



FSC

Single-Phase Solid-State Relay with LED and built-in transil



Description

The **FSC** series provides a compact solid state switching solution suited for confined spaces. Long life time is ensured by the use of assembly technology that reduces stresses on the power semiconductors.

The **FSC** series is suitable for resistive loads. The zero-cross switching type model, switches ON when the voltage crosses zero. The Random Turn-On type model switches ON when the control voltage is applied. Switch OFF occurs when current crosses zero.

Integrated transils provide protection against overvoltages. A green LED indicates presence of the control voltage. FASTON terminals enable fast installation. The **FSC** is provided with pre-attached thermal interface ready for mounting on chassis or heatsink.

Benefits

- **Panel space savings.** 70% space savings with the RF compared to standard hockey puck SSRs.
- **Fast installation.** Quick connect terminals for fast and easy wiring.
- **User friendly.** LED for visual indication of control status.
- **Ready for use.** Pre-attached thermal interface to backplate.
- **Low equipment downtime.** Integrated protection against over-voltages across the RF output.
- **Long lifetime.** Wire bonding technology reduces thermal and mechanical stresses of the output chips.
- **Food & Beverage certification conformance.** 100,000 cycle endurance test according to UL508. Conformance to EN 60335-1 requirements.

Applications

- Coffee Machines
- Vending Machines
- Food Warmers
- Griddles
- Fryers
- Thermoforming Machines
- Temperature Control Units
- Plastic Dryers
- Plastic Sealing Machines
- Laboratory Oven Chambers, etc.

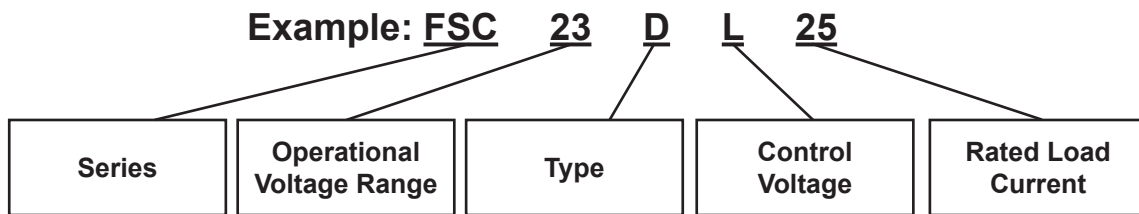
Main Features

- Ratings up to 280 VAC, 25 A
- DC control voltage of 5 VDC, 12 Vdc, 24 Vdc
- Integrated overvoltage protection on output
- Pre-attached thermal interface

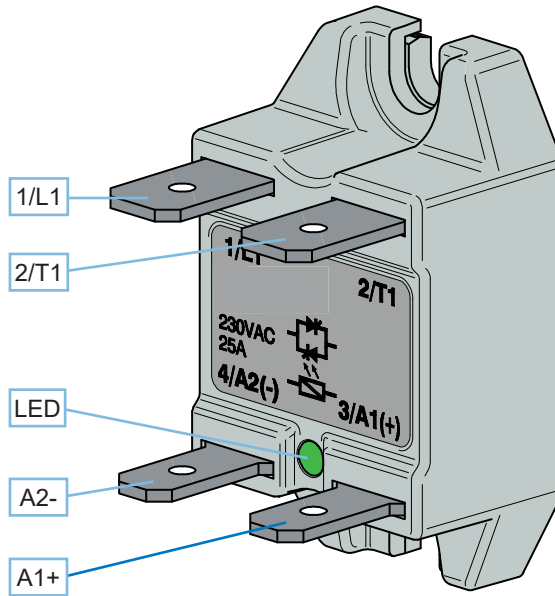


Part Numbering System

Code	Option	Description	Notes
FSC		Product Series	
-	23	Operational Voltage Range: 24-280 VAC (230 VAC Nom.)	
-	D	Zero Cross Switching	
-	R	Random Turn-On Switching	
-	L	Control Voltage: 4.25 - 9 VDC	
-	M	Control Voltage: 9 - 18 VDC	
-	D	Control Voltage: 18 - 28.8 VDC	
-	25	25A Rated Load Current	



