1 Description

The RedRock™ RR121 Series is a magnetic sensor with digital push-pull output ideal for use in medical, industrial, automotive, and consumer applications. Based on patented Tunneling Magnetoresistance (TMR) technology with seamless CMOS integration, the RR121 offers multiple configurations of several parameters to enable applications like proximity sensing, rotary sensing, and level detection.

The RR121 features available operate sensitivities from 9 G (0.9 mT) to 70 G (7 mT), and either omnipolar, unipolar, or bipolar magnetic field response. It has the world's lowest average current drain (200 nA) for an active magnetic sensor, as well as operating frequencies up to 10 kHz and high operating temperature ranges from -40°C up to 125°C.

Device Information

Part Series	Package	Body Size (mm)
RR121	SOT-23-3	2.9 x 1.6 x 1.2
	LGA-4	1.4 x 1.4 x 0.45

Device Packages

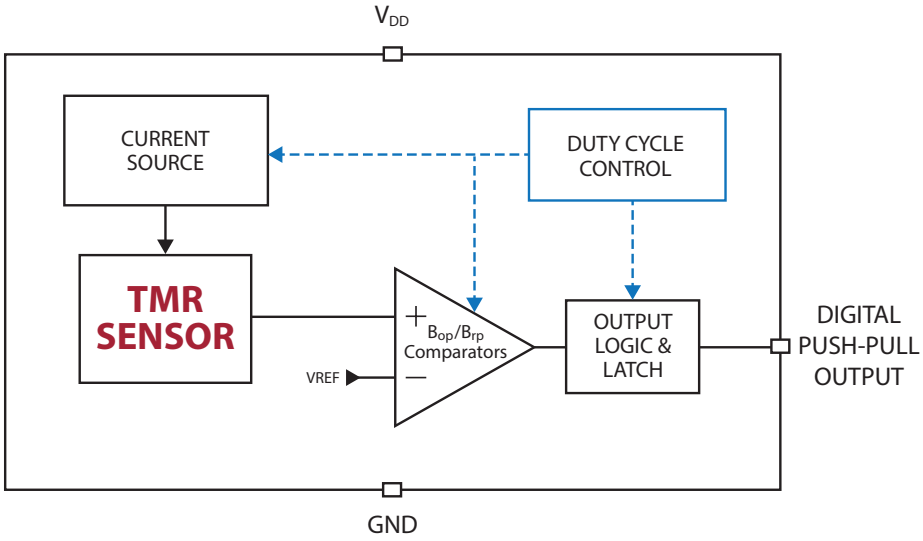
2 Features

- Operate sensitivity from 9 G to 70 G
- Lowest Average Current < 200 nA
- Omnipolar and Bipolar Latching Responses Available
- Operating Frequencies up to 10 kHz
- Temperature Rated up to 125°C
- RoHS & REACH Compliant

3 Applications

- Proximity Detection
- Rotary Sensing
- Fluid Level Detection
- Door & Lid Closure Detection
- Utility Meters
- Portable Medical Devices
- Motor Controllers
- Consumer Electronics
- Wake-Up µProcessor

Functional Block Diagram



Copyright 2018. All rights reserved.

Table of Contents

1. Description 1
2. Features 1
3. Applications 1
4. Specifications for all RR121 Series Sensors 3
   - 4.1 Absolute Environmental Ratings for all RR121 Series Sensors. . 3
   - 4.2 Absolute Electrical Ratings for all RR121 Series Sensors 3
   - 4.3 Operating Electrical Characteristics for all RR121 Series Sensors 3
5. Operating Characteristics for RR121-1B13-311 and RR121-1B13-312 4
6. Graphs - Typical Electrical Characteristics for RR121-1B13-311 and RR121-1B13-312 4
   - 6.1 Average Supply Current vs. Supply Voltage vs. Temperature . 4
   - 6.2 Average Supply Current vs. Temperature vs. Supply Voltage . 4
   - 6.3 Sampling Frequency vs. Supply Voltage vs. Temperature 5
7. Graphs - Typical Magnetic Characteristics for RR121-1B13-311 and RR121-1B13-312 5
   - 7.1 B_{OPN} (Red) and B_{OPS} (Blue) vs. Supply Voltage at +25ºC 5
   - 7.2 B_{RPN} (Red) and B_{RPS} (Blue) vs. Supply Voltage at +25ºC 5
   - 7.3 B_{OPN} (Orange) and B_{OPS} (Green) vs. Operating Temperature at V_{DD}=3.0 V 6
   - 7.4 B_{OPN} (Red) and B_{OPS} (Blue) vs. Supply Voltage at +25ºC 6
8. Operate & Release Lobe Plots 6
   - 8.1 RR121-1B13-311 6
   - 8.2 RR121-1B13-312 6
9. Operating Characteristics for RR121-1A23-311 7
10. Operating Characteristics for RR121-1F23-311 7
11. Graphs - Typical Characteristics for RR121-1A23-311 and RR121-1F23-311 8
   - 11.1 Average Supply Current vs. Supply Voltage vs. Temperature 8
   - 11.2 Average Supply Current vs. Temperature vs. Supply Voltage 8
   - 11.3 Sampling Frequency vs. Supply Voltage vs. Temperature ... 8
12. Graphs - Typical Magnetic Characteristics for RR121-1A23-311 ... 9
   - 12.1 B_{OPN} (Red) and B_{OPS} (Blue) vs. Supply Voltage at +25ºC 9
   - 12.2 B_{RPN} (Red) and B_{RPS} (Blue) vs. Supply Voltage at +25ºC 9
   - 12.3 B_{OPN} (Orange) and B_{OPS} (Green) vs. Operating Temperature at V_{DD}=3.0 V 9
   - 12.4 B_{OPN} (Red) and B_{OPS} (Blue) vs. Supply Voltage at +25ºC 9
13. Operate & Release Lobe Plot 10
   - 11.1 RR121-1A23-311 10
14. Operating Characteristics for RR121-1B53-311 10
15. Operating Characteristics for RR121-1A53-311 11
16. Graphs - Typical Characteristics for RR121-1B53-311 and RR121-1A53-311 11
   - 16.1 Average Supply Current vs. Supply Voltage vs. Temperature 11
   - 16.2 Average Supply Current vs. Temperature vs. Supply Voltage 11
   - 16.3 Sampling Frequency vs. Supply Voltage vs. Temperature .. 12
17. Graphs - Typical Magnetic Characteristics for RR121-1B53-311 .. 12
   - 17.1 B_{OPN} (Red) and B_{OPS} (Blue) vs. Supply Voltage at +25ºC 12
   - 17.2 B_{RPN} (Red) and B_{RPS} (Blue) vs. Supply Voltage at +25ºC 12
   - 17.3 B_{OPN} (Orange) and B_{OPS} (Green) vs. Operating Temperature at V_{DD}=3.0 V 13
   - 17.4 B_{OPN} (Red) and B_{OPS} (Blue) vs. Supply Voltage at +25ºC 13
18. Operate & Release Lobe Plots 13
   - 18.1 RR121-1B53-311 13
19. Operating Characteristics for RR121-3C63-311 14
20. Graphs - Typical Characteristics for RR121-3C63-311 14
   - 20.1 Average Supply Current vs. Supply Voltage vs. Temperature 14
   - 20.2 Average Supply Current vs. Temperature vs. Supply Voltage 14
   - 20.3 Sampling Frequency vs. Supply Voltage vs. Temperature .. 14
21. Operating Characteristics for RR121-1E73-311 15
22. Graphs - Typical Characteristics for RR121-1E73-311 15
   - 22.1 Average Supply Current vs. Supply Voltage vs. Temperature 15
   - 22.2 Average Supply Current vs. Temperature vs. Supply Voltage 15
   - 22.3 Sampling Frequency vs. Supply Voltage vs. Temperature .. 16
23. Operating Characteristics for RR121-1B93-312 16
24. Graphs - Typical Characteristics for RR121-1B93-312 17
   - 24.1 Sampling Frequency vs. Supply Voltage vs. Temperature .. 17
25. Graphs - Typical Magnetic Characteristics for RR121-1B93-311 .. 17
   - 25.1 B_{OPN} (Red) and B_{OPS} (Blue) vs. Supply Voltage at +25ºC 17
   - 25.2 B_{RPN} (Red) and B_{RPS} (Blue) vs. Supply Voltage at +25ºC 17
   - 25.3 B_{OPN} (Orange) and B_{OPS} (Green) vs. Operating Temperature at V_{DD}=3.0 V 18
   - 25.4 B_{OPN} (Red) and B_{OPS} (Blue) vs. Supply Voltage at +25ºC 18
26. Application Information 18
   - 26.1 RR121 Push-Pull Output Application Circuit (SOT-23) 18
   - 26.2 RR121 Push-Pull Output Application Circuit (LGA-4) 18
27. Part Selection & Ordering Information 19
   - 27.1 Part Selection Table 19
   - 27.2 Device Nomenclature Ordering Information 19
28. Axis of Sensitivity 19
29. Dimensions 20
   - 29.1 LGA-4 Package Dimensions 20
   - 29.2 SOT-23-3 Package Dimensions 20
30. TMR Sensor Location 20
   - 30.1 LGA Package 20
   - 30.2 SOT Package 20
31. Magnetic Flux Response Diagrams 21
   - 31.1 Omnipolar Magnetic Flux Response (Active Low Option) .. 21
   - 31.2 Bipolar Magnetic Flux Response (Active Low Option) 21
32. Output Behavior vs. Magnetic Field Diagrams 21
   - 32.1 Output Behavior vs. Magnetic Field - Omnipolar 21
   - 32.2 Output Behavior vs. Magnetic Field - Bipolar 21
33. TMR Sensor & Switch Packaging 22
   - 33.1 SOT-23-3 Tape & Reel Packaging 22
   - 33.2 LGA-4 Tape & Reel Packaging 23
34. Suggested Pb-Free Reflow Profile 24
35. Suggested Solder Pad Layout 24
   - 35.1 SOT-23-3 Solder Pad Layout 24
   - 35.2 LGA-4 Solder Pad Layout 24

(401) 943-2686 | redrock@cotorelay.com | www.cotorelay.com

4 Specifications for all RR121 Series Sensors

4.1 Absolute Environmental Ratings for all RR121 Series Sensors[1]

Parameters	Units	Min	Typ	Max
Operating Temperature (T_{OP})	°C	-40		+125
Storage Temperature (T_{STG})	°C	-65		+150
Junction Temperature (T_J)	°C	-40		+150
Soldering Temperature (3 cycles, 1 min.) (T_{SOL})	°C			+260
ESD Level Human Body Model per JESD22-A114	V			±4000

4.2 Absolute Electrical Ratings for all RR121 Series Sensors[1]

Parameters	Units	Min	Typ	Max
Supply Voltage (V_{DD})	V	-0.3		+4.0
Push-pull Output (Active Low)(V_{OUT_PP})	V	-0.3		V_{DD} +0.3
Open Drain Output Voltage (Active Low) (V_{OUT_OD})	V	-0.3		+5.5
Input and Output Current (V_{IN}/I_{OUT})	mA	-10		+10

4.3 Operating Electrical Characteristics for all RR121 Series Sensors[2]

Parameters	Units	Min	Typ	Max
Supply Voltage (V_{DD})	V	+2.7	+3.0	+3.6
Output Voltage (High)[3] (V_{OUTH})	V	90% V_{DD}		
Output Voltage (Low)[3] (V_{OUTL})	V			10% V_{DD}
Power-On Time (t_{ON})(V_{DD} > 2.7V)	µs		500	
Under-Voltage Lockout Threshold Rising V_{DD} (V_{UVLO_RISE})	V		+2.20	+2.60
Under-Voltage Lockout Threshold Falling V_{DD} (V_{UVLO_FALL})	V	+1.90	+2.15	
Under-Voltage Lockout Hysteresis (V_{UV_HYST})	mV		+50	

Notes:

1. Exceeding Absolute Ratings may cause permanent damage to the device. Exposure at the maximum rated conditions for extended periods of time may also affect device reliability.
2. Unless otherwise specified, all characteristics are measured at 25°C.
3. See "Magnetic Field vs. Output Status" for more details.

