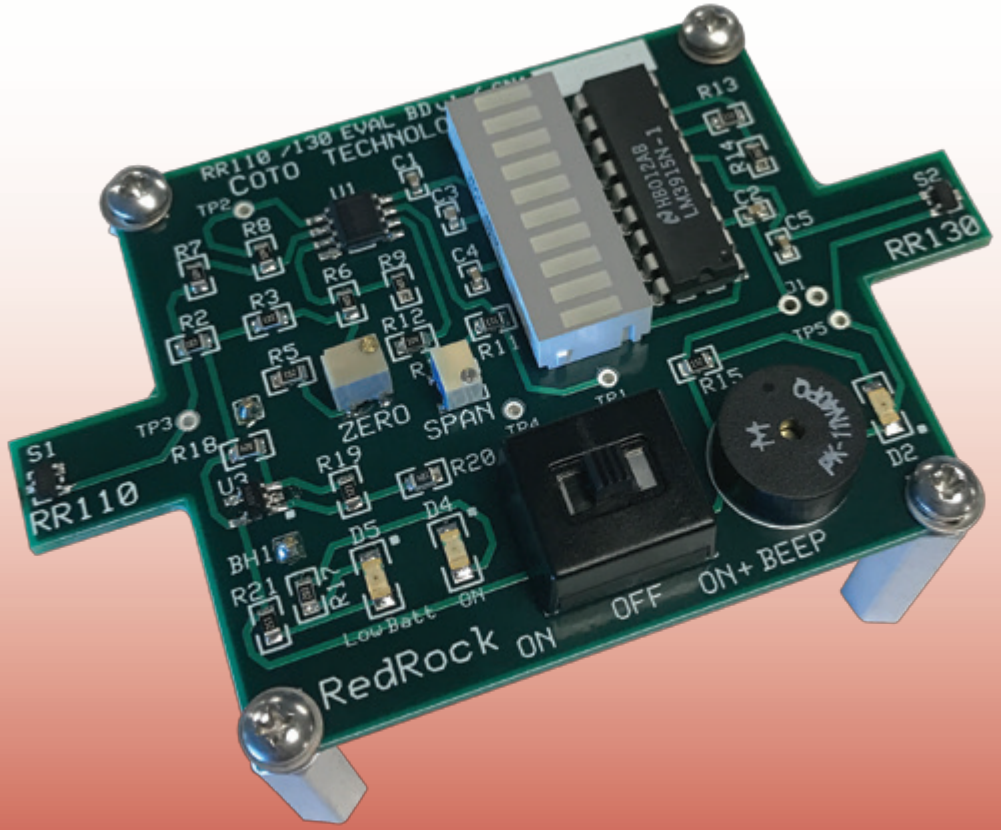
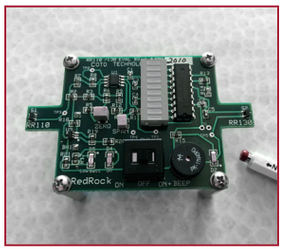
RedRock™

RR1EK2-0001 Evaluation Board User's Guide



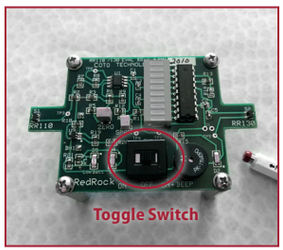
Q. What have I got here?

A. The RR1EK2-0001 is a demonstration and evaluation kit that showcases the capabilities and suggested applications for Coto Technology's RedRock RR110 analog sensor and the RR130 digital switch. The kit contains:



- The dual demonstration board with the two RedRock devices mounted at opposite ends
- An N52 Cylindrical magnet measuring 3/16" x 3/8". Note that the north pole is indicated for easy reference.

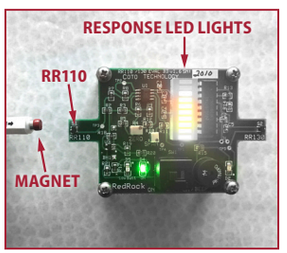
Q. How do I use the board?

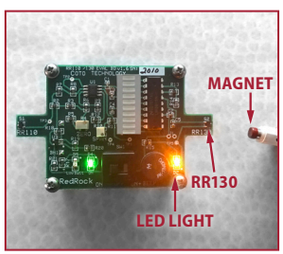


A. There is a toggle switch located near the bottom center of the board. Toggling the switch to the left will turn the board "on" with visual feedback only. Toggling the switch to the right will turn it "on" with both audio and visual feedback active.

PLEASE NOTE: When the device is not in use, this switch should be kept to the center "off" position to conserve battery power.

When the included magnet is brought near the RR110 (mounted on the left side), the changing resistance of the analog sensor will trigger a variable response on the LED array located in the center of the board. Put simply, the stronger/closer the magnetic field presented to the analog sensor, the more LEDs will be activated on the LED array.





