

FEATURES/BENEFITS

- Random and zero-cross models available for all applications
- Low zero-cross turn-on voltage
- Input and output protection and control LED standard
- IP20 touch-proof flaps
- Connectors for power wiring and heat sinks available
- Designed in conformity with EN60947-4-3 (IEC947-4-3) and EN60950/VDE0805 (Reinforced Insulation)



| Part No. | Load Voltage | Load Current | Control Voltage | Switch Type |
|-----------|--------------|--------------|-----------------|-------------|
| SH24D25 | 12-275 Vac | 25A | 3-32 Vdc | Zero Cross |
| SH24A25 | 12-275 Vac | 25A | 20-265 Vac/Vdc | Zero Cross |
| SH24A25T5 | 12-275 Vac | 25A | 20-265 Vac/Vdc | Zero Cross |
| SH24R50 | 12-275 Vac | 50A | 3-32 Vdc | Random |
| SH24D50 | 12-275 Vac | 50A | 3-32 Vdc | Zero Cross |
| SH48D35 | 24-510 Vac | 35A | 3.5-32 Vdc | Zero Cross |
| SH48D50 | 24-510 Vac | 50A | 3.5-32 Vdc | Zero Cross |
| SH48A50 | 24-510 Vac | 50A | 20-265 Vac/Vdc | Zero Cross |
| SH48D95 | 24-510 Vac | 95A | 3.5-32 Vdc | Zero Cross |
| SH48A95 | 24-510 Vac | 95A | 20-265 Vac/Vdc | Zero Cross |
| SH48R125 | 24-510 Vac | 125A | 3.5-32 Vdc | Random |
| SH48D125 | 24-510 Vac | 125A | 3.5-32 Vdc | Zero Cross |
| SH48A125 | 24-510 Vac | 125A | 20-265 Vac/Vdc | Zero Cross |
| SH60D50 | 24-690 Vac | 50A | 3.5-32 Vdc | Zero Cross |
| SH60D125 | 24-690 Vac | 125A | 3.5-32 Vdc | Zero Cross |

For RoHS Compliant Contact Factory

ELECTRICAL SPECIFICATIONS

(+25°C ambient temperature unless otherwise specified)

INPUT (CONTROL) SPECIFICATIONS

| | Min | Max | Units |
|----------------------------------|-----|-----|-------|
| Input Current Range | | | |
| SHXXR/D (except SH60) | 10 | 13 | mA |
| SHXXA | 5 | 10 | mA |
| SH60 | | 12 | mA |
| Must Turn-Off Voltage | | | |
| SHXXR/D | | 2.0 | Vdc |
| SHXXA | | 5.0 | Vdc |
| Reverse Voltage Protection (R/D) | | 32 | V |
| Clamping Voltage (R/D) | | 36 | V |
| Input Immunity (EN61000-4-4) | | 2 | kV |
| Input Immunity (EN61000-4-5) | | 2 | kV |

