Industrial Solid-State Relays
Selection Guide
The advantages Industrial Solid State Relays (ISSR) compared to Electromechanical Relays (EMR) are well known. ISSRs are fully electronic, with no moving parts inside; no audible noise, able to withstand significant vibration without operational issues, fast response time, but most important of all higher life-time expectancy. Used in optimal operating conditions, ISSRs have nearly unlimited life compared to EMRs, it also does not require any maintenance and prevents production downtime, which is a great advantage when continuous operation is necessary.

MAIN APPLICATIONS

HEATING
- Plastic injection molding
- Furnaces
- Power supply distribution
- Air conditioning
- Textile
- Home heating
- Infrared heating
- Drying
- Thermoforming

MOTOR STARTING
- Pumps
- Compressor
- Plastic injection molding
- Conveyors
- Fans

LIGHTING
- Public lighting
- Cinema
- Theatre lamps
- Airport runway lamps
- Road lighting

CONTROL
- PLC interface
- Heating element control
- Solenoid valves
- Contractor coils
- Optocoupling of sensors

MISCELLANEOUS
- Transformer starting
- Power factor corrector
- Uninterrupted power supply
- Energy source switching
- Capacitors control

SWITCHING SOLUTIONS

Teledyne Relays has been providing industrial power solid-state relays for over 50 years. The company offers a broad range of products, from standard off-the-shelf single-, dual-, three- and quad-output relays to custom products with diagnostics and phase monitoring. These relays are used in numerous applications, including food equipment, heating, lighting, medical equipment, motor control, refrigeration, temp control and mil-aero applications. Teledyne's selection of high-quality components results in reduced EMI and lower start-up surges. The rugged design, including the direct-bond copper (DBC) and wirebond assembly, offers the most reliable and thermally efficient product on the market. Teledyne is also the world’s innovative leader in manufacturing hermetically sealed solid-state and electromechanical relays. Teledyne Relays’ industrial SSRs, mil-aero SSRs, electromechanical relays and coaxial switches offer switching solutions across a wide range of markets and applications.

Product Assurance
Under an aggressive Total Quality Management (TQM) program, Teledyne Relays has embraced a “continuous improvement” culture. With recognized certifications such as Boeing D6-82479, MIL-STD-790, AS/EN/JISQ9100:2009 (Rev C) and ISO 9001:2008, Teledyne Relays has become a primary supplier of switching solutions with the highest quality and reliability to industry leaders around the world.
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**InP1012**
- Greater than 40Gbps bandwidth
- Frequency range, DC to 60GHz
- Small form factor, 3mm X 3mm X 1mm
- High isolation
- Low insertion loss
- Switching time of less than 100ns

See Page 16

**RF121 / GRF121**
- Broader bandwidth (DC - 18GHz)
- Signal integrity up to 40Gbps
- SPDT, Magnetic Latching
- Metal Enclosure for EMI shielding
- High Repeatability
- 3 Million Cycle Life

See Page 17
Series SH High Industrial Performance (HIPpak)
AC Solid-State Relays with Covers

Series SH relays offer high performance in a flexible and innovative package. Designed for all types of loads, they provide output to 125A, 690Vac. They incorporate removable touch-proof terminal covers for versatile, easy, and quick connections. SH relays feature a metal baseplate and built-in LED. They are up to 30% lighter than standard relays.

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Load Current</th>
<th>Load Voltage</th>
<th>Peak Voltage</th>
<th>Switch Type</th>
<th>Control Voltage</th>
<th>I²t</th>
<th>Dimensions LxWxH</th>
</tr>
</thead>
<tbody>
<tr>
<td>SH24A25</td>
<td>25A</td>
<td>12–275 Vac</td>
<td>600 Vpeak</td>
<td>Zero Cross</td>
<td>20–265 Vac/Vdc</td>
<td>600 A²s</td>
<td>2.3 x 1.77 x 1.18 in.</td>
</tr>
<tr>
<td>SH24A25T5</td>
<td>25A</td>
<td>12–275 Vac</td>
<td>600 Vpeak</td>
<td>Zero Cross</td>
<td>20–265 Vac/Vdc</td>
<td>600 A²s</td>
<td>58.5 x 45 x 30 mm</td>
</tr>
<tr>
<td>SH24D25</td>
<td>25A</td>
<td>12–275 Vac</td>
<td>600 Vpeak</td>
<td>Zero Cross</td>
<td>3–32 Vdc</td>
<td>600 A²s</td>
<td></td>
</tr>
<tr>
<td>SH48D35</td>
<td>35A</td>
<td>24–510 Vac</td>
<td>1200 Vpeak</td>
<td>Zero Cross</td>
<td>3.5–32 Vdc</td>
<td>1250 A²s</td>
<td></td>
</tr>
<tr>
<td>SH48A50</td>
<td>50A</td>
<td>24–510 Vac</td>
<td>1200 Vpeak</td>
<td>Zero Cross</td>
<td>20–265 Vac/Vdc</td>
<td>2500 A²s</td>
<td></td>
</tr>
<tr>
<td>SH48D95</td>
<td>95A</td>
<td>24–510 Vac</td>
<td>1200 Vpeak</td>
<td>Zero Cross</td>
<td>3.5–32 Vdc</td>
<td>14400 A²s</td>
<td></td>
</tr>
<tr>
<td>SH48R125</td>
<td>125A</td>
<td>24–510 Vac</td>
<td>1200 Vpeak</td>
<td>Random</td>
<td>3.5–32 Vdc</td>
<td>24000 A²s</td>
<td></td>
</tr>
<tr>
<td>SH48D125</td>
<td>125A</td>
<td>24–510 Vdc</td>
<td>1200 Vpeak</td>
<td>Zero Cross</td>
<td>3.5–32 Vdc</td>
<td>24000 A²s</td>
<td></td>
</tr>
<tr>
<td>SH48A125</td>
<td>125A</td>
<td>24–510 Vdc</td>
<td>1200 Vpeak</td>
<td>Zero Cross</td>
<td>20–265 Vac/Vdc</td>
<td>24000 A²s</td>
<td></td>
</tr>
<tr>
<td>SH60D50</td>
<td>50A</td>
<td>24–690 Vac</td>
<td>1600 Vpeak</td>
<td>Zero Cross</td>
<td>3.5–32 Vdc</td>
<td>2500 A²s</td>
<td></td>
</tr>
<tr>
<td>SH60D125</td>
<td>125A</td>
<td>24–690 Vac</td>
<td>1600 Vpeak</td>
<td>Zero Cross</td>
<td>3.5–32 Vdc</td>
<td>24000 A²s</td>
<td></td>
</tr>
</tbody>
</table>

- Random and zero-cross models available
- Low zero-cross turn-on voltage
- Input and output protection and control LED
- IP20 touch-proof terminal covers
- Heat sinks available

SINGLE PHASE AC

ESPRESSO & COFFEE MACHINES

- Water tank heater
- Pump motor
- Grinder motor

See Appendix for heat-sink information and other options.
For SH48D75, contact factory for availability
RoHS Compliant.
Series STH High Industrial Performance (HIPpak) AC Solid-State Relays

Series STH relays offer high performance in a flexible and innovative package. Designed for all types of loads, they deliver output to 75A, 600Vac for resistive loads. They have removable touch-proof terminal covers for versatile, easy, and quick connections. STH relays feature a metal baseplate and are up to 30% lighter than standard relays.

- Regulated input current
- Low zero-cross turn-on voltage
- Input protection and control LED standard
- IP20 touch-proof terminal covers optional
- Heat sinks available

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Load Current</th>
<th>Load Voltage</th>
<th>Peak Voltage</th>
<th>Switch Type</th>
<th>Control Voltage</th>
<th>I^2t</th>
<th>Dimensions LxWxH</th>
</tr>
</thead>
<tbody>
<tr>
<td>STH24D12</td>
<td>12A</td>
<td>12–280 Vac</td>
<td>600 Vpeak</td>
<td>Zero Cross</td>
<td>3–32 Vdc</td>
<td>128 A's</td>
<td>2.3 x 1.77 x 1.18 in.</td>
</tr>
<tr>
<td>STH24D25</td>
<td>25A</td>
<td>12–280 Vac</td>
<td>600 Vpeak</td>
<td>Zero Cross</td>
<td>3–32 Vdc</td>
<td>600 A's</td>
<td>58.5 x 45 x 30 mm</td>
</tr>
<tr>
<td>STH24D35</td>
<td>35A</td>
<td>12–280 Vac</td>
<td>600 Vpeak</td>
<td>Zero Cross</td>
<td>3–32 Vdc</td>
<td>1250 A's</td>
<td></td>
</tr>
<tr>
<td>STH48D50</td>
<td>50A</td>
<td>24–600 Vac</td>
<td>1200 Vpeak</td>
<td>Zero Cross</td>
<td>3–32 Vdc</td>
<td>2500 A's</td>
<td></td>
</tr>
</tbody>
</table>

See Appendix for heat-sink information and other options. IP20 touchproof covers option: -17
RoHS Compliant.
For STH49D35, contact factory for availability.

