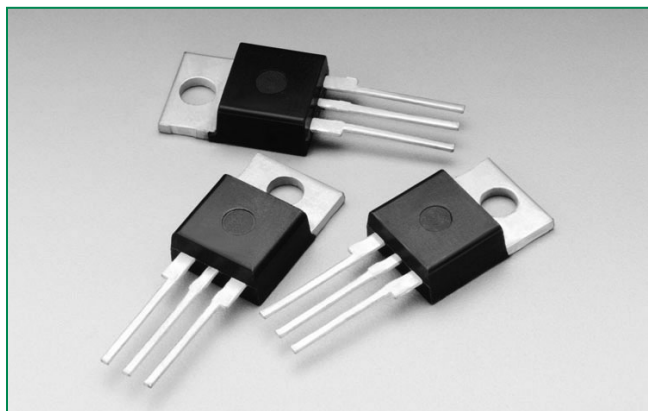
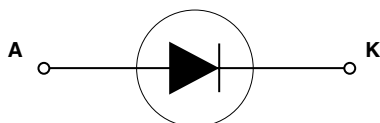




#### Agency Approval

| Agency    | Agency File Number |
|-----------|--------------------|
| <b>RL</b> | L Package : E71639 |

#### Schematic Symbol



#### Description

Silicon rectifiers that are excellent for DC phase control applications with motor loads.

Isolated mounting tab allows for use in circuits with common anode or common cathode connections.

#### Features & Benefits

- RoHS Compliant
- Glass – passivated junctions
- Voltage capability up to 1000 V
- Surge capability up to 350 A

#### Applications

Typical applications are AC to DC solid-state switches for industrial power tools, exercise equipment, white goods, and commercial appliances.

Internally constructed isolated package is offered for ease of heat sinking with highest isolation voltage.

#### Main Features

| Symbol       | Value        | Unit |
|--------------|--------------|------|
| $I_{T(RMS)}$ | 15 / 20 / 25 | A    |
| $V_{RRM}$    | 400 to 1000  | V    |

#### Absolute Maximum Ratings

| Symbol       | Parameter                            | Test Conditions                                                                 | Value      |        |        | Unit                 |
|--------------|--------------------------------------|---------------------------------------------------------------------------------|------------|--------|--------|----------------------|
|              |                                      |                                                                                 | Dxx15L     | Dxx20L | Dxx25L |                      |
| $I_{F(RMS)}$ | RMS forward current                  | Dxx15L: $T_C = 85^\circ\text{C}$                                                | 15         | 20     | 25     | A                    |
| $I_{F(AV)}$  | Average forward current              | Dxx20L/Dxx25L: $T_C = 80^\circ\text{C}$                                         | 9.5        | 12.7   | 15.9   | A                    |
| $I_{FSM}$    | Peak non-repetitive surge current    | single half cycle; $f = 50\text{Hz}$ ; $T_J(\text{initial}) = 25^\circ\text{C}$ | 188        | 255    | 300    | A                    |
|              |                                      | single half cycle; $f = 60\text{Hz}$ ; $T_J(\text{initial}) = 25^\circ\text{C}$ | 225        | 300    | 350    |                      |
| $I^2t$       | $I^2t$ Value for fusing              | $t_p = 8.3 \text{ ms}$                                                          | 210        | 374    | 508    | $\text{A}^2\text{s}$ |
| $T_{stg}$    | Storage temperature range            |                                                                                 | -40 to 150 |        |        | $^\circ\text{C}$     |
| $T_J$        | Operating junction temperature range |                                                                                 | -40 to 125 |        |        | $^\circ\text{C}$     |

Note: xx = voltage

**Electrical Characteristics ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)**

| Symbol   | Parameter             | Test Conditions                           |      | Value | Unit          |
|----------|-----------------------|-------------------------------------------|------|-------|---------------|
| $t_{rr}$ | Reverse-recovery Time | $I_F = 0.9\text{A}$ , $I_R = 1.5\text{A}$ | TYP. | 4     | $\mu\text{s}$ |