TYPICAL APPLICATION

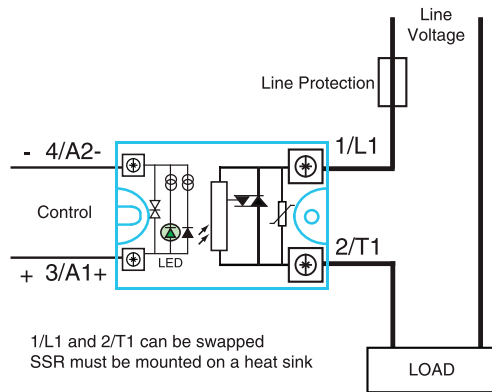


Figure 1a — SHXXDXX relays

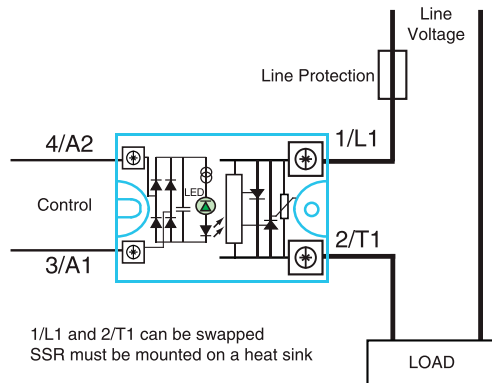


Figure 1b — SHXXAXX relays

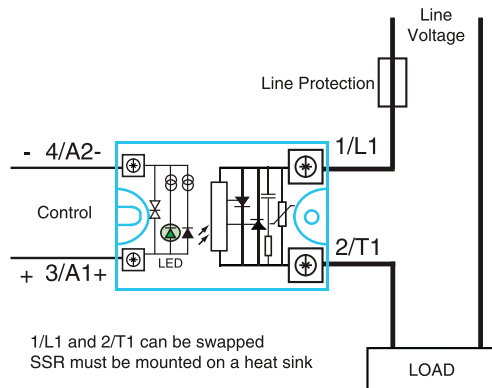
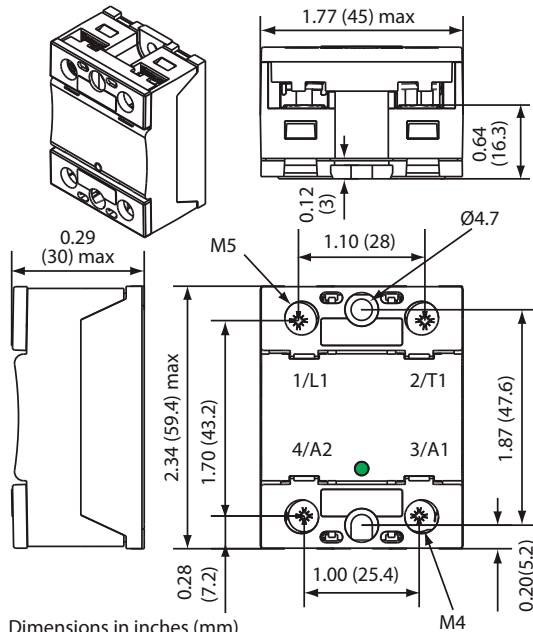


Figure 1c — SHXXRXX relays

MECHANICAL SPECIFICATION



Dimensions in inches (mm)
Weight: 2.82 oz. (80g)

