Solid State Relays – Application Data

Definition: A SSR (solid state relay) can perform many tasks that an EMR (electromechanical relay) can perform. The SSR differs in that it has no moving mechanical parts within it. It is essentially an electronic device that relies on the electrical, magnetic and optical properties of semiconductors, and electrical components to achieve its isolation and relay switching function.

Principle of Operation: Solid State Relays are similar to electromechanical relays, in that both use a control circuit and a separate circuit for switching the load. When voltage is applied to the input of the SSR, the relay is energized by a light emitting diode. The light from the diode is beamed into a light sensitive semiconductor which, in the case of zero voltage crossover relays, conditions the control circuit to turn on the output solid state switch at the next zero voltage crossover. In the case of nonzero voltage crossover relays, the output solid state switch is turned on at the precise voltage occurring at the time. Removal of the input power disables the control circuit and the solid state switch is turned off when the load current passes through the zero point of its cycle.

Applications: Since its introduction the SSR, as a technology, has gained acceptance in many areas, which had previously been the sole domain of the EMR or the Contactor. The major growth areas have come from Industrial Process Control applications; particularly heat/cool temperature control, motors, lamps, solenoids, valves, and transformers. The list of applications for the SSR is almost limitless.

The following are typical examples of SSR applications: industrial automation, electronic appliances, industrial appliances, packaging machines, tooling machines, manufacturing equipment, food equipment, security systems, industrial lighting, fire and security systems, dispensing machines, production equipment, on-board power control, traffic control, instrumentation systems, vending machines, test systems, office machines, medical equipment, display lighting, elevator control, metrology equipment, and entertainment lighting.

Advantages: When used correctly in the intended application, the SSR provides many of the characteristics that are often difficult to find in the EMR; a high degree of reliability, long service life, significantly reduced electromagnetic interference, fast response and high vibration resistance are significant benefits of the SSR. The SSR has no moving parts to wear out or arcing contacts to deteriorate, which are often the primary cause of failure with an EMR.

- Long life (reliability) > 10^9 operations
- Zero voltage turn on, low EMI / RFI
- Shock and Vibration resistant
- Random turn-on, proportional control
- No contact bounce
- Arc-less switching
- No acoustical noise
- Microprocessor compatible
- Fast response
- No moving parts

Thermal Considerations: One of the major considerations when using a SSR is properly managing the heat that is generated when switching currents higher than about 5 amps. In this scenario one must mount the base plate of the SSR onto a good heat conductor, typically aluminum; along with utilizing a good thermal transfer medium such as thermal grease or heat transfer pad. Using this technique, the SSR case to heat sink thermal resistance is reduced to a negligible value of 0.1 °C/W.

Thermal Calculations: To understand the thermal relationship between the output semiconductor junction (T_J) and the surrounding ambient temperature (T_A) one has to look at the temperature gradient or drop of temperature from junction to ambient (TJ - TA); which simply equals the sum of the thermal resistances multiplied by the junction power dissipation.

$$T_J - T_A = P(R_{\Theta JC} + R_{\Theta CS} + R_{\Theta SA})$$

Where

T_J	=	Junction Temperature, ˚C
T_A	=	Ambient Temperature, ˚C
P	=	Power Dissipation (I_{LOAD} X E_{DROP}) watts
$R_{\Theta JC}$	=	Thermal resistance, junction to case, ˚C/W
$R_{\Theta CS}$	=	Thermal resistance, case to sink, ˚C/W
$R_{\Theta SA}$	=	Thermal resistance, sink to ambient, ˚C/W

To use the equation, the maximum junction temperature of the semiconductor must be known, typically 125 ˚C, along with the actual power dissipation. When these two parameters are known, the third can be found as shown in the following examples:

1.) Determine the maximum allowable ambient temperature, for 1 ˚C/W heat sink and 10 amp load (12 watts) with a maximum allowable junction temperature (T_J) of 100 ˚C and assume thermal resistance from junction to case ($R_{\Theta JC}$) of 1.3:

$$\begin{aligned} T_J - T_A &= P(R_{\Theta JC} + R_{\Theta CS} + R_{\Theta SA}) \\ &= 12\,(1.3 + 0.1 + 1.0) \\ &= 28.8 \end{aligned}$$

hence,

$$\begin{aligned} T_A &= T_J - 28.8 \\ &= 100 - 28.8 \\ &= 71.2\ ˚C \end{aligned}$$

2.) Determine **required heat sink thermal resistance**, for 71.2 ˚C maximum ambient temperature and a 10 amp load (12 watts):

$$\begin{aligned} R_{\Theta SA} &= \frac{T_J - T_A}{P} - (R_{\Theta JC} + R_{\Theta CS}) \\ &= \frac{100 - 71.2}{12} - (1.3 + 0.1) \\ &= 1\ ˚C/W \end{aligned}$$

3.) Determine **maximum load current**, for 1 ˚C/W heat sink and 71.2 ˚C ambient temperature:

$$\begin{aligned} P &= \frac{T_J - T_A}{(R_{\Theta JC} + R_{\Theta CS} + R_{\Theta SA})} \\ &= \frac{100 - 71.2}{1.3 + 0.1 + 1.0} \\ &= 12 \text{ watts} \end{aligned}$$

hence,

$$\begin{aligned} I_{LOAD} &= \frac{P}{E_{DROP}} \\ & \frac{12}{1.2} \\ &= 10 \text{ amperes} \end{aligned}$$

Load Considerations: The major cause of application problems with SSRs is improper heat sinking. Following that, are problems which result from operating conditions which specific loads impose upon an SSR. The surge characteristics of the load should be carefully considered when designing in an SSR as a switching solution.