**Static Characteristics**

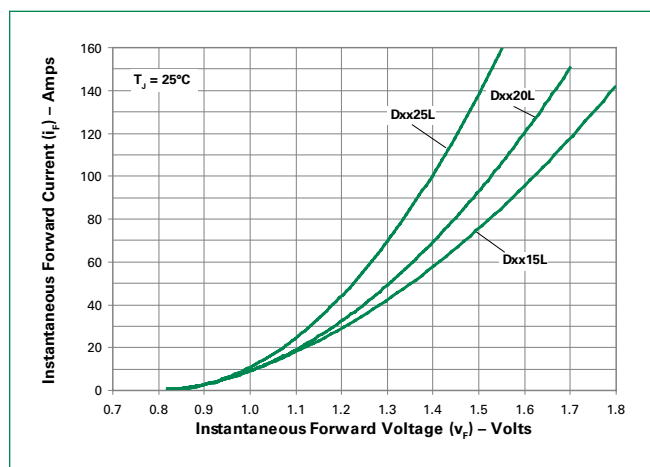
| Symbol          | Test Conditions                                         |                        |           |      | Value | Unit |
|-----------------|---------------------------------------------------------|------------------------|-----------|------|-------|------|
| V <sub>FM</sub> | 15A Device I <sub>T</sub> = 30A; t <sub>p</sub> = 380μs |                        |           | MAX. | 1.6   | V    |
|                 | 20A Device I <sub>T</sub> = 40A; t <sub>p</sub> = 380μs |                        |           |      |       |      |
|                 | 25A Device I <sub>T</sub> = 50A; t <sub>p</sub> = 380μs |                        |           |      |       |      |
| I <sub>RM</sub> | V <sub>RRM</sub>                                        | T <sub>J</sub> = 25°C  | 400-600V  | MAX. | 10    | μA   |
|                 |                                                         |                        | 800-1000V |      | 20    |      |
|                 |                                                         | T <sub>J</sub> = 100°C | 400-800V  |      | 500   |      |
|                 |                                                         |                        | 1000V     |      | 3000  |      |
|                 |                                                         | T <sub>J</sub> = 125°C | 400-800V  |      | 1000  |      |
|                 |                                                         |                        |           |      |       |      |

**Thermal Resistances**

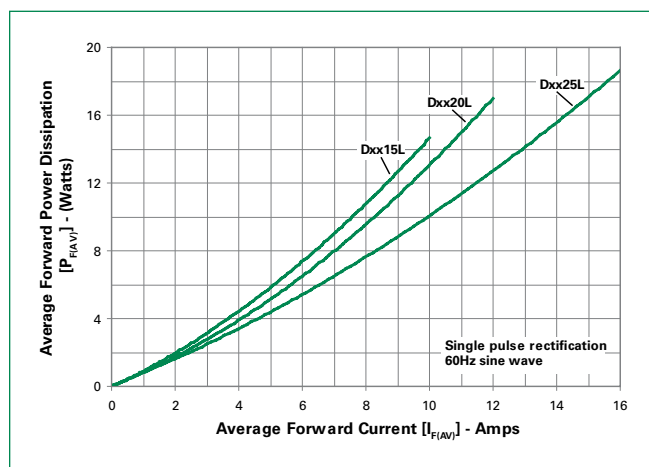
| Symbol            | Parameter             |        | Value | Unit               |
|-------------------|-----------------------|--------|-------|--------------------|
| $R_{\theta(J-C)}$ | Junction to case (AC) | Dxx15L | 2.85  | $^\circ\text{C/W}$ |
|                   |                       | Dxx20L | 2.55  |                    |
|                   |                       | Dxx25L | 2.50  |                    |