ESD Note: This product uses semiconductors that can be damaged by electrostatic discharge (ESD). When handling, proper ESD precautions should be taken to avoid performance degradation or loss of functionality. Damage due to inappropriate handling is not covered under warranty.

Copyright 2018. All rights reserved.

5 Operating Characteristics for RR121-1B13-311 and RR121-1B13-312[1]

Parameters	Units	Min	Typ	Max
Average Supply Current ($I_{DD\ (AVG)}$)[2]	nA		200	700
Switching Frequency (f_{SW})	Hz	1	2	4
Active Mode Time (t_{ACT})	µs		1.4	
Idle Mode Time (t_{IDLE})	ms		500	
Operate Point (B_{OPN})	G	27	30	38
Operate Point (B_{OPS})	G	-38	-30	-27
Release Point (B_{RPN})	G	18	20	27
Release Point (B_{RPS})	G	-27	-20	-18
Hysteresis (B_{HYST})[3]	G	5	10	

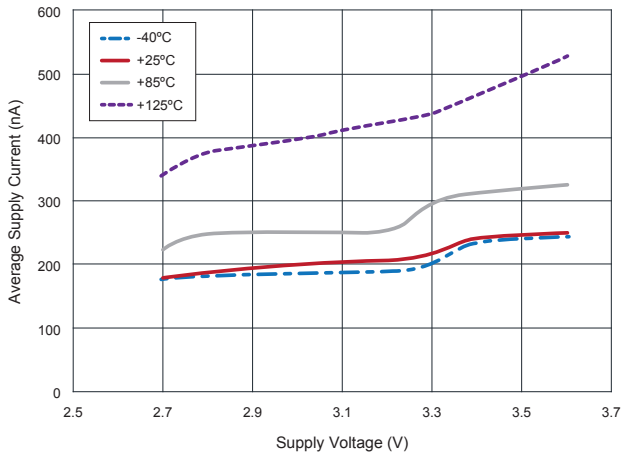
Notes:

1. Unless otherwise specified, V_{DD} = 2.7 V to 3.6 V, T_A = -40°C to +125°C. Typical values are V_{DD} = 3.0 V and T_A = +25°C.
2. Conditions: t = 10 seconds
3. Conditions: $B_{HYST} = B_{OP} - B_{RP}$

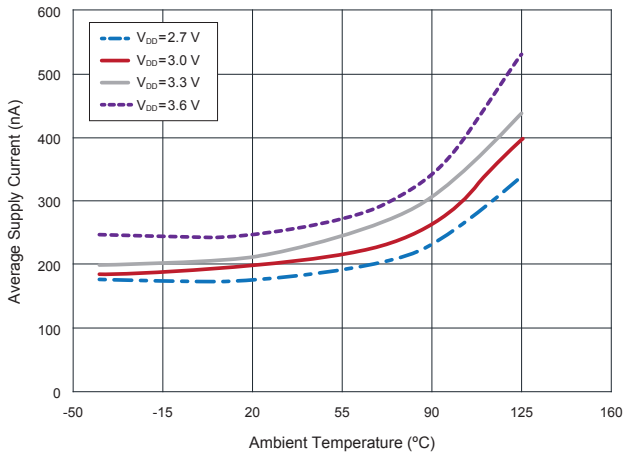
6 Graphs - Typical Electrical Characteristics for RR121-1B13-311 and RR121-1B13-312

V_{DD} = 3.0 V and T_A = +25 °C, C_{DD} = 1.0 µF (unless otherwise specified)

6.1 Average Supply Current vs. Supply Voltage vs. Temperature



6.2 Average Supply Current vs. Temperature vs. Supply Voltage

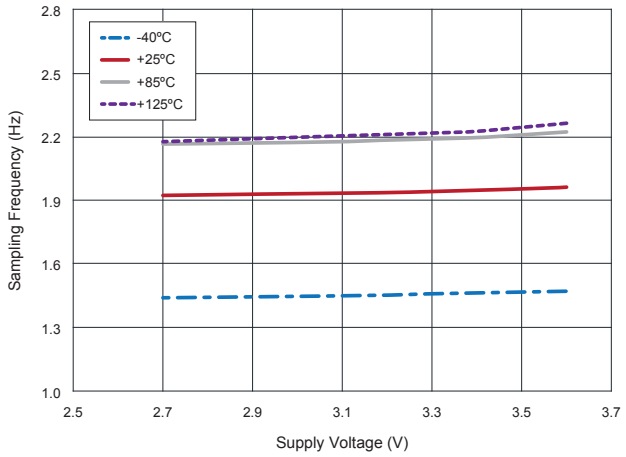


(401) 943-2686 | redrock@cotorelay.com | www.cotorelay.com

6 Graphs - Typical Electrical Characteristics for RR121-1B13-311 and RR121-1B13-312

V_{DD} = 3.0 V and T_A = +25 °C, C_{DD} = 1.0 µF (unless otherwise specified)

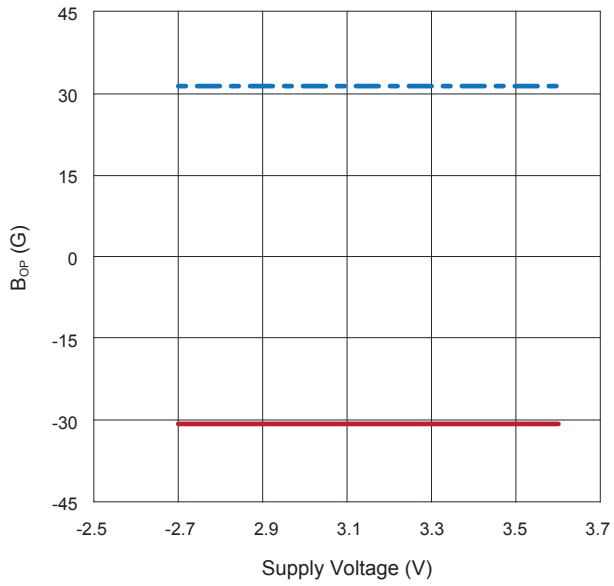
6.3 Sampling Frequency vs. Supply Voltage vs. Temperature



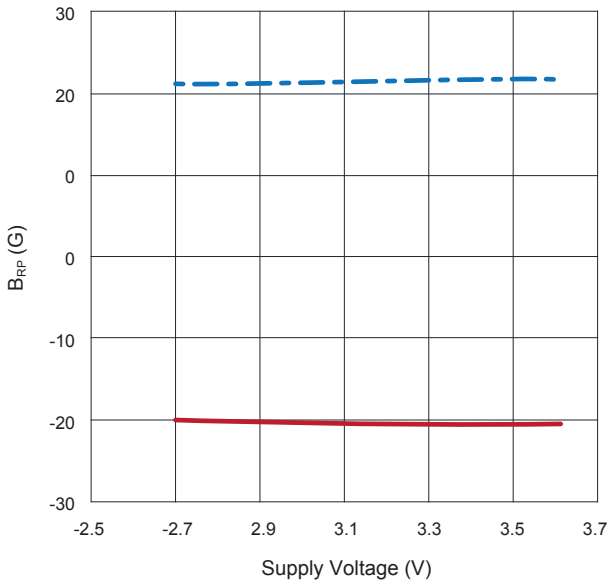
7 Graphs - Typical Magnetic Characteristics for RR121-1B13-311 and RR121-1B13-312

V_{DD} = 3.0 V and T_A = +25 °C, C_{DD} = 1.0 µF (unless otherwise specified)

7.1 B_{OPN} (Blue) and B_{OPS} (Red) vs. Supply Voltage at +25°C



7.2 B_{RPN} (Blue) and B_{RPS} (Red) vs. Supply Voltage at +25°C

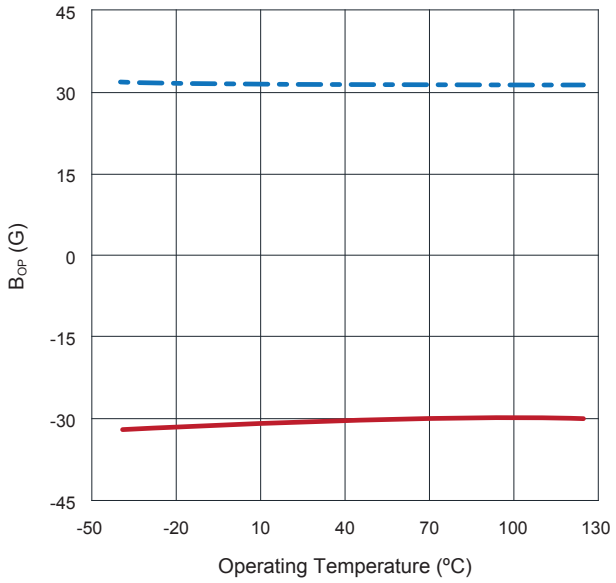


Copyright 2018. All rights reserved.

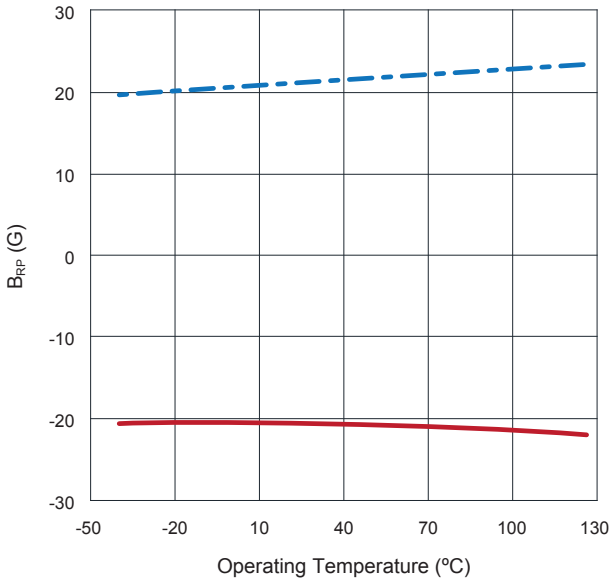
7 Graphs - Typical Magnetic Characteristics for RR121-1B13-311 and RR121-1B13-312

V_{DD} = 3.0 V and T_A = +25 °C, C_{DD} = 1.0 µF (unless otherwise specified)

7.3 B_{OPN} (Blue) and B_{OPS} (Red) vs. Operating Temperature at V_{DD}=3.0 V



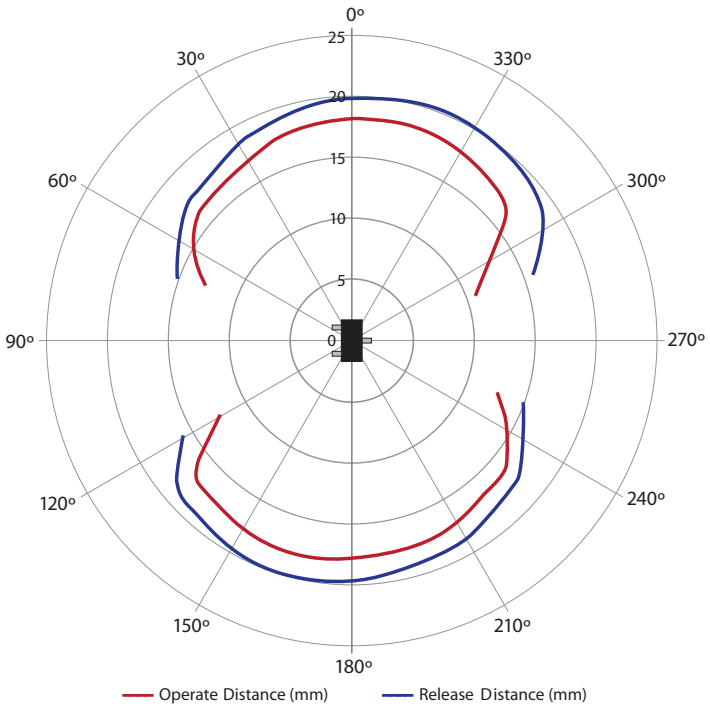
7.4 B_{RPN} (Blue) and B_{RPS} (Red) vs. Operating Temperature at V_{DD}=3.0 V



