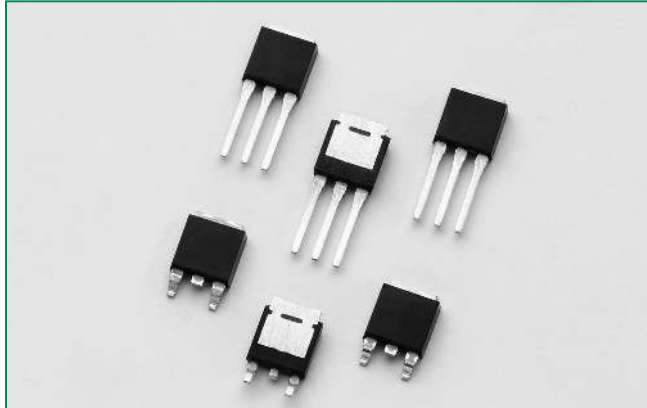


LJxx04xx & QJxx04xx Series

PRELIMINARY & CONFIDENTIAL

Littelfuse, Inc. has characterized initial samples of this device and is currently conducting reliability testing. Parts numbers and specifications are subject to change until the datasheet is made final.



Description

This 4 A High Temperature Triac solid state switch series is designed for AC switching and phase control applications such as motor speed and temperature modulation controls, lighting controls, and static switching relays.

Sensitive type components guarantee gate control in Quadrants I & IV needed for digital control circuitry.

Standard type components normally operate in Quadrants I & III triggered from AC line.

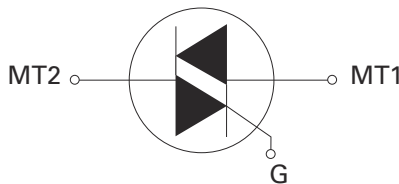
Features & Benefits

- **RoHS Compliant**
- 150°C maximum junction temperature
- Voltage capability up to 600V
- Surge capability up to 48A at 60HZ half cycle
- Solid-state switching eliminates arcing or contact bounce that create voltage transients
- No contacts to wear out from reaction of switching events
- Restricted (or limited) RFI generation, depending on activation point of sine wave
- Requires only a small gate activation pulse in each half-cycle
- Halogen free and RoHS compliant

Main Features

| Symbol | Value | Unit |
|-------------------|------------|------|
| $I_{T(RMS)}$ | 4 | A |
| V_{DRM}/V_{RRM} | 400 or 600 | V |
| $I_{GT(Q1)}$ | 10 to 25 | mA |

Schematic Symbol



Applications

Typical applications are AC solid-state switches, power tools, home/brown goods and white goods appliances. Sensitive gate Triacs can be directly driven by microprocessor or popular opto-couplers/isolators. Internally constructed isolated packages are offered for ease of heat sinking with highest isolation voltage.

Absolute Maximum Ratings — Sensitive Triacs (4 Quadrants)

| Symbol | Parameter | Value | Unit | |
|-------------------|---|---------------------|----------------------------|---------|
| V_{DSM}/V_{RSM} | Peak non-repetitive blocking voltage | Pw=100 μs | 700 V | |
| $I_{T(RMS)}$ | RMS on-state current (full sine wave) | LJxx04Vy/LJxx04Dy | $T_C = 135^\circ C$ 4 A | |
| I_{TSM} | Non repetitive surge peak on-state current (full cycle, T_J initial = 25°C) | f = 50 Hz | t = 20 ms | 40 A |
| | | f = 60 Hz | t = 16.7 ms | 48 A |
| I^2t | I^2t Value for fusing | $t_p = 8.3$ ms | 9.5 A ² s | |
| di/dt | Critical rate of rise of on-state current ($I_G = 50$ mA with ≤ 0.1μs rise time) | f = 60 Hz | $T_J = 150^\circ C$ | 50 A/μs |
| I_{GTM} | Peak gate trigger current | $t_p \leq 10$ μs | $T_J = 150^\circ C$ | 1.2 A |
| $P_{G(AV)}$ | Average gate power dissipation | $T_J = 150^\circ C$ | 0.3 W | |
| T_{stg} | Storage temperature range | | -40 to 150 °C | |
| T_J | Operating junction temperature range | | -40 to 150 °C | |

