

# POWER-GATE™ Solid-State Devices

## Single Rectifier (Isolator/Ideal Diode)

### Specification Sheet

#### Generation 3.0

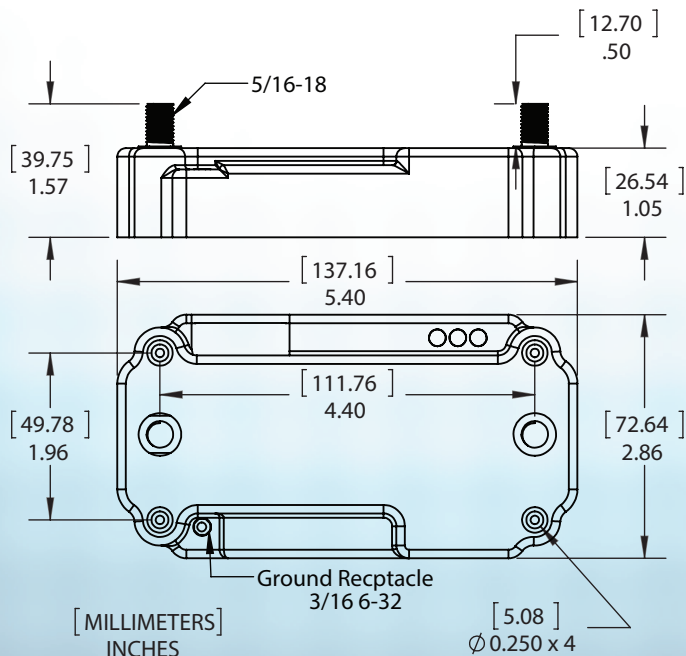


#### ABSOLUTE MAXIMUM RATINGS<sup>(1)</sup>

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

Symbol	Parameter	Min.	Max.	Units
V <sub>A</sub>	Anode Voltage, Model SRxxxA	-0.3 <sup>(2)</sup>	21 <sup>(3)</sup>	Vdc
	Anode Voltage, Model SRxxxB	-0.3 <sup>(2)</sup>	39 <sup>(4)</sup>	
V <sub>K</sub>	Cathode Voltage (anode voltage at min), Model SRxxxA	-0.6 <sup>(2)</sup>	21 <sup>(3)</sup>	Vdc
	Cathode Voltage (anode voltage at min), Model SRxxxB	-0.6 <sup>(2)</sup>	39 <sup>(4)</sup>	
V <sub>R, gndfloat</sub> <sup>(5)</sup>	Reverse Voltage (ground floating), Model SRxxxA	-	21	Vdc
	Reverse Voltage (ground floating), Model SRxxxB	-	39	
I <sub>F, gndfloat</sub> <sup>(5)</sup>	Forward Current (ground floating), SR050x	-	5	A
	Forward Current (ground floating), SR100x	-	10	
	Forward Current (ground floating), SR150x	-	15	
	Forward Current (ground floating), SR200x	-	20	
	Forward Current (ground floating), SR250x	-	25	
	Forward Current (ground floating), SR300x	-	30	
T <sub>A</sub>	Ambient Temperature	-45	+110	°C
V <sub>ALTEXC</sub>	Alternator Excitation Trigger Voltage	-39 <sup>(6)</sup>	39 <sup>(4)</sup>	Vdc

#### MECHANICAL SPECIFICATIONS



#### ADDITIONAL INFORMATION

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

Four integrated mounting holes pre-drilled to .250" Mounting torque not to exceed 60 inch-pounds or 7 newton-meters.

Mounting 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.

## RECOMMENDED OPERATING CONDITIONS

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

Symbol	Parameter	Min.	Max.	Units
$V_A$	Anode Voltage, Model SRxxxA	7.5	18	Vdc
	Anode Voltage, Model SRxxxB	7.5	36	
$V_K$	Cathode Voltage (anode voltage at min), Model SRxxxA	7.5	18	Vdc
	Cathode Voltage (anode voltage at min), Model SRxxxB	7.5	36	
$T_A$	Ambient Temperature	-40	+105	°C
$V_{ALTEXC}$	Alternator Excitation Trigger Voltage	0	36	Vdc

## ELECTRICAL SPECIFICATIONS

All devices,  $T_A = +25\text{ °C}$ ,  $7.5\text{ V} \leq V_A$  (SRxxxA)  $\leq 18\text{ V}$ ,  $7.5\text{ V} \leq V_A$  (SRxxxB)  $\leq 36\text{ V}$ , all LEDs enabled, unless otherwise specified; all voltages referenced to ground.

