Solid-State Relays
SRP1-CC Series

Description

The SRP1-CC series of solid-state relays (SSRs) offers a dependable solution for DC output applications. Designed to meet industry standards, the Littelfuse SRP1-CC series provides consistent performance for everyday use. With a broad voltage range and practical design, these relays are suitable for a variety of applications, from industrial automation to renewable energy systems.

- Reliable Operation: The SRP1-CC series ensures stable performance, making it a solid choice for standard DC output needs.
- IP20 Removable Protection: The IP20-rated design ensures protection against dust and accidental contact. Easily remove the cover for maintenance or adjustments.

Features & Benefits

FEATURES	BENEFITS
MOSFET Technology	Provides efficient switching with low power dissipation and high overcurrent capability, ensuring reliable performance in demanding applications.
Compliance with International Standards (cЯUus, VDE, CE, UKCA)	Ensures that the Solid-State Relay (SSR) has undergone rigorous testing, providing enhanced safety and product quality.
Efficient Design with High Quality	Balances cost-effectiveness with reliable performance, making it an ideal choice for budget-conscious projects

Applications

- DC heaters
- Solenoid valves
- Fans and electric motors
- Battery connection/disconnection
- Packaging machinery
- Medical & test equipment

Ordering Information

FOR HEATING CONTROL

CATALOG NUMBER	OUTPUT MAX CURRENT	OUTPUT VOLTAGE	OUTPUT SWITCHING STYLE	OUTPUT OVERVOLTAGE PROTECTION	INPUT VOLTAGE RANGE	COMPLIANCE
SRP1-CCDDV-020NC-N	20A	100 VDC	DC	-	4-32 V DC	cЯUus, CE
SRP1-CCDDL-020NC-N	20A	200 VDC	DC	-	4-32 V DC	cЯUus, CE
SRP1-CCDDV-040NC-N	40A	100 VDC	DC	-	4-32 V DC	cЯUus, CE
SRP1-CCDDL-040NC-N	40A	200 VDC	DC	-	4-32 V DC	cЯUus, CE

Input/Control Specifications[1]

GENERAL DATA

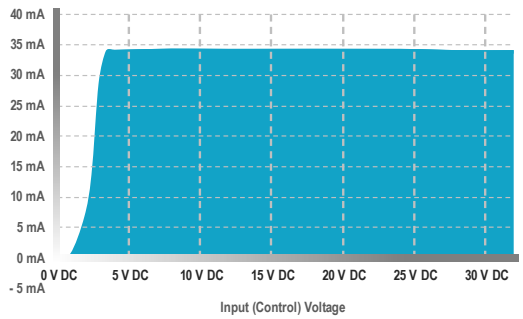
SYMBOL	PARAMETER	RANGE	VALUE	UNIT
Uc	Input (Control) Voltage*	Maximum	32	V DC
		Nominal	12-24	V DC
		Minimum	3,5	V DC
Urv	Reverse Voltage	Maximum	-32	V DC
Uc on	Turn-On Voltage (Pick-up/Engage/Activation Voltage)	Minimum	3,5	V DC
Uc off	Turn-Off Voltage (Drop Out/Release Deactivation Voltage)	Nominal	1,0	V DC
Ic	Input (Control) Current	Maximum	35	mA
		Minimum	32	mA
-	Input Impedance	Nominal	Current Regulated	-
Ton	Turn-On Time	Maximum	40	µs
Toff	Turn-Off Time	Maximum	40	µs

*Increase Min voltage by 1V for operations from -20 to -40°C.

Input Current vs Input Voltage Graphs (For Power Supply Selection)

To ensure the Solid-State Relay (SSR) operates efficiently and reliably, it is essential to understand the relationship between input voltage and input current. The following input current graphs provide detailed information on the current consumption of our SSRs across the specified input voltage range (4-32 VDC). This data is crucial for selecting an appropriate power supply and ensuring the relay functions within its safe operating limits. Proper understanding of current consumption is vital for the optimal performance of your application.

