

# POWER-GATE™ Solid-State Devices Programmable OR'ing using two Bi- Directional DC Relays Specification Sheet



## Generation 4.1



THE SPECIFICATIONS IN THIS DATASHEET APPLY TO ALL BI-DIRECTIONAL-TYPE DEVICES. SPECIFIED VALUE FOR STAND-ALONE BI-DIRECTIONAL RELAYS (RB) ARE ALSO APPLICABLE TO PROGRAMMABLE OR'ING (RP, RK, RI, RC) AND SPDT (RT, RV, RA, RE) DEVICES. SPECIFICATIONS SPECIFIC TO PROGRAMMABLE OR'ING AND SPDT DEVICES ARE INDICATED AS SUCH

### ABSOLUTE MAXIMUM RATINGS<sup>(1)</sup>

All devices ("x" = don't care), all amperages DC, all voltages DC and referenced to relay ground, unless otherwise specified.

Symbol	Parameter	Min.	Max.	Units
V <sub>Tx</sub>	Terminals 1 and 2 Voltage, Models RBx41A-xxx	-19 <sup>(2)</sup>	19 <sup>(2,3)</sup>	V
	Terminals 1 and 2 Voltage, Models RBx41B-xxx	-37 <sup>(2)</sup>	37 <sup>(2,4)</sup>	
V <sub>TT,OPEN</sub>	Terminal-to-Terminal Relay-Open Voltage Differential, Models RBx41A-xxx	-19	19	V
	Terminal-to-Terminal Relay-Open Voltage Differential, Models RBx41B-xxx	-37	37	
T <sub>A</sub>	Ambient Temperature	-45	85	°C
T <sub>P</sub>	Terminals 1 and 2 Post Temperature	-45	105	°C
V <sub>TRIG,M</sub>	Main Trigger Voltage <sup>(5)</sup>	-37 <sup>(6)</sup>	37 <sup>(4)</sup>	V
V <sub>TRIG,O</sub>	Override Trigger Voltage <sup>(7)</sup>	-37 <sup>(6)</sup>	37 <sup>(4)</sup>	V
I <sub>LED</sub>	Remote LED Current	-	30	mA
V <sub>LED(OFF)</sub>	Remote LED Voltage (LED Off)	-50	50	V

### RECOMMENDED OPERATING CONDITIONS

All devices ("x" = don't care), all amperages DC, all voltages DC and referenced to relay ground, unless otherwise specified.

Symbol	Parameter	Min.	Max.	Units
V <sub>Tx</sub>	Terminals 1 and 2 Voltage, Models RBx41A-xxx	4.8	18	V
	Terminals 1 and 2 Voltage, Models RBx41B-xxx	4.8	36	
T <sub>A</sub>	Ambient Temperature	-40	85	°C
T <sub>P</sub>	Terminals 1 and 2 Post Temperature	-40	105	°C
V <sub>TRIG,M</sub>	Main Trigger Voltage <sup>(5)</sup>	0	36	V
V <sub>TRIG,O</sub>	Override Trigger Voltage <sup>(7)</sup>	0	36	V

### ELECTRICAL SPECIFICATIONS

All devices ("x" = don't care), all amperages DC, all voltages DC and referenced to device ground,  
 $T_A = +25 \pm 3 \text{ }^\circ\text{C}$ ,  $4.8 \text{ V} \leq V_{T1}$  (RBx41A-xxx)  $\leq 18 \text{ V}$ ,  $4.8 \text{ V} \leq V_{T1}$  (RBx41B-xxx)  $\leq 36 \text{ V}$ , terminal 2 floating, all LEDs enabled,  
 non-isolated active-high main trigger, non-isolated active-low override trigger, unless otherwise specified.