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
$I_{F,MAX}$	Maximum Forward Continuous Current	-	-	50	A	Model SR050x, $-40\text{ °C} \leq T_A \leq +105\text{ °C}$
		-	-	100		Model SR100x, $-40\text{ °C} \leq T_A \leq +105\text{ °C}$
		-	-	150		Model SR150x, $-40\text{ °C} \leq T_A \leq +105\text{ °C}$
		-	-	200		Model SR200x, $-40\text{ °C} \leq T_A \leq +105\text{ °C}$
		-	-	250		Model SR250x, $-40\text{ °C} \leq T_A \leq +105\text{ °C}$
		-	-	300		Model SR300x, $-40\text{ °C} \leq T_A \leq +105\text{ °C}$
$I_{SURGE,MAX}$	Maximum Forward Surge Current	-	-	$5 \times I_{F,MAX}$	A	Pulse width = 2 s, $-40\text{ °C} \leq T_A \leq +105\text{ °C}$
$V_F$	Forward Voltage Drop	-	25	30	mV	SR050x, SR100x, SR150x, Forward Current = $I_{F,MAX}$
		-	30	35		SR200x, SR250x, Forward Current = $I_{F,MAX}$
		-	35	40		SR300x, Forward Current = $I_{F,MAX}$
		-	-	80		Forward Current = $I_{F,MAX}$ , $-40\text{ °C} \leq T_A \leq +105\text{ °C}$
$I_S$	Operating Current <sup>(7)</sup>	0.77	-	-	mA	$V_K = 7.5\text{ V}$ , $V_A = V_{ALTEXC} = 0\text{ V}$ , Combine not active
		-	0.84	-		$V_K = 12\text{ V}$ , $V_A = V_{ALTEXC} = 0\text{ V}$ , Combine not active
		-	-	0.95		$V_K = 18\text{ V}$ , $V_A = V_{ALTEXC} = 0\text{ V}$ , Combine not active
		-	1.01	-		Model SRxxxB, $V_K = 24\text{ V}$ , $V_A = V_{ALTEXC} = 0\text{ V}$ , Combine not active
		-	-	1.25		Model SRxxxB, $V_K = 36\text{ V}$ , $V_A = V_{ALTEXC} = 0\text{ V}$ , Combine not active
		22.5	-	-		$V_A = 7.5\text{ V}$ , $V_{ALTEXC} = 0\text{ V}$ , Combine not active
		-	22.9	-		$V_A = 12\text{ V}$ , $V_{ALTEXC} = 0\text{ V}$ , Combine not active
		-	-	23.5		$V_A = 18\text{ V}$ , $V_{ALTEXC} = 0\text{ V}$ , Combine not active
		-	23.7	-		Model SRxxxB, $V_A = 24\text{ V}$ , $V_{ALTEXC} = 0\text{ V}$ , Combine not active
		-	-	24.4		Model SRxxxB, $V_A = 36\text{ V}$ , $V_{ALTEXC} = 0\text{ V}$ , Combine not active
$I_R$	Reverse Leakage Current	-	-	10	$\mu\text{A}$	SRxxxA, $V_K = 7.5\text{ V}$ , $V_A = 0\text{ V}$
		-	-	30		SRxxxA, $V_K = 12\text{ V}$ , $V_A = 0\text{ V}$
		-	-	140		SRxxxA, $V_K = 18\text{ V}$ , $V_A = 0\text{ V}$
		-	-	7		SRxxxB, $V_K = 7.5\text{ V}$ , $V_A = 0\text{ V}$
		-	-	15	SRxxxB, $V_K = 12\text{ V}$ , $V_A = 0\text{ V}$	
		-	-	30	SRxxxB, $V_K = 18\text{ V}$ , $V_A = 0\text{ V}$	
		-	-	75	SRxxxB, $V_K = 24\text{ V}$ , $V_A = 0\text{ V}$	
		-	-	1.2	mA	SRxxxB, $V_K = 36\text{ V}$ , $V_A = 0\text{ V}$
$V_{ALTEXC,ON}$	Alternator Excitation Trigger On Voltage	1.8	-	-	V	
$V_{ALTEXC,OFF}$	Alternator Excitation Trigger Off Voltage	-	-	1.7	V	
$I_{ALTEXC}$	Alternator Excitation Trigger Current	-	10	-	$\mu\text{A}$	$V_{ALTEXC} = 1.8\text{ V}$
		-	60	-		$V_{ALTEXC} = 12\text{ V}$
		-	170	-		$V_{ALTEXC} = 24\text{ V}$
		-	290	-		$V_{ALTEXC} = 36\text{ V}$
$t_{ALTEXC,DELAY}$	Alternator Excitation Delay Time	-	4	-	s	
$t_{ALTEXC,ACTIVE}$	Alternator Excitation Active Time	-	60	-	s	

