

QJxx25xHx Series



Description

This 25 A Alternistor 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.

Alternistor TRIAC components only operate in Quadrants I, II, & III and are used in circuits requiring high dv/dt capability.

Agency Approvals

| Agency | Agency File Number |
|--------|--------------------|
| | E71639* |

* - J, K and L Packages

Features & Benefits

- Voltage capability up to 600 V
- Surge capability of 250 A at 60 Hz full cycle
- Halogen-free and RoHS-compliant
- Recognized to UL 1557 as an Electrically Isolated Semiconductor Devices

Main Features

| Symbol | Value | Unit |
|-------------------|------------------|------|
| $I_{T(RMS)}$ | 25 | A |
| V_{DRM}/V_{RRM} | 400, 600, or 800 | V |
| I_{GT} | 35 to 80 | mA |

Applications

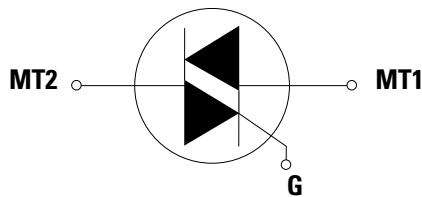
Excellent for AC switching and phase control applications such as heating, lighting, and motor speed controls.

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

Alternistor TRIACs (no snubber required) are used in applications with high inductive loads requiring the highest commutation performance.

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

Schematic Symbol



Absolute Maximum Ratings – Alternistor TRIAC

| Symbol | Parameter | Test Conditions | | Value | Unit |
|-------------------|---|--|---------------------------|-------------------------|------------------------|
| | | | | | |
| $I_{T(RMS)}$ | RMS on-state current | QJxx25LHy | $T_c = 90^\circ\text{C}$ | 25 | A |
| | | QJxx25KH6 QJxx25JH6 | $T_c = 110^\circ\text{C}$ | | |
| | | QJxx25RHy QJxx25NHy | $T_c = 120^\circ\text{C}$ | | |
| I_{TSM} | Peak non-repetitive surge current | Full cycle; $f = 50\text{ Hz}$; $T_J(\text{initial}) = 25^\circ\text{C}$ | | 208 | A |
| | | Full cycle; $f = 60\text{ Hz}$; $T_J(\text{initial}) = 25^\circ\text{C}$ | | 250 | |
| I^2t | I^2t Value for fusing | $t_p = 8.3\text{ms}$ | | 260 | A^2s |
| di/dt | Critical rate-of-rise of on-state current | $f = 60\text{ Hz}$; $T_J = 150^\circ\text{C}$ | | 100 | $\text{A}/\mu\text{s}$ |
| I_{GTM} | Peak gate current | $t_p = 20\text{ }\mu\text{s}$, $T_J = 150^\circ\text{C}$ | | 4 | A |
| $P_{G(AV)}$ | Average gate power dissipation | $T_J = 150^\circ\text{C}$ | | 0.5 | W |
| T_{stg} | Storage temperature range | - | | -40 to 150 | $^\circ\text{C}$ |
| T_J | Operating junction temperature range | - | | -40 to 150 | $^\circ\text{C}$ |
| V_{DSM}/V_{RSM} | Peak non-repetitive blocking voltage | Pulse Width = 100 μs | 600 V | $V_{DRM}/V_{RRM} + 100$ | V |
| V_{DSM}/V_{RSM} | Peak non-repetitive blocking voltage | Pulse Width = 100 μs | 800 V | $V_{DRM}/V_{RRM} + 200$ | V |

