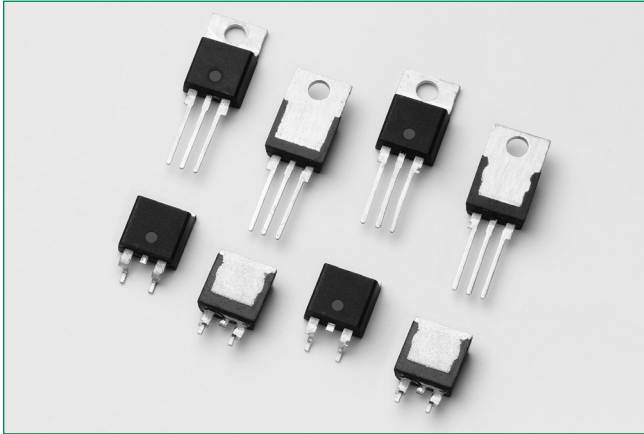


# QJxx16xHx Series

## 16 Amp High Temperature Alternistor Triacs



### Description

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

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

### Features & Benefits

- High  $T_J$  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 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

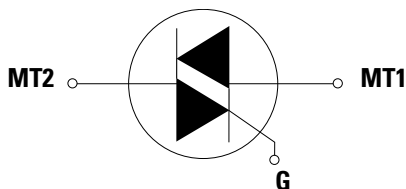
TRIAC is an excellent AC switch in applications such as heating, lighting, and motor speed controls.

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 = $25^\circ\text{C}$ )	$f = 50\text{Hz}$ $t = 20\text{ms}$	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	$\text{A}^2\text{s}$
$di/dt$	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/ $\mu\text{s}$
		800V		-	-	400	600	-	
	$V_D = 2/3V_{DRM}$ Gate Open $T_J = 150^\circ\text{C}$	600V	MIN.	50	300	400	-	925	
		800V		-	600	700	800	-	
$(dv/dt)_c$	$(di/dt)_c = 8.6\text{A}/\text{ms}$ $T_J = 150^\circ\text{C}$		MIN.	2	20	25	30	30	V/ $\mu\text{s}$
$t_{gt}$	$I_G = 2X I_{GT}$ $PW = 15\text{s}$ $I_T = 22.6\text{A(pk)}$		TYP.	3	3	3	5	5	$\mu\text{s}$

### 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
$I_{DRM} / I_{RRM}$	@ $V_{DRM} / V_{RRM}$	$T_J = 25^\circ\text{C}$	5	$\mu\text{A}$
		$T_J = 150^\circ\text{C}$	4	mA

### Thermal Resistances

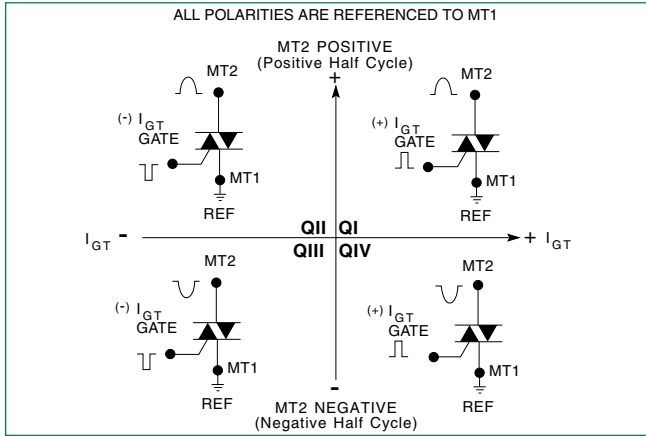
Symbol	Parameter	Value	Unit	
$R_{\theta(J-C)}$	Junction to case (AC)	QJxx16RHx QJxx16NHx	0.90	$^\circ\text{C}/\text{W}$
		QJxx16LHy	1.8	
		QJxx16RHx QJxx16NHx	45	
$R_{\theta(J-A)}$	Junction to ambient	QJxx16LHy	50	$^\circ\text{C}/\text{W}$

xx = voltage/10, y = sensitivity

# QJxx16xHx Series

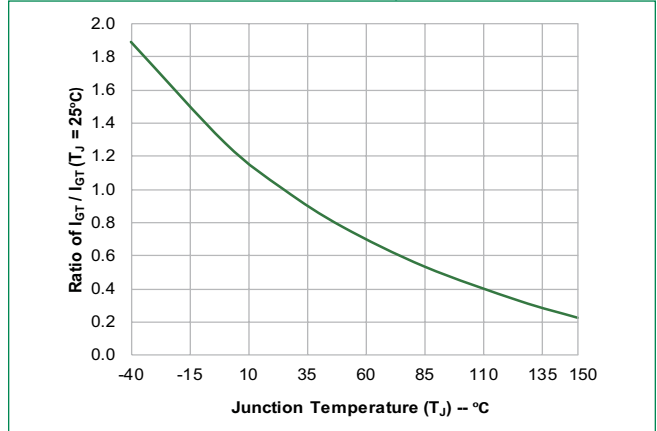
## 16 Amp High Temperature Alternistor Triacs