Note: xx=voltage/10, y = sensitivity

LJxx04xx & QJxx04xx Series

Absolute Maximum Ratings — Standard Triacs

| Symbol | Parameter | | Value | Unit | |
|-------------------|---|---|---------------------------|------------|----------------------|
| V_{DSM}/V_{RSM} | Peak non-repetitive blocking voltage | | Pw=100 μ s | 700 | V |
| $I_{T(RMS)}$ | RMS on-state current (full sine wave) | QJxx04Vy/QJxx04Dy | $T_c = 135^\circ\text{C}$ | 4 | A |
| I_{TSM} | Non repetitive surge peak on-state current (full cycle, T_j initial = 25°C) | f = 50 Hz | t = 20 ms | 40 | A |
| | | f = 60 Hz | t = 16.7 ms | 48 | |
| I^2t | I^2t Value for fusing | | $t_p = 8.3$ ms | 9.5 | A^2s |
| di/dt | Critical rate of rise of on-state current ($I_G = 50\text{mA}$ with $\leq 0.1\mu\text{s}$ rise time) | f = 60 Hz | $T_j = 150^\circ\text{C}$ | 50 | A/ μ s |
| I_{GTM} | Peak gate trigger current | $t_p \leq 10 \mu\text{s};$ $I_{GT} \leq I_{GTM}$ | $T_j = 150^\circ\text{C}$ | 1.2 | A |
| $P_{G(AV)}$ | Average gate power dissipation | | $T_j = 150^\circ\text{C}$ | 0.3 | W |
| T_{stg} | Storage temperature range | | | -40 to 150 | $^\circ\text{C}$ |
| T_j | Operating junction temperature range | | | -40 to 150 | $^\circ\text{C}$ |

Note: xx=voltage/10, y = sensitivity

Electrical Characteristics ($T_j = 25^\circ\text{C}$, unless otherwise specified) — Sensitive Triac (4 Quadrants)

| Symbol | Test Conditions | Quadrant | | LJxx04x8 | Unit |
|----------|--|--------------|------|----------|------------|
| I_{GT} | $V_D = 12\text{V}$ $R_L = 60 \Omega$ | I – II – III | MAX. | 10 | mA |
| | | IV | | 20 | |
| V_{GT} | $V_D = 12\text{V}$ $R_L = 60 \Omega$ | ALL | MAX. | 1.3 | V |
| V_{GD} | $V_D = V_{DRM}$ $R_L = 3.3 \text{k}\Omega$ $T_j = 150^\circ\text{C}$ | ALL | MIN. | 0.2 | V |
| I_H | $I_T = 100\text{mA}$ | | MAX. | 20 | mA |
| dv/dt | $V_D = V_{DRM}$ Gate Open $T_j = 150^\circ\text{C}$ | 400V | TYP. | 75 | V/ μ s |
| | | 600V | | 45 | |
| (dv/dt)c | (di/dt)c = 2.16 A/ms $T_j = 150^\circ\text{C}$ | | TYP. | 1 | V/ μ s |
| t_{gt} | $I_G = 2 \times I_{GT}$ PW = 15 μ s $I_T = 5.6$ A(pk) | | TYP. | 10 | μ s |

Note: xx=voltage/10, x = package

Electrical Characteristics ($T_j = 25^\circ\text{C}$, unless otherwise specified) — Standard Triac