4-32 VDC Input



Output/Load Specifications[1]

GENERAL DATA

SYMBOL	PARAMETER	CONDITION	RANGE	VALUE FOR 20A /100V VERSIONS	VALUE FOR 20A / 200V VERSIONS	VALUE FOR 40A /100V VERSIONS	VALUE FOR 40A / 200V VERSIONS	UNIT
-	Output Configuration	-	-	SPST-NO	SPST-NO	SPST-NO	SPST-NO	-
f	Operating Frequency	-	Minimum	-	-	-	-	Hz
			Nominal	-	-	-	-	
			Maximum	>1000	>1000	>1000	>1000	
Ue	Recommended Operating Voltage	47-63Hz	Minimum	5	5	5	5	V DC
			Nominal	48	90	48	90	
			Maximum	60	110	60	110	
Utp	Absolute Maximum Rating (Non-repetitive peak voltage)	47-63Hz	Minimum	100	200	100	200	V DC
-Ut	Reverse voltage drop (Internal diode at OFF state)	Ie=50A / 80A / 56A, Uc=0	Nominal	1,3	1,5	1,3	1,5	V
PWM	Pulse Width Modulation (PWM) Frequency	-	Maximum*	1000	1000	1000	1000	Hz
V	On-State Voltage Drop	At Rated Current	Maximum	0,88	0,97	1,05	1,93	Vrms
RDS-ON	On-State Dynamic Resistance	-	Maximum	56	90	30	46	mΩ
Ipeak	Transient Over-Current (Surge/Overload/Non-Repetitive Current)	t= 0,1ms	Nominal	200	160	320	380	Apk
Ilk	Leakage Current (Off-State)	At Umax, Tjmax	Maximum	3	3	3	3	mArms
Rthj/c	Thermal Resistance Junction to Case (Rjc)	-	Maximum	1,4	1,2	0,9	0,7	°C/W

*For high frequency, take 2 x Ie to calculate the heatsink; the protections must be chosen carefully.

Littelfuse SSRs are designed for various DC applications and can manage specific load types effectively. The maximum continuous current value provided in this datasheet applies to non-inductive or slightly inductive loads (DC-1 type), such as DC heating elements, or small solenoids.

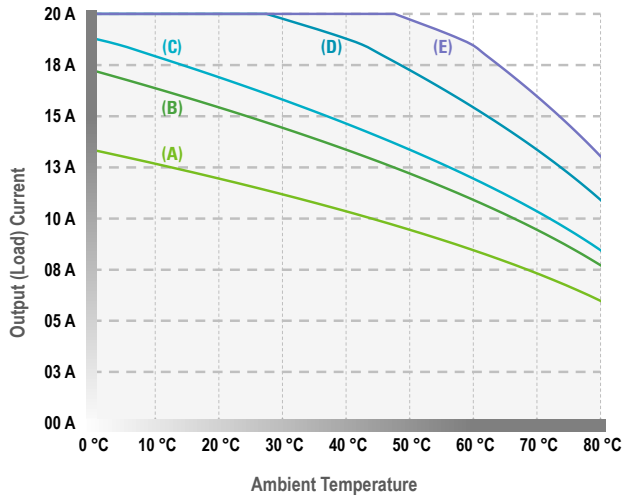
SYMBOL	PARAMETER	CONDITION	RANGE	VALUE FOR 20A / 100V VERSIONS	VALUE FOR 20A / 200V VERSIONS	VALUE FOR 40A / 100V VERSIONS	VALUE FOR 40A / 200V VERSIONS	UNIT
Ie (DC-1)	Load Current (Continuous) – Non-inductive or slightly inductive loads (DC-1)	At 40 °C	Maximum*	20	20	40	40	A DC
			Minimum	0,005	0,005	0,005	0,005	A DC

*Heat sinking required, see derating curves.