### NOTES

- 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.
- Larger negative voltages will blow internal fuse. If fuse blows, as long as  $V_A$  is not more negative than -21/-39 V for model SRxxxA/SRxxxB, respectively, and is less than  $V_K$ , no damage to device will occur. Call manufacturer to replace blown fuse.
- Transient-protected to 40 V. Additional external protection may be required in some applications.
- Transient-protected to 60 V. Additional external protection may be required in some applications.
- Using the rectifier with the device ground disconnected is not recommended. Exceeding any of these ratings will cause excessive heat buildup, leading to MOSFET failure.
- Transient-protected to -60 V. Additional external protection may be required in some applications.
- $I_S$  sourced from cathode (anode), when  $V_A < V_K$  ( $V_A > V_K$ ).

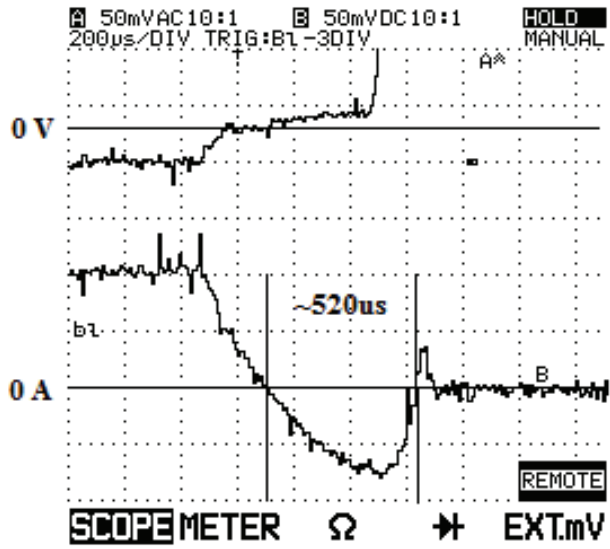


Figure 1: Reverse Current Shutdown Performance

Top Trace:  $V_K - V_A$   
Bottom Trace: Forward,  $I_F$  (50A/div)

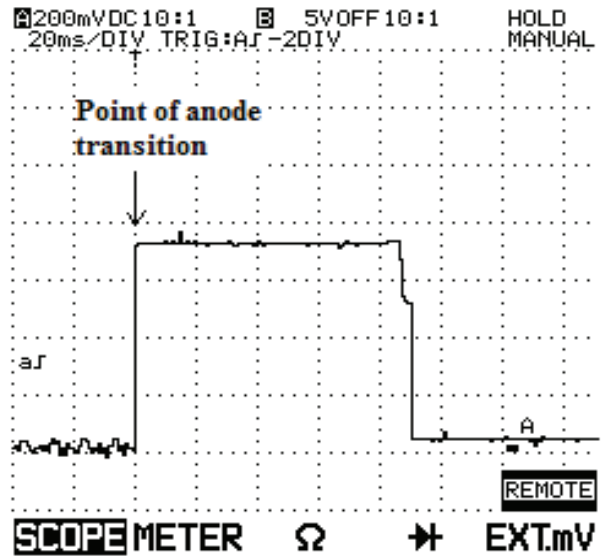
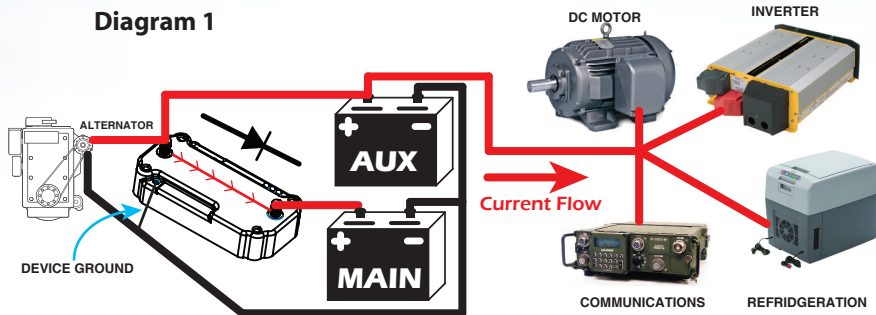


