POWER-GATE™ Solid-State Devices
Bi-Directional DC Relay
Specification Sheet
Generation 3.0

Made in U.S.A

ABSOLUTE MAXIMUM RATINGS[1]

All devices, all voltages referenced to relay ground, unless otherwise specified.

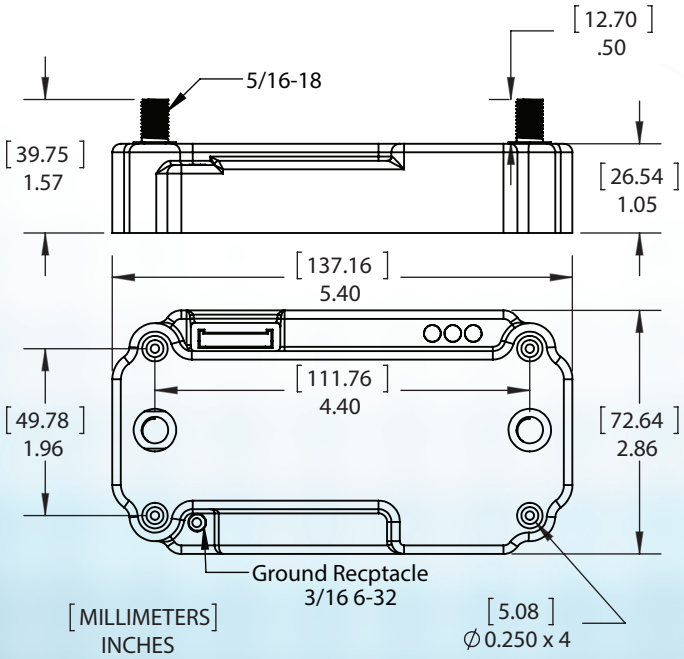
Symbol	Parameter	Min.	Max.	Units
V_S	Source Voltage, RBxxxA	-0.3[2]	21[3]	Vdc
	Source Voltage, RBxxxB	-0.3[2]	39[4]	
V_L	Load Voltage, RBxxxA	-0.3[5]	21	Vdc
	Load Voltage, RBxxxB	-0.3[5]	39	
T_A	Ambient Temperature	-45	110	°C
V_{TRIG}	Trigger Voltage[6]	-39[7]	39[4]	Vdc
$V_{OVERRIDE}$	Override Trigger Voltage	-39[7]	39[4]	Vdc

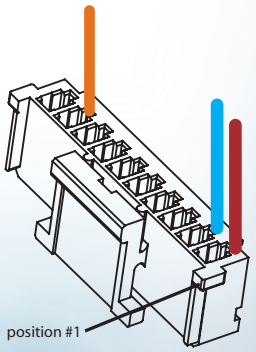
RECOMMENDED OPERATING CONDITIONS

All devices, all voltages referenced to relay ground, unless otherwise specified.

Symbol	Parameter	Min.	Max.	Units
V_S	Source Voltage, RBxxxA	6.5	18	Vdc
	Source Voltage, RBxxxB	6.5	36	
V_L	Load Voltage, RBxxxA	6.5	18	Vdc
	Load Voltage, RBxxxB	6.5	36	
T_A	Ambient Temperature	-40	105	°C
V_{TRIG}	Trigger Voltage[6]	0	36	Vdc
$V_{OVERRIDE}$	Override Trigger Voltage	0	36	Vdc

MECHANICAL SPECIFICATIONS





1	OVERRIDE – *	Brown
2	OVERRIDE + *	Blue
3	Empty	
4	Empty	
5	Empty	
6	Empty	
7	Empty	
8	TRIGGER – **	Black
9	TRIGGER +	Orange
10	Empty	

ADDITIONAL INFORMATION

Autonomous devices fitted with a master on/off switch for safe installation and master reset purposes.

Electronic assembly inserted into ABS encapsulation shell then backfilled with black, flame retardent, filled epoxy specifically developed for the potting of electronic modules.

Four integrated mounting holes pre-drilled to .250".

Mouting posts, 5/16-18 x .50" with provided brass washers and nylon insert 5/16-18 nuts. Mounting torque not to exceed 75 inch-pounds or 8.5 newton-meters.

