

# Solid State Relay



## Solid State Relay Offers More For Less: Longer Heater Life at Lower Cost

Watlow® solid state relays (SSR) offer many of the advantages of solid state power controllers, yet at a lower cost. Watlow's extensive knowledge in power controller design has led to the development of a special fast cycle input card that enables a SSR to operate from a standard 4-20mA instrumentation command signal. Test results have shown that a zero cross SSR in combination with the fast cycle card promotes better temperature control and longer heater life than slow cycle relays. Through a time proportional cycle rate of  $\frac{1}{10}$  of a second heater life will be extended.

Both low and high voltage models are available from 24 up to 660V~(ac). All ac output models include back to back Silicon Controlled Rectifiers (SCRs) for a more rugged design than the traditional triac based SSR. The internal design allows it to handle high currents and the harsh electrical environments of heavy industry. Watlow also offers a switched vdc model for dc heating applications.

Watlow can provide all the components necessary for trouble-free operation. This includes two standard convenience items: a thermal foil to ensure proper thermal transfer from the relay to the heat sink and belville washers that ensure the relay is mounted with sufficient pressure for good heat transfer. Matched semiconductor fuses and heat sinks are available to complete the power switching package.

Watlow® is a registered trademark of Watlow Electric Manufacturing Company.

UL® is a registered trademark of Underwriter's Laboratories, Inc.

### Features and Benefits

#### Fast cycle card

- Increases heater life
- Optimizes temperature control
- Allows for higher watt density heaters

#### Zero cross firing

- Results in minimal electrical noise

#### Back-to-back SCR design

- Withstands harsh or hostile industrial environments

UL® recognized File #E151484 and #E73741 CSA certified up to 600V~(ac), File #LR700195 VDE 60950 License #40021401, File #1995500 up to 480V~(ac)

- Meets applications requiring agency approval



WIN-SSR-0408

**ISO 9001**



Registered Company  
Winona, Minnesota USA





## Heater Life

Watlow has extensively tested electric heating elements with a variety of power switching devices. Results prove that the life of an electric element dramatically increases when the on-off cycle time that is used to time-proportion the heater is kept at less than one second. This reduces the thermal expansion and contraction of the element and improves heater life as much as 20 times. This very fast cycle time controls temperature much more accurately and allows the use of higher watt density heating elements.

## Fast Cycle Card

In order to obtain the very rapid cycling time required for longer heater life, accurate temperature control and higher watt densities, Watlow has developed a loop-powered firing card for SSRs. This card operates from a standard instrumentation signal of 4 to 20mA and controls solid state relays with a time proportional cycle rate of less than one second (4V~ cycles on and 4V~(ac) cycles off at 50 percent power).

## Thermal Transfer

A thermal foil is provided with each solid state relay for mounting on the base of the relay to improve heat transfer. In addition, two belville washers are supplied to provide the proper pressure for this transfer of heat. Use two #8-32 screws 16 mm (0.625 in.) long to secure the relay to the heat sink.

## Replacing Contactors or Mercury Displacement Relays (MDRs)

Improvements in heater life and control accuracy can be achieved with SSRs operated with rapid cycle times as compared to slower operating electromechanical relays or even MDRs. When replacing these types of relays with the SSR, it is important to consider two aspects:

### 1. Heat

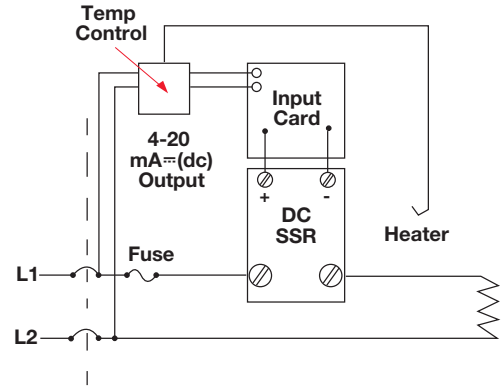
Solid state devices require a small voltage to turn on, which is consumed as heat (approx. 1.5 volts x amps = watts). This heat must be removed from the device and is usually accomplished by mounting the relay on heat sinks.