Figure 2: Start-Up Forward Voltage Drop

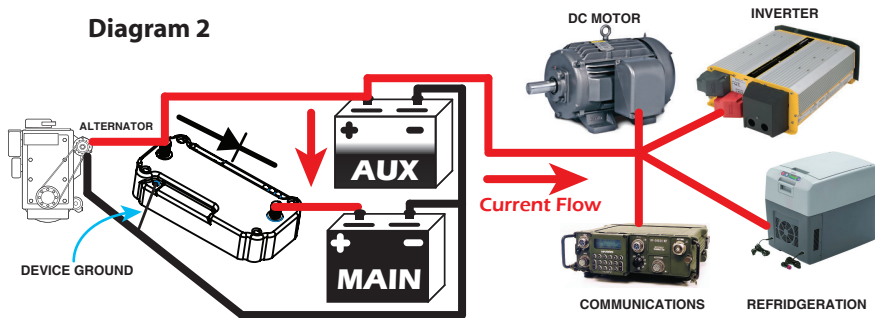
Trace:  $V_F$   
 $V_A$ : 0 to 12.5 V,  $I_F = 100$  A

Diagram 1



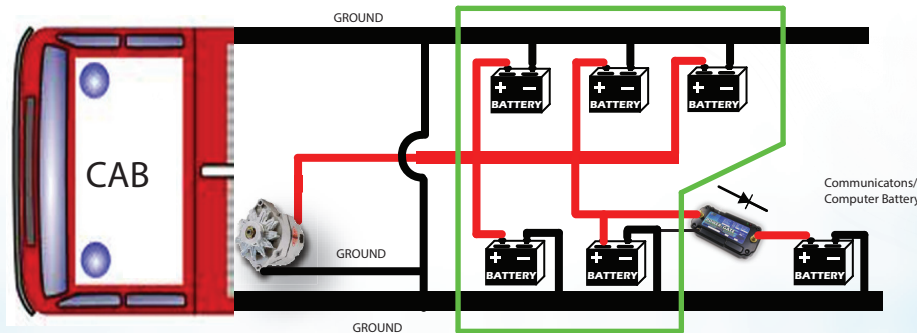
**POWER-GATE Single Rectifier Isolator allows all batteries in the network to be charged. In Diagram 1, the alternator is charging the AUX battery which is common on the device input post, and current is flowing through the MOSFET array to the MAIN battery. All loads applied to both batteries are being powered. See Diagram 2 to see what happens when the AUX battery is discharged.**

Diagram 2



**When the vehicle is off and load(s) are applied to the AUX battery, the AUX battery will discharge independent of the MAIN battery. Note the orientation of the diode symbol. The POWER-GATE's MOSFET array behaves like an "ideal" diode in that reverse current cannot flow from MAIN to AUX while forward current enjoys an absolute minimum voltage drop as denoted in Diagram 1.**