Harness 500492 Rev E
Connector housing Molex 355071000
Terminals Molex 50212-8000
Control harness, one meter, 24AWG wires

*** Override trigger is non-isolated. OVERRIDE - is internally connected to relay ground. Override enabled only when under-voltage or over-voltage are enabled.**

**** Only required for isolated trigger**

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Specifications subject to change without notice.

ELECTRICAL SPECIFICATIONS

All devices, T_A = 25 ± 3 °C, 6.5 V ≤ V_S (RBxxxA) ≤ 18 V, 6.5 V ≤ V_S (RBxxxB) ≤ 36 V, all LEDs enabled, non-isolated trigger, all voltages referenced to relay ground, unless otherwise specified.

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
$I_{L,MAX}$	Maximum Continuous Load Current	-	-	50	A	RB050x, -40 °C ≤ T_A ≤ 105 °C
		-	-	100		RB100x, -40 °C ≤ T_A ≤ 105 °C
		-	-	150		RB150x, -40 °C ≤ T_A ≤ 105 °C
$I_{L,SURGE}$	Maximum Surge Load Current	-	-	5 x $I_{L,MAX}$	A	
V_{DROP}	Input-to-Output Voltage Drop	-	35	40	mV	RB050x, Load Current = $I_{L,MAX}$
		-	40	45		RB100x, Load Current = $I_{L,MAX}$
		-	45	55		RB150x, Load Current = $I_{L,MAX}$
		-	-	110		Load Current = $I_{L,MAX}$, T_A = +105 °C
$I_{S,OFF}$	Operating Current, Relay Triggered Open	20.0	20.5	21.0	mA	V_S = 6.5 V, V_{TRIG} = 0 V[6]
		10.7	11.2	11.7		V_S = 6.5 V, V_{TRIG} = 0 V[6], All LEDs disabled
		19.7	20.2	20.6		V_S = 12 V, V_{TRIG} = 0 V[6]
		10.3	10.9	11.5		V_S = 12 V, V_{TRIG} = 0 V[6], All LEDs disabled
		21.1	21.4	21.7		V_S = 18 V, V_{TRIG} = 0 V[6]
		11.3	12.2	13.0		V_S = 18 V, V_{TRIG} = 0 V[6], All LEDs disabled
		21.1	21.4	21.8		RBxxxB, V_S = 24 V, V_{TRIG} = 0 V[6]
		11.9	12.2	12.5		RBxxxB, V_S = 24 V, V_{TRIG} = 0 V[6], All LEDs disabled
		21.2	21.5	21.9		RBxxxB, V_S = 36 V, V_{TRIG} = 0 V[6]
		12.0	12.3	12.7		RBxxxB, V_S = 36 V, V_{TRIG} = 0 V[6], All LEDs disabled
$I_{S,ON}$	Operating Current, Relay Triggered Closed	33.0	35.0	37	mA	V_S = 6.5 V, V_{TRIG} = 10 V[6]
		15.7	16.6	17.4		V_S = 6.5 V, V_{TRIG} = 10 V[6], All LEDs disabled
		34.2	35.4	36.6		V_S = 12 V, V_{TRIG} = 10 V[6]
		16.1	17.0	18.0		V_S = 12 V, V_{TRIG} = 10 V[6], All LEDs disabled
		34.7	36.0	37.3		V_S = 18 V, V_{TRIG} = 10 V[6]
		16.7	17.7	18.7		V_S = 18 V, V_{TRIG} = 10 V[6], All LEDs disabled
		35.5	36.4	37.3		RBxxxB, V_S = 24 V, V_{TRIG} = 10 V[6]
		17.4	18.1	18.9		RBxxxB, V_S = 24 V, V_{TRIG} = 10 V[6], All LEDs disabled
		35.8	37.2	38.6		RBxxxB, V_S = 36 V, V_{TRIG} = 10 V[6]
		18.1	19.0	19.9		RBxxxB, V_S = 36 V, V_{TRIG} = 10 V[6], All LEDs disabled
$I_{S,LP}$	Low Power Sleep Mode Supply Current[8]	-	-	1.3	mA	RBxxxA
		-	-	1.5		RBxxxB
I_{LEAK}	Relay Off Leakage Current	-	193	220	µA	RBxxxA, V_S = 6.5 V, Load shorted to relay ground
		-	204	230		RBxxxA, V_S = 12 V, Load shorted to relay ground
		-	253	330		RBxxxA, V_S = 18 V, Load shorted to relay ground
		-	193	210		RBxxxB, Load shorted to relay ground
$I_{LEAK,LP}$	Relay Low Power Sleep Mode Leakage Current[8]	-	-	5		Load shorted to relay ground, relay in low power sleep mode
$V_{TRIG,ON}$	Trigger On Voltage	-	0.83	-	V	
		-	2.0	-		Isolated Trigger[6]
$V_{TRIG,OFF}$	Trigger Off Voltage	-	0.82	-		
		-	1.6	-		Isolated Trigger[6]
I_{TRIG}	Trigger Current	-	34	-	µA	V_{TRIG} = 3.3 V[6]
		-	172	-		V_{TRIG} = 12 V[6]
		-	413	-		V_{TRIG} = 24 V[6]
		-	654	-		V_{TRIG} = 36 V[6]
		-	2.1	-	mA	Isolated Trigger, V_{TRIG} = 3.3 V[6]
		-	2.9	-		Isolated Trigger, V_{TRIG} = 12 V[6]
		-	4.1	-		Isolated Trigger, V_{TRIG} = 24 V[6]
		-	5.3	-		Isolated Trigger, V_{TRIG} = 36 V[6]

