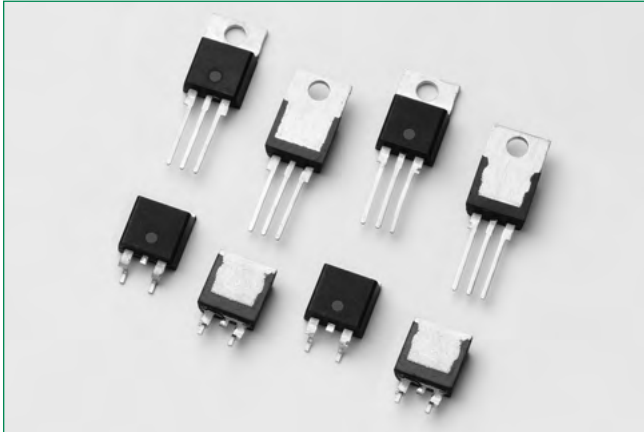


QJxx16xHx Series

16 Amp High Temperature Alternistor Triacs



Description

This 16A Alternistor TRIAC solid state switch series is designed for AC power control applications such as hear control, motor speed control, lighting control and static switching relays. This series is designed to enable easier thermal management and higher surge handing capability.

Alternistor TRIAC operates in quadrants I, II, & III and offers high performance in applications requiring high commutation capability.

Features & Benefits

- High TJ of 150°C
- Voltage capability up to 600V
- Surge capability of 200A at 60Hz half cycle
- Mechanically and thermally robust TO-220
- Internally-isolated TO-220 and TO-218 packages
- Halogen-free and RoHS-compliant
- Recognized to UL 1557 for 2500 V_{RMS} as an Electrically Isolated Semiconductor Devices

Additional Information



Resources



Accessories



Samples

Agency Approval

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

* - L Package only

Main Features

| Symbol | Value | Unit |
|-------------------|------------------|------|
| $I_{T(RMS)}$ | 16 | A |
| V_{DRM}/V_{RRM} | 400, 600, or 800 | V |
| $I_{GT(Q1)}$ | 10 to 80 | mA |

Applications

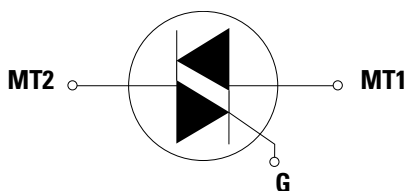
TRIAC is an excellent AC switch in applications such as heating, lighting, and motor speed controls.

Typical applications are

- Heater control such as coffee brewer, tankless water heater and infrared heater
- AC solid-state relays
- Light dimmers including incandescent and LED lighting
- Motor speed control in kitchen appliances, power tools, home/brow/white goods and light industrial applications as compressor motor control

Alternistor TRIAC is used with high inductive loads requiring the high commutation capability. Internally isolated packages offer better heat sinking with higher isolation voltage.

Schematic Symbol



QJxx16xHx Series

16 Amp High Temperature Alternistor Triacs

Absolute Maximum Ratings – Alternistor Triac (3 Quadrants)

| Symbol | Parameter | Value | Unit | |
|-------------------|--|--|-------------------------|------------------------|
| $I_{T(RMS)}$ | RMS on-state current (full sine wave) | QJxx16LHy $T_C = 115^\circ\text{C}$ | 16 | A |
| | | QJxx16RHx QJxx16NHx $T_C = 130^\circ\text{C}$ | | |
| I_{TSM} | Non repetitive surge peak on-state current (Single half cycle, T_J initial = 25°C) | $f = 50\text{Hz}$ $t = 20\text{ms}$ | 167 | A |
| | | $f = 60\text{Hz}$ $t = 16.7\text{ms}$ | 200 | |
| I^2t | I^2t Value for fusing | $t_p = 8.3\text{ms}$ | 166 | 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 trigger current | $t_p \leq 10\mu\text{s};$ $I_{GT} \leq I_{GTM}$ $T_J = 150^\circ\text{C}$ | 2.0 | 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 = $100\mu\text{s}$ 600V | $V_{DRM}/V_{RRM} + 100$ | V |
| V_{DSM}/V_{RSM} | Peak non-repetitive blocking voltage | Pulse Width = $100\mu\text{s}$ 800V | $V_{DRM}/V_{RRM} + 200$ | V |

xx = voltage/10, y = sensitivity

Electrical Characteristics ($T_J = 25^\circ\text{C}$, unless otherwise specified) – Alternistor Triac (3 Quadrants)