Resistive Loads: Loads of constant value of resistance are the simplest application of SSRs. Proper thermal consideration along with attention to the steady state current ratings will result in trouble free operation.

DC Loads: This type of load should be considered inductive and a diode should be placed across the load to absorb any surges during turn off.

Lamp loads: Incandescent lamp loads, though basically resistive, present some special problems. Because the resistance of the cold filament is about 5 to 10 percent of the heated value, a large inrush current can occur. It is essential to verify that this inrush current is within the surge specifications of the SSR. One must also check that the lamp rating of the SSR is not exceeded. This is a UL rating based on the inrush of a typical lamp. Due to the unusually low filament resistance at the time of turn-on, a zero voltage turn on characteristic is particularly desirable with incandescent lamps.

Capacitive Loads: These types of loads can also prove to be problematic because of their initial appearance as short circuits. High surge currents can occur while charging, limited only by circuit resistance. Caution must be used with low impedance capacitive loads to verify that the di/dt capabilities are not exceeded. Zero voltage turn on is a particularly valuable means of limiting di/dt with capacitive loads.

Motors and Solenoids: Motor and solenoid loads can create special problems for reliable SSR functionality. Solenoids have high initial surge currents because their stationary impedance is very low. Motors also frequently have severe inrush currents during starting and can impose unusually high voltages during turn off. As a motor's rotor rotates, it creates a back EMF that reduces the flow of current. This back EMF can add to the applied line voltage and create an over voltage condition during turn off. Likewise, the inrush currents associated with mechanical loads having high starting torque or inertia, such as fans and flywheels, should be carefully considered to verify that they are within the surge capabilities of the SSR. A current shunt and oscilloscope should be used to examine the duration of the inrush current.

Transformers: In controlling transformers, the characteristics of the secondary load should be considered because they reflect the effective load on the SSR. Voltage transients from secondary loads circuits, similarly, are frequently transformer and can be imposed on the SSR. Transformers present a special problem in that, depending on the state of the transformer flux at the time of turn off, the transformer may saturate during the first half-cycle of subsequently applied voltage. This saturation can impose a very large current (10 to 100 times rated typical) on the SSR which far exceeds its half cycle surge rating. SSRs having random turn on may have a better chance of survival than a zero cross turn on device for they commonly require the transformer to support only a portion of the first half cycle of the voltage. On the other hand, a random turn on device will frequently close at the zero cross point and then the SSR must sustain the worst case saturation current. A zero cross turn on device has the advantage that it turns on in a known mode and will immediately demonstrate the worst case condition. The use of a current shunt and an oscilloscope is recommended to verify that the half cycle surge capability is not exceeded.

A rule of thumb in applying an SSR to a transformer load is to select an SSR having a half cycle current surge rating greater than the maximum applied line voltage divided by the transformer primary resistance. The primary resistance is usually easily measured and can be relied on as a minimum impedance limiting the first half cycle of inrush current. The presence of some residual flux plus the saturated reactance of the primary will then further limit, in the worst case, the half cycle surge safely within the surge rating of the SSR.

Switching Devices: The thyristor family of semiconductors consists of several very useful devices. The most widely used of this family are metal-oxide semiconductor field effect transistors (MOSFETs), silicon controlled rectifiers (SCRs), Triac, and Alternistor Triac. In many applications these devices perform key functions and therefore it is imperative that one understand their advantages as well as their shortcomings to properly specify a reliable system. Once applied correctly thyristors are a real asset in meeting environmental, speed, and reliability specifications which their electro-mechanical counterparts could not fulfill.

MOSFET: The MOSFET is a semiconductor device that consists of two metal-oxide semiconductor field effect transistors (MOSFETs), one N-type and one P-type, integrated on a single silicon chip. The MOSFET is ideal for switching DC loads.

Triacs: A TRIAC, is an electronic component approximately equivalent to two silicon-controlled rectifiers joined in inverse parallel (paralleled but with the polarity reversed) and with their gates connected together. This results in a bidirectional electronic switch which can conduct current in either direction. The Triac is ideal for switching resistive AC loads.

Alternistor Triac: Used to switch AC loads; the Alternistor has been specifically designed for applications that switch highly inductive loads. A special chip offers similar performance as two SCRs wired inverse parallel (back-to-back), providing better turn-off behavior than a standard Triac. The Alternistor Triac is an economical solution; ideal for switching inductive AC loads.

SCR: The silicon-controlled rectifier is a 4-layer solid state device that controls current flow. The SCR acts as a switch, conducting when its gate receives a current pulse, and continue to conduct for as long as it is forward biased. The SCR is ideal for switching all types of AC loads.

Heat Sinking: Thermal management is a fundamental consideration in the design and use of solid state relays (SSRs) because of the contact dissipation (typically 1 W per amp). It is, therefore, vital that sufficient heat sinking is provided, or the life and switching reliability of the SSR will be compromised.

In order to properly size a heat sink one has to consider at what goes into getting the thermal resistance **Rth** (X° C/W) numbers in order to understand what it means.

Let's first begin by defining some variables.