### 2. Failure Mode

Solid state devices should last for many years when properly protected with voltage snubbers, mounted on appropriate heat sinks and when fused with semiconductor fuses against the high currents caused by electrical shorts. Watlow's SSRs include an internal voltage snubber. However, if the unit fails, the most probable condition will be a short. Mechanical relays also have a good probability of failing short. In all cases where uncontrolled full power can cause damage, it is recommended that a high limit temperature controller and contactor be used for protection.

## Wiring Diagrams

### Single-Phase Fast Cycle Input Card

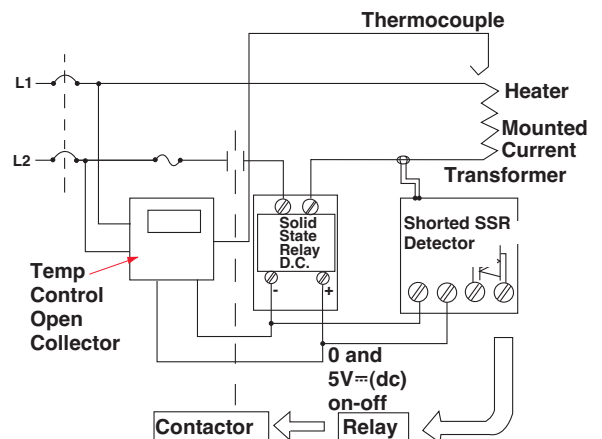


### Shorted SSR Alarm

The most prevalent concern when using solid state relays is the possibility of a relay failing in a shorted condition. With this in mind, Watlow has designed a cost effective "Shorted SSR Alarm".

The device monitors the output (current through the heater) and activates a triac (alarm) if there is no command signal from the temperature controller. The triac can be wired to a bell, or to a normally closed latching relay to remove power to the heater.

### Single-Phase Shorted SSR Detector

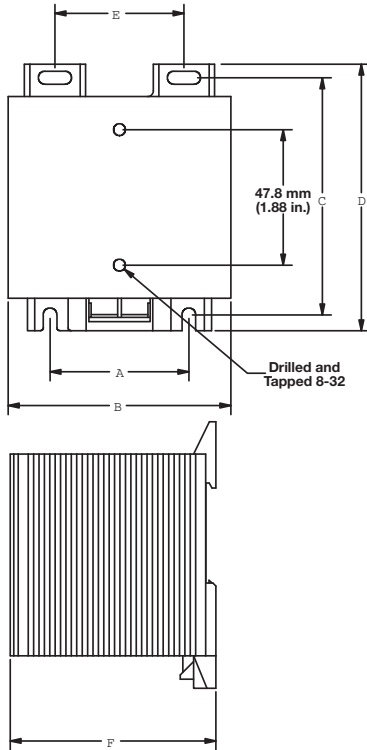


**Note:** Semiconductor power switching devices are not legal for over temperature limit or safety devices. For limit and safety devices you must have a positive mechanical break of all electrically hot legs simultaneously.