xx = voltage/10

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

| Symbol | Test Condition | Quadrant | | Value | | | Unit |
|-------------|--|----------|------|-----------|-----------|-----------|------------------------|
| | | | | QJxx25xH4 | QJxx25xH5 | QJxx25xH6 | |
| I_{GT} | $V_D = 12\text{ V}$, $R_L = 60\text{ }\Omega$ | I-II-III | MAX. | 35 | 50 | 80 | mA |
| V_{GT} | | I-II-III | MAX. | 1.3 | | | V |
| V_{GD} | $V_D = V_{DRM}$, $R_L = 3.3\text{ K}\Omega$, $T_J = 150^\circ\text{C}$ | I-II-III | MIN. | 0.15 | | | V |
| I_H | $I_T = 400\text{ mA}$ | | MAX. | 50 | 50 | 100 | mA |
| dv/dt | $V_D = V_{DRM}$, Gate Open $T_J = 150^\circ\text{C}$ | 400 V | MIN. | - | 575 | 600 | $\text{V}/\mu\text{s}$ |
| | | 600 V | | 500 | 500 | 600 | |
| | | 800 V | | 350 | 450 | - | |
| $(dv/dt)_c$ | $(di/dt)_c = 13.3\text{ A/ms}$, $T_J = 150^\circ\text{C}$ | | MIN. | 15 | 20 | 30 | $\text{V}/\mu\text{s}$ |
| t_{gt} | $I_G = 2X I_{GT}$, $P_W = 15\text{ s}$, $I_T = 35.4\text{ (pk)}$ | | TYP. | 3 | 3 | 5 | μs |

Static Characteristics

| Symbol | Test Conditions | | | Value | Unit | |
|-------------------|--|---------------------------|------|-------|---------------|---|
| V_{TM} | $I_T = 35.4\text{ A}$; $t_p = 380\text{ }\mu\text{s}$ | | | MAX. | 1.8 | V |
| I_{DRM}/I_{RRM} | V_{DRM}/V_{RRM} | $T_J = 25^\circ\text{C}$ | MAX. | 10 | μA | |
| | | $T_J = 125^\circ\text{C}$ | | 2000 | | |
| | | $T_J = 150^\circ\text{C}$ | | 4000 | | |

xx = voltage/10, x = package

Thermal Resistances

| Symbol | Parameter | Value | Unit |
|-------------------|-----------------------|-----------------------|------|
| $R_{\theta(J-C)}$ | Junction to case (AC) | QJxx25RHy / QJxx25NHy | 0.90 |
| | | QJxx25LHy | 1.8 |
| | | QJxx25KH6 / QJxx25JH6 | 1.25 |
| $R_{\theta(J-A)}$ | Junction to ambient | QJxx25RHy | 45 |
| | | QJxx25LHy | 50 |

