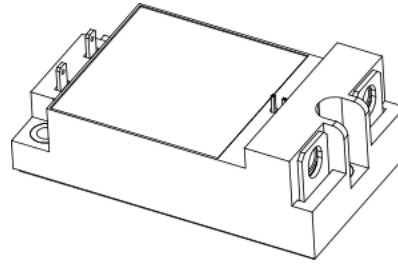


## Solid State DC Contactor

**Applications:**

- Main DC Bus Switch
- DC Motor Bus Switch
- Battery Disconnect
- Bus Discharge



**Description:**

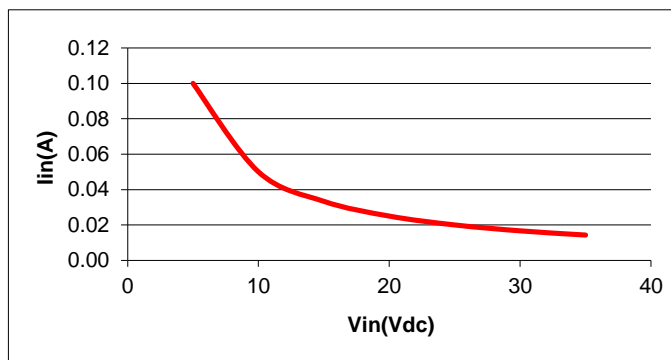
Sensitron has developed a small footprint High Voltage/High Current DC solid state Relay/Contactor. This device incorporates the latest state of the art technology to reduce the “on” state power losses and voltage drop to a minimum. The device is a true four terminal relay, and doesn’t need an additional power source for bias. This device uses robust magnetic coupling to achieve high isolation, reliability, and long life. The input control lead will accept any voltage from 4.6V to 36VDC.

**Features:**

- 2000V Input to Output / Output to Baseplate Isolation
- Up to 1200V Blocking
- Up to 100A Continuous Current
- Up to 400A Surge Capability
- Single wide range DC input signal 4.6V to 36V
- Low Power Control, 0.5W Typ.
- Low “on” state resistance
- Fast turn on/turn off
- High Current Terminals
- Three Point Mounting Plate
- $R_{\theta JC} \leq 1.15^{\circ}\text{C/W}$
- 1.4” x 2.6” x .5”

**Input Control Specifications:**

Parameter	Description	MIN	TYP	MAX	Unit
$V_{\text{control}}$	DC Control Voltage Between pins 1 and 2	4.6		36	Volts
$I_{\text{control}}$	Input Current at control pins 1 and 2, $V_{\text{in}} = 4.6\text{V to }36\text{V}$	10		150	mA
$P_{\text{control}}$	Control Input Power Consumption		0.5	0.69	Watt



**Fig. 1 – Typical Input Current vs. Input Volt**

**TECHNICAL DATA**  
**DATASHEET 5475, REV. C**
**SSRxxxD005 (50V Models) Output Specifications:**

Parameter	Description	MIN	TYP	MAX	Unit
V <sub>OUT</sub>	Max Blocking Voltage Across Pins 3 and 4			50	V <sub>DC</sub>
I <sub>LEAK</sub>	Output leakage T <sub>J</sub> = 25 °C, V <sub>DS</sub> = 50V, V <sub>GS</sub> = 0V T <sub>J</sub> = 125 °C, V <sub>DS</sub> = 50V, V <sub>GS</sub> = 0V <sup>(1)</sup>			60 750	μA
I <sub>OUT</sub>	Max Continuous Contact Current SSR033D005 SSR066D005 SSR100D005	0 0 0		33 66 100	A
I <sub>SURGE</sub>	Output Surge Current Capability, T <sub>J</sub> = 25 °C 250μS Pulse			1400	A(pk)
I <sub>LATCH</sub>	Over Current latch, at 25 °C SSR033D005 SSR066D005 SSR100D005		265 400 400		A(pk)
R <sub>ON</sub>	Contact Resistance, T <sub>J</sub> = 25 °C		2.3	2.9	mOhm
R <sub>ON</sub>	Contact Resistance, T <sub>J</sub> = 150 °C <sup>(1)</sup>		3.0	3.8	mOhm
V <sub>DROP</sub>	Voltage drop at I <sub>OUT</sub> , T <sub>J</sub> = 25 °C SSR033D005 SSR066D005 SSR100D005		0.076 0.152 0.230	0.096 0.191 0.290	V <sub>DC</sub>
V <sub>DROP</sub>	Voltage drop at I <sub>OUT</sub> , T <sub>J</sub> = 150 °C <sup>(1)</sup> SSR033D005 SSR066D005 SSR100D005			0.126 0.251 0.380	V <sub>DC</sub>
C <sub>OUT</sub>	Capacitance, V <sub>DS</sub> =50V, f=100kHz		2160		pF
E <sub>AS</sub>	Avalanche energy, single pulse T <sub>J</sub> = 25 °C, I <sub>D</sub> = 120A, V <sub>DS</sub> = 50V, L = 23μH			170	mJ
V <sub>SD</sub>	Reverse Diode V <sub>F</sub> , at I <sub>OUT</sub> , T <sub>J</sub> = 25 °C I <sub>F</sub> = 75A, di/dt = 100A/μs, V <sub>R</sub> = 40V			1.3	V <sub>DC</sub>
t <sub>rr</sub>	Reverse recovery time, T <sub>J</sub> = 25 °C I <sub>F</sub> = 75A, di/dt = 100A/μs, V <sub>R</sub> = 40V			50	ns