| Symbol | Test Conditions | Quadrant | | QJxx04x3 | QJxx04x4 | Unit |
|----------|--|--------------|------|----------|----------|------------|
| I_{GT} | $V_D = 12\text{V}$ $R_L = 60 \Omega$ | I – II – III | MAX. | 10 | 25 | mA |
| | | IV | TYP. | 25 | 50 | |
| V_{GT} | $V_D = 12\text{V}$ $R_L = 60 \Omega$ | I – II – III | MAX. | 1.3 | 1.3 | V |
| V_{GD} | $V_D = V_{DRM}$ $R_L = 3.3 \text{k}\Omega$ $T_j = 150^\circ\text{C}$ | ALL | MIN. | 0.2 | 0.2 | V |
| I_H | $I_T = 200\text{mA}$ | | MAX. | 20 | 30 | mA |
| dv/dt | $V_D = V_{DRM}$ Gate Open $T_j = 150^\circ\text{C}$ | 400V | MIN. | 75 | 150 | V/ μ s |
| | | 600V | | 45 | 100 | |
| (dv/dt)c | (di/dt)c = 2.16 A/ms $T_j = 150^\circ\text{C}$ | | TYP. | 2 | 2 | V/ μ s |
| t_{gt} | $I_G = 2 \times I_{GT}$ PW = 15 μ s $I_T = 5.6$ A(pk) | | TYP. | 10 | 15 | μ s |

Note: xx=voltage/10, x = package

Littelfuse, Inc. has characterized initial samples of this device and is currently conducting reliability testing. Parts numbers and specifications are subject to change until the datasheet is made final.

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

| Symbol | Test Conditions | | Value | Unit | |
|------------------------|------------------------|-------------------------|---------------------------|---------------------------|-----------------|
| V_{TM} | $I_{TM} = 5.6\text{A}$ | $t_p = 380 \mu\text{s}$ | MAX. | 1.40 V | |
| I_{DRM} I_{RRM} | $V_{DRM} = V_{RRM}$ | MAX. | LJxx04xy | $T_J = 25^\circ\text{C}$ | 5 μA |
| | | | | $T_J = 125^\circ\text{C}$ | 0.5 mA |
| | | | $T_J = 150^\circ\text{C}$ | 3 mA | |
| | | | QJxx04xy | $T_J = 25^\circ\text{C}$ | 5 μA |
| | | | | $T_J = 125^\circ\text{C}$ | 0.5 mA |
| | | | | $T_J = 150^\circ\text{C}$ | 3 mA |

Note: xx=voltage/10, x = package, y = sensitivity

Thermal Resistances

| Symbol | Parameter | Value | Unit |
|-------------------|-----------------------|----------------------------|------|
| $R_{\theta(JC)}$ | Junction to case (AC) | LJ/QJxx04Dy | 1.5 |
| | | LJ/QJxx04Vy | 1.5 |
| $R_{\theta(J-A)}$ | Junction to ambient | LJ/QJxx04Vy LJ/QJxx04Dy | 70 |

Note: xx=voltage/10, y = sensitivity

Figure 1: Definition of Quadrants

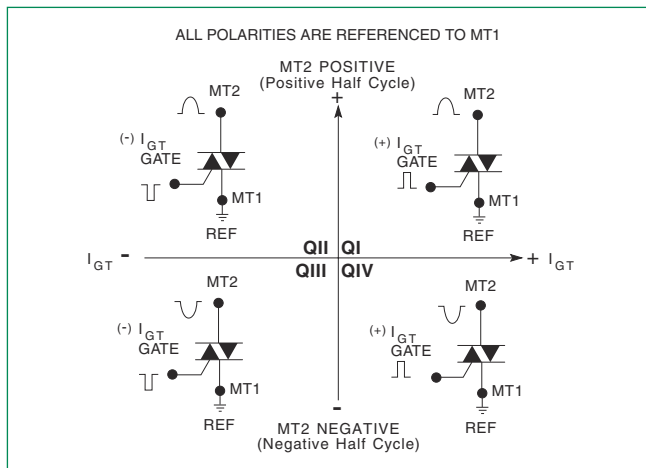


Figure 2: Normalized DC Gate Trigger Current for All Quadrants vs. Junction Temperature