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
$I_{L,CONT(MAX)}$	Maximum Continuous Load Current <sup>(40)</sup>	-	-	50	A	Models RBS41x-050, $-40 \text{ }^\circ\text{C} \leq T_A \leq 85 \text{ }^\circ\text{C}$
		-	-	100		Models RBx41x-100, $-40 \text{ }^\circ\text{C} \leq T_A \leq 85 \text{ }^\circ\text{C}$
		-	-	150		Models RBx41x-150, $-40 \text{ }^\circ\text{C} \leq T_A \leq 85 \text{ }^\circ\text{C}$
		-	-	200		Models RBx41x-200, $-40 \text{ }^\circ\text{C} \leq T_A \leq 85 \text{ }^\circ\text{C}$
		-	-	250		Models RBM41x-250, $-40 \text{ }^\circ\text{C} \leq T_A \leq 85 \text{ }^\circ\text{C}$
		-	-	300		Models RBx41x-300, $-40 \text{ }^\circ\text{C} \leq T_A \leq 85 \text{ }^\circ\text{C}$
		-	-	400		Model RBL41x-400, $-40 \text{ }^\circ\text{C} \leq T_A \leq 85 \text{ }^\circ\text{C}$
		-	-	500		Model RBL41x-500, $-40 \text{ }^\circ\text{C} \leq T_A \leq 85 \text{ }^\circ\text{C}$
		-	-	600		Model RBL41x-600, $-40 \text{ }^\circ\text{C} \leq T_A \leq 85 \text{ }^\circ\text{C}$
DF	Continuous Load Current Derating Factor <sup>(41)</sup>	2.15	-	-	%/ $^\circ\text{C}$	$T_A > 85 \text{ }^\circ\text{C}$
$I_{L,INT(MAX)}$	Maximum Load Interrupt Current	-	-	9 x $I_{L,CONT(MAX)}$	A	$-40 \text{ }^\circ\text{C} \leq T_A \leq +85 \text{ }^\circ\text{C}$
		-	-	8 x $I_{L,CONT(MAX)}$		$+85 \text{ }^\circ\text{C} < T_A \leq +105 \text{ }^\circ\text{C}$
$V_{TT,CLOSED}$	Terminal-to-Terminal Relay-Closed Voltage Drop <sup>(8)</sup>	-	22	30	mV	Model RBS41A-050, Load Current = $I_{L,CONT(MAX)}$
		-	35	53		Model RBS41A-100, Load Current = $I_{L,CONT(MAX)}$
		-	25	37		Model RBM41A-100, Load Current = $I_{L,CONT(MAX)}$
		-	45	66		Model RBS41A-150, Load Current = $I_{L,CONT(MAX)}$
		-	27	40		Model RBM41A-150, Load Current = $I_{L,CONT(MAX)}$
		-	51	75		Model RBS41A-200, Load Current = $I_{L,CONT(MAX)}$
		-	28	41		Model RBM41A-200, Load Current = $I_{L,CONT(MAX)}$
		-	29	42		Model RBM41A-250, Load Current = $I_{L,CONT(MAX)}$
		-	34	49		Model RBM41A-300, Load Current = $I_{L,CONT(MAX)}$
		-	27	40		Model RBL41A-300, Load Current = $I_{L,CONT(MAX)}$
		-	29	42		Model RBL41A-400, Load Current = $I_{L,CONT(MAX)}$
		-	35	50		Model RBL41A-500, Load Current = $I_{L,CONT(MAX)}$
		-	40	57		Model RBL41A-600, Load Current = $I_{L,CONT(MAX)}$
		-	29	41		Model RBS41B-050, Load Current = $I_{L,CONT(MAX)}$
		-	49	69		Model RBS41B-100, Load Current = $I_{L,CONT(MAX)}$
		-	27	38		Model RBM41B-100, Load Current = $I_{L,CONT(MAX)}$
		-	64	90		Model RBS41B-150, Load Current = $I_{L,CONT(MAX)}$
		-	32	45		Model RBM41B-150, Load Current = $I_{L,CONT(MAX)}$
		-	41	57		Model RBM41B-200, Load Current = $I_{L,CONT(MAX)}$
		-	48	67		Model RBM41B-250, Load Current = $I_{L,CONT(MAX)}$
		-	55	77		Model RBM41B-300, Load Current = $I_{L,CONT(MAX)}$
		-	36	50		Model RBL41B-300, Load Current = $I_{L,CONT(MAX)}$
		-	47	65		Model RBL41B-400, Load Current = $I_{L,CONT(MAX)}$
-	55	77	Model RBL41B-500, Load Current = $I_{L,CONT(MAX)}$			
-	65	90	Model RBL41B-600, Load Current = $I_{L,CONT(MAX)}$			
MF	Terminal-to-Terminal Voltage Drop High Temperature Multiplication Factor <sup>(42)</sup>	-	1.4	1.6		$T_A = 105 \text{ }^\circ\text{C}$
$I_{S,OPEN}$	Operating Current, Relay Triggered Open	17.1	18.1	19.1	mA	$V_{TRIG,M} = 0 \text{ V}^{(5)}$ , $OVERRIDETRIG+^{(7)}$ floating
$I_{S,CLOSED}$	Operating Current, Relay Triggered Closed	20.1	22.1	24.1	mA	$V_{TRIG,M} = V_{T1}^{(5)}$ , $OVERRIDETRIG+^{(7)}$ floating
$I_{S,LP}$	Low Power Sleep Mode Operating Current <sup>(9)</sup>	-	-	2.4	mA	Models RBx41A-xxx
		-	-	2.5		Models RBx41B-xxx

**ELECTRICAL SPECIFICATIONS**

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 non-isolated active-high main trigger, non-isolated active-low override trigger, unless otherwise specified.

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I <sub>LEAK</sub>	Relay Open Output Leakage Current: Normal Operation (Low Power Sleep Mode <sup>(9)</sup> )	-	5 (4)	210 (210)	μA	Model RBS41A-050 <sup>(34)</sup>
		-	7 (5)	25 (25)		Model RBS41A-100 <sup>(34)</sup>
		-	11 (3)	35 (25)		Model RBM41A-100 <sup>(34)</sup>
		-	10 (9)	215 (215)		Model RBS41A-150 <sup>(34)</sup>
		-	17 (6)	220 (220)		Model RBM41A-150 <sup>(34)</sup>
		-	16 (14)	730 (725)		Model RBS41A-200 <sup>(34)</sup>
		-	22 (10)	740 (730)		Model RBM41A-200 <sup>(34)</sup>
		-	33 (19)	1300 (1300)		Model RBM41A-250 <sup>(34)</sup>
		-	36 (22)	1600 (1600)		Model RBM41A-300 <sup>(34)</sup>
		-	44 (27)	1600 (1600)		Model RBL41A-300 <sup>(34)</sup>
		-	24 (3)	845 (835)		Model RBL41A-400 <sup>(34)</sup>
		-	23 (4)	2800 (2800)		Model RBL41A-500 <sup>(34)</sup>
		-	110 (95)	9200 (9200)		Model RBL41A-600 <sup>(34)</sup>
		-	8 (2)	20 (15)		Model RBS41B-050 <sup>(35)</sup>
		-	9(2)	20 (15)		Model RBS41B-100 <sup>(35)</sup>
		-	18 (4)	30 (20)		Model RBM41B-100 <sup>(35)</sup>
		-	9 (2)	20 (15)		Model RBS41B-150 <sup>(35)</sup>
		-	18 (4)	20 (15)		Model RBM41B-150 <sup>(35)</sup>
		-	20 (5)	30 (20)		Model RBM41B-200 <sup>(35)</sup>
		-	22(6)	50 (30)		Model RBM41B-250 <sup>(35)</sup>
		-	25 (7)	100 (85)		Model RBM41B-300 <sup>(35)</sup>
		-	25 (5)	100 (85)		Model RBL41B-300 <sup>(35)</sup>
		-	51 (30)	1700 (1700)		Model RBL41B-400 <sup>(35)</sup>
-	26 (4)	75 (55)	Model RBL41B-500 <sup>(35)</sup>			
-	27 (6)	10100 (10000)	Model RBL41B-600 <sup>(35)</sup>			
V <sub>TRIG,H</sub>	Trigger High Threshold Voltage <sup>(10)</sup>	-	0.92	1.23	V	
V <sub>TRIG,L</sub>	Trigger Low Threshold Voltage <sup>(12)</sup>	0.55	0.86	-	V	
V <sub>TRIG,HYS</sub>	Trigger Hysteresis Voltage <sup>(12)</sup>	20	-	95	mV	

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 non-isolated active-high main trigger, non-isolated active-low override trigger, unless otherwise specified.

