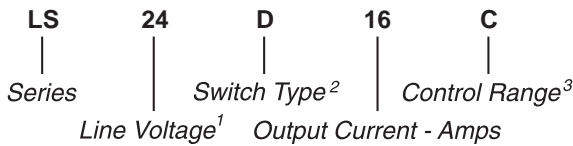


| Part Number | Description  |
|-------------|--------------|
| LS24D16C    | 16A, 240 Vac |
| LS24D21C    | 21A, 240 Vac |
| LS60D22C    | 22A, 600 Vac |
| LS24D27C    | 27A, 240 Vac |
| LS60D27C    | 27A, 600 Vac |
| LS60D30C    | 30A, 600 Vac |

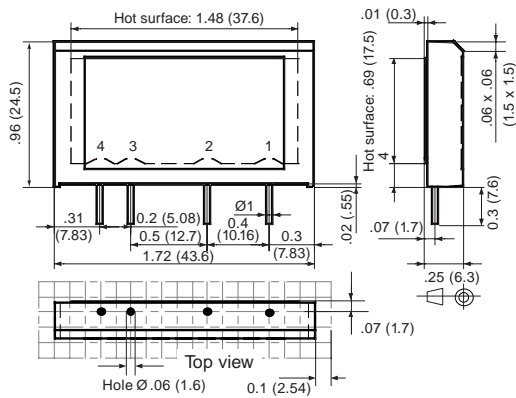
**Part Number Explanation**



**NOTES**

- 1) Line Voltage (nominal): 24 = 240 Vac; 60 = 600 Vac
- 2) Switch Type: D = Zero-cross turn-on
- 3) Control Range: C = 4-14 Vdc (N = 8-32 Vdc also available)

**MECHANICAL SPECIFICATION**



WEIGHT: 0.53 oz. (15g)      TOLERANCES:  $\pm$ 0.01

Figure 1 — LS relays; dimensions in inches (mm)  
(See Figure 12 for LS with HS1)

**TYPICAL APPLICATION**

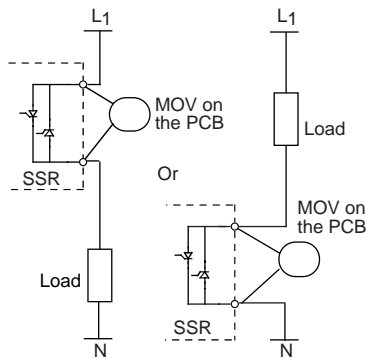


Figure 2 — LS relays



**FEATURES/BENEFITS**

- Industry standard package
- Designed for external heat-sink attachment
- Over-sized thyristor ratings
- Direct-copper bonding technology

**DESCRIPTION**

These solid-state single inline package (SIP) relays are designed for mounting on printed circuit boards. The Series LS relays facilitate heat sinking by providing an interface surface. The relays are designed with 16A, 25A and 50A thyristors. They can switch loads with high starting currents. The nominal switched currents depend on the size of the heat sink and are limited by the cross section of the tracks of the printed circuit (mainly 25A/30A). The relays use a direct-bonded copper substrate for thermal efficiency, thermal stress performance and long-life expectancy.

**APPLICATIONS**

- Motor control — Pumps, reversing, integration of relays in terminal boxes
- Lamp control — Infrared drying, traffic lights, theater lighting

**APPROVALS**

All models are UL recognized.  
UL File Number: E128555.

**BLOCK DIAGRAM**

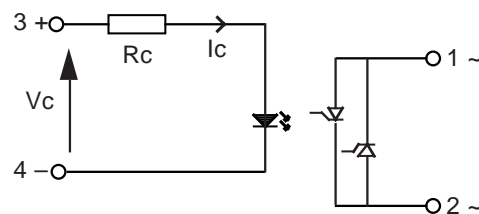


Figure 3 — LS relays

**INPUT (CONTROL) SPECIFICATION**

|                            | Min | Max | Units |
|----------------------------|-----|-----|-------|
| Control Range              | 4   | 14  | Vdc   |
| Input Current Range        | 6.5 | 30  | mAdc  |
| Must Turn-off Voltage      |     | 1   | Vdc   |
| Input Resistance (Typical) |     | 440 | Ohms  |