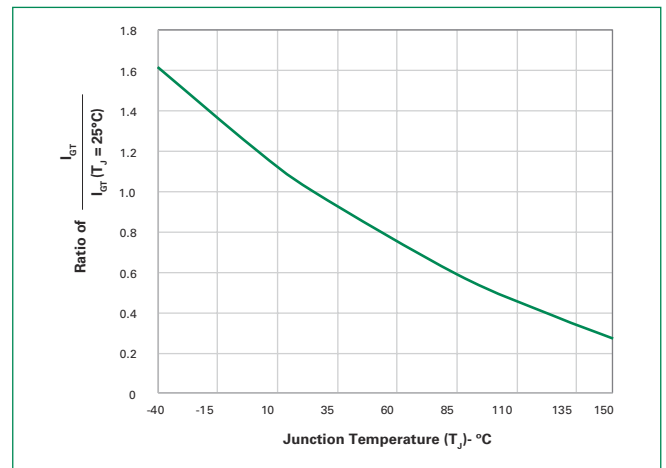


Figure 3: Normalized DC Holding Current vs. Junction Temperature

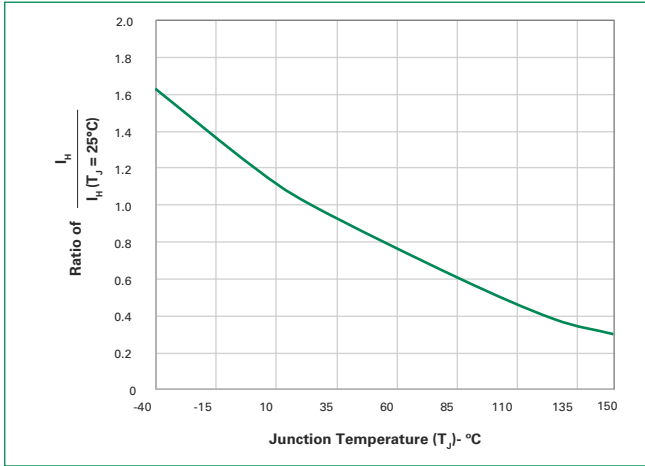


Figure 4: Normalized DC Gate Trigger Voltage for All Quadrants vs. Junction Temperature