xx = voltage/10, y = sensitivity

Figure 1: Normalized DC Gate Trigger Current vs. Junction Temperature

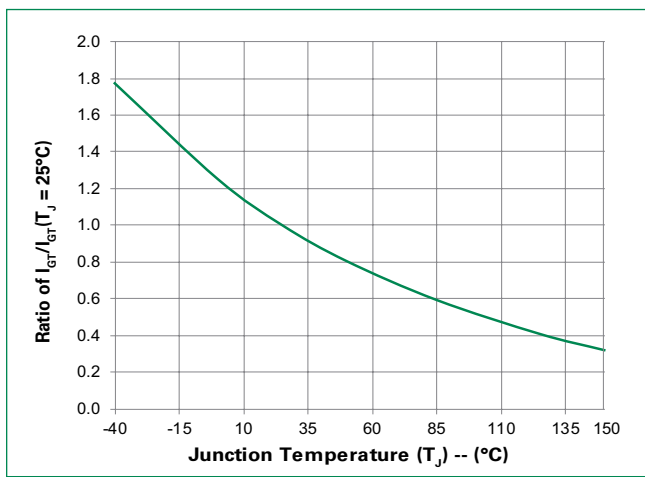


Figure 2: Normalized DC Gate Trigger Voltage vs. Junction Temperature

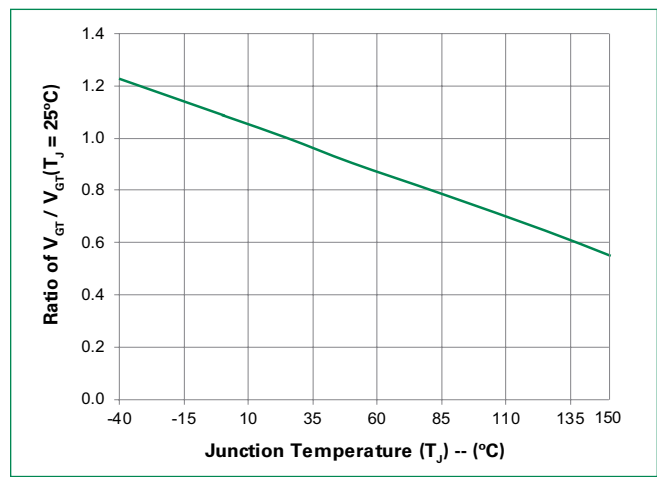


Figure 3: Normalized DC Holding Current vs. Junction Temperature

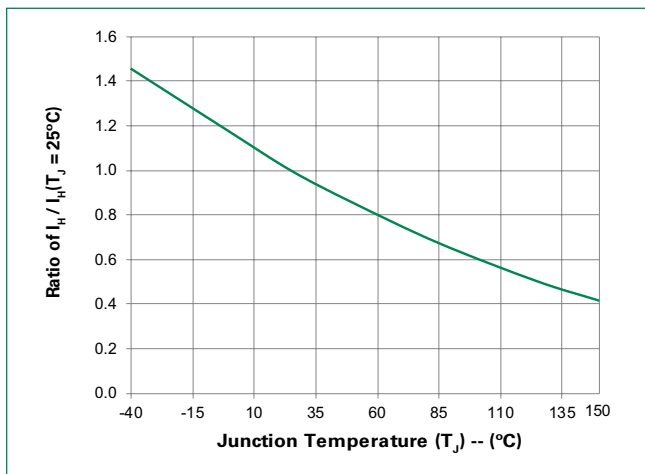


Figure 4: On-State Current vs. On-State Voltage (Typical)