Structure



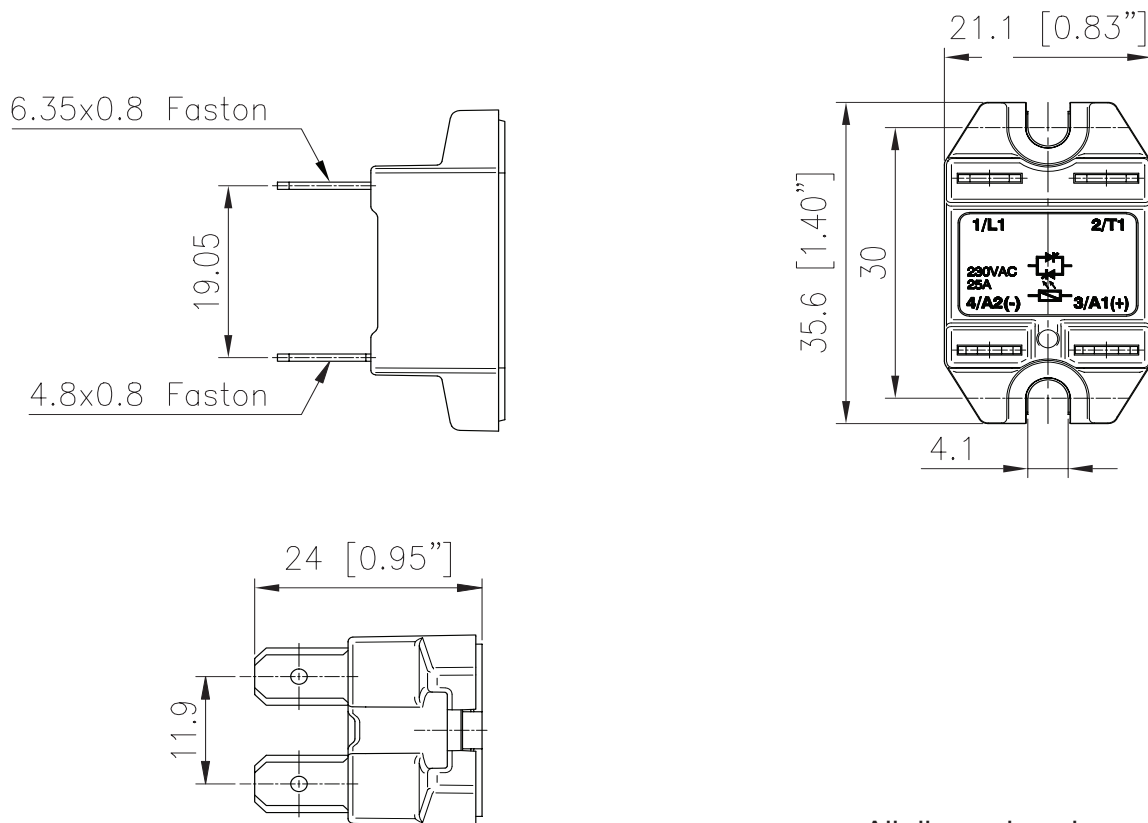
Element	Component	Function
1/L1	Power connection	Mains connection: Faston 6.35 x 0.8 mm
2/T1	Power connection	Load connection: Faston 6.35 x 0.8 mm
A1+	Control connection	Control signal
A2-	Control connection	Ground
LED	LED indicator	Green LED ON when control signal is applied



General Data

Material	PA66 (UL94 V0), RAL7035 conforms to IEC / EN 60335-1 glow wire requirements
Mounting	Panel
Touch Protection	IP20
Overvoltage Category	III, 4 kV (1.2/50 μs) rated impulse withstand voltage
Isolation	Input to Output: 3750 Vrms Input and Output to Case: 2500 Vrms
Weight	approx. 15 g approx. 210 g (box of 10 pcs.)

Dimensions



All dimensions in mm.
[Inches]



Output Specification*

Operational Voltage Range, Ue	24-280 VAC
Blocking Voltage	600 Vp
Max. Operational Current: AC-51 Rating**	25 A
Operational Frequency Range	45 to 65 Hz
Power Factor	> 0.9 @ Rated Voltage
Output Protection	Integrated transil
Leakage Current @ Rated Voltage	< 3 mAAC
Minimum Operational Current	150 mA
Rep. Overload Current - UL508: T=40°C, t _{ON} =1s, t _{OFF} =9s, 50 cycles	40 A
Non-Repetitive Surge Current (t=10ms)	325 Ap
I ² t for Fusing (t=10ms), minimum	525 A ² s
LED Indication - CONTROL	Continuously ON Green LED, when control input is applied
Critical dV/dt (@Tj init = 40°C)	1000 V/μs
Endurance Testing acc. to UL508	100,000 cycles

* Specifications are stated at 25°C unless otherwise noted.

