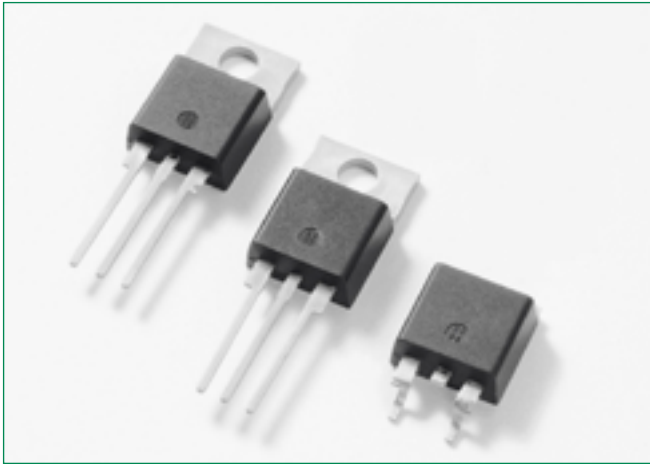


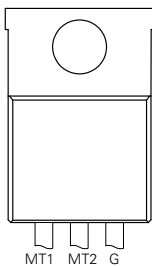
# QJxx10xHx and QJxx10xx Series

## 10 A High Temperature Alternistor and Standard (High Communication) TRIACs

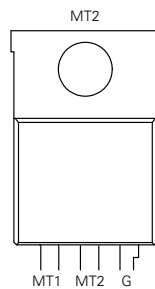


### Pinout Diagram

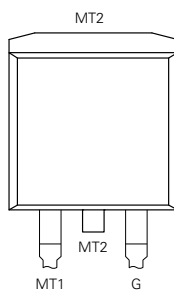
TO-220AB (L-Package)



TO-220AB (R-Package)



TO-263AB



**MT1:** Main Terminal 1; **MT2:** Main Terminal 2; **G:** Gate

### Description

This 10 A high temperature Alternistor and Standard TRIAC series, offered in TO-220AB, TO-220 isolated, and TO-263 packages, has 150°C maximum junction temperature and 120 A  $I_{TSM}$  (60 Hz).

This series enables easier thermal management and higher surge handling capability in AC power control applications such as heater control, motor speed control, lighting controls, and static switching relays. Alternistor TRIAC operates in Quadrants I, II, and III, and offers high performance in applications requiring high commutation capability.

### Features

- Recognized to UL 1557 as an Electrically Isolated Semiconductor Device
- Glass-passivated junctions
- Surge capability up to 120 A and 60 Hz
- L package UL recognized under E71639 for Electrical isolated at 2500 V<sub>RMS</sub>
- No contacts to wear out from reaction of switching events
- Solid-state switching eliminates arcing or contact bounce that creates voltage transients
- Restricted (or limited) RFI generation, depending on activation point sine wave
- Requires only a small gate activation pulse in each half-cycle
- RoHS compliant

### Applications

- Excellent for AC switching and phase control applications such as heating, lighting, and motor speed controls. Typical applications are AC solid-state switches, light dimmers, power tools, lawn care equipment, home/brown goods, and white goods appliances.
- Alternistor TRIACs (no snubber required) are used in applications with extremely inductive loads requiring highest commutation performance.
- Internally constructed isolated packages are offered for ease of heat sinking with highest isolation voltage.
- Standard type devices normally operate in Quadrants I & III triggered from AC line.

### Product Summary

Characteristic	Value	Unit
$I_{T(RMS)}$	10	A
$V_{DRM}/V_{RRM}$	600 or 800	V
$I_{GT(Q1)}$	10 to 50	mA