Thermal Derating Curves (For Heatsink Selection)

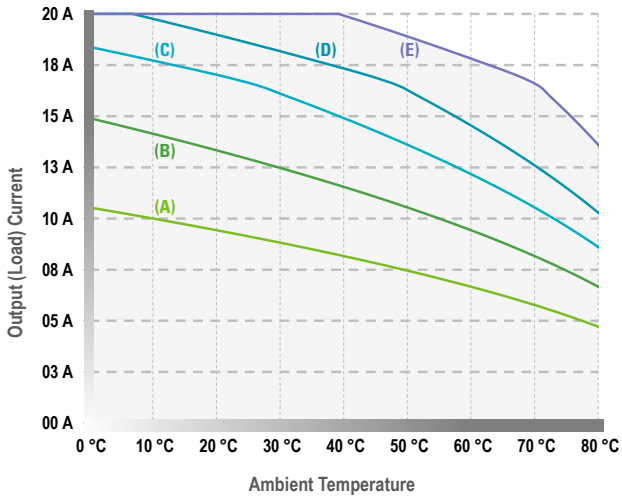
To operate the Solid-State Relay (SSR) at its specified ratings, the use of a heatsink is mandatory. The following thermal derating curves illustrate the maximum load current that our SSRs can manage under varying ambient temperatures and heatsink sizes. It is crucial to select a heatsink that is most suitable for your specific application.

20A | 100V Versions



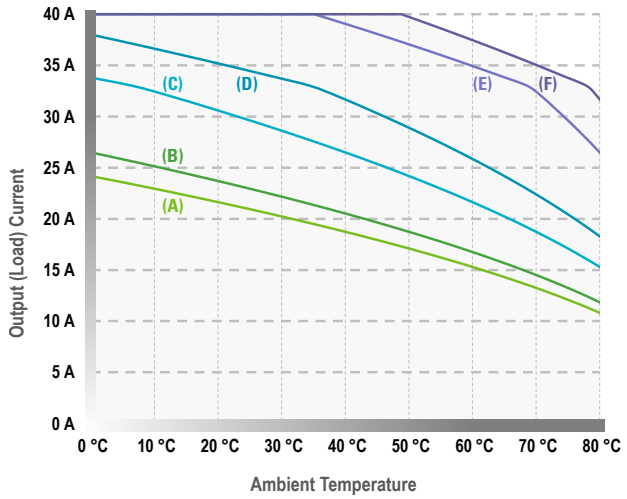
(A): No Heatsink (C) 5,0 °C/W: Heatsink (E) 2,1 °C/W: Heatsink
(B) 6,0 °C/W: Heatsink (D) 3,0 °C/W: Heatsink

20A | 200V Versions



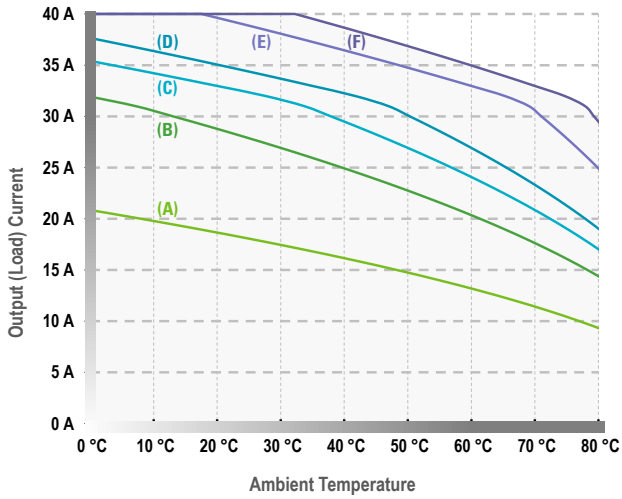
(A) 10 °C/W: Heatsink (C) 3,0 °C/W: Heatsink (E) 3,0 °C/W: Heatsink
(B) 5,0 °C/W: Heatsink (D) 2,1 °C/W: Heatsink

40A | 100V Versions



(A) 6,0 °C/W: Heatsink (C) 3,0 °C/W: Heatsink (E) 1,0 °C/W: Heatsink
(B) 5,0 °C/W: Heatsink (D) 2,1 °C/W: Heatsink (F) 0,7 °C/W: Heatsink

40A | 200V Versions



(A) 5,0 °C/W: Heatsink (C) 1,5 °C/W: Heatsink (E) 0,7 °C/W: Heatsink
(B) 2,1 °C/W: Heatsink (D) 1,2 °C/W: Heatsink (F) 0,5 °C/W: Heatsink

Considerations – Switching Type

DC output SSRs are versatile and can be used to control various types of loads, including resistive loads such as heating elements, and inductive loads like DC motors and valves. This flexibility makes them suitable for a wide range of industrial and commercial applications.