**OUTPUT (LOAD) SPECIFICATION**

|                 | Min | Max | Unit |
|-----------------|-----|-----|------|
| Operating Range |     |     |      |
| LS24            | 12  | 280 | Vrms |
| LS60            | 24  | 600 | Vrms |

**Peak Voltage**

|          |  |      |       |
|----------|--|------|-------|
| LS24D16C |  | 600  | Vpeak |
| LS60D22C |  | 1200 | Vpeak |

**Load Current Range**

|          |      |     |      |
|----------|------|-----|------|
| LS24D16C | .005 | 16* | Arms |
| LS24D21C | .005 | 25* | Arms |
| LS60D22C | .005 | 25* | Arms |
| LS24D27C | .005 | 30* | Arms |
| LS60D27C | .005 | 30* | Arms |
| LS60D30C | .005 | 30* | Arms |

\*Limited by the heat sink

**Maximum Surge Current Rating (Non-Repetitive)**

(See Figure 6)

|          |  |      |       |
|----------|--|------|-------|
| LS24D16C |  | 160  | Apeak |
| LS24D21C |  | 250  | Apeak |
| LS60D22C |  | 300  | Apeak |
| LS24D27C |  | 600  | Apeak |
| LS60D27C |  | 600  | Apeak |
| LS60D30C |  | 1000 | Apeak |

**On-State Voltage Drop**

|            |  |     |   |
|------------|--|-----|---|
| All relays |  | 1.6 | V |
|------------|--|-----|---|

**Zero-Cross Window (Typical)**

|            |  |     |   |
|------------|--|-----|---|
| All relays |  | ±12 | V |
|------------|--|-----|---|

**Off-State Leakage Current (60Hz)**

|            |  |   |    |
|------------|--|---|----|
| All relays |  | 1 | mA |
|------------|--|---|----|