# QJxx10xHx and QJxx10xx Series

## 10 A High Temperature Alternistor and Standard (High Communication) TRIACs

### Maximum Ratings – Alternistor TRIAC (3 Quadrants)

Symbol	Parameter	Value	Unit		
$I_{T(RMS)}$	RMS on-state current (full sine wave)	QJxx10LHy $T_c = 120^\circ\text{C}$	10	A	
		QJxx10RHx QJxx10NHx $T_c = 130^\circ\text{C}$			
$I_{TSM}$	Non repetitive surge peak on-state current (full cycle, $T_{VJ}$ initial = $25^\circ\text{C}$ )	f = 50 Hz, t = 20 ms	100	A	
		f = 60 Hz, t = 16.7 ms	120		
$I^2t$	$I^2t$ Value for fusing	$t_p = 8.3$ ms	60	$\text{A}^2\text{s}$	
di/dt	Critical rate of rise of on-state current	f = 60 Hz, $T_{VJ} = 150^\circ\text{C}$	70	$\text{A}/\mu\text{s}$	
$I_{GTM}$	Peak gate trigger current	$t_p = 20$ $\mu\text{s}$ , $T_{VJ} = 150^\circ\text{C}$	4	A	
$P_{G(AV)}$	Average gate power dissipation	$T_{VJ} = 150^\circ\text{C}$	0.5	W	
$T_{stg}$	Storage temperature range	-	-40 to 150	$^\circ\text{C}$	
$T_{VJ}$	Operating junction temperature range	-	-40 to 150	$^\circ\text{C}$	
$V_{DSM}/V_{RSM}$	Peak Non-repetitive Blocking Voltage	Pulse Width = 100 $\mu\text{s}$	600 V	$V_{DRM}/V_{RRM} + 100$	V
			800 V	$V_{DRM}/V_{RRM} + 200$	

### Maximum Ratings – Standard TRIAC

Symbol	Parameter	Value	Unit		
$V_{DSM}/V_{RSM}$	Peak non-repetitive blocking voltage	Pulse Width = 100 $\mu\text{s}$	600 V	$V_{DRM}/V_{RRM} + 100$ V	V
		800 V	$V_{DRM}/V_{RRM} + 200$ V		
$I_{T(RMS)}$	RMS on-state current (full sine wave)	QJxx10Ly $T_c = 120^\circ\text{C}$	10	A	
		QJxx10Ry/QJxx10Ny $T_c = 130^\circ\text{C}$			
$I_{TSM}$	Non repetitive surge peak on-state current (full cycle, $T_{VJ}$ initial = $25^\circ\text{C}$ )	f = 50 Hz, t = 20 ms	QJxx10xy	100	A
		f = 60 Hz, t = 16.7 ms	QJxx10xy	120	
$I^2t$	$I^2t$ Value for fusing	$t_p = 8.3$ ms	QJxx10xy	60	$\text{A}^2\text{s}$
di/dt	Critical rate of rise of on-state current $I_G = 200$ mA with $\leq 0.1$ $\mu\text{s}$ rise time	f = 60 Hz, $T_{VJ} = 150^\circ\text{C}$	70	$\text{A}/\mu\text{s}$	
$I_{GTM}$	Peak gate trigger current	$t_p = 20$ $\mu\text{s}$ , $T_{VJ} = 150^\circ\text{C}$	4	$\text{A}/\mu\text{s}$	
$P_{G(AV)}$	Average gate power dissipation	$T_{VJ} = 150^\circ\text{C}$	0.5	W	
$T_{stg}$	Storage temperature range	-	-40 to 150	$^\circ\text{C}$	
$T_{VJ}$	Operating junction temperature range	-	-40 to 150	$^\circ\text{C}$	

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

### Thermal Characteristics

Symbol	Parameter	Value	Unit	
$R_{thJC}$	Thermal Resistance, junction-to-case (AC)	QJxx10RHx/QJxx10NHx QJxx10Ry/QJxx10Ny	1.2	K/W
		QJxx10LHy/QJxx10Ly	2.3	
$R_{thJA}$	Thermal Resistance, junction-to-ambient (AC)	QJxx10RHx/QJxx10Ry	45	K/W
		QJxx10LHy/QJxx10Ly	90	

# QJxx10xHx and QJxx10xx Series

## 10 A High Temperature Alternistor and Standard (High Communication) TRIACs

### Electrical Characteristics ( $T_{VJ} = 25^{\circ}\text{C}$ , unless otherwise specified) – Alternistor TRIAC (3 Quadrants)