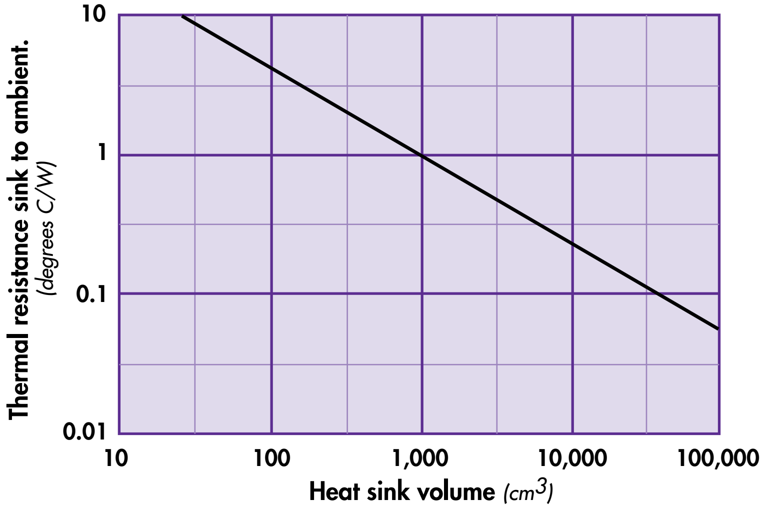
Tr - Temperature rise
Ta - Ambient temperature (example 22°C)
Th - Heat sink temperature (example 54°C)
Vh - Voltage to heater (example 12V)
Ih - Current to heater (example 3.5A)
Ph - Power applied to heat sink
Rth - Thermal resistance (in °C/W)

so...

Tr = Th - Ta = 54 - 22 = 32°C
Ph = Vh * Ih = 12 * 3.5 = 42W
Rth = Tr / Ph = 32 / 42 = 0.76°C/W

Okay, now that we have calculated the Thermal Resistance **(Rth)** we can look at the Thermal resistance vs. Heat sink volume curve.

Thermal resistance vs. Heat sink volume.
Natural convection at 50C rise above ambient.



Using the attached curve, one can see that in our example one would need around 1000 cm cubed sized heat sink in order to successfully sink the amount of heat generated by the device.

The Complete System Solution!

Optional Heat Sink
(SSR-HS-1)
Section 3 p.20

Optional Thermal Pad
(SSR-TP-1)
Section 3 p.21

We at Magnecraft strive to be your one-stop-shop for all of your solid state relay needs. The new line of 6 series solid-state relays give industrial relay users an energy-efficient current switching alternative. Depending on the application, these solid-state relays offer a number of advantages over electromechanical relays, including longer life cycles, less energy consumption and reduced maintenance costs. This is why great care and attention was given when developing the next generation of "Hockey Puck" style SSRs. These new SSRs will be finger-safe , fit a pre-cut heat transfer thermal pad (sold separately) and have the ability to be mounted onto a factory tested pre-drilled and tapped heat sink (sold separately).

Magnecraft's expertise in both SSR design and thermal management enables us to provide customers with a solution to their solid state relay requirements. This solution comes ready-to-use, virtually eliminating in-house assembly and complex heat sink calculations. Furthermore, each SSR, thermal pad (sold separately) and heat sink assembly (sold separately) utilizes the reliability and technology only available in our 6 series solid state relays. These features, coupled with Magnecraft's superior customer service and engineering support team, provide our customers with a level of convenience not easily found in the market today!

Evolut

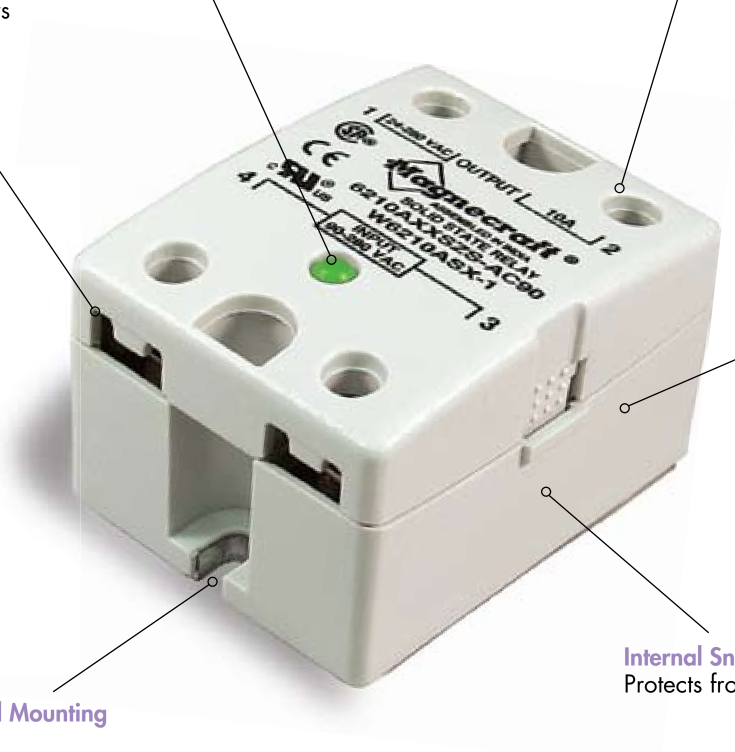
Legacy

The Class 6 is also available with Blade Terminals.

The new finger-safe Class 6* "Hockey Puck" Style Solid State Relay (SSR) expands and enhances the current Magnecraft Solid State Relay product line.

This product features a finger-safe cover and LED Status Indicator. The optically coupled circuitry isolates the input from the output to give pure solid state performance. This product carries with it agency certifications from UL, CSA, and CE.