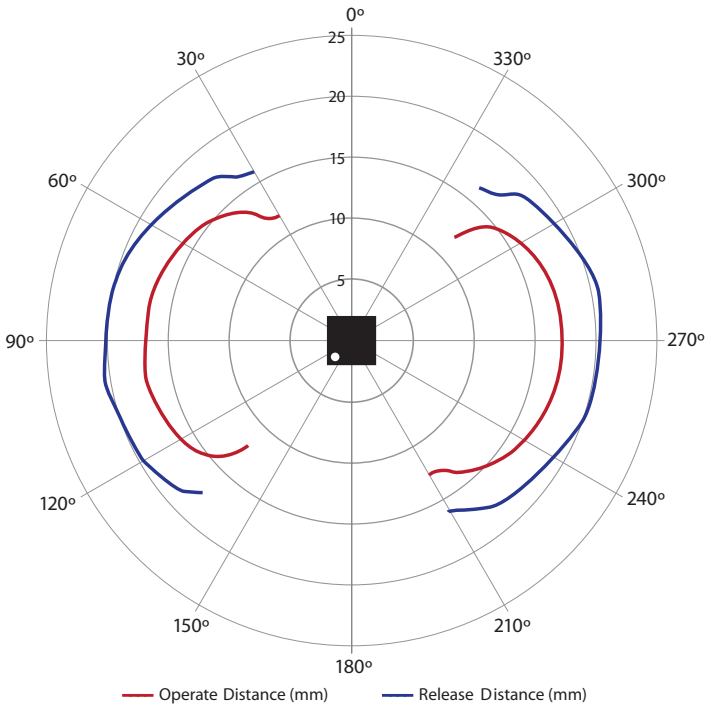
8 Operate & Release Lobe Plots

Operate and release distances show are relative. The actual operate and release distances will depend on the type of magnet that is used.

8.1 RR121-1B13-311



8.2 RR121-1B13-312



(401) 943-2686 | redrock@cotorelay.com | www.cotorelay.com

9 Operating Characteristics for RR121-1A23-311[1]

Parameters	Units	Min	Typ	Max
Average Supply Current ($I_{DD\ (AVG)}$)[2]	nA		230	700
Switching Frequency (f_{SW})	Hz	7	10	13
Active Mode Time (t_{ACT})	µs		1.4	
Idle Mode Time (t_{IDLE})	ms		100	
Operate Point (B_{OPN})	G	8	9	12
Operate Point (B_{OPS})	G	-12	-9	-8
Release Point (B_{RPN})	G	3	5	7
Release Point (B_{RPS})	G	-7	-5	-3
Hysteresis (B_{HYST})[3]	G	3	4	

Notes:

1. Unless otherwise specified, V_{DD} = 2.7 V to 3.6 V, T_A = -40°C to +125°C. Typical values are V_{DD} = 3.0 V and T_A = +25°C.
2. Conditions: t = 10 seconds
3. Conditions: $B_{HYST} = B_{OP} - B_{RP}$

10 Operating Characteristics for RR121-1F23-311[1]

Parameters	Units	Min	Typ	Max
Average Supply Current ($I_{DD\ (AVG)}$)[2]	nA		230	700
Switching Frequency (f_{SW})	Hz	7	10	13
Active Mode Time (t_{ACT})	µs		1.4	
Idle Mode Time (t_{IDLE})	ms	77	100	143
Operate Point (B_{OPN})	G		70	
Operate Point (B_{OPS})	G		-70	
Release Point (B_{RPN})	G		50	
Release Point (B_{RPS})	G		-50	
Hysteresis (B_{HYST})[3]	G		20	

Notes:

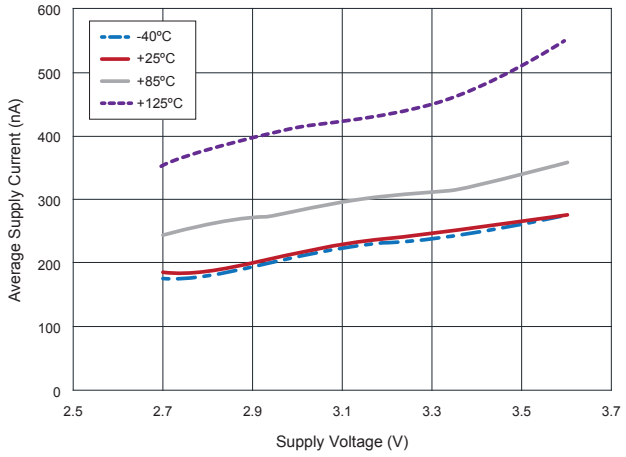
1. Unless otherwise specified, V_{DD} = 2.7 V to 3.6 V, T_A = -40°C to +125°C. Typical values are V_{DD} = 3.0 V and T_A = +25°C.
2. Conditions: t = 10 seconds
3. Conditions: $B_{HYST} = B_{OP} - B_{RP}$

Copyright 2018. All rights reserved.

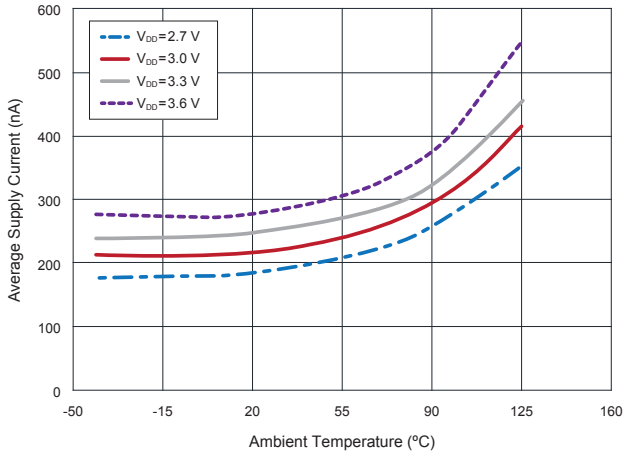
11 Graphs - Typical Characteristics for RR121-1A23-311 and RR121-1F23-311

V_{DD} = 3.0 V and T_A = +25 °C, C_{DD} = 1.0 µF (unless otherwise specified)

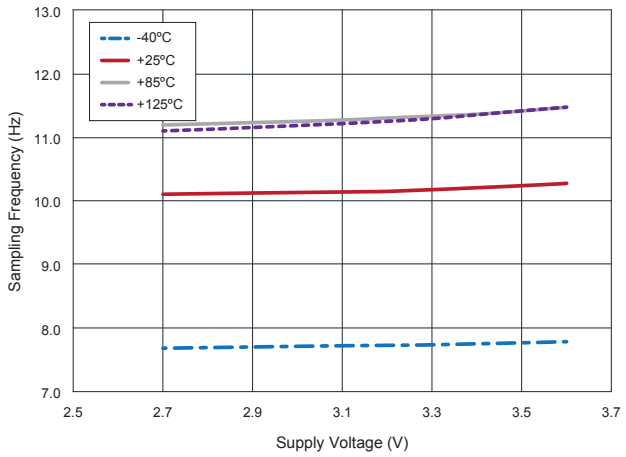
11.1 Average Supply Current vs. Supply Voltage vs. Temperature



11.2 Average Supply Current vs. Temperature vs. Supply Voltage



11.3 Sampling Frequency vs. Supply Voltage vs. Temperature

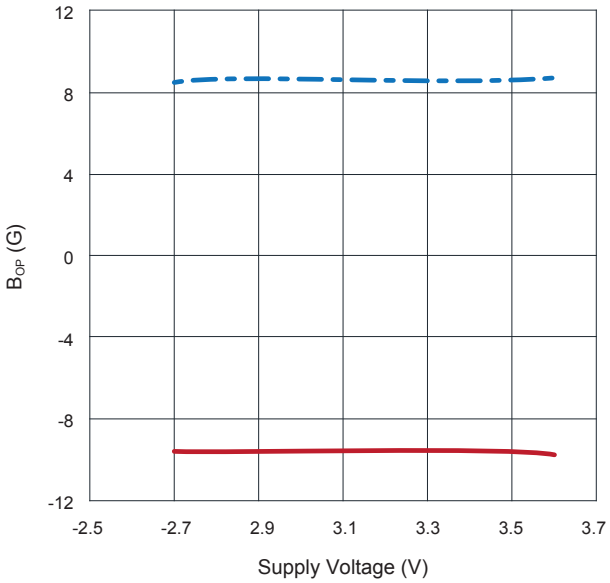


(401) 943-2686 | redrock@cotorelay.com | www.cotorelay.com

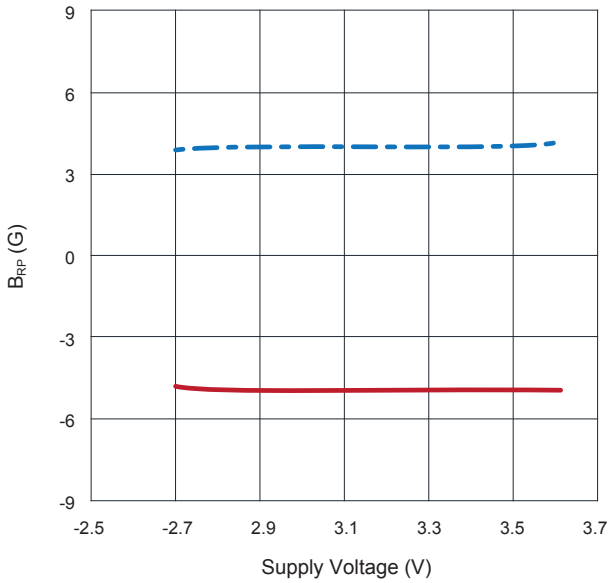
12 Graphs - Typical Magnetic Characteristics for RR121-1A23-311

V_{DD} = 3.0 V and T_A = +25 °C, C_{DD} = 1.0 µF (unless otherwise specified)

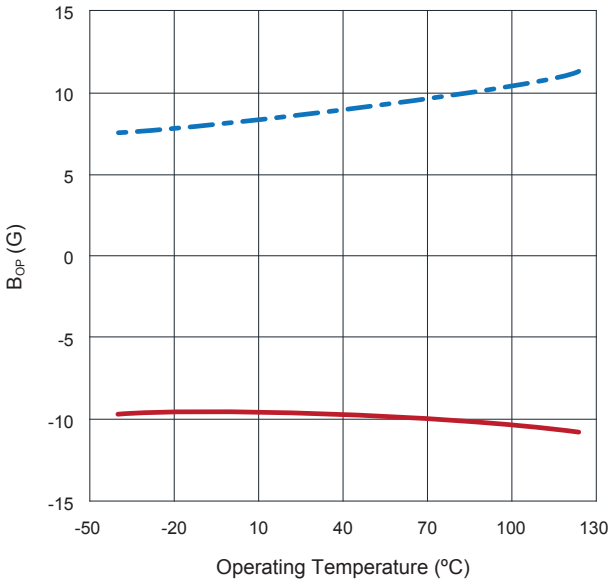
12.1 B_{OPN} (Blue) and B_{OPS} (Red) vs. Supply Voltage at +25°C



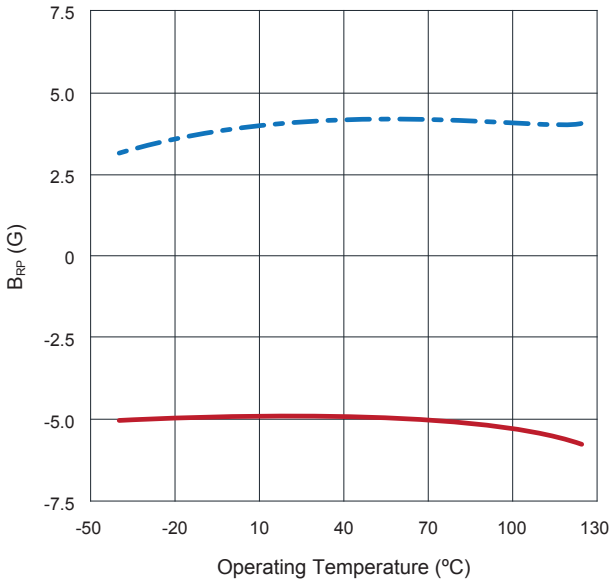
12.2 B_{RPN} (Blue) and B_{RPS} (Red) vs. Supply Voltage at +25°C