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ELECTRICAL SPECIFICATIONS (continued)

All devices, T_A = 25 ± 3 °C, 6.5 V ≤ V_S (RBxxxA) ≤ 18 V, 6.5 V ≤ V_S (RBxxxB) ≤ 36 V, all LEDs enabled, non-isolated trigger, all voltages referenced to relay ground, unless otherwise specified.

$V_{OVERRIDE}$	Override Trigger Open Circuit Voltage	-	5[9]	-	V	
f_{TRIG}	Trigger Frequency	-	-	2	Hz	
$I_{OVERRIDE}$	Override Trigger Leakage Current	-	50	-	µA	OVERRIDE+ and OVERRIDE-[10] shorted
I_{OI1}	Over-current Threshold - Level 1[11]	1.02 x $I_{L,MAX}$	1.2 x $I_{L,MAX}$	1.38 x $I_{L,MAX}$	A	
t_{OI1}	Over-current Threshold Shutdown Delay - Level 1	-	60	-	s	
I_{OI2}	Over-current Threshold - Level 2[11]	1.7 x $I_{L,MAX}$	2 x $I_{L,MAX}$	2.3 x $I_{L,MAX}$	A	
t_{OI2}	Over-current Threshold Shutdown Delay - Level 2	-	5	-	s	
I_{SC}	Short-circuit Threshold [11]	3.4 x $I_{L,MAX}$	4 x $I_{L,MAX}$	4.6 x $I_{L,MAX}$	A	
t_{SC}	Short-circuit Threshold Shutdown Delay	-	7	-	ms	
T_{OFF}	Internal Overtemp Shutdown	-	135	-	°C	
T_{RESET}	Internal Overtemp Reset	-	130	-	°C	
$\Delta V_{UV/OV}$	Under- and Over-voltage Threshold Tolerance[12]	-1	±0.5	1	%	
Δt	Timing Tolerance[13]	-2	±1	2	%	

NOTES:

1. Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. Exposure to any absolute maximum rating condition for extended periods may affect device reliability and lifetime.
2. Larger negative voltages will blow internal fuse. If fuse blows, as long as V_S is not more negative than -21/-39 V, and V_L - V_S is less than 21/39 V, for RYxxxA/RYxxxB, respectively, no damage to device will occur. Call manufacturer to replace blown fuse.
3. Transient-protected to 40 V. Additional external protection may be required in some applications.
4. Transient-protected to 60 V. Additional external protection may be required in some applications.
5. Larger negative voltages will blow internal fuse. If fuse blows, as long as V_L is not more negative than -21/-39 V, and V_S - V_L is less than 21/39 V, for RYxxxA/RYxxxB, respectively, no damage to device will occur. Call manufacturer to replace blown fuse.
6. Non-Isolated trigger: V_{TRIG} equals difference between TRIGGER + and relay ground; Isolated trigger: V_{TRIG} equal difference between TRIGGER + and TRIGGER -.
7. Transient protected to -60 V. Additional external protection may be required in some applications.
8. Low power sleep mode non-standard. Call manufacturer for more information.
9. 100 kΩ (typical) between OVERRIDE+ and internal 5 V.
10. OVERRIDE- is internally connected to relay ground.
11. Over-current and short-circuit functionality active for current flow from source to load.
12. Under- and over-voltage shutdown features non-standard. Call manufacturer for more information.
13. Applies to over-current, short-circuit, circuit-break, under-voltage, and over-voltage shutdowns.