***Available for products up to 40 Amps (AC Load) and 12 Amps (DC Load).**



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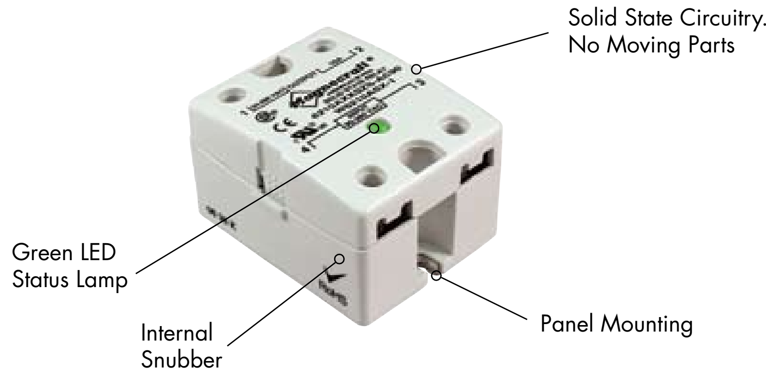

General Specifications (UL 508)

Output Characteristics	New Part # / Superceding Part #	Units	6210AXXSZS-AC90 / 6210ASX-1
Number and type of Contacts			SPST-NO
Switching Device			SCR (2)
Current rating		A	10
Switching voltage		V	24....280 AC
Switching Type			Zero Cross
Maximum Rate of Rise Off State Voltage (dv/dt)		V/us	200
Incandescent Lamp Ampere Rating (rms)		A	8
Motor Load Rating (rms)		A	4.5
Min. Load current to maintain on		mA	50
Non-Repetitive Surge Current (1 cycle)		A	83
Max. RMS overload current (1 second)		A	24
Max. Off state leakage current (rms)		mA	8
Peak Blocking Voltage		Vpk	600
Typical On State Voltage Drop (rms)		V	1.6 AC
Max. On State Voltage Drop (rms)		V	1.6 AC
Maximum I^2 T for Fusing (A^2)			72
Input Characteristics			
Voltage Range		V	90...280 AC/80...140 DC
Must Release Voltage		V	10 AC
Nominal Input Impedance		Ω	13K
Typical Input Current @ 5VDC or 240VAC		mA	20
Reverse Polarity Protection			N/A
Performance Characteristics			
Operating Time (response time)	On	ms	8.3
	Off	ms	8.3
Rated Insulation Voltage	Input to Output	V	4000 AC
Dielectric strength	Terminals to Chassis	V	4000 AC
Environment			
Product certifications	Standard version		UR, CSA, CE
Ambient air temperature	Storage	°C	-40…+100
around the device	Operation	°C	-40…+80
Degree of protection			IP 20
Miscellaneous Characteristics			
Thermal Resistance (Junction to Case)		°C/W	3.5
Weight		g (oz)	100 (3.5)
LED	Input		Green
Input Terminals			M3.5
Output Terminals			M4
Mounting Screw Torque		Nm	1.0

Thermal Pad
(SSR-TP-1)
Section 3 p.21

Blade Terminals
DPST-NO

Heat Sink
(SSR-HS-1)
Section 3 p.20

6225AXXSZS-AC90	**6250AXXSZS-AC90**	**6275AXXSZS-AC90**	**6210AXXSZS-DC3**	**6225AXXSZS-DC3**
6225ASX-1	6250ASX-1	6275ASX-1	6210DSX-1	6225DSX-1
SPST-NO	SPST-NO	SPST-NO	SPST-NO	SPST-NO
SCR (2)	SCR (2)	SCR (2)	SCR (2)	SCR (2)
25	50	75	10	25
24….280 AC	24….280 AC	24….280 AC	24….280 AC	24….280 AC
Zero Cross	Zero Cross	Zero Cross	Zero Cross	Zero Cross
500	500	500	200	500
16	39	39	8	16
8	14	25	4.5	8
120	250	250	50	120
250	520	1150	83	250
40	100	150	24	40
8	10	10	10	10
600	600	600	600	600
1.6 AC	1.1 AC	1.8 AC	1.6 AC	1.6 AC
1.6 AC	1.8 AC	1.8 AC	1.6 AC	1.6 AC
312	1250	5000	83	250
90...280 AC/80...140 DC	90...280 AC/80...140 DC	90...280 AC/80...140 DC	3…32	3…32
10 AC	10 AC	10 AC	1 DC	1 DC
13K	13K	13K	Current Regulator	Current Regulator
20	20	20	16	16
N/A	N/A	N/A	Yes	Yes
8.3	8.3	8.3	8.3	8.3
8.3	8.3	8.3	8.3	8.3
4000 AC	4000 AC	4000 AC	4000 AC	4000 AC
4000 AC	4000 AC	4000 AC	4000 AC	4000 AC
UR, CSA, CE	UR, CSA, CE	UR, CSA, CE	UR, CSA, CE	UR, CSA, CE
-40…+100	-40…+100	-40…+100	-40…+100	-40…+100
-40…+80	-40…+80	-40…+80	-40…+80	-40…+80
IP 20	IP 20	IP 20	IP 20	IP 20
1.02	0.63	0.6	3.50	1.02
100 (3.5)	135 (4.8)	200 (7.1)	100 (3.5)	100 (3.5)
Green	Green	Green	Green	Green
M3.5	M3.5	M3.5	M3.5	M3.5
M4	M6	M6	M4	M4
1.0	1.0	1.0	1.0	1.0

UL Recognized
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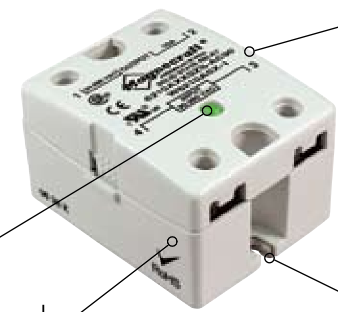
NEW NEW NEW NEW NEW



General Specifications (UL 508)

