Solid-State Relays
SRP1-ME Series

*SRP1-ME size comparison to the standard SSR.

Description

The SRP1-ME Relays series offers an affordable solution for controlling simple heating applications. Designed with efficiency in mind, the Littelfuse SRP1-ME solid-state relays (SSRs) provide essential features without compromising on quality.

- Industrial-Grade Build: Crafted for durability, the SRP1-ME series are built to withstand demanding environments using back-to-back SCRs to guarantee high quality, reliability, and longevity.
- Compact Design: Featuring a mini puck form-factor, the SRP1-ME series are just a quarter the size of traditional hockey-puck relays, making them perfect for applications where space is limited.

Features & Benefits

FEATURES	BENEFITS
Zero Cross Switching	Reduces electrical noise and minimizes voltage spikes during switching, enhancing overall system stability.
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

- Coffee machines
- Cooking ovens
- Hot drinks dispensers
- Commercial fryers
- Cooking suites
- Commercial toasters

Revised: 05/06/2025

Ordering Information

FOR HEATING CONTROL						
CATALOG NUMBER	OUTPUT MAX CURRENT	OUTPUT VOLTAGE	OUTPUT SWITCHING STYLE	OUTPUT OVERVOLTAGE PROTECTION	INPUT VOLTAGE RANGE	COMPLIANCE
SRP1-MEDZL-025NF-N	25A	12-280 V AC	Zero Cross	VDC	4-30 V DC	cЯUus, VDE, CE

Input/Control Specifications[1]

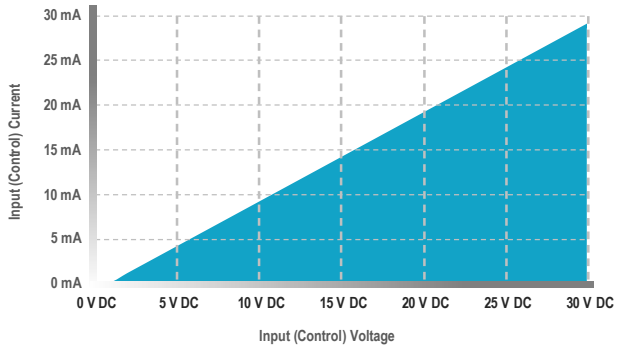
GENERAL DATA				
SYMBOL	PARAMETER	RANGE	VALUE FOR DC INPUT VERSIONS	UNIT
Uc	Input (Control) Voltage	Maximum	30	V DC
		Nominal	5 – 12 – 24	V DC
		Minimum*	4	V DC
Urv	Reverse Voltage	Maximum	-30	V DC
Uc on	Turn-On Voltage (Pick-up/Engage/Activation Voltage)	Minimum	4,0	V DC
Uc off	Turn-Off Voltage (Drop Out/Release/Deactivation Voltage)	Nominal	1,0	V DC
Ic	Input (Control) Current	Maximum	29	mA
		Minimum	3	mA
-	Input Impedance	Nominal	1,2	-
Ton	Turn-On Time	Maximum	10	ms
Toff	Turn-Off Time	Maximum	10	ms

*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 (4-30 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.

4-30 VDC Input



Output/Load Specifications[1]