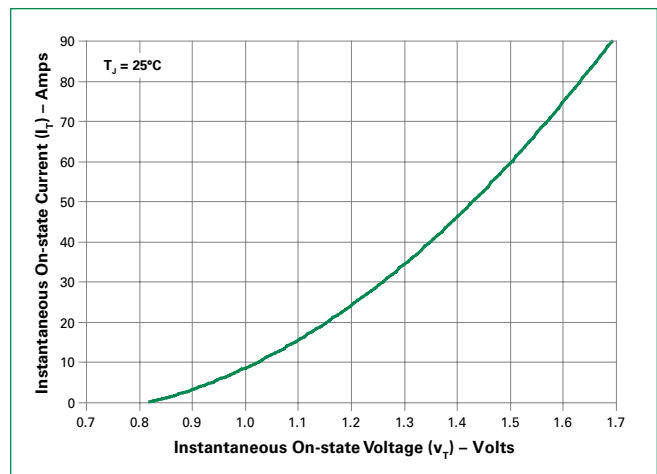


Figure 5: Power Dissipation (Typical) vs. RMS On-State Current

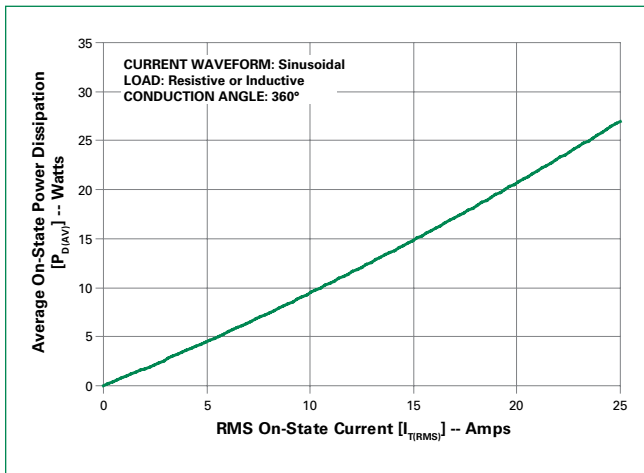


Figure 6: Maximum Allowable Case Temperature vs. RMS On-State Current

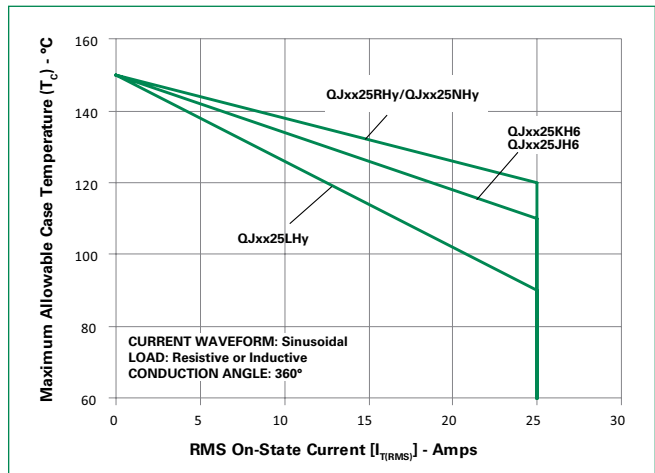
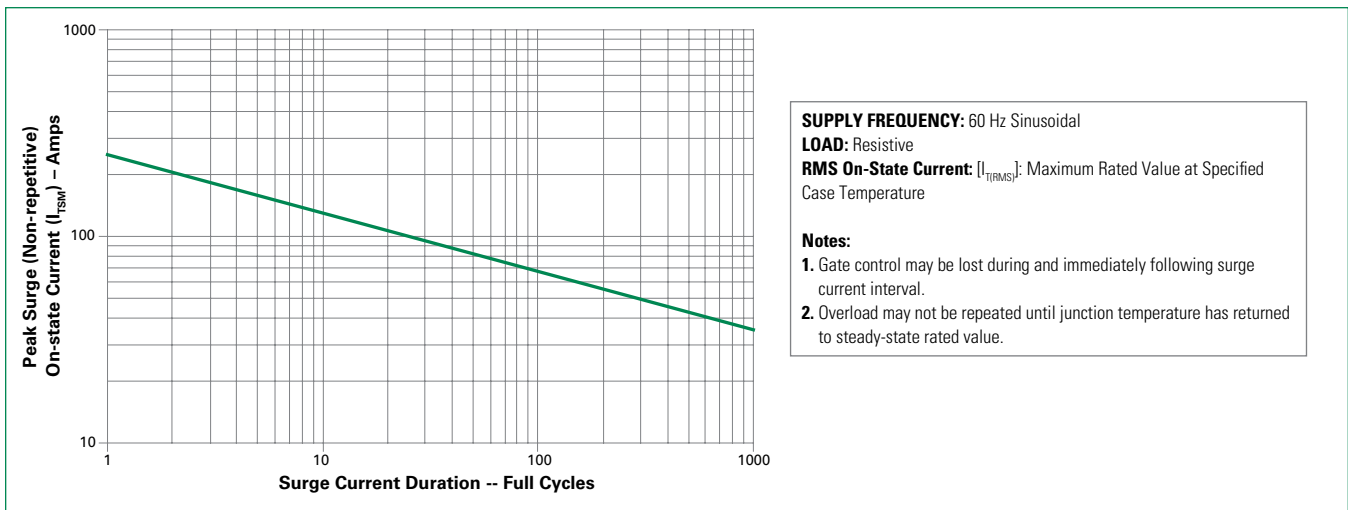
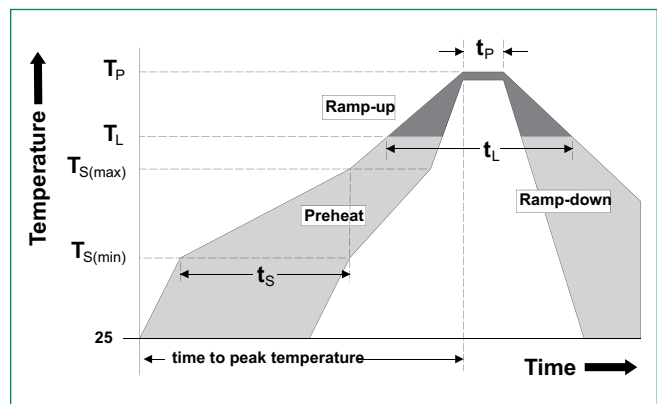


Figure 8: Surge Peak On-State Current vs. Number of Cycles



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 seconds |
| 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 ^{+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 |
| Lead Material | Copper Alloy |