12.3 B_{OPN} (Blue) and B_{OPS} (Red) vs. Operating Temperature at V_{DD}=3.0 V



12.4 B_{RPN} (Blue) and B_{RPS} (Red) vs. Operating Temperature at V_{DD}=3.0 V

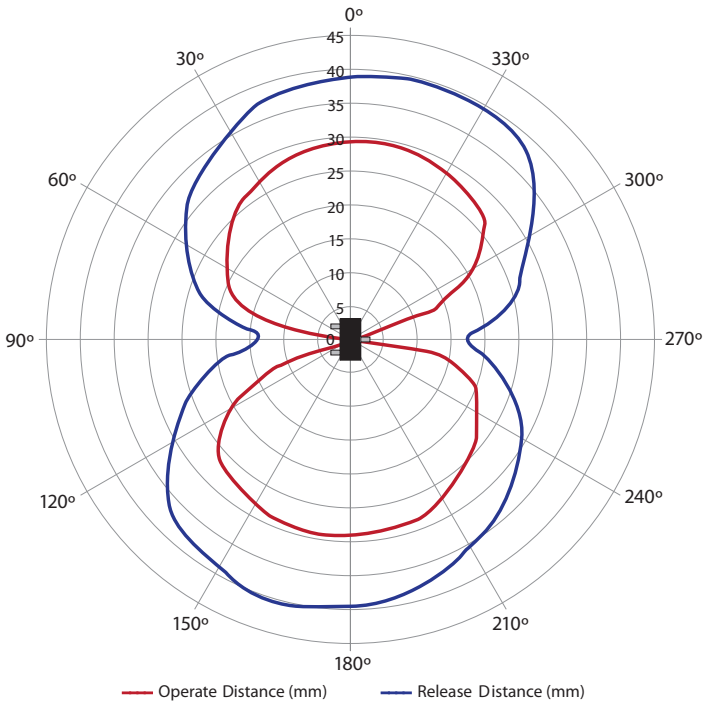


Copyright 2018. All rights reserved.

13 Operate & Release Lobe Plot

Operate and release distances show are relative. The actual operate and release distances will depend on the type of magnet that is used.

13.1 RR121-1A23-311



14 Operating Characteristics for RR121-1B53-311[1]

Parameters	Units	Min	Typ	Max
Average Supply Current ($I_{DD\ (AVG)}$)[2]	µA		1.4	2.5
Switching Frequency (f_{SW})	Hz	165	250	300
Active Mode Time (t_{ACT})	µs		1.4	
Idle Mode Time (t_{IDLE})	ms		4.0	
Operate Point (B_{OPN})	G	27	30	38
Operate Point (B_{OPS})	G	-38	-30	-27
Release Point (B_{RPN})	G	18	20	27
Release Point (B_{RPS})	G	-27	-20	-18
Hysteresis (B_{HYST})[3]	G	5	10	

Notes:

1. Unless otherwise specified, V_{DD} = 2.7 V to 3.6 V, T_A = -40°C to +125°C. Typical values are V_{DD} = 3.0 V and T_A = +25°C.
2. Conditions: t = 10 seconds
3. Conditions: $B_{HYST} = B_{OP} - B_{RP}$

(401) 943-2686 | redrock@cotorelay.com | www.cotorelay.com

15 Operating Characteristics for RR121-1A53-311[1]

Parameters	Units	Min	Typ	Max
Average Supply Current ($I_{DD\ (AVG)}$)[2]	µA		1.2	2.5
Switching Frequency (f_{SW})	Hz	165	250	300
Active Mode Time (t_{ACT})	µs		1.4	
Idle Mode Time (t_{IDLE})	ms	3.3	4.0	6.0
Operate Point (B_{OPN})	G	8	9	12
Operate Point (B_{OPS})	G	-12	-9	-8
Release Point (B_{RPN})	G	3	5	7
Release Point (B_{RPS})	G	-7	-5	-3
Hysteresis (B_{HYST})[3]	G	3	4	

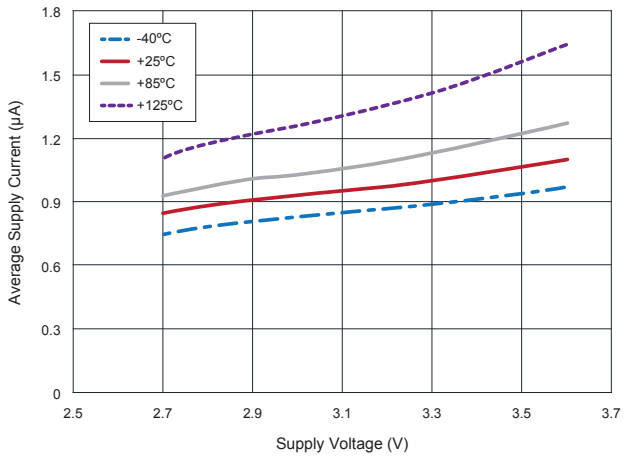
Notes:

1. Unless otherwise specified, V_{DD} = 2.7 V to 3.6 V, T_A = -40°C to +125°C. Typical values are V_{DD} = 3.0 V and T_A = +25°C.
2. Conditions: t = 10 seconds
3. Conditions: $B_{HYST} = B_{OP} - B_{RP}$

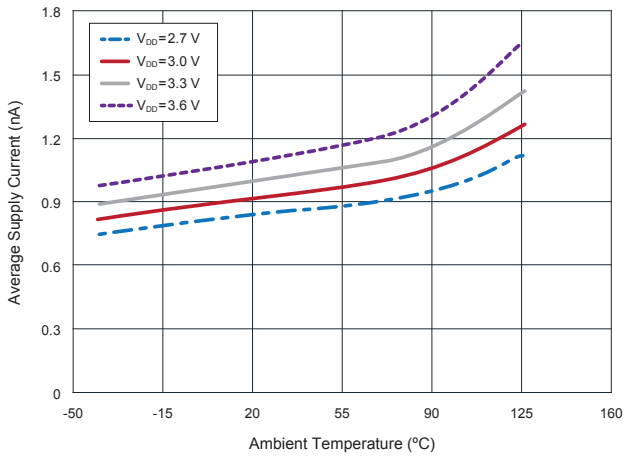
16 Graphs - Typical Characteristics for RR121-1B53-311 and RR121-1A53-311

V_{DD} = 3.0 V and T_A = +25 °C, C_{DD} = 1.0 µF (unless otherwise specified)

16.1 Average Supply Current vs. Supply Voltage vs. Temperature



16.2 Average Supply Current vs. Temperature vs. Supply Voltage

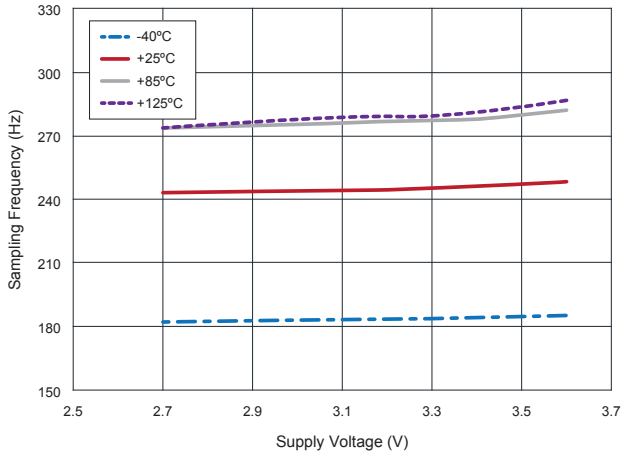


Copyright 2018. All rights reserved.

16 Typical Characteristics for RR121-1B53-311 and RR121-1A53-311

V_{DD} = 3.0 V and T_A = +25 °C, C_{DD} = 1.0 µF (unless otherwise specified)

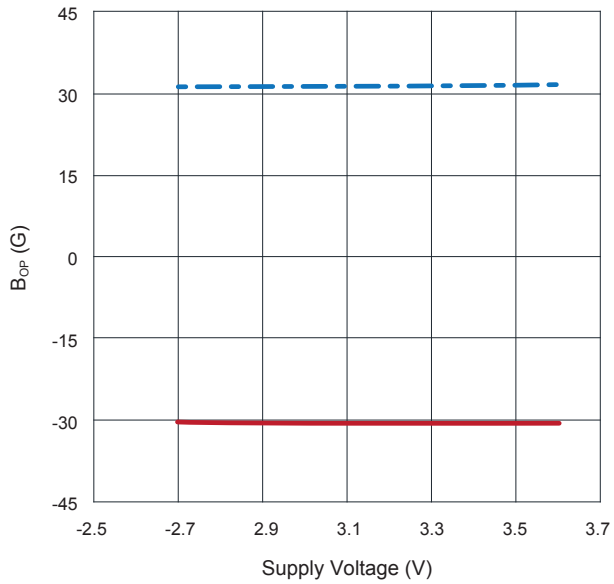
16.3 Sampling Frequency vs. Supply Voltage vs. Temperature



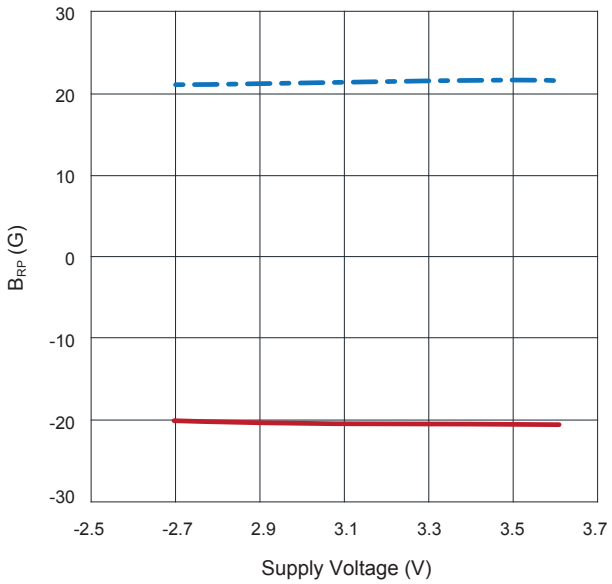
17 Graphs - Typical Magnetic Characteristics for RR121-1B53-311

V_{DD} = 3.0 V and T_A = +25 °C, C_{DD} = 1.0 µF (unless otherwise specified)

17.1 B_{OPN} (Blue) and B_{OPS} (Red) vs. Supply Voltage at +25°C



17.2 B_{RPN} (Blue) and B_{RPS} (Red) vs. Supply Voltage at +25°C

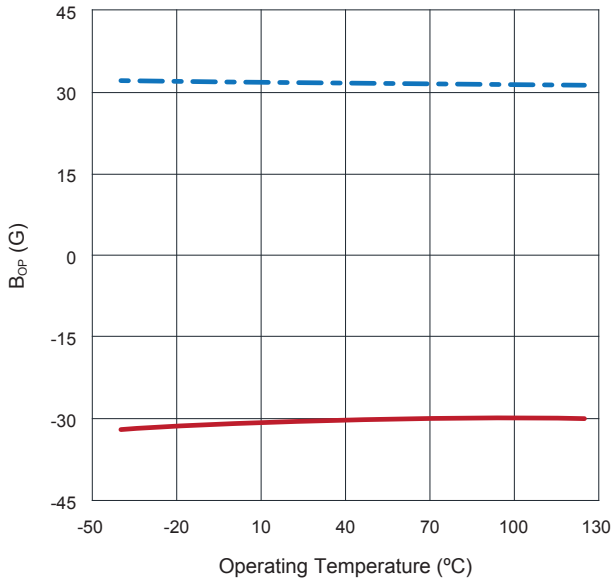


(401) 943-2686 | redrock@cotorelay.com | www.cotorelay.com

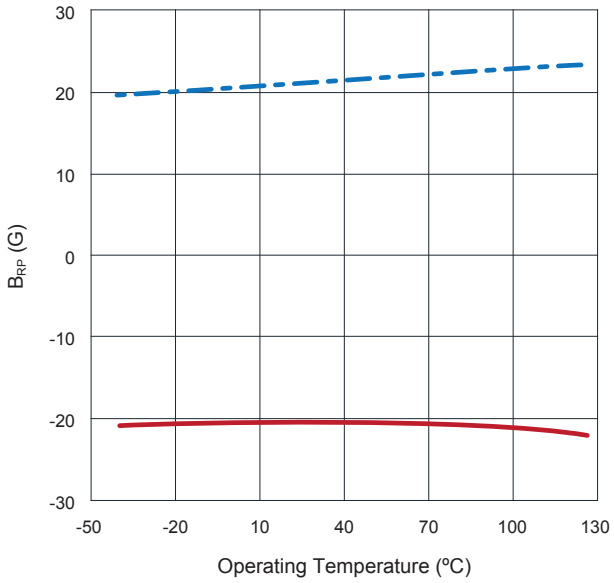
17 Graphs - Typical Magnetic Characteristics for RR121-1B53-311