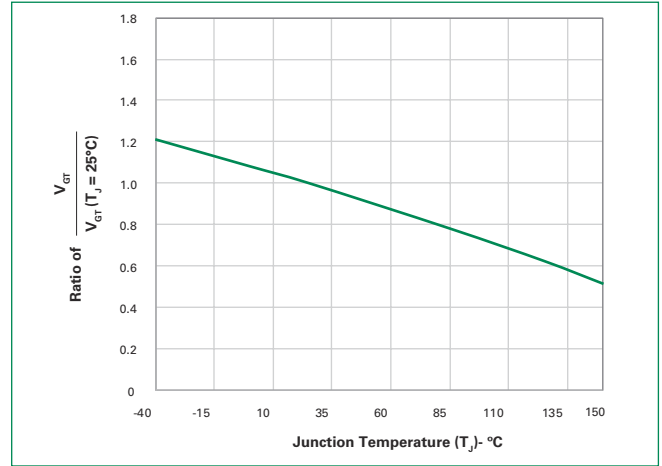


Figure 5: Power Dissipation (Typical) vs. RMS On-State Current

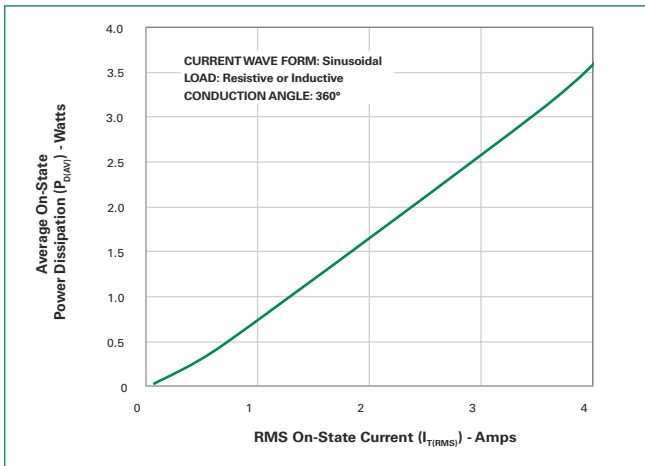


Figure 6: Maximum Allowable Case Temperature vs. On-State Current

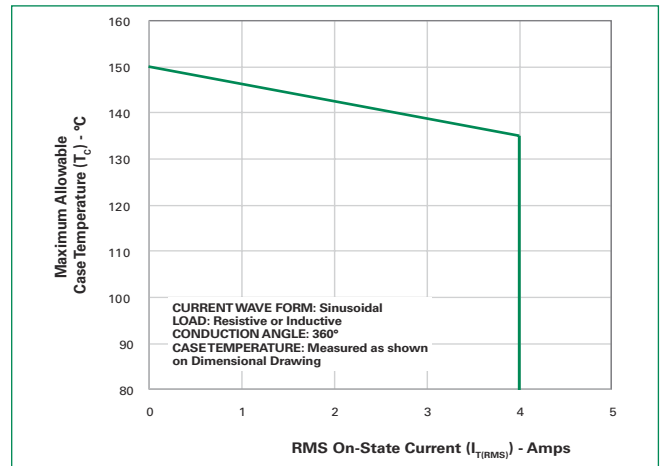
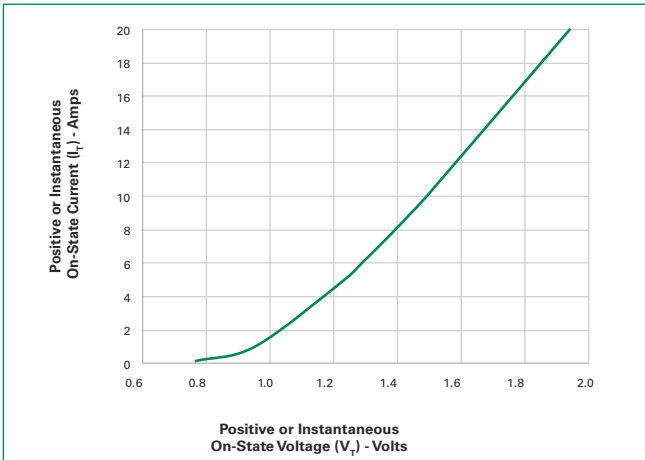


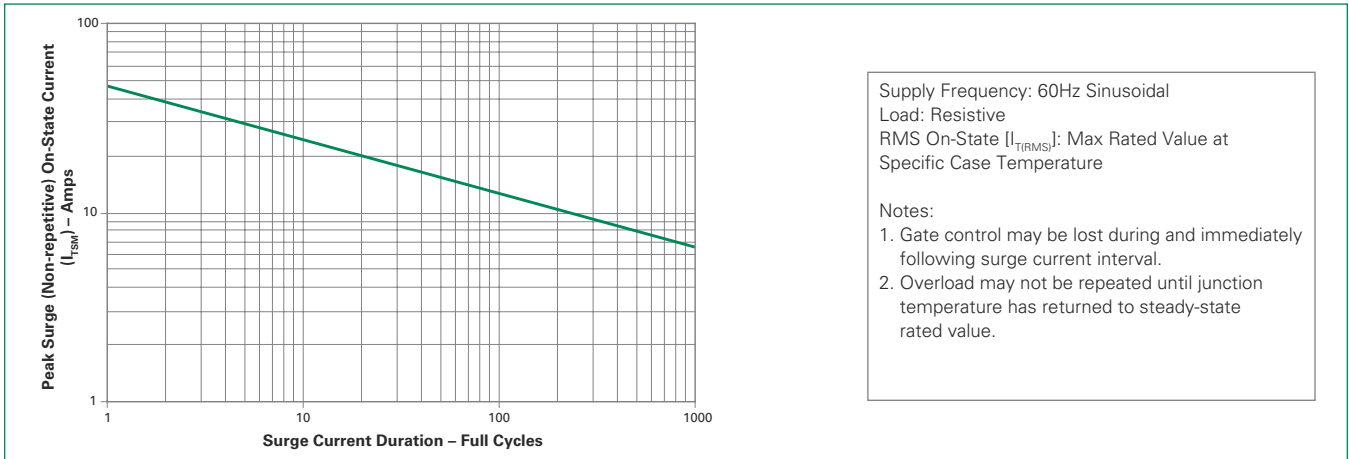
Figure 7: On-State Current vs. On-State Voltage (Typical)