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TYPICAL PERFORMANCE

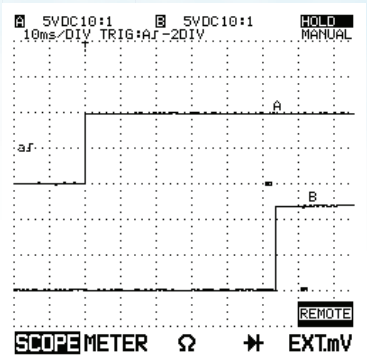


Figure 1: RBxxxA Turn-On Time
Top Trace: Trigger Voltage
Bottom Trace: Output Voltage

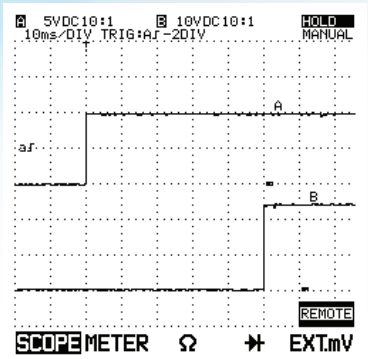


Figure 2: RBxxxB Turn-On Time
Top Trace: Trigger Voltage
Bottom Trace: Output Voltage

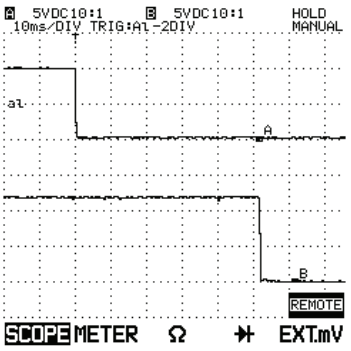


Figure 3: RBxxxA Turn-Off Time
Top Trace: Trigger Voltage
Bottom Trace: Output Voltage

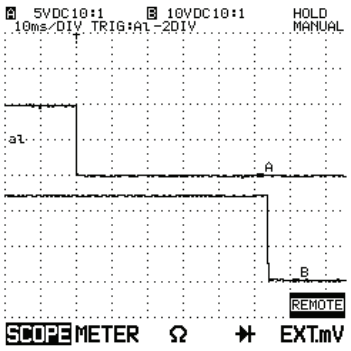


Figure 4: RBxxxB Turn-Off Time
Top Trace: Trigger Voltage
Bottom Trace: Output Voltage

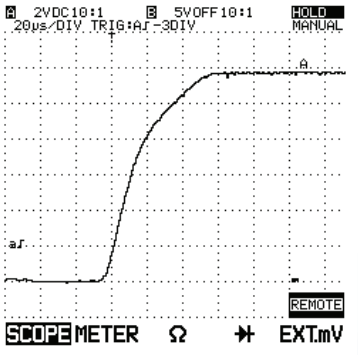


Figure 5: RBxxxA Output Rise Time

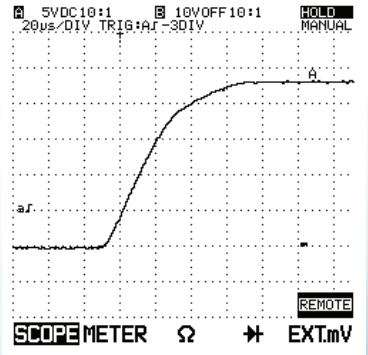


Figure 6: RBxxxB Output Rise Time

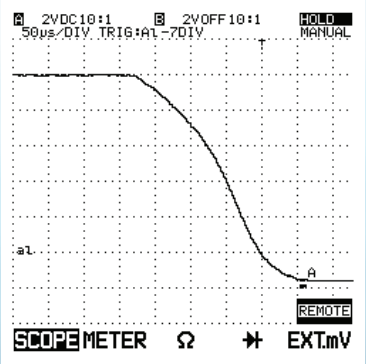


Figure 7: RBxxxA Output Fall Time

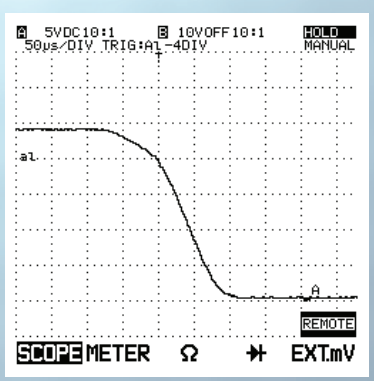


Figure 8: RBxxxB Output Fall Time

TYPICAL PERFORMANCE (continued)