Considerations – Inrush Current

When dealing with DC loads, it's important to consider the inrush current, especially for inductive loads such as motors and valves:

- DC motors and valves can generate inrush currents that are 3-4 times their steady-state current. To accommodate this, it is recommended to select an SSR with a current rating 3-4 times the nominal current of the load, or to operate the SSR at 25%-35% of its maximum capacity to help manage these high currents and protect the relay and other components.

- For DC resistive loads, inrush current is generally less of a concern compared to inductive loads. However, it's still prudent to account for any potential surges, especially if the load includes capacitive elements. Ensuring the SSR operates within 80%-90% of its maximum capacity can enhance reliability and lifespan.

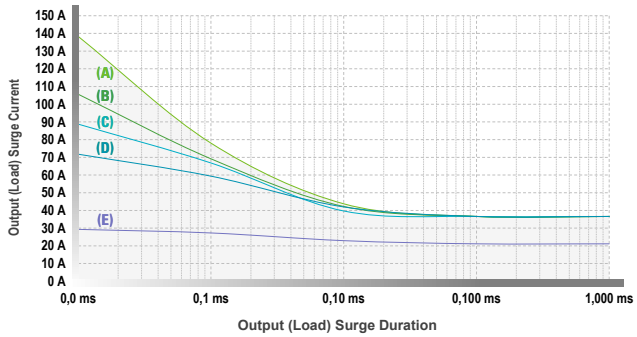
NOMINAL SSR CURRENT RATING	MAXIMUM RECOMMENDED CURRENT RESISTIVE LOADS	MAXIMUM RECOMMENDED CURRENT INDUCTIVE LOADS
20 A	16-18 A	6-10 A
40 A	32-36 A	12-20 A

Output Surge Current Withstand Graphs (For Transient Protection)

To ensure the Solid-State Relay (SSR) can handle sudden increases in current without damage, it is essential to understand its surge current capacity. The following surge current graphs illustrate the maximum surge current that our SSRs can withstand over various durations. This information is crucial for selecting an SSR that can endure transient overcurrent events, ensuring the reliability and safety of your electrical system. Proper understanding of surge current capacity helps in preventing equipment failure and maintaining optimal performance in your application.

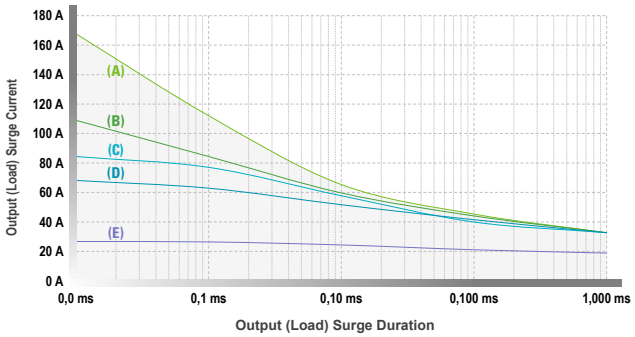
The graphs include a Single Pulse Surge Current curve used to define the protection offered by fuses, helping in the selection of appropriate protective devices. Additionally, is important to ensure that the Repetitive Surge Current curve is not exceeded during normal operation, as frequent overload currents can decrease the life expectancy of the SSR. Therefore, caution is advised to maintain the longevity and reliability of the SSR.

20A | 100V Versions



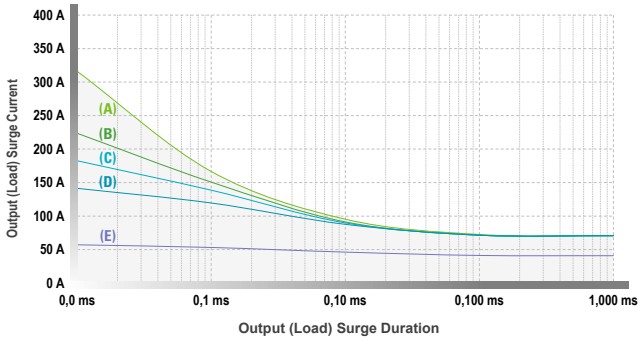
(A) Single Pulse Surge: Initial SSR internal temperature at 125 °C
(B) Repetitive Surges (5% Duty Cycle): Initial SSR internal temperature 175 °C
(C) Repetitive Surges (10% Duty Cycle): Initial SSR internal temperature 175 °C
(D) Repetitive Surges (20% Duty Cycle): Initial SSR internal temperature 175 °C
(E) Repetitive Surges (50% Duty Cycle): Initial SSR internal temperature 125°C