Symbol	Description	Conditions	QJxx10xH3			QJxx10xH4			QJxx10xH5			Unit	
			MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX		
$I_{GT}$	DC Gate Trigger Current	$V_D = 12\text{ V}$ , $R_L = 60\ \Omega$	I-II-III	-	-	10	-	-	35	-	-	50	mA
$V_{GT}$	DC Gate Trigger Voltage	$V_D = 12\text{ V}$ , $R_L = 60\ \Omega$	I-II-III	-	-	1.3	-	-	1.3	-	-	1.3	V
$V_{GD}$	Gate Non-trigger Voltage	$V_D = V_{DRM}$ , $R_L = 3.3\text{ k}\Omega$ , $T_{VJ} = 150^{\circ}\text{C}$	I-II-III	0.2	-	-	0.2	-	-	0.2	-	-	V
$I_H$	Holding Current	$I_T = 100\text{ mA}$		-	-	15	-	-	40	-	-	50	mA
$dv/dt$	Critical Rate-of-rise of Off-stage Voltage	$V_D = V_{DRM}$ , Gate Open, $T_{VJ} = 150^{\circ}\text{C}$	600 V	100	-	-	250	-	-	350	-	-	V/ $\mu\text{s}$
			800 V	150	-	-	450	-	-	700	-	-	
		$V_D = 2/3 V_{DRM}$ , Gate Open, $T_{VJ} = 150^{\circ}\text{C}$	600 V	150	-	-	300	-	-	500	-	-	
			800 V	200	-	-	600	-	-	1000	-	-	
$(dv/dt)_c$		$(di/dt)_c = 6.5\text{ A/ms}$ , $T_{VJ} = 150^{\circ}\text{C}$		10	-	-	20	-	-	30	-	-	V/ $\mu\text{s}$
$t_{gt}$	Turn-on Time	$I_G = 2 \times I_{GT}$ , $P_W = 15\ \mu\text{s}$ , $I_T = 14.1\text{ A(pk)}$		-	4	-	-	-	7	-	-	9	-

### Electrical Characteristics ( $T_{VJ} = 25^{\circ}\text{C}$ , unless otherwise specified) – Standard TRIAC

Symbol	Description	Conditions	Quadrant	Value		Unit	
				Qxx10x4	Qxx10x5		
$I_{GT}$	DC Gate Trigger Current	$V_D = 12\text{ V}$ , $R_L = 60\ \Omega$	I – II – III	MAX.	25	50	mA
			IV	TYP.	50	75	
$V_{GT}$	DC Gate Trigger Voltage	$V_D = 12\text{ V}$ , $R_L = 60\ \Omega$	ALL	MAX.	1.3		V
$V_{GD}$	Gate Non-trigger Voltage	$V_D = V_{DRM}$ , $R_L = 3.3\text{ k}\Omega$ , $T_{VJ} = 150^{\circ}\text{C}$	ALL	MIN.	0.2		V
$I_H$	Holding Current	$I_T = 100\text{ mA}$		MAX.	35	50	mA
$dv/dt$	Critical Rate-of-rise of Off-stage Voltage	$V_D = V_{DRM}$ , Gate Open, $T_{VJ} = 150^{\circ}\text{C}$	600 V	MIN.	400	800	V/ $\mu\text{s}$
			800 V		600	1000	
		$V_D = 2/3 V_{DRM}$ , Gate Open, $T_{VJ} = 150^{\circ}\text{C}$	600 V		600	1000	
			800 V		800	1200	
$(dv/dt)_c$		$(di/dt)_c = 6.5\text{ A/ms}$ , $T_{VJ} = 150^{\circ}\text{C}$		TYP.	3	4	V/ $\mu\text{s}$
$t_{gt}$	Turn-on Time	$I_G = 2 \times I_{GT}$ , $P_W = 15\ \mu\text{s}$ , $I_T = 14.1\text{ A(pk)}$	I – II – III	TYP.	1-2-6	1-2-6	$\mu\text{s}$
			IV		10	11	