Series S AC Hockey Puck Solid-State Relays

The Series S single-phase relays are designed for all types of loads. The design incorporates an SCR or triac output. The relays utilize optical isolation to protect the control from load transients. All contain an internal snubber for output protection. High-current models are excellent for motor and UPS control.

- Low zero-cross turn-on voltage for low EMI
- AC or DC control available
- Excellent thermal performance
- High immunity to surges
- Internal snubber (except S60 models)

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Load Current</th>
<th>Load Voltage</th>
<th>Peak Voltage</th>
<th>Switch Type</th>
<th>Control Voltage</th>
<th>I^2t</th>
<th>Dimensions LxWxH</th>
</tr>
</thead>
<tbody>
<tr>
<td>S24D25</td>
<td>25A</td>
<td>12–280 Vrms</td>
<td>600 Vpeak</td>
<td>Zero Cross</td>
<td>4–30 Vdc</td>
<td>288 A's</td>
<td>2.29 x 1.75 x 1.06 in.</td>
</tr>
<tr>
<td>S24D40</td>
<td>40A</td>
<td>12–280 Vrms</td>
<td>600 Vpeak</td>
<td>Random</td>
<td>4–30 Vdc</td>
<td>612 A's</td>
<td></td>
</tr>
<tr>
<td>S24R40</td>
<td>40A</td>
<td>12–280 Vrms</td>
<td>600 Vpeak</td>
<td>Zero Cross</td>
<td>3–30 Vdc</td>
<td>612 A's</td>
<td></td>
</tr>
<tr>
<td>S24A40</td>
<td>40A</td>
<td>12–280 Vrms</td>
<td>600 Vpeak</td>
<td>Zero Cross</td>
<td>90–240 Vac/Vdc</td>
<td>612 A's</td>
<td></td>
</tr>
<tr>
<td>S48A50</td>
<td>50A</td>
<td>24–520 Vrms</td>
<td>1200 Vpeak</td>
<td>Zero Cross</td>
<td>90–240 Vac/Vdc</td>
<td>1500 A's</td>
<td></td>
</tr>
<tr>
<td>S48D50</td>
<td>50A</td>
<td>24–520 Vrms</td>
<td>1200 Vpeak</td>
<td>Zero Cross</td>
<td>5–30 Vdc</td>
<td>1500 A's</td>
<td></td>
</tr>
<tr>
<td>S48A50-22/R**</td>
<td>50A</td>
<td>24–520 Vrms</td>
<td>1200 Vpeak</td>
<td>Zero Cross</td>
<td>17–80 Vac/Vdc</td>
<td>1500 A's</td>
<td></td>
</tr>
<tr>
<td>S48R75</td>
<td>75A</td>
<td>24–520 Vrms</td>
<td>1200 Vpeak</td>
<td>Zero Cross</td>
<td>90–240 Vac/Vdc</td>
<td>1500 A's</td>
<td></td>
</tr>
<tr>
<td>S48R125</td>
<td>125A</td>
<td>24–520 Vrms</td>
<td>1200 Vpeak</td>
<td>Random</td>
<td>4–30 Vdc</td>
<td>20000 A's</td>
<td></td>
</tr>
<tr>
<td>S48R125-22</td>
<td>125A</td>
<td>24–520 Vrms</td>
<td>1200 Vpeak</td>
<td>Random</td>
<td>17–80 Vac/Vdc</td>
<td>20000 A's</td>
<td></td>
</tr>
<tr>
<td>S60D125</td>
<td>125A</td>
<td>24–660 Vrms</td>
<td>1600 Vpeak</td>
<td>Zero Cross</td>
<td>7–30 Vdc</td>
<td>20000 A's</td>
<td></td>
</tr>
</tbody>
</table>

See Appendix for heat-sink information and other options.
RoHS Compliant **. S48A50-22 available with /R option
Series ST AC Hockey Puck Solid-State Relays

Series ST relays are designed for high-power applications. The design incorporates an SCR or triac output. The relays utilize optical isolation to protect the control from load transients. A control LED is available on certain models. All Series ST relays are zero crossing. Internal MOV is also available on ST24D25A and 50A models.

- Tight zero-cross window for low EMI
- AC or DC control available
- Excellent thermal performance
- Internal MOV (certain models)
- Control LED (certain models)

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Load Current</th>
<th>Load Voltage</th>
<th>Peak Voltage</th>
<th>Switch Type</th>
<th>Control Voltage</th>
<th>I^t</th>
<th>Dimensions LxWxH</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST24D12</td>
<td>12A</td>
<td>12–280 Vrms</td>
<td>600 Vppeak</td>
<td>Zero Cross</td>
<td>4–30 Vdc</td>
<td>72 A/s</td>
<td>2.29 x 1.75 x 1.06 in. 58.2 x 44.5 x 27 mm</td>
</tr>
<tr>
<td>ST48D50</td>
<td>50A</td>
<td>24–600 Vrms</td>
<td>1200 Vppeak</td>
<td>Zero Cross</td>
<td>5–30 Vdc</td>
<td>1500 A/s</td>
<td></td>
</tr>
</tbody>
</table>

-02 = Control LED; -16 = Internal MOV; -22 = 24 Vdc control
See Appendix for heat-sink information and other options.
RoHS Compliant

Series FS Miniature AC Solid-State Relays

Series FS relays are designed for medium-power loads. The relays incorporate a triac output and utilize optical isolation to protect the control from load transients. The package is available with faston or PCB terminals. The compact size of the FS makes it ideal for designs where space is limited. The FS has excellent thermal performance.

- Miniature package
- Faston or PCB terminals available
- Tight zero-cross window for low EMI
- Excellent thermal performance
- High immunity to surges

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Load Current</th>
<th>Load Voltage</th>
<th>Peak Voltage</th>
<th>Switch Type</th>
<th>Control Voltage</th>
<th>I^t</th>
<th>Dimensions LxWxH</th>
</tr>
</thead>
<tbody>
<tr>
<td>FS24D10-06</td>
<td>10A</td>
<td>12–280 Vrms</td>
<td>600 Vppeak</td>
<td>Zero Cross</td>
<td>4–30 Vdc</td>
<td>72 A/s</td>
<td>1.18 x .83 x .59 in. 30 x 21 x 15 mm</td>
</tr>
<tr>
<td>FS24D10</td>
<td>10A</td>
<td>12–280 Vrms</td>
<td>600 Vppeak</td>
<td>Zero Cross</td>
<td>4–30 Vdc</td>
<td>72 A/s</td>
<td></td>
</tr>
<tr>
<td>FS24D20-06</td>
<td>20A</td>
<td>12–280 Vrms</td>
<td>600 Vppeak</td>
<td>Zero Cross</td>
<td>4–30 Vdc</td>
<td>200 A/s</td>
<td></td>
</tr>
</tbody>
</table>

-06 = Faston
RoHS Compliant available with option: /R

Series G AC Solid-State Relays

Series G relays are designed for medium-power loads. The design incorporates a thyristor output. Series G relays utilize optical isolation to protect the control from load transients. An internal MOV is also provided to protect against load transient voltages. The compact size makes it ideal for designs where space is limited.

