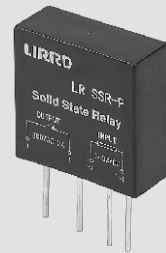
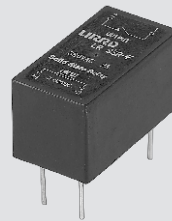
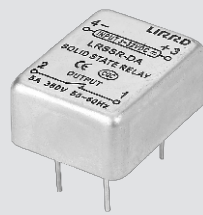
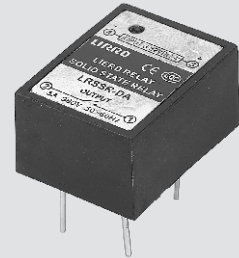
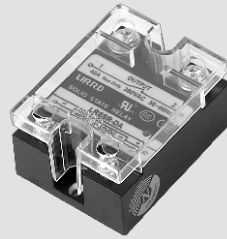
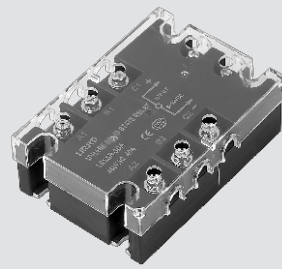


B

固态继电器系列

SOLID STATE RELAY SERIES



固态继电器使用说明

Operating instruction for solid state relays

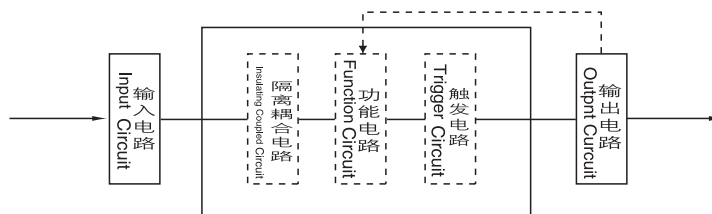
1 固态继电器的特点Characteristic of solid state relays

1.1 固态继电器（Solid State Relays, 缩写SSR），是具有隔离功能、无机械触点的电子开关，由半导体器件和无源元件组成，利用光电耦合器件或变压器实现控制电路（输入端）与负载电路（输出端）之间的电隔离和电耦合，内部无任何可动部件。固态继电器除具有与电磁继电器相同的开关切换功能外，还具有与逻辑电路兼容、开关无抖动、电磁和射频干扰小、寿命长和可靠性高等突出特点。

1.1 Solid state relays (SSR for short) is a kind of electronic switch with isolating function and without mechanical contacts, made up of semiconductor and passive element, make use of photoelectric coupler and transformer to electric isolate or electric couple the control circuit (input terminal) and load circuit (output terminal), there isn't any movable parts inside. The solid state relay not only has switching function that is the same as electromagnetic relay, but also has advantages such as compatible with logic circuit, firm mounted switch, low electromagnet interference or radio frequency interference, long service life and high reliability.

2 固态继电器的工作原理Working principle of solid state relays

2.1 固态继电器是一种无触点电子开关，采用光电器件或变压器实现控制电路（输入电路）与负载回路（输出电路）的电隔离及信号耦合，驱动固态功率器件实现负载电路的通断切换功能。尽管市场上的固态继电器规格型号繁多，但它们的工作原理基本上是相似的，主要由输入（控制）电路，驱动电路和输出（负载）电路三部分组成。如图



2.2 固态继电器的输入电路是为输入控制信号提供的一个回路，使之成为固态继电器的触发信号源。固态继电器的输入电路多为直流输入（如阻性输入，输入电流随输入电压呈线性变化），个别的为交流输入。

2.3 固态继电器驱动电路包括隔离耦合电路、功能电路和触发电路三个部分。隔离耦合电路，目前多采用光电耦合器和高频变压器两种电路形式。常用的光电耦合器有光—三极管、光—双向可控硅、光—二极管阵列（光—伏）等。高频变压器耦合，是在一定的输入电压下，形成约10MHz的自激振荡，通过变压器磁芯将高频信号耦合传递到变压器次级，实现对触发电路的驱动。功能电路主要应用在对要求具备某些功能特性的固态继电器电路中，也对驱动电路起完善作用，包括检波整流、稳压、加速、保护、显示等各种功能电路。触发电路的作用是给输出器件提供触发信号。

2.4 固态继电器的输出电路是在触发信号的控制下，实现对负载电路通断切换的开关作用。输出电路主要是由功率器件（芯片）组成，有些还包括起瞬态抑制作用的吸收回路。目前，固态继电器常用的输出功率器件有双向可控硅（Triac）、单向可控硅（Thyristor或SCR）、MOS场效应管（MOSFET）、晶体三极管（Transistor）、绝缘栅型双极性晶体管（IGBT）等。

2.1 Solid state relays is a kind of electronic switch that without mechanical contacts, adopting photoelectric device and transformer to electric isolate or signal couple the control circuit (input circuit) and load circuit (output circuit), drive solid power device to make and break or switch the load circuit. Although there are various solid state relays of different specifications in the market, their working principle is similar, and mainly made up of input (control) circuit, drive circuit and output (load) circuit.

2.2 The input circuit of solid state relays is used to input control signal and work as the triggering signal source. Generally, the input circuit of solid state relays is DC input (like resistant input, the input current will have a linear variation when voltage changes), but some are AC input.