**CONTROL CHARACTERISTIC**

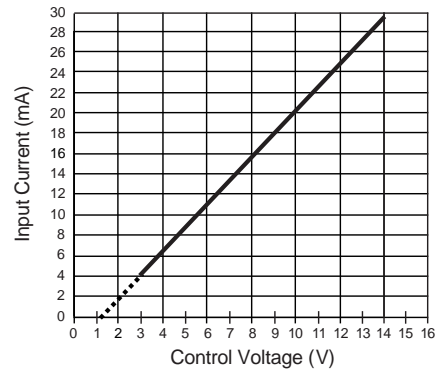


Figure 4 — LS relays

**THERMAL CHARACTERISTICS**

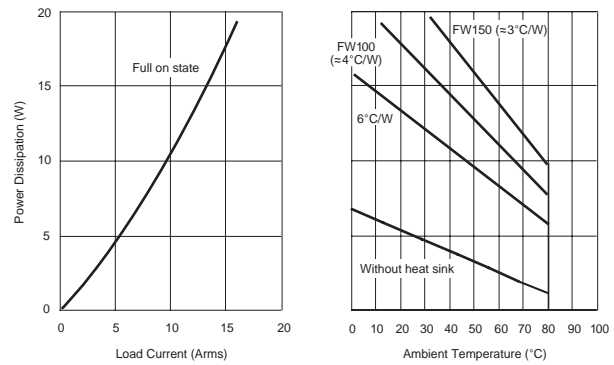


Figure 5a — LS24D16C relay

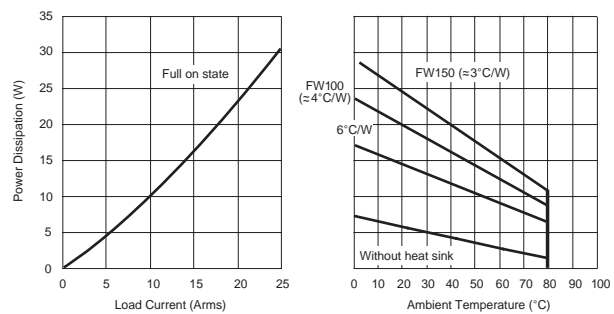


Figure 5b — LS24D21C, LS60D22C relays

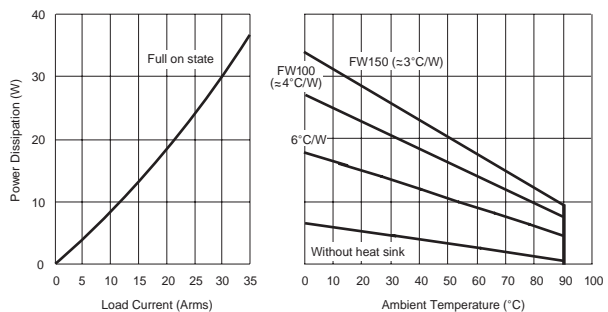


Figure 5c — LS24D27C, LS60D27C, LS60D30C relays

**OUTPUT (LOAD) SPECIFICATION (continued)**

|                      | Min | Max | Unit       |
|----------------------|-----|-----|------------|
| Turn-On Time (60Hz)  |     |     |            |
| All relays           |     | 8.3 | ms         |
| Turn-Off Time (60Hz) |     |     |            |
| All relays           |     | 8.3 | ms         |
| Off-State dv/dt      |     |     |            |
| All relays           |     | 500 | V/ $\mu$ s |
| Operating Frequency  |     |     |            |
| All relays           | 10  | 440 | Hz         |

**I<sup>2</sup>t for match fusing (<8.3ms)**

|          |      |                  |
|----------|------|------------------|
| LS24D16C | 128  | A <sup>2</sup> S |
| LS24D21C | 312  | A <sup>2</sup> S |
| LS60D22C | 450  | A <sup>2</sup> S |
| LS24D27C | 1800 | A <sup>2</sup> S |
| LS60D27C | 1800 | A <sup>2</sup> S |
| LS60D30C | 5000 | A <sup>2</sup> S |

**ENVIRONMENTAL SPECIFICATION**

|                        | Min  | Max | Unit |
|------------------------|------|-----|------|
| Operating Temperature  | -40  | 80  | °C   |
| Storage Temperature    | -40  | 120 | °C   |
| Input-Output Isolation | 4000 |     | Vrms |
| Output-Case Isolation  | 3300 |     | Vrms |

**NOTES:**

- MOV across the output recommended for non-resistive loads — minimum size: 14mm
- Maximum current based on size of the heat sink and the ambient temperature.
- For 800Hz applications, contact factory.
- For additional/custom options, contact factory.

**SURGE CURRENTS**

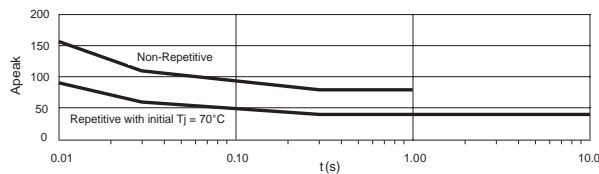


Figure 6a — LS24D16C relay

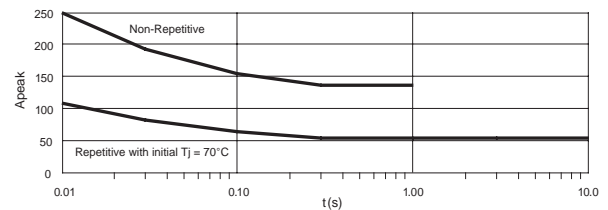


Figure 6b — LS24D21C relay

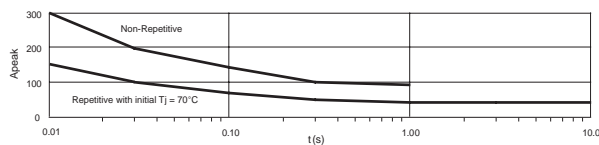
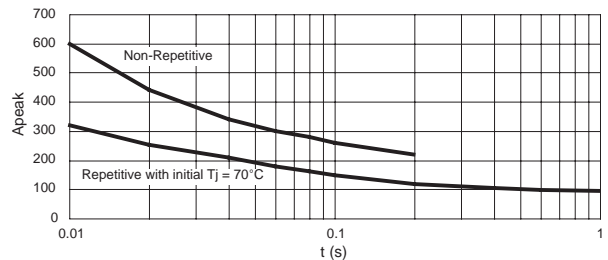