- Miniature size package
- Power and control connections by Faston terminals
- Internal MOV protection
- Excellent thermal performance
- High immunity to surges

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Load Current</th>
<th>Load Voltage</th>
<th>Peak Voltage</th>
<th>Switch Type</th>
<th>Control Voltage</th>
<th>I^t</th>
<th>Dimensions LxWxH</th>
</tr>
</thead>
<tbody>
<tr>
<td>G24R12-06</td>
<td>12 Arms</td>
<td>12–320 Vrms</td>
<td>520 Vppeak</td>
<td>Random</td>
<td>3–32 Vdc</td>
<td>340 A/s</td>
<td>2.63 x 1.50 x .87 in. 56.9 x 38 x 22 mm</td>
</tr>
</tbody>
</table>

-06 = Faston
RoHS Compliant
Series SHP Phase-Control AC Solid-State Relays

The Series SHP phase-angle controller provides analog switching. It features an internal microcontroller and overvoltage protection. Choose relays with either removable input spring connectors or IP20 touch-proof flaps. The relays are designed in conformity with EN60947-4-3 (IEC947-4-3) and EN60950/VDE0805 (Reinforced Insulation).

- Microcontroller inside
- Analog switching
- Overvoltage protection by varistor
- Green LED for input visualization
- Short-circuit protection

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Load Current</th>
<th>Load Voltage</th>
<th>Peak Voltage</th>
<th>Switch Type</th>
<th>Control Range</th>
<th>I2t</th>
<th>Dimensions LxWxH</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHP24N50R</td>
<td>50A</td>
<td>90–280 Vac</td>
<td>600 Vpeak</td>
<td>Phase Angle</td>
<td>4–20 mA</td>
<td>2500 A²s</td>
<td>1.77 x 2.30 x 1.18 in.</td>
</tr>
</tbody>
</table>

RoHS Compliant

Series DH (slimpac) AC Solid State Relays

Series DH relays are designed for all types of loads. These relays feature our new high efficiency back-to-back thyristors for long lifetime expectancy. The relays utilize optical isolation to protect the control from load transients. All relays offer a green control LED.

- New High Efficiency Back-to-Back Thyristors
- Zero-cross models designed for resistive loads
- Input protection and control LED standard
- IP20 protective cover
- Up to 600Vrms load voltage

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Load Current</th>
<th>Load Voltage</th>
<th>Peak Voltage</th>
<th>Switch Type</th>
<th>Control Voltage</th>
<th>I2t</th>
<th>Dimensions LxWxH</th>
</tr>
</thead>
<tbody>
<tr>
<td>DH24D25</td>
<td>25 Arms</td>
<td>12-280 Vrms</td>
<td>600 Vpeak</td>
<td>Zero Cross</td>
<td>3-32 Vdc</td>
<td>340 A²s</td>
<td>3.58 x .89 x 1.65 in.</td>
</tr>
</tbody>
</table>

RoHS Compliant

Series DRS AC Solid State Relays

Series DRS relays are designed for all types of loads. These relays feature our new high efficiency back-to-back thyristors for long lifetime expectancy, with zero cross switching. The relays utilize optical isolation to protect the control from load transients.

- AC Semiconductor Contactor with Diagnostic
- Compact size and DIN rail mounting
- Zero Cross switch ON in case of overvoltage
- Large control range: 3-32 Vdc
- IP20 housing
- UL conformity

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Load Current</th>
<th>Load Voltage</th>
<th>Peak Voltage</th>
<th>Switch Type</th>
<th>Control Voltage</th>
<th>I2t</th>
<th>Dimensions LxWxH</th>
</tr>
</thead>
<tbody>
<tr>
<td>DH24D25</td>
<td>32 Arms</td>
<td>12-280 Vrms</td>
<td>1200 Vpeak</td>
<td>Zero Cross</td>
<td>3-32 Vdc</td>
<td>1500 A²s</td>
<td>3.15 x .89 x 4.89 in.</td>
</tr>
</tbody>
</table>

RoHS Compliant
Series LS AC Solid-State Relays with Optional Heat Sinks

Series LS single-inline package (SIP) relays are designed for mounting on printed circuit boards. LS relays facilitate heat sinking by providing an metallic interface surface. The relays use a direct-bonded copper substrate for thermal efficiency, thermal stress performance and long-life expectancy. Optional heat sinks are available.

- Compact SIP package
- Designed for external heat-sink attachment
- Over-sized thyristor ratings (up to 50A)
- Direct-copper bonding technology
- Optional heat sinks available

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Load Current</th>
<th>Load Voltage</th>
<th>Peak Voltage</th>
<th>Switch Type</th>
<th>Control Voltage</th>
<th>I^t</th>
<th>Dimensions LxWxH</th>
</tr>
</thead>
<tbody>
<tr>
<td>LS24D16C-HS1</td>
<td>16A</td>
<td>12–280 Vrms</td>
<td>600 Vpeak</td>
<td>Zero Cross</td>
<td>4–14 Vdc</td>
<td>128 A's</td>
<td>LS with H1 Heat Sink: 1.72 x 1.4 x .87 in.</td>
</tr>
<tr>
<td>LS24D16N</td>
<td>16A</td>
<td>12–280 Vrms</td>
<td>600 Vpeak</td>
<td>Zero Cross</td>
<td>8–32 Vdc</td>
<td>128 A's</td>
<td></td>
</tr>
<tr>
<td>LS60D22C</td>
<td>22A</td>
<td>24–600 Vrms</td>
<td>1200 Vpeak</td>
<td>Zero Cross</td>
<td>4–14 Vdc</td>
<td>450 A's</td>
<td></td>
</tr>
<tr>
<td>LS60D22C-HS1</td>
<td>22A</td>
<td>24–600 Vrms</td>
<td>1200 Vpeak</td>
<td>Zero Cross</td>
<td>4–14 Vdc</td>
<td>450 A's</td>
<td></td>
</tr>
<tr>
<td>LS60D30C</td>
<td>30A</td>
<td>24–600 Vrms</td>
<td>1200 Vpeak</td>
<td>Zero Cross</td>
<td>4–14 Vdc</td>
<td>5000 A^2</td>
<td></td>
</tr>
</tbody>
</table>

Series BS Single-Inline Package AC Solid-State Relays

Series BS 4-amp solid-state single inline (SIP) four-pin relays are designed for mounting on a printed circuit board. BS relays can withstand very high current overloads. The compact size and triac output make the BS relay an excellent choice for switching medium-power resistive loads.

- Industry-standard package
- High in-rush capabilities
- Low input current draw
- Low zero-cross turn-on voltage for low EMI
- Up to 600Vrms load voltage

-02 = LED; X1 = DIN rail clip with LED; X2 = DIN rail clip without LED

RoHS Compliant

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Load Current</th>
<th>Load Voltage</th>
<th>Peak Voltage</th>
<th>Switch Type</th>
<th>Control Voltage</th>
<th>I^t</th>
<th>Dimensions LxWxH</th>
</tr>
</thead>
<tbody>
<tr>
<td>BS24D4A</td>
<td>4 Arms</td>
<td>15–280 Vrms</td>
<td>600 Vpeak</td>
<td>Zero Cross</td>
<td>3–10 Vdc</td>
<td>72 A's</td>
<td>1.70 x 1.0 x .39 in.</td>
</tr>
</tbody>
</table>

Series AS4 Single-Inline Package AC Solid-State Relays

Series AS4 solid-state single inline (SIP) four-pin relays are designed for mounting on a printed circuit board. The relays offer built-in voltage protection and can withstand very high current overloads. The relays have a low zero-cross window. The compact size and triac output make the AS relay the perfect retrofit for electromechanical relays.

- Industry-standard package
- Tight zero-cross window for low EMI
- Low input current draw
- Integral transient voltage protection
- DIN rail available

-02 = LED; X1 = DIN rail clip with LED; X2 = DIN rail clip without LED

RoHS Compliant

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Load Current</th>
<th>Load Voltage</th>
<th>Peak Voltage</th>
<th>Switch Type</th>
<th>Control Voltage</th>
<th>I^t</th>
<th>Dimensions LxWxH</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS24D4E/R</td>
<td>4 Arms</td>
<td>12–275 Vrms</td>
<td>600 Vpeak</td>
<td>Zero Cross</td>
<td>4–30 Vdc</td>
<td>50 A's</td>
<td>1.70 x 1.0 x .39 in.</td>
</tr>
<tr>
<td>A24D4E-X1</td>
<td>4 Arms</td>
<td>12–275 Vrms</td>
<td>600 Vpeak</td>
<td>Zero Cross</td>
<td>6–30 Vdc</td>
<td>50 A's</td>
<td></td>
</tr>
<tr>
<td>A54D6E4/R</td>
<td>5 Arms</td>
<td>12–460 Vrms</td>
<td>800 Vpeak</td>
<td>Zero Cross</td>
<td>4–30 Vdc</td>
<td>72 A's</td>
<td>43.2 x 25.4 x 10.2 mm</td>
</tr>
</tbody>
</table>
Series SD Dual-Output AC Solid-State Relays

Series SD dual-phase relays are designed for all types of loads. The design incorporates two relays in a single package. The relays utilize optical isolation to protect the control from load transients. High-current models are excellent for motor and phase angle control. SD Series are available with faston or screw terminals.