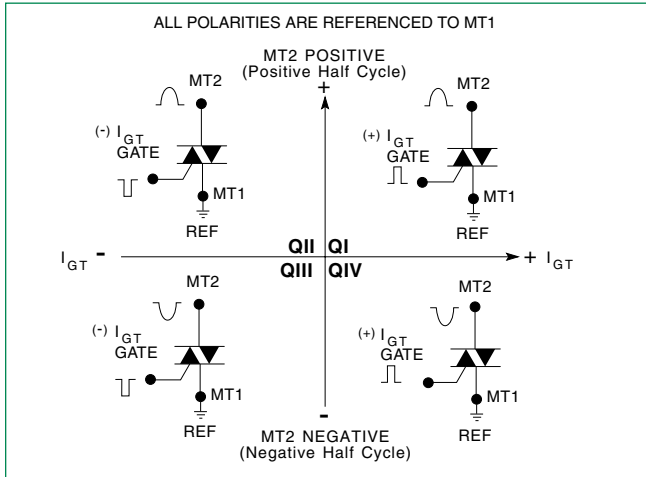
### Static Characteristics

Symbol	Description	Conditions	Maximum Value	Unit
$V_{TM}$	Peak On-state Voltage	$I_{TM} = 14.1\text{ A}$ , $t_p = 380\ \mu\text{s}$	1.60	V
$I_{DRM}/I_{RRM}$	Off-state Current, Peak Repetitive	$V_D = V_{DRM} = V_{RRM}$ , $T_{VJ} = 25^{\circ}\text{C}$	10	$\mu\text{A}$
		$V_D = V_{DRM} = V_{RRM}$ , $T_{VJ} = 150^{\circ}\text{C}$	4	mA

# QJxx10xHx and QJxx10xx Series

## 10 A High Temperature Alternistor and Standard (High Communication) TRIACs

Figure 1: Definition of Quadrants



Note: Alternistors will not operate in QIV

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

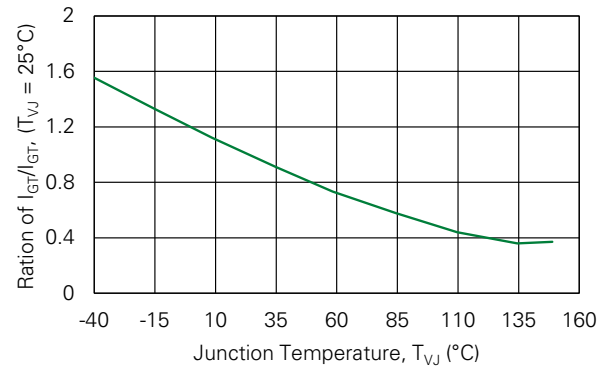


Figure 3: Normalized DC Holding Current vs. Junction Temperature

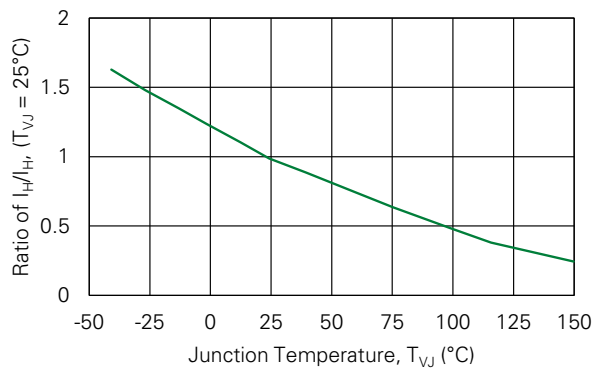


Figure 4: Normalized DC Gate Trigger Voltage for all Quadrants vs. Junction Temperature