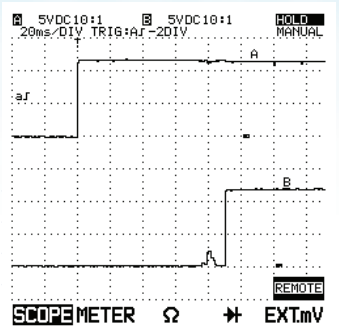


Figure 9: Start-up Output Turn-On Delay
Top Trace: Source Voltage
Bottom Trace: Output Voltage

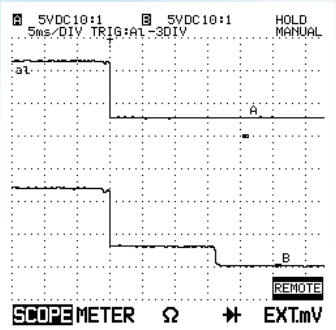


Figure 10: Source Voltage Drop to Output Off Delay
Top Trace: Source Voltage (12 V to 3 V)
Bottom Trace: Output Voltage

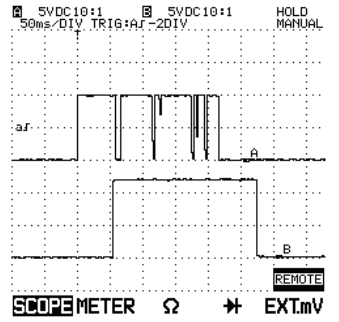


Figure 11: RBxxxA Trigger Noise Immunity
Top Trace: Trigger Voltage
Bottom Trace: Output Voltage

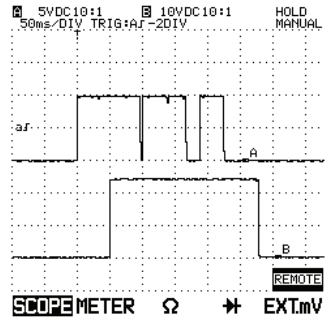


Figure 12: RBxxxB Trigger Noise Immunity
Top Trace: Trigger Voltage
Bottom Trace: Output Voltage

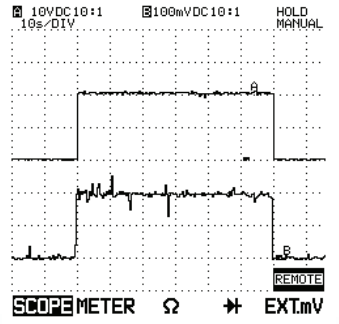


Figure 13: Overcurrent Level 1 Shutdown (RB150B shown)
Top Trace: Output Voltage
Bottom Trace: Output Current (100 A/div)

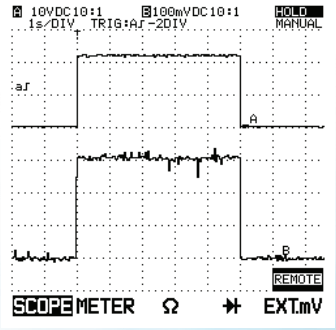


Figure 14: Overcurrent Level 2 Shutdown (RB150B shown)
Top Trace: Output Voltage
Bottom Trace: Output Current (100 A/div)

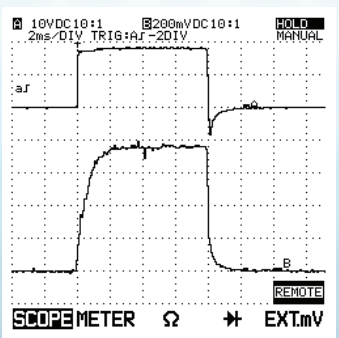


Figure 15: Short Circuit Shutdown (RB150B shown)
Top Trace: Output Voltage
Bottom Trace: Output Current (200 A/div)

