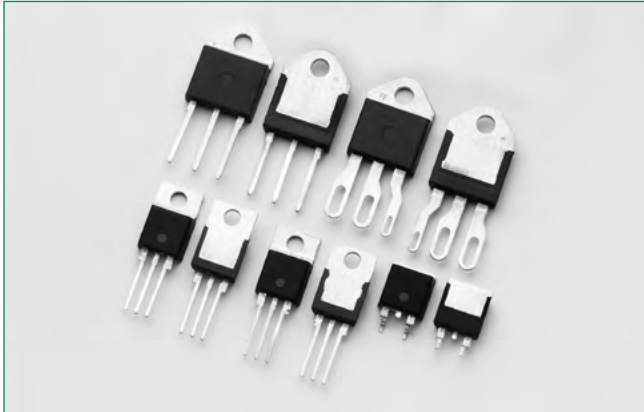


**QJxx25xHx Series**



**Description**

This 25A 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 600V
- Surge capability of 250A at 60Hz half 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**

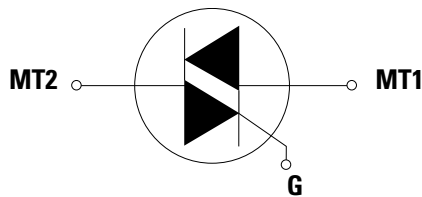
Excellent for AC switching and phase control applications such as heating, lighting, and motor speed controls.

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	Single half cycle; $f = 50\text{Hz}$ ; $T_J(\text{initial}) = 25^\circ\text{C}$		208	A
		Single half 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	$\text{A}^2\text{s}$
$di/dt$	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 current	$t_p = 20\mu\text{s}$ , $T_J = 150^\circ\text{C}$		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 $\mu\text{s}$	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

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

Symbol	Test Condition	Quadrant		Value			Unit
				QJxx25xH4	QJxx25xH5	QJxx25xH6	
$I_{GT}$	$V_D = 12\text{V}$ $R_L = 60\Omega$	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 $T_J = 150^\circ\text{C}$	400V	MIN.	-	575	600	$\text{V}/\mu\text{s}$
		600V		500	500	600	
		800V		350	450	-	
$(dv/dt)_c$	$(di/dt)_c = 13.3\text{A}/\text{ms}$ $T_J = 150^\circ\text{C}$		MIN.	15	20	30	$\text{V}/\mu\text{s}$
$t_{gt}$	$I_G = 2X I_{GT}$ $PW = 15\text{s}$ $I_T = 35.4(\text{pk})$		TYP.	3	3	5	$\mu\text{s}$

### Static Characteristics

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

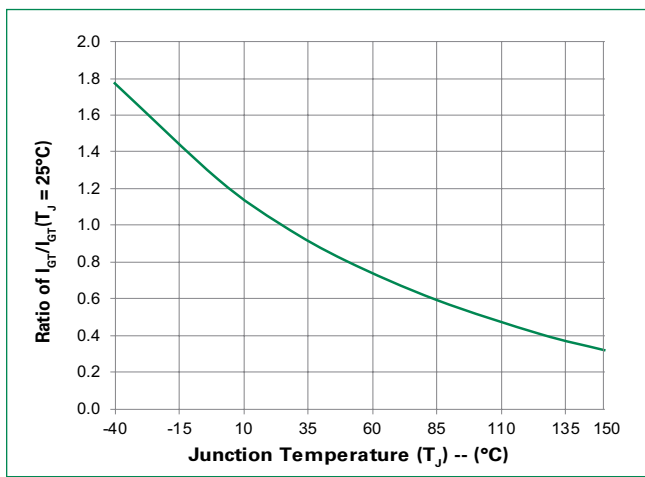
xx = voltage/10, x = package

**Thermal Resistances**

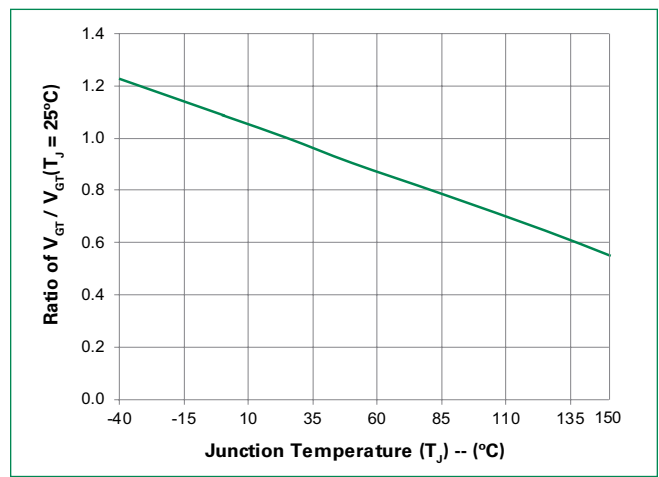
Symbol	Parameter	Value	Unit	
$R_{\theta(J-C)}$	Junction to case (AC)	QJxx25RH6 / QJxx25NH6 QJxx25RH5 / QJxx25NH5	0.90	°C/W
		QJxx25LH6 / QJxx25LH5	3.1	
		QJxx25KH6 / QJxx25JH6	1.25	
$R_{\theta(J-A)}$	Junction to ambient	QJxx25RHy	45	°C/W
		QJxx25LH6 / QJxx25LH5	50	