** Max. 25 AAC with suitable heatsink. Refer to Heatsink Selection tables.

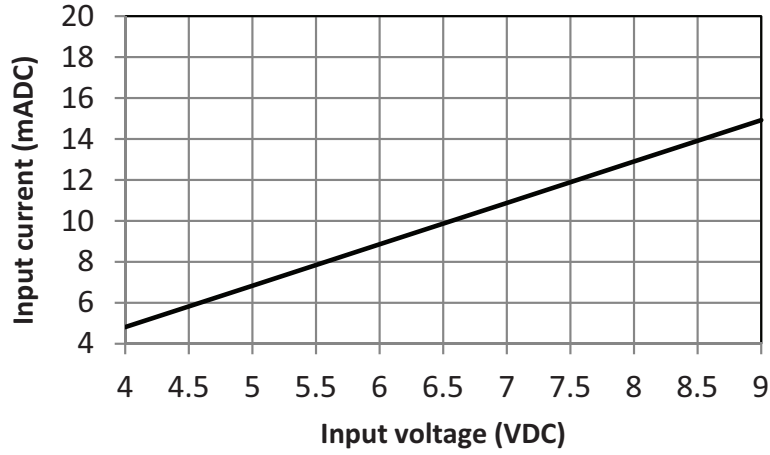
Input Specification

	L	M	D
Control Voltage Range (Uc) FSC23Dx25 FSC23Rx25	4.25 - 9.0 VDC 4.5 - 9.0 VDC	9.0 - 18.0 VDC 11.0 - 18.0 VDC	18.0 - 28.8 VDC 18.0 - 28.8 VDC
Pick-Up Voltage FSC23Dx25 FSC23Rx25	4.25 VDC 4.5 VDC	9.0 VDC 11.0 VDC	18.0 VDC 18.0 VDC
Drop-Out Voltage	1.0 VDC		
Maximum Reverse Voltage	9.0 VDC	18.0 VDC	28.8 VDC
Maximum Response Time Pick-Up FSC23Dx25 FSC23Rx25	1/2 cycle 350 μs		
Response Time Drop-Out	1/2 cycle		
Input Current @ 40°C	See diagrams pg.5		