Figure 2

CONTROL CHARACTERISTICS

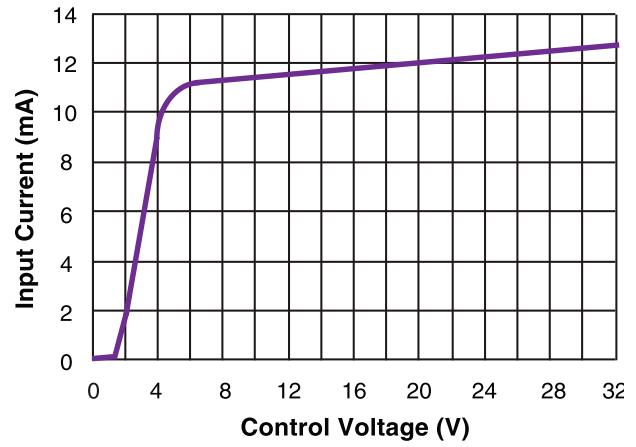


Figure 3a — SH24R/D, SH48R/D relays

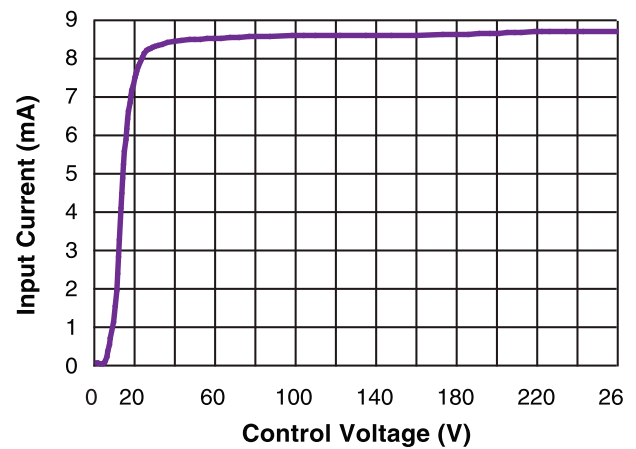


Figure 3b — SH24A, SH48A relays

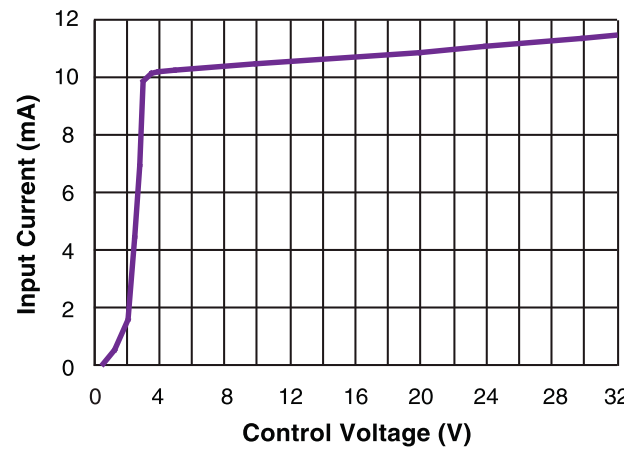


Figure 3c — SH60D relays

| ELECTRICAL SPECIFICATIONS | | | | ELECTRICAL SPECIFICATIONS (continued) | | | |
|--|--|------------|-------------------|--|-------------------------------------|------------------|----|
| (+25°C ambient temperature unless otherwise specified) | | | | Min | Max | Units | |
| OUTPUT (LOAD) SPECIFICATIONS | | | | | | | |
| | Min | Max | Units | | | | |
| Peak Voltage (VDR Clamping) | | | | Turn-On Time (60 Hz) | | | |
| SH24 | (450) | 600 | V _{peak} | SHXXR | 0.04 | ms | |
| SH48 | (950) | 1200 | V _{peak} | SHXXD | 8.3 | ms | |
| SH60 | | 1600 | V _{peak} | SHXXA | 24.9 | ms | |
| Load Current Range (Resistive) | | | | Turn-Off Time (60 Hz) | | | |
| 25 output current | .005 | 25 | Arms | SHXXR/D | 8.3 | ms | |
| 35 output current | .005 | 40 | Arms | SHXXA | 24.9 | ms | |
| 50 output current | .005 | 60 | Arms | Off-State dv/dt | | | |
| 75 output current | .005 | 90 | Arms | | 500 | V/μs | |
| 95 output current | .005 | 110 | Arms | Maximum di/dt (Non-Repetitive) | | | |
| 125 output current | .005 | 150 | Arms | | 50 | A/μs | |
| Maximum Surge Current Rating (Non-Repetitive) | | | | Operating Frequency | | | |
| 25 output current | | 350 | A | SHXXR | 0.1 | 400 | Hz |
| 35 output current | | 500 | A | SHXXD/A | 0.1 | 800 | Hz |
| 50 output current | | 720 | A | I ² T for fuse matching (<10ms) | | | |
| 75 output current | | 1200 | A | 25 output current | 600 | A ² s | |
| 95 output current | | 1700 | A | 35 output current | 1250 | A ² s | |
| 125 output current | | 2200 | A | 50 output current | 2500 | A ² s | |
| On-State Voltage Drop | | | | | 0.9 | V | |
| Output Power Dissipation (Max) | | | | 75 output current | 7200 | A ² s | |
| 25 output current | $0.9 \times 0.9 \times I + 0.016 \times I^2$ | | W | 95 output current | 14400 | A ² s | |
| 35 output current | $0.9 \times 0.9 \times I + 0.015 \times I^2$ | | W | 125 output current | 24000 | A ² s | |
| 50 output current | $0.9 \times 0.9 \times I + 0.012 \times I^2$ | | W | Junction-Case Thermal Resistance | | | |
| 75 output current | $0.9 \times 0.9 \times I + 0.045 \times I^2$ | | W | 25 output current | 1.7 | °C/W | |
| 95 output current | $0.9 \times 0.9 \times I + 0.035 \times I^2$ | | W | 35 output current | 0.6 | °C/W | |
| 125 output current | $0.9 \times 0.9 \times I + 0.002 \times I^2$ | | W | 50 output current | 0.45 | °C/W | |
| Zero-Cross Window (Typical) | | | | 75 output current | 0.4 | °C/W | |
| SHXXR | | NA | | 95 output current | 0.3 | °C/W | |
| SHXXD/A | | ±12 | Vac | 125 output current | 0.25 | °C/W | |
| Off-State Leakage Current | | | | Conducted Immunity Level | | | |
| SHXXR | | 3 | mA | IEC/EN61000-4-4 (bursts) | | | |
| SHXXD/A | | 1 | mA | SH24 | 2kV criterion A | | |
| | | | | SH48/SH60 | 4kV criterion A | | |
| | | | | IEC/EN61000-4-5 (surge) | | | |
| | | | | SH24 | 2kV criterion A | | |
| | | | | SH48 | 4kV criterion A | | |
| | | | | SH60 | 4kV criterion A (with external VDR) | | |