V_{DD} = 3.0 V and T_A = +25 °C, C_{DD} = 1.0 µF (unless otherwise specified)

17.3 B_{OPN} (Blue) and B_{OPS} (Red) vs. Operating Temperature at V_{DD}=3.0 V



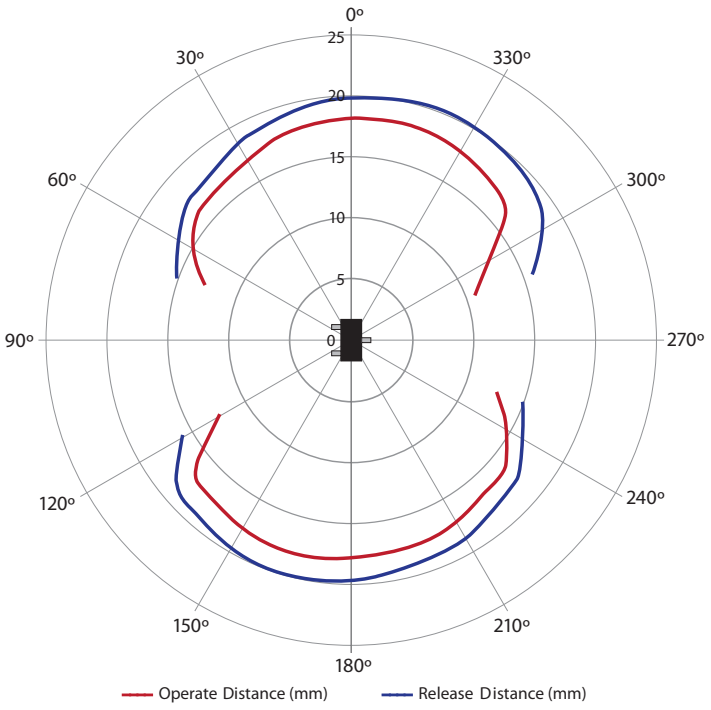
17.4 B_{RPN} (Blue) and B_{RPS} (Red) vs. Operating Temperature at V_{DD}=3.0 V



18 Operate & Release Lobe Plot

Operate and release distances show are relative. The actual operate and release distances will depend on the type of magnet that is used.

18.1 RR121-1B53-311



Copyright 2018. All rights reserved.

19 Operating Characteristics for RR121-3C63-311[1]

Parameters	Units	Min	Typ	Max
Average Supply Current ($I_{DD\ (AVG)}$)[2]	µA		1.7	3.3
Switching Frequency (f_{SW})	Hz	325	500	600
Active Mode Time (t_{ACT})	µs		1.4	
Idle Mode Time (t_{IDLE})	ms		2.0	
Operate Point (B_{OPS})	G	8	10	14
Release Point (B_{RPN})	G	14	-10	-8

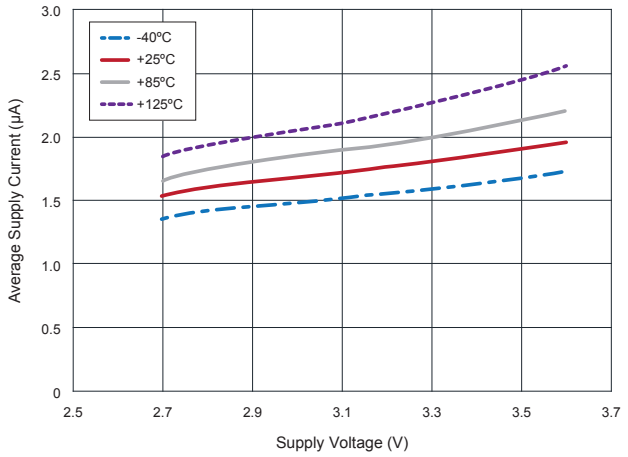
Notes:

1. Unless otherwise specified, V_{DD} = 2.7 V to 3.6 V, T_A = -40ºC to +125ºC. Typical values are V_{DD} = 3.0 V and T_A = +25ºC.
2. Conditions: t=10

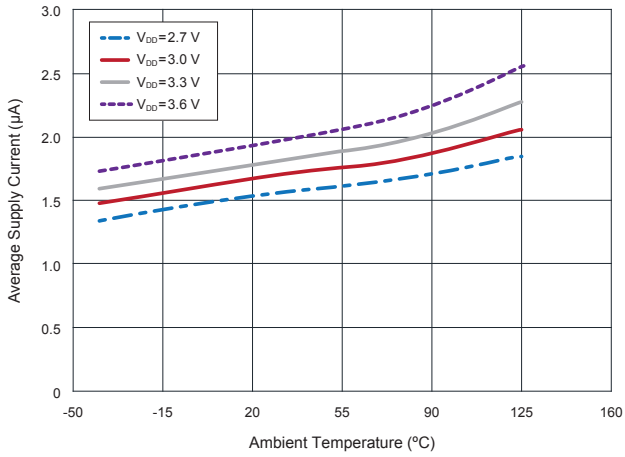
20 Graphs - Typical Characteristics for RR121-3C63-311

V_{DD} = 3.0 V and T_A = +25 °C, C_{DD} = 1.0 µF (unless otherwise specified)

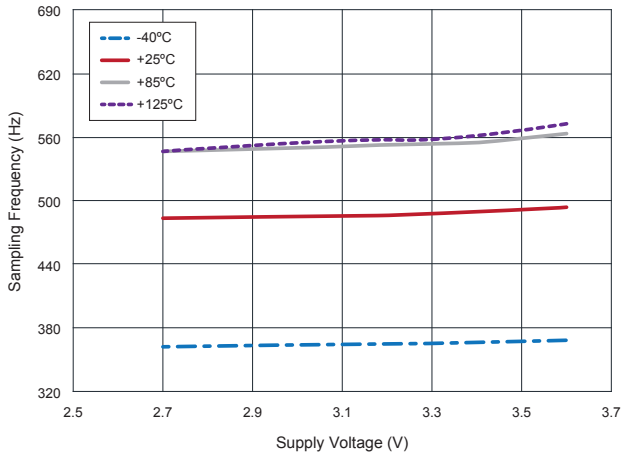
20.1 Average Supply Current vs. Supply Voltage vs. Temperature



20.2 Average Supply Current vs. Temperature vs. Supply Voltage



20.3 Sampling Frequency vs. Supply Voltage vs. Temperature



(401) 943-2686 | redrock@cotorelay.com | www.cotorelay.com

21 Operating Characteristics for RR121-1E73-311[1]

Parameters	Units	Min	Typ	Max
Average Supply Current ($I_{DD\ (AVG)}$)[2]	µA		8	13
Switching Frequency (f_{SW})	Hz	1.63	2.50	3.25
Active Mode Time (t_{ACT})	µs		1.4	
Idle Mode Time (t_{IDLE})	ms	308	400	614
Operate Point (B_{OPN})	G	13	15	18
Operate Point (B_{OPS})	G	-18	-15	-13
Release Point (B_{RPN})	G	8	10	13
Release Point (B_{RPS})	G	-13	-10	-8
Hysteresis (B_{HYST})[3]	G	3	5	

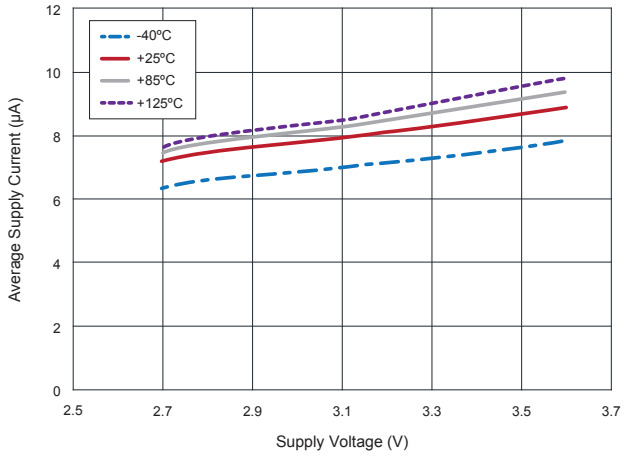
Notes:

1. Unless otherwise specified, V_{DD} = 2.7 V to 3.6 V, T_A = -40°C to +125°C. Typical values are V_{DD} = 3.0 V and T_A = +25°C.
2. Conditions: t = 10 seconds
3. Conditions: $B_{HYST} = B_{OP} - B_{RP}$

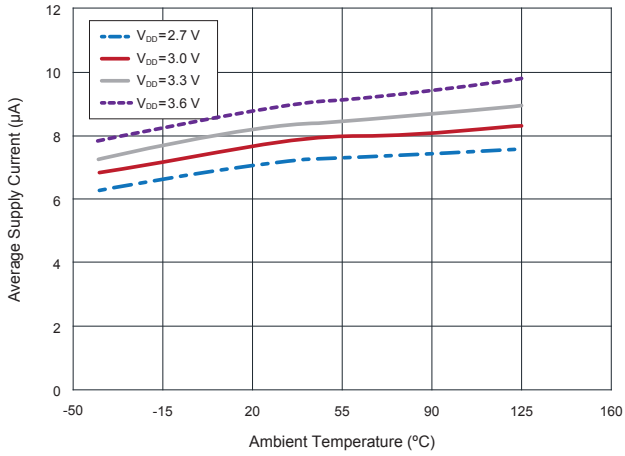
22 Graphs - Typical Characteristics for RR121-1E73-311

V_{DD} = 3.0 V and T_A = +25 °C, C_{DD} = 1.0 µF (unless otherwise specified)

22.1 Average Supply Current vs. Supply Voltage vs. Temperature



22.2 Average Supply Current vs. Temperature vs. Supply Voltage

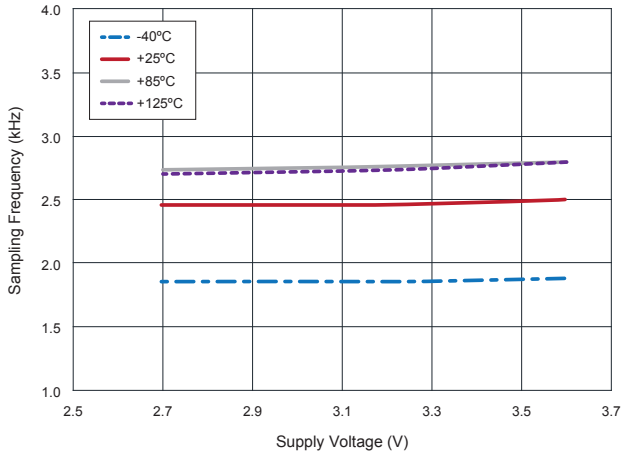


Copyright 2018. All rights reserved.