xx = voltage/10, y = sensitivity

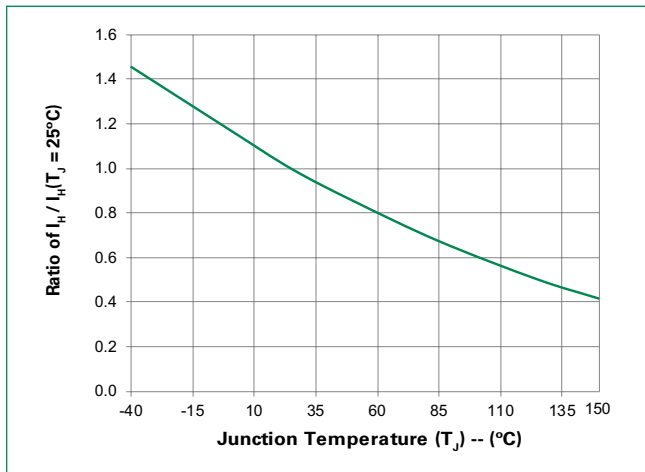
**Figure 1: Normalized DC Gate Trigger Current vs. Junction Temperature**



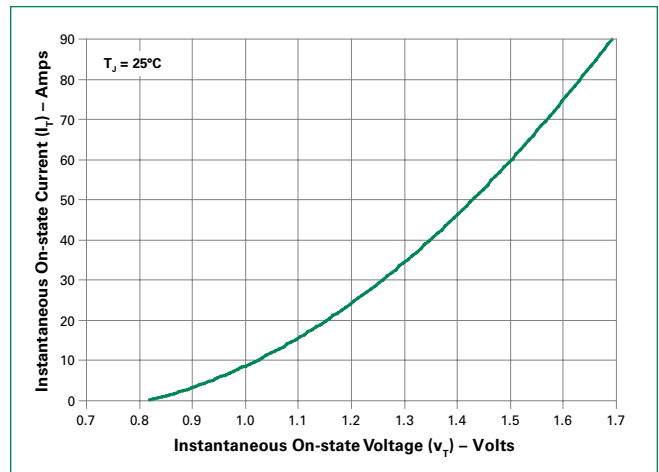
**Figure 2: Normalized DC Gate Trigger Voltage vs. Junction Temperature**



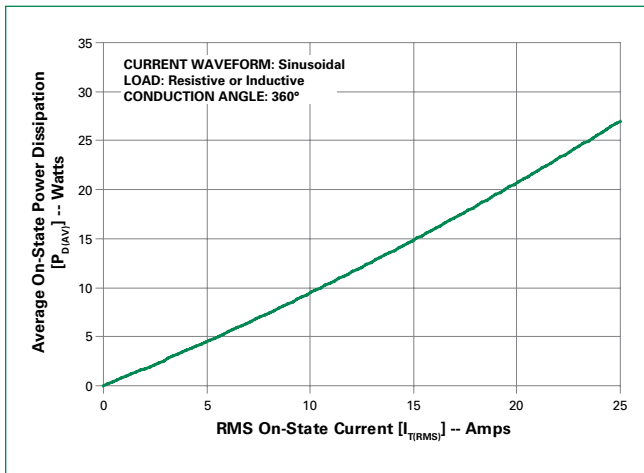
**Figure 3: Normalized DC Holding Current vs. Junction Temperature**