SURGE CURRENT

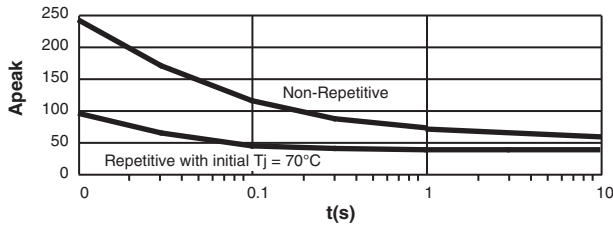


Figure 4a — 25A output current

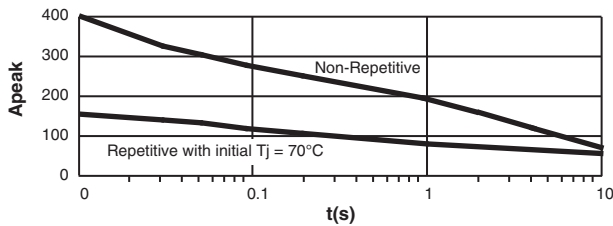


Figure 4b — 35A output current

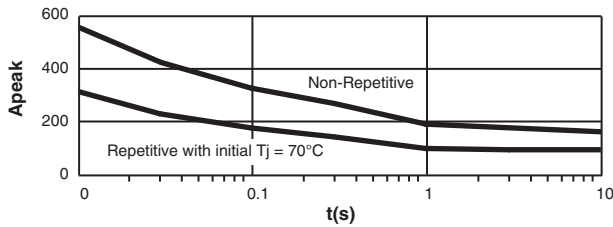


Figure 4c — 50A output current

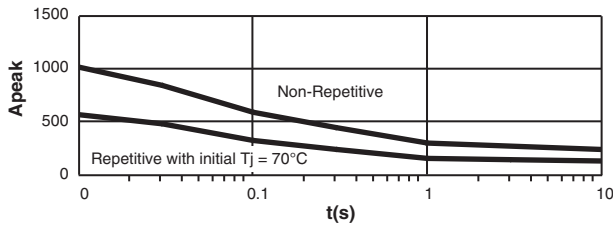


Figure 4d — 75A output current

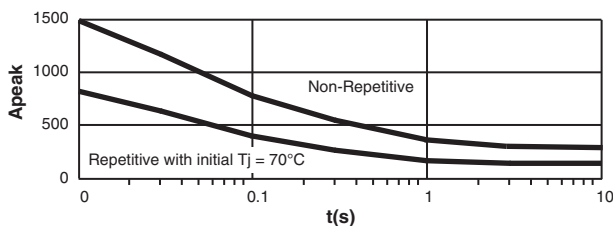


Figure 4e — 95A output current

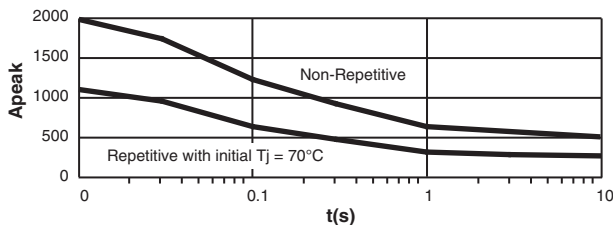


Figure 4f — 125A output current

GENERAL SPECIFICATIONS

(+25°C ambient temperature unless otherwise specified)

ENVIRONMENTAL SPECIFICATIONS

| | Min | Max | Units |
|-------------------------|-----|-----|-------|
| Operating Temperature | | | |
| Up to 25 output current | -55 | 80 | °C |
| Above 25 output current | -40 | 80 | °C |
| SH48D50 | -55 | 80 | °C |

| | | | |
|-------------------------|-----|-----|----|
| Storage Temperature | | | |
| Up to 25 output current | -55 | 125 | °C |
| Above 25 output current | -40 | 125 | °C |
| SH48D50 | -55 | 80 | °C |

| | | | |
|------------------|----|----|---|
| Ambient Humidity | 40 | 85 | % |
|------------------|----|----|---|