**TECHNICAL DATA**  
**DATASHEET 5475, REV. C**
**SSRxxxD010 (100V Models) Output Specifications:**

Parameter	Description	MIN	TYP	MAX	Unit
V <sub>OUT</sub>	Max Blocking Voltage Across Pins 3 and 4			100	V <sub>DC</sub>
I <sub>LEAK</sub>	Output leakage T <sub>J</sub> = 25 °C, V <sub>DS</sub> = 100V, V <sub>GS</sub> = 0V T <sub>J</sub> = 125 °C, V <sub>DS</sub> = 100V, V <sub>GS</sub> = 0V <sup>(1)</sup>			60 750	μA
I <sub>OUT</sub>	Max Continuous Contact Current SSR033D010 SSR066D010 SSR100D010	0 0 0		33 66 100	A
I <sub>SURGE</sub>	Output Surge Current Capability, T <sub>J</sub> = 25 °C 250μS Pulse			1200	A(pk)
I <sub>LATCH</sub>	Over Current latch, at 25 °C SSR033D010 SSR066D010 SSR100D010		265 400 400		A(pk)
R <sub>ON</sub>	Contact Resistance, T <sub>J</sub> = 25 °C		3.1	4.1	mOhm
R <sub>ON</sub>	Contact Resistance, T <sub>J</sub> = 150 °C <sup>(1)</sup>		5.0	6.8	mOhm
V <sub>DROP</sub>	Voltage drop at I <sub>out</sub> , T <sub>J</sub> = 25 °C SSR033D010 SSR066D010 SSR100D010		0.103 0.205 0.310	0.133 0.266 0.403	V <sub>DC</sub>
V <sub>DROP</sub>	Voltage drop at I <sub>out</sub> , T <sub>J</sub> = 150 °C <sup>(1)</sup> SSR033D010 SSR066D010 SSR100D010			0.224 0.448 0.679	V <sub>DC</sub>
C <sub>OUT</sub>	Capacitance, V <sub>DS</sub> =50V, f=100kHz		1470		pF
E <sub>AS</sub>	Avalanche energy, single pulse T <sub>J</sub> = 25 °C, I <sub>D</sub> = 75A, V <sub>DS</sub> = 50V, L = 47μH			130	mJ
V <sub>SD</sub>	Reverse Diode V <sub>F</sub> , at I <sub>out</sub> , T <sub>J</sub> = 25 °C I <sub>F</sub> = 75A, di/dt = 100A/μs, V <sub>R</sub> = 85V			1.3	V <sub>DC</sub>
t <sub>rr</sub>	Reverse recovery time, T <sub>J</sub> = 25 °C I <sub>F</sub> = 75A, di/dt = 100A/μs, V <sub>R</sub> = 85V		40		ns

**TECHNICAL DATA**  
**DATASHEET 5475, REV. C**
**SSRxxxD020 (200V Models) Output Specifications:**

Parameter	Description	MIN	TYP	MAX	Unit
V <sub>OUT</sub>	Max Blocking Voltage Across Pins 3 and 4			200	V <sub>DC</sub>
I <sub>LEAK</sub>	Output leakage T <sub>J</sub> = 25 °C, V <sub>DS</sub> = 200V, V <sub>GS</sub> = 0V T <sub>J</sub> = 125 °C, V <sub>DS</sub> = 200V, V <sub>GS</sub> = 0V <sup>(1)</sup>			60 750	μA
I <sub>OUT</sub>	Max Continuous Contact Current SSR025D020 SSR033D020 SSR066D020	0 0 0		25 33 66	A
I <sub>SURGE</sub>	Output Surge Current Capability, T <sub>J</sub> = 25 °C 250μS Pulse			600	A(pk)
I <sub>LATCH</sub>	Over Current latch, at 25 °C SSR025D020 SSR033D020 SSR066D020		200 265 400		A(pk)
R <sub>ON</sub>	Contact Resistance, T <sub>J</sub> = 25 °C		4.2	5.5	mOhm
R <sub>ON</sub>	Contact Resistance, T <sub>J</sub> = 150 °C <sup>(1)</sup>		8.7	11.8	mOhm
V <sub>DROP</sub>	Voltage drop at I <sub>out</sub> , T <sub>J</sub> = 25 °C SSR025D020 SSR033D020 SSR066D020		0.104 0.138 0.275	0.137 0.180 0.360	V <sub>DC</sub>
V <sub>DROP</sub>	Voltage drop at I <sub>out</sub> , T <sub>J</sub> = 150 °C <sup>(1)</sup> SSR025D020 SSR033D020 SSR066D020			0.295 0.390 0.777	V <sub>DC</sub>
C <sub>OUT</sub>	Capacitance, V <sub>DS</sub> =25V, f=100kHz		2430		pF
E <sub>AS</sub>	Avalanche energy, single pulse T <sub>J</sub> = 25 °C, I <sub>D</sub> = 60A, V <sub>DS</sub> = 50V			760	mJ
V <sub>SD</sub>	Reverse Diode V <sub>F</sub> , at I <sub>out</sub> , T <sub>J</sub> = 25 °C I <sub>F</sub> = 81A, di/dt = 100A/μs			1.3	V <sub>DC</sub>
t <sub>rr</sub>	Reverse recovery time, T <sub>J</sub> = 25 °C I <sub>F</sub> = 81A, di/dt = 100A/μs		130		ns