GENERAL DATA

SYMBOL	PARAMETER	CONDITION	RANGE	VALUE	UNIT
-	Output Configuration	-	-	SPST-NO	-
f	Operating Frequency	-	Minimum Nominal Maximum	0,1 50-60 800	Hz
Ue	Operating Voltage	47-63Hz	Minimum Nominal Maximum	12 120-240 280	Vrms
Usync	Zero Cross Level (Zero Voltage Turn-on)	-	Maximum	12	V
Ua	Latching Voltage	At Ue Nominal	Minimum	8	V
V	On-State Voltage Drop	At Rated Current	Maximum	0,85 + 0,016 x Ie	Vrms
Vto	Threshold Voltage (Power Loss Calculations only)	-	Maximum	0,85	V
rt	On state dynamic resistance (Power Loss Calculations only)	-	Maximum	16	mΩ
Up	Transient Over-Voltage* (Peak/Blocking/Non-Repetitive Voltage)	-	Maximum	600	Vpk
Itsm	Transient Over-Current (Surge/Overload/Non-Repetitive Current)	Max 1 Cycle f = 50 Hz / 60 Hz	Minimum Nominal	250 260	Apk
Ilk	Leakage Current (Off-State)	At Rated Voltage, 50Hz	Maximum	< 3	mArms
dv/dt	Critical dV/dt (Off-State)	At Maximum Rated Voltage	Minimum	500	V/µsec
di/dt	Non-repetitive di/dt	-	Maximum	50	A/µsec
I2t	I²t Value for Fusing	½ Cycle at 50/60Hz (Tvj=45 °C)	Minimum Nominal	330 340	A² sec
Pf	Minimum Power Factor	At Maximum Load	Minimum	0,8	-
Pd	Power Dissipation	@ Rated Current	Maximum	0.765 x Ie + 0,016 x Ie²	W
Rthj/c	Thermal Resistance Junction to Case (Rjc)	-	Maximum	1,7	°C/W

*Output will self trigger between 450-600 Vpk not suitable for capacitive loads.

The maximum continuous current value given in this datasheet is only for resistive loads (specifically AC-1 type), which are mainly used for heating contror.

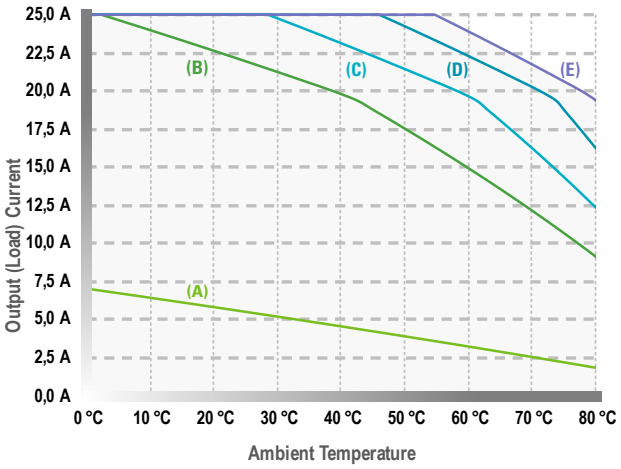
SYMBOL	PARAMETER	CONDITION	RANGE	VALUE	UNIT
Ie (AC-51)	Load Current (Continuous) – Heating Elements (AC-1)	At 40 °C	Maximum* Minimum	25 0,005	Arms Arms

*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.

Version A



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

Considerations – Switching Type

In applications requiring precise temperature management, solid-state relays (SSRs) play a crucial role. Specifically, the Zero Cross Switching type of SSR is commonly employed to regulate heaters based on signals from a temperature controller.

This technology proves particularly valuable in scenarios where high-frequency switching occurs—such as when a heater cycles on and off frequently over short intervals for extended periods.

Considerations – Inrush Current

It's essential to recognize that variations exist between different types of heating elements, especially in hot or cold conditions. While it is generally expected that heating elements exhibit no inrush current, in certain heating elements cold conditions can lead to an inrush current equivalent to 1.4 times the nominal current. To mitigate this, we highly recommend oversizing the current rating and ensuring an appropriately sized heatsink. Doing so improves the relay's thermal endurance and extends its operational lifespan.

So, when selecting an SSR, consider using one with a capacity approximately 1.4 times that of the heater or operating the SSR at only 75%-80% of its maximum capacity. The following table provides guidance for choosing the right SSR for a specific heater load.

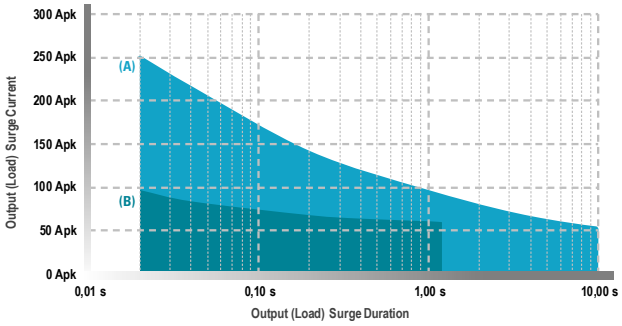
NOMINAL SSR CURRENT RATING	MAXIMUM RECOMMENDED HEATER CURRENT	HEATER POWER AT 120 VAC	HEATER POWER AT 240 VAC
25 A	20 A	2,4 W	4,8 KW

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.