| Symbol | Test Condition | Quadrant | QJxx16xH2 | QJxx16xH3 | QJxx16xH4 | QJxx16xH5 | QJxx16xH6 | Unit | |
|-------------|---|----------|-----------|-----------|-----------|-----------|-----------|------|------------------|
| I_{GT} | $V_D = 12\text{V}$ $R_L = 60\Omega$ | I-II-III | MAX. | 10 | 20 | 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 | $I_T = 100\text{mA}$ | | MAX. | 15 | 35 | 50 | 50 | 70 | mA |
| dv/dt | $V_D = V_{DRM}$ Gate Open $T_J = 150^\circ\text{C}$ | 600V | MIN. | - | 250 | 350 | - | 850 | V/ μs |
| | | 800V | MIN. | - | - | 400 | 500 | - | |
| | $V_D = 2/3V_{DRM}$ Gate Open $T_J = 150^\circ\text{C}$ | 600V | MIN. | 50 | 300 | 400 | - | 925 | |
| | | 800V | MIN. | - | 600 | 700 | 700 | - | |
| $(dv/dt)_c$ | $(di/dt)_c = 8.6\text{A/ms}$ $T_J = 150^\circ\text{C}$ | | MIN. | 2 | 20 | 25 | 30 | 30 | V/ μs |
| t_{gt} | $I_G = 2X I_{GT}$ $PW = 15\text{s}$ $I_T = 22.6\text{A(pk)}$ | | TYP. | 3 | 3 | 3 | 5 | 5 | μs |

Static Characteristics

| Symbol | Test Conditions | Value | Unit | | |
|---------------------|---|---------------------------|------|---|---------------|
| V_{TM} | $I_T = 22.6\text{A}$ $t_p = 380\mu\text{s}$ | MAX | 1.60 | V | |
| I_{DRM} / I_{RRM} | @ V_{DRM} / V_{RRM} | $T_J = 25^\circ\text{C}$ | MAX | 5 | μA |
| | | $T_J = 150^\circ\text{C}$ | MAX | 4 | mA |

Thermal Resistances

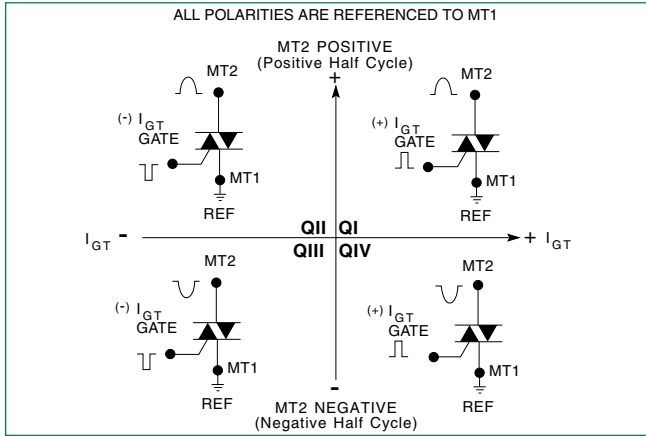
| Symbol | Parameter | Value | Unit | |
|-------------------|-----------------------|------------------------|------|---------------------------|
| $R_{\theta(J-C)}$ | Junction to case (AC) | QJxx16RHx QJxx16NHx | 0.90 | $^\circ\text{C}/\text{W}$ |
| | | QJxx16LHy | 1.8 | |
| | | QJxx16RHx QJxx16NHx | 45 | |
| $R_{\theta(J-A)}$ | Junction to ambient | QJxx16LHy | 50 | $^\circ\text{C}/\text{W}$ |

xx = voltage/10, y = sensitivity

QJxx16xHx Series

16 Amp High Temperature Alternistor Triacs

Figure 1:
Definition of Quadrants



Note: Alternistors will not operate in QIV

Figure 2:

Normalized DC gate trigger current for Quadrants I, II, and III vs Junction Temperature