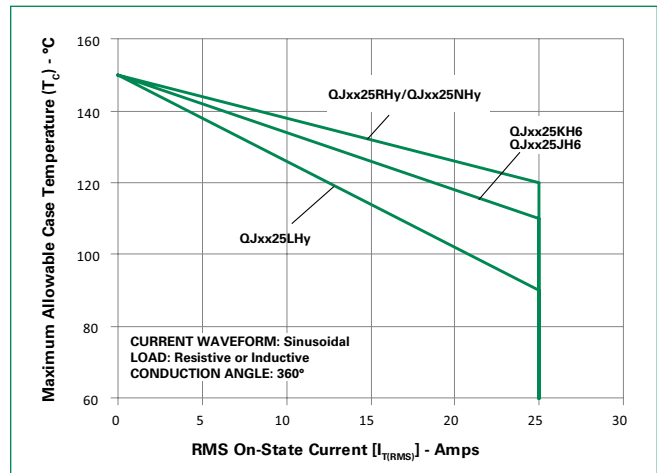
**Figure 4: On-State Current vs. On-State Voltage (Typical)**



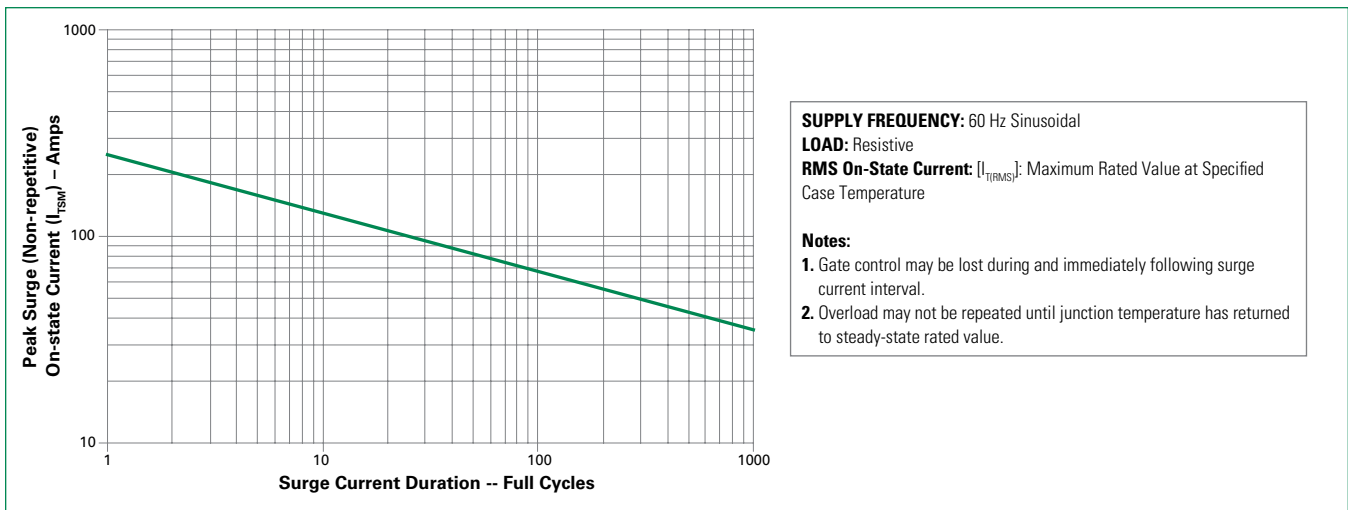
**Figure 5: Power Dissipation (Typical) vs. RMS On-State Current**



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

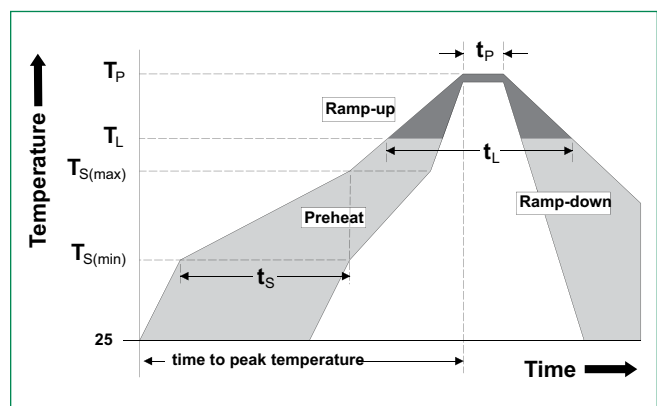


**Figure 8: Surge Peak On-State Current vs. Number of Cycles**



### Soldering Parameters

<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 - 180 secs
<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
	- Temperature ( $t_L$ )	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>		20 - 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 compound meeting flammability rating V-0
<b>Lead Material</b>	Copper Alloy