Figure 6c — LS60D22C relay



| Long time overload @ Tj init = 45°C | Temps | 60 s | 100 s |
|-------------------------------------|-------|------|-------|
|                                     | I (A) | 20   | 15    |

Figure 6d — LS60D27C, LS24D27C relays

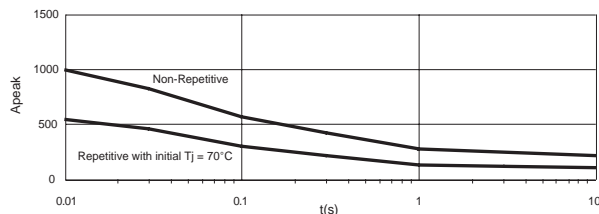


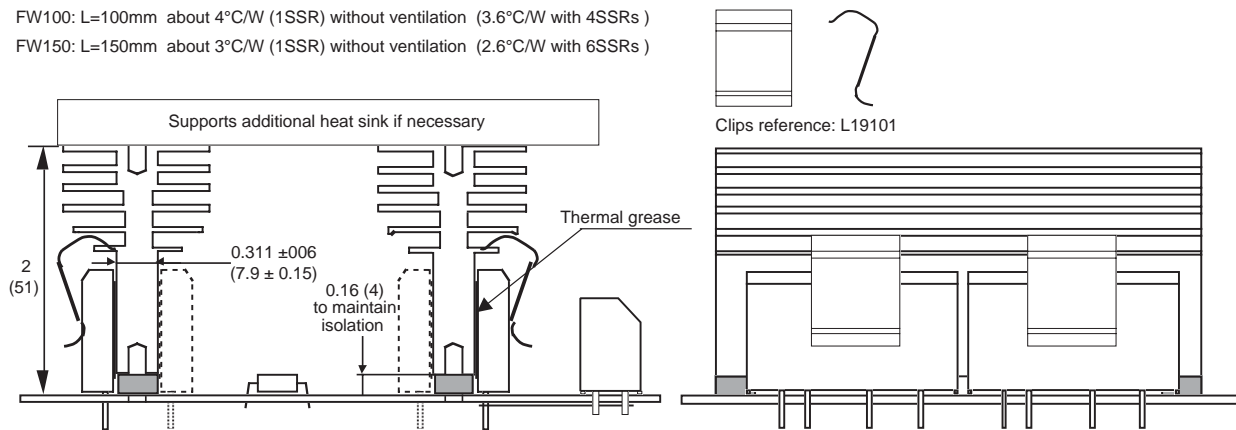
Figure 6e — LS60D30C relay

**MOUNTING EXAMPLES**

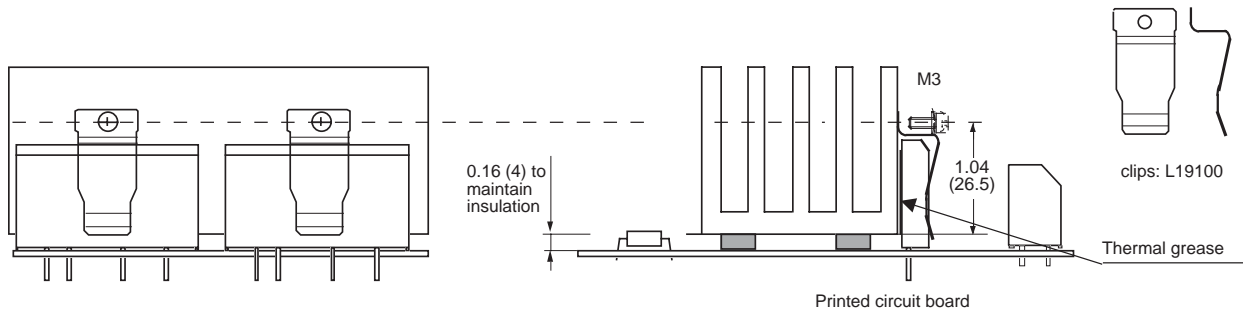
Heat sinks references:

FW100: L=100mm about 4°C/W (1SSR) without ventilation (3.6°C/W with 4SSRs )

FW150: L=150mm about 3°C/W (1SSR) without ventilation (2.6°C/W with 6SSRs )



*Figure 7a — Thermal heat sinks with mounting clips; dimensions in inches (mm)*



*Figure 7b — Clips with screws on standard heat sinks; dimensions in inches (mm)*

In each case, allow 0.16 in. (4mm) between the printed circuit board and the heat sink to keep a correct insulation between input to output (0.16 in./4mm insulated washer). To maintain a good contact between the SSR and the heat sink, use thermal grease.