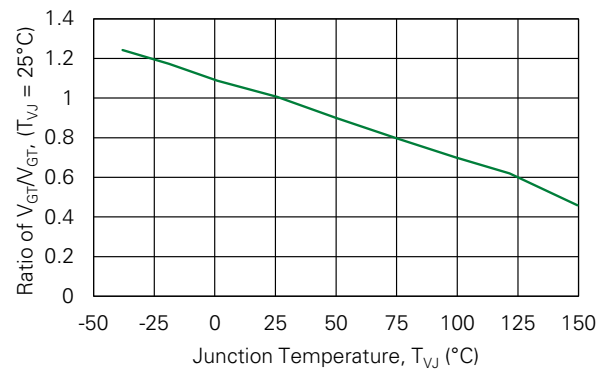


Figure 5: Typical Power Dissipation vs. RMS On-state Current

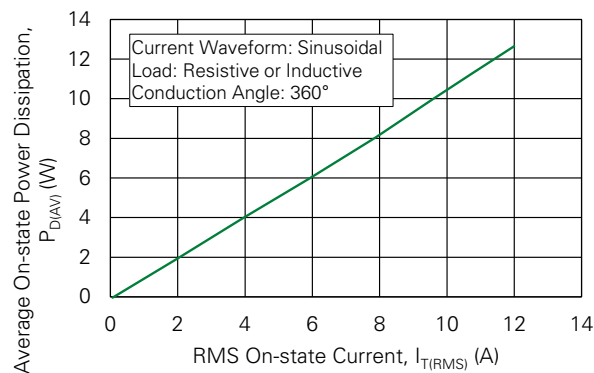
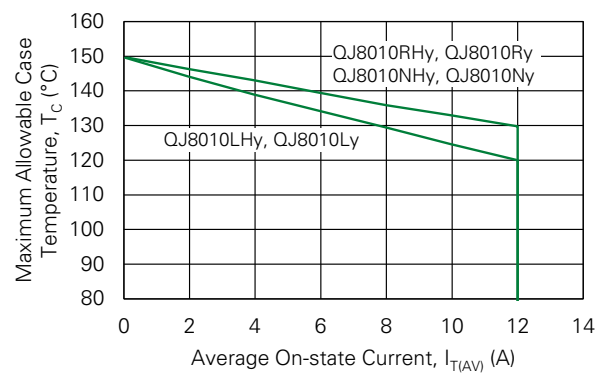


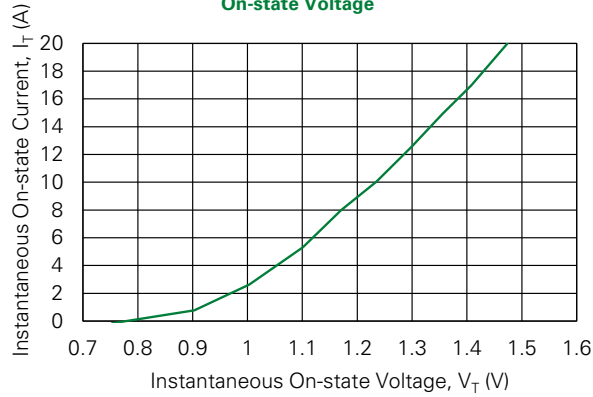
Figure 6: Maximum Allowable Case Temperature vs. On-state Current



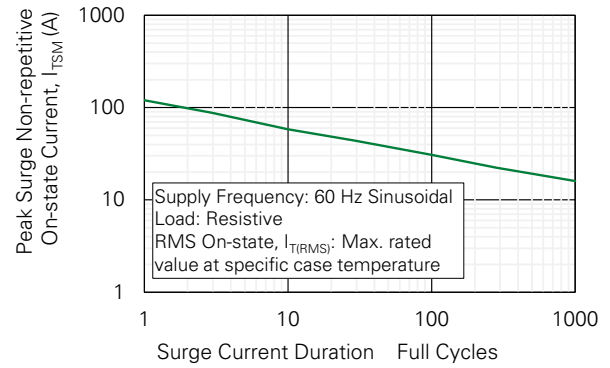
# QJxx10xHx and QJxx10xx Series

## 10 A High Temperature Alternistor and Standard (High Communication) TRIACs

**Figure 7. Typical On-state Current vs. On-state Voltage**



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



**Notes:**

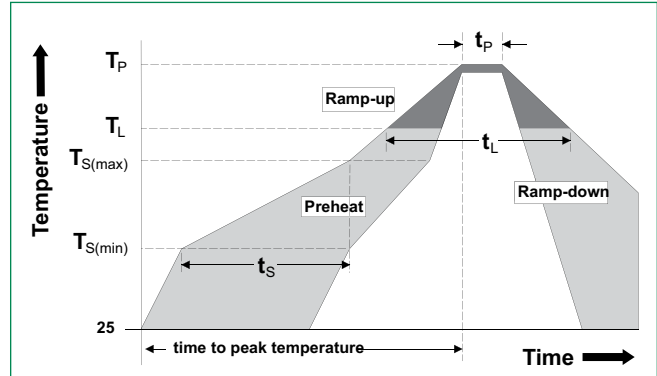
1. Gate control may be lost during and immediately following surge current interval.
2. Overload may not be repeated until junction temperature has returned to steady-state rated value