- Designed for all types of loads
- Dual output (two relays in one package)
- Faston or screw terminals
- Tight zero-cross window for low EMI
- High immunity to surges

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Load Current</th>
<th>Load Voltage</th>
<th>Peak Voltage</th>
<th>Switch Type</th>
<th>Control Voltage</th>
<th>( I_t )</th>
<th>Dimensions LxWxH</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD24D40-06</td>
<td>40 Arms</td>
<td>12–280 Vrms</td>
<td>600 Vpeak</td>
<td>Zero Cross</td>
<td>4–30 Vdc</td>
<td>612 A’s</td>
<td>2.28 x 1.75 x 1.26 in.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>58 x 44.5 x 32 mm</td>
</tr>
<tr>
<td>SD24R50</td>
<td>50 Arms</td>
<td>12–280 Vrms</td>
<td>600 Vpeak</td>
<td>Random</td>
<td>4–30 Vdc</td>
<td>1500 A’s</td>
<td>2.28 x 1.75 x 1.06 in.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>58 x 44.5 x 27 mm</td>
</tr>
<tr>
<td>SD24D50-06</td>
<td>50 Arms</td>
<td>12–280 Vrms</td>
<td>600 Vpeak</td>
<td>Zero Cross</td>
<td>4–30 Vdc</td>
<td>1500 A’s</td>
<td>2.28 x 1.75 x 1.26 in.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>58 x 44.5 x 32 mm</td>
</tr>
<tr>
<td>SD48D50A</td>
<td>50 Arms</td>
<td>24–600 Vrms</td>
<td>1200 Vpeak</td>
<td>Zero Cross</td>
<td>10–30 Vdc</td>
<td>1500 A’s</td>
<td>2.28 x 1.75 x 1.06 in.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>58 x 44.5 x 27 mm</td>
</tr>
<tr>
<td>SD48D50A2</td>
<td>50 Arms</td>
<td>24–600 Vrms</td>
<td>1200 Vpeak</td>
<td>Zero Cross</td>
<td>10–30 Vdc</td>
<td>1500 A’s</td>
<td>2.28 x 1.75 x 1.40 in.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>58 x 44.5 x 35.6 mm</td>
</tr>
<tr>
<td>SD48D40-06</td>
<td>40 Arms</td>
<td>24–510 Vrms</td>
<td>1200 Vpeak</td>
<td>Zero Cross</td>
<td>5–30 Vdc</td>
<td>612 A’s</td>
<td>2.28 x 1.75 x 1.26 in.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>58 x 44.5 x 32 mm</td>
</tr>
</tbody>
</table>

-06 = Faston terminals  See Appendix for heat-sink information and other options.
RoHS Compliant
Series E3P Three-Phase AC Solid-State Relays

Series E3P three-phase relays are designed for all types of loads. The design incorporates an oversized thyristor output. Control status LED is standard on all models. Output protection is provided internally on certain models. The E3P is available in random and zero-cross turn-on. High-current models are ideal for motor control.

- Three-phase output
- AC or DC control
- Internal output protection
- Tight zero-cross window for low EMI
- High immunity to surges

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Load Current</th>
<th>Load Voltage</th>
<th>Peak Voltage</th>
<th>Switch Type</th>
<th>Control Voltage</th>
<th>I2t</th>
<th>Dimensions LxWxH</th>
</tr>
</thead>
<tbody>
<tr>
<td>E3P48A50</td>
<td>50A</td>
<td>24–600 Vrms</td>
<td>1200 Vpeak</td>
<td>Zero Cross</td>
<td>90-240 Vac</td>
<td>1500 A’s</td>
<td>3.94 x 2.89 x 1.56 in.</td>
</tr>
<tr>
<td>E3P48A75</td>
<td>75A</td>
<td>24–600 Vrms</td>
<td>1200 Vpeak</td>
<td>Zero Cross</td>
<td>90-240 Vac</td>
<td>5000 A’s</td>
<td></td>
</tr>
<tr>
<td>E3P48A75-22</td>
<td>75A</td>
<td>24–600 Vrms</td>
<td>1200 Vpeak</td>
<td>Zero Cross</td>
<td>10-30 Vac</td>
<td>5000 A’s</td>
<td></td>
</tr>
<tr>
<td>E3P48D25</td>
<td>25A</td>
<td>24–600 Vrms</td>
<td>1200 Vpeak</td>
<td>Zero Cross</td>
<td>8.5–30 Vdc</td>
<td>265 A’s</td>
<td></td>
</tr>
<tr>
<td>E3P48D50</td>
<td>50A</td>
<td>24–600 Vrms</td>
<td>1200 Vpeak</td>
<td>Zero Cross</td>
<td>8.5–30 Vdc</td>
<td>1500 A’s</td>
<td></td>
</tr>
<tr>
<td>E3P48D75</td>
<td>75A</td>
<td>24–600 Vrms</td>
<td>1200 Vpeak</td>
<td>Zero Cross</td>
<td>8.5–30 Vdc</td>
<td>5000 A’s</td>
<td></td>
</tr>
<tr>
<td>E3P48D75-16</td>
<td>75A</td>
<td>24–520 Vrms</td>
<td>1200 Vpeak</td>
<td>Zero Cross</td>
<td>8.5–30 Vdc</td>
<td>5000 A’s</td>
<td></td>
</tr>
</tbody>
</table>

-14 = Touch-proof cover
-16 = Internal protection
RoHS Compliant.
For E3P48R50-16, contact factory for availability.
Series E3PT Three-Phase Touch-Proof AC Solid-State Relays

Series E3PT three-phase solid-state relays are designed for all types of loads. The E3PT relays include as a standard a control LED for visual status. The E3PT is touch-proof for user safety. An internal MOV and snubber circuit protect the output thyristor. The E3PT relays are highly immune to large current surges.

- Designed for all types of loads
- Tight zero-cross window for low EMI
- Control LED on all models
- Internal output transient protection
- IP20 touch-proof

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Load Current</th>
<th>Load Voltage</th>
<th>Peak Voltage</th>
<th>Switch Type</th>
<th>Control Voltage</th>
<th>I²t</th>
<th>Dimensions LxWxH</th>
</tr>
</thead>
<tbody>
<tr>
<td>E3PT48D50</td>
<td>50A</td>
<td>24–520 Vrms</td>
<td>1200 Vpeak</td>
<td>Zero Cross</td>
<td>8.5–30 Vdc</td>
<td>7200 A²s</td>
<td>3.94 x 2.99 x 2.22 in. 100 x 76 x 56.5 mm</td>
</tr>
</tbody>
</table>

H = High surge capability
RoHS Compliant.
For E3PT48D50H and E3PT48A50H, contact factory for availability.

Series C3P Three-Phase AC Solid-State Relays

Series C3P relays control medium amounts of power in three-phase applications. Optical isolation ensures complete protection of the C3P’s control circuit from load transients. The compact plastic housing provides a low-cost alternative to large metallic three-phase contactors. The ceramic baseplate provides excellent thermal performance.