| | | | |
|------------------------|------|--|------|
| Input-Output Isolation | 4000 | | Vrms |
|------------------------|------|--|------|

| | | | |
|-----------------------|------|--|------|
| Output-Case Isolation | 4000 | | Vrms |
|-----------------------|------|--|------|

| | | | |
|----------------------------------|------|--|----|
| Insulation Resistance @500Vdc | 1000 | | mΩ |
|----------------------------------|------|--|----|

| | | | |
|-----------------------|--|------|---|
| Rated Impulse Voltage | | 4000 | V |
|-----------------------|--|------|---|

| | | | |
|---------------------------|--|------|--|
| Protection Level (CEI529) | | IP20 | |
|---------------------------|--|------|--|

| | | | |
|---|----|--|---|
| Vibration (10-55 Hz according to CE168) | 10 | | g |
|---|----|--|---|

| | | | |
|----------------------------|--|-------|---|
| Shock (according to CE168) | | 30/50 | g |
|----------------------------|--|-------|---|

| | | | |
|------------------|--|------------|--|
| Housing Material | | PA6 UL94VO | |
|------------------|--|------------|--|

| | | | |
|-----------|--|-------------------------|--|
| Baseplate | | Aluminum, nickel-plated | |
|-----------|--|-------------------------|--|