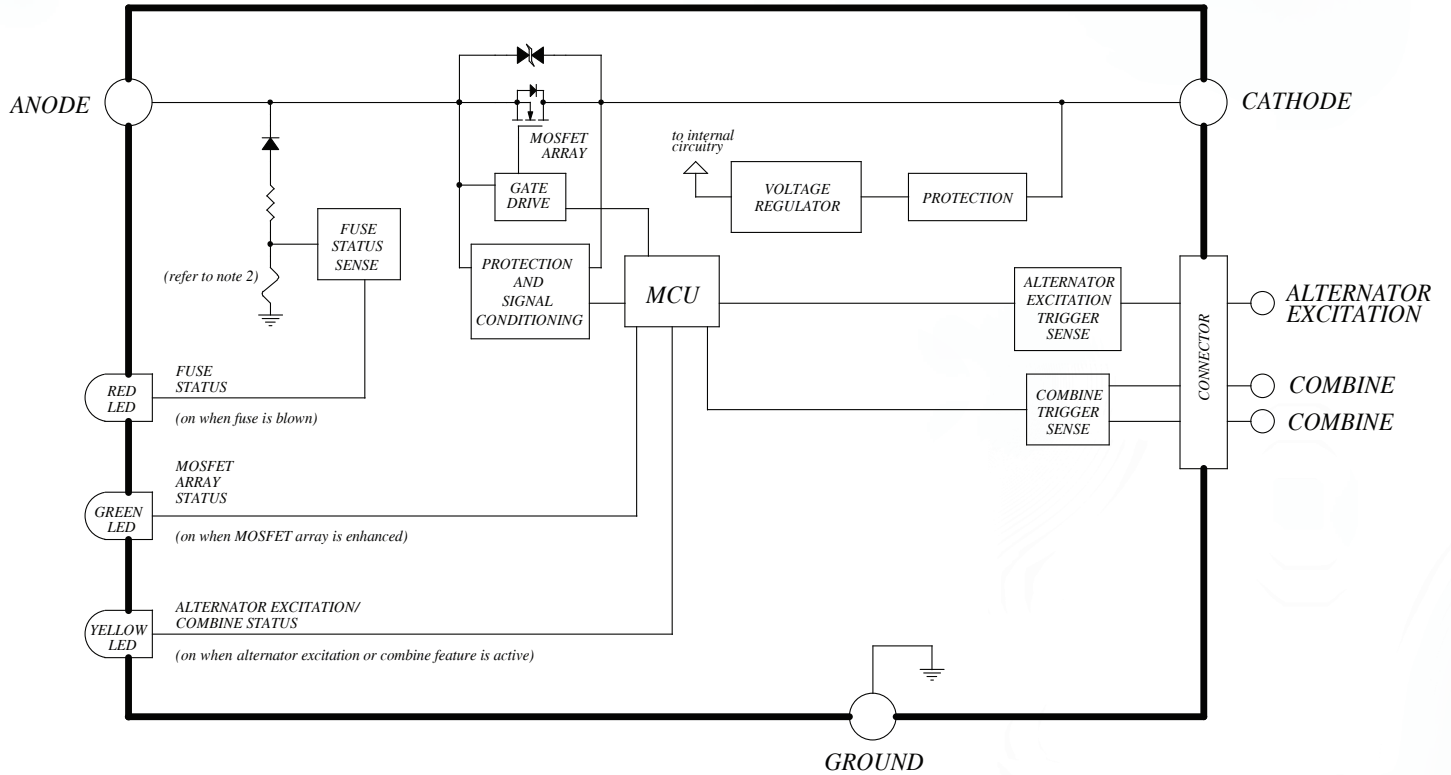
Diagram 3



**POWER-GATE Single Rectifier Isolator can be installed as an ideal diode. In Diagram 3, the Communications/Computer battery is isolated from the rest of the battery network. When the vehicle engine is cranked, the resulting dip in system voltage can cause the Communications and Computer equipment to reset. However, with the Comms/Computer battery isolated on its own dedicated cathode, when the system voltage dips, the Comm/Computer battery is automatically isolated alleviating wait-time needed for systems to reboot.**


**Under normal charging conditions either provided by the alternator or shore-power, all batteries charge as normal.**

FUNCTIONAL BLOCK DIAGRAM



REVISION HISTORY

REV	DATE	DESCRIPTION	PAGE NUMBER (S)
0	02/28/14	Original Release	
1	03/13/14	Comprehensive Update	
2	05/02/14	Comprehensive Update	
3	05/23/14	Added torque specification for enclosure mounts	1

 <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 DESCARGE ELECTRIQUE OU EXPLOSION</b></p> <ul style="list-style-type: none"> <li>Eteindre toutes les sources d'énergie 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-suivi de ces instructions provoquera la mort ou des lésions sérieuses sérieuses.</p>	<p><b>GEFAHR EINES ELEKTRISCHE N 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'alimentazione 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'alimentazione</li> </ul> <p>L'omissione di seguire queste istruzioni provocherà la morte o di lesioni serie</p>	<p><b>RISCO DE DESCARGA ELÉTRICA OU EXPLOSÃO</b></p> <ul style="list-style-type: none"> <li>Desconectar o equipamento de toda a energia antes de instalar ou trabalhar com este equipamento</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>