Surge Current Graph



(A) Single Pulse Surge: Initial SSR internal temperature at 25 °C (cooler state from minimal or no operation).
(B) Repetitive Surges: Initial SSR internal temperature 121 °C (warmer state from continuous operation).

General Specifications[1]

GENERAL DATA

SYMBOL	PARAMETER	CONDITION	RANGE	VALUE	UNIT
Ui	Isolation (Dielectric Strength)	Input to Output (50/60 HZ)	Nominal	4 000	Vrms
		Input/Output to Ground (50/60 HZ)	Nominal	2 500	
Ri	Insulation Resistance	@ 500 V DC	Minimum	1000	GΩ
-	Coupling Capacitance	Input/Output	Maximum	0,8	pF
Uimp	Impulse Withstand Voltage	-	Nominal	4000	Vrms
-	Short Circuit Current Rating (SCCR)	-	-	5	kA
-	Endurance according to American Standard UL508	-	Typical	6 000	Cycles
-	MTTDF (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)	-	-	318	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	-	163	Years
		@ 60 °C ambient	-	101	

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

General Specifications[1] (Continued)

ENVIRONMENTAL DATA

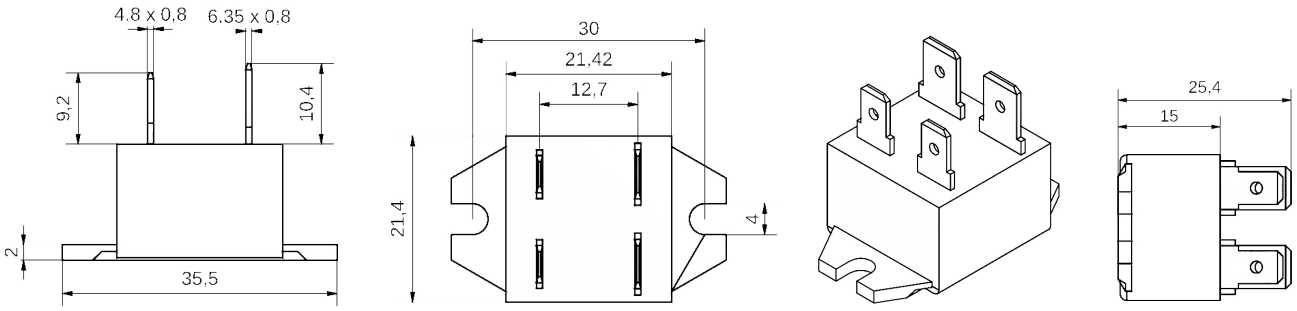
SYMBOL	PARAMETER	CONDITION	RANGE	VALUE	UNIT
-	Vibration (Test conducted in accordance with the Vibration Environmental Testing Guidelines of the International Standard IEC 60068-2-6)	5-100Hz	Nominal	10	g
-	Shock (Test conducted in accordance with the Shock Environmental Testing Guidelines of the International Standard IEC 60068-2-27)	11ms	Nominal	30, 40, 50	g
-	Ambient Temperature - Operating (Working)	No icing, no condensation	Maximum Minimum	100 (212) -40 (-40)*	°C (°F) °C (°F)
-	Ambient Temperature - Storage	No icing, no condensation	Maximum Minimum	100 (212) -40 (-40)*	°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).

