Absolute Maximum Ratings — Standard Triac

Symbol	Parameter			Value	Unit
$I_{T(RMS)}$	RMS on-state current (full sine wave)	Qxx15Ly	T_C = 80°C	15	A
		Qxx15Ry Qxx15Ny	T_C = 90°C		
I_{TSM}	Non repetitive surge peak on-state current (full cycle, T_J initial = 25°C)	f = 50 Hz	t = 20 ms	167	A
		f = 60 Hz	t = 16.7 ms	200	
I^2t	I^2t Value for fusing	-	t_p = 8.3 ms	166	A^2s
di/dt	Critical rate of rise of on-state current	f = 120 Hz	T_J = 125°C	100	A/μs
I_{GTM}	Peak gate trigger current	t_p=20μs	T_J = 125°C	4	A
$P_{G(AV)}$	Average gate power dissipation		T_J = 125°C	0.5	W
T_{stg}	Storage temperature range		-	-40 to 150	°C
T_J	Operating junction temperature range		-	-40 to 125	°C

Note: xx = voltage/10, y = sensitivity

Absolute Maximum Ratings — Alternistor Triac (3 Quadrants)

Symbol	