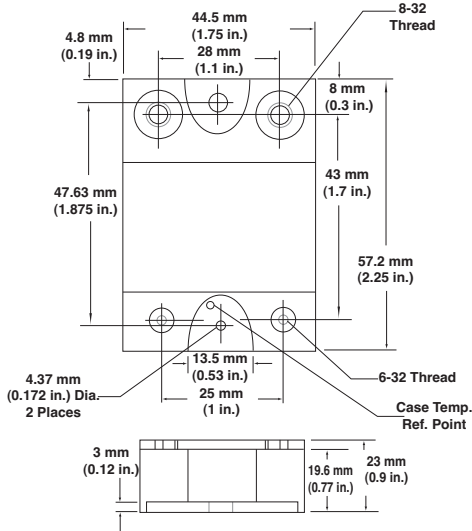
## Dimensions

Code Number	Descriptor	Dimensions					
		A mm (in.)	B mm (in.)	C mm (in.)	D mm (in.)	E mm (in.)	F mm (in.)
Z100-0815-000A	18A	N/A	46 (1.8)	82.6 (3.25)	94 (3.7)	N/A	48 (1.9)
Z100-0815-000B	35A	48.5 (1.91)	81 (3.2)	82.6 (3.25)	94 (3.7)	46 (1.81)	74 (2.9)
Z100-0815-000C	55A	48 (1.89)	81 (3.2)	138.4 (5.45)	149.6 (5.89)	46 (1.81)	91 (3.6)
Z100-0815-XXFC*	75A	48 (1.89)	81 (3.2)	138.4 (5.45)	181.9 (7.16)	46 (1.81)	91 (3.6)

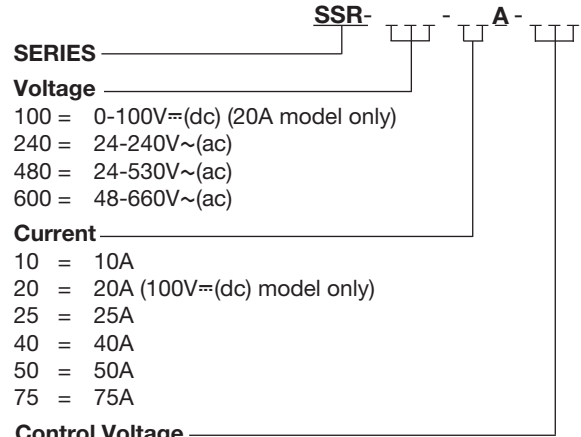
\* Fan cooled



### Dimensions - Solid State Relay



### Ordering Information



**SERIES** \_\_\_\_\_

**Voltage**

100 = 0-100V=(dc) (20A model only)

240 = 24-240V~(ac)

480 = 24-530V~(ac)

600 = 48-660V~(ac)

**Current** \_\_\_\_\_

10 = 10A

20 = 20A (100V=(dc) model only)

25 = 25A

40 = 40A

50 = 50A

75 = 75A

**Control Voltage** \_\_\_\_\_

DC1 = 3-32V=(dc) (see specifications)

AC1 = 90-280V~(ac)

RND = 3-32V=(dc) 10, 50 and 75A models only

Note: Relay will also include thermal foil, two belville washers and #8-32 screws for mounting to a heat sink.

#### Heat Sinks (Sold Separately)

Z100-0815-000A = 18A or 2.2°C/watt

Z100-0815-000B = 35A or 1.1°C/watt

Z100-0815-000C = 55A or 0.6°C/watt

Z100-0815-12FC = 75A or 0.16°C/watt (120V~(ac) fan)

Z100-0815-24FC = 75A or 0.16°C/watt (240V~(ac) fan)

#### Fast Cycle Input Card and Shorted SSR Alarm Card

For direct mounting on zero cross dc input solid state relay.

RPC-5399-42-000 = Fast Cycle Input card, 4-20mA input

RPC-5386-0000 = Shorted SSR alarm card

#### Sub Cycle Fuses-I<sup>2</sup>t (sold separately)

Recommended and available with holders

### Your Authorized Watlow Distributor is:

To be automatically connected to the nearest North American Technical Sales Office:

**1-800-WATLOW2 • www.watlow.com • info@watlow.com**

**International Technical Sales Offices:** Australia, +61-3-9335-6449 • China, +86-21-3950-9510 • France, +33 (0) 3073-2425 • Germany, +49 (0) 7253-9400-0 • Italy, +39 (0) 2 458-8841 • Japan, +81-3-3518-6630 • Korea, +82-2-575-9804 • Malaysia, +60-3-7980-7741 • Mexico, +52 (442) 217-6235 • Shanghai, +86-21-3950-9504 • Singapore, +65-6777-1266 • Spain, +34 91 675 1292 • Sweden, +46 35-27-11-66 • Taiwan, +886-7-288-5168 • United Kingdom, +44 (0) 115-964-0777