**Figure 1:**  
Definition of Quadrants

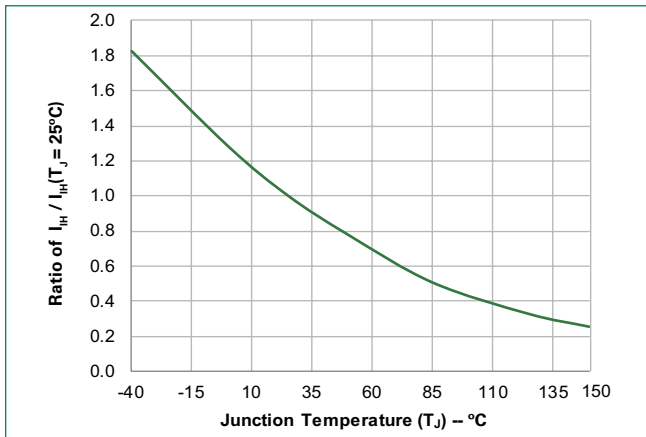


Note: Alternistors will not operate in QIV

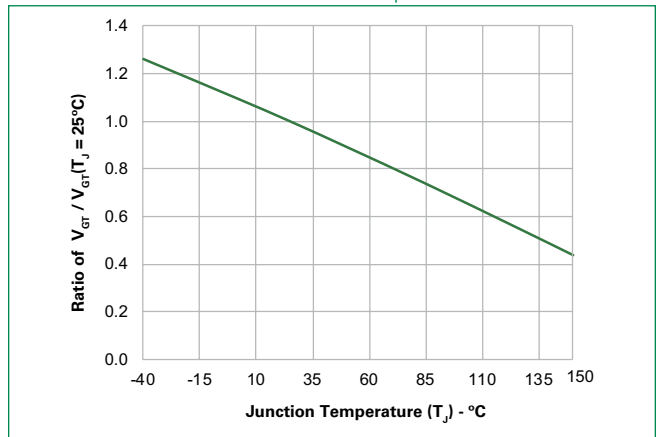
**Figure 2:**  
Normalized DC gate trigger current for Quadrants I, II, and III vs Junction Temperature



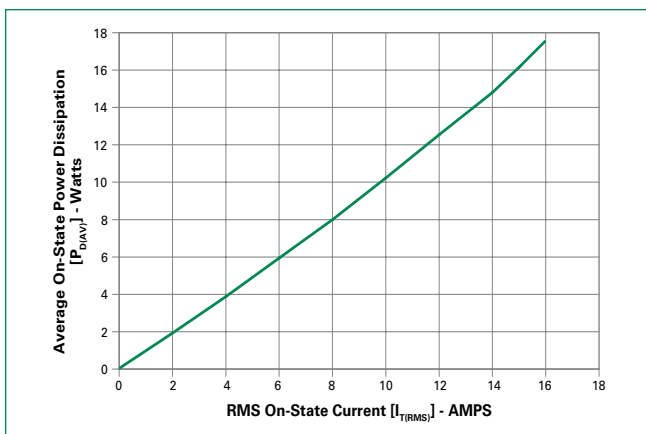
**Figure 3:**  
Normalized DC Holding Current vs. Junction Temperature



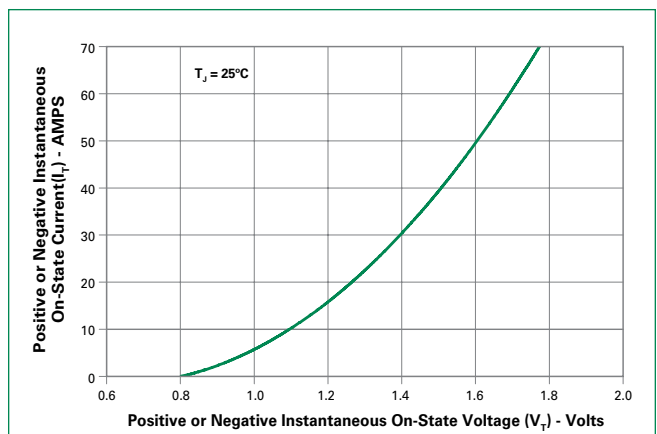
**Figure 4:**  
Normalized DC gate trigger current for Quadrants I, II, and III vs Junction Temperature