- Three-phase relay in a compact single-inline package
- High-temperature plastic housing
- Tight zero-cross window for low EMI
- Exposed ceramic baseplate for reduced thermal resistance

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Load Current</th>
<th>Load Voltage</th>
<th>Peak Voltage</th>
<th>Switch Type</th>
<th>Control Voltage</th>
<th>I²t</th>
<th>Dimensions LxWxH</th>
</tr>
</thead>
<tbody>
<tr>
<td>C3P24D25</td>
<td>25 Arms</td>
<td>24–280 Vrms</td>
<td>600 Vpeak</td>
<td>Zero Cross</td>
<td>10–30 Vdc</td>
<td>260 A²s</td>
<td>3.2 x 1.09 x 0.32 in 81.9 x 27.7 x 8.3 mm</td>
</tr>
<tr>
<td>C3P24D25C</td>
<td>25 Arms</td>
<td>24–280 Vrms</td>
<td>600 Vpeak</td>
<td>Zero Cross</td>
<td>3.5–10 Vdc</td>
<td>260 A²s</td>
<td></td>
</tr>
</tbody>
</table>

Lead forming available upon request.

STEAM & INDUSTRIAL OVENS

- Steam heating element
- Oven heating element
- Circulation fan
Series S3P Three-Phase AC Solid-State Relays
Series S3P relays are made up of three separate relays controlled by a common DC voltage control. They are designed to control 10A AC loads such as resistors and small motors on a mains from 12 to 440 Vac, either single- or three-phase. They are well suited for applications requiring compact size and low cost.

- Industry-standard hockey-puck package
- Spring connectors
- Three relays in a single package
- Zero-cross and random turn-on options
- RoHS Compliant available with option -/R

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Load Current</th>
<th>Load Voltage</th>
<th>Peak Voltage</th>
<th>Switch Type</th>
<th>Control Voltage</th>
<th>I^2t</th>
<th>Dimensions LxWxH</th>
</tr>
</thead>
<tbody>
<tr>
<td>S3P44D10</td>
<td>10 Arms</td>
<td>12–440 Vrms</td>
<td>850 Vpeak</td>
<td>Zero Cross</td>
<td>4–30 Vdc</td>
<td>72 A^2s</td>
<td>2.3 x 1.75 x 1.14 in.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>44.5 x 58.5 x 29 mm</td>
</tr>
</tbody>
</table>

See Appendix for heat-sink information and other options. RoHS Compliant

Series SQ Quad-Output AC Solid-State Relays
Series SQ relay provides four independent 25A relays in a standard hockey-puck package. The SQ package conserves space while providing high-power switching. The tight zero-cross window reduces the EMI level. Optical isolation ensures complete protection of the control circuit from load transients.

- Four solid-state relays in a hockey-puck package
- Tight zero-cross window for low EMI
- Constant current input for low current draw
- High immunity to surges
- RoHS Compliant available with option -/R

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Load Current</th>
<th>Load Voltage</th>
<th>Peak Voltage</th>
<th>Switch Type</th>
<th>Control Voltage</th>
<th>I^2t</th>
<th>Dimensions LxWxH</th>
</tr>
</thead>
<tbody>
<tr>
<td>SQ24D25</td>
<td>25 Arms</td>
<td>12–280 Vrms</td>
<td>600 Vpeak</td>
<td>Zero Cross</td>
<td>3–32 Vdc</td>
<td>288 A^2s</td>
<td>2.28 x 1.75 x 1.29 in.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>58 x 44.5 x 33 mm</td>
</tr>
</tbody>
</table>

See Appendix for heat-sink information and other options. RoHS Compliant
Series S20, S60 and S75 DC Solid-State Relays

- Low on-state resistance
- Low output leakage current
- Triggered control input to avoid linear control risks
- Low conducted and radiated disturbances

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Load Current</th>
<th>Load Voltage</th>
<th>Peak Voltage</th>
<th>Turn-On Time</th>
<th>Control Voltage</th>
<th>ON Resistance</th>
<th>Dimensions LxWxH</th>
</tr>
</thead>
<tbody>
<tr>
<td>S20DC100</td>
<td>100A</td>
<td>0–130 Vdc</td>
<td>200 Vpeak</td>
<td>10 μs</td>
<td>4.5–32 Vdc</td>
<td>22 mΩ</td>
<td>2.29 x 1.75 x 1.1 in.</td>
</tr>
<tr>
<td>S20DC30</td>
<td>30A</td>
<td>0–130 Vdc</td>
<td>200 Vpeak</td>
<td>10 μs</td>
<td>4.5–32 Vdc</td>
<td>164 mΩ</td>
<td></td>
</tr>
<tr>
<td>S60DC40</td>
<td>40A</td>
<td>0–350 Vdc</td>
<td>600 Vpeak</td>
<td>10 μs</td>
<td>4.5–32 Vdc</td>
<td>70 mΩ</td>
<td></td>
</tr>
<tr>
<td>S75DC150</td>
<td>150A</td>
<td>0–42 Vdc</td>
<td>75 Vpeak</td>
<td>10 μs</td>
<td>4.5–32 Vdc</td>
<td>2.25 mΩ</td>
<td></td>
</tr>
</tbody>
</table>

*275 Vrms size 20 varistor as protection across the output

See Appendix for heat-sink information and other options.

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Series SH DC Solid-State Relays

- Built-in diagnostics with status LED
- Ultra low on-state resistance
- Low output leakage current
- IP20 protection by terminal covers on load terminals
- No radiated or conducted disturbances

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Load Current</th>
<th>Load Voltage</th>
<th>Peak Voltage</th>
<th>Turn-On Time</th>
<th>Control Voltage</th>
<th>ON Resistance</th>
<th>Dimensions LxWxH</th>
</tr>
</thead>
<tbody>
<tr>
<td>SH10DC40</td>
<td>40A</td>
<td>5–100 Vdc</td>
<td>100 Vpeak</td>
<td>20 μs</td>
<td>3.5–32 Vdc</td>
<td>30 mΩ</td>
<td>2.3 x 1.77 x 1.18 in.</td>
</tr>
<tr>
<td>SH10DC40-16</td>
<td>40A</td>
<td>5–60 Vdc</td>
<td>100 Vpeak</td>
<td>20 μs</td>
<td>3.5–32 Vdc</td>
<td>30 mΩ</td>
<td>2.3 x 1.77 x 1.18 in.</td>
</tr>
</tbody>
</table>

-16 = Internal protection

See Appendix for heat-sink information and other options.

RoHS Compliant
Series LS10 DC Solid-State Relays
Series LS10 DC solid-state relays are designed for mounting on printed circuit boards. They facilitate heatsinking by providing an interface surface. They can switch loads with high starting currents. The nominal switched currents depend on the size of the heat sink. The relays use a direct-bonded copper substrate for thermal efficiency and long life.

- Slim compact design
- Heatsinking capabilities
- Integrated voltage protection
- High surge handling capability
- MOSFET output

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Load Current</th>
<th>Load Voltage</th>
<th>Peak Voltage</th>
<th>Turn-On Time</th>
<th>Control Voltage</th>
<th>ON Resistance</th>
<th>Dimensions LxWxH</th>
</tr>
</thead>
<tbody>
<tr>
<td>LS60DC10C-21</td>
<td>10A</td>
<td>7–36 Vdc</td>
<td>60 Vpeak</td>
<td>10 μs</td>
<td>3–10 Vdc</td>
<td>20 mΩ</td>
<td>1.71 x 0.96 x 0.25 in.</td>
</tr>
<tr>
<td>LS60DC10F-21</td>
<td>10A</td>
<td>7–36 Vdc</td>
<td>60 Vpeak</td>
<td>10 μs</td>
<td>7–30 Vdc</td>
<td>20 mΩ</td>
<td>43.6 x 24.5 x 6.3 mm</td>
</tr>
</tbody>
</table>

Series PS DC Solid-State Relays
Series TS and Series PS relays provide AC/DC switching in a compact size. They also provide AC/DC control. These relays can withstand high surge currents. TS and PS relays are pin-to-pin compatible with electromechanical relays and may be used as replacements. Applications include vending machines, lighting and fans.