When a sufficiently strong magnetic field is presented to the RR130 on the right side of the board, it will toggle a yellow LED on.

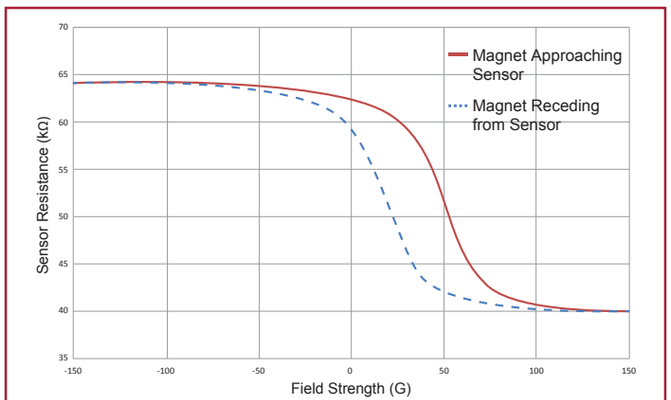
Feel free to experiment with other magnets you may be considering in your application to vary the activation distances. You can also activate the devices by bringing a south magnetic pole near the two-pin side of the devices.

Q. What is the underlying technology in the RedRock RR110, RR120, and RR130?

A. They operate on the principle of tunneling magnetoresistance (TMR). It is a thin film technology utilizing two ferromagnetic layers, one with fixed orientation and the other with variable orientation. Between them is a very thin (typically nanometers) insulating layer.

Together these layers form a magnetic sensor array. When the sensor is exposed to an external magnetic field, the variable magnetic layer can "shift," increasing the rate at which electrons "tunnel" through the insulating layer.

This results in a change in resistance of the sensor array, sort of like a magnetic potentiometer:



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.

Q. What are the differences between the analog and digital sensors and switches?

A. The RR110 analog sensor offers a straightforward resistance measurement, which varies depending on the strength of magnetic field the sensor is exposed to. The RR120 digital sensor takes it a step further by integrating CMOS circuitry to establish a "high" and "low" output. A strong enough field will decrease resistance enough to turn the RR120's output to "low" whereas, when the field is removed, it will be "high." The outputs from the RR110 and RR120 are intended as inputs to a microprocessor. The RR130 digital switch adds an open-drain MOSFET at the output pin to allow the device to act as a toggle switch to control a larger voltage signal, potentially the control signal for a power relay handling even higher loads.

Q. What are TMR's advantages over other magnetic sensing technologies?

A. Unlike Hall Effect, GMR, and AMR devices, TMR devices can function with significantly less power consumption and are highly sensitive (yet resistant to damage from high power electromagnetic fields). Furthermore, they offer an incredibly small package size with the potential for even further size reductions.

Q. What are some of the other benefits of TMR?

A. TMR offers the opportunity to customize the sensitivity response to produce high or low hysteresis devices. The analog sensor (RR110) offers a means of continuous sensing vs. a binary "on" and "off" response, opening up some rather interesting design opportunities. The devices are all RoHS compliant and manufacturing friendly with tape & reel packaging for automated pick and place.

Q. Is RedRock easy to "design in" to my application?

A. The answer is YES! The RR110 is a two pin resistor; all it takes is a reference resistor to setup a voltage divider circuit that can easily wire into an analog input on your preferred microprocessor for easy analog readouts. The RR120 and RR130 are both three-pin devices, easily wired into a digital input on a microprocessor or toggling another circuit path, respectively.

Q. How are design engineers already using the RR110, RR120, and RR130?

A. The magnetically operated sensors are being used as the critical component in a "wakeup" circuit for a microprocessor-driven device that spends significant time in "standby" mode. They can also act as a "mode changer" to switch between different operating modalities (e.g. hearing aid telecoil coupling mode). The digital switch is ideal for power switching.

The analog sensor offers the capability for high precision multi-level fluid sensing and proximity detection while both the digital sensor and switch are ideal in small battery-powered medical devices like insulin pumps, capsule endoscopes, and hearing aids. Utility meters can also replace bare glass reed switches with TMR sensors to increase reliability in rugged environments where the glass reed switches might crack under stress.

Q. How is the board powered?

A. The board uses 3 AAA batteries, installed on the underside of the board. If the Red LED is lit, this means the batteries should be replaced.