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



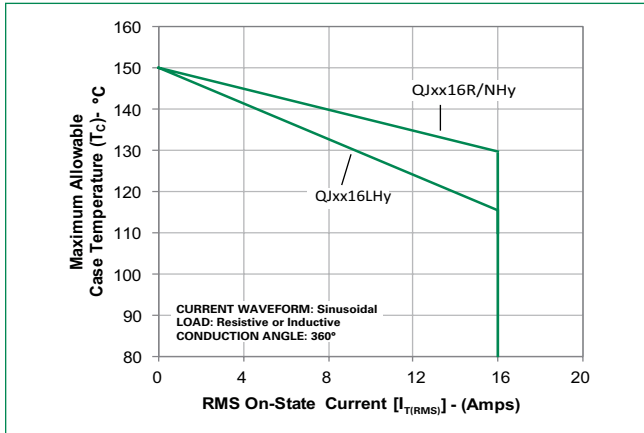
**Figure 6:**  
On-State Current vs. On-State Voltage (Typical)



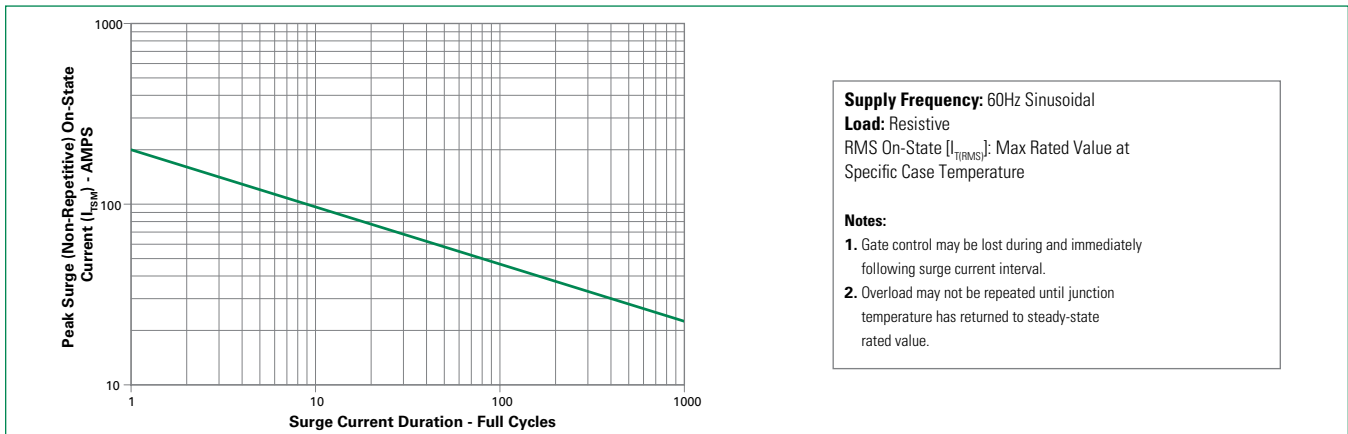
# QJxx16xHx Series

## 16 Amp High Temperature Alternistor Triacs

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

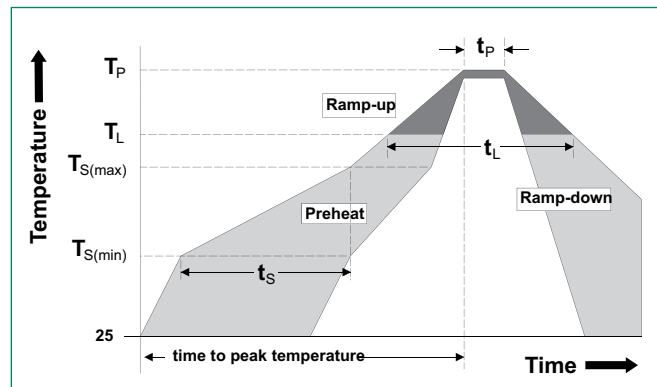


**Figure 8:** Surge Peak On-State Current vs. Number of Cycles



### Soldering Parameters

<b>Reflow Condition</b>		Pb – Free assembly
<b>Pre Heat</b>	- Temperature Min ( $T_{s(min)}$ )	150°C
	- Temperature Max ( $T_{s(max)}$ )	200°C
	- Time (min to max) ( $t_s$ )	60 – 120 secs
<b>Average ramp up rate (Liquidus Temp) (<math>T_L</math>) to peak</b>		3°C/second max
<b><math>T_{s(max)}</math> to <math>T_L</math> - Ramp-up Rate</b>		3°C/second max
<b>Reflow</b>	- Temperature ( $T_L$ ) (Liquidus)	217°C
	- Time ( $t_L$ )	60 – 150 seconds
<b>Peak Temperature (<math>T_p</math>)</b>		260 <sup>+0/+5</sup> °C
<b>Time within 5°C of actual peak Temperature (<math>t_p</math>)</b>		30 seconds max.
<b>Ramp-down Rate</b>		6°C/second max
<b>Time 25°C to peak Temperature (<math>T_p</math>)</b>		8 minutes max.
<b>Do not exceed</b>		280°C



# QJxx16xHx Series

## 16 Amp High Temperature Alternistor Triacs

### Physical Specifications

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