2.3 The drive circuit of solid state relays includes isolating and coupling circuit, functional circuit and triggering circuit. At present, we adopt photoelectric coupler and high frequency transformer for isolating and coupling circuit. The photoelectric coupler that often used is light-triode, light- bidirectional thyristor and light- diode array (light-volt), etc. The high frequency transformer coupling, under a certain input voltage, a self-oscillation of 10MHz is formed, and transmits the high frequency signal coupling to secondary of transformer through the transformer's magnetic core, and finally drive the trigger circuit. The functional circuit is mainly applied in circuits of solid state relay that require some special functions, it also perfects the drive circuit, includes detection and rectifying, acceleration, protection and display. The trigger circuit is used to supply triggering signal for the output device.

2.4 The output circuit of solid state relay realize to make or break the load circuit under the control of triggering signal. It usually include power device (chip), some also include absorption circuit that has transient inhibitory action. At present, we often adopt output device such as bidirectional thyristor (Triac), single-directional thyristor (Thyristor or SCR), MOS field effect tube (MOSFET), crystal triode (Transistor) and insulating grid type bipolar transistor (IGBT) for solid state relays.

3 固态继电器的选型 Type-choosing of solid state relays

3.1 输入 参考固态继电器的输入特性曲线及输入电压范围，来选择符合实际需要的输入规格。

3.2 输出 固态继电器的输出电压通常是指加至继电器输出端的稳态电压。而瞬态电压则是指处于关断状态的继电器输出端不被击穿或失去阻断功能的最大瞬时电压。在使用中一定要保证加至继电器输出端的最大电压峰值低于继电器的瞬态电压值。在切换交流感性负载，如单相（三相）电机负载时，继电器输出端可能出现两倍于电源电压峰值的瞬时电压。对于此类负载，在选型使用时应对固态继电器的输出电压留有一定裕量。

3.3 固态继电器的输出电流通常是指流经继电器输出端的稳态电流。但由于感性负载、容性负载引起的浪涌电流以及电源自身的浪涌问题，在选型使用时应注意保证固态继电器的输出电流留有一定裕量，在常温下，满足公式：实际负载的稳态工作电流=所选产品额定输出电流×降额系数，将会使可靠性成倍提高（参见表1）。

负载类型 Load type	电阻 Resistance	白炽灯 Incandescent lamp	交流电磁铁 AC electromagnet	变压器 Transformer	单相电机 Single-phase motor	三相电机 Three-phase motor
降额系数Reduction ratio	1	0.8	0.5	0.5	0.12/0.24	0.18/0.33

注 表格中单相、三相电机降额系数的较小值对应着大惯性负载。本册说明书所列交流固态继电器最佳输出负载频率为60Hz以下（如工频50 Hz）。

3.1 Input Please refer to the input character curve and input voltage range of solid state relay, and choose the input specification that you need.

3.2 Output The output voltage of solid state relay usually means the steady state voltage in the output terminal of relay. And the transient voltage means the max transient voltage of the output terminal of relay under off state that will not be arc over or lose blockout function. During operation, please make sure that the peak value of max voltage on the relay's output terminal should lower than the transient voltage value. When switching AC inductive load, like switch on single-phase (three-phase) electric machine, the output terminal of relay may appear transient voltage that is two times of peak value of power supply. For this kind of load, please remain a certain allowance for output voltage when select solid state relays.

3.3 The output current of solid state relays usually means steady state current that flow through the output terminal of relay. Because of the surge current caused by inductive load and condensive load and surge that caused by power supply itself, please remain a certain allowance for output current when select solid state relays, under normal temperature, please satisfy the formula: steady state working current of actual load=the rated output current of selected product× reduction ratio, it will improve the reliability of product(refer to table 1).

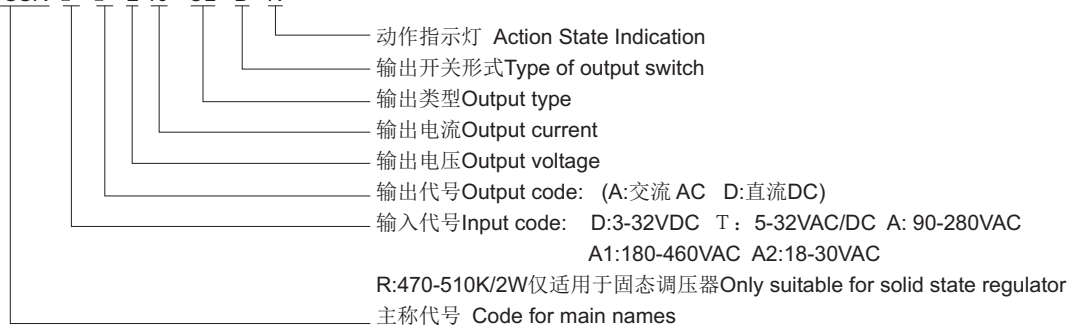
Notice The smaller value of reduction ratio of single-phase and three-phase electric machine in the table corresponding to the mass load. The best output load frequency of AC solid state relay list in this manual is below 60Hz (such as power frequency 50Hz).

4 固态继电器的标志 Symbol of solid state relays

Q/XWQH1007-2003《通用固态继电器总规范》规定了通用固态继电器的产品标志，由主称代号、输入输出代号、输出电压电流、输出类型等。示例如下：

Q/XWQH1007-2003 Norm for General Solid State Relays stipulates product symbol for general solid state relays, include code of main names, input and output code, output voltage and current, output type. For example:

LR SSR-□ □ 2 10 - OL - B - N



- LRSSR:单相固态继电器Single-phase solid state relay
- LRSSVR:固态调压器Solid state regulator
- LRSSR-3:三相固态继电器Three-phase solid state relay
- LRSSR-M:单相模块式固态继电器Single-phase modular or solid state relay
- LRSSR-F:小型固态继电器Miniature solid state relay
- LRSSR-P:小型固态继电器Miniature solid state relay

注：类型代号主要有0、OL、1、，1L分别代表过零型、适用于感性负载的过零型、随机型、适用于感性负载的随机型。

Notice: The type code includes O,OL, 1 and 1L, respectively means zero crossing type, zero crossing suitable for inductive load, stochastic type, and stochastic type suitable for inductive load.