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
$I_{TRIG,AH}$	Active-high Trigger Current <sup>(13)</sup>	-	34	-	$\mu\text{A}$	$V_{TRIG,x} = 3.3 \text{ V}^{(5,7)}$
		-	173	-		$V_{TRIG,x} = 12 \text{ V}^{(5,7)}$
		-	293	-		$V_{TRIG,x} = 18 \text{ V}^{(5,7)}$
		-	413	-		$V_{TRIG,x} = 24 \text{ V}^{(5,7)}$
		-	653	-		$V_{TRIG,x} = 36 \text{ V}^{(5,7)}$
$I_{TRIG,AL}$	Active-low Trigger Leakage Current <sup>(13)</sup>	-	34	-	$\mu\text{A}$	$V_{TRIG,x} = 0 \text{ V}^{(6,8)}$
$V_{TRIG,ALOCV}$	Active-low Trigger Open Circuit Voltage <sup>(13)</sup>	-	3.3 <sup>(14)</sup>	-	V	
$f_{SW}$	Relay Switching Frequency <sup>(15)</sup>	-	-	1	Hz	
$t_{TRIG,HOLD}$	Trigger Hold Time <sup>(13,16)</sup>	45	-	-	ms	
$I_{OI1}$	Over-current Threshold - Level 1 <sup>(17)</sup>	-	2 x $I_{L,CONT(MAX)}$	-	A	
$t_{OI1}$	Over-current Shutdown Delay - Level 1	-	60	-	s	
$I_{OI2}$	Over-current Threshold - Level 2 <sup>(17)</sup>	-	2.5 x $I_{L,CONT(MAX)}$	-	A	
$t_{OI2}$	Over-current Shutdown Delay - Level 2	-	10	-	s	
$I_{OI3}$	Over-current Threshold - Level 3 <sup>(17)</sup>	-	3 x $I_{L,CONT(MAX)}$	-	A	
$t_{OI3}$	Over-current Shutdown Delay - Level 3	-	1	-	s	
$I_{OI4}$	Over-current Threshold - Level 4 <sup>(17)</sup>	-	4 x $I_{L,CONT(MAX)}$	-	A	
$t_{OI4}$	Over-current Shutdown Delay - Level 4	-	20	-	ms	
$I_{OI5}$	Over-current Threshold - Level 5 <sup>(17)</sup>	-	5 x $I_{L,CONT(MAX)}$	-	A	
$t_{OI5}$	Over-current Shutdown Delay - Level 5	-	4	-	ms	
$I_{OI6}$	Over-current Threshold - Level 6 <sup>(17)</sup>	-	6 x $I_{L,CONT(MAX)}$	-	A	
$t_{OI6}$	Over-current Shutdown Delay - Level 6	-	2	-	ms	
$t_{OI,D}$	Over-current Detection Delay <sup>(18)</sup>	-	-	2	ms	
$I_{SC}$	Short-circuit Threshold <sup>(17)</sup>	-	7 x $I_{L,CONT(MAX)}$	-	A	
$t_{SC}$	Short-circuit Shutdown Delay	-	-	1	ms	
$\Delta I_{OI/SC}$	Over-current/Short-circuit Threshold Tolerance <sup>(19)</sup>	-15	-	15	%	
$t_{OI/SC,LOCK}$	Over-current/Short-circuit Lockout Period <sup>(20)</sup>	-	10	-	s	
-	Over-current Fault LED Blinks - Level 1 <sup>(21)</sup>	-	1	-	-	
-	Over-current Fault LED Blinks - Level 2 <sup>(21)</sup>	-	2	-	-	
-	Over-current Fault LED Blinks - Level 3 <sup>(21)</sup>	-	3	-	-	

## ELECTRICAL SPECIFICATIONS

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 $T_A = +25 \pm 3 \text{ }^\circ\text{C}$ ,  $4.8 \text{ V} \leq V_{T1}$  (RBx41A-xxx)  $\leq 18 \text{ V}$ ,  $4.8 \text{ V} \leq V_{T1}$  (RBx41B-xxx)  $\leq 36 \text{ V}$ , terminal 2 floating, all LEDs enabled,  
 non-isolated active-high main trigger, non-isolated active-low override trigger, unless otherwise specified.

