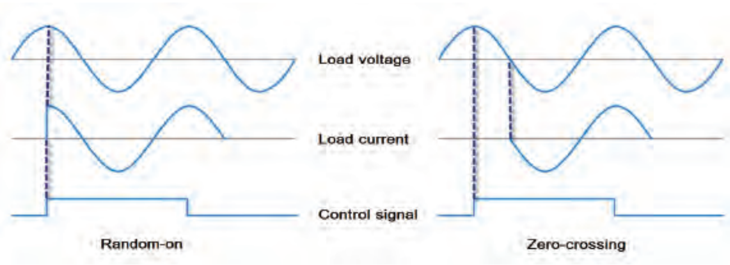
1. What's the difference between zero crossing and random-on solid state relay?

Zero crossing: When there is a control signal, the load is connected at the zero-crossing point of AC voltage. Its advantage is that it can suppress the generation of electromagnetic noise and reduce the impact on the power grid. It is recommended for general applications.

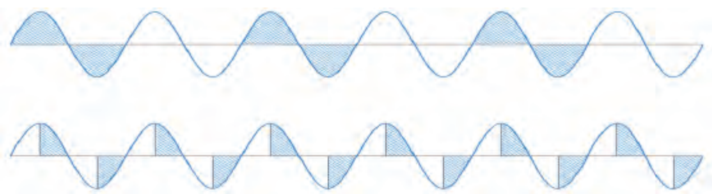
Random-on: When there is a control signal, the load is switched on immediately (at any AC voltage), which is mainly used in dimming and speed regulating applications.



2. What's the difference between cycle voltage regulation and phase angle voltage regulation?

Cycle voltage regulation: The voltage regulation module is controlled by on or off, the on / off time interval is multiple of power grid cycle, and the output power is adjusted by duty cycle. The advantage of the cycle voltage regulation is to be able to turn on/off the machine at the zero-crossing point in order to reduce the impact on the power grid.

Phase angle voltage regulation: The output voltage is controlled by adjusting the conduction angle of every half cycle.



3. Suggestion for the AC load control.

For AC output SSR, there are two switching modes zero-crossing and random-on. Except for some special application (for example phase angel control must apply random-on switching mode), zero-crossing SSR is recommended for resistive, capacitive, lighting control and small inductive loads. Random-on SSR is recommended for the inductive loads with power factor less than 0.8, or when there is a need to have the phase angle control. If there is any special requirement, please contact us for further technical support.

4. How to calculate the rating current of a resistive load?

Single-phase: I＝P/220 or I=P/380

Three-phase: I=P /380/$\sqrt{3}$

Considering the ambient temperature, heat dissipation and other conditions, it is recommended to choose the rated current as 1.4-1.6 times of the exact load current when it is a resistive load.

5. How to calculate the steady-state current of a motor load?

Single-phase motor: I=P/ 220/0.85

Three-phase motor: I=P /380 /$\sqrt{3}$ /0.85

When the motor turns on, the surge current could be 5-7 times of steady-state current and it will last for several seconds. Please consider the derating and contact with our technical team when choose the solid state relay for inductive load.

6. How to choose an appropriate MOV for overvoltage protection?

SSR is used for various applications, overvoltage may occur during its operation. We can use MOV to suppress the transient voltage on the output terminals to reduce the damage to SSR. To choose an appropriate MOV, first you must determine circuit conditions such as peak voltage and current during the event. You also must determine the number of surges the MOV must survive as well as the acceptable let-through voltage for the application.

The transient overvoltage endurance of a 380 series AC SSR is 800V, it can operate a 220VAC load or lower without MOV.

The transient overvoltage endurance of a 480 series AC SSR is 1200V, it can operate a 380VAC load or lower without MOV.

7. Over-current and short-circuit protection.

There is no over-current protection designed in our regular SSR. In order to protect the SSR, we recommend to series connect a fast fuse to the load circuit.