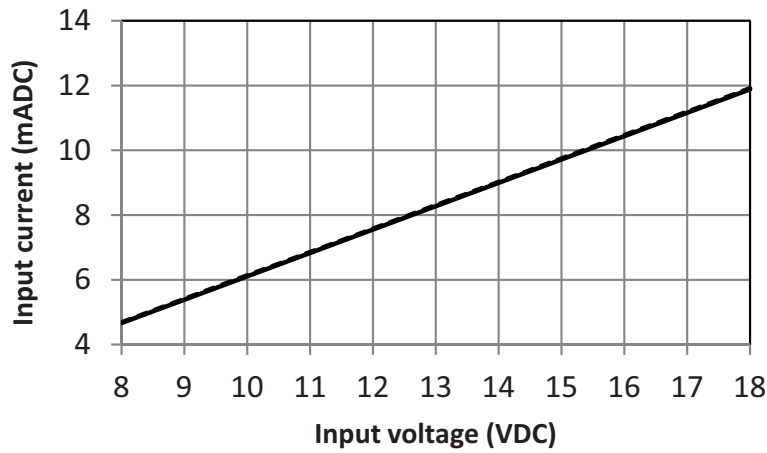


Input Current vs. Input Voltage

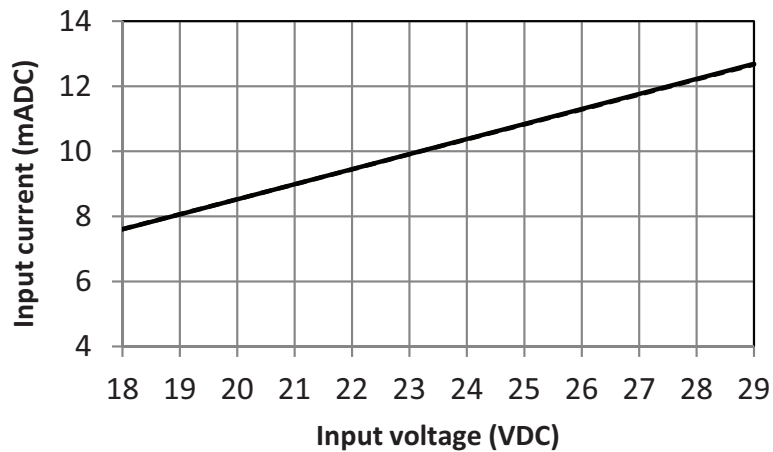
FSC23xL



FSC23xM

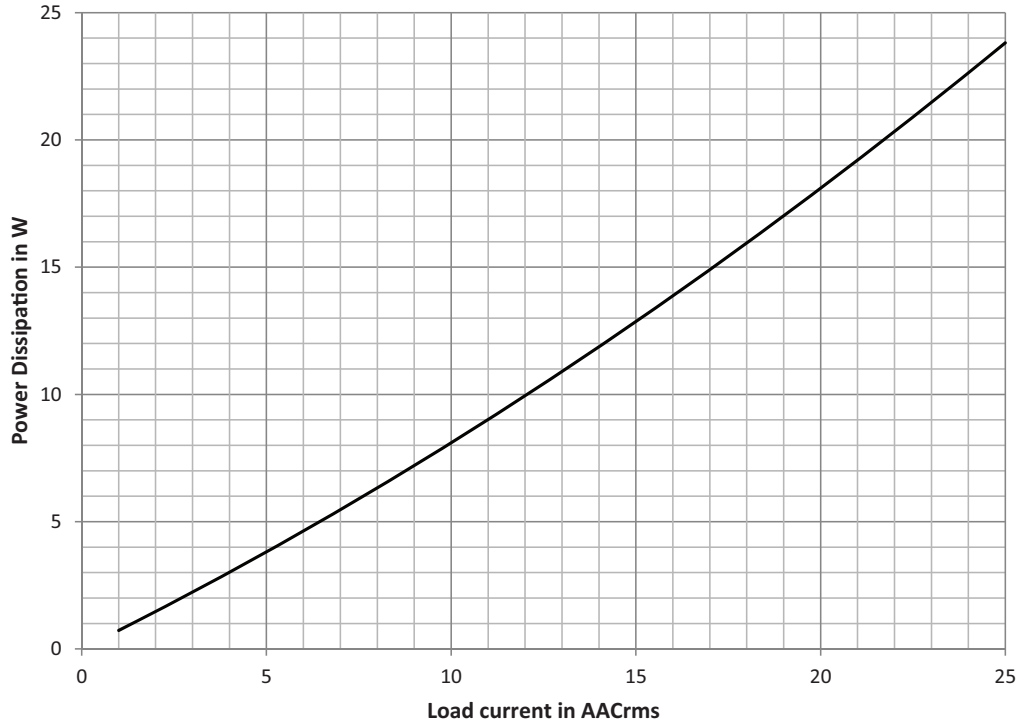


FSC23xD





Output Power Dissipation (P_D)



Heatsink Selection

Thermal Resistance ($^{\circ}\text{C}/\text{W}$)