# QJxx10xHx and QJxx10xx Series

## 10 A High Temperature Alternistor and Standard (High Communication) TRIACs

### 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 to 180 s
<b>Average ramp up rate (Liquidus Temp) (<math>T_L</math>) to peak</b>		5°C/second max
<b><math>T_{s(max)}</math> to <math>T_L</math> - Ramp-up Rate</b>		5°C/second max
<b>Reflow</b>	- Temperature ( $T_L$ ) (Liquidus)	217°C
	- Time (min to max) ( $t_r$ )	60 to 150 seconds
<b>Peak Temperature (<math>T_p</math>)</b>		260 °C ( $\pm 5$ °C)
<b>Time within 5°C of actual peak Temperature (<math>t_p</math>)</b>		20 to 40 seconds
<b>Ramp-down Rate</b>		5°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



### Physical Specifications

<b>Terminal Finish</b>	100% Matte Tin-plated
<b>Body Material</b>	UL Recognized epoxy meeting flammability classification 94V-0.
<b>Terminal Material</b>	Copper Alloy

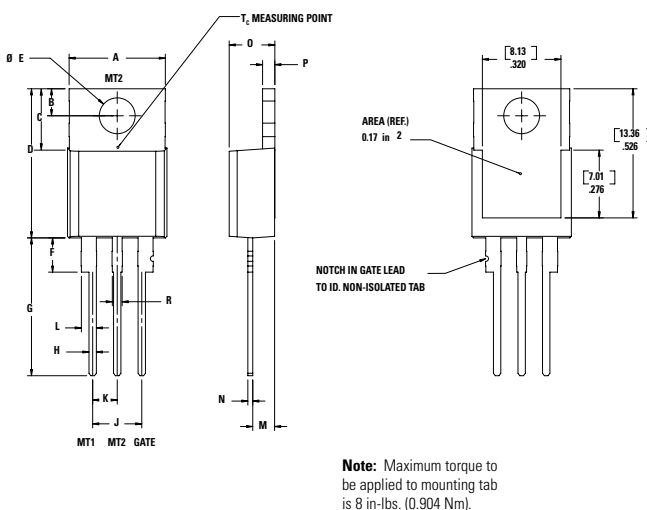
### Design Considerations

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 @ 125°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; 320V - 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

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

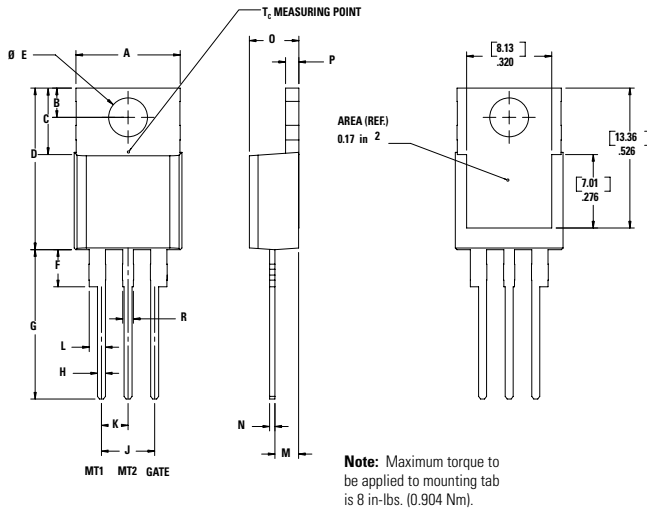


Dimension	Millimeters		Inches	
	Min	Max	Min	Max
A	0.380	0.420	9.65	10.67
B	0.105	0.115	2.67	2.92
C	0.230	0.250	5.84	6.35
D	0.590	0.620	14.99	15.75
E	0.142	0.147	3.61	3.73
F	0.110	0.130	2.79	3.30
G	0.540	0.575	13.72	14.61
H	0.025	0.035	0.64	0.89
J	0.195	0.205	4.95	5.21
K	0.095	0.105	2.41	2.67
L	0.060	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