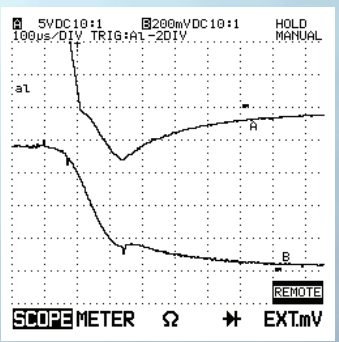
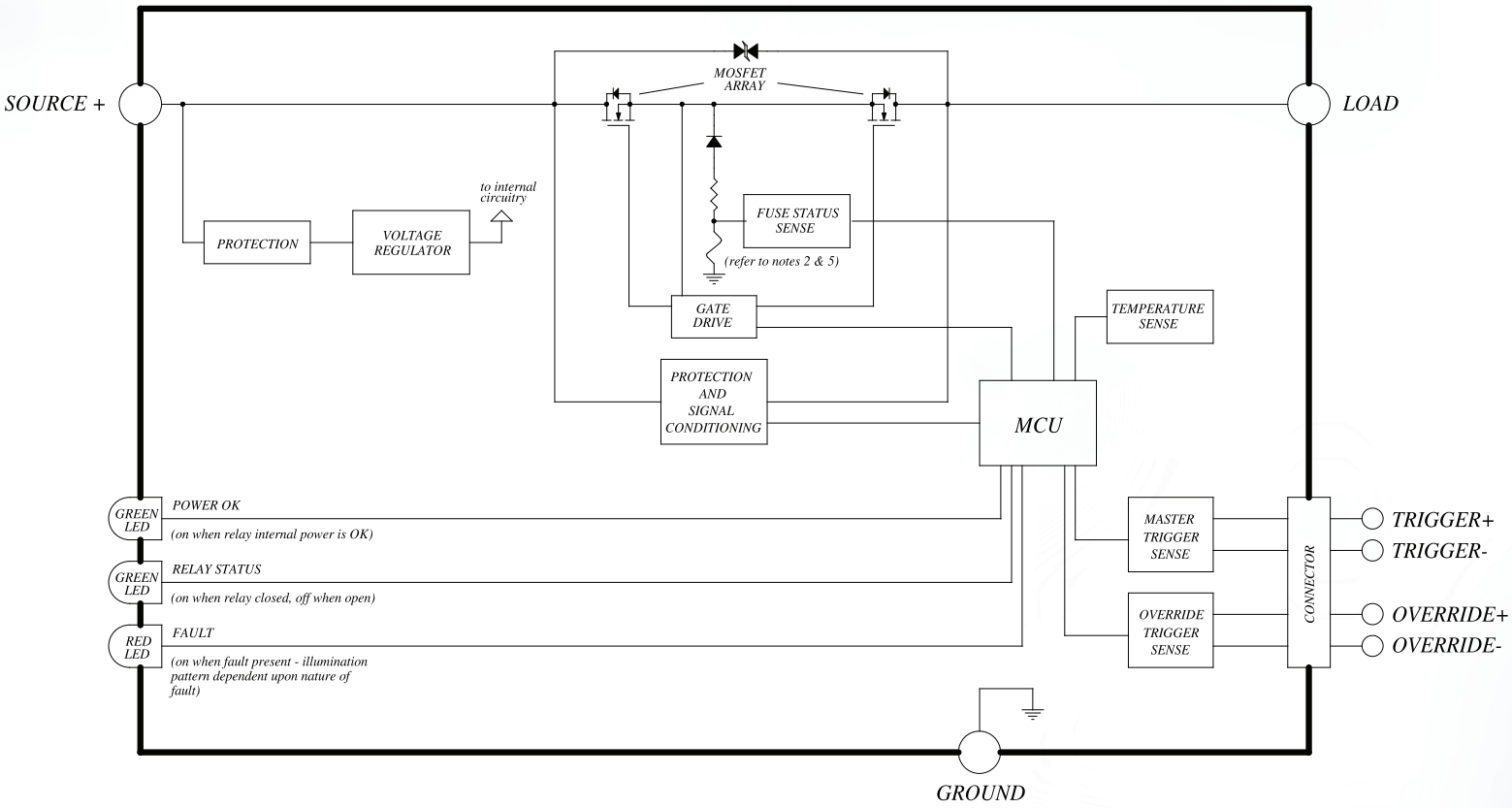