- Compact size
- Pin-to-pin compatible with electromechanical relays
- AC and DC control; AC and DC output
- Random and zero-cross turn-on voltage
- High inrush capabilities

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Load Current</th>
<th>Load Voltage</th>
<th>Peak Voltage</th>
<th>Turn-On Time</th>
<th>Control Voltage</th>
<th>ON Resistance</th>
<th>Dimensions LxWxH</th>
</tr>
</thead>
<tbody>
<tr>
<td>PS3R5G</td>
<td>5A</td>
<td>0–30 V</td>
<td>60 Vpeak</td>
<td>50 μs</td>
<td>10–30 Vdc</td>
<td>2100 Ω</td>
<td>1.14 x .50 x 1 in</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>29 x 12.7 x 25.4 mm</td>
</tr>
</tbody>
</table>

RoHS Compliant

■ BATTERY POWER SYSTEMS
- Solar charging
- Shipboard secondary power
Series DX DIN-Rail DC Solid-State Relays
Series DX relays are designed for DIN-rail mounting. These solid-state relays include a control LED that provides visual control status. Its compact size and user-friendly package make the Series DX relay an excellent choice for designers. The DX series relays offers a long life versus mechanical relays.

- Solid-state relays for DIN-rail mounting
- Control visualization by LED
- AC/DC control
- High immunity to surges
- Compact design

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Load Current</th>
<th>Load Voltage</th>
<th>Peak Voltage</th>
<th>Turn-On Time</th>
<th>Control Voltage</th>
<th>ON Resistance</th>
<th>Dimensions LxWxH</th>
</tr>
</thead>
<tbody>
<tr>
<td>DX6R3E-02</td>
<td>3A</td>
<td>2–60 V</td>
<td>60 Vpeak</td>
<td>20 μs</td>
<td>3–30 Vdc</td>
<td>600 Ω</td>
<td>3.01 x 2.09 x 0.48 in.</td>
</tr>
</tbody>
</table>

RoHS Compliant

Series DS Single-Inline Package DC Solid-State Relays
Series DS single inline package (SIP) four-pin relays are designed for mounting on printed circuit boards. The relays are designed for medium-power DC loads. The Series DS relay is an alternative to electromechanical and reed relays. The DS series relays offers a long life versus mechanical relays.

- Industry-standard package
- Surge tolerant
- Compact size
- Designed for medium-power DC loads
- Solid-state technology offering long life

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Load Current</th>
<th>Load Voltage</th>
<th>Peak Voltage</th>
<th>Turn-On Time</th>
<th>Control Voltage</th>
<th>ON Resistance</th>
<th>Dimensions LxWxH</th>
</tr>
</thead>
<tbody>
<tr>
<td>DS6R3E</td>
<td>3A</td>
<td>2–60 V</td>
<td>60 Vpeak</td>
<td>200 μs</td>
<td>3–30 Vdc</td>
<td>1000 Ω</td>
<td>1.70 x 0.98 x 0.39 in.</td>
</tr>
</tbody>
</table>

RoHS Compliant

DC MOTORS
- Crane motor control
- Material equipment motor drive
Series SI DC Solid-State Relays
Series SI relays are designed to switch high voltage (high power) DC loads. These devices feature the latest generation of High Voltage IGBT Technology as well as an innovative isolated driver to ensure fast power turn on and OFF. The relays feature triggered control input to avoid linear control risks and fast switching times. The relays also offer an LED for status.

- Latest generation of High Voltage IGBT Technology
- Ultra low output leakage current
- Low control current consumption
- Triggered control input to avoid linear control risks
- Low conducted and radiated disturbances

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Load Current</th>
<th>Load Voltage</th>
<th>Peak Voltage</th>
<th>Turn-On Time</th>
<th>Control Voltage</th>
<th>ON-State Voltage Drop</th>
<th>Dimensions L x W x H</th>
</tr>
</thead>
<tbody>
<tr>
<td>SI60DC100</td>
<td>100 A</td>
<td>0-500 Vdc</td>
<td>600 Vpeak</td>
<td>10 μs</td>
<td>4.5-32 Vdc</td>
<td>1.35 V</td>
<td>2.29 x 1.75 x 1.1 in</td>
</tr>
<tr>
<td>SI120DC50</td>
<td>50 A</td>
<td>0-1000 Vdc</td>
<td>1200 Vpeak</td>
<td>10 μs</td>
<td>4.5-32 Vdc</td>
<td>1.5 V</td>
<td>5.82 x 44.5 x 28 mm</td>
</tr>
<tr>
<td>SI170DC25</td>
<td>25 A</td>
<td>0-1400 Vdc</td>
<td>1700 Vpeak</td>
<td>10 μs</td>
<td>4.5-32 Vdc</td>
<td>3.3 V</td>
<td>5.67 x 2.67 x 1.1 in</td>
</tr>
</tbody>
</table>

See Appendix for heat-sink information and other options.
RoHS Compliant

Series SHI DC Solid-State Relays
Series SHI relays are designed to switch high voltage (high power) DC loads. These devices feature the latest generation of High Voltage IGBT Technology as well as an innovative isolated driver to ensure fast power turn on and OFF. The relays feature triggered control input to avoid linear control risks and fast switching times. The relays also offer an LED for status.

- Latest generation of IGBT Technology
- Ultra low drop out voltage
- Built-in protection against overvoltage and fast transient burst
- Built-in over-temperature protection
- Pluggable control connector with spring terminals

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Load Current</th>
<th>Load Voltage</th>
<th>Peak Voltage</th>
<th>Turn-On Time</th>
<th>Control Voltage</th>
<th>ON-State Voltage Drop</th>
<th>Dimensions L x W x H</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHI75DC50-6</td>
<td>50 A</td>
<td>12-940 Vdc</td>
<td>1270 Vpeak</td>
<td>50 μs</td>
<td>24-48 Vdc</td>
<td>35 Ω</td>
<td>5.67 x 2.67 x 3.27 in</td>
</tr>
<tr>
<td>SHI75DC50-9</td>
<td>50 A</td>
<td>12-940 Vdc</td>
<td>1270 Vpeak</td>
<td>50 μs</td>
<td>72-110 Vdc</td>
<td>35 Ω</td>
<td>144 x 68 x 83 mm</td>
</tr>
</tbody>
</table>

RAILWAY INDUSTRY
- HVAC System
- Hydraulic/pneumatic pumps
- Railway switch points
- Traffic Signaling
Series EMCR Three-Phase Motor Reverser up to 7.5kW Motors

The Series EMCR three-phase induction motor reverser can be used to turn on an industrial motor in either direction safely. It is designed to control and invert the direction of a three-phase motor. The reverser incorporates very-high-immunity components and can be mounted on a DIN rail or attached with screws.

- Controls and reverses three-phase motors without direct third leg (two legs)
- IP20 touch-proof housing
- Built-in snubber and MOV
- Forward/Reverse display LED

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Motor Current</th>
<th>Mains Voltage</th>
<th>Peak Voltage</th>
<th>Switch Type</th>
<th>Control Voltage</th>
<th>Ip</th>
<th>Dimensions LxWxH</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMCR48D50</td>
<td>8.5A</td>
<td>24–520 Vac</td>
<td>1600 Vpeak</td>
<td>Zero Cross</td>
<td>12–30 Vdc</td>
<td>1500 A's</td>
<td>3.94 x 2.99 x 2.22 in.</td>
</tr>
<tr>
<td>EMCR48D75</td>
<td>16A</td>
<td>24–550 Vac</td>
<td>1600 Vpeak</td>
<td>Zero Cross</td>
<td>12–30 Vdc</td>
<td>5000 A's</td>
<td>100 x 76 56.5 mm</td>
</tr>
</tbody>
</table>

RoHS Compliant

Series EMC Soft-Start Motor Controller up to 26kW Motors

The Series EMC motor controllers provide an alternative to costly and large variable speed controllers in pumps, fans, compressors and conveyors. Its six-thyristor structure, working like a full-wave phase angle controller, reduces the induction motor starting current as well as the motor starting torque to improves the efficiency of the power used.

- Controls both positive and negative cycles
- Avoids voltage fluctuations that lead to flicker
- Fits existing applications without modification of the wiring field configuration
- Features diagnostic and self-test functions

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Max. Motor Power @40°C</th>
<th>IAC53a @40°C</th>
<th>Phase to Phase Voltage</th>
<th>Mains Frequency</th>
<th>Input</th>
<th>Operating Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMC48S50-04</td>
<td>15kW</td>
<td>8.6kW</td>
<td>26kW</td>
<td>15kW</td>
<td>30A</td>
<td>480Vac</td>
</tr>
</tbody>
</table>

RoHS Compliant

Series PR Protection Module

Series PR is a protection module that helps protect DC solid-state relays against voltage transients due to inductive effects of lines and loads. The PR Series offer 2 types, one with additional output protection for DC relays that already have built-in MOV and one with a full protection scheme for relays that have no built-in protection. The PR Series also features IP20 touch-proof covers.