22 Typical Characteristics for RR121-1E73-311

V_{DD} = 3.0 V and T_A = +25 °C, C_{DD} = 1.0 µF (unless otherwise specified)

22.3 Sampling Frequency vs. Supply Voltage vs. Temperature



23 Operating Characteristics for RR121-1B93-312[1]

Parameters	Units	Min	Typ	Max
Average Supply Current ($I_{DD\ (AVG)}$)[2]	µA		36	
Switching Frequency (f_{SW})	kHz	7	10	13
Active Mode Time (t_{ACT})	µs		1.4	
Idle Mode Time (t_{IDLE})	ms	77	100	143
Operate Point (B_{OPN})	G	27	30	38
Operate Point (B_{OPS})	G	-38	-30	-27
Release Point (B_{RPN})	G	18	20	27
Release Point (B_{RPS})	G	-27	-20	-18
Hysteresis (B_{HYST})[3]	G	5	10	

Notes:

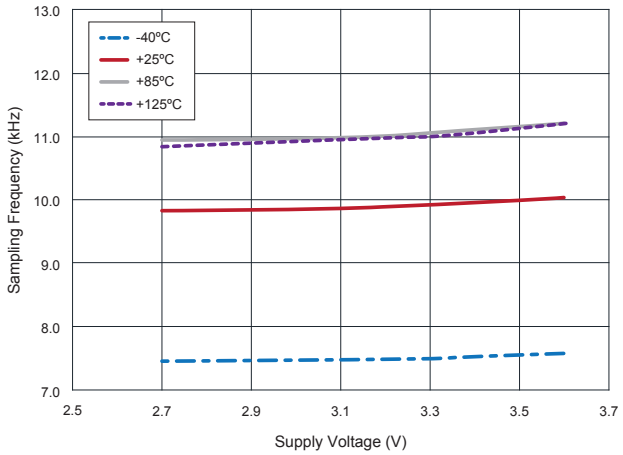
1. Unless otherwise specified, V_{DD} = 2.7 V to 3.6 V, T_A = -40°C to +125°C. Typical values are V_{DD} = 3.0 V and T_A = +25°C.
2. Conditions: t = 10 seconds
3. Conditions: $B_{HYST} = B_{OP} - B_{RP}$

(401) 943-2686 | redrock@cotorelay.com | www.cotorelay.com

24 Graphs - Typical Characteristics for RR121-1B93-312

V_{DD} = 3.0 V and T_A = +25 °C, C_{DD} = 1.0 µF (unless otherwise specified)

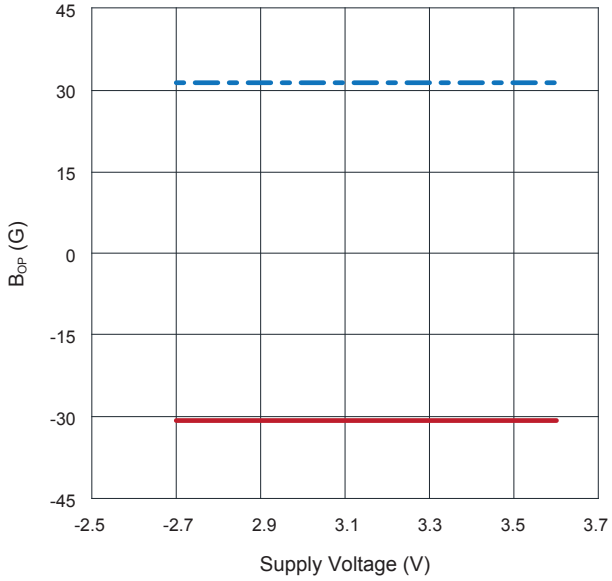
24.1 Sampling Frequency vs. Supply Voltage vs. Temperature



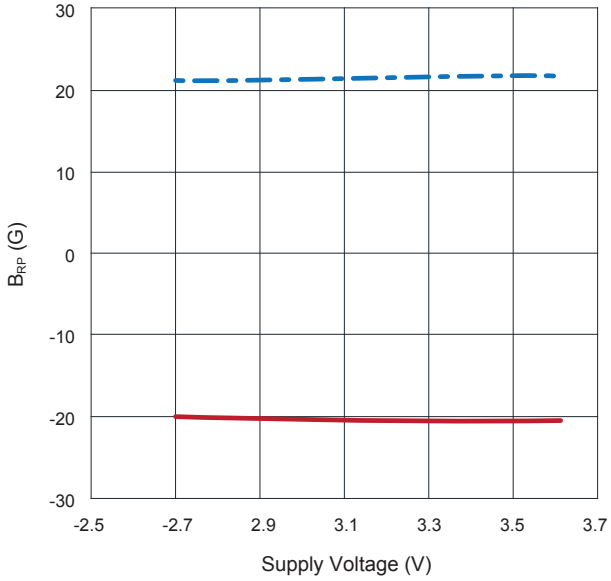
25 Graphs - Typical Magnetic Characteristics for RR121-1B93-312

V_{DD} = 3.0 V and T_A = +25 °C, C_{DD} = 1.0 µF (unless otherwise specified)

25.1 B_{OPN} (Blue) and B_{OPS} (Red) vs. Supply Voltage at +25°C



25.2 B_{RPN} (Blue) and B_{RPS} (Red) vs. Supply Voltage at +25°C

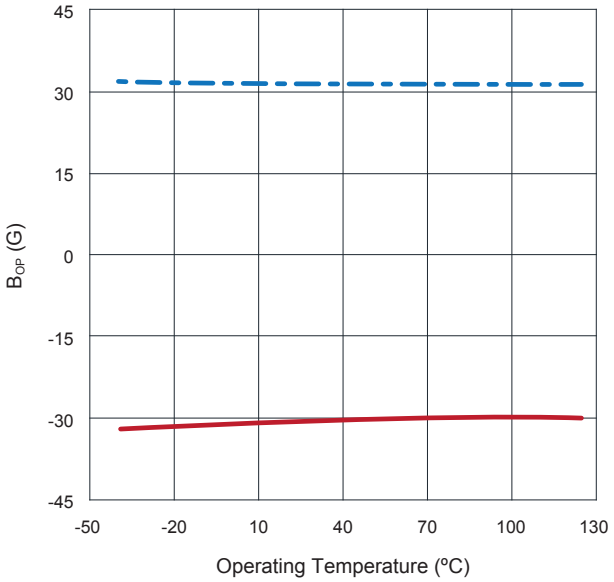


Copyright 2018. All rights reserved.

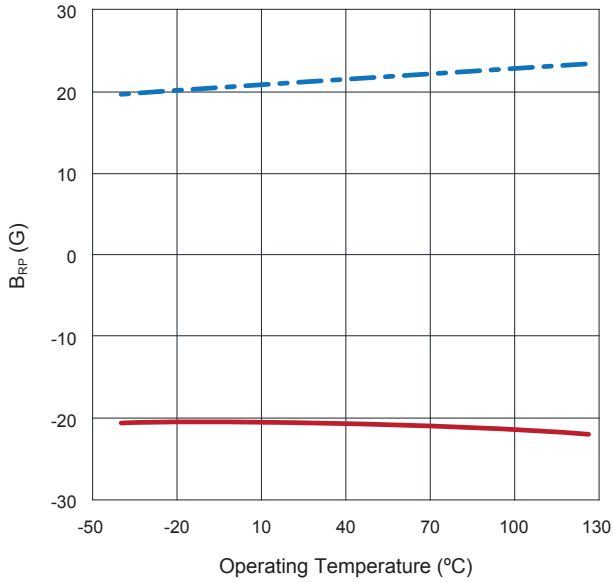
25 Typical Magnetic Characteristics for RR121-1B93-312

V_{DD} = 3.0 V and T_A = +25 °C, C_{DD} = 1.0 µF (unless otherwise specified)

25.3 B_{OPN} (Blue) and B_{OPS} (Red) vs. Operating Temperature at V_{DD}=3.0 V

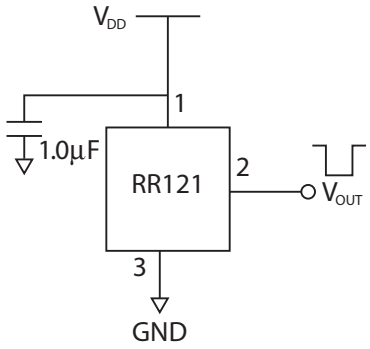


25.4 B_{RPN} (Blue) and B_{RPS} (Red) vs. Operating Temperature at V_{DD}=3.0 V

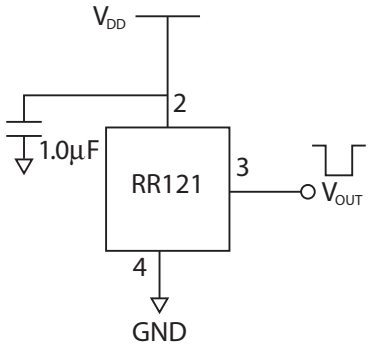


26 Application Information

26.1 Application Circuit (SOT-23)



26.2 Application Circuit (LGA-4)



RR121 Push-Pull Output Application Circuit

The output voltage on the RR121 is active low, meaning that while a sufficiently strong magnetic field is present, the output voltage is low. The output voltage can be connected to a digital I/O pin on a microcontroller. A decoupling capacitor between the supply voltage and ground is required with placement close to the magnetic sensor. A typical capacitor value of 1.0 µF will suffice.

(401) 943-2686 | redrock@cotorelay.com | www.cotorelay.com

27 Part Selection and Ordering Information

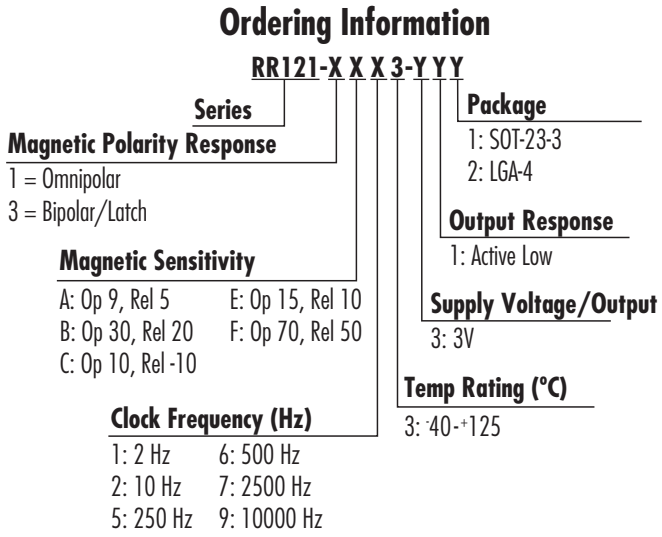
27.1 Part Selection Table

Part Number	Magnetic Polarity Response	Operate Sensitivity (G)	Release Sensitivity (G)	Frequency (Hz)	I_{avg} (µA)	Temp. Rating (°C)	Supply Voltage (V_{dd})	Output Response	Package
RR121-1B13-312	Omnipolar	30	20	2	0.20	-40 - +125	2.7 - 3.6	Active Low	LGA-4
RR121-1B13-311	Omnipolar	30	20	2	0.20	-40 - +125	2.7 - 3.6	Active Low	SOT-23-3
RR121-1B53-311	Omnipolar	30	20	250	1.44	-40 - +125	2.7 - 3.6	Active Low	SOT-23-3
RR121-1A23-311	Omnipolar	9	5	10	0.24	-40 - +125	2.7 - 3.6	Active Low	SOT-23-3
RR121-3C63-311	Bipolar	10	-10	500	1.70	-40 - +125	2.7 - 3.6	Active Low	SOT-23-3
RR121-1F23-311	Omnipolar	70	50	10	0.24	-40 - +125	2.7 - 3.6	Active Low	SOT-23-3
RR121-1A53-311	Omnipolar	9	5	250	1.44	-40 - +125	2.7 - 3.6	Active Low	SOT-23-3
RR121-1E73-311	Omnipolar	15	10	2500	8	-40 - +125	2.7 - 3.6	Active Low	SOT-23-3
RR121-1B93-312	Omnipolar	30	20	10000	36	-40 - +125	2.7 - 3.6	Active Low	LGA-4

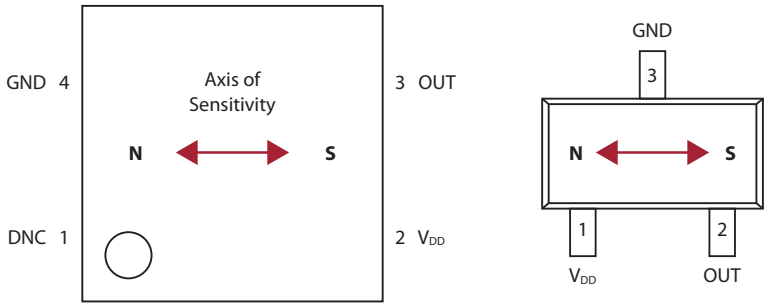
Note:

1. Custom options available for Sensitivity, Frequency, Temperature Rating, Supply Voltage, Output Response & more. Please contact redrock@cotorelay.com for more details.