**MECHANICAL SPECIFICATION**

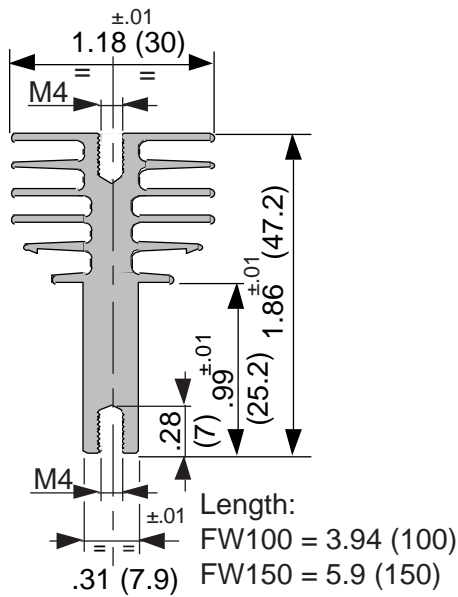


Figure 8 – FW100 and FW150 heat sinks; dimensions in inches (mm)

**FW100 heat sink with Max Clip System\***

Rth = 3.6°C/W (4 SSRs)

Rth = 4°C/W (1 SSR)

**FW150 heat sink with Max Clip System\***

Rth = 2.6°C/W (4 SSRs)

Rth = 3°C/W (1 SSR)

\*The Max Clip System of Aavid Thermalloy, patented worldwide

**L19101 CLIP**

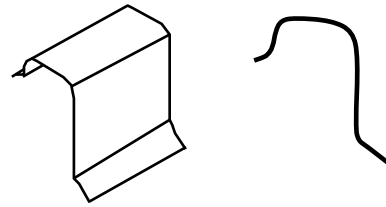


Figure 9a – Clip for FW100 and FW150 heat sinks

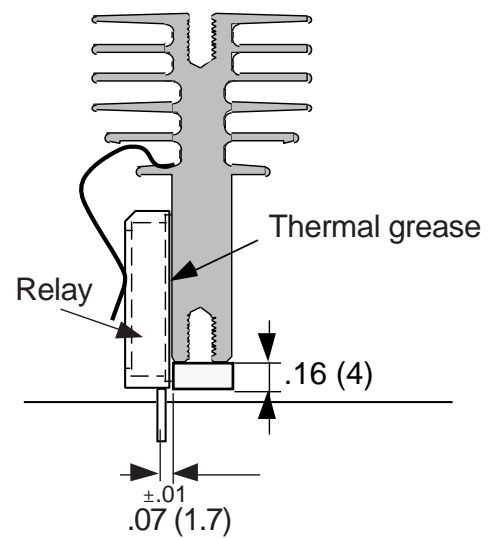


Figure 9b – Mounting with L 19101 clip; dimensions in inches (mm)

**L19100 CLIP**

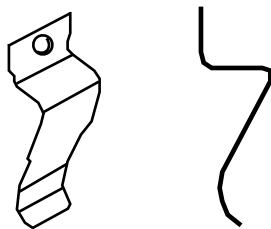


Figure 10a – Clips with screws for other heat sinks

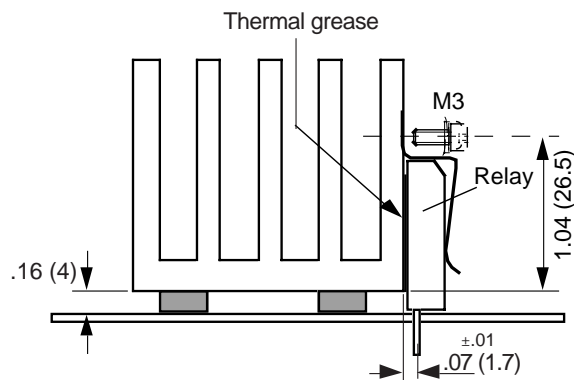


Figure 10b – Mounting with L 19100 clip; dimensions in inches (mm)