**TECHNICAL DATA**  
**DATASHEET 5475, REV. C**
**SSRxxxD060 (600V Models) Output Specifications:**

Parameter	Description	MIN	TYP	MAX	Unit
V <sub>OUT</sub>	Max Blocking Voltage Across Pins 3 and 4			600	V <sub>DC</sub>
I <sub>LEAK</sub>	Output leakage T <sub>J</sub> = 25 °C, V <sub>DS</sub> = 600V, V <sub>GS</sub> = 0V T <sub>J</sub> = 125 °C, V <sub>DS</sub> = 600V, V <sub>GS</sub> = 0V <sup>(1)</sup>			3 300	μA
I <sub>OUT</sub>	Max Continuous Contact Current SSR015D060 SSR025D060 SSR033D060 SSR050D060	0 0 0 0		15 25 33 50	A
I <sub>SURGE</sub>	Output Surge Current Capability, T <sub>J</sub> = 25 °C 250μS Pulse			600	A(pk)
I <sub>LATCH</sub>	Over Current latch, at 25 °C SSR015D060 SSR025D060 SSR033D060 SSR050D060		120 200 265 400		A(pk)
R <sub>ON</sub>	Contact Resistance, T <sub>J</sub> = 25 °C		9.5	12.3	mOhm
R <sub>ON</sub>	Contact Resistance, T <sub>J</sub> = 150 °C <sup>(1)</sup>		19.1	25.1	mOhm
V <sub>DROP</sub>	Voltage drop at I <sub>out</sub> , T <sub>J</sub> = 25 °C SSR015D060 SSR025D060 SSR033D060 SSR050D060		0.143 0.238 0.314 0.475	0.185 0.308 0.406 0.615	V <sub>DC</sub>
V <sub>DROP</sub>	Voltage drop at I <sub>out</sub> , T <sub>J</sub> = 150 °C <sup>(1)</sup> SSR015D060 SSR025D060 SSR033D060 SSR050D060			0.376 0.627 0.827 1.253	V <sub>DC</sub>
C <sub>OUT</sub>	Capacitance, V <sub>DS</sub> =100V, f=100kHz		669		pF
E <sub>AS</sub>	Avalanche energy, single pulse T <sub>J</sub> = 25 °C, I <sub>D</sub> = 15A, V <sub>DS</sub> = 50V			2000	mJ
V <sub>SD</sub>	Reverse Diode V <sub>F</sub> , at I <sub>out</sub> , T <sub>J</sub> = 25 °C I <sub>SD</sub> = 84A, di/dt = 100A/μs, V <sub>DS</sub> = 100V			1.5	V <sub>DC</sub>
t <sub>rr</sub>	Reverse recovery time, T <sub>J</sub> = 25 °C I <sub>SD</sub> = 84A, di/dt = 100A/μs, V <sub>DS</sub> = 100V		544		ns