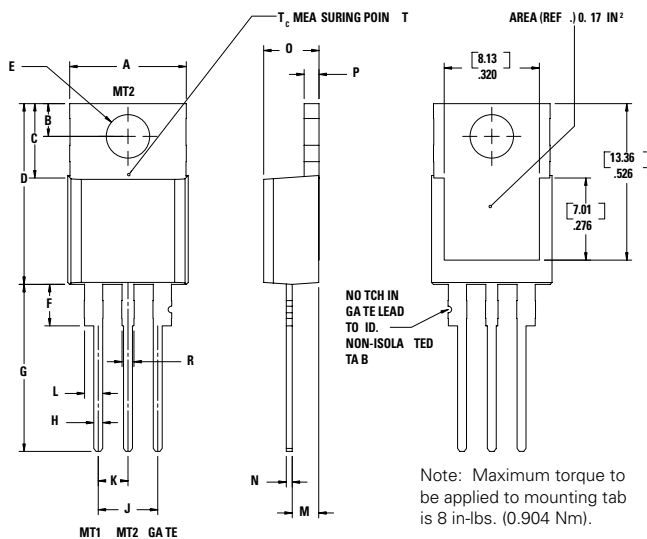
### Design Considerations

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
<b>AC Blocking</b>	MIL-STD-750, M-1040, Cond A Applied Peak AC voltage @ 150°C for 1008 hours
<b>Temperature Cycling</b>	MIL-STD-750, M-1051, 100 cycles; -40°C to +150°C; 15-min dwell time
<b>Temperature/Humidity</b>	EIA / JEDEC, JESD22-A101 1008 hours; 160V - DC: 85°C; 85% rel humidity
<b>High Temp Storage</b>	MIL-STD-750, M-1031, 1008 hours; 150°C
<b>Low-Temp Storage</b>	1008 hours; -40°C
<b>Resistance to Solder Heat</b>	MIL-STD-750 Method 2031
<b>Solderability</b>	ANSI/J-STD-002, category 3, Test A
<b>Lead Bend</b>	MIL-STD-750, M-2036 Cond E
<b>Moisture Sensitivity Level</b>	Level 1, JEDEC-J-STD-020

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

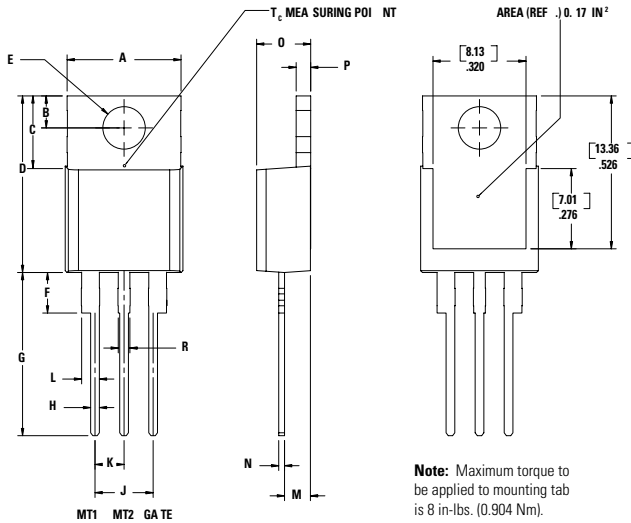


Dimension	Inches		Millimeters	
	Min	Max	Min	Max
<b>A</b>	0.380	0.420	9.65	10.67
<b>B</b>	0.105	0.115	2.66	2.92
<b>C</b>	0.230	0.250	5.84	6.35
<b>D</b>	0.590	0.620	14.99	15.75
<b>E</b>	0.142	0.147	3.61	3.73
<b>F</b>	0.110	0.130	2.79	3.30
<b>G</b>	0.540	0.575	13.72	14.61
<b>H</b>	0.025	0.035	0.64	0.89
<b>J</b>	0.195	0.205	4.95	5.21
<b>K</b>	0.095	0.105	2.41	2.67
<b>L</b>	0.060	0.075	1.52	1.91
<b>M</b>	0.085	0.095	2.16	2.41
<b>N</b>	0.018	0.024	0.46	0.61
<b>O</b>	0.178	0.188	4.52	4.78
<b>P</b>	0.045	0.060	1.14	1.52
<b>R</b>	0.038	0.048	0.97	1.22