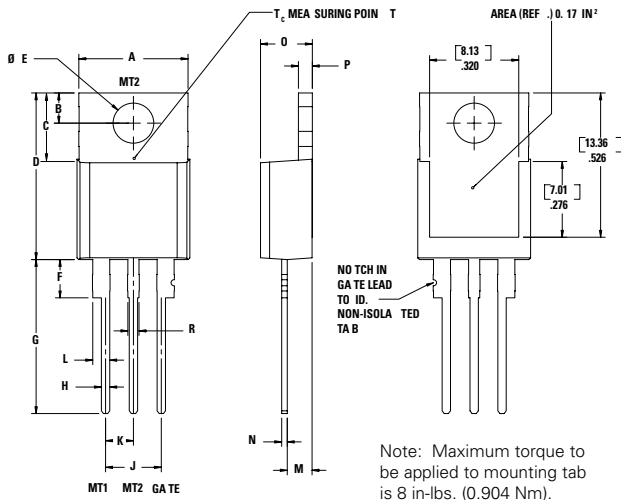
Design Considerations

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

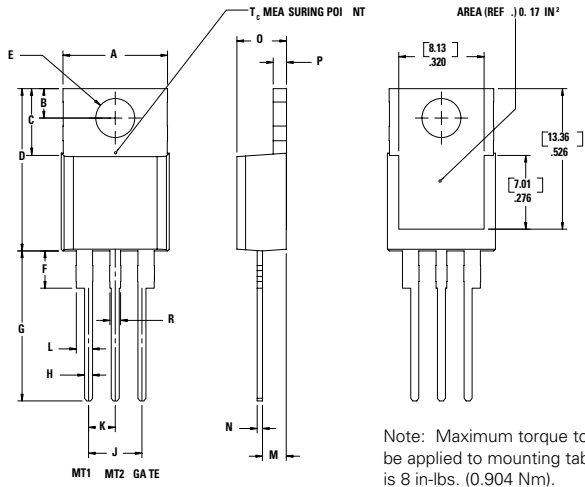
| Test | Specifications and Conditions |
|--|--|
| High Temperature Voltage Blocking | MIL-STD-750: Method 1040, Condition A Rated V_{RRM} 150°C, 1008 hours |
| Temperature Cycling | MIL-STD-750: Method 1051 -40°C to 150°C, 15-minute dwell, 100 cycles |
| Biased Temp & Humidity | EIA/JEDEC: JESD22-A101 320VDC, 85°C, 85%RH, 1008 hours |
| High Temp. Storage | MIL-STD-750: Method 1031 150°C, 1008 hours |
| Low-Temp Storage | -40°C, 1008 hours |
| Resistance to Solder Heat | MIL-STD-750: Method 2031 260°C, 10 seconds |
| Solderability | ANSI/J-STD-002, Category 3, Test A |
| Lead Bend | MIL-STD-750: Method 2036, Condition E |
| Moisture Sensitivity Level | Level 1, JEDEC-J-STD-020 |

Dimensions — TO-220AB (R Package) — Non-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 |

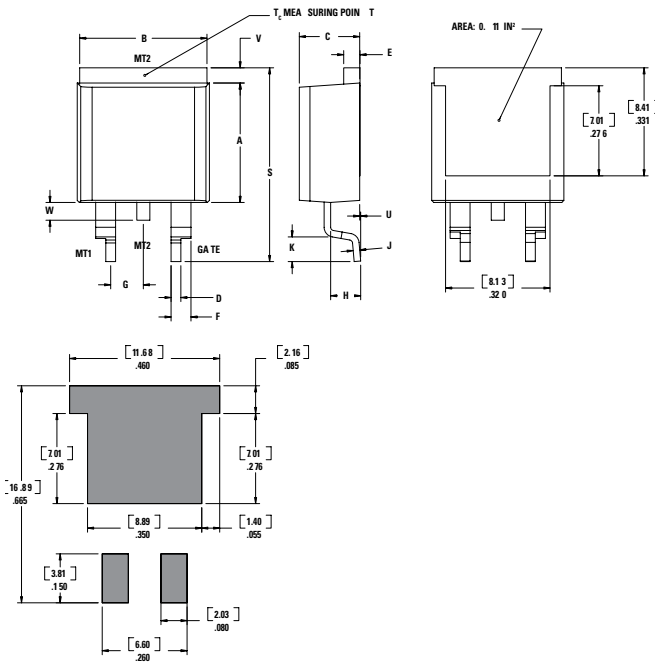
Dimensions — TO-220AB (L Package) — Isolated Mounting Tab



Note: Maximum torque to be applied to mounting tab is 8 in-lbs. (0.904 Nm).