PRELIMINARY & CONFIDENTIAL

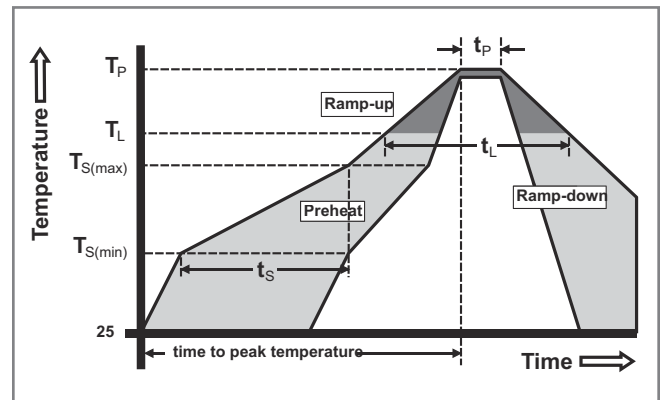
Littelfuse, Inc. has characterized initial samples of this device and is currently conducting reliability testing. Parts numbers and specifications are subject to change until the datasheet is made final.

Figure 8: 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 |
| | - Time (t_L) | 60 – 150 seconds |
| Peak Temperature (T_p) | | 260 ^{+0/-5} °C |
| 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

| | |
|--------------------------|---|
| Terminal Finish | 100% Matte Tin-plated |
| Body Material | UL recognized compound meeting flammability rating V-0. |
| Terminal Material | Copper Alloy |

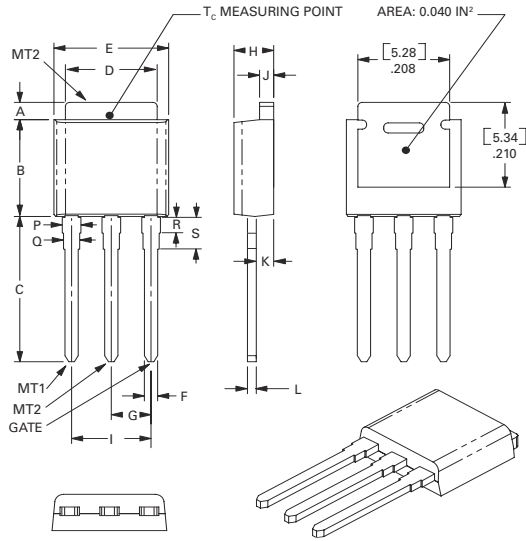
Design Considerations

Careful selection of the correct component for the application's operating parameters and environment will go a long way toward extending the operating life of the Thyristor. Good design practice should limit the maximum continuous current through the main terminals to 75% of the component 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

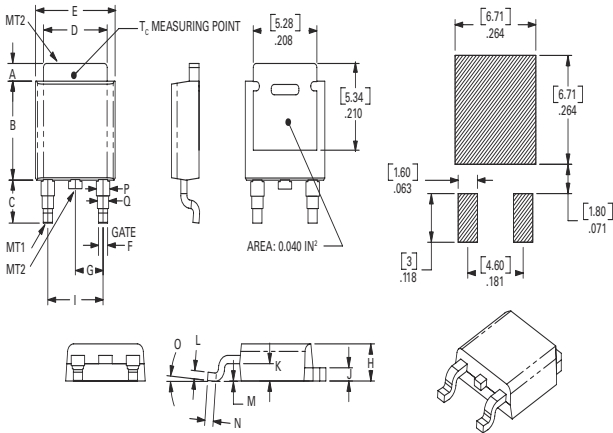
| Test | Specifications and Conditions |
|---|--|
| AC Blocking (V_{DRM}) | MIL-STD-750, M-1040, Cond A Applied Peak AC voltage @ 150°C for 1008 hours |
| Temperature Cycling | MIL-STD-750, M-1051, 100 cycles; -55°C to +150°C; 15-min dwell-time |
| Temperature/Humidity | EIA / JEDEC, JESD22-A101 1008 hours; 160V - DC: 85°C; 85% rel humidity |
| High Temp Storage | MIL-STD-750, M-1031, 1008 hours; 150°C |
| Low-Temp Storage | 1008 hours; -40°C |
| Resistance to Solder Heat | MIL-STD-750 Method 2031 |
| Solderability | ANSI/J-STD-002, category 3, Test A |
| Lead Bend | MIL-STD-750, M-2036 Cond E |