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
-	Over-current Fault LED Blinks - Level 4 <sup>(21)</sup>	-	4	-	-	
-	Over-current Fault LED Blinks - Level 5 <sup>(21)</sup>	-	5	-	-	
-	Over-current Fault LED Blinks - Level 6 <sup>(21)</sup>	-	6	-	-	
-	Short-circuit Fault LED Blinks <sup>(21)</sup>	-	7	-	-	
T <sub>OFF</sub>	Internal Over-temperature Shutdown	-	135	-	°C	
T <sub>RESET</sub>	Internal Over-temperature Reset	-	130	-	°C	
-	Over-temperature Fault LED Blink Frequency <sup>(22)</sup>	-	3.8	-	Hz	
$\Delta V_{UV/OV}$	Under- and Over-voltage Threshold Tolerance <sup>(23)</sup>	-1	$\pm 0.5$	1	%	
t <sub>UV/OV,Dmin</sub>	Under- and Over-voltage Minimum Shutdown Delay	-	-	1.5	ms	
$\Delta t$	Timing Tolerance <sup>(24)</sup>	-2	$\pm 1$	2	%	
V <sub>Tx,PWRDWN</sub>	Terminal Voltage Power-down Threshold	-	3.8	-	V	
V <sub>Tx,WARNON</sub>	Terminal Voltage Warning On Threshold <sup>(25)</sup>	-	4.7	-	V	
V <sub>Tx,WARNOFF</sub>	Terminal Voltage Warning Off Threshold <sup>(25)</sup>	-	4.8	-	V	
t <sub>D,CLOSE</sub>	Turn-on (Relay Open-to-Close) Delay <sup>(26)</sup>	-	-	2	ms	
t <sub>D,OPEN</sub>	Turn-off (Relay Close-to-Open) Delay <sup>(27)</sup>	-	-	3	ms	
t <sub>RISE</sub>	Output Voltage Rise Time <sup>(28)</sup>	-	-	8	$\mu\text{s}$	Models RBx41A-xxx: $V_{T1} = 12 \text{ V}$ , $R_L = 120 \text{ }\Omega$ <sup>(29)</sup> Models RBx41B-xxx: $V_{T1} = 24 \text{ V}$ , $R_L = 240 \text{ }\Omega$ <sup>(29)</sup>
t <sub>FALL</sub>	Output Voltage Fall Time <sup>(30)</sup>	-	-	50	$\mu\text{s}$	Models RBx41A-xxx: $V_S = 12 \text{ V}$ , $R_L = 120 \text{ }\Omega$ <sup>(30)</sup> Models RBx41B-xxx: $V_S = 24 \text{ V}$ , $R_L = 240 \text{ }\Omega$ <sup>(30)</sup>
t <sub>CC</sub>	Cold Crank Tolerance Time <sup>(31)</sup>	-	-	7	ms	Applied V <sub>T1</sub> step = 12 to 3 V
t <sub>D,PWRUP</sub>	Power-up Delay <sup>(32)</sup>	-	650	-	ms	Models RBx41A-xxx: Applied V <sub>T1</sub> step = 0 to 12 V Models RBx41B-xxx: Applied V <sub>T1</sub> step = 0 to 24 V
t <sub>WD</sub>	Low Power Sleep Mode Watchdog Time <sup>(33)</sup>	-	8	-	s	

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. Minimum and maximum values are dependent upon the relay-open voltage differential between the two terminals ( $V_{TT,OPEN}$ ), which must never exceed 19/37 V for models RBx41A/RBx41B, respectively. For example, if the terminal 1 voltage, referenced to ground, of a RBx41B device is 24 V, then the terminal 2 voltage (again, referenced to ground) cannot be lower than -13 V.
3. Transient-protected to 40 V. Additional external protection may be required in some applications; see application sheet AS0705-41.
4. Transient-protected to 60 V. Additional external protection may be required in some applications; see application sheet AS0705-41.
5.  $V_{TRIG,M}$  equals difference between MAINTRIG+ and relay ground (MAINTRIG- is internally connected to relay ground through 330  $\Omega$  resistor and is generally not required for active-high type, but is often used for active-low type to simplify connection to mechanical trigger switch).
6. Transient protected to -60 V. Additional external protection may be required in some applications; see application sheet AS0705-41.
7.  $V_{TRIG,O}$  equals difference between OVERRIDETRIG+ and OVERRIDETRIG- (OVERRIDETRIG- is internally connected to relay ground through 330  $\Omega$  resistor and is not required for active-high type, but is often used for active-low type to simplify connection to mechanical trigger switch).
8. Voltage drop tested under pulsed conditions with pulse length  $\leq 2$  s.
9. Low power sleep mode is a non-standard feature. Refer to application sheet AS0705-41 for more information.
10.  $V_{TRIG,H}$  is the threshold to activate/deactivate both the main and override triggers for active-high/active-low configurations, respectively.
11.  $V_{TRIG,L}$  is the threshold to deactivate/activate both the main and override triggers for active-high/active-low configurations, respectively.
12.  $V_{TRIG,HYS} = V_{TRIG,H} - V_{TRIG,L}$
13. Applies to both main and override triggers.
14. 100 k $\Omega$  (typical) between MAINTRIG+/OVERRIDETRIG+ and internal 3.3 V.
15. Relay switching frequency is limited internally by firmware. Trigger frequencies in excess of 1 Hz will not cause faster switching.
16. Trigger hold time is defined as the length of time that a trigger voltage must be held above/below  $V_{TRIG,H}/V_{TRIG,L}$ , respectively, in order to yield a valid trigger state change.
17. Over-current and short-circuit thresholds are specifically designed for MOSFET array protection and cannot be changed by customer request. If other current-related shutdowns are desired, refer to available circuit-break thresholds described in application sheet AS0705-41.
18. Over-current detection delay is defined as the length of time between when an over-current threshold level is first exceeded and when the delay timer begins.
19. Over-current/short-circuit threshold tolerance applies equally to all levels (e.g. if level 1 over-current threshold has a -5% error, then over-current levels 2, 3, 4, 5, and 6, and the short-circuit threshold, will all have the same -5% error).
20. If the relay opens due to an over-current or short-circuit event, relay reset is inhibited for the lockout period. If the relay opens due to a circuit-break event, and the circuit-break threshold is greater than  $I_{L,CONT(MAX)}$ , relay reset by trigger toggle is also inhibited for the lockout period.
21. Typical blink on- and off-time is 262 ms. Typical delay between blinking sequences is 2 seconds. See application sheet AS0705-41 for more information.
22. Over-temperature blinking pattern has equal on- and off-time.