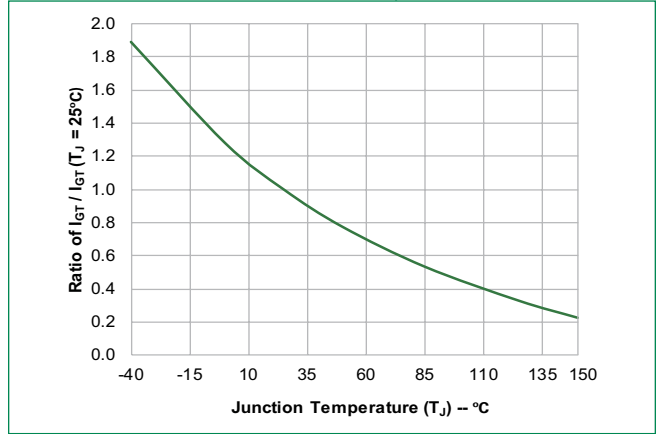


Figure 3:

Normalized DC Holding Current vs. Junction Temperature

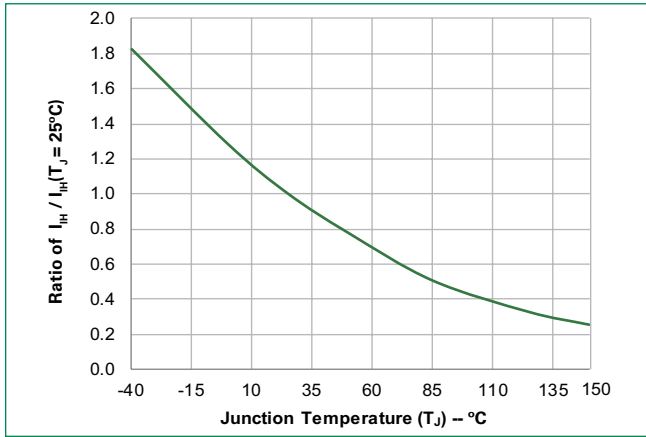


Figure 4:

Normalized DC gate trigger current for Quadrants I, II, and III vs Junction Temperature

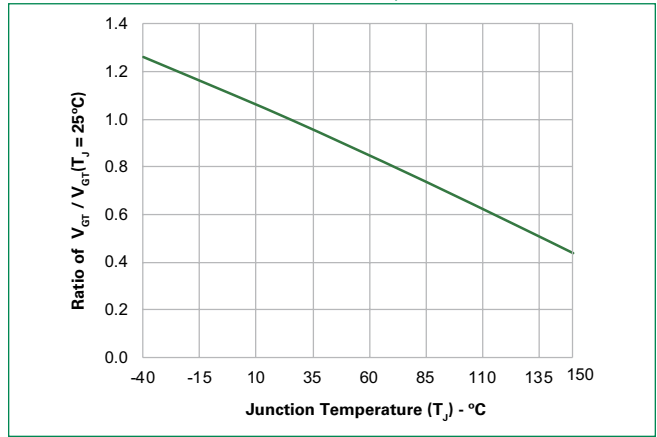


Figure 5:

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

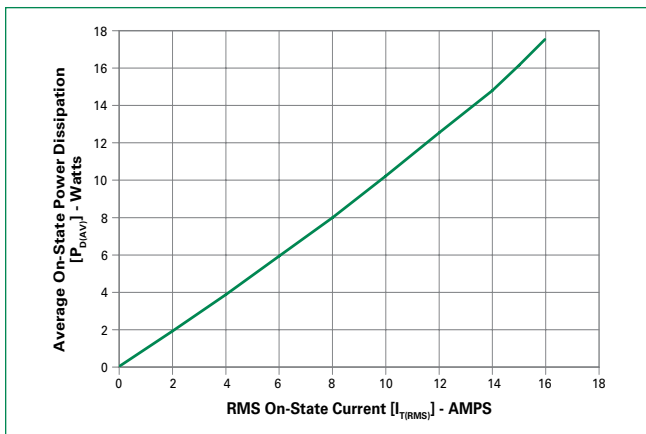
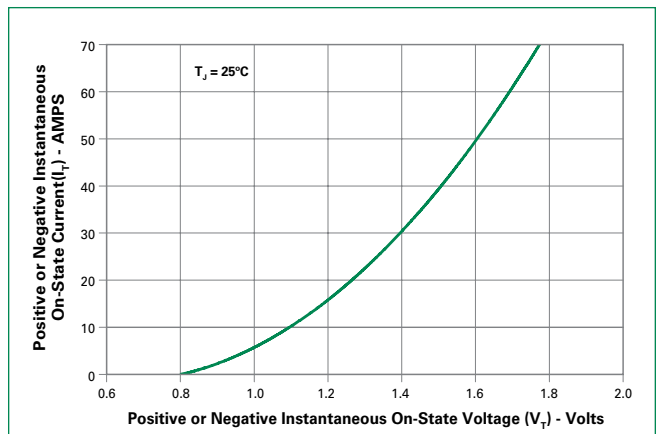