20A | 200V Versions



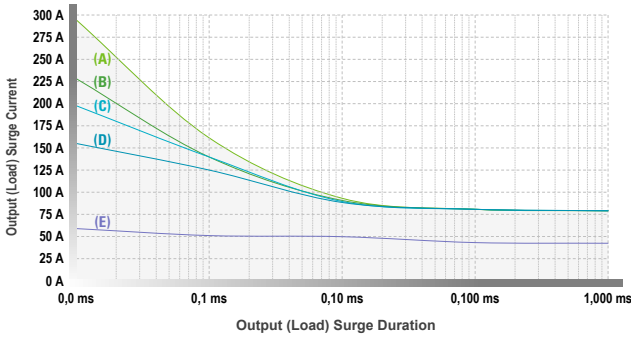
(A) Single Pulse Surge: Initial SSR internal temperature at 125 °C
(B) Repetitive Surges (5% Duty Cycle): Initial SSR internal temperature 175 °C
(C) Repetitive Surges (10% Duty Cycle): Initial SSR internal temperature 175 °C
(D) Repetitive Surges (20% Duty Cycle): Initial SSR internal temperature 175 °C
(E) Repetitive Surges (50% Duty Cycle): Initial SSR internal temperature 125°C

40A | 100V Versions



(A) Single Pulse Surge: Initial SSR internal temperature at 125 °C
(B) Repetitive Surges (5% Duty Cycle): Initial SSR internal temperature 175 °C
(C) Repetitive Surges (10% Duty Cycle): Initial SSR internal temperature 175 °C
(D) Repetitive Surges (20% Duty Cycle): Initial SSR internal temperature 175 °C
(E) Repetitive Surges (50% Duty Cycle): Initial SSR internal temperature 125°C

40A | 200V Versions



(A) Single Pulse Surge: Initial SSR internal temperature at 125 °C
(B) Repetitive Surges (5% Duty Cycle): Initial SSR internal temperature 175 °C
(C) Repetitive Surges (10% Duty Cycle): Initial SSR internal temperature 175 °C
(D) Repetitive Surges (20% Duty Cycle): Initial SSR internal temperature 175 °C
(E) Repetitive Surges (50% Duty Cycle): Initial SSR internal temperature 125°C

General Specifications[1]

GENERAL DATA

SYMBOL	PARAMETER	CONDITION	RANGE	VALUE	UNIT
-	LED for Input (Control) Status Indicator	-	-	Continuously ON Green LED, when control input is applied	-
Ui	Isolation (Dielectric Strength)	Input to Output (50/60 HZ)	Nominal	2 500	Vrms
		Input/Output to Ground (50/60 HZ)	Nominal	2 500	
Ri	Insulation Resistance	@ 500 V DC	Minimum	1	GΩ
Ci	Coupling Capacitance	Input/Output	Maximum	<8	pF
Uimp	Impulse Withstand Voltage	-	Nominal	2500	Vrms
-	Short Circuit Current Rating (SCCR)	-	-	5	kA
-	Endurance according to American Standard UL508	-	Typical	6 000	Cycles
-	MTTFd (Mean Time to Dangerous Failure) (Calculated in accordance with the guidelines for safety-related parts of control systems, as specified by the international standard ISO 13849-1)	-	-	45	Years
-	MTBF* (Mean Time Between Failures) (Calculated in accordance with the Military Handbook Guidelines for Reliability Prediction of Electronic Equipment, as specified by the US Department of Defense Standard MIL-HDBK-217)	@ 40 °C ambient	-	25	Years
		@ 60 °C ambient	-	17	

*All parameters at 50% power rating and 100% duty cycle.