5 固态继电器的安装 Installation of solid state relays

本册说明书中，所列插装式引出端固态继电器，引脚为高热传导材料，使用时印刷电路板上相应插装孔的孔距、孔径应与之配合紧密、准确，钎焊温度控制在260度以下，5s以内；螺栓式引出端固态继电器端子配有垫片及紧固螺钉，安装时应采取合适的紧固力矩（但不能大于20N.m），防止增大接触电阻、松动或开裂，实现与外接导线之间电气与机械的可靠连接。底板应均匀地涂一层导热硅脂，并与散热片或安装板紧密配合。固态继电器使用中，应定期检查螺钉是否紧固。

The insert type leading out end solid state relay listed in this manual adopt intense heat conducting material for leading foot. When operation, the hole distance and aperture on the printed-circuit board should be fit tightly and correctly, the brazing temperature should below 260 degree, and within 5s; the bolt type leading out end solid state relay fit with washer and fastening screw, when operation, please adopt suitable fastening moment (but should not more than 20N.m), prevent from adding contacting resistance, loose or craze, make sure it is reliable connect with conductor and machine. Coat a layer of heat conducting silicone grease on the bottom board, and fit tightly with cooling plate and installing board. During the operation, please check the screw of solid state relay regularly, make sure it is tight.

6 固态继电器使用注意事项 Notice for operation of solid state relays

6.1 输入控制信号:

交流固态继电器的输入控制频率一般不超过10 Hz；直流固态继电器控制信号的周期应大于继电器接通、关断时间之和的5倍。在环境温度过高时，应适当降低控制电流，在环境温度过低时，应适当增大控制电流。尽量缩短输入连线、采用平行传输线或双绞线以降低射频干扰。尤其是现场有接触器、自动开关时，可在输入端并联电容或由电阻、电容串联组成的RC电路，或者在输入端串联由LC组成的电磁滤波器、滤波电路，以防止由电磁干扰引起的误接通。

6.2 输出保护电路:

实际应用中，非阻性负载比较普遍，应外加相应的保护电路，如快速熔断器、瞬态抑制（吸收）电路（如TVS）、电压钳位电路（压敏电阻MOV，见表3）、泄放电器等措施，如图B、图C所示。

本册说明书所列产品，有些规格内部已有RC吸收回路（如输出规格中类型代号为OL或1L）。

Input control signal:

The input control frequency of AC solid state relay should not exceed 10Hz; the period for DC solid state relay to control signal should more than 5 times of the summation of making time and breaking time of relay. When the ambient is too high, please decrease the control current appropriately, and when the ambient is too low, please increase the control current appropriately. Try to shorten the input line and adopt twin line or twisted pair wire to reduce the radio frequency interference. When there are contactor or automatic switch exists, you can parallel connect capacitance or RC circuit that series connected with resistance and capacitance on the input terminal, or series connected with electromagnetic filter and filter circuit that made by LC to prevent from error connection caused by electromagnet interference.

Output protecting circuit:

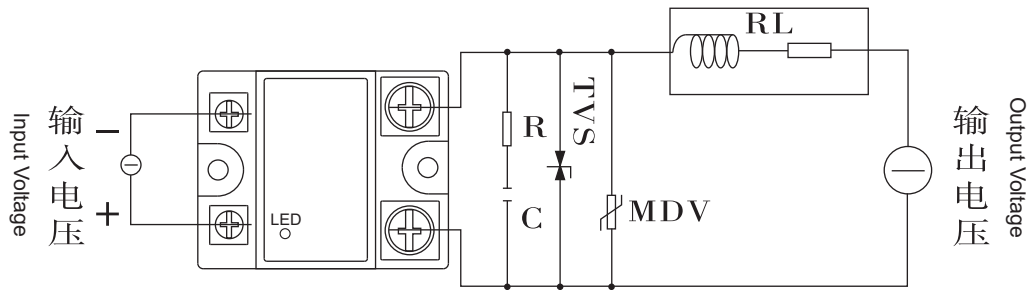
In the actual application, non-resistance load is used often, please add corresponding protecting circuit, such as quick-acting fuse, transient suppressing circuit (absorption circuit), voltage dependent resistor MOV and discharging appliance, etc., see diagram B and C. Some products listed in this manual already contain absorption circuit (such as the output specification of OL or 1L).

表2
sheet 2

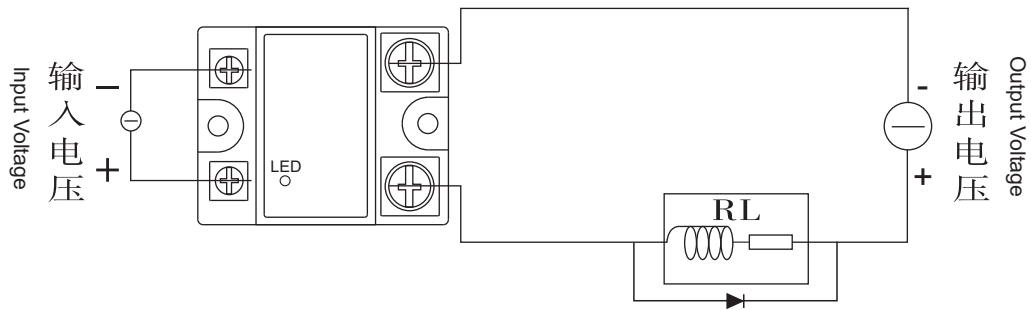
序号 Series NO	规格型号 Spec Type	额定输出电压(V) Rated output Voltage	瞬态抑制电压(V) Inst oppressing Voltage	输出最大漏电流(mA) Output leakage current	
1	TVS	220	350~420	10(内置RC吸收电路) RC aption Circuit inside	1(无RC电路) NO RC circuit
2	TVS	380	620~720	15(内置RC吸收电路) RCaption Circuit inside	1.5(无RC电路) NO RC circuit