Figure 6:

On-State Current vs. On-State Voltage (Typical)



QJxx16xHx Series

16 Amp High Temperature Alternistor Triacs

Figure 7:
Maximum Allowable Case Temperature vs. RMS On-State Current

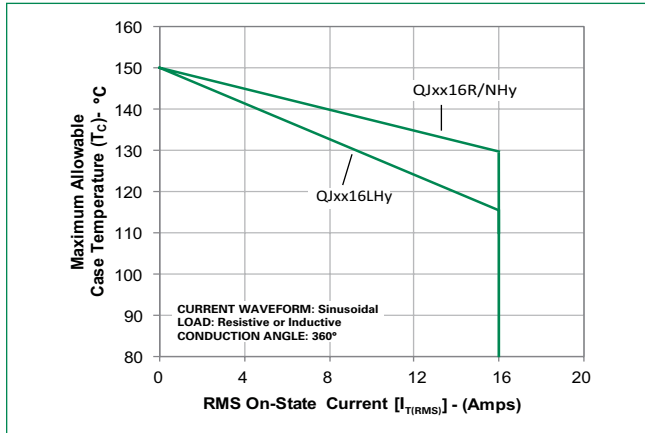
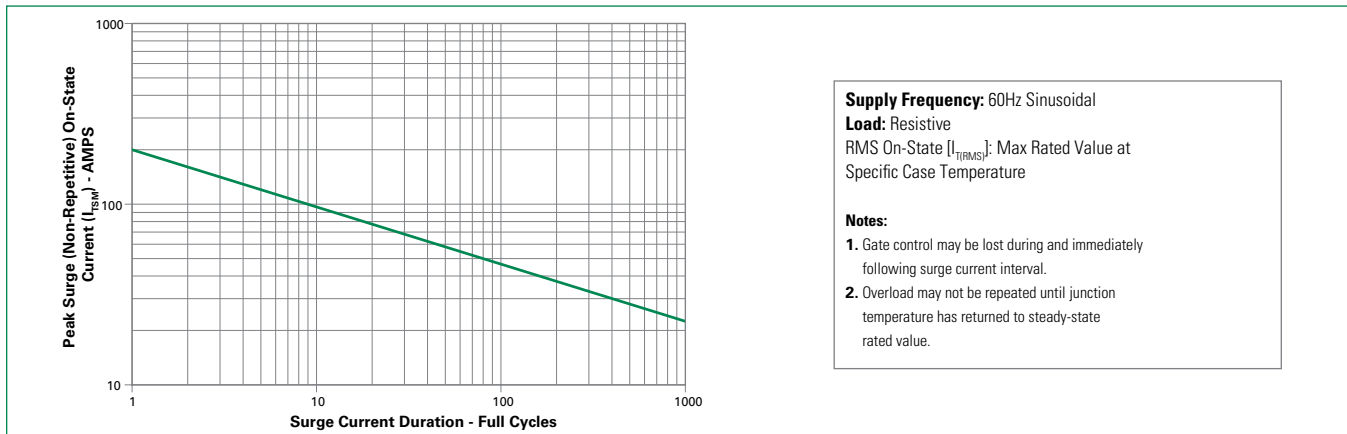
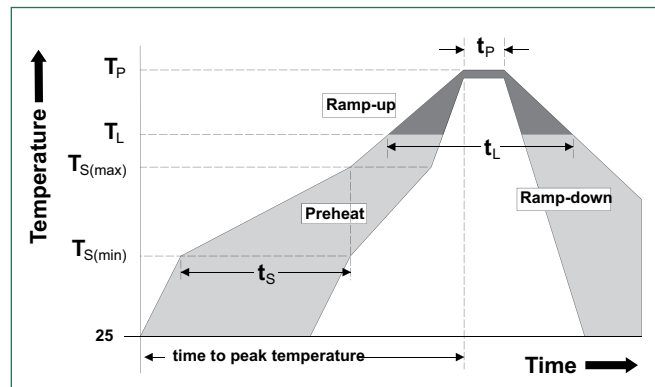