General Specifications[1] (Continued)

ENVIRONMENTAL DATA

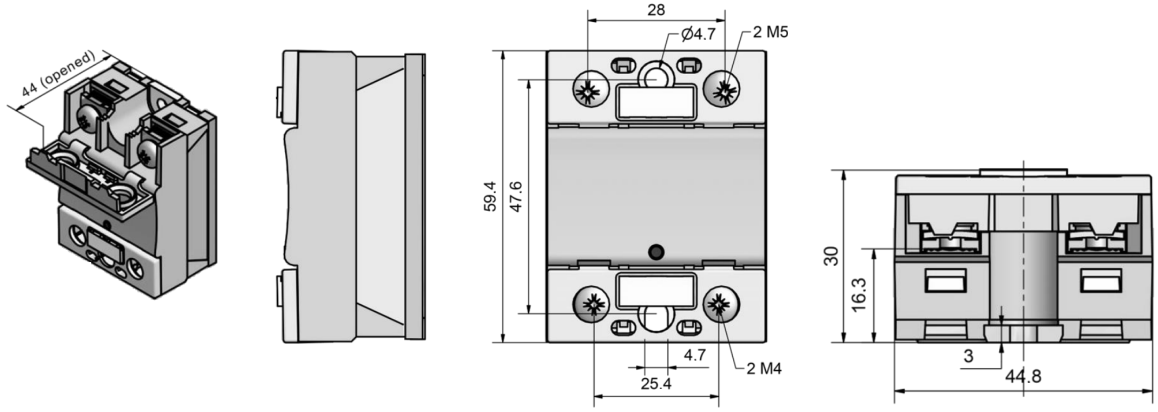
SYMBOL	PARAMETER	CONDITION	RANGE	VALUE	UNIT
-	Vibration (Test conducted in accordance with the Vibration Environmental Testing Guidelines of the International Standard IEC 60068-2-6)	5-100Hz	Nominal	10	g
-	Shock (Test conducted in accordance with the Shock Environmental Testing Guidelines of the International Standard IEC 60068-2-27)	11ms	Nominal	30, 40, 50	g
Tamb	Ambient Temperature - Operating (Working)	No icing, no condensation	Maximum Minimum	100 (212) -40 (-40)*	°C (°F) °C (°F)
Tstg	Ambient Temperature - Storage	No icing, no condensation	Maximum Minimum	90 (194) -25 (-13)	°C (°F) °C (°F)
HR	Relative Ambient Humidity (Per international standard IEC/EN 60068-2-78)	Non-condensing @ 40 °C	Nominal	40 to 85	%
-	Pollution Degree	Non-conductive pollution with condensation possibilities	Nominal	2	-

*Value for 10A, 20A, 40A and 50A versions is -55 (-67) °C (°F).