负载电压 (V) Load Voltage	压敏电阻电压 (V) Varistor Voltage
220	430
380	750
660	1200

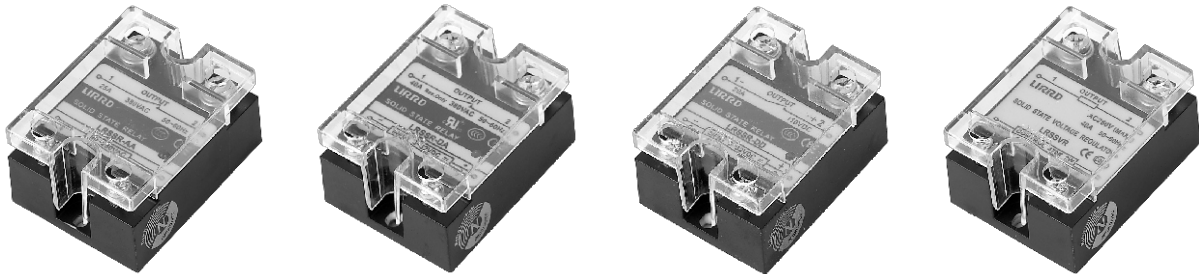
图B 交流负载保护电路
Drawing B: AC load Protection Circuit



图C 直流负载保护电路
Drawing C: DC load Protection Circuit

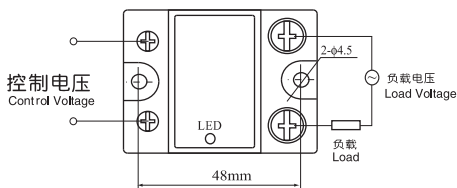


LRSSR 系列 Series

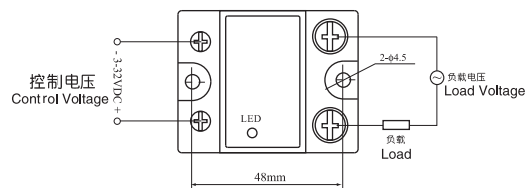


类别 Classification	交流固态系列 AC Solid State Series		直流固态系列 DC Solid State Series			调压器系列 Voltage Regulator Series
产品型号 Model	LRSSR-AA	LRSSR-DA	LRSSR-DD			LRSSVR
负载电压 (V) Load Voltage	28~285 36~530	28~285 36~530 48~660	50,100 300,400	50,600	700,800, 900	40~250 80~380
负载电流 (A) Load Current	5,10,20,30,40,50,60,80,100		5,10,20,30,40, 50,60,80,100	5,10,20, 30,40,	5,10,20,	5,10,20, 30,40,
介质耐压 (Vac) Dielectric Strength	2500					
绝缘电阻 (MΩ) Insulation Resistance	100					
控制电压 (Vdc) Control Voltage	90-265	3-32	3-32			
控制电流 (mA) Control Current	≤10	3-35	5-20			
通态压降 (V) On Voltage Drop	≤10	≤1.5	≤2.5			
断态漏电流 (mA) Off Leakage Current	≤4	≤2	≤1			
频率范围 (Hz) Frequency Range	47~63					
通断时间 (ms) on-off Time	≤10		≤0.8			
动作状态指示 Action State Indication	LED					
环境温度 Ambient Temperature	-30℃+75℃					
安装形式 Mounting Method	螺栓固定 Bolt Fixation					
同类型参照 Same Reference	SSR,G3NA-420B, LSAP3810A,LSAP2210A		SSR,JGX-1572F,JGX-1554F, JGX-1598F,JG53FA,JGX-54FA			
说明 Directions	负载电流阻性5A以上, 必须安装散热器 Load Current Resistance Above DC 5A Must Be Set Radiator					