# QJxx10xHx and QJxx10xx Series

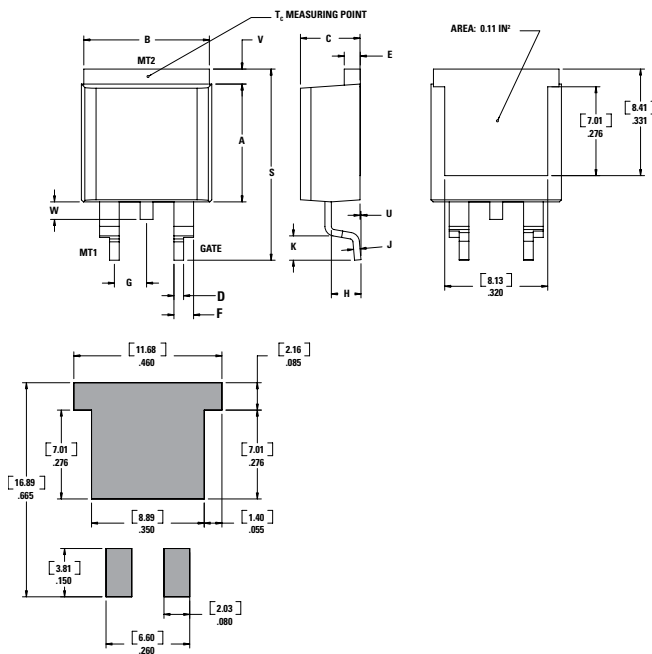
## 10 A High Temperature Alternistor and Standard (High Communication) TRIACs

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



Dimension	Millimeters		Inches	
	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-263AB (N-Package) - D2-PAK Surface Mount

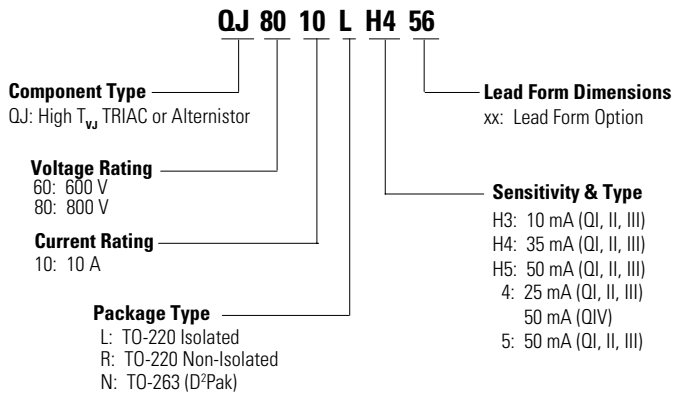


Dimension	Inches		Millimeters	
	Min	Max	Min	Max
A	0.360	0.370	9.14	9.40
B	0.380	0.420	9.65	10.67
C	0.178	0.188	4.52	4.78
D	0.025	0.035	0.64	0.89
E	0.045	0.060	1.14	1.52
F	0.060	0.075	1.52	1.91
G	0.095	0.105	2.41	2.67
H	0.092	0.102	2.34	2.59
J	0.018	0.024	0.46	0.61
K	0.090	0.110	2.29	2.79
S	0.590	0.625	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

# QJxx10xHx and QJxx10xx Series

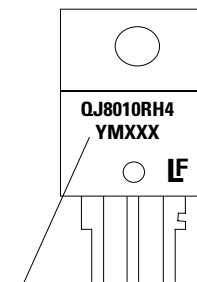
## 10 A High Temperature Alternistor and Standard (High Communication) TRIACs