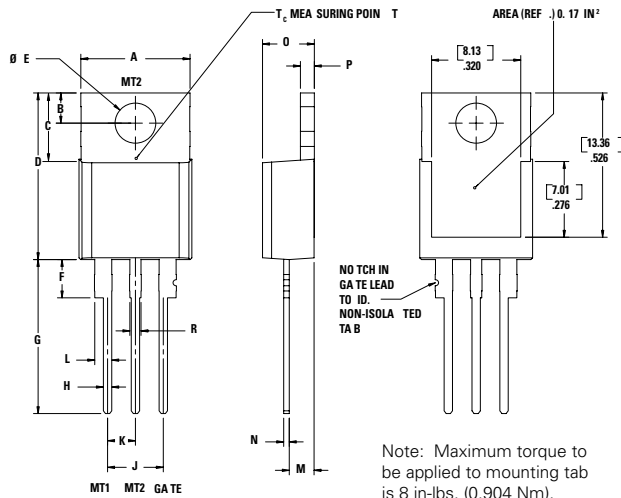
### Design Considerations

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

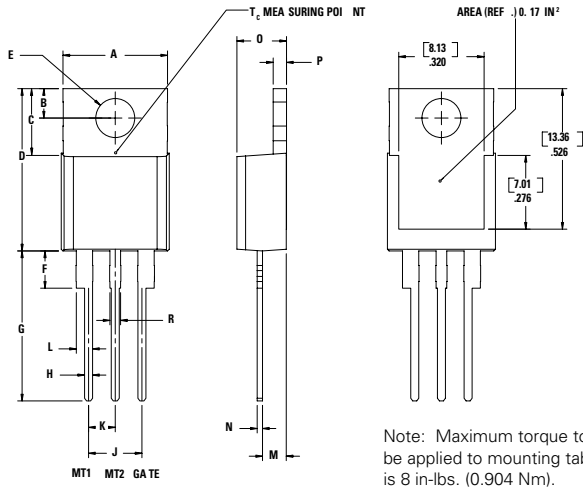
Test	Specifications and Conditions
<b>High Temperature Voltage Blocking</b>	MIL-STD-750: Method 1040, Condition A Rated $V_{RRM}$ 150°C, 1008 hours
<b>Temperature Cycling</b>	MIL-STD-750: Method 1051 -40°C to 150°C, 15-minute dwell, 100 cycles
<b>Biased Temp &amp; Humidity</b>	EIA/JEDEC: JESD22-A101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

### Dimensions — TO-220AB (R Package) — Non-isolated Mounting Tab



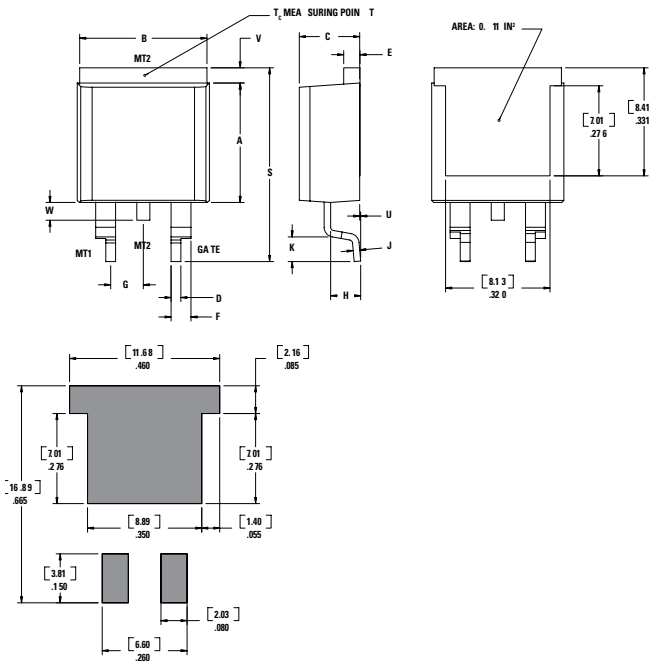
Dimension	Inches		Millimeters	
	Min	Max	Min	Max
<b>A</b>	0.380	0.420	9.65	10.67
<b>B</b>	0.105	0.115	2.67	2.92
<b>C</b>	0.230	0.250	5.84	6.35
<b>D</b>	0.590	0.620	14.99	15.75
<b>E</b>	0.142	0.147	3.61	3.73
<b>F</b>	0.110	0.130	2.79	3.30
<b>G</b>	0.540	0.575	13.72	14.61
<b>H</b>	0.025	0.035	0.64	0.89
<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