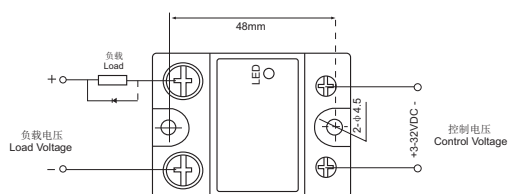
LRSSR-AA接线图 Connection diagram



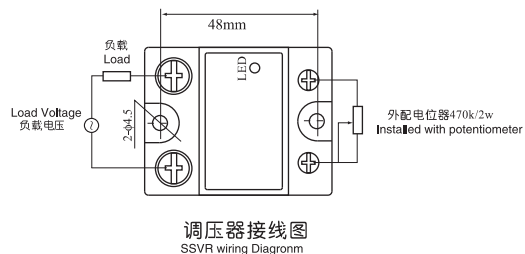
LRSSR-DA接线图 Connecting diagram



LRSSR-DD接线图 Connecting diagram



LRSSVR接线图 Connecting diagram

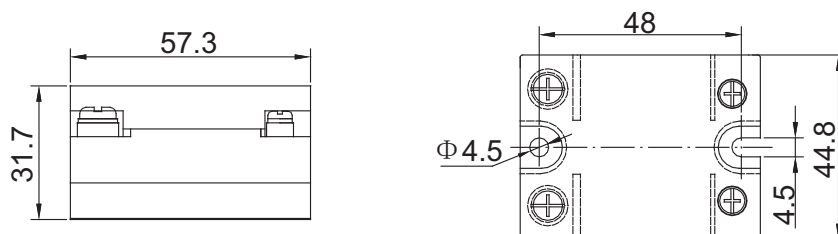


备注：固态与散热器之间必须敷导热硅脂以利散热。

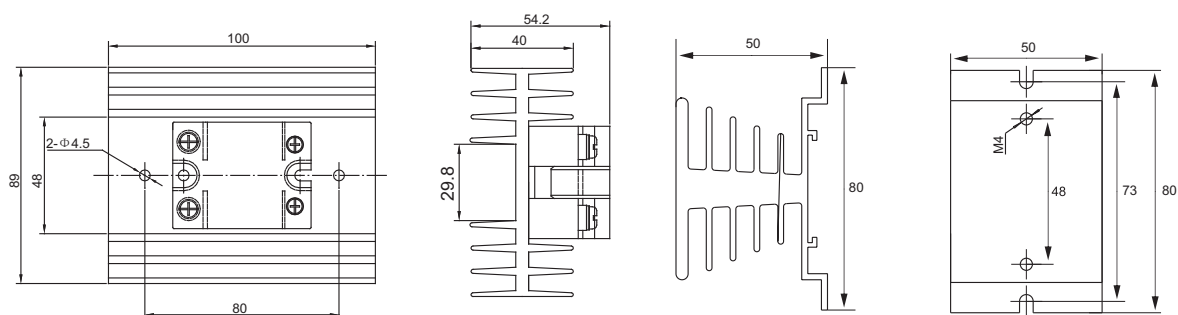
Remark: Thermal silicone grease should be spread between solidity and radiator for heat rejection.

LRSSR 系列外形尺寸和安装尺寸

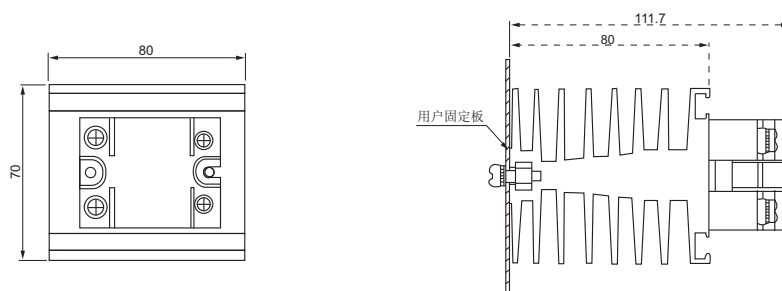
LRSSR Series dimension and installation dimensions



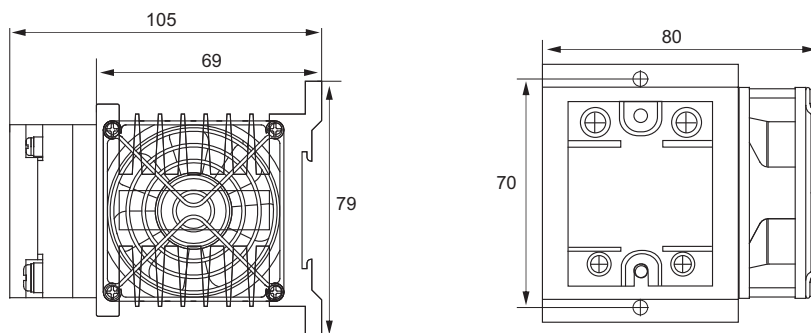
5A~25A配散热器尺寸 Dimensions of the equipped radiator



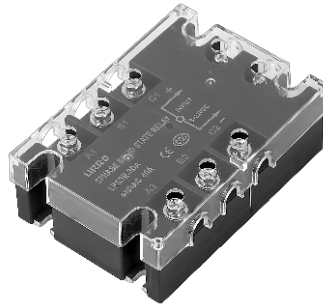
25A~40A配散热器尺寸 Dimensions of the equipped radiator



40A~100A配散热器尺寸 Dimensions of the equipped radiator



LRSSR-3 系列 Series

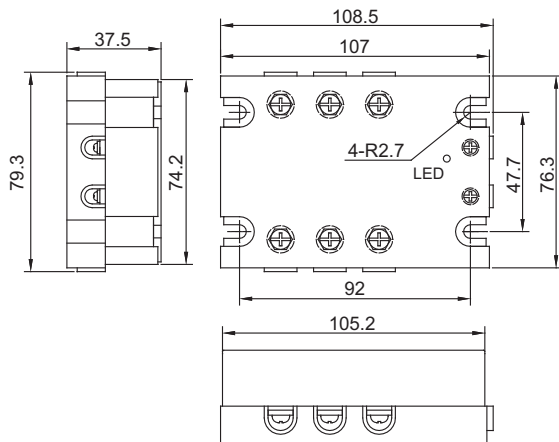


产品型号 Model	LRSSR-3AA	LRSSR-3DA
负载电压 (V) Load Voltage	24~440,48~480,90~660	
负载电流 (A) Load Current	5,10,20,30,40,50,60,80,100	
介质耐压 (Vac) Dielectric Strength	2500	
绝缘电阻 (MΩ) Insulation Resistance	100	
控制电压 (Vdc) Control Voltage	90-280/280-440	3-32
控制电流 (mA)Control Current	≤10	≤25
通态压降 (V) On Voltage Drop	≤1.5	
断态漏电流 (mA) Off Leakage Current	≤10	
频率范围 (Hz)Frequency Range	47~63	
通断时间 (ms)on-off Time	1/2 Cycle	
动作状态指示 Action State Indication	LED	
环境温度 Ambient Temperature	-30℃~+75℃	
安装形式 Mounting Method	螺栓固定 Bolt Fixation	
同类型参照 Same Reference	SSR,JG-2FA,JG2FB,JG-2FC,JGX	
说明 Directions	负载电流阻性5A以上，必须安装散热器 Load Current Resistance Above DC 5A Must Be Set Radiator	