8. Ingress Protection (IP) protection level

The IP rating normally has two (or three) numbers:

Protection from solid objects or materials

Protection from liquids (water)

Protection against mechanical impacts (commonly omitted, the third number is not a part of IEC 60529)

For example, IP20 is used to prevent the human body from touching the terminal directly but not waterproof grade.

9. How to protect a DC SSR controlling an inductive load?

To protect a DC SSR from the electromagnetic field (EMF) when the inductive load is turned off, you need to place a freewheeling diode in reverse parallel across the load.Capacitive load will produce very high surge current at the moment of conduction, which may lead to the damage of solid state relay due to the excessive surge current. Therefore, if the actual load is capacitive, or the load has parallelled large capacitance, it is strongly recommended that NTC should be connected in series in the load loop to suppress surge current in order to avoid damage to the product.

10. Why do I see leakage current from the SSR when the relay is not on?

During the SSR is turned-off, we can observe an extremely small current when apply a voltage to SSR output, due to the power component has an impedance. Besides, the leakage current is caused by the snubber network which is a resistor and capacitor in series placed in parallel across the output of the SSR. This snubber protects the relay from static and commutating dv/dt. Therefore, it is recommended to choose SSR without RC for small power load.

11. Can SSR be used in parallel?

Yes, AC output SSR is not recommended for parallel output. DC output SSR with output in parallel can increase the total current carrying capacity.

12. Can SSR output be used in series?

Yes, but not recommended for series connection.

13. Can AC output SSR be applied to DC load?

No. SCR is usually used as power switch component for AC output SSR, and SCR is self-closing device at zero cross point, so it can only work under AC load.

14. Can DC output SSR be applied to AC loads?

No. AC load is usually controlled by AC output SSR. If you need DC output SSR for control, please contact us.

15. Why do I need to use a heat sink with an SSR? How to select an appropriate heatsink?

When an SSR is on, the SSR will generate heat due to the forward voltage drop across the output. Heat dissipation is an important issue in the use of SSR because it is directly affecting the max. load current and max. allowable ambient temperature of SSR. Usually, the user needs to fix the SSR firmly on the heatsink with a thermal pad or silicone grease in order to improve the heat dissipation performance. For high temperature operation, forced air cooling is also needed.

We can use a formula to calculate the heat dissipation.

Tj-Ta=P*Rja

Tj is junction temperature (℃)

Ta is ambient temperature (℃)

P is total power consumption (W)

Rja is thermal resistance from core to environment of power device (℃ / W)

Thermal resistance of SSR is composed of two parts: Rja = Rjc + Rca

Rjc is thermal resistance of junction to case

Rca is thermal resistance from case to the ambient

We take a relay as example. The Rjc of this product is about 1.7℃/W and Rca is about 8.5℃/W. the maximum allowable junction temperature is 125℃ and the power consumption is P = U * I. when the current is 10A below, the voltage drop of the product is about 1.1V. When the product is not operating with a heatsink, 125 - Ta =1.1*I*(1.7+8.5).

According to the above formula, the maximum load current of the product without heatsink is 8.9A at 25℃ and 5.8A at 60℃.

To select the proper sized heat sink, you need to know two things: the load current and the maximum ambient temperature the relay will be exposed to. Once you know these parameters and have selected the proper SSR, you can now use the thermal derating curves included in the data sheet of the particular model you have selected. For example: SSR # KSI240D60-L, if you want to use it load current at 36A, ambient temperature at 60°C, with this example we go to the data sheet and find 60 A thermal curve. On the left side we find 36A and draw a line straight across to the right then we find the ambient temperature of 60°C on the bottom and draw a line straight up until it intersects with the previous line. At this point we can see that the point falls between the 1.4°C/W and the 0.6°C/W line. You always pick the rating above your point since the heat sink rating below would not keep the relay cool enough. So therefore, we need a 0.6°C/W sized heat sink.