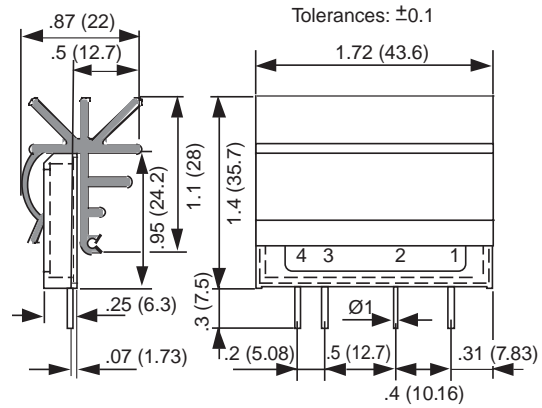
**NOTES**

1. 0.16-inch (4mm) mounting washer must have correct insulation between input to output.

**LS WITH HS1 HEAT SINK**



Figure 11 – LS with HS1



WEIGHT:  
1.06 oz. (30g)

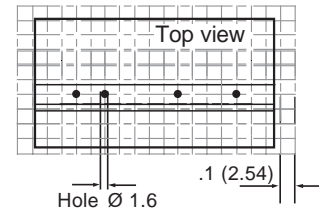


Figure 12 — LS relays with HS1; dimensions in inches (mm)

**INPUT (CONTROL) SPECIFICATION**

|               | Min | Max | Units |
|---------------|-----|-----|-------|
| Control Range |     |     |       |
| LS24D16C-HS1  | 4   | 14  | Vdc   |
| LS60D22C-HS1  | 4   | 14  | Vdc   |
| LS24D16N-HS1  | 8   | 32  | Vdc   |

**Input Current Range**

|              |     |    |      |
|--------------|-----|----|------|
| LS24D16C-HS1 | 6.5 | 30 | mAdc |
| LS60D22C-HS1 | 6.5 | 30 | mAdc |
| LS24D16N-HS1 | 3.5 | 18 | mAdc |

**Must Turn-Off Voltage**

|            |   |     |
|------------|---|-----|
| All relays | 1 | Vdc |
|------------|---|-----|

**Input Resistance (Typical)**

|              |      |      |
|--------------|------|------|
| LS24D16C-HS1 | 440  | Ohms |
| LS60D22C-HS1 | 440  | Ohms |
| LS24D16N-HS1 | 1640 | Ohms |

**LOAD CURRENT DERATING CURVE**

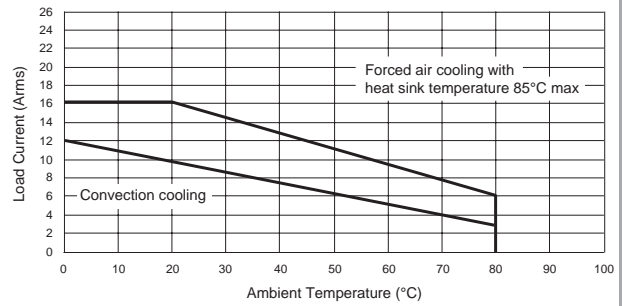


Figure 13a — LS24D16X-HS1 relays

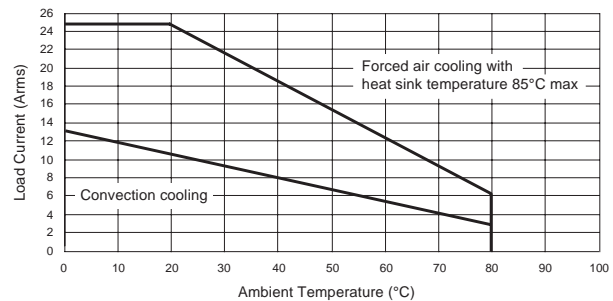


Figure 13b — LS60D22N-HS1 relays