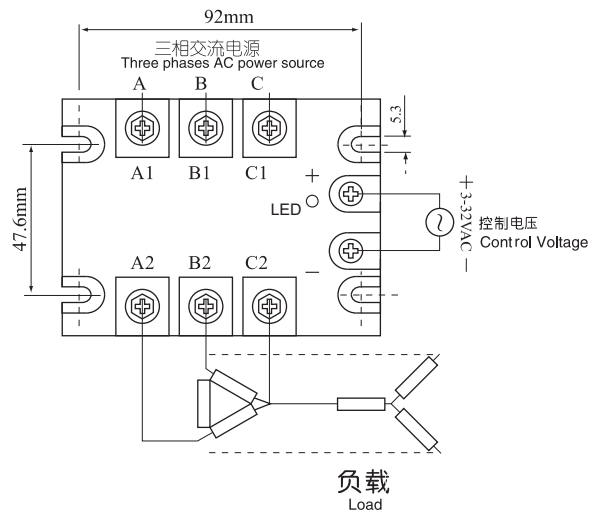
备注：固态与散热器之间必须敷导热硅酯以利散热。

Remark:Thermal silicone grease should be spread between solidity and radiator for heat rejection.

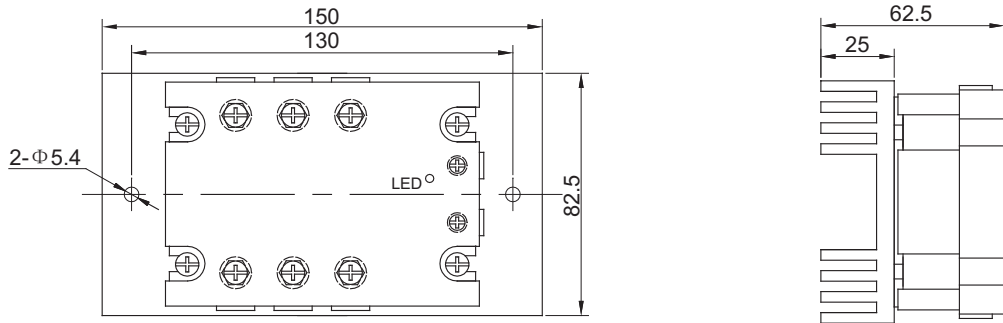
LRSSR-3 系列外形尺寸和安装尺寸
LRSSR-3 Series dimension and
installation dimensions



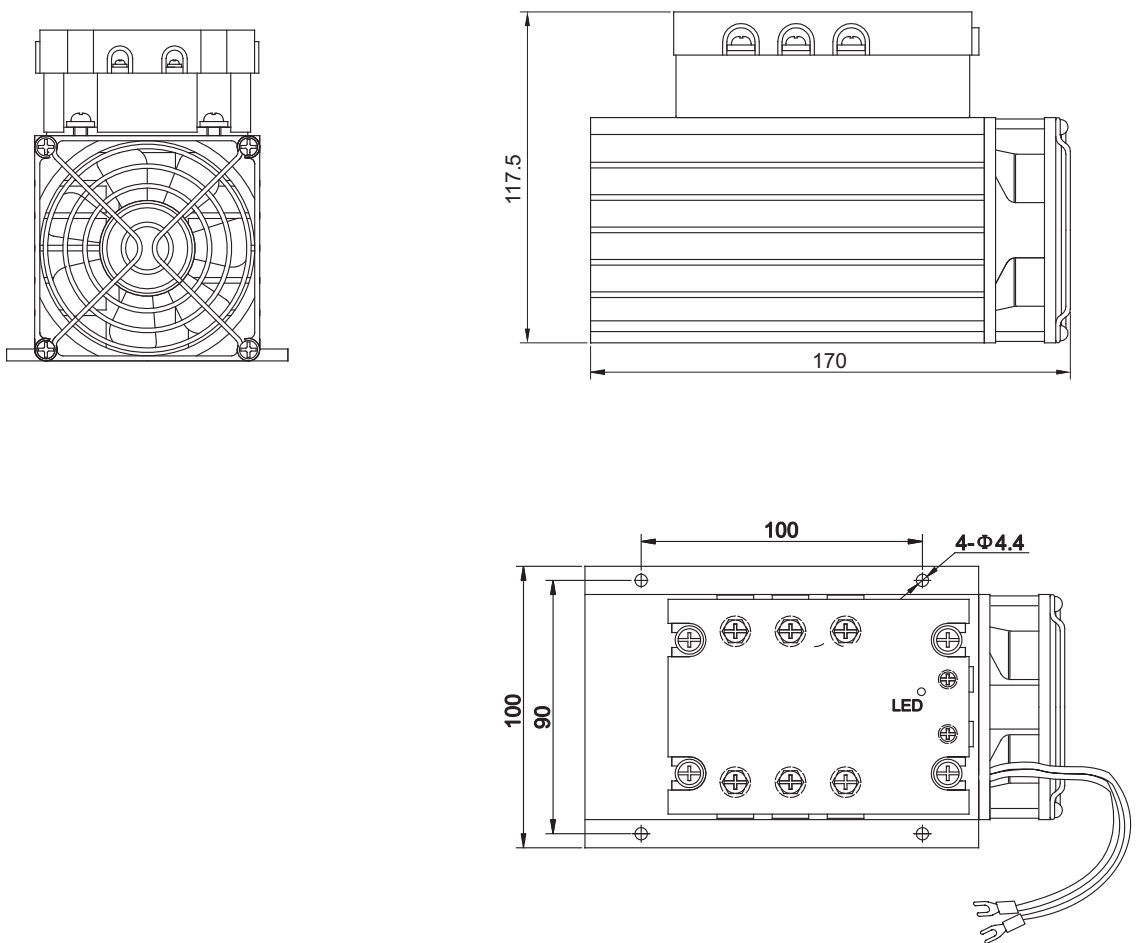
LRSSR-3系列接线图
LRSSR-3 Serise connecting diagram