27.2 Device Nomenclature



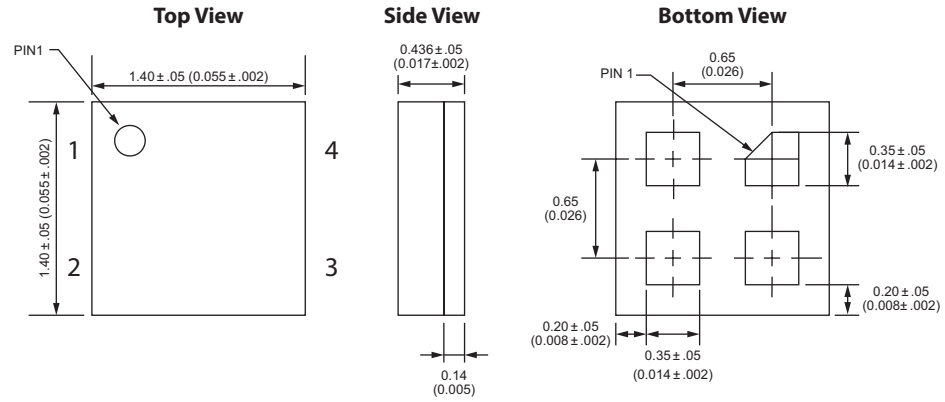
28 Axis of Sensitivity



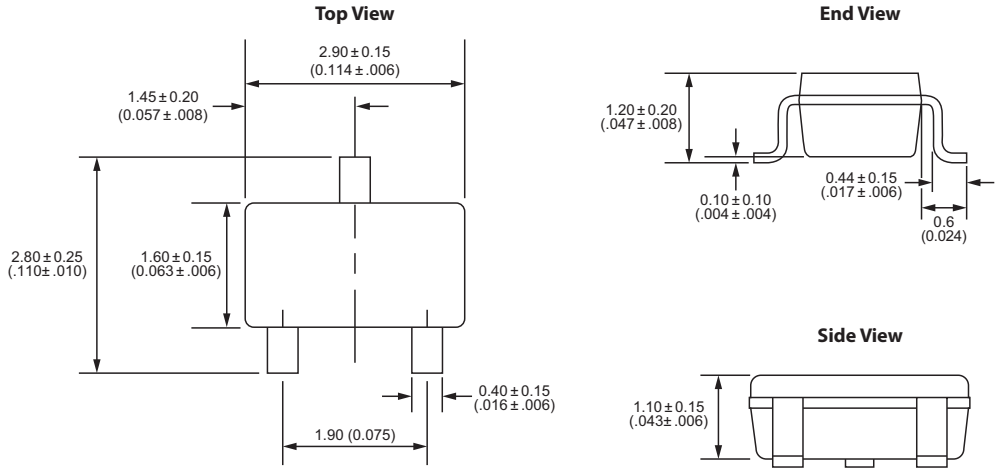
Copyright 2018. All rights reserved.

29 Dimensions *Millimeters (Inches)*

29.1 LGA-4 Package

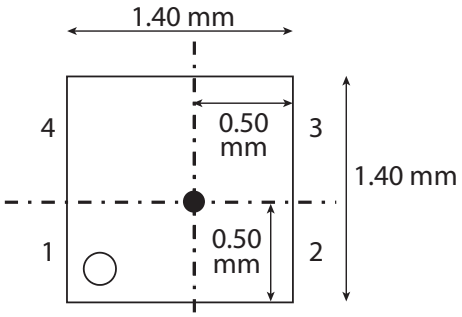


29.2 SOT-23-3 Package

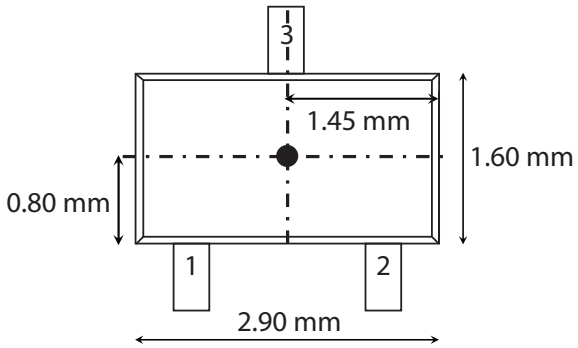


30 TMR Sensor Location

30.1 LGA Package



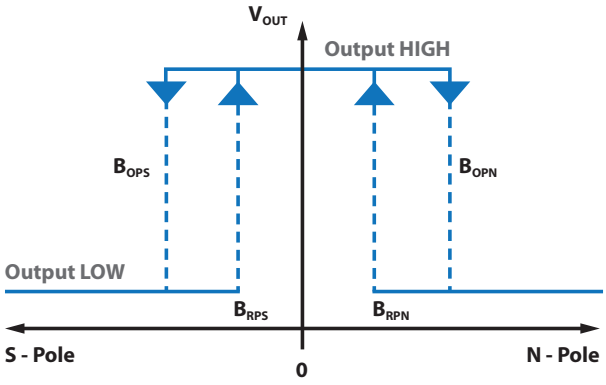
30.2 SOT Package



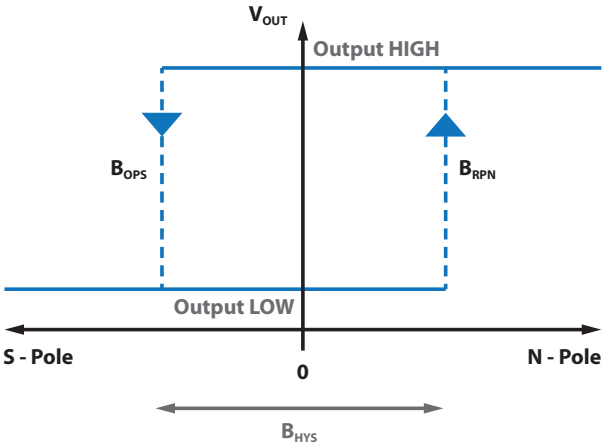
(401) 943-2686 | redrock@cotorelay.com | www.cotorelay.com

31 Magnetic Flux Response Diagrams

31.1 Omnipolar Magnetic Flux Response
(Active Low Option)



31.2 Bipolar Magnetic Flux Response
(Active Low Option)



32 Output Behavior vs. Magnetic Field Diagrams

32.1 Output Behavior vs. Magnetic Field - Omnipolar

Characteristics	Conditions	Output
South Pole	$B < B_{OPS}$ $0 > B > B_{RPS}$	Low (ON) High (OFF)
North Pole	$B > B_{OPN}$ $0 < B < B_{RPN}$	Low (ON) High (OFF)

32.2 Output Behavior vs. Magnetic Field - Bipolar

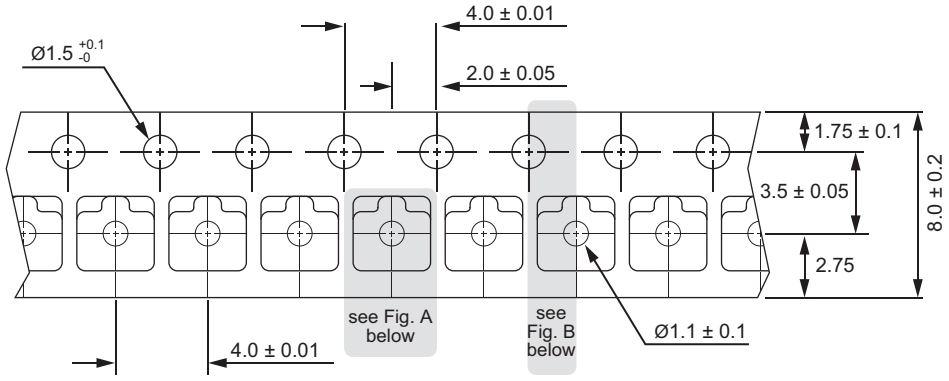
Characteristics	Conditions	Output
South Pole	$B < B_{OPS}$	Low (ON)
North Pole	$B > B_{RPN}$	High (OFF)

Copyright 2018. All rights reserved.

33TMR Sensor & Switch Packaging

33.1 SOT-23-3 Tape & Reel Packaging

Standard packaging is Tape & Reel containing 3,000 pieces. MSL Rating is 1.



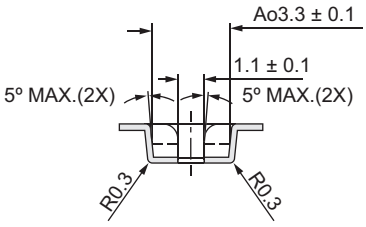


Fig. A

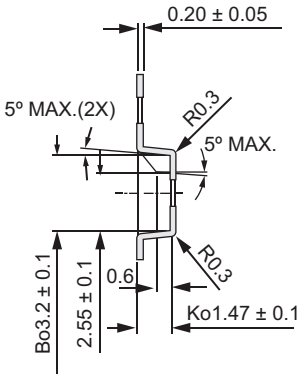
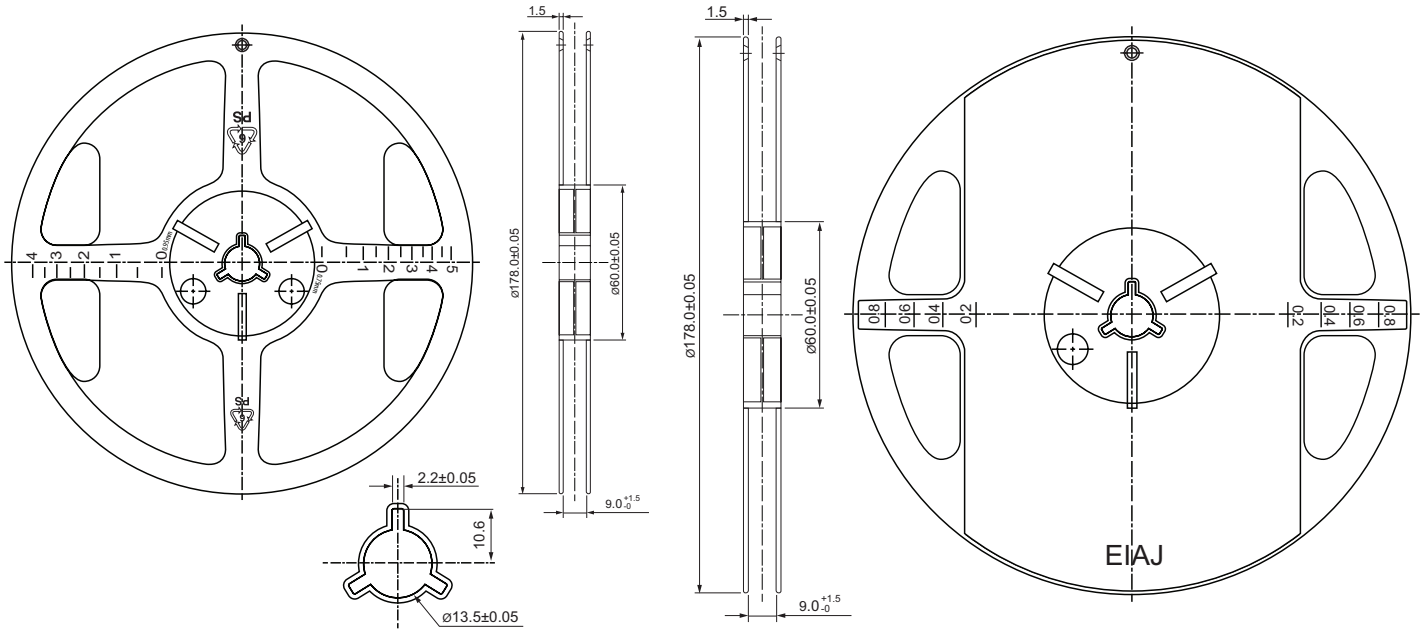