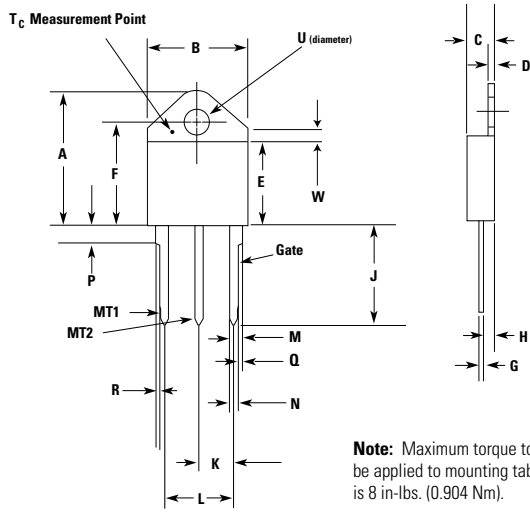
| Dimension | Inches | | Millimeters | |
|-----------|--------|-------|-------------|-------|
| | Min | Max | Min | Max |
| A | 0.380 | 0.420 | 9.65 | 10.67 |
| B | 0.105 | 0.115 | 2.66 | 2.92 |
| C | 0.230 | 0.250 | 5.85 | 6.35 |
| D | 0.590 | 0.620 | 14.98 | 15.75 |
| E | 0.142 | 0.147 | 3.61 | 3.73 |
| F | 0.110 | 0.130 | 2.80 | 3.30 |
| G | 0.540 | 0.575 | 13.71 | 14.60 |
| H | 0.025 | 0.035 | 0.63 | 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 | 1.78 | 2.16 |
| N | 0.018 | 0.024 | 0.45 | 0.61 |
| O | 0.178 | 0.188 | 4.52 | 4.78 |
| P | 0.045 | 0.060 | 1.14 | 1.53 |
| R | 0.038 | 0.048 | 0.97 | 1.22 |

Dimensions — TO-263 (N Package) — D²Pak Surface Mount



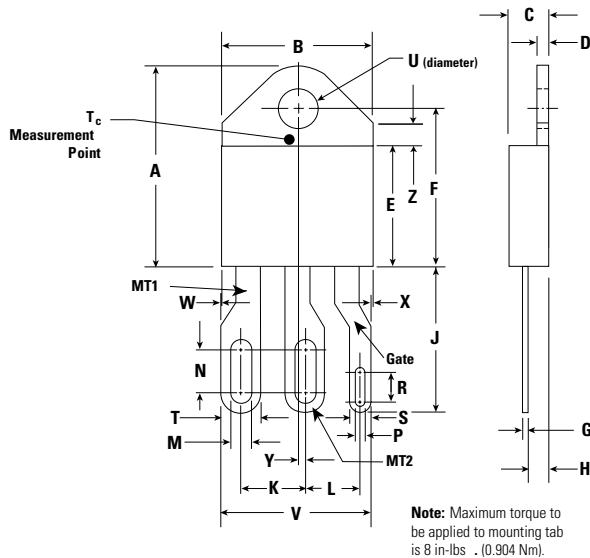
| Dimension | Inches | | Millimeters | |
|-----------|--------|-------|-------------|-------|
| | Min | Max | Min | Max |
| A | 0.360 | 0.370 | 9.14 | 9.40 |
| B | 0.380 | 0.420 | 9.65 | 10.67 |
| C | 0.178 | 0.188 | 4.52 | 4.78 |
| D | 0.025 | 0.035 | 0.64 | 0.89 |
| E | 0.045 | 0.060 | 1.14 | 1.52 |
| F | 0.060 | 0.075 | 1.52 | 1.91 |
| G | 0.095 | 0.105 | 2.41 | 2.67 |
| H | 0.092 | 0.102 | 2.34 | 2.59 |
| J | 0.018 | 0.024 | 0.46 | 0.61 |
| K | 0.090 | 0.110 | 2.29 | 2.79 |
| S | 0.590 | 0.625 | 14.99 | 15.88 |
| V | 0.035 | 0.045 | 0.89 | 1.14 |
| U | 0.002 | 0.010 | 0.05 | 0.25 |
| W | 0.040 | 0.070 | 1.02 | 1.78 |