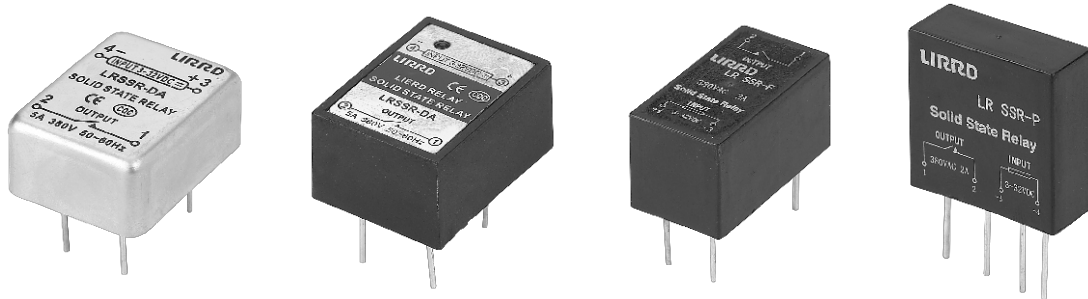
5A~40A配散热器尺寸 Dimensions of the equipped radiator



40A~100A配散热器尺寸 Dimensions of the equipped radiator

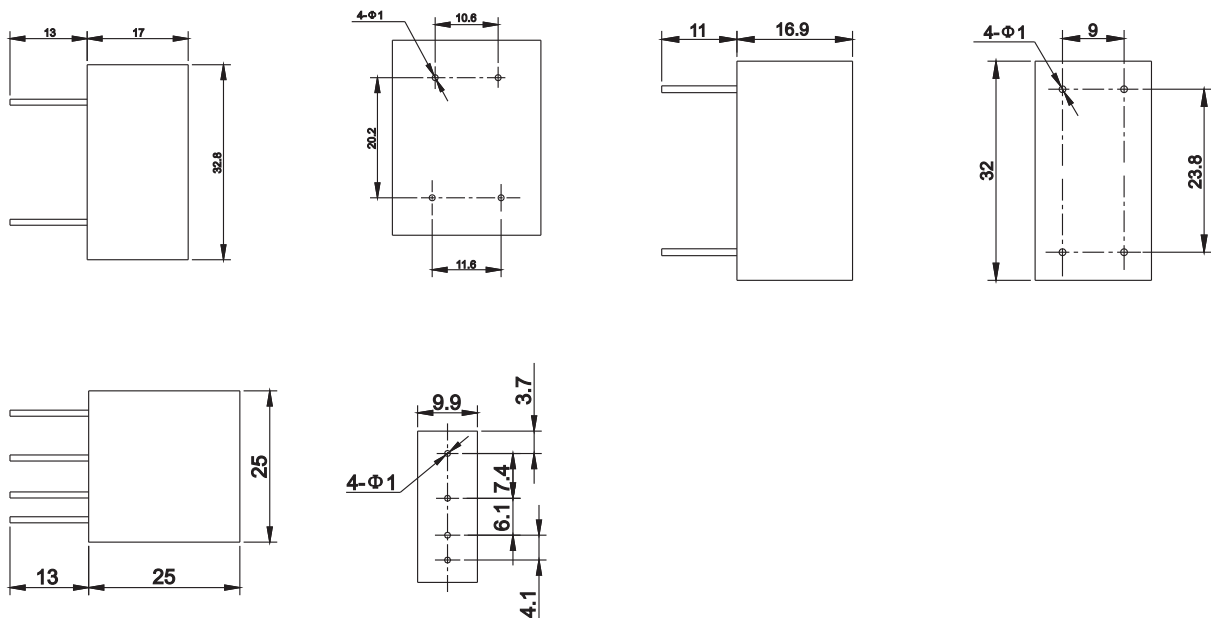


LRSSR PCB 系列 Series

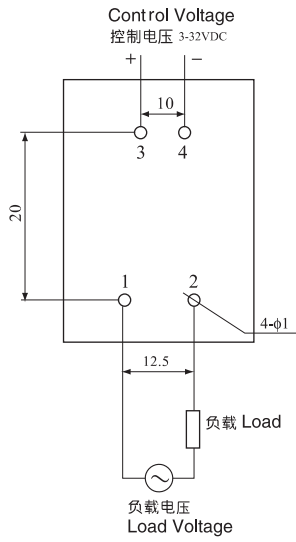


产品型号 Model	LRSSR-DA	LRSSR-DA	LRSSR-F	LRSSR-P	LRSSR-P-DD
负载电压 (V) Load Voltage	40-240/36-530	40-240/36-530	28-280/36-530	28-280/36-530	2-150VDC
负载电流 (A) Load Current	1~10A	1~5A	1~3A	1~3A	1~5A
介质耐压 (Vac) Dielectric Strength	2500				
绝缘电阻 (MΩ) Insulation Resistance	100				
控制电压 (Vdc) Control Voltage	3-32				
控制电流 (mA) Control Current	≤7				≤10mA
通态压降 (V) On Voltage Drop	≤1.5				≤0.7
断态漏电流 (mA) Off Leakage Current	≤2				
频率范围 (Hz) Frequency Range	47-63				
通断时间 (ms) on-off Time	≤1/2 Cycle				≤1ms
动作状态指示 Action State Indication	无	LED	无		
环境温度 Ambient Temperature	-30℃~+75℃				
安装形式 Mounting Method	直插PCB Put PCB In Directly				
同类型参照 Same Reference	SSR,JG-3F,G3CN				
说明 Directions					