Q. HELP! My board is acting strange.

A. The batteries are likely getting low. Installing new batteries should resolve these issues.

Q. What if I have other questions?

A. Visit Coto Technology 24/7 online at cotorelay.com for a full library of technical and applications information including product datasheets, pad layouts, suggested soldering reflow profiles, a full glossary of terms, and more. You can also submit questions directly to our Applications engineers through a form on our website or contact us via email at **appsupport@cotorelay.com**

RedRock™

Ultra-Miniature Magnetic Switches & Sensors

RedRock® TMR-Based Magnetic Sensors

- **HIGH SENSITIVITY**
  Maximizes activation distance
- **ULTRA LOW LEAKAGE CURRENT**
  Preserves battery power
- **TINY PACKAGE**
  Saves PCB real estate

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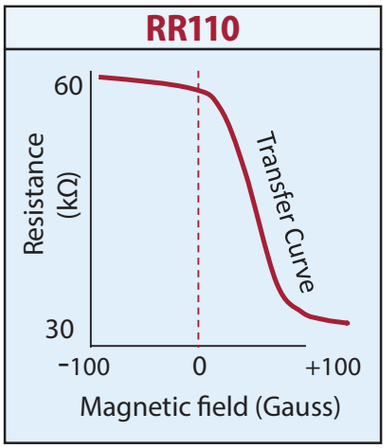
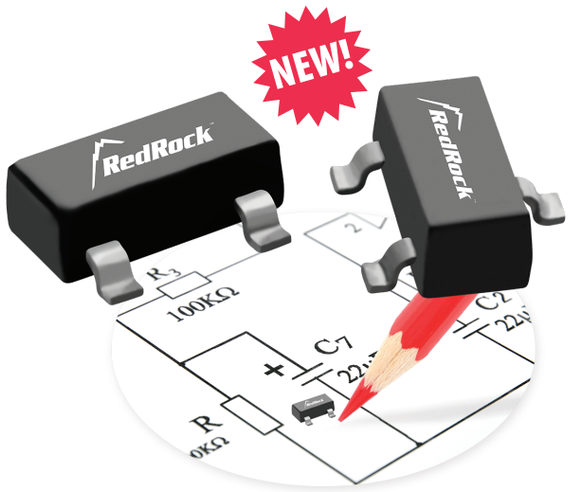
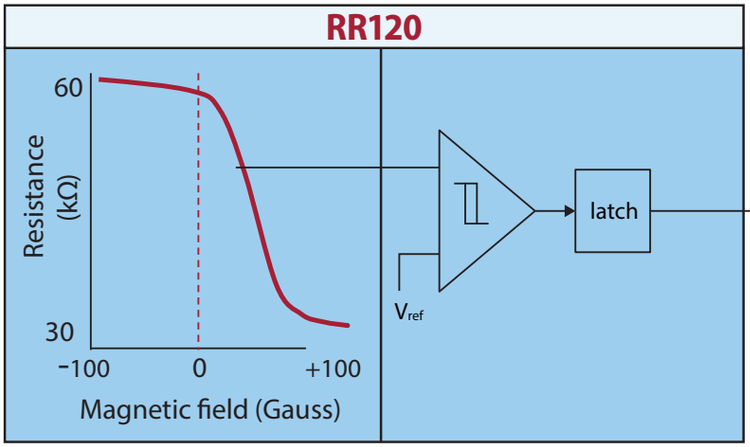
RR110



RR110 Series
- Analog Sensor
- Two Pin - Resistance Output
- No Power Needed

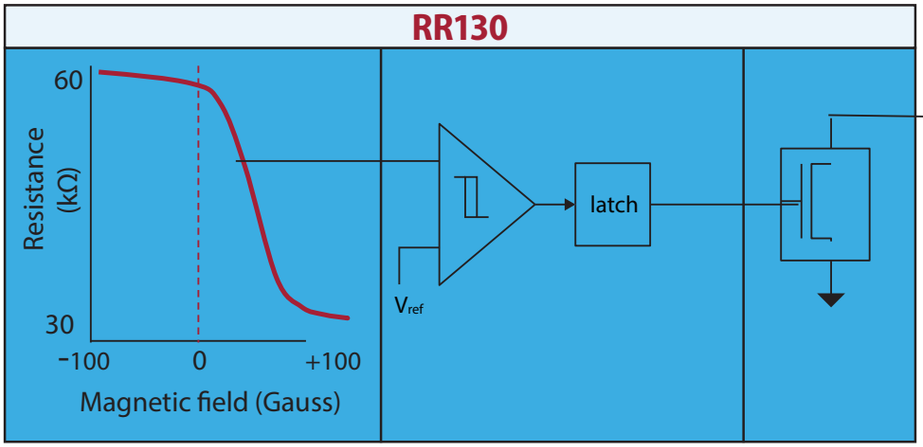


RR120



RR120 Series
- Digital Sensor
- Logic Voltage Output
- Extremely Low Power

RR130



RR130 Series
- Digital Switch
- Pull Up Voltage Output
- Extremely Low Power

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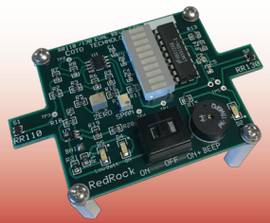

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