Dimensions – TO-218AC (K Package) – Isolated Mounting Tab



| Dimension | Inches | | Millimeters | |
|-----------|--------|-------|-------------|-------|
| | Min | Max | Min | Max |
| A | 0.810 | 0.835 | 20.57 | 21.21 |
| B | 0.610 | 0.630 | 15.49 | 16.00 |
| C | 0.178 | 0.188 | 4.52 | 4.78 |
| D | 0.055 | 0.070 | 1.40 | 1.78 |
| E | 0.487 | 0.497 | 12.37 | 12.62 |
| F | 0.635 | 0.655 | 16.13 | 16.64 |
| G | 0.022 | 0.029 | 0.56 | 0.74 |
| H | 0.075 | 0.095 | 1.91 | 2.41 |
| J | 0.575 | 0.625 | 14.61 | 15.88 |
| K | 0.211 | 0.219 | 5.36 | 5.56 |
| L | 0.422 | 0.437 | 10.72 | 11.10 |
| M | 0.058 | 0.068 | 1.47 | 1.73 |
| N | 0.045 | 0.055 | 1.14 | 1.40 |
| P | 0.095 | 0.115 | 2.41 | 2.92 |
| Q | 0.008 | 0.016 | 0.20 | 0.41 |
| R | 0.008 | 0.016 | 0.20 | 0.41 |
| U | 0.164 | 0.165 | 4.10 | 4.20 |
| W | 0.085 | 0.095 | 2.17 | 2.42 |

Dimensions – TO-218X (J Package) – Isolated Mounting Tab



| Dimension | Inches | | Millimeters | |
|-----------|--------|-------|-------------|-------|
| | Min | Max | Min | Max |
| A | 0.810 | 0.835 | 20.57 | 21.21 |
| B | 0.610 | 0.630 | 15.49 | 16.00 |
| C | 0.178 | 0.188 | 4.52 | 4.78 |
| D | 0.055 | 0.070 | 1.40 | 1.78 |
| E | 0.487 | 0.497 | 12.37 | 12.62 |
| F | 0.635 | 0.655 | 16.13 | 16.64 |
| G | 0.022 | 0.029 | 0.56 | 0.74 |
| H | 0.075 | 0.095 | 1.91 | 2.41 |
| J | 0.575 | 0.625 | 14.61 | 15.88 |
| K | 0.256 | 0.264 | 6.50 | 6.71 |
| L | 0.220 | 0.228 | 5.58 | 5.79 |
| M | 0.080 | 0.088 | 2.03 | 2.24 |
| N | 0.169 | 0.177 | 4.29 | 4.49 |
| P | 0.034 | 0.042 | 0.86 | 1.07 |
| R | 0.113 | 0.121 | 2.87 | 3.07 |
| S | 0.086 | 0.096 | 2.18 | 2.44 |
| T | 0.156 | 0.166 | 3.96 | 4.22 |
| U | 0.164 | 0.165 | 4.10 | 4.20 |
| V | 0.603 | 0.618 | 15.31 | 15.70 |
| W | 0.000 | 0.005 | 0.00 | 0.13 |
| X | 0.003 | 0.012 | 0.07 | 0.30 |
| Y | 0.028 | 0.032 | 0.71 | 0.81 |
| Z | 0.085 | 0.095 | 2.17 | 2.42 |