23. Under- and over-voltage shutdown features non-standard. Call manufacturer for more information.
24. Applies to over-current, short-circuit, circuit-break, under-voltage, and over-voltage shutdowns.
25. If the relay is closed when the source voltage falls below  $V_{TX,WARNON}$ , it will stay closed, but the over-current and short-circuit features will revert to a single level. If the relay is open when the source voltage falls below  $V_{TX,WARNON}$ , closing of relay will be inhibited until the source voltage rises above  $V_{TX,WARNOFF}$ .
26. Turn-on delay is defined as the length of time between when a valid trigger state change is detected (refer to note 16) and when the output voltage reaches 10 % of its final value.
27. Turn-off delay is defined as the length of time between when a valid trigger state change is detected (refer to note 16) and when the output voltage reaches 90 % of its final value.
28. Output voltage rise time is defined as the length of time the output voltage takes to go from 10 to 90 % of its final value.
29.  $R_L$  is the load resistance between terminal 2 and ground.
30. Output voltage fall time is defined as the length of time the output voltage takes to go from 90 to 10 % of its final value.
31. Cold crank tolerance time is defined as the length of time the relay will remain closed while the source voltage is below the power-down threshold.
32. Power-up delay is defined as the length of time between when the source voltage rises above the warning off threshold ( $V_{TX,WARNOFF}$ ) and when the relay is enabled for normal operation.
33. Low power sleep mode watchdog time is defined as the length of time the relay is in its lowest-power state, between wakeup check intervals. Refer to application sheet AS0705-41 for more information.
34. Terminal 2 shorted to relay ground, Typical value:  $V_{T1} = 12$  V, Maximum value:  $V_{T1} = 18$  V
35. Terminal 2 shorted to relay ground, Typical value:  $V_{T1} = 24$  V, Maximum value:  $V_{T1} = 36$  V
36. Break-before-make switchover deadtime is defined as the period of time during a switchover event when both relays are off/open.
37. Make-before-break switchover cross-conduction time is defined as the period of time during a switchover event when both relays are on/closed.
38. Primary source minimum under-voltage response delay is defined as the minimum period of time between the falling of the primary source voltage below the under-voltage switchover threshold and the turning on/closing of the backup relay. This parameter is especially important to consider as it represents a period of time when the common load may not be powered when, for instance, the primary source becomes shorted to system ground or develops an open circuit between itself and the primary relay.
39. Under normal operating conditions, the primary/master source provides power to both relay's internal circuitry. Should the primary/master source voltage fall below the switchover falling threshold, internal power for the relays will be provided by the backup/slave source. Then, should the primary/master source voltage rise above the switchover rising threshold, internal power for the relays will revert back to the primary/master source.
40. Maximum continuous current as specified at 85 °C is achieved using cabling scheme that results in no more than 1 W/ft power dissipation for every 100 A. Cable power dissipation larger than 1 W/ft for every 100 A requires a decrease in the maximum ambient temperature (or alternatively, operation at ambient temperatures lower than 85 °C can tolerate larger overall cable power dissipation). Please see application sheet APS-0705-41 for more information.
41. To calculate the maximum continuous load current at ambient temperatures between +85 and +105 °C, use the following formula:  

$$I_{L,CONT(MAX)}\{T_A\} = I_{L,CONT(MAX)}\{T_A = 85\text{ °C}\} \times (1 - DF/100 \times (T_A - 85\text{ °C})).$$
42. To calculate the expected terminal-to-terminal voltage at an ambient temperature of 105 °C, multiply the typical and/or maximum voltage drop at an ambient temperature of 25 °C by MF (e.g.  $V_{TT,CLOSED,TYP}\{T_A = 105\text{ °C}\} = MF \times V_{TT,CLOSED,TYP}\{T_A = 25\text{ °C}\}$ ).

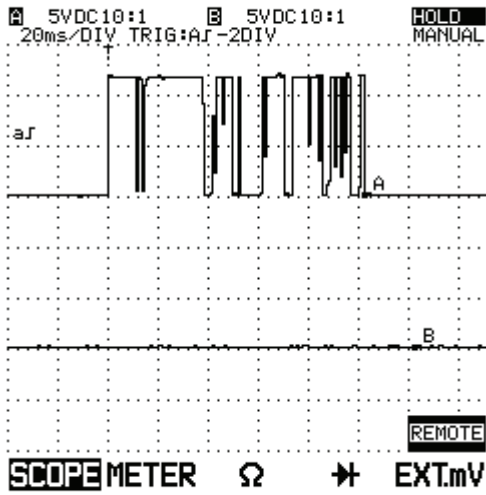


Figure 1: Trigger Noise Immunity (Relay Open)

Top Trace: Trigger Voltage  
Bottom Trace: Load Voltage

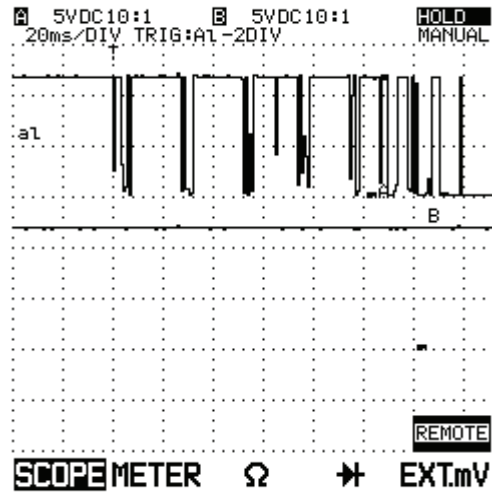


Figure 2: Trigger Noise Immunity (Relay Closed)