THERMAL CURVES

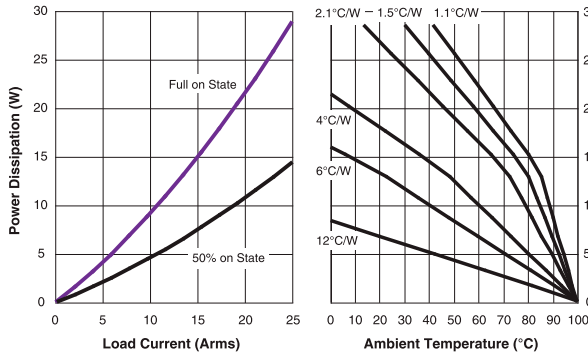


Figure 5a — 25A output power

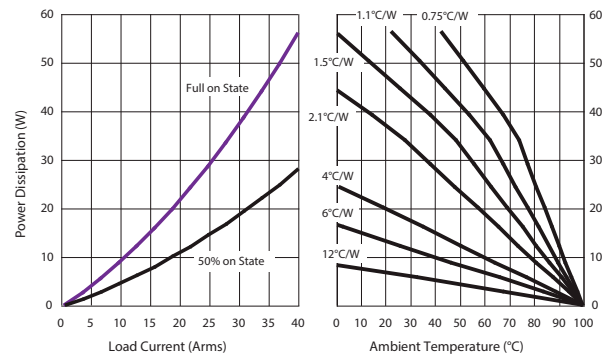


Figure 5b — 35A output power

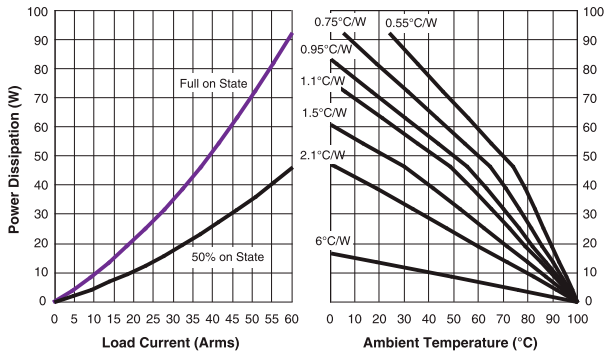


Figure 5c — 50A output power

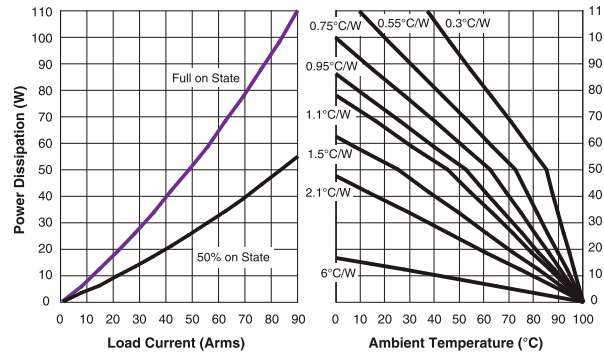


Figure 5d — 75A output power

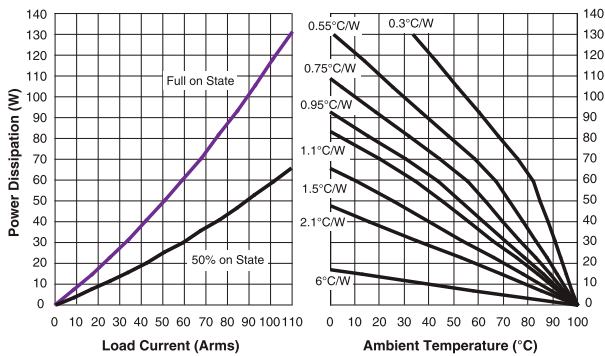


Figure 5e — 95A output power

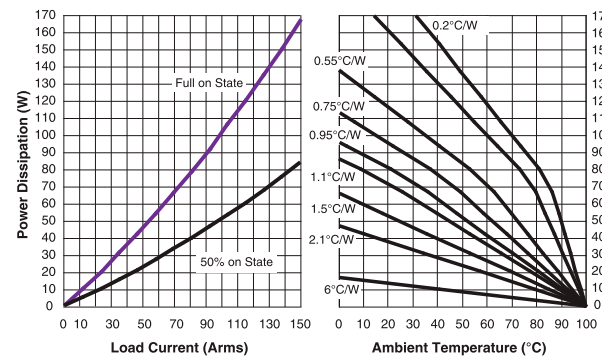
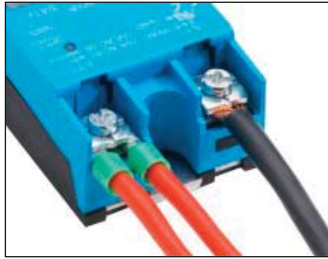


Figure 5f — 125A output power

12°C/W corresponds to a relay without heat sink
6°C/W corresponds to a relay mounted on a DIN-rail adaptor (Teledyne P/N DL12)

OPTIONAL CONNECTIONS



Directly with wires,
with or without ferrules


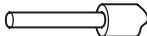

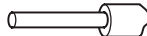



With tips
(ring terminals)


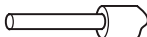

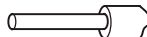



With special adaptation for
high-voltage relays

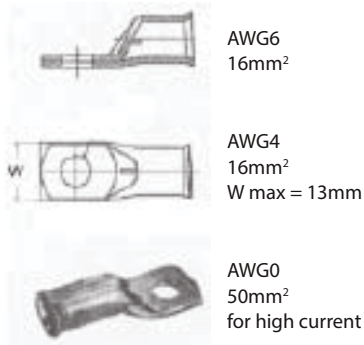
CONTROL WIRING

| Number of Wires | | | | Screwdriver Type | Recommended Torque |
|---|---|---|---|---|--------------------|
| 1 | | 2 | | | |
| Solid (no ferrule) | Fine Stranded (with ferrule) | Solid (no ferrule) | Fine Stranded (with ferrule) |  | N.m |
|  |  |  |  | | |
| AWG18...AWG14 | AWG18...AWG14 | AWG18...AWG14 | AWG18...AWG14 | | |

POWER WIRING

| Number of Wires | | | | Screwdriver Type | Recommended Torque |
|---|---|---|---|---|--------------------|
| 1 | | 2 | | | |
| Solid (no ferrule) | Fine Stranded (with ferrule) | Solid (no ferrule) | Fine Stranded (with ferrule) |  | N.m |
|  |  |  |  | | |
| AWG16...AWG8 | AWG16...AWG10 | AWG16...AWG8 | AWG16...AWG10 | | |

Power with tips



Options

Fastons: Call us



Special kit for high current

AWG2 / 35mm²



AWG0 / 50mm²





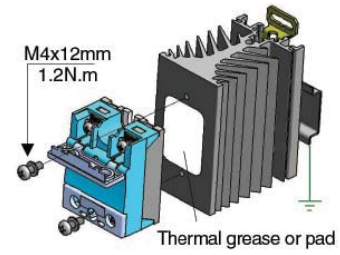
2–2.5°C/W
Teledyne P/N FW151



1.1°C/W
Teledyne P/N FW108



0.3°C/W
Teledyne P/N FW031



Thermal grease or pad

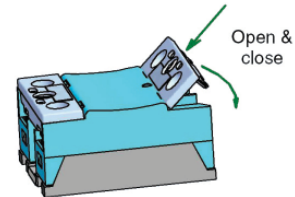


DIN Rail Adapter
Teledyne P/N DL12

Mounting
HIPpak SSRs must be mounted on heat sinks. A large range of heat sinks is available. For heat-sink mounting, use thermal grease or a thermal pad with high conductivity specified by Teledyne.