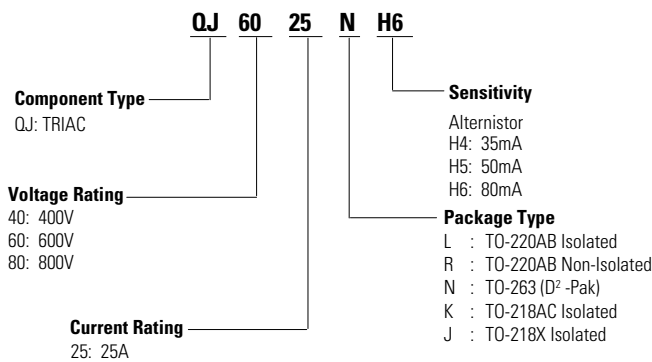
Product Selector

| Part Number | Voltage | | | Gate Sensitivity Quadrants I - II - III | Package |
|-------------|---------|------|------|--|----------------------------|
| | 400V | 600V | 800V | | |
| QJxx25RH4 | X | X | X | 35 mA | TO-220R |
| QJxx25LH4 | X | X | X | 35 mA | TO-220L |
| QJxx25NH4 | X | X | X | 35 mA | TO-263 D ² -Pak |
| QJxx25RH5 | X | X | X | 50 mA | TO-220R |
| QJxx25LH5 | X | X | X | 50 mA | TO-220L |
| QJxx25NH5 | X | X | X | 50 mA | TO-263 D ² -Pak |
| QJxx25NH6 | X | X | - | 80 mA | TO-263 D ² -Pak |
| QJxx25JH6 | X | X | - | 80 mA | TO-218X |
| QJxx25KH6 | X | X | - | 80 mA | TO-218AC |
| QJxx25LH6 | X | X | - | 80 mA | TO-220L |
| QJxx25RH6 | X | X | - | 80 mA | TO-220R |

Packing Options

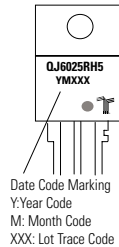
| Part Number | Marking | Weight | Packing Mode | Base Quantity |
|-------------|-----------|--------|------------------|--------------------|
| QJxx25RH4TP | QJxx25RH4 | 2.20 g | Tube Pack | 1000 (50 per tube) |
| QJxx25LH4TP | QJxx25LH4 | 2.20 g | Tube Pack | 1000 (50 per tube) |
| QJxx25NH4TP | QJxx25NH4 | 1.60 g | Tube Pack | 1000 (50 per tube) |
| QJxx25NH4RP | QJxx25NH4 | 1.60 g | Embossed Carrier | 500 |
| QJxx25RH5TP | QJxx25RH5 | 2.20 g | Tube Pack | 1000 (50 per tube) |
| QJxx25LH5TP | QJxx25LH5 | 2.20 g | Tube Pack | 1000 (50 per tube) |
| QJxx25NH5TP | QJxx25NH5 | 1.60 g | Tube Pack | 1000 (50 per tube) |
| QJxx25NH5RP | QJxx25NH5 | 1.60 g | Embossed Carrier | 500 |
| QJxx25NH6TP | QJxx25NH6 | 1.60 g | Tube Pack | 1000 (50 per tube) |
| QJxx25NH6RP | QJxx25NH6 | 1.60 g | Embossed Carrier | 500 |
| QJxx25JH6TP | QJxx25JH6 | 5.23 g | Tube Pack | 250 (25 per tube) |
| QJxx25KH6TP | QJxx25KH6 | 4.40 g | Tube Pack | 250 (25 per tube) |
| QJxx25LH6TP | QJxx25LH6 | 2.20 g | Tube Pack | 1000 (50 per tube) |
| QJxx25RH6TP | QJxx25RH6 | 2.20 g | Tube Pack | 1000 (50 per tube) |

Part Numbering System

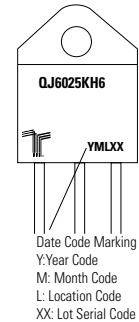


Part Marking System

TO-220 AB - (L and R Package)
TO-263 AB - (N Package)



TO-218AC - (K Package)
TO-218X - (J Package)



TO-263 Embossed Carrier Reel Pack (RP) Specifications

Meets all EIA-481-2 Standards