Top Trace: Trigger Voltage  
Bottom Trace: Load Voltage

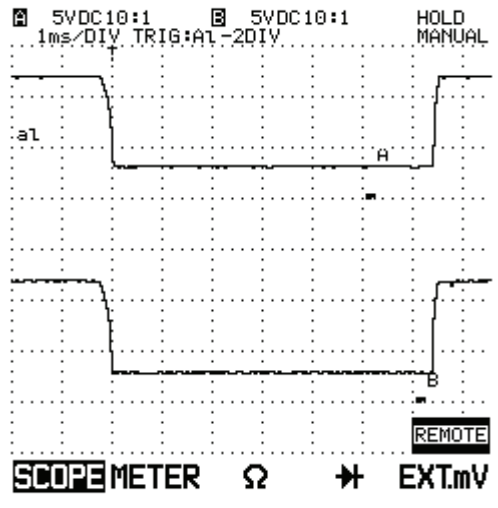
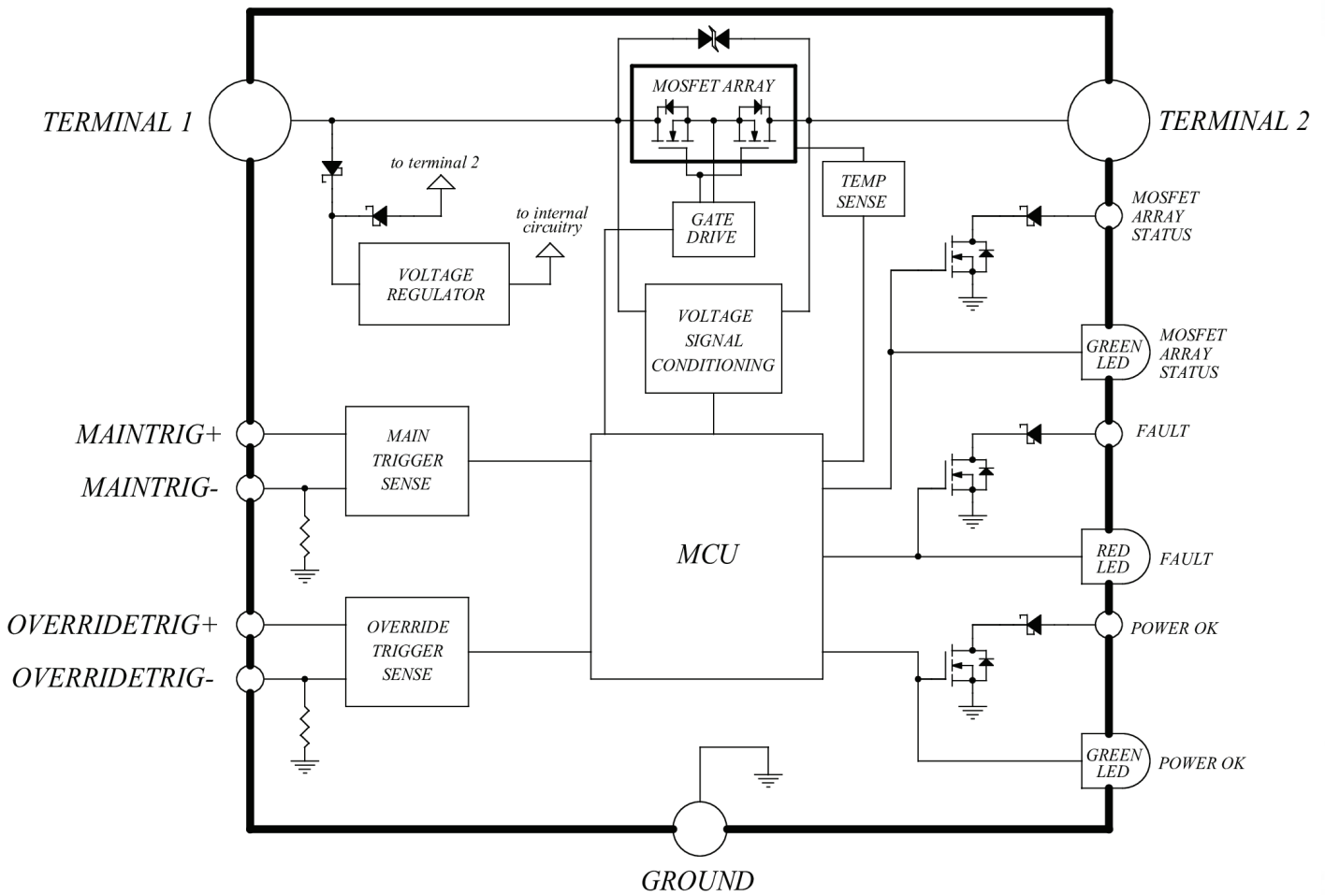


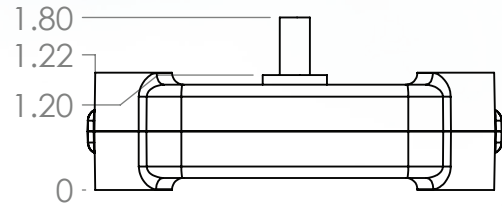
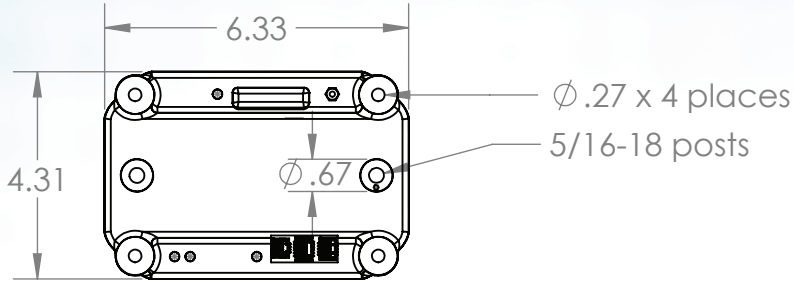
Figure 3: Cold-Crank Performance

Top Trace: Source Voltage  
Bottom Trace: Load Voltage

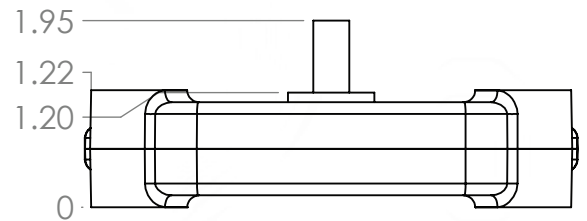
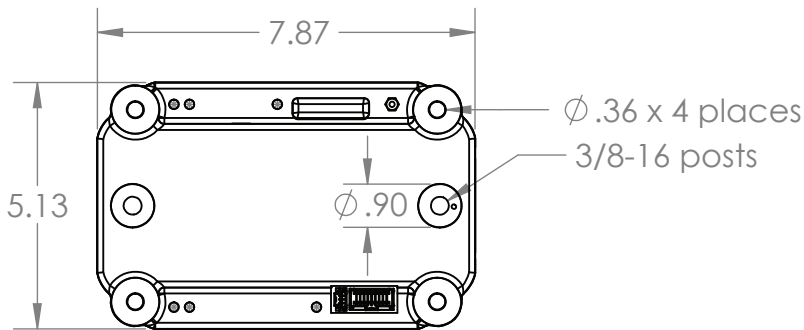


*MOSFET ARRAY STATUS: on when MOSFET array is enhanced  
 FAULT: on during over-current, short-circuit, circuit-break, over-temperature, and under- and over-voltage  
 POWER OK: on when source voltage is above minimum allowable*