Figure 16: Inductive Load Shutdown - Current Decay (RB150B shown)
Top Trace: Output Voltage
Bottom Trace: Output Current (200 A/div)

FUNCTIONAL BLOCK DIAGRAM



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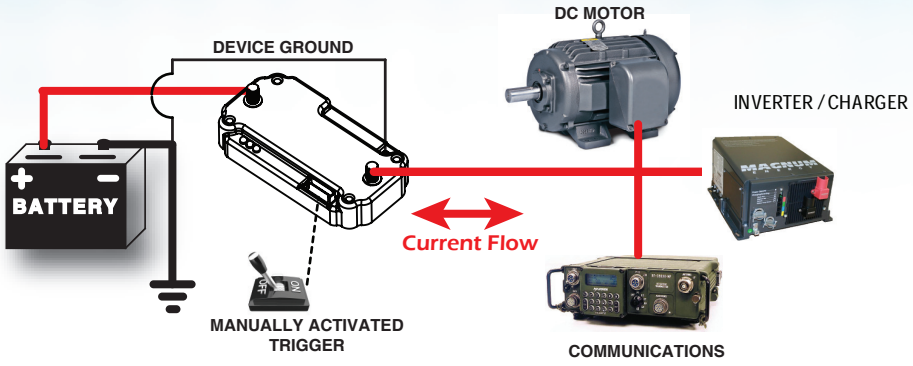
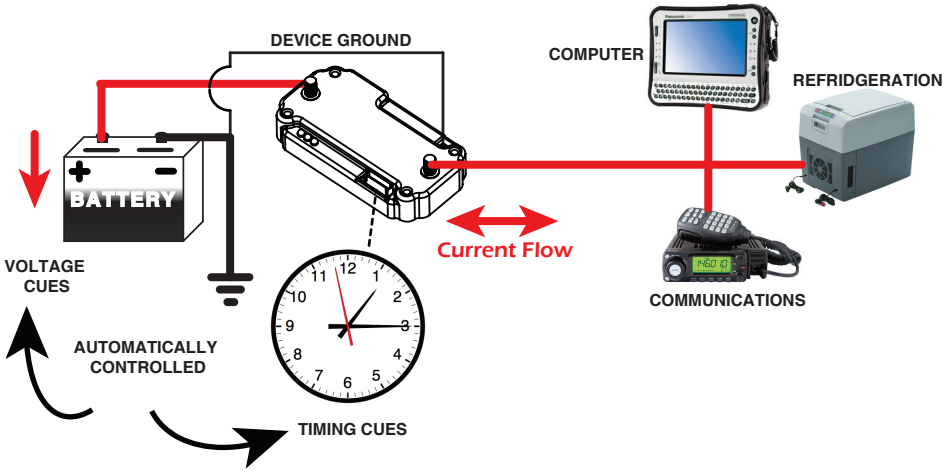
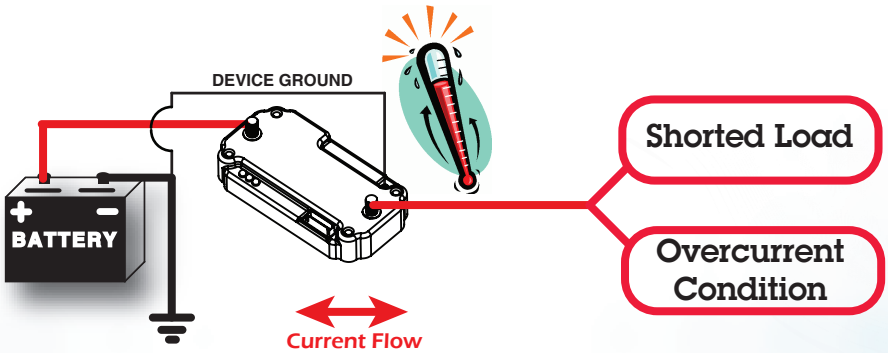
SAMPLE APPLICATIONS



POWER-GATE Bi-directional relays can be manually activated or ignition-switched to power or de-power all high and low current accessories including motors, inverter/chargers, communications equipment, lighting, refrigerators/freezers, and sensitive computer equipment.