Output Characteristics	New Part # / Superceding Part #	Units	6250AXXSZS-DC3 / 6250DSX-1	6275AXXSZS-DC3 / 6275DSX-1
Number and type of Contacts			SPST-NO	SPST-NO
Switching Device			SCR (2)	SCR (2)
Current rating		A	50	75
Switching voltage		V	24….280 AC	24….280 AC
Switching Type			Zero Cross	Zero Cross
Maximum Rate of Rise Off State Voltage (dv/dt)		V/us	500	500
Incandescent Lamp Ampere Rating (rms)		A	39	39
Motor Load Rating (rms)		A	14	25
Min. Load current to maintain on		mA	250	250
Non-Repetitive Surge Current (1 cycle)		A	520	1150
Max. RMS overload current (1 second)		A	100	150
Max. Off state leakage current (rms)		mA	8	10
Peak Blocking Voltage		Vpk	600	600
Typical On State Voltage Drop (rms)		V	1.8	1.8
Max. On State Voltage Drop (rms)		V	1.8	1.8
Maximum I^2 T for Fusing (A^2)			1250	5000
Input Characteristics				
Voltage Range		V	3….32	3….32
Must Release Voltage		V	1 DC	1 DC
Nominal Input Impedance		Ω	Current Regulator	Current Regulator
Typical Input Current @ 5VDC or 240VAC		mA	16	16
Reverse Polarity Protection			Yes	Yes
Performance Characteristics				
Operating Time (response time)	On	ms	8.3	8.3
	Off	ms	8.3	8.3
Rated Insulation Voltage	Input to Output	V	4000 AC	4000 AC
Dielectric strength	Terminals to Chassis	V	4000 AC	4000 AC
Environment				
Product certifications	Standard version		UR, CSA, CE	UR, CSA, CE
Ambient air temperature	Storage	°C	-40…+100	-40…+100
around the device	Operation	°C	-40…+80	-40…+80
Degree of protection			IP 20	IP 20
Miscellaneous Characteristics				
Thermal Resistance (Junction to Case)		°C/W	0.63	0.6
Weight		g (oz)	135 (4.8)	200 (7.1)
LED	Input		Green	Green
Input Terminals			M3.5	M3.5
Output Terminals			M6	M6
Mouniting Screw Torque		Nm	1.0	1.0

Thermal Pad
(SSR-TP-1)
Section 3 p.21

Blade Terminals
DPST-NO

Heat Sink
(SSR-HS-1)
Section 3 p.20

6210AXXTZS-DC3 6210DTX-1	*6425BXXAZB-DC3** *6425DTX-3**	6312AXXMDS-DC3 6212DDX-1	6325AXXMDS-DC3 6225DDX-1	6340AXXMDS-DC3 6240DDX-1
SPST-NO	DPST-NO	SPST-NO	SPST-NO	SPST-NO
Triac	Alternistor	MOSFET	MOSFET	MOSFET
10	25	12	25	40
24….280 AC	48….480 AC	3….200 DC	3….200 DC	3….200 DC
Zero Cross	Zero Cross	DC Switching	DC Switching	DC Switching
250	250	N/A	N/A	N/A
16	N/A	N/A	N/A	N/A
8	N/A	N/A	N/A	N/A
120	80	20	20	20
250	250	27	50	90
80	80	N/A	N/A	N/A
10	10	8	8	8
300	300			
1.6	1.1	1.6	1.6	1.6
1.6	1.6	2.83	2.83	2.83
300	200	N/A	N/A	N/A
3….32	3.5….32	3….32	3….32	3….32
1 DC	1 DC	1 DC	1 DC	1 DC
1.5 K	Current Regulator	1K	1K	1K
2	16	10	10	10
Yes	Yes	No	No	No
8.3	8.3	300 µs	600 µs	600 µs
8.3	8.3	1	2.6	2.6
4000 AC	4000 AC	4000 AC	4000 AC	4000 AC
4000 AC	4000 AC	2500 AC	2500 AC	2500 AC
UR, CSA, CE	UR, CSA, CE	UR, CSA, CE	UR, CSA, CE	UR, CSA, CE
-40…+100	-40…+100	-40…+100	-40…+100	-40…+100
-40…+80	-40…+80	-40…+80	-40…+80	-40…+80
IP 20	IP 20	IP 20	IP 20	IP 20
1.45	1.20	1.06	1.06	1.06
100 (3.5)	100 (3.5)	110 (3.9)	135 (4.8)	135 (4.8)
Green	Green	Green	Green	Green
M3.5	0.187" QC	M3.5	M3.5	M3.5
M4	0.250" QC	M4	M4	M4
1.0	1.0	1.0	1.0	1.0