Dimensions — TO-251AA (V-Package) — V-PAK Through Hole



| Dimension | Inches | | | Millimeters | | |
|-----------|--------|-------|-------|-------------|------|------|
| | Min | Typ | Max | Min | Typ | Max |
| A | 0.037 | 0.040 | 0.043 | 0.94 | 1.01 | 1.09 |
| B | 0.235 | 0.242 | 0.245 | 5.97 | 6.15 | 6.22 |
| C | 0.350 | 0.361 | 0.375 | 8.89 | 9.18 | 9.53 |
| D | 0.205 | 0.208 | 0.213 | 5.21 | 5.29 | 5.41 |
| E | 0.255 | 0.262 | 0.265 | 6.48 | 6.66 | 6.73 |
| F | 0.027 | 0.031 | 0.033 | 0.69 | 0.80 | 0.84 |
| G | 0.087 | 0.090 | 0.093 | 2.21 | 2.28 | 2.36 |
| H | 0.085 | 0.092 | 0.095 | 2.16 | 2.34 | 2.41 |
| I | 0.176 | 0.180 | 0.184 | 4.47 | 4.57 | 4.67 |
| J | 0.018 | 0.020 | 0.023 | 0.46 | 0.51 | 0.58 |
| K | 0.035 | 0.037 | 0.039 | 0.90 | 0.95 | 1.00 |
| L | 0.018 | 0.020 | 0.023 | 0.46 | 0.52 | 0.58 |
| P | 0.042 | 0.047 | 0.052 | 1.06 | 1.20 | 1.32 |
| Q | 0.034 | 0.039 | 0.044 | 0.86 | 1.00 | 1.11 |
| R | 0.034 | 0.039 | 0.044 | 0.86 | 1.00 | 1.11 |
| S | 0.074 | 0.079 | 0.084 | 1.86 | 2.00 | 2.11 |

Dimensions — TO-252AA (D-Package) — D-PAK Surface Mount



| Dimension | Inches | | | Millimeters | | |
|-----------|--------|-------|-------|-------------|------|------|
| | Min | Typ | Max | Min | Typ | Max |
| A | 0.037 | 0.040 | 0.043 | 0.94 | 1.01 | 1.09 |
| B | 0.235 | 0.243 | 0.245 | 5.97 | 6.16 | 6.22 |
| C | 0.106 | 0.108 | 0.113 | 2.69 | 2.74 | 2.87 |
| D | 0.205 | 0.208 | 0.213 | 5.21 | 5.29 | 5.41 |
| E | 0.255 | 0.262 | 0.265 | 6.48 | 6.65 | 6.73 |
| F | 0.027 | 0.031 | 0.033 | 0.69 | 0.80 | 0.84 |
| G | 0.087 | 0.090 | 0.093 | 2.21 | 2.28 | 2.36 |
| H | 0.085 | 0.092 | 0.095 | 2.16 | 2.33 | 2.41 |
| I | 0.176 | 0.179 | 0.184 | 4.47 | 4.55 | 4.67 |
| J | 0.018 | 0.020 | 0.023 | 0.46 | 0.51 | 0.58 |
| K | 0.035 | 0.037 | 0.039 | 0.90 | 0.95 | 1.00 |
| L | 0.018 | 0.020 | 0.023 | 0.46 | 0.51 | 0.58 |
| M | 0.000 | 0.000 | 0.004 | 0.00 | 0.00 | 0.10 |
| N | 0.021 | 0.026 | 0.027 | 0.53 | 0.67 | 0.69 |
| O | 0° | 0° | 5° | 0° | 0° | 5° |
| P | 0.042 | 0.047 | 0.052 | 1.06 | 1.20 | 1.32 |
| Q | 0.034 | 0.039 | 0.044 | 0.86 | 1.00 | 1.11 |