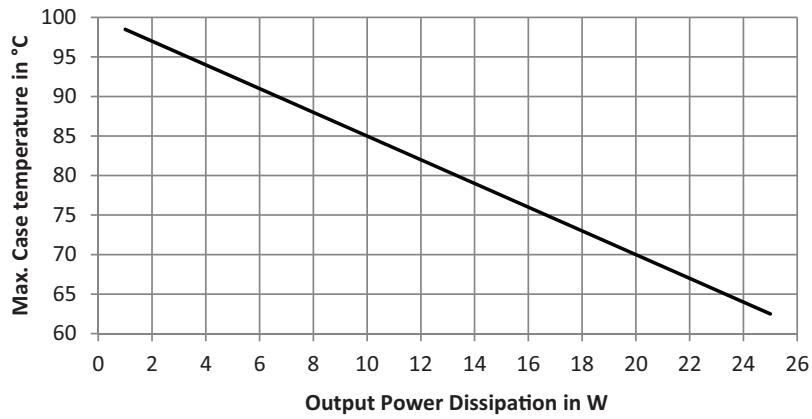
Load Current, AC-51 (A)	Ambient Temperature ($^{\circ}\text{C}$)						
	20	30	40	50	60	70	80
25	2.5	1.9	1.3	0.8	0.3	---	---
22.5	3.2	2.5	1.8	1.1	0.5	---	---
20	4.1	3.2	2.4	1.6	0.9	0.2	---
17.5	5.5	4.3	3.2	2.3	1.4	0.6	---
15	7.5	5.9	4.4	3.2	2.1	1.0	0.1
12.5	10	8.4	6.4	4.6	3.1	1.7	0.5
10	16	12	9.3	6.8	4.7	2.8	1.2
7.5	---	---	15	10	7.1	4.3	2.0
5	---	---	---	---	13	7.5	3.4
2.5	---	---	---	---	---	---	8.5

Note: These thermal resistance values are only applicable to the **FSC** using the pre-attached thermal interface.



Thermal Data


Max. Junction Temperature, T_j	100°C (212°F)
Junction-to-Case Thermal Resistance (including the pre-attached thermal interface), R_{thjc}	1.5 °C/W
Max. Case Temperature, T_c	$T_j - (P_D \times R_{thjc})$ See chart below



Duty cycle is considered to be 100%



Environmental Specifications

Operating Temperature	-30°C to 80°C (-22 to 176°F)
Storage Temperature	-40°C to 100°C (-40 to 212°F)
Relative Humidity	95% non-condensing @ 40°C
Pollution Degree	2
Installation Altitude	0-1000 m. Above 1000 m derate linearly by 1% of FLC per 100 m up to a maximum of 2000 m
Vibration Resistance	2g / axis (2-100Hz, IEC60068-2-6, EN50155, EN61373)
Impact Resistance	15/11 g/ms (EN50155, EN61373)
EU RoHS Compliant	Yes
China RoHS	

The declaration in this section is prepared in compliance with People’s Republic of China Electronic Industry Standard SJ/T11364-2014: Marking for the Restricted Use of Hazardous Substances in Electronic and Electrical Products.

Part Name	Toxic or Harardous Substances and Elements					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr(VI))	Polybrominated biphenyls (PBB)	Polybrominated diphenyl ethers (PBDE)
Power Unit Assembly	x	o	o	o	o	o

O: Indicates that said hazardous substance contained in homogeneous materials for this part are below the limit requirement of GB/T 26572.

X: Indicates that said hazardous substance contained in one of the homogeneous materials used for this part is above the limit requirement of GB/T 26572.