Note: xx = voltage

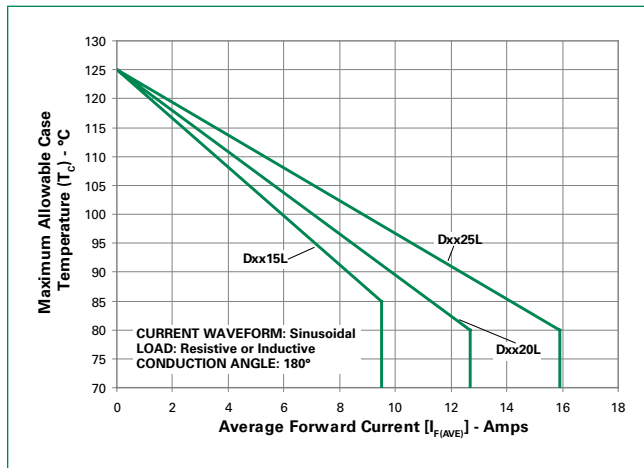
**Figure 1: On-State Current vs. On-State Voltage (Typical)**



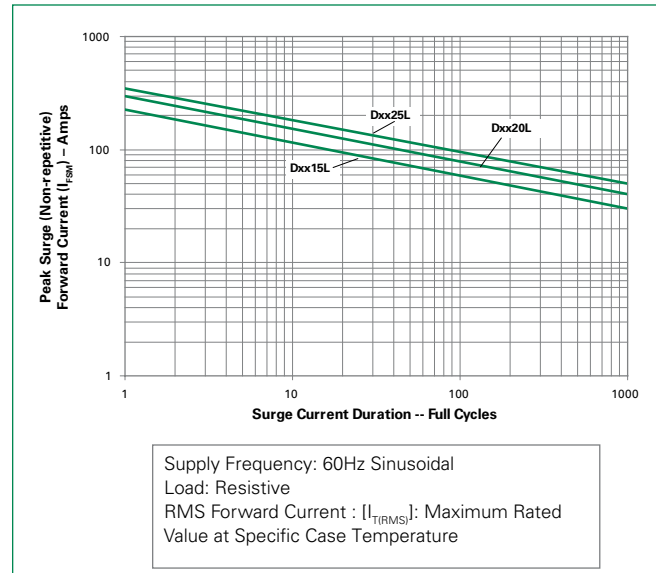
**Figure 2: Power Dissipation vs. RMS On-State Current (Typical)**