**TECHNICAL DATA**  
**DATASHEET 5475, REV. C**
**SSRxxxD080 (800V Models) Output Specifications:**

Parameter	Description	MIN	TYP	MAX	Unit
V <sub>OUT</sub>	Max Blocking Voltage Across Pins 3 and 4			800	V <sub>DC</sub>
I <sub>LEAK</sub>	Output leakage T <sub>J</sub> = 25 °C, V <sub>DS</sub> = 800V, V <sub>GS</sub> = 0V T <sub>J</sub> = 125 °C, V <sub>DS</sub> = 800V, V <sub>GS</sub> = 0V <sup>(1)</sup>			3 300	μA
I <sub>OUT</sub>	Max Continuous Contact Current SSR015D080 SSR025D080 SSR033D080	0 0 0		15 25 33	A
I <sub>SURGE</sub>	Output Surge Current Capability, T <sub>J</sub> = 25 °C 250μS Pulse			400	A(pk)
I <sub>LATCH</sub>	Over Current latch, at 25 °C SSR015D080 SSR025D080 SSR033D080		120 200 265		A(pk)
R <sub>ON</sub>	Contact Resistance, T <sub>J</sub> = 25 °C		14.9	20.7	mOhm
R <sub>ON</sub>	Contact Resistance, T <sub>J</sub> = 150 °C <sup>(1)</sup>		29.5	41.7	mOhm
V <sub>DROP</sub>	Voltage drop at I <sub>OUT</sub> , T <sub>J</sub> = 25 °C SSR015D080 SSR025D080 SSR033D080		0.225 0.371 0.490	0.311 0.518 0.684	V <sub>DC</sub>
V <sub>DROP</sub>	Voltage drop at I <sub>OUT</sub> , T <sub>J</sub> = 150 °C <sup>(1)</sup> SSR015D080 SSR025D080 SSR033D080			0.626 1.043 1.376	V <sub>DC</sub>
C <sub>OUT</sub>	Capacitance, V <sub>DS</sub> =1000V, f=100kHz		450		pF
E <sub>AS</sub>	Avalanche energy, single pulse T <sub>J</sub> = 25 °C, I <sub>D</sub> = 40A, V <sub>DS</sub> = 50V			2000	mJ
V <sub>SD</sub>	Reverse Diode V <sub>F</sub> , at I <sub>OUT</sub> , T <sub>J</sub> = 25 °C I <sub>F</sub> = 20A, di/dt = 1000A/μs, V <sub>R</sub> = 800V		3.3		V <sub>DC</sub>
t <sub>rr</sub>	Reverse recovery time, T <sub>J</sub> = 25 °C I <sub>F</sub> = 20A, di/dt = 1000A/μs, V <sub>R</sub> = 800V		54		ns

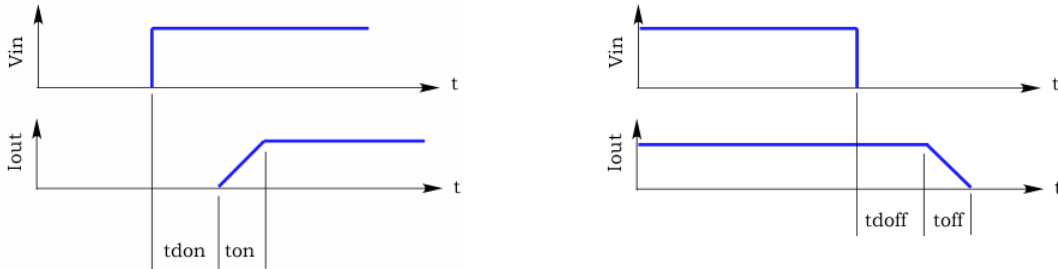
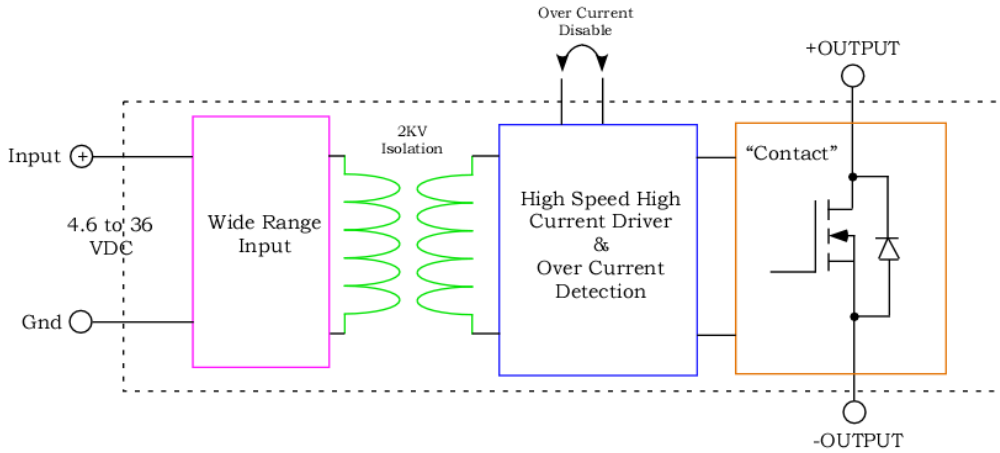
**TECHNICAL DATA**  
**DATASHEET 5475, REV. C**
**SSRxxxD120 (1200V Models) Output Specifications:**