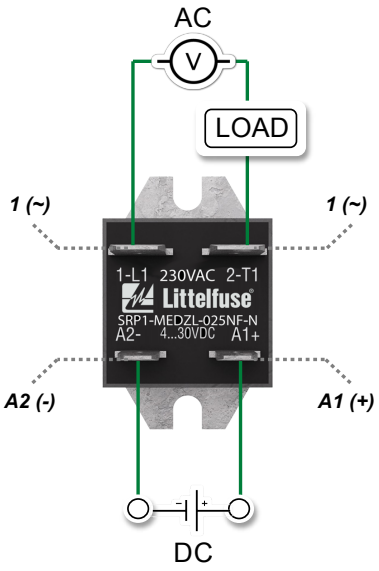
MECHANICAL DATA

SYMBOL	PARAMETER	CONDITION	RANGE	VALUE	UNIT
-	Product Weight	-	Typical	90 (0.20)	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	SSR Mounting	Minimum Maximum	1.2 (11) 1.5 (13)	Nm (in-lb)
-	Screw Thread Size	SSR Mounting	-	M4 x 12mm or #6-32 Pan Head	-

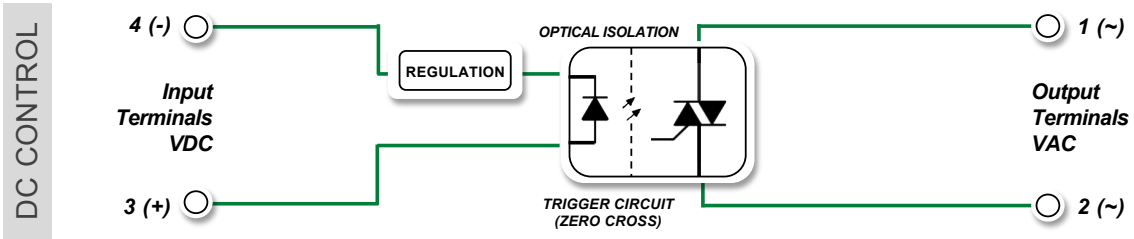
Product Dimensions (Millimeters)



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 I^2t value (energy withstand capability) of the fuse should be less than half of the I^2t 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 ЯUs	cЯUus	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.
VDE	VDE	European certificate of compliance with the Safety requirements for Solid-state relays and Low Voltage Gear Safety	**IEC/EN 60947-1, VDE 0660-100** European Standard of Safety for Low-Voltage Switchgear and Controlgear. **IEC/EN 60947-4-3, VDE 0660-109** European Standard of Safety for Semiconductor Controllers and Contactors for Non-Motor Loads.
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
UK CA	UKCA	Conformity with the UK product safety regulations	**SI 1101** UK Regulations of Safety for Electrical Equipment. In accordance with the Low Voltage Gear Testing Guidelines of the International Standard IEC 60947-4-3 **SI 1091** UK Regulations of Electromagnetic Compatibility. In accordance with the Low Voltage Gear Testing Guidelines of the International Standard IEC 60947-4-3 **SI 3032** UK Regulations 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	Radiated RF	Immunity to Radiated Radio Frequency	International Standard IEC 61000-4-3	Level 3: 10 V/m (80MHz-2GHz) Level 2: 3 V/m (2GHz-6GHz) 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
IEC	Conducted RF	Immunity to Conducted Radio Frequency	International Standard IEC 61000-4-6	Level 3: 10V/m (0.15-80 MHz) Performance Criteria: A
IEC	Dips	Immunity to Voltage Dips	International Standard IEC 61000-4-11	0% for 0.5, 1 cycle, Performance Criteria: A 40% for 10/12 cycles, Performance Criteria: A 70% for 25/30 cycles, Performance Criteria: A 80% for 250/300 cycles, Performance Criteria: A
IEC	Interruptions	Immunity to Voltage Interruptions	International Standard IEC 61000-4-11	0% for 250/300 cycles, 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
	P1015-13	Terminals	AWG 10/12 Female Quick Connect Terminals 0.25 in. (6.35 mm)
	P1015-14	Terminals	AWG 18/22 Female Quick Connect Terminals 0.25 in. (6.35 mm)
	P1015-64	Terminals	AWG 14/16 Female Quick Connect Terminals 0.25 in. (6.35 mm)
	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)
	SANG-CNN090	Thermal Interface	Heat Sink Thermal Paste 20 ml (Usable for 60+ 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.