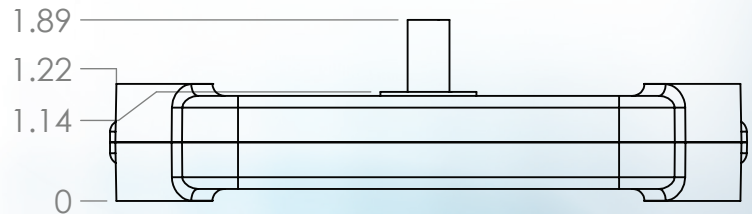
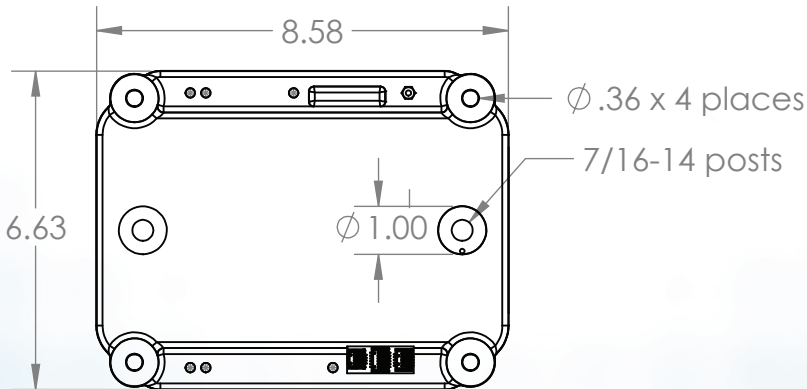
SMALL PACKAGE



MEDIUM PACKAGE

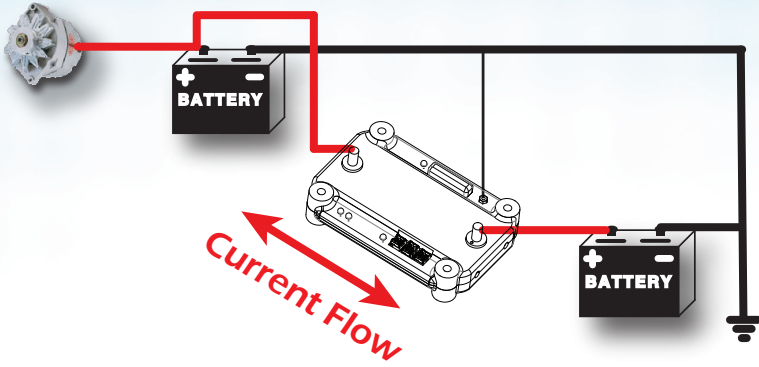


LARGE PACKAGE

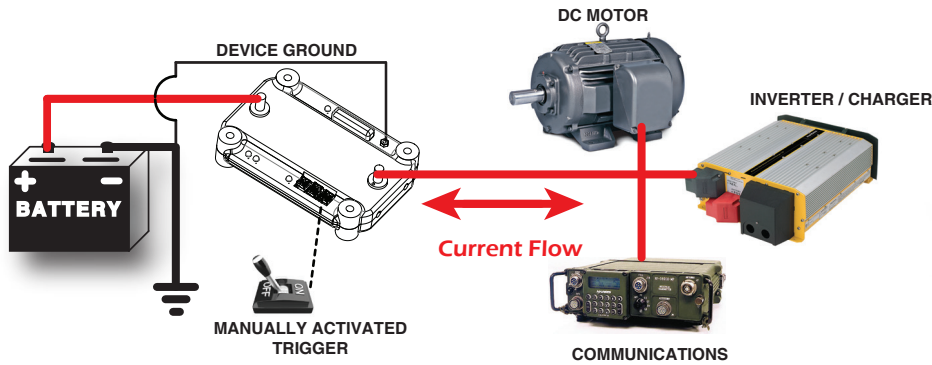


Solid models for all packages available for website download.

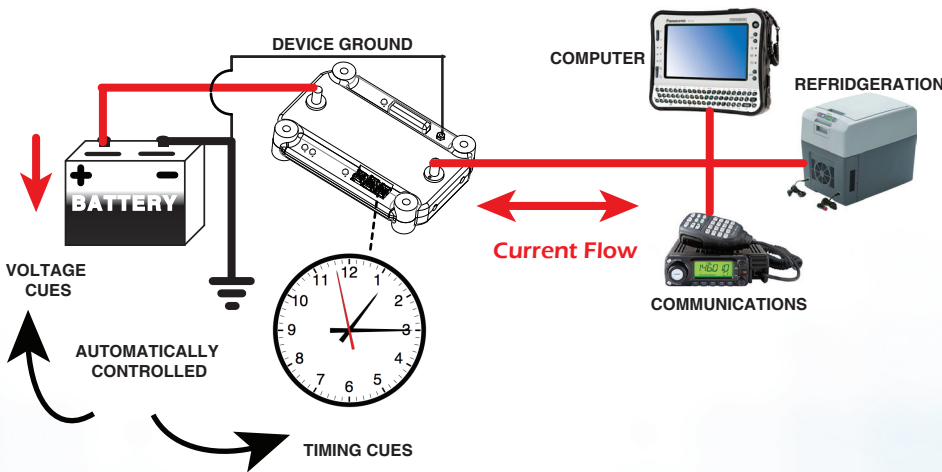
- Polycarbonate enclosure
- Dow Corning Sylgard encapsulation
- Brass conductive posts
- Four integrated reinforced mounting points
- 6-32 ground connection
- LED indicator lights



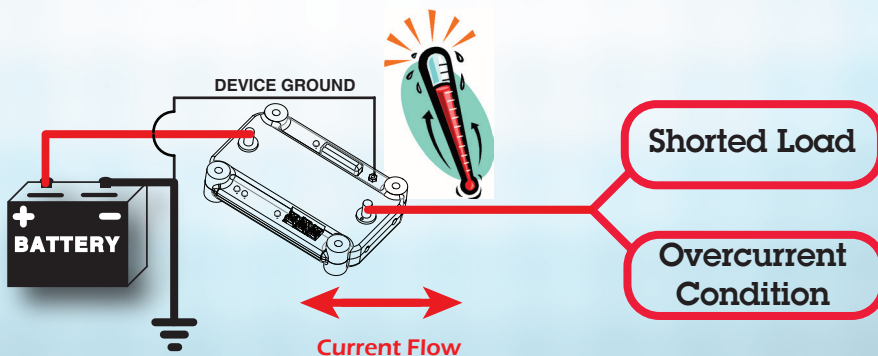
A Bi-directional relay must be used when voltage sources are present on both sides of the device in order to fully open the electrical circuit and insure no MOSFET damage occurs.