Parameter	Description	MIN	TYP	MAX	Unit
V <sub>OUT</sub>	Max Blocking Voltage Across Pins 3 and 4			1200	V <sub>DC</sub>
I <sub>LEAK</sub>	Output leakage T <sub>J</sub> = 25 °C, V <sub>DS</sub> = 1200V, V <sub>GS</sub> = 0V T <sub>J</sub> = 125 °C, V <sub>DS</sub> = 1200V, V <sub>GS</sub> = 0V <sup>(1)</sup>			3 300	μA
I <sub>OUT</sub>	Max Continuous Contact Current SSR015D120 SSR025D120 SSR033D120	0 0 0		15 25 33	A
I <sub>SURGE</sub>	Output Surge Current Capability, T <sub>J</sub> = 25 °C 250μS Pulse			400	A(pk)
I <sub>LATCH</sub>	Over Current latch, at 25 °C SSR015D120 SSR025D120 SSR033D120		120 200 265		A(pk)
R <sub>ON</sub>	Contact Resistance, T <sub>J</sub> = 25 °C		14.9	20.7	mOhm
R <sub>ON</sub>	Contact Resistance, T <sub>J</sub> = 150 °C <sup>(1)</sup>		29.5	41.7	mOhm
V <sub>DROP</sub>	Voltage drop at I <sub>OUT</sub> , T <sub>J</sub> = 25 °C SSR015D120 SSR025D120 SSR033D120		0.225 0.371 0.490	0.311 0.518 0.684	V <sub>DC</sub>
V <sub>DROP</sub>	Voltage drop at I <sub>OUT</sub> , T <sub>J</sub> = 150 °C <sup>(1)</sup> SSR015D120 SSR025D120 SSR033D120			0.626 1.043 1.376	V <sub>DC</sub>
C <sub>OUT</sub>	Capacitance, V <sub>DS</sub> =1000V, f=100kHz		450		pF
E <sub>AS</sub>	Avalanche energy, single pulse T <sub>J</sub> = 25 °C, I <sub>D</sub> = 40A, V <sub>DS</sub> = 50V			2000	mJ
V <sub>SD</sub>	Reverse Diode V <sub>F</sub> , at I <sub>OUT</sub> , T <sub>J</sub> = 25 °C I <sub>F</sub> = 20A, di/dt = 1000A/μs, V <sub>R</sub> = 800V		3.3		V <sub>DC</sub>
t <sub>rr</sub>	Reverse recovery time, T <sub>J</sub> = 25 °C I <sub>F</sub> = 20A, di/dt = 1000A/μs, V <sub>R</sub> = 800V		54		ns

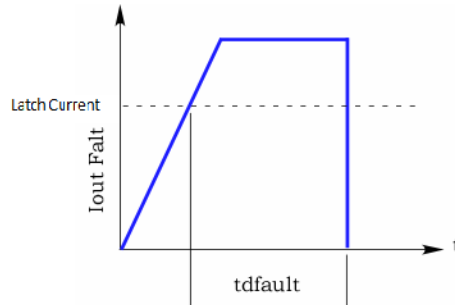
**Notes:**

1. These parameters are controlled via design or process and are not directly tested. Parameters are characterized on initial design release and upon design changes which would affect these characteristics.

**TECHNICAL DATA**  
**DATASHEET 5475, REV. C**



**Fig. 4 – Input vs. Output Timing**



**Fig. 5 – Over Current Fault Shut Down**

**Switching Characteristics:**

Parameter	Description	MIN	TYP	MAX	Unit
$t_{on}$	“Contact” turn on time	-	0.5	-	us
$t_{off}$	“Contact” turn off time	-	0.6	-	us
$t_{don}$	Delay from input command to contact on	-	2.3	3	ms
$t_{doff}$	Delay from input command to contact off	-	0.2	1.5	ms
$t_{dlatch}$	Delay to latch after detection of Over Current, $I_{out} = I_{latch} + 10\%$ , $T_j = 25\text{ }^\circ\text{C}$	-	50	150	us
$F_{switch}$	Repetitive on to off switching frequency	-	-	200	Hz