Figure 8: Surge Peak On-State Current vs. Number of Cycles



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 – 120 secs |
| Average ramp up rate (Liquidus Temp) (T_L) to peak | | 3°C/second max |
| $T_{s(max)}$ to T_L - Ramp-up Rate | | 3°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) | | 30 seconds max. |
| Ramp-down Rate | | 6°C/second max |
| Time 25°C to peak Temperature (T_p) | | 8 minutes max. |
| Do not exceed | | 280°C |



QJxx16xHx Series

16 Amp High Temperature Alternistor Triacs

Physical Specifications

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

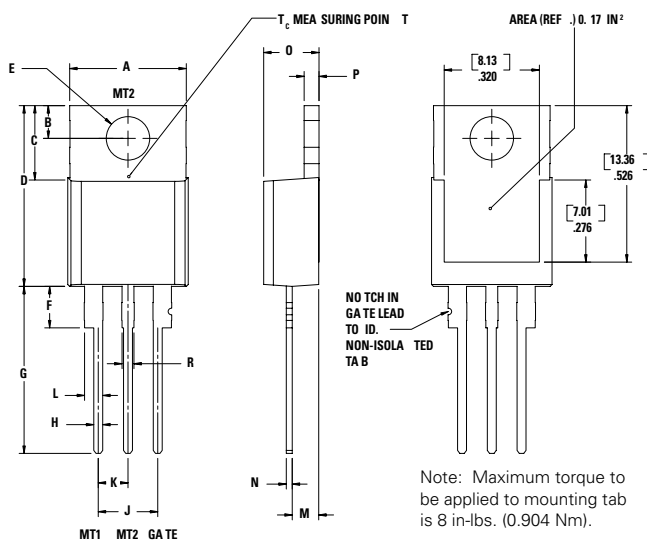
Design Considerations

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 | 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; -40°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 |
| Moisture Sensitivity Level | Level 1, JEDEC-J-STD-020 |

Dimensions — TO-220AB (R-Package) — Non-Isolated Mounting Tab Common with Center Lead

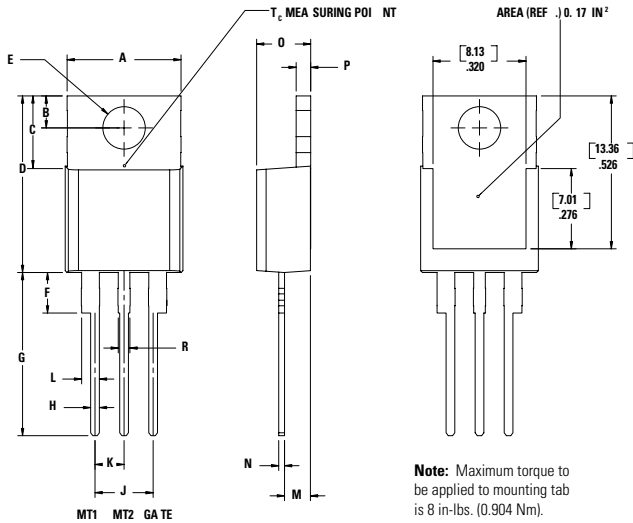


| Dimension | Inches | | Millimeters | |
|-----------|--------|-------|-------------|-------|
| | Min | Max | Min | Max |
| A | 0.380 | 0.420 | 9.65 | 10.67 |
| B | 0.105 | 0.115 | 2.66 | 2.92 |
| C | 0.230 | 0.250 | 5.84 | 6.35 |
| D | 0.590 | 0.620 | 14.99 | 15.75 |
| E | 0.142 | 0.147 | 3.61 | 3.73 |
| 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 |

QJxx16xHx Series

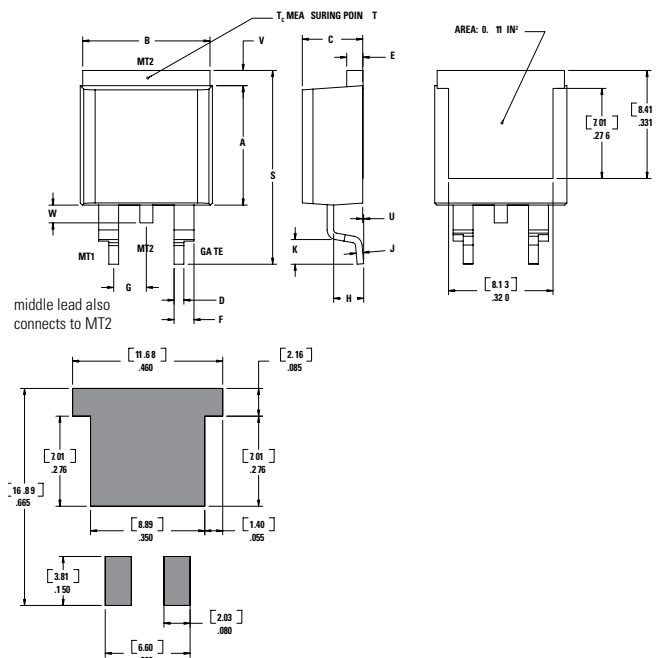
16 Amp High Temperature Alternistor Triacs