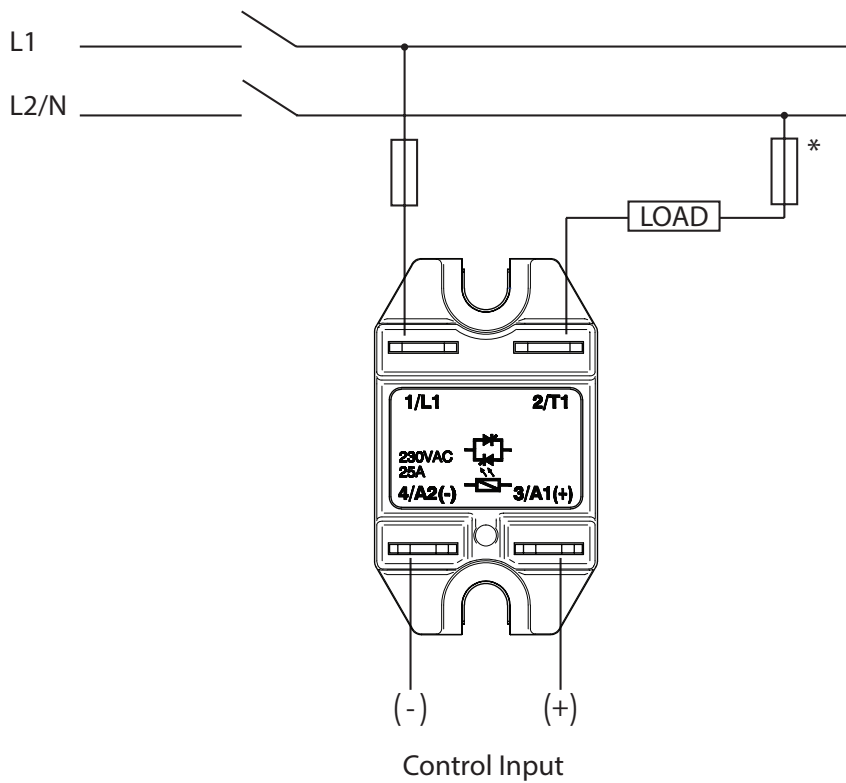
Short Circuit Protection

Protection Co-ordination Type 2

Part No.	Prospective Short Circuit Current (kArms)	Mersen*	Siba
FSC..25	10	690 VAC, 25A gR 10x38 mm, FR10GR69V25	600 VAC, 25A gRL 10x38 mm, 60 034 34.25

* Formerly Ferraz Shawmut

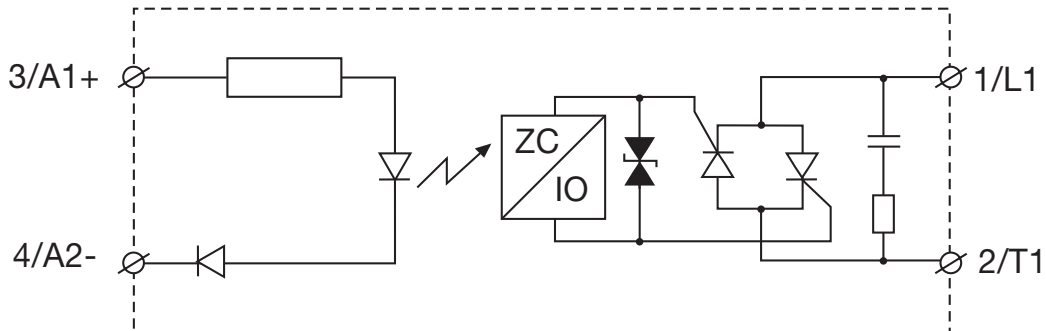
Connection Diagram



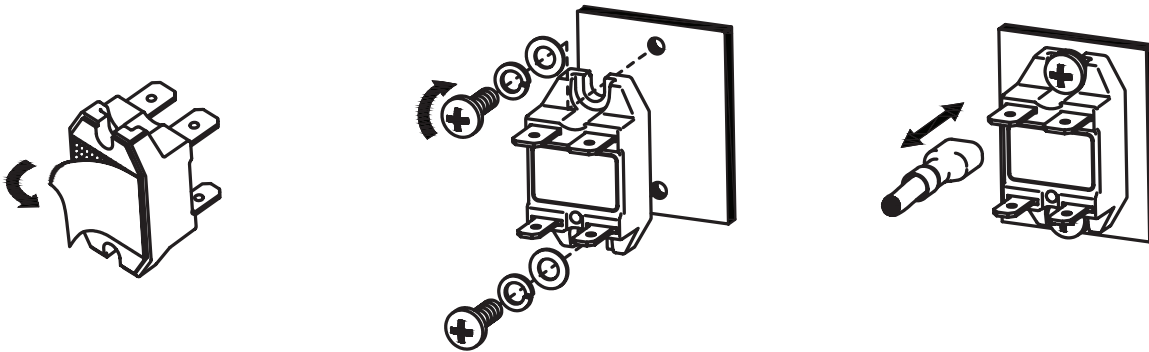
*Depends on system requirements



Functional Diagram



Installation



1. Peel off liner before mounting on heatsink.

2. Tighten screws alternately to max. 1.0 Nm.

3. Insert / remove FASTON receptacle only with FSC tightened to a surface.

Connection Specifications

Power Connection	
Terminal	1/L1, 2/T1
Connection type	Faston 6.35 x 0.8 mm
Conductors	Use 75°C copper (Cu) conductors
Fastons pull-out force*	130 N








Control Connection	
Terminal	3/A1+, 4/A2-
Connection Type	Faston 4.8 x 0.8 mm
Fastons Pull-Out Force*	130 N