Fig. B

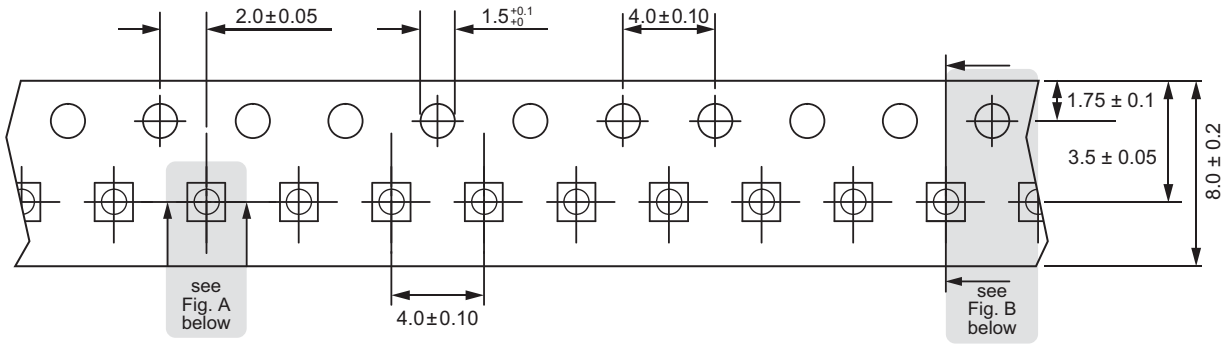


(401) 943-2686 | redrock@cotorelay.com | www.cotorelay.com

33 TMR Sensor & Switch Packaging

33.2 LGA-4 Tape & Reel Packaging

Standard packaging is Tape & Reel containing 3,000 pieces. MSL Rating is 3.



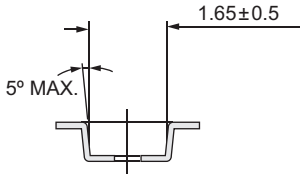


Fig. A

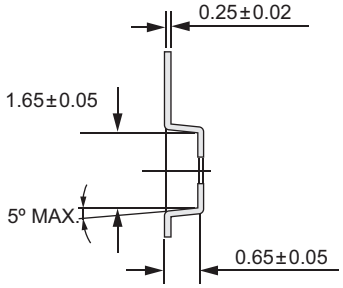
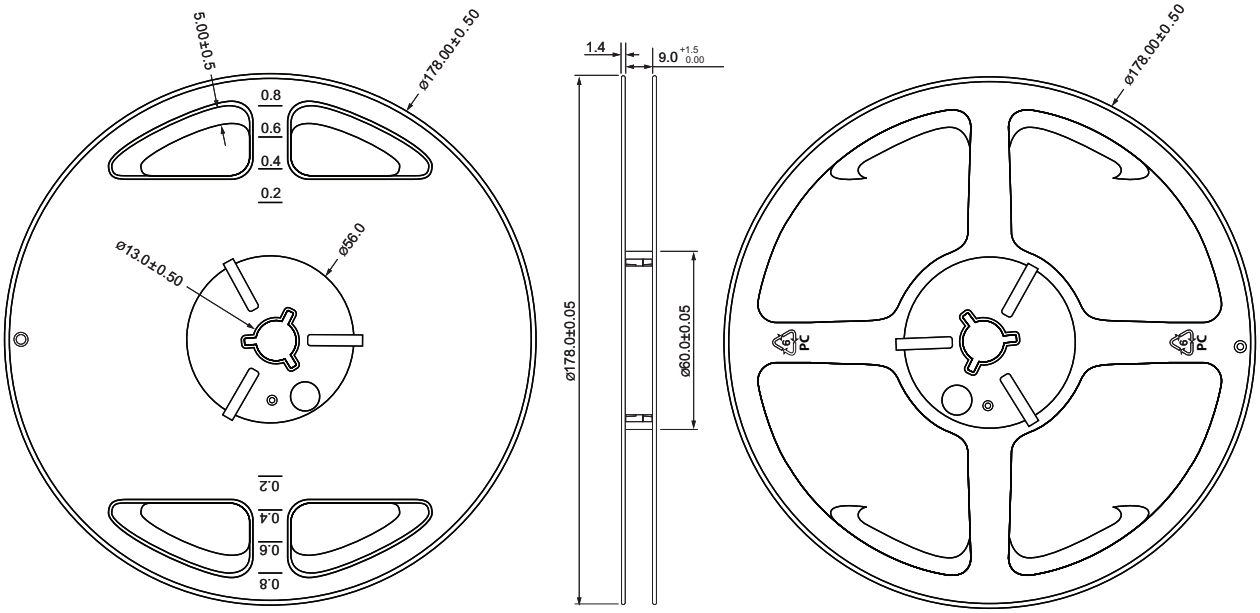


Fig. B

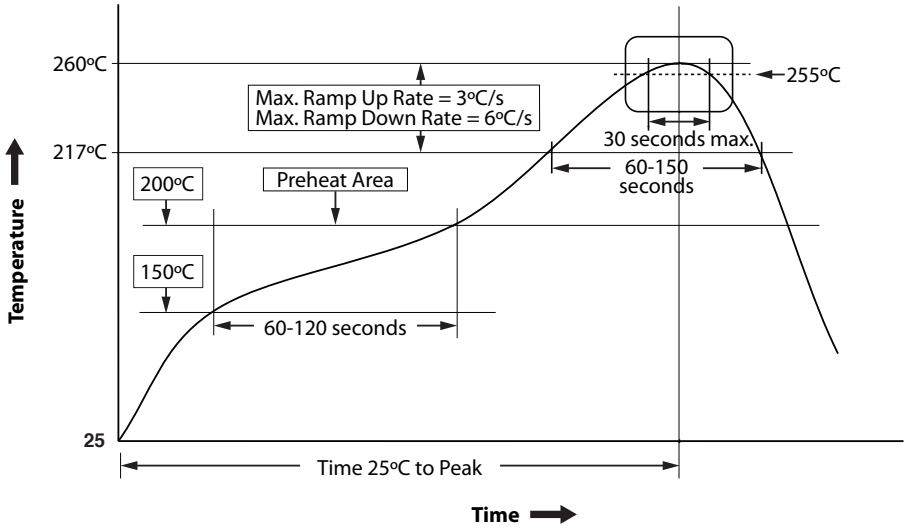


Copyright 2018. All rights reserved.

34 Suggested Pb-Free Reflow Profile

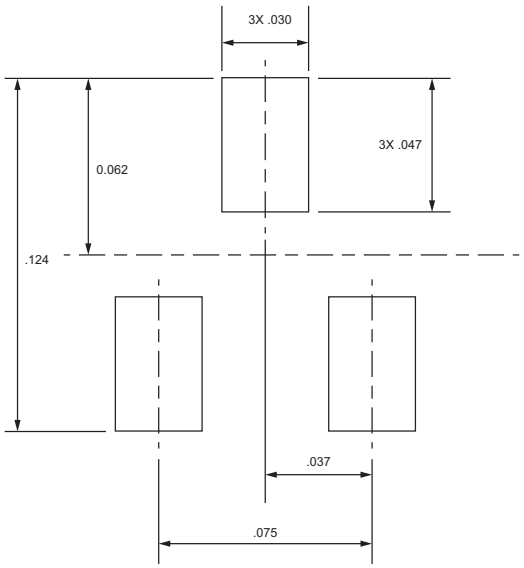
Notes:

1. Fully compatible with standard no-lead solder profile, 260 °C for 30 seconds max (3 cycles max).
2. Profile shown as example. Users are advised to develop their own board-level profile.
3. Suggested Pb-free reflow profile derived from IPC/JEDEC J-STD-020E.
4. Temperature tolerance: +0 °C, as measured at any point on the package or leads
5. MSL rating of 1 (SOT-23-3 only) compatible with J-STD-020 or equivalent.
6. MSL rating of 3 (LGA-4 only) compatible with J-STD-020 or equivalent.
7. All temperatures refer to the center of the package, measured on the package body surface that is facing up during assembly reflow (e.g., live-bug). If parts are reflowed in other than the normal live bug assembly reflow orientation (i.e., dead-bug), Tp shall be within ± 2 °C of the live bug Tp and still meet the Tc requirements, otherwise, the profile shall be adjusted to achieve the latter. To accurately measure actual peak package body temperatures, refer to JEP140 for recommended thermocouple use.
8. Reflow profiles in this document are for classification/preconditioning and are not meant to specify board assembly profiles. Actual board assembly profiles should be developed based on specific process needs and board designs and should not exceed the parameters in this table.

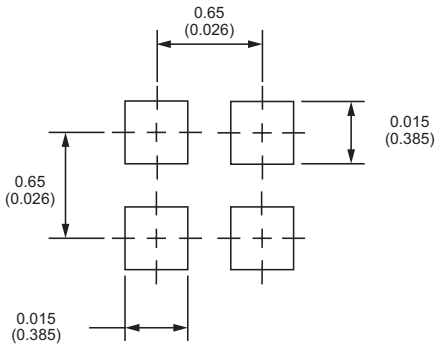


35 Suggested Solder Pad Layout

35.1 SOT -23-3 Solder Pad Layout



35.2 LGA-4 Solder Pad Layout



(401) 943-2686 | redrock@cotorelay.com | www.cotorelay.com

LifeElectronics
Живое партнерство

ООО «ЛайфЭлектроникс» **“LifeElectronics” LLC**

ИНН 7805602321 КПП 780501001 Р/С 40702810122510004610 ФАКБ "АБСОЛЮТ БАНК" (ЗАО) в г.Санкт-Петербурге К/С 30101810900000000703 БИК 044030703

Компания «Life Electronics» занимается поставками электронных компонентов импортного и отечественного производства от производителей и со складов крупных дистрибьюторов Европы, Америки и Азии.

С конца 2013 года компания активно расширяет линейку поставок компонентов по направлению коаксиальный кабель, кварцевые генераторы и конденсаторы (керамические, пленочные, электролитические), за счёт заключения дистрибьюторских договоров

Мы предлагаем:

- *Конкурентоспособные цены и скидки постоянным клиентам.*
- *Специальные условия для постоянных клиентов.*
- *Подбор аналогов.*
- *Поставку компонентов в любых объемах, удовлетворяющих вашим потребностям.*

- *Приемлемые сроки поставки, возможна ускоренная поставка.*
- *Доставку товара в любую точку России и стран СНГ.*
- *Комплексную поставку.*
- *Работу по проектам и поставку образцов.*
- *Формирование склада под заказчика.*

- *Сертификаты соответствия на поставляемую продукцию (по желанию клиента).*
- *Тестирование поставляемой продукции.*
- *Поставку компонентов, требующих военную и космическую приемку.*
- *Входной контроль качества.*
- *Наличие сертификата ISO.*

В составе нашей компании организован Конструкторский отдел, призванный помогать разработчикам, и инженерам.

Конструкторский отдел помогает осуществить:

- *Регистрацию проекта у производителя компонентов.*
- *Техническую поддержку проекта.*
- *Защиту от снятия компонента с производства.*
- *Оценку стоимости проекта по компонентам.*
- *Изготовление тестовой платы монтаж и пусконаладочные работы.*

Тел: +7 (812) 336 43 04 (многоканальный)
Email: org@lifeelectronics.ru

www.lifeelectronics.ru