**Blade Terminal*

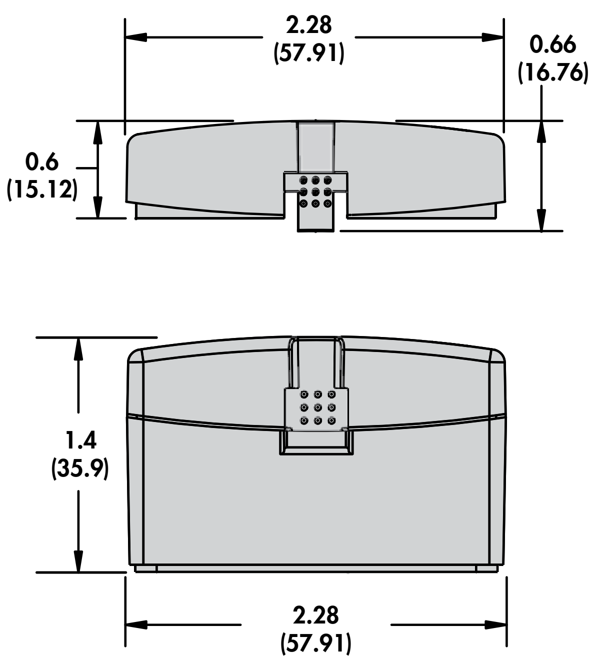
SECTION 4

NEW

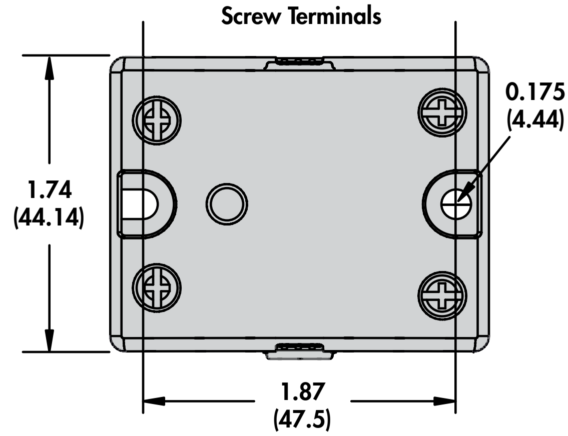
Screw Terminals
SPST-NO

Blade Terminals
DPST-NO

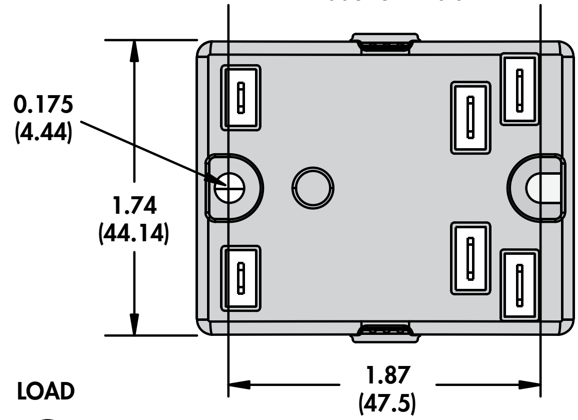
***Finger-safe safety cover is available for products up to 40 Amps.**

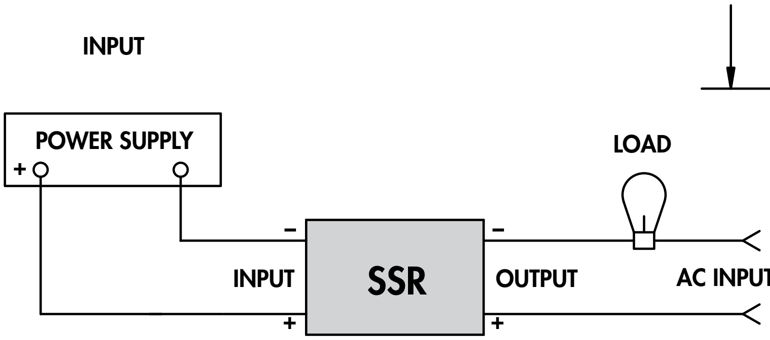


Screw Terminals



Blade Terminals





WIRING DIAGRAM

Heat Sink/Class 6 SSR Relay

Thermal management is a fundamental consideration in the design and use of Solid State Relays (SSRs) because of the contact dissipation (typically 1 W per amp). It is, therefore, vital that sufficient heat sinking is provided, or the life and switching reliability of the SSR will be compromised. The unique design of the Magnecraft aluminum heat sink maximizes heat dissipation. This heat sink is available for Magnecraft's panel mount SSRs and ensures reliable operation when properly selected for the specific application. For ease of installation, all mounting holes are pre-drilled and tapped.

Optional Thermal Pad (SSR-TP-1)
See Section 3 p.21

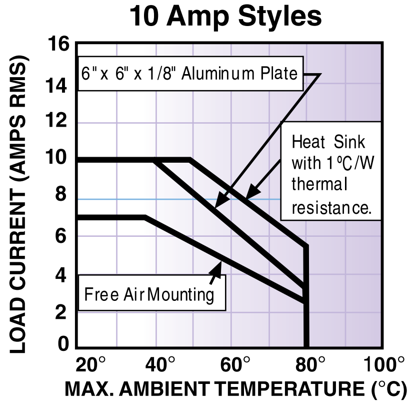
Optional Heat Sink (SSR-HS-1)
See Section 3 p.20

User Guide:

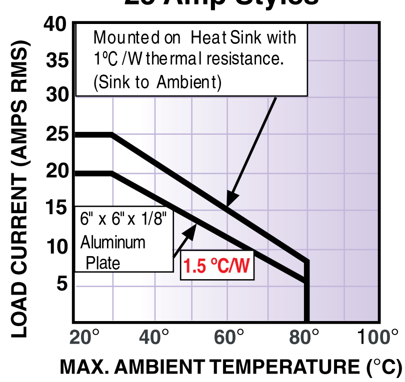
The Magnecraft SSR should be firmly mounted on a clean, smooth heat sink surface using thermally conductive or suitable thermal transfer pads.

- The Magnecraft heat sink matches heat dissipation requirements for Magnecraft 6 Series SSRs; up to 50 amps.
- The Magnecraft heat sink design achieves outstanding thermal efficiency.
- The Magnecraft heat sink is pre-drilled and tapped to suit the Magnecraft SSR 6 Series "hockey puck style" range.