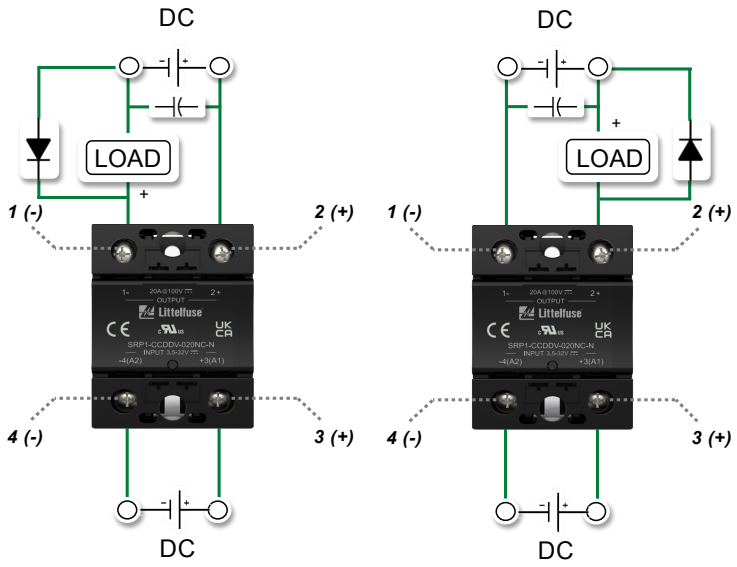
MECHANICAL DATA

SYMBOL	PARAMETER	CONDITION	RANGE	VALUE	UNIT
-	Product Weight	-	Typical	80 (0.18)	g (lbs)
-	Housing Material (In accordance with the American Standard UL- 94 for Safety of Flammability of Plastic Materials for Parts in Devices and Appliances)	-	-	Plastic UL 94 V-0	-
-	Baseplate Material	-	-	Aluminum, Tinned-plated	-
-	Touch Protection Level (Test conducted in accordance with the IP Code of Degrees of Protection Testing Guidelines of the International Standard IEC 60529)	-	-	IP20	-
-	Screw Torque Range	Input (Control) Terminals	Minimum Maximum	1.2 (11) 2.0 (18)	Nm (in-lb)
		Input (Control) Terminals	Minimum Maximum	2 (18) 3 (26)	Nm (in-lb)
		SSR Mounting	Minimum Maximum	1.2 (11) 1.5 (13)	Nm (in-lb)
-	Screw Thread Size	Input Terminals	-	M4 x 0.7	-
		Output Terminals	-	M5 x 0.8	-
		SSR Mounting	-	M4 x 12mm or #6-32 Pan Head	-

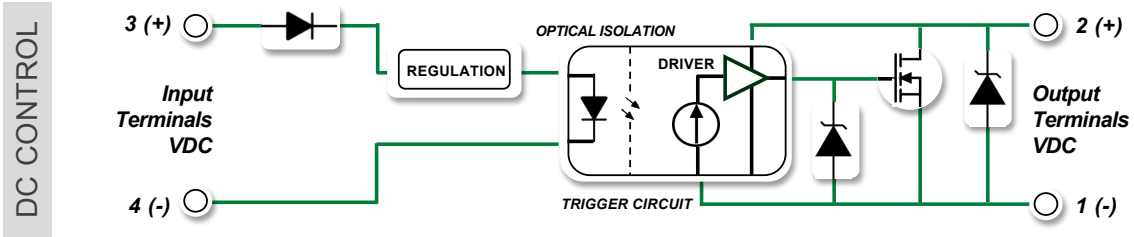
Product Dimensions (Millimeters)



Wiring Diagram



Equivalent Circuit Block



Short-Circuit Protection by Fuse

To safeguard solid-state relays (SSRs) against load short circuits, the use of fuses is essential, especially fast-acting ones. Here are the key considerations:

- Fuse Selection: The I²t value (energy withstand capability) of the fuse should be less than half of the I²t value of the relay. Standard fuses are inadequate because they cannot react swiftly enough to prevent fault currents from exceeding the maximum levels that thyristors (used in SSRs) can handle. Therefore, we strongly recommend employing ultra-fast fuses.
- Fuse Placement: Position the fuse in front of the SSR in the circuit. This strategic placement ensures that if the relay must unexpectedly break the earth insulation (due to overheating, case damage, or leakage with the heatsink), the fuse will protect the entire circuit from firing.
- Resource for Fuse Options: For the most suitable fuse options, consider checking the Littelfuse website.

Standards Conformity & Certifications

Product Safety Certifications

Products tested, compliant and certified to the following standards that states the requirements for electrical products to ensure they are safe for consumers to use.

CERTIFICATION BODY MARK	CERTIFICATION BODY NAME	CERTIFICATION DESCRIPTION	STANDARDS COVERED BY THE CERTIFICATION
c UL us	cRUus	North American certificate of compliance with the Safety requirements for Industrial Control Equipment	**UL508** American Standard of Safety for Industrial Control Equipment. **CAN/CSA C22.2 No.14-18** Canadian Standard of Safety for Industrial Control Equipment.
CE	CE	Conformity with the European safety, health, and environmental protection requirements.	**LVD Directive 2014/35/EU** EU Directive of Safety for Low Voltage Gear Equipment. In accordance with the Low Voltage Gear Testing Guidelines of the International Standard IEC 60947-4-3 **EMC Directive 2014/30/EU** EU Directive of Electromagnetic Compatibility. In accordance with the Low Voltage Gear Testing Guidelines of the International Standard IEC 60947-4-3 **RoHS Directive 2015/863/EU** EU Directive of Hazardous Substances Restriction. In accordance with the Assessment of electrical and electronic products with respect to the restriction of Hazardous substances Guidelines of the International Standard IEC 63000