- External protection for DC Solid-State Relays
- Fly wheel diode
- Decoupling capacitor and discharge resistor
- Clamping voltage function
- IP20 touch-proof flaps

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Load Current</th>
<th>Load Voltage</th>
<th>Peak Voltage</th>
<th>Recover Time</th>
<th>Vdrop During Fly Wheel</th>
<th>Discharge Time Constant</th>
<th>Dimensions LxWxH</th>
</tr>
</thead>
<tbody>
<tr>
<td>PR20DC80</td>
<td>0–80A</td>
<td>0–130 Vdc</td>
<td>200 Vpeak</td>
<td>190 ns</td>
<td>1.2 V</td>
<td>2 s</td>
<td>2.3 x 1.77 x 1.18 in.</td>
</tr>
<tr>
<td>PR75DC80</td>
<td>0–80A</td>
<td>0–40 Vdc</td>
<td>75 Vpeak</td>
<td>190 ns</td>
<td>1.2 V</td>
<td>1 s</td>
<td>58.5 x 45 x 30 mm</td>
</tr>
</tbody>
</table>

See Appendix for heat-sink information and other options.

RoHS Compliant
## ACCESSORIES

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Thermal Characteristics</th>
<th>Specifications</th>
<th>Dimensions mm</th>
<th>Relay Type</th>
<th>Fig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>FW031</td>
<td>0.3 °C/W</td>
<td>DIN rail or screw - fan supply 230Vac</td>
<td>110 x 120 x 145</td>
<td>SH, S, E3P, E3PT</td>
<td>1</td>
</tr>
<tr>
<td>FW108</td>
<td>1.1 °C/W</td>
<td>for DIN rail or screw</td>
<td>89.8 x 81 x 98.02</td>
<td>SH, S</td>
<td>2</td>
</tr>
<tr>
<td>FW151</td>
<td>2.2 °C/W</td>
<td>for DIN rail or screw</td>
<td>45 x 73 x 80</td>
<td>SH, S, DH,</td>
<td>3</td>
</tr>
</tbody>
</table>

### ACCESSORIES

#### PROTECTION COVER / FLAPS
- 47001  Protection cover for S
- 47002  Protection cover for SD
- 47003  Protection cover for E3P
- 1LK00600 Protection cover for STH

#### DIN RAIL ADAPTER
- DL12  DIN Rail Clip

#### THERMAL PAD
- 46488 Thermal pad attached

#### HARDWARE KIT
- 1LK00700 Buss-Bar hardware kit for SH
Description
The InP1012 Series is a highly compact, reflective SPDT Active RF switch, manufactured using Teledyne's high speed, low-loss InP HEMT process. The switch die is packaged in a low-loss, surface mount package, with a small form factor: 3mm(L) x 3mm(W) x 1mm(H). It supports a wide frequency range from DC to 60GHz, and delivers low insertion loss, fast switching time, and good isolation-making this switch ideal for test and measurement, microwave communications, and radar applications. The unique construction features and manufacturing techniques provide excellent robustness to environmental extremes and overall high reliability.

Features
• High digital bandwidth, greater than 40Gbps
• Very high linearity
• Low insertion loss
• Very fast switching time of less than 100ns
• Radiation tolerant up to 100 krad

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Frequency</th>
<th>Insertion Loss (dB)</th>
<th>Isolation (dB)</th>
<th>Return Loss (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC (20mV-200mV)</td>
<td>2.0</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>10KHz</td>
<td>0.9</td>
<td>67</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>100MHz</td>
<td>1.2</td>
<td>60</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>6GHz</td>
<td>1.6</td>
<td>37</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>14GHz</td>
<td>2.0</td>
<td>30</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>20GHz</td>
<td>2.3</td>
<td>27</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>30GHz</td>
<td>2.6</td>
<td>24</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>40GHz</td>
<td>2.9</td>
<td>21</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>50GHz</td>
<td>3.3</td>
<td>19</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>60GHz</td>
<td>3.7</td>
<td>17</td>
<td>16</td>
<td></td>
</tr>
</tbody>
</table>

TYPICAL SIGNAL INTEGRITY CHARACTERISTICS @ 40Gbps

OUTLINE DIMENSIONS

PATTERM GENERATOR SETTINGS
• 2^31-1 PRBS signal
• 40Gbps data rate
• Data amplitude of 500mVpp
Series GRF121 Electromechanical Relays

The ultraminiature GRF121 relay is designed to provide a practical surface-mount switching solution with RF performance and repeatability to 18GHz. The GRF121 improves on Teledyne Relays’ heritage of miniature RF relays by incorporating a precision transmission line structure in the internal construction of the contact system. GRF121 relays feature a unique ground shield to facilitate surface mounting and to extend the frequency range when compared to through-hole solutions.

<table>
<thead>
<tr>
<th>Relay Type</th>
<th>Frequency Range</th>
<th>Bit Rate</th>
<th>Mounting</th>
<th>Available Coil Voltages</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPDT Magnetic-Latching</td>
<td>DC - 12GHz</td>
<td>RF121</td>
<td>RF = Thru-hole</td>
<td>5V: Resistance (Ω) = 61</td>
<td>-65°C to +125°C</td>
</tr>
<tr>
<td></td>
<td>DC - 18GHz</td>
<td>GRF121</td>
<td>GRF = Surface-Mount (Stub)</td>
<td>12V: Resistance (Ω) = 500</td>
<td>-55°C to +85°C</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Typical RF Performance</th>
<th>Frequency (GHz)</th>
<th>VSWR (max)</th>
<th>Isolation (dB)</th>
<th>Insertion Loss (dB) (max)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RF121</td>
<td>DC - 4</td>
<td>1.3 : 1</td>
<td>55</td>
<td>0.25</td>
</tr>
<tr>
<td></td>
<td>4 - 8</td>
<td>1.50 : 1</td>
<td>50</td>
<td>0.45</td>
</tr>
<tr>
<td></td>
<td>8 - 12</td>
<td>2.0 : 1</td>
<td>40</td>
<td>1.35</td>
</tr>
<tr>
<td>GRF121</td>
<td>DC - 4</td>
<td>1.1 : 1</td>
<td>65</td>
<td>0.2</td>
</tr>
<tr>
<td></td>
<td>4 - 8</td>
<td>1.20 : 1</td>
<td>50</td>
<td>0.2</td>
</tr>
<tr>
<td></td>
<td>8 - 12</td>
<td>1.35 : 1</td>
<td>40</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>12 - 16</td>
<td>2.0 : 1</td>
<td>30</td>
<td>0.95</td>
</tr>
<tr>
<td></td>
<td>16 - 18</td>
<td>2.3 : 1</td>
<td>30</td>
<td>1.1</td>
</tr>
</tbody>
</table>

**RF121 : 20Gbps**

- Bit Rate: 20Gbps
- Eye Height: 360 mV
- Eye Width: 40.3 ps
- Jitter\(_{pp}\): 6.93 ps

**GRF121 : 40Gbps**

- Bit Rate: 40Gbps
- Eye Height: 95 mV
- Eye Width: 13.34 ps
- Jitter\(_{pp}\): 8.73 ps

**PATTERN GENERATOR SETTINGS**
- 20Gbps Random Pulse Pattern Generator
- 2^23 - 1 PRBS signal
- PRBS output of 500 mV\(_{pp}\) (nominal)
- RF PCB effect (negligible) not removed from measurement
- Data shown is typical of both contacts

**PATTERN GENERATOR SETTINGS**
- 40Gbps Random Pulse Pattern Generator
- 2^23 - 1 PRBS signal
- PRBS output of 500 mV\(_{pp}\) (nominal)
- RF PCB effect (negligible) not removed from measurement
- Data shown is typical of both poles
**Description**

The Mini Matrix Series is an ideal solution that incorporate Teledyne Coax Switches for off the self, easy to use application. The Mini Matrix Series is designed to allow the remote operation of SPDT, Transfer, or SP3T to SP8T Multi-Throw switches. Remote operation is accomplished via TCP/IP commands to the Matrix’s Ethernet interface. Switch control is also accessible via the USB virtual serial port, using the provided command set. Through these interfaces the Coax Switch can be switched to the desired position and its position can be read for verification. The default switch position at power up can be set by the user.