Thermal Pad
Teledyne P/N –12



Removable IP20 touch-proof

Typical Loads (Random)

SH relays with random turn-on are designed for high inductive loads or phase angle control applications. Our data sheet lists nominal current of power thyristors corresponding to a resistive load (AC-51). Depending on the loads, check the inrush current at turn ON and possible overvoltages at turn OFF.

Main applications:

- AC-55b — Incandescent or infrared lamps. Inrush current is generally 10 times I_n during few 10ms. Random relays often use in-phase angle controllers or soft-starters with the right control.
- AC-53 — Three-phase motors. 2 or 3 random turn-on relays can drive such motors.
- AC-56a — Transformer loads. Very high inrush current up to 100 times I_n . Use a random turn-on SSR like the SH.

The table below lists recommended current values for proper lifetime expectancy.

| SSR Model | AC-53 Current (motor) | AC-55b Current (lamp) | AC-55b Current (transformer) | AC-55b Current (capacitor) |
|-----------|-----------------------|-----------------------|------------------------------|----------------------------|
| 12A | 2.5A | 2.5A | 0.4A | XXX |
| 25A | 5A | 5A | 1A | XXX |
| 35A | 9A | 9A | 2A | XXX |
| 50A | 12A | 12A | 3A | 13A |
| 75A | 16A | 16A | 6A | 24A |
| 95A | 24A | 24A | 9A | 36A |
| 125A | 32A | 32A | 12A | 48A |

Typical Loads (Zero-Cross)

SH relays with zero-cross turn-on are designed for most types of loads.

Our data sheet lists the AC-51 current value corresponding to resistive loads.

For other loads, check the inrush current at turn ON and possible overvoltages at turn OFF:

- AC-55b — Incandescent lamps. Inrush current is generally 10 times I_n during few 10ms.
- AC-55a — Electric discharge lamp. These loads often have overcurrent at turn ON and overvoltage at turn OFF, so use 400VAC SSR on 230VAC mains.
- AC-58 — One-pole motors. These loads often have overcurrent at turn ON and overvoltage at turn OFF, so use 400VAC SSR on 230VAC mains and adapt the SSR current to the starting current of the motor.
- AC-53 — Three-phase motors. 2 or 3 SH zero-cross relays can drive these motors, but generally use E3P/E3PT or other three-phase relays or SH random range.
- AC-56a — Transformer loads. Very high inrush current up to 100 times I_n . Use SH random relay or peak control SSR.
- AC-56b — Capacitor loads with very high current at turn ON and overvoltage at turn OFF. Our high-voltage relays are well adapted for high inrush current.

Protection

- To protect the SSR against a short-circuit of the load, use a fuse with a I^2t value = $1/2 I^2t$ value specified.

EMC

Immunity:

- Our data sheets list the immunity level of our SSRs according to the main standards for these products: IEC/EN61000-4-4 and IEC/EN61000-4-5. You can compare the high immunity level with other products on the market.

Emission:

- Teledyne SSRs are designed in compliance with standards for class A equipment (Industry).
- Use of this product in domestic environments may cause radio interference. In this case the user may be required to employ additional devices to reduce noise. SSRs are complex devices that must be interconnected with other equipment (loads, cables, etc.) to form a system. Because the other equipment or interconnections may not be under Teledyne's control, it shall be the responsibility of the system integrator to ensure that systems containing SSRs comply with the requirement of any rules and regulations applicable at the system level.
- In phase angle applications, a filter adapted to the load must be necessary.
- The very low zero-cross voltage of SH relays (<12V) improves the conducted emission level in comparison with most other SSRs on the market with zero-cross voltages often higher than 50V.

Mouser Electronics

Authorized Distributor

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Teledyne Relays:

[SH24A25](#) [SH24D25](#) [SH48A125](#) [SH48A50](#) [SH48D125](#) [SH48D50](#) [SH48D95](#) [SH48R125](#) [SH60D125](#) [SH60D50](#)
[SH24R50](#)