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



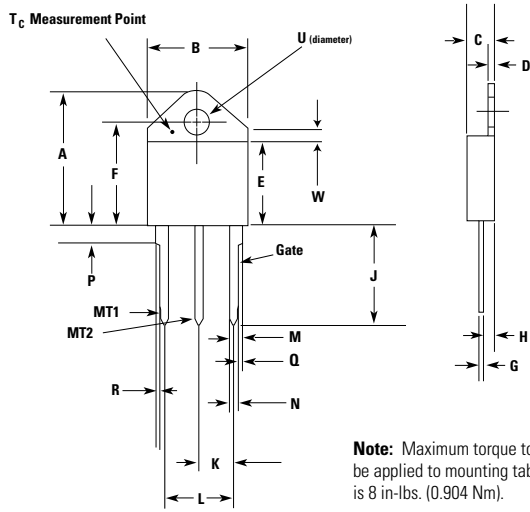
Dimension	Inches		Millimeters	
	Min	Max	Min	Max
A	0.380	0.420	9.65	10.67
B	0.105	0.115	2.66	2.92
C	0.230	0.250	5.85	6.35
D	0.590	0.620	14.98	15.75
E	0.142	0.147	3.61	3.73
F	0.110	0.130	2.80	3.30
G	0.540	0.575	13.71	14.60
H	0.025	0.035	0.63	0.89
J	0.195	0.205	4.95	5.21
K	0.095	0.105	2.41	2.67
L	0.060	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) — D<sup>2</sup>Pak Surface Mount



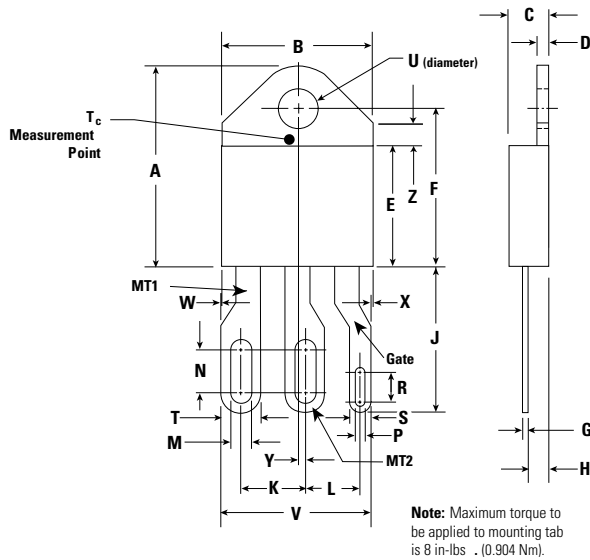
Dimension	Inches		Millimeters	
	Min	Max	Min	Max
A	0.360	0.370	9.14	9.40
B	0.380	0.420	9.65	10.67
C	0.178	0.188	4.52	4.78
D	0.025	0.035	0.64	0.89
E	0.045	0.060	1.14	1.52
F	0.060	0.075	1.52	1.91
G	0.095	0.105	2.41	2.67
H	0.092	0.102	2.34	2.59
J	0.018	0.024	0.46	0.61
K	0.090	0.110	2.29	2.79
S	0.590	0.625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

**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

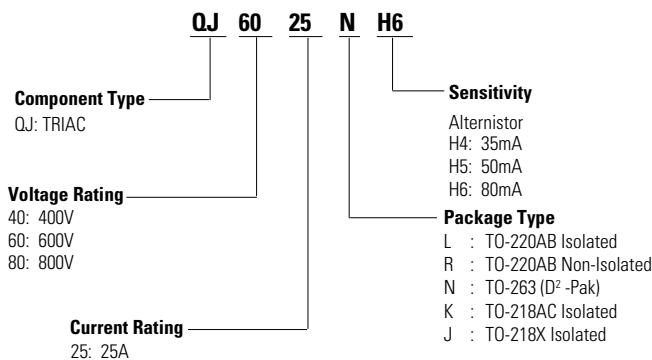
### Product Selector

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 <sup>2</sup> -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 <sup>2</sup> -Pak
QJxx25NH6	X	X	-	80 mA	TO-263 D <sup>2</sup> -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

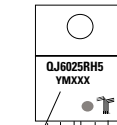
Part Number	Marking	Weight	Packing Mode	Base Quantity
QJxx25RH4TP	QJxx25RH4	2.20g	Tube Pack	1000 (50 per tube)
QJxx25LH4TP	QJxx25LH4	2.20g	Tube Pack	1000 (50 per tube)
QJxx25NH4TP	QJxx25NH4	1.60g	Tube Pack	1000 (50 per tube)
QJxx25NH4RP	QJxx25NH4	1.60g	Embossed Carrier	500
QJxx25RH5TP	QJxx25RH5	2.20g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

### Part Numbering System



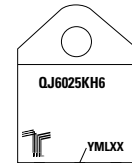
### Part Marking System

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

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



Date Code Marking  
Y: Year Code  
M: Month Code  
L: Location Code  
XX: Lot Serial Code