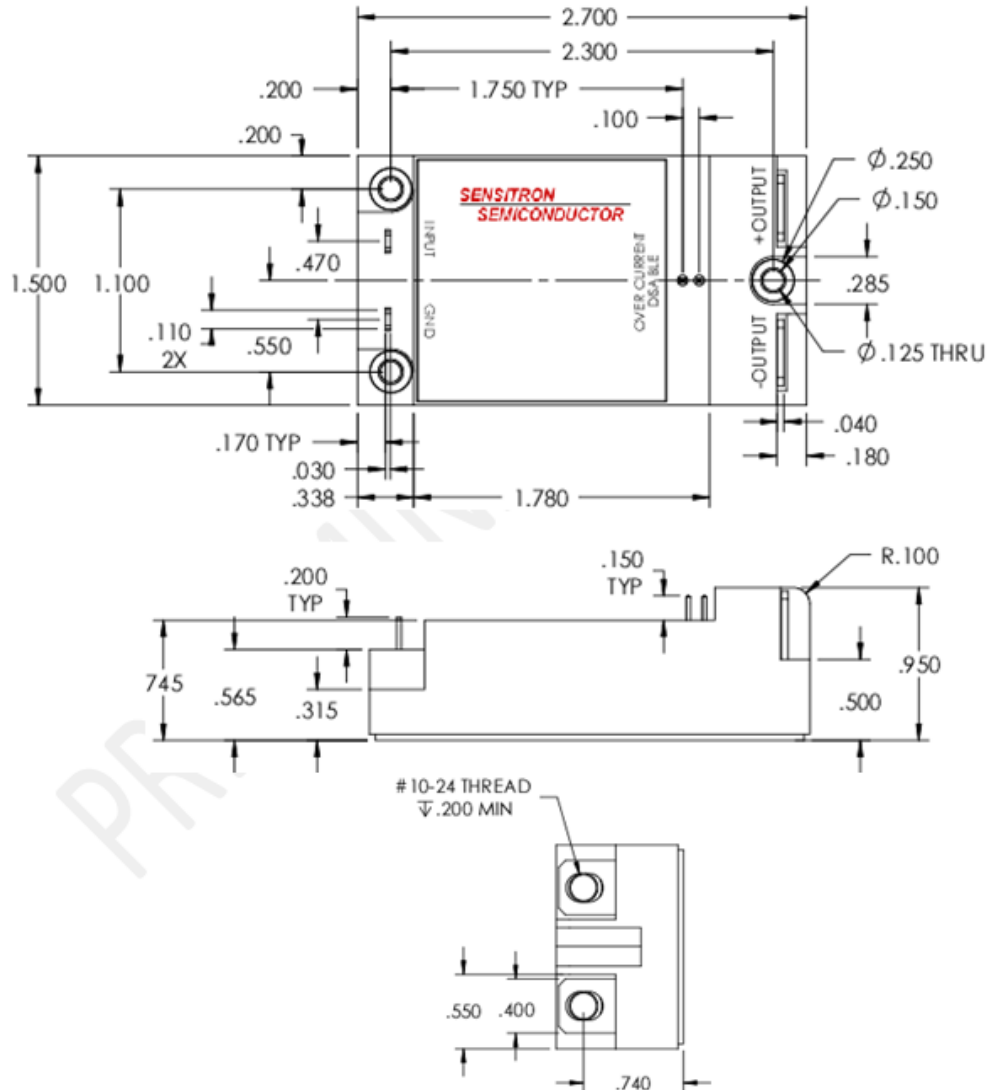


**TECHNICAL DATA**  
**DATASHEET 5475, REV. C**

**Environmental**

Parameter	Description	MIN	TYP	MAX	Unit
Isolation	Input to Output, <1mA	2000	-	-	VDC
Isolation	Input or Output to Case, <1mA	2000	-	-	VDC
T <sub>STG</sub>	Storage Temperature	-55	-	150	°C
T <sub>CASE</sub>	Operating Temperature (Baseplate)	-55	-	100	°C
T <sub>J</sub>	Operating Temperature (Junction)	-55	-	150	°C
R <sub>θJC</sub>	Thermal Resistance (Baseplate – Junction)	-	0.9	1.15	°C/W
	Weight	-	85	-	g

**Mechanical Outline**



Over Current Disable Pin Diameter = 0.025"

**Pin Assignments:**

**Input** – Apply a positive voltage to this pin with respect to pin Gnd to “close” the contacts.

**GND** – This is the return pin for the Input control voltage.

**+OUTPUT** – This is the positive terminal of the “contact”.

**-OUTPUT** – this is the return terminal for the +OUTPUT pin.

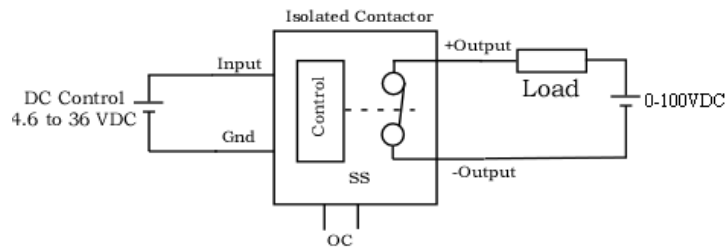
**Note:**

1. Input pins and output pins are isolated up to 2000VDC
2. The device may be damaged if the input polarity is reversed.
3. The “contact” is uni-polar; a voltage reversal will result in current flow in the internal diode.