PRELIMINARY & CONFIDENTIAL

Littelfuse, Inc. has characterized initial samples of this device and is currently conducting reliability testing. Parts numbers and specifications are subject to change until the datasheet is made final.

Product Selector

| Part Number | Voltage | | Gate Sensitivity Quadrants | | Type | Package |
|-------------|---------|------|----------------------------|------|-----------------|--------------|
| | 400V | 600V | I – II – III | IV | | |
| LJxx04D8 | x | x | 10mA | 20mA | Sensitive Triac | TO-252 D-PAK |
| LJxx04V8 | x | x | 10mA | 20mA | Sensitive Triac | TO-251 V-PAK |
| QJxx04D3 | x | x | 10mA | 25mA | Standard Triac | TO-252 D-PAK |
| QJxx04V3 | x | x | 10mA | 25mA | Standard Triac | TO-251 V-PAK |
| QJxx04D4 | x | x | 25mA | 50mA | Standard Triac | TO-252 D-PAK |
| QJxx04V4 | x | x | 25mA | 50mA | Standard Triac | TO-251 V-PAK |

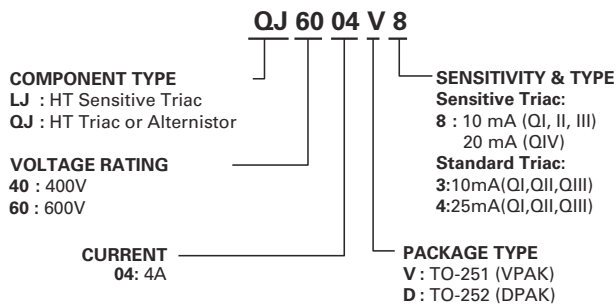
Note: xx=voltage/10

Packing Options

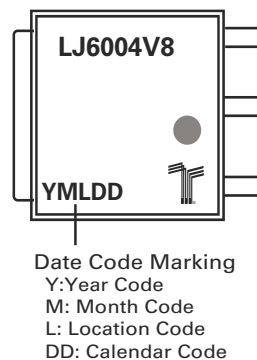
| Part Number | Marking | Weight | Packing Mode | Base Quantity |
|-------------|----------|--------|------------------|------------------|
| LJxx04D8TP | LJxx04D8 | 0.3g | Tube Pack | 750(75 per tube) |
| LJxx04D8RP | LJxx04D8 | 0.3g | Embossed Carrier | 2500 |
| LJxx04V8TP | LJxx04V8 | 0.4g | Tube Pack | 750(75 per tube) |
| QJxx04D3TP | QJxx04D3 | 0.3g | Tube Pack | 750(75 per tube) |
| QJxx04D3RP | QJxx04D3 | 0.3g | Embossed Carrier | 2500 |
| QJxx04V3TP | QJxx04V3 | 0.4g | Tube Pack | 750(75 per tube) |
| QJxx04D4TP | QJxx04D4 | 0.3g | Tube Pack | 750(75 per tube) |
| QJxx04D4RP | QJxx04D4 | 0.3g | Embossed Carrier | 2500 |
| QJxx04V4TP | QJxx04V4 | 0.4g | Tube Pack | 750(75 per tube) |

Note: xx=voltage/10

Part Numbering System



Part Marking System



PRELIMINARY & CONFIDENTIAL

Littelfuse, Inc. has characterized initial samples of this device and is currently conducting reliability testing. Parts numbers and specifications are subject to change until the datasheet is made final.