EMC Compliance (Electro-Magnetic Compatibility)

Radiated Emissions

-	STANDARD NAME	STANDARD DESCRIPTION	STANDARD NUMBER	LEVELS
IEC	Radiated RF	Radio interference field emission (radiated)	International Standard CISPR 11	Class A: 30M – 1GHz
IEC	Conducted RF	Radio interference voltage emissions (conducted)	International Standard CISPR 11	Class A (with external filter): 150k – 30MHz

Immunity

-	STANDARD NAME	STANDARD DESCRIPTION	STANDARD NUMBER	LEVELS
IEC	ESD	Immunity to Electrostatic Discharge (ESD)	International Standard IEC 61000-4-2	Level 3: -Contact Discharge: ± 6 kV -Air Discharge: ± 8 kV -Performance Criteria: A
IEC	Burst	Immunity Electrical Fast Transients (Burst)	International Standard IEC 61000-4-4	2 kV Performance Criteria: B
IEC	Surge	Immunity to Electrical Surges	International Standard IEC 61000-4-5	2 kV Performance Criteria: B

While these products are designed to meet high industrial standards for Class A equipment, ensuring robust performance in demanding environments, they may cause radio interference when used in domestic settings. To mitigate this, additional noise reduction measures, such as filters or shielding, may be necessary. Ensure that the entire setup where the SSR is installed complies with all relevant EMC regulations required by the application.

Environmental Compliance[2]

Products comply to the following environmental standard requirements for electrical products to ensure they are safe for consumers to use.

-	STANDARD NAME	STANDARD DESCRIPTION	STANDARD NUMBER
RoHS	RoHS	Conformity with the European Restriction of Hazardous Substances in electrical and electronic products	European Directive 2015/863/EU (IEC 63000)
REACH	REACH	Conformity with the Registration, Evaluation, Authorization and Restriction of Chemicals regulation to ensure safe use of chemicals	European Directive 1907/2006
	WEEE	Conformity with the Waste Electrical and Electronic Equipment regulation to ensure proper disposal and recycling of e-waste	Regulation 2002/96/EC

Accessories

IMAGE	CATALOG NUMBER	TYPE	DESCRIPTION
	SADH-C1N600	DIN Rail Adapter	Allows SSR to be mounted on a 35 mm DIN type rail. It has a 6 °C/W Thermal Resistance
	C103PM	DIN Rail	35 mm aluminum DIN rail available in a 36 in. (91.4 cm) length
	SADH-NN210	Heatsink	2.1 °C/W Thermal Resistance
	SADH-NN175	Heatsink	1.75 °C/W Thermal Resistance
	SADH-NN120	Heatsink	1.2 °C/W Thermal Resistance
	SADH-NN100	Heatsink	1.0 °C/W Thermal Resistance
	SADH-NN050	Heatsink	0.5 °C/W Thermal Resistance, 24 VDC
	SADH-ND030	Heatsink	0.3 °C/W Thermal Resistance, 24 VDC
	SADH-NA030	Heatsink	0.3 °C/W Thermal Resistance, 230 VAC
	SANT-C1NM40	Mounting Screws	Screw Kit for heatsink mounting
	SANP-C1N030	Thermal Interface	Thermal Pad (Usable for 1 relay)
	SANG-CNN090	Thermal Interface	Heat Sink Thermal Paste 20 ml (Usable for 60+ relays)
	P0200-19	Thermal Interface	Heat Sink Compound 2 grams (Usable for 1 relay)
	P0200-20	Thermal Interface	Heat Sink Compound 100 grams (Usable for 50+ relays)

Notes:

[1]All parameters at 25 °C unless otherwise specified.

[2]The environmental compliance data reflects the most current information available and adheres to our rigorous standards for quality and sustainability. These specifications are valid from the product's initial release and are subject to change with ongoing improvements.

Warning Information

Caution: Material Damage, Electric Shock, and Arc Flash Hazard. Before installing or working with this equipment, take the following precautions:

1. **Disconnect all power:** Ensure that all power sources are disconnected.
2. **Verify connections:** Double-check all connections.

Failure to adhere to these instructions may lead to **serious injury or damage** of equipment.