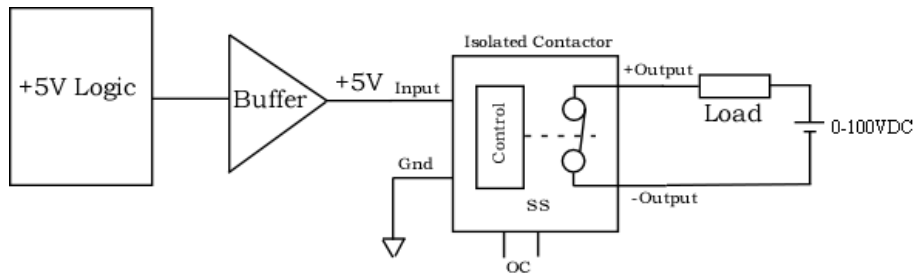
**Application Notes:**

A. Input Bias

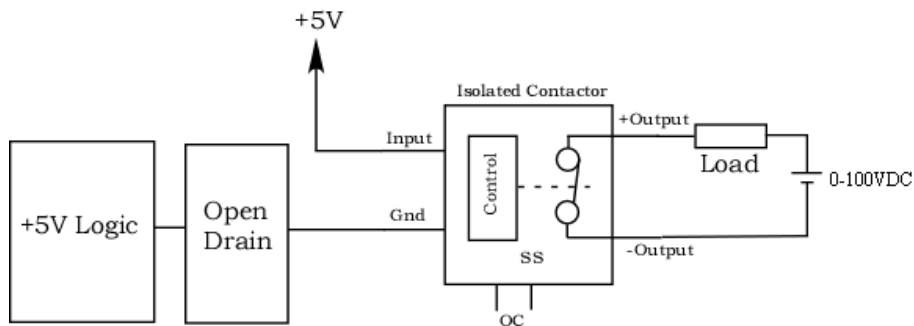
The SSR will be energized and the “Contact” will be closed, when a positive potential of 4.6VDC to 36VDC is applied between Input and Gnd. The input power consumption will be constant throughout the control voltage range therefore the contactor will draw more current at lower control voltages.



**DC Supply**



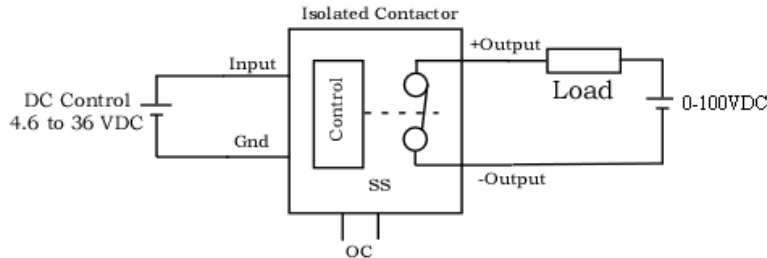
**TTL with Buffer**



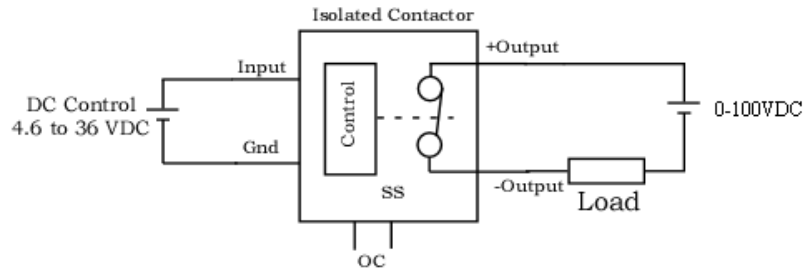
**Input Driven from TTL with Open Drain Driver**

**B. Output Load Connection**

The output circuit is completely floating therefore the Load can be connected to either output terminal.



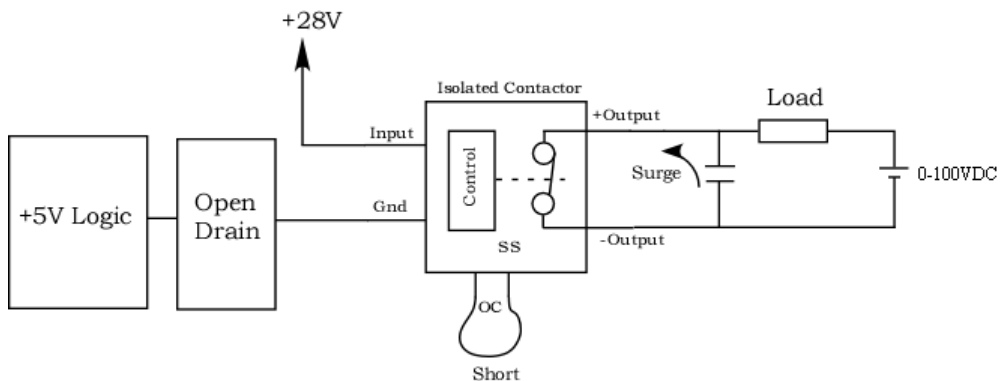
**Load connected to +Output Terminal**



**Load Connected to -Output Terminal**

**C. Over Current Disable**

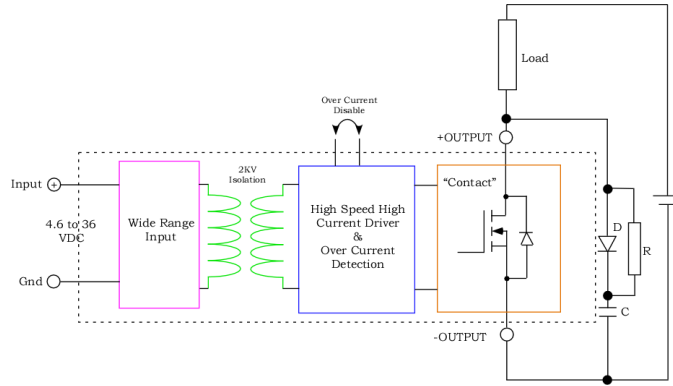
The SSR contains an Over Current latch which disables (opens) the contact whenever a large current in excess of the latching current is detected. The latch can only be reset by removing and re-applying the input control power. In noisy environments and in applications where high surge currents are encountered, the latch may be triggered prematurely. In these applications the latch circuit can be disabled by placing a short circuit between the over current disable terminals.