### 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

### Product Selector

Part Number	Voltage		Gate Sensitivity Quadrants		Type	Package
	600 V	800 V	I – II – III	IV		
QJxx10LH3	x	x	10 mA	-	Alternistor TRIAC	TO-220L
QJxx10RH3	x	x	10 mA	-	Alternistor TRIAC	TO-220R
QJxx10NH3	x	x	10 mA	-	Alternistor TRIAC	TO-263 D <sup>2</sup> PAK
QJxx10LH4	x	x	35 mA	-	Alternistor TRIAC	TO-220L
QJxx10RH4	x	x	35 mA	-	Alternistor TRIAC	TO-220R
QJxx10NH4	x	x	35 mA	-	Alternistor TRIAC	TO-263 D <sup>2</sup> PAK
QJxx10LH5	x	x	50 mA	-	Alternistor TRIAC	TO-220L
QJxx10RH5	x	x	50 mA	-	Alternistor TRIAC	TO-220R
QJxx10NH5	x	x	50 mA	-	Alternistor TRIAC	TO-263 D <sup>2</sup> PAK
QJxx10L4	x	x	25 mA	50 mA	Standard TRIAC	TO-220L
QJxx10R4	x	x	25 mA	50 mA	Standard TRIAC	TO-220R
QJxx10N4	x	x	25 mA	50 mA	Standard TRIAC	TO-263 D <sup>2</sup> PAK
QJxx10L5	x	x	50 mA	TYP 75 mA	Standard TRIAC	TO-220L
QJxx10R5	x	x	50 mA	TYP 75 mA	Standard TRIAC	TO-220R
QJxx10N5	x	x	50 mA	TYP 75 mA	Standard TRIAC	TO-263 D <sup>2</sup> PAK



# QJxx10xHx and QJxx10xx Series

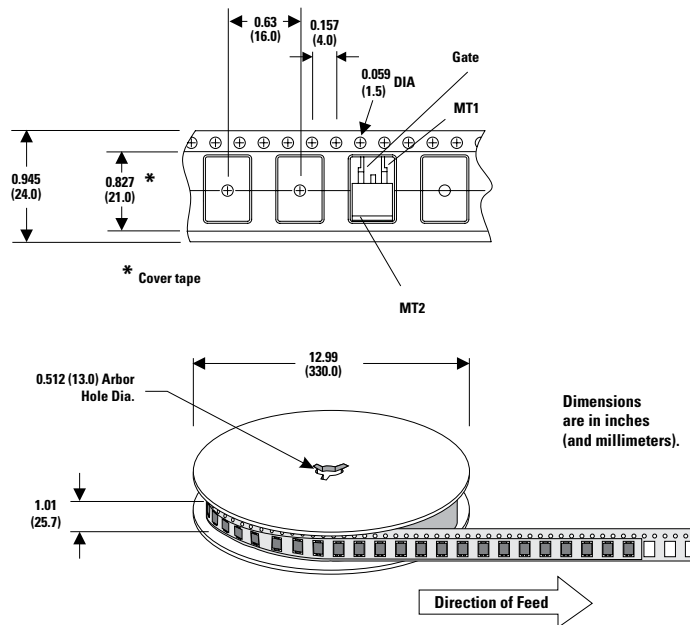
## 10 A High Temperature Alternistor and Standard (High Communication) TRIACs

### Packing Options

Part Number	Marking	Weight	Packing Mode	M.O.Q
QJxx10RHyTP	QJxx10RHy	2.2 g	Tube Pack	1000 (50 per tube)
QJxx10LHyTP	QJxx10LHy	2.2 g	Tube Pack	1000 (50 per tube)
QJxx10NHyTP	QJxx10NHy	1.6 g	Tube Pack	1000 (50 per tube)
QJxx10NHyRP	QJxx10NHy	1.6 g	Embossed Carrier	500
QJxx10LyTP	QJxx10Ly	2.2 g	Tube Pack	1000 (50 per tube)
QJxx10RyTP	QJxx10Ry	2.2 g	Tube Pack	1000 (50 per tube)
QJxx10NyTP	QJxx10Ny	1.6 g	Tube Pack	1000 (50 per tube)
QJxx10NyRP	QJxx10Ny	1.6 g	Embossed Carrier	500

### TO-263 Embossed Carrier Reel Pack (RP) Specifications

Meets all EIA-481-2 Standards



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