**Figure 3: Maximum Allowable Case Temperature vs. Average On-State Current**

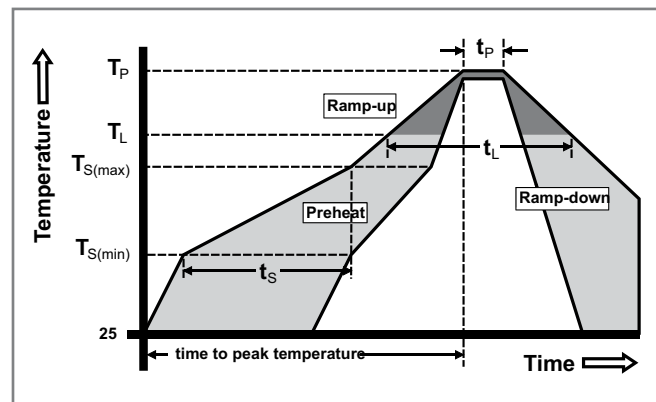


**Figure 4: Surge Peak On-State Current vs. Number of Cycles**



## Soldering Parameters

|                                                        |                                    |                    |
|--------------------------------------------------------|------------------------------------|--------------------|
| Reflow Condition                                       |                                    | Pb – Free assembly |
| Pre Heat                                               | - Temperature Min ( $T_{s(min)}$ ) | 150°C              |
|                                                        | - Temperature Max ( $T_{s(max)}$ ) | 200°C              |
|                                                        | - Time (min to max) ( $t_s$ )      | 60 – 180 secs      |
| Average ramp up rate (Liquidus Temp) ( $T_L$ ) to peak |                                    | 5°C/second max     |
| $T_{s(max)}$ to $T_L$ - Ramp-up Rate                   |                                    | 5°C/second max     |
| Reflow                                                 | - Temperature ( $T_L$ ) (Liquidus) | 217°C              |
|                                                        | - Temperature ( $t_L$ )            | 60 – 150 seconds   |
| Peak Temperature ( $T_p$ )                             |                                    | 260°C $\pm 0/-5$   |
| Time within 5°C of actual peak Temperature ( $t_p$ )   |                                    | 20 – 40 seconds    |
| Ramp-down Rate                                         |                                    | 5°C/second max     |
| Time 25°C to peak Temperature ( $T_p$ )                |                                    | 8 minutes Max.     |
| Do not exceed                                          |                                    | 280°C              |



### Physical Specifications

|                        |                                                               |
|------------------------|---------------------------------------------------------------|
| <b>Terminal Finish</b> | 100% Matte Tin Plated                                         |
| <b>Body Material</b>   | UL recognized epoxy meeting flammability classification 94V-0 |
| <b>Lead Material</b>   | Copper Alloy                                                  |

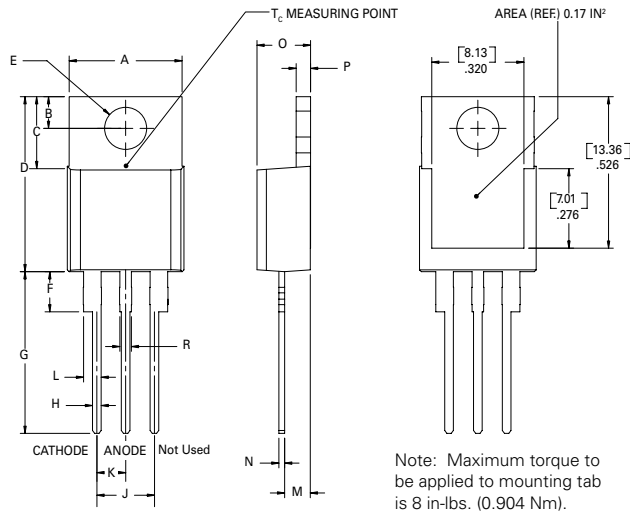
### Design Considerations

Careful selection of the correct device for the application's operating parameters and environment will go a long way toward extending the operating life of the rectifier. Good design practice should limit the maximum continuous current through the main terminals to 75% of the device rating. Other ways to ensure long life for a power discrete semiconductor are proper heat sinking and selection of voltage ratings for worst case conditions. Overheating, overvoltage (including dv/dt), and surge currents are the main killers of semiconductors. Correct mounting, soldering, and forming of the leads also help protect against component damage.

### Environmental Specifications

| Test                                     | Specifications and Conditions                                                              |
|------------------------------------------|--------------------------------------------------------------------------------------------|
| <b>High Temperature Voltage Blocking</b> | MIL-STD-750: Method 1040, Condition A<br>Rated $V_{RRM}$ , 125°C, 1008 hours               |
| <b>Temperature Cycling</b>               | MIL-STD-750: Method 1051<br>-40°C to 150°C, 15-minute dwell,<br>100 cycles                 |
| <b>Biased Temperature &amp; Humidity</b> | EIA/JEDEC: JESD22-A101<br>320VDC, 85°C, 85%RH, 1008 hours                                  |
| <b>High Temp Storage</b>                 | MIL-STD-750: Method 1031<br>150°C, 1008 hours                                              |
| <b>Low-Temp Storage</b>                  | 1008 hours; -40°C                                                                          |
| <b>Thermal Shock</b>                     | MIL-STD-750: Method 1056<br>0°C to 100°C, 5-minute dwell,<br>10-second transfer, 10 cycles |
| <b>Autoclave (Pressure Cooker Test)</b>  | EIA/JEDEC: JESD22-A102<br>121°C, 100%RH, 2atm, 168 hours                                   |
| <b>Resistance to Solder Heat</b>         | MIL-STD-750: Method 2031<br>260°C, 10 seconds                                              |
| <b>Solderability</b>                     | ANSI/J-STD-002, Category 3, Test A                                                         |
| <b>Lead Bend</b>                         | MIL-STD-750: Method 2036, Condition E                                                      |