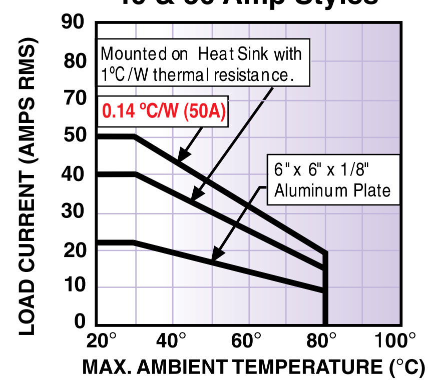
10 Amp Styles



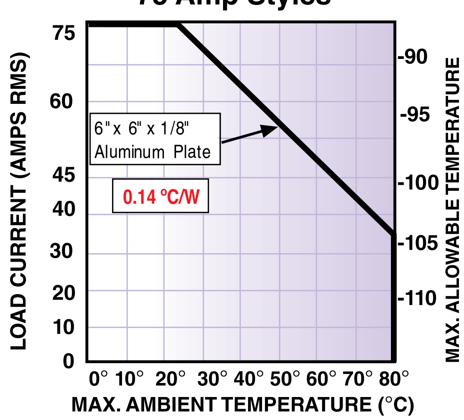
25 Amp Styles



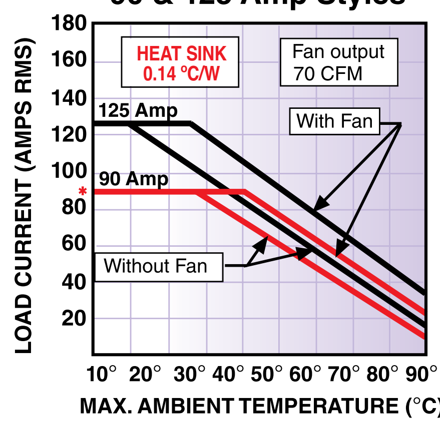
40 & 50 Amp Styles



75 Amp Styles



90 & 125 Amp Styles



* De-rating curve without fan.

UL Recognized
File No. E258297

NEW
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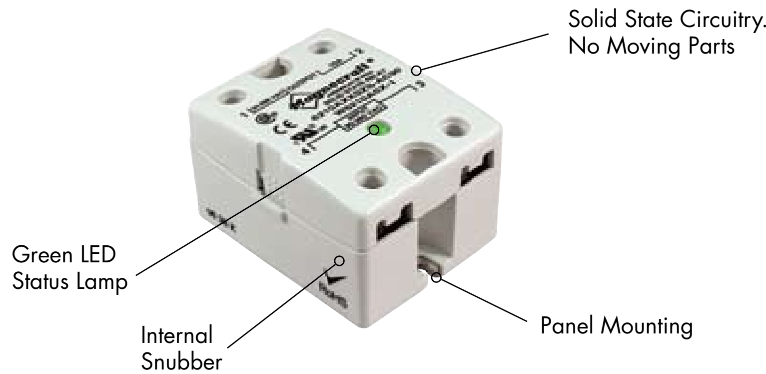

Standard Part Numbers

BOLD-FACED PART NUMBERS ARE NORMALLY STOCKED

AC Operated, DUAL MARKED		Input Voltage Range	Output Voltage Range	Contact Configuration	Switching Type	Rated Current Load (Amps)
New Part #	Supercedes		SCR Output			
6210AXXSZS-AC90	W6210ASX-1	90....280 VAC	24....280 VAC	SPST-NO	Zero Cross	10
6225AXXSZS-AC90	W6225ASX-1	90....280 VAC	24....280 VAC	SPST-NO	Zero Cross	25
6240AXXSZS-AC90	W6240ASX-1	90....280 VAC	24....280 VAC	SPST-NO	Zero Cross	40
6250AXXSZS-AC90**	**W6250ASX-1**	90....280 VAC	24....280 VAC	SPST-NO	Zero Cross	50
6275AXXSZS-AC90**	**W6275ASX-1**	90....280 VAC	24....280 VAC	SPST-NO	Zero Cross	75
6410AXXSZS-AC90	W6410ASX-1	90....280 VAC	48....480 VAC	SPST-NO	Zero Cross	10
6425AXXSZS-AC90	W6425ASX-1	90....280 VAC	48....480 VAC	SPST-NO	Zero Cross	25
6440AXXSZS-AC90	W6440ASX-1	90....280 VAC	48....480 VAC	SPST-NO	Zero Cross	40
6450AXXSZS-AC90**	**W6450ASX-1**	90....280 VAC	48....480 VAC	SPST-NO	Zero Cross	50
6475AXXSZS-AC90**	**W6475ASX-1**	90....280 VAC	48....480 VAC	SPST-NO	Zero Cross	75
6690AXXSZS-AC90**	**W6690ASX-1**	90....280 VAC	48....600 VAC	SPST-NO	Zero Cross	90
66125AXXSZS-AC90**	**W66125ASX-1**	90....280 VAC	48....600 VAC	SPST-NO	Zero Cross	125
DC Operated, DUAL MARKED						
New Part #	Supercedes					
6210AXXSZS-DC3	W6210DSX-1	3....32 VDC	24....280 VAC	SPST-NO	Zero Cross	10
6225AXXSZS-DC3	W6225DSX-1	3....32 VDC	24....280 VAC	SPST-NO	Zero Cross	25
6240AXXSZS-DC3	W6240DSX-1	3....32 VDC	24....280 VAC	SPST-NO	Zero Cross	40
6250AXXSZS-DC3**	**W6250DSX-1**	3....32 VDC	24....280 VAC	SPST-NO	Zero Cross	50
6275AXXSZS-DC3**	**W6275DSX-1**	3....32 VDC	24....280 VAC	SPST-NO	Zero Cross	75
6410AXXSZS-DC3	W6410DSX-1	3....32 VDC	48....480 VAC	SPST-NO	Zero Cross	10
6425AXXSZS-DC3	W6425DSX-1	3....32 VDC	48....480 VAC	SPST-NO	Zero Cross	25
6440AXXSZS-DC3	W6440DSX-1	3....32 VDC	48....480 VAC	SPST-NO	Zero Cross	40
6450AXXSZS-DC3**	**W6450DSX-1**	3....32 VDC	48....480 VAC	SPST-NO	Zero Cross	50
6475AXXSZS-DC3**	**W6475DSX-1**	3....32 VDC	48....480 VAC	SPST-NO	Zero Cross	75
6690AXXSZS-DC3**	**W6690DSX-1**	3....32 VDC	48....600 VAC	SPST-NO	Zero Cross	90
66125AXXSZS-DC3**	**W66125DSX-1**	3....32 VDC	48....600 VAC	SPST-NO	Zero Cross	125
DC Operated, DUAL MARKED						
New Part #	Supercedes		TRIAC Output			
6210AXXTZS-DC3	W6210DTX-1	3....32 VDC	24....280 VAC	SPST-NO	Zero Cross	10
6225AXXTZS-DC3	W6225DTX-1	3....32 VDC	24....280 VAC	SPST-NO	Zero Cross	25
6240AXXTZS-DC3	W6240DTX-1	3....32 VDC	24....280 VAC	SPST-NO	Zero Cross	40
6210BXXTZB-DC3	W6210DTX-3	3....32 VDC	24....280 VAC	*DPST-NO*	Zero Cross	10
6210XXATRS-DC3	W6210DTX-4	3....32 VDC	24....280 VAC	*SPST-NC*	*Random*	10
6225XXATRS-DC3	W6225DTX-4	3....32 VDC	24....280 VAC	*SPST-NC*	*Random*	25
6240XXATRS-DC3	W6240DTX-4	3....32 VDC	24....280 VAC	*SPST-NC*	*Random*	40
6410AXXTZS-DC3	W6410DTX-1	3....32 VDC	48....480 VAC	SPST-NO	Zero Cross	10
6425AXXTZS-DC3	W6425DTX-1	3....32 VDC	48....480 VAC	SPST-NO	Zero Cross	25
6440AXXTZS-DC3	W6440DTX-1	3....32 VDC	48....480 VAC	SPST-NO	Zero Cross	40
DC Operated, DUAL MARKED						
New Part #	Supercedes		MOSFET Output			
6312AXXMDS-DC3	W6212DDX-1	3....32 VDC	3....200 VDC	SPST-NO	*Random*	12
6325AXXMDS-DC3**	**W6225DDX-1**	3....32 VDC	3....200 VDC	SPST-NO	*Random*	25
6340AXXMDS-DC3**	**W6240DDX-1**	3....32 VDC	3....200 VDC	SPST-NO	*Random*	40