SSR Mounting	
Connection Type	M4 screws
Mounting Torque	1.0 Nm (8.85 lb-in)

*refer to Installation section



Compatibility and Conformance

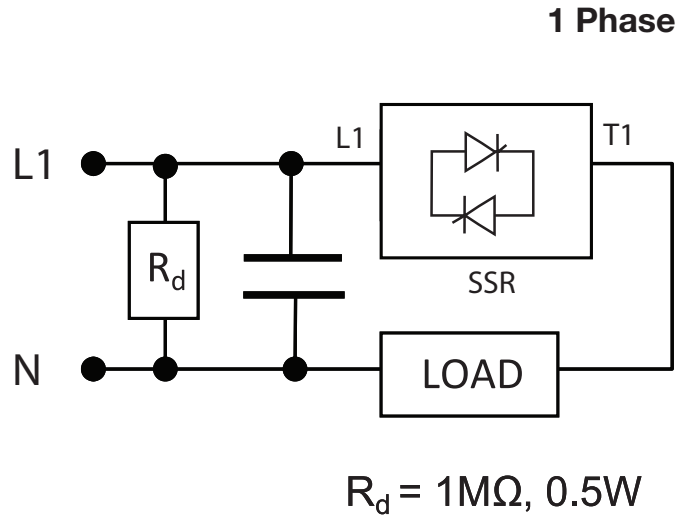
Approvals	      
Standards Compliance	<p>LVD: EN 60947-4-3 EMCD: EN 60947-4-3 EE: EN 60947-4-3 EMC: EN 60947-4-3 UR: UL508 Recognised (E80573), NRNT2 cUR: C22.2 No. 14 (E80573), NRNT8 CSA: C22.2 No. 14 (204075) VDE: DIN EN 60947-4-3 (VDE 0660-109), DIN EN 60335-1 (VDE 0700-1)</p>

Electromagnetic Compatibility (EMC) - Immunity	
Electrostatic Discharge (ESD)	EN/IEC 61000-4-2 8 kV air discharge, 4 kV contact (PC2)
Radiated Radio Frequency	EN/IEC 61000-4-3 10 V/m, from 80 MHz to 1 GHz (PC1) 10 V/m, from 1.4 to 2 GHz (PC1) 3 V/m, from 2 to 2.7 GHz (PC1)
Electrical Fast Transient (burst)	EN/IEC 61000-4-4 Output: 2 kV, 5 kHz (PC2) Input: 1 kV, 5 kHz (PC2)
Conducted Radio Frequency	EN/IEC 61000-4-6 10 V/m, from 0.15 to 80 MHz (PC1)
Electrical Surge	EN/IEC 61000-4-5 Output, line to line: 1 kV (PC1) Output, line to earth: 2 kV (PC1) Input, line to line: 500 V (PC1) Input, line to earth: 500 V (PC1)
Voltage Dips	EN/IEC 61000-4-11 0% for 0.5, 1 cycle (PC2) 40% for 10 cycles (PC2) 70% for 250 cycles (PC2)
Voltage Interruptions	EN/IEC 61000-4-11 0% for 5000 ms (PC2)

Electromagnetic Compatibility (EMC) - Emissions	
Radio Interference Field Emission (Radiated)	EN/IEC 55011 Class B: from 30 to 1000 MHz
Radio Interference Voltage Emissions (Conducted)	EN/IEC 55011 Class A: from 0.15 to 30 MHz (for currents >15 AAC a filter 100 nF / 275 VAC / X1 is needed for compliance)



Filter Connection Diagram



Note:

- Control input lines must be installed together to maintain products' susceptibility to Radio Frequency interference.
- Use of AC solid state relays may, according to the application and the load current, cause conducted radio interferences. Use of mains filters may be necessary for cases where the user must meet E.M.C requirements. The capacitor values given inside the filtering specification tables should be taken only as indications, the filter attenuation will depend on the final application.
- Performance Criteria 1 (PC1): No degradation of performance or loss of function is allowed when the product is operated as intended.
- Performance Criteria 2 (PC2): During the test, degradation of performance or partial loss of function is allowed. However when the test is complete the product should return operating as intended by itself.
- Performance Criteria 3 (PC3): Temporary loss of function is allowed, provided the function can be restored by manual operation of the controls.

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