# QJxx16xHx Series

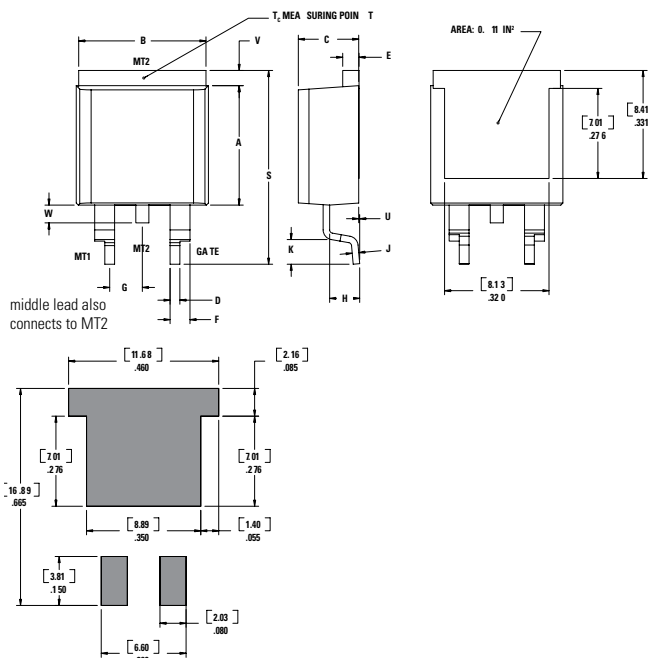
## 16 Amp High Temperature Alternistor Triacs

### 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

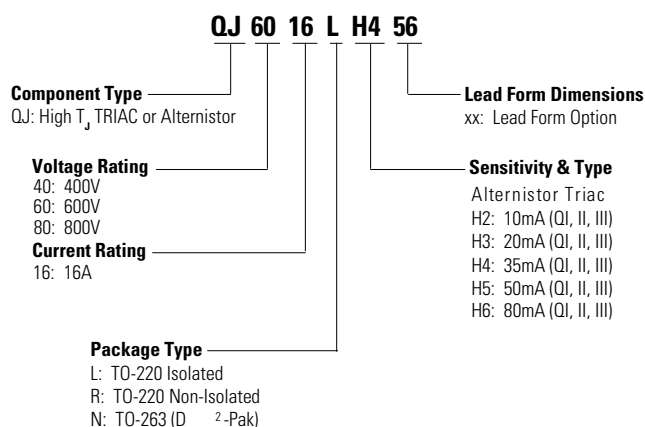
Part Number	Voltage			Gate Sensitivity Quadrants I – II – III	Type	Package
	400V	600V	800V			
QJxx16LH2	X	X	-	10 mA	Alternistor Triac	TO-220L
QJxx16RH2	X	X	-	10 mA	Alternistor Triac	TO-220R
QJxx16NH2	X	X	-	10 mA	Alternistor Triac	TO-263 D <sup>2</sup> -PAK
QJxx16LH3	X	X	X	20 mA	Alternistor Triac	TO-220L
QJxx16RH3	X	X	X	20 mA	Alternistor Triac	TO-220R
QJxx16NH3	X	X	X	20 mA	Alternistor Triac	TO-263 D <sup>2</sup> -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 <sup>2</sup> -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 <sup>2</sup> -PAK
QJxx16LH5	-	-	X	50 mA	Alternistor Triac	TO-220L
QJxx16RH5	-	-	X	50 mA	Alternistor Triac	TO-220R
QJxx16NH5	-	-	X	50 mA	Alternistor Triac	TO-263 D <sup>2</sup> -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

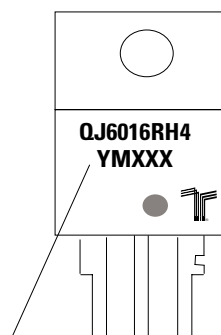
xx = voltage/10; y = Sensitivity

### 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