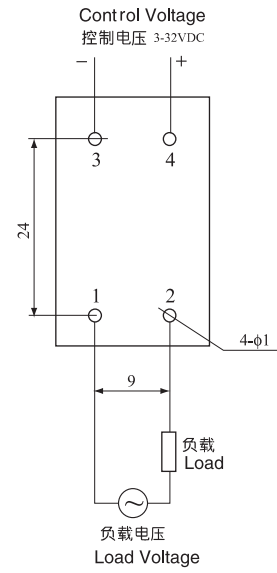
LRSSR系列外形尺寸和安装尺寸 LRSSR Series dimension and installation dimensions



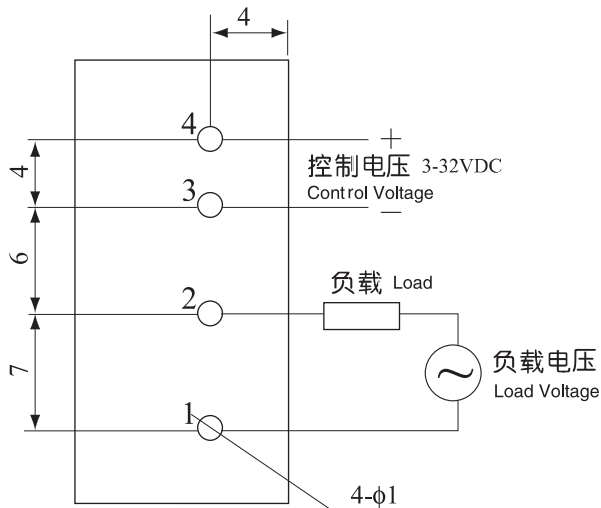
LRSSR接线图 Connecting diagram



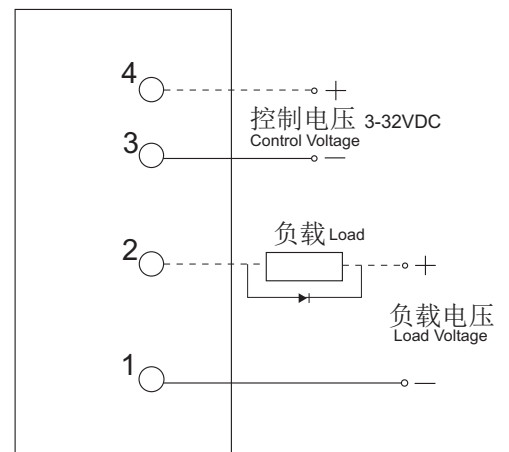
LRSSR-F 接线图 Connecting diagram



LRSSR-P接线图 Connecting diagram



LRSSR-P-DD 接线图 Connecting diagram



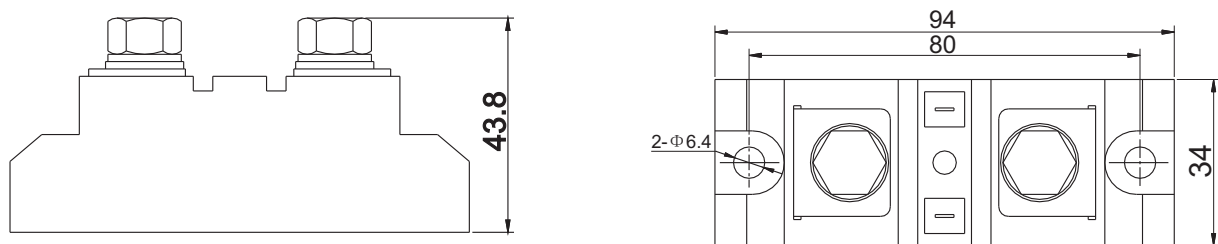
LRSSR-M 系列 Series



产品型号 Model	LRSSR-M
负载电压 (V) Load Voltage	28~280,90~450,48~660
负载电流 (A) Load Current	100,120,150,200,250,300
介质耐压 (Vac) Dielectric Strength	2500
绝缘电阻 (MΩ) Insulation Resistance	100
控制电压 (Vdc) Control Voltage	3-32
控制电流 (mA) Control Current	≤ 10
通态压降 (V) On Voltage Drop	≤ 1.5
断态漏电流 (mA) Off Leakage Current	≤ 4
频率范围 (Hz) Frequency Range	47~63
通断时间 (ms) on-off Time	≤ 1/2 Cycle
动作状态指示 Action State Indication	LED
环境温度 Ambient Temperature	-30℃~+75℃
安装形式 Mounting Method	螺栓固定 Bolt Fixation
同类型参照 Same Reference	SSR,JG-3F,G3CN
说明 Directions	

备注：固态与散热器之间必须敷导热硅脂以利散热。

LRSSR-M系列外形尺寸和安装尺寸 LRSSR-M Series dimension and installation dimensions



LRSSR-M 系列接线图 LRSSR Series connecting diagram