***Only Legacy (superceding) part is currently available.*

SECTION 4

Thermal Pad (SSR-TP-1)
Section 3 p.21

Blade Terminals
DPST-NO

Heat Sink (SSR-HS-1)
Section 3 p.20

Available Part Numbers (Non-Standard)

AC Operated (SCR Output)	DC Operated (SCR Output)	DC Operated (Triac Output)	DC Operated (MOSFET Output)
6210AXXSRS-AC90	6210AXXSRS-DC3	6210AXXTRS-DC3	6312AXXMDB-DC3
6210XXASRS-AC90	6210XXASRS-DC3	6210BXXTZB-DC3	6312AXXMDS-DC20
6225AXXSZS-AC90	6210AXXSZS-DC20	6225AXXTRS-DC3	6325BXXMDS-DC3
6225AXXSRS-AC90	6225AXXSRS-DC3	6225BXXTZB-DC3	6340BXXMDS-DC3
6225XXASRS-AC90	6225XXASRS-DC3	6225XXATRB-DC3	
6225AXXSZS-AC18	6225BXXSZB-DC4	6240AXXTZS-DC3	
6225BXXSZB-AC90	6225BXXSZB-DC3	6425AXXTZB-DC3	
6240AXXSRS-AC90	6225BXXSRB-DC4	6425BXXTZB-DC3	
6240XXASRS-AC90	6240AXXSRS-DC3	6440AXXTZB-DC3	
6240AXXSZS-AC18	6240XXASRS-DC3	6440BXXTZB-DC3	
6240BXXSZB-AC90	6240AXXSZB-DC3		
6250XXASRS-AC90	6240BXXSZB-DC4		
6250AXXSZS-AC18	6240BXXSZB-DC3		
6425BXXSZB-AC90	6240BXXSRB-DC4		
6440XXASRS-AC90	6250AXXSRS-DC3		
6440BXXSZB-AC90	6250XXASRS-DC3		
64125XXASRS-AC90	6425BXXSZB-DC3		
	6440BXXSZB-DC3		
	6450AXXSRS-DC3		
	6490AXXSRS-DC3		
	6650AXXSRS-DC3		
	6690AXXSRS-DC3		
	66125AXXSRS-DC3		

Part Number Builder

Series	Output Voltage	Output Current	Contact Config.	Output Type	Turn On Type	Connection Type	–	Input Voltage
6	1 = 2 to 60 VDC	07 = 7 AMPS	AXX = SPST-NO	S = SCR	Z = ZERO CROSS	S = SCREW TERMINALS		AC90 = 90 - 280 VAC
	2 = 24 to 280 VAC	10 = 10 AMPS	XXA = SPST-NC	T = STANDARD TRIAC	R = RANDOM	B = BLADE TERMINALS		AC18 = 18 - 28 VAC
	3 = 3 to 200 VDC	12 = 12 AMPS	BXX = DPST-NO	M = MOSFET	D = DC SWITCH			DC3 = 3 - 32 VDC
	4 = 48 to 480 VAC	25 = 25 AMPS	XXB = DPST-NC					DC4 = 4 - 15 VDC
	6 = 48 to 600 VAC	40 = 40 AMPS						DC20 = 20 - 50 VDC
		50 = 50 AMPS						
		75 = 75 AMPS						
		90 = 90 AMPS						
		100 = 100 AMPS						
		125 = 125 AMPS						

Note - Not all iterations of option codes are available.

SECTION 4