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

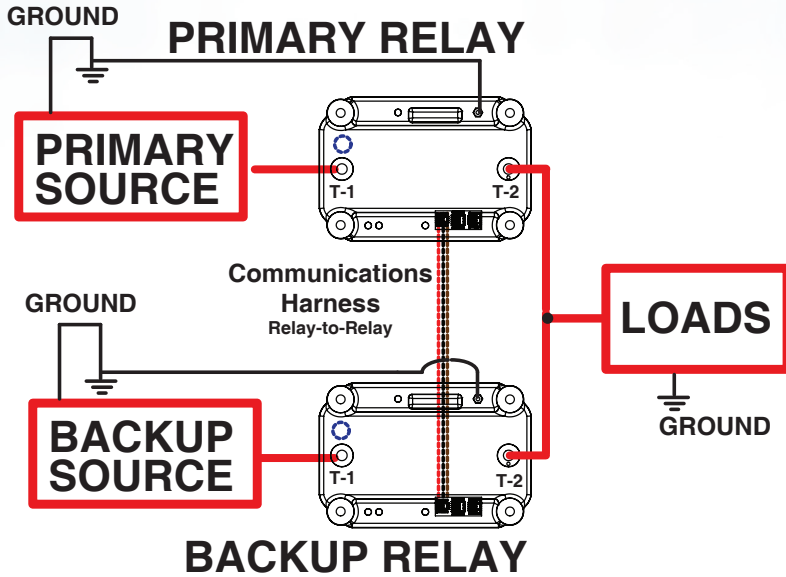


POWER-GATE Bi-directional relay can be programmed to automatically respond to low-voltage or high voltage battery conditions, and various timing cues making the device highly customizable. The ability to handle both high and low current in a single, easy-to-install module makes POWER-GATE a compelling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



POWER-GATE Bi-directional relay 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.



Deployed as a Programmage OR-ing assembly, two POWER-GATE bi-directional relays can “OR” one of two Sources to a Load. Make-before-Break with 50us cross-conduction, or Break-before-Make for zero cross-conduction, relays can be programmed to automatically respond to voltage, timing cues, current, PLC trigger, or manually triggered. This highly customizable assembly can be tailored to suit most applications.

REVISION HISTORY

Rev	Date	Description	Page Number(s)
0	7/22/2025	Original Release	-
1	3/30/2026	1. Absolute maximum and minimum, and recommended operating conditions for terminal post temperatures added.	1
		2. Maximum continuous load current specification updated.	3
		3. Continuous load current derating factor specification added.	3
		4. Terminal-to-terminal relay-closed voltage drop specification updated.	3
		5. Terminal-to-terminal voltage drop high temperature multiplication factor specification added.	3
		6. Output voltage rise time specification updated.	6
		7. Output voltage fall time specification updated.	6

<b>DANGER / PELIGRO / DANGER /GEFAHR / PERICOLO / PERIGO</b>					
<p><b>HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH.</b></p> <ul style="list-style-type: none"> <li>Disconnect all power before installing or working with this equipment.</li> <li>Verify all connections and replace all covers before turning on power.</li> </ul> <p>Failure to follow these instructions will result in death or serious injury.</p>	<p><b>RIESGO DE DESCARGA ELECTRICA O EXPLOSION.</b></p> <ul style="list-style-type: none"> <li>Desconectar todos los suministros de energia a este equipo antes de trabajar con este equipo.</li> <li>Verificar todas las conexiones y colocar todas las tapas antes de energizar el equipo.</li> </ul> <p>El incumplimiento de estas instrucciones puede provocar la muerte o lesiones serias.</p>	<p><b>RISQUE DE DESCARGA ELECTRIQUE OU EXPLOSION</b></p> <ul style="list-style-type: none"> <li>Eteindre toutes les sources d'energie de cet appareil avant de travailler dessus de cet appareil</li> <li>Vérifier tous connections, et remettre tous couverts en olace avant de mettre sous</li> </ul> <p>De non-sulvi de ces instructions provoquera la mort ou des lésions sérieuses.</p>	<p><b>GEFAHR EINES ELEKTRISCHEN SCHLAGES ODER EINER EXPLOSION.</b></p> <ul style="list-style-type: none"> <li>Stellen Sie jeglichen Strom ab, der dieses Gerät versorgt, bevor Sie an dem Gerät Arbeiten durchführen</li> <li>Vor der Inbetriebnahme alle Anschlüsse überprüfen und alle Gehäuseteile montieren.</li> </ul> <p>Unterlassung dieser Anweisungen können zum Tode oder zu schweren Verletzungen führen.</p>	<p><b>RISCHIO DI SCOSSA ELETTRICA O DELL'ESPLOSIONE.</b></p> <ul style="list-style-type: none"> <li>Spenga tutta l'alimentazion e che fornisce questa apparecchiatura prima del lavorare a questa apparecchiatura</li> <li>Verificare tutti i collegamenti e sostituire tutte le coperture prima della rotazione sull'alimentazi one</li> </ul> <p>L'omissione di seguire queste istruz ioni provocherà la morte o di lesioni serie</p>	<p><b>RISCO DE DESCARGA ELÉTRICA OU EXPLOSAO</b></p> <ul style="list-style-type: none"> <li>Desconectar o equipamento de toda a energia antes de instalar ou trabalhar com este equipamen to</li> <li>Verificar todas as conexões e recolocar todas as tampas antes de religar o equipamento</li> </ul> <p>O não cumprimento destas instruções pode levar à morte ou lesões sérias.</p>