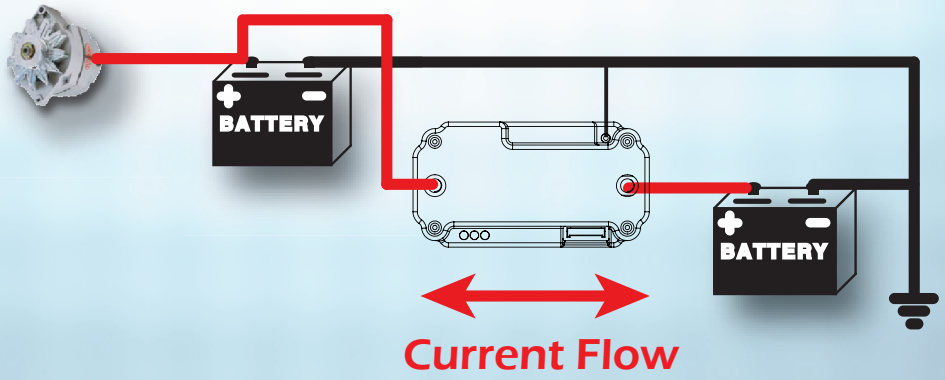


POWER-GATE Bi-directional relays can be programmed to automatically respond to low-voltage or high voltage battery conditions, and various timing cues making the device highly customizable. The ability to handle both high and low current in a single, easy-to-install module makes POWER-GATE a compelling choice when programmed to behave as a low voltage disconnect and preserve battery health.



POWER-GATE Bi-directional relays can be programmed to respond as a precision circuit breaker. If the device senses a shorted load or an overcurrent condition, the device will "open" and de-power the output.

The device will also respond to over temperature conditions by sensing strategically placed sensors within the sealed module.



POWER-GATE Bi-directional relays can behave as the smartest "smart solenoid" you've ever used. No mechanical contacts to arc and wear yield long-term reliability and unparalleled long-term performance. Programmable logic on-board means you can customize the way the device will perform specifically for your application.

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NOTES

REVISION HISTORY

REV	DATE	DESCRIPTION	PAGE NUMBER (S)
0	02/28/14	Original Release	
1	03/13/14	Comprehensive Update	
2	04/30/14	Comprehensive Update	

⚠ DANGER / PELIGRO / DANGER /GEFAHR / PERICOLO / PERIGO

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH.

- Disconnect all power before installing or working with this equipment.
- Verify all connections and replace all covers before turning on power.

Failure to follow these instructions will result in death or serious injury.

RIESGO DE DESCARGA ELECTRICA O EXPLOSION.

- Desconectar todos los suministros de energia a este equipo antes de trabajar con este equipo.
- Verificar todas las conexiones y colocar todas las tapas antes de energizer el equipo.

El incumplimiento de estas instrucciones puede provocar la muerte o lesiones serias.

RISQUE DE DESCHARGE ELECTRIQUE OU EXPLOSION

- Eteindre toutes les sources d'énergie de cet appareil avant de travailler dessus de cet appareil
- Vérifier tous connections, et remettre tous couverts en olace avant de mettre sous

De non-suivi de ces instructions provoquera la mort ou des lésions sérieuses sérieuses.

GEFAHR EINES ELEKTRISCHE N SCHLAGES ODER EINER EXPLOSION.

- Stellen Sie jeglichen Strom ab, der dieses Gerät versorgt, bevor Sie an dem Gerät Arbeiten durchführen
- Vor der Inbetriebnahme alle Anschlüsse überprüfen und alle Gehäuseteile montieren.

Unterlassung dieser Anweisungen können zum Tode oder zu schweren Verletzungen führen.

RISCHIO DI SCOSSA ELETTRICA O DELL'ESPLOSI ONE.

- Spenga tutta l'alimentazion e che fornisce questa apparecchiatu ra prima del lavorare a questa apparecchiatu ra
- Verificare tutti i collegamenti e sostituire tutte le coperture prima della rotazione sull'alimentazi one

L'omissione di seguire queste istruz ioni provocherà la morte o di lesioni serie

RISCO DE DESCARGA ELÉTTRICA OU EXPLOSÃO

- Desconectar o equipamento de toda á energia antes de instalar ou trabalhar com este equipamen to
- Verificar todas as conexões e recolocar todas as tampas antes de religar o equipamento

O não cumprimento destas instruções pode levar á morte ou lesões sérias.

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