**TECHNICAL DATA**  
**DATASHEET 5475, REV. C**

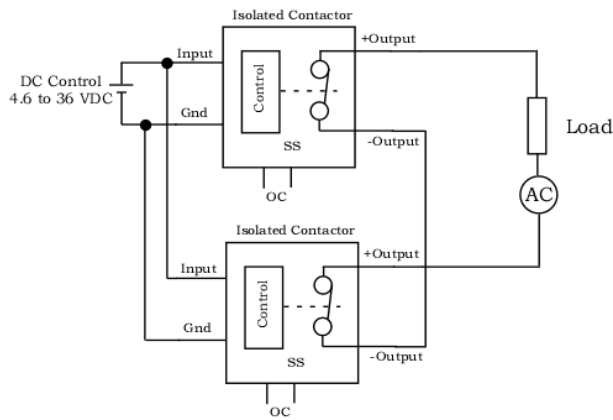
D. Contact Protection

The user must insure that the peak voltage rating of the SSR is not exceeded. The SSRXXDXXX family of devices switch at extremely fast speeds, therefore extra care must be taken to suppress voltage transients that are generated when interrupting high currents. Sensitron strongly advises the user to use a snubber network similar in design to the one shown below. This is an energy absorbing snubber that transfers the energy from any parasitic line inductance into the capacitor and then is dissipated through the resistor. The capacitor should be sized so that the captured energy does not charge the capacitor beyond the contacts rated voltage.



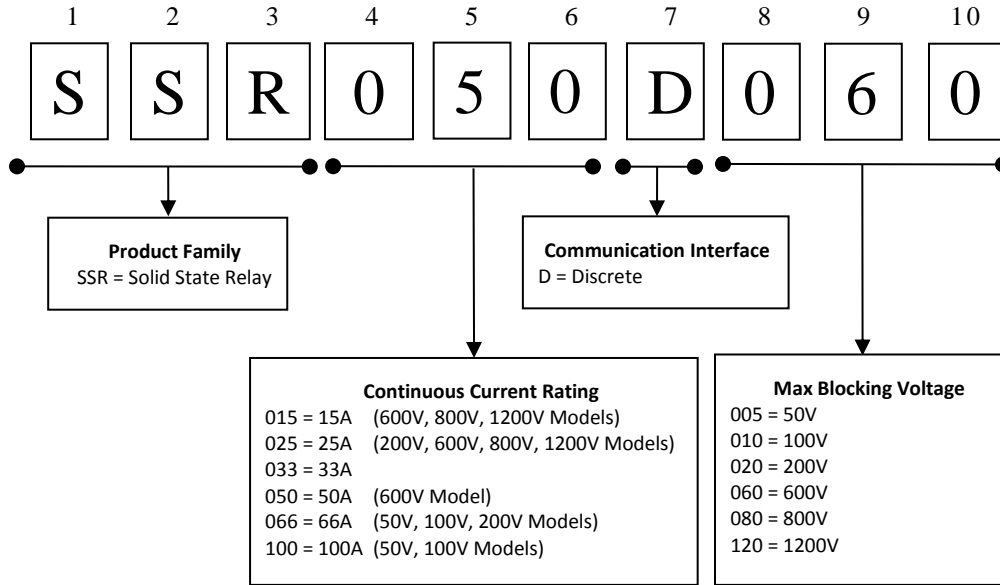
E. AC Operation

The contactor can be used for AC loads if two devices are connected "back to back".



**TECHNICAL DATA**  
**DATASHEET 5475, REV. C**

**Part Number Ordering Information**



**Available Part Numbers**

50V Models:	SSR033D005,	SSR066D005,	SSR100D005
100V Models:	SSR033D010,	SSR066D010,	SSR100D010
200V Models:	SSR025D020,	SSR033D020,	SSR066D020
600V Models:	SSR015D060,	SSR025D060,	SSR033D060, SSR050D060
800V Models:	SSR015D080,	SSR025D080,	SSR033D080
1200V Models:	SSR015D120,	SSR025D120,	SSR033D120

**DISCLAIMER:**

1- The information given herein, including the specifications and dimensions, is subject to change without prior notice to improve product characteristics. Before ordering, purchasers are advised to contact the Sensitron Semiconductor sales department for the latest version of the datasheet(s).

2- In cases where extremely high reliability is required (such as use in nuclear power control, aerospace and aviation, traffic equipment, medical equipment, and safety equipment), safety should be ensured by using semiconductor devices that feature assured safety or by means of users' fail-safe precautions or other arrangement.

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