**Options**

- USB only or USB & Ethernet Control
- Terminated or Non-Terminated
- Failsafe or Latching
- Various Connectors
- Multiple Frequency Ranges

**Number of Switches**

<table>
<thead>
<tr>
<th>Switch Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 to 2 SPDT, Transfer, or SP3T-SP8T</td>
<td>The Mini Matrix Series is designed to allow the remote operation of SPDT, Transfer, or SP3T to SP8T Multi-Throw switches. Remote operation is accomplished via TCP/IP commands to the Matrix’s Ethernet interface. Switch control is also accessible via the USB virtual serial port, using the provided command set. Through these interfaces the Coax Switch can be switched to the desired position and its position can be read for verification. The default switch position at power up can be set by the user.</td>
</tr>
</tbody>
</table>

**Switching Type**

Electromechanical

**Temperature**

Operating: -40°C to +65°C

**Connector Types**

<table>
<thead>
<tr>
<th>Connector Type</th>
<th>Frequency Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.92 mm</td>
<td>DC - 40GHz</td>
</tr>
<tr>
<td>SMA</td>
<td>DC - 26.5GHz</td>
</tr>
<tr>
<td>Type N</td>
<td>DC - 12GHz</td>
</tr>
<tr>
<td>TNC</td>
<td>DC - 12GHz</td>
</tr>
</tbody>
</table>

**Available Connectors**

- SMA, 2.92 mm, Type N, TNC

**Line Power**

Universal 90-260 VAC, 47-63Hz

**Enclosure A Size (WxHxD)**

Non-Terminated SPMT: 5.08" Wide, 2.17 High, 7.75" Depth

**Enclosure B Size (WxHxD)**

Terminated SPMT: 8.00" Wide, 3.00" High, 8.00" Depth

**Typical Cycle Life**

5,000,000 cycles

**Connector Types**

- 2.92 mm
- SMA
- Type N
- TNC
Teledyne has over 50 years of experience in developing a wide spectrum of custom solutions.

Experienced in Custom Hybrid Solutions

Teledyne Relays is a leading manufacturer with the capability of providing build-to-print solutions on hybrid microcircuits devices. Our current products portfolio includes solid state power controllers, DC/DC converters, high current drivers, digital-analog converters, activator control hybrids, deflection amplifiers, base drivers, custom designed multi-layers thick-film/thin film substrates and many more...

With over 50 years of heritage in serving the space, aerospace, and defense markets, Teledyne continues to uphold the same standards and commitment to excellence. Our optimized solutions are supported by teams of engineers and manufacturing personnel with wide ranging experiences in developing products deployed in highly demanding applications, such as electrical power systems, radar receivers, and stores management solutions, for ground or aerial defense platforms.

Teledyne is accredited by Defense Logistics Agency (DLA) in accordance with MIL-PRF-38534, Class H and Class G Qualified Manufacturers List (QML). Since 2014 Teledyne has successfully launched over twenty hybrids into production for our customers. We welcome opportunities to partner with our customers to provide customized solutions to your hybrid needs. Our typical custom solution development cycle is as follows:
Did you know...

Teledyne Relays offers electromechanical relays for various markets?

**RF RELAYS**
- Signal Integrity up to 40Gbps
- DC - 18GHz
- Surface-Mount
- DPDT, SPDT, 4PST and Loopback Relays

**MILITARY GRADE RELAYS**
- Built and tested to meet MIL-PRF-39016
- Built and tested to meet MIL-PRF-28776
- Built-in Diodes, Transistor Driver and CMOS
- Low Power coils

**TELEDYNE ESTABLISHED RELIABILITY RELAYS**
- Fully defined product requirements and screening levels
- Spacer/Spreader pad options not allowed by military specifications
- Reduced lead time and cost vs Military Grade

**HIGH PERFORMANCE RELAYS**
- -65 °C to +200 °C
- Shock up to 4,000 g’s
- Vibration up to 380 g’s
- Non-Latching & Magnetic-Latching

**COMMERCIAL RELAYS**
- Standard electrical tests at 25 °C
- “Low cost” switching solutions
- Surface-Mount
- Short lead times
Teledyne Coax Switches offers coaxial switches for ATE, Radar, Amplifier Switching, Etc.?

SPDT SWITCHES

- DC - 40GHz, Internal 50 Ω Termination
- SMA, mini-SMB, TNC & N Connectors
- 5 Million Cycles
- High Power & Low PIM
- Failsafe & Latching

TRANSFER SWITCHES

- DC - 18GHz
- SMA, TNC & N Connectors
- 5 Million Cycles
- High Power
- Failsafe & Latching

MULTI-THROW SWITCHES

- DC - 40 GHz, Internal 50 Ω Termination
- SMA, mini-SMB, TNC & N Connectors
- SP3T - SP10T
- 5 Million Cycles
- Normally Open & Latching

LOW PIM SWITCHES

- DC - 3 GHz
- SMA, N and 7/16 D Connectors
- SPDT, Transfer and Multi-Throw
- Failsafe & Latching

SPECIALTY SWITCHES

- DC - 40GHz
- 3-State Attenuated Switch
- Radiation Shielding
- Switch Blocks
- Redundant Diode Configuration
Did you know...

Teledyne Relays offers Military Solid State Relays?

**DC SOLID STATE RELAYS**

- Meet MIL-PRF-28750
- Tested Per MIL-STD-704
- Silicon Carbide MOSFET
- Up to 250Vdc, 1A
- Chassis and PCB Mount
- Short-Circuit Protection
- Plastic and Hermetically Sealed

**BI-DIRECTIONAL/AC SOLID STATE RELAYS**

- Meet MIL-PRF-28750
- Tested Per MIL-STD-704
- Up to 250Vac, 25A
- Chassis and PCB Mount
- Short-Circuit Protection
- Plastic and Hermetically Sealed

**COMMERCIAL, LOW POWER, I/O MODULES**

- Up to 250Vac, 10A
- Short-Circuit Protection
- Chassis and PCB Mount
- Zero-Cross & Random Switching
- Low Off-State Leakage Current

**SILICON CARBIDE TECHNOLOGY**

- Up to 270Vdc, 20 A
- Meet MIL-PRF-28750
- Tested Per MIL-STD-704
- Low ON resistance
- Low Profile Hermetic Package
Did you know...

Teledyne Coax Switches offers coaxial switch matrices for ATE, Radar, Filter Switching, Airborne Surveillance Systems, Etc.?

MINI MATRICES

• Remote Control via USB and/or Ethernet
• GUI controllable
• Accepts ASCII code
• Available in 18, 26.5 and 40 GHz
• SPDT, Transfer and Multi-throw configurations

MULTIPLEXOR/FANOUT SWITCH MATRICES

• Up to 1x1024 Switch Matrix
• SMA, mini-SMB, TNC & N Connectors
• Failsafe, Latching or Normally Open Configurations
• Switching Systems for 50 Ω & 75 Ω applications

MIMO/BLOCKING AND MIMO SINGLE CONNECTION SWITCH MATRICES

• Up to 1x1024 Switch Matrix
• SMA, mini-SMB, TNC & N Connectors
• RS-232, TTL, USB, GPIB, TTL, Ethernet Control
• 1 Million Cycles
• Failsafe & Latching

CUSTOMIZED SWITCH MATRICES

• EMI/RFI
• Transient Suppression
• Ballistic Shock Fatigue
• Crash Load
• Altitude
Did you know...

Teledyne Relays offers Space Qualified Switches?

SPACE MARKET SEGMENTS SERVED

• Deep-Space Probes
• Manned Programs
• Communications Satellites
• Launch Vehicles
• Earth Observatory / Weather Satellites
• Commercial / Military Satellites

CAPABILITIES

• Logistic Infrastructure
• Chemical Analysis Lab
• Scanning Electro Microscope
• In-house Plating Shop
• Environment Test Lab
• Field Technical Support

ELECTROMECHANICAL RELAY SPECIFICATIONS

• MIL-PRF-39016
• MIL-PRF-28776
• NASA/GSFC S-311-P-754
• NASA EEE-INST-002
• ESA/SCC 3601 & 3602