### Dimensions — TO-220AB (L-Package) — Isolated Mounting Tab



| Dimension | Inches |       | Millimeters |       |
|-----------|--------|-------|-------------|-------|
|           | Min    | Max   | Min         | Max   |
| A         | 0.380  | 0.420 | 9.65        | 10.67 |
| B         | 0.105  | 0.115 | 2.67        | 2.92  |
| C         | 0.230  | 0.250 | 5.84        | 6.35  |
| D         | 0.590  | 0.620 | 14.99       | 15.75 |
| E         | 0.142  | 0.147 | 3.61        | 3.73  |
| F         | 0.110  | 0.130 | 2.79        | 3.30  |
| G         | 0.540  | 0.575 | 13.72       | 14.61 |
| H         | 0.025  | 0.035 | 0.64        | 0.89  |
| J         | 0.195  | 0.205 | 4.95        | 5.21  |
| K         | 0.095  | 0.105 | 2.41        | 2.67  |
| L         | 0.060  | 0.075 | 1.52        | 1.91  |
| M         | 0.085  | 0.095 | 2.16        | 2.41  |
| N         | 0.018  | 0.024 | 0.46        | 0.61  |
| O         | 0.178  | 0.188 | 4.52        | 4.78  |
| P         | 0.045  | 0.060 | 1.14        | 1.52  |
| R         | 0.038  | 0.048 | 0.97        | 1.22  |

## Product Selector

| Part Number | Voltage |      |      |       | Type      | Package |
|-------------|---------|------|------|-------|-----------|---------|
|             | 400V    | 600V | 800V | 1000V |           |         |
| Dxx15L      | X       | X    | X    | X     | Rectifier | TO-220L |
| Dxx20L      | X       | X    | X    | X     | Rectifier | TO-220L |
| Dxx25L      | X       | X    | X    | X     | Rectifier | TO-220L |

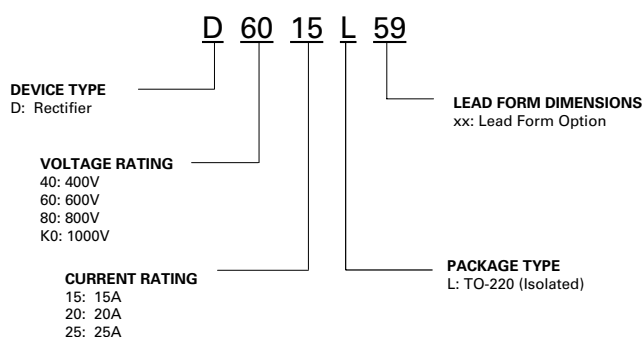
Note: xx = Voltage

## Packing Options

| Part Number | Marking | Weight | Packing Mode | Base Quantity     |
|-------------|---------|--------|--------------|-------------------|
| Dxx15L      | Dxx15L  | 2.2 g  | Bulk         | 500               |
| Dxx15LTP    | Dxx15L  | 2.2 g  | Tube         | 500 (50 per tube) |
| Dxx20L      | Dxx20L  | 2.2 g  | Bulk         | 500               |
| Dxx20LTP    | Dxx20L  | 2.2 g  | Tube         | 500 (50 per tube) |
| Dxx25L      | Dxx25L  | 2.2 g  | Bulk         | 500               |
| Dxx25LTP    | Dxx25L  | 2.2 g  | Tube         | 500 (50 per tube) |

Note: xx = Voltage

## Part Numbering System



## Part Marking System

TO-220AB (L Package)