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 | 14.60 |
| 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-263AB (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 |

QJxx16xHx Series

16 Amp High Temperature Alternistor Triacs

Product Selector

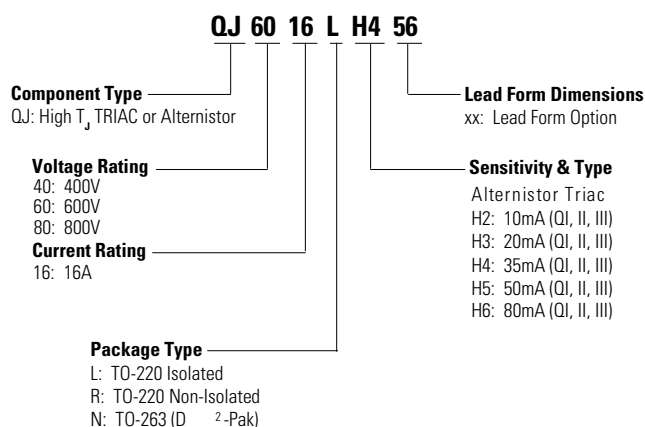
| Part Number | Voltage | | | Gate Sensitivity Quadrants I – II – III | Type | Package |
|-------------|---------|------|------|--|-------------------|----------------------------|
| | 400V | 600V | 800V | | | |
| QJxx16LH2 | X | X | - | 10 mA | Alternistor Triac | TO-220L |
| QJxx16RH2 | X | X | - | 10 mA | Alternistor Triac | TO-220R |
| QJxx16NH2 | X | X | - | 10 mA | Alternistor Triac | TO-263 D ² -PAK |
| QJxx16LH3 | X | X | X | 20 mA | Alternistor Triac | TO-220L |
| QJxx16RH3 | X | X | X | 20 mA | Alternistor Triac | TO-220R |
| QJxx16NH3 | X | X | X | 20 mA | Alternistor Triac | TO-263 D ² -PAK |
| QJxx16LH4 | X | X | X | 35 mA | Alternistor Triac | TO-220L |
| QJxx16RH4 | X | X | X | 35 mA | Alternistor Triac | TO-220R |
| QJxx16NH4 | X | X | X | 35 mA | Alternistor Triac | TO-263 D ² -PAK |
| QJxx16LH6 | X | X | - | 80 mA | Alternistor Triac | TO-220L |
| QJxx16RH6 | X | X | - | 80 mA | Alternistor Triac | TO-220R |
| QJxx16NH6 | X | X | - | 80 mA | Alternistor Triac | TO-263 D ² -PAK |
| QJxx16LH5 | - | X | X | 50 mA | Alternistor Triac | TO-220L |
| QJxx16RH5 | - | X | X | 50 mA | Alternistor Triac | TO-220R |
| QJxx16NH5 | - | X | X | 50 mA | Alternistor Triac | TO-263 D ² -PAK |

Packing Options

| Part Number | Marking | Weight | Packing Mode | Base Quantity |
|---------------|-------------|--------|------------------|--------------------|
| QJxx16L/RHyTP | QJxx16L/RHy | 2.2 g | Tube Pack | 1000 (50 per tube) |
| QJxx16NHyTP | QJxx16NHy | 1.6 g | Tube Pack | 1000 (50 per tube) |
| QJxx16NHyRP | QJxx16NHy | 1.6 g | Embossed Carrier | 500 |

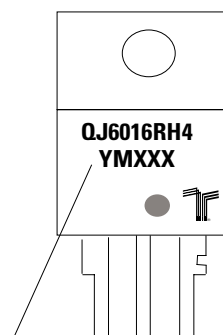
xx = voltage/10; y = Sensitivity

Part Numbering System



Part Marking System

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



Date Code Marking
Y: Year Code
M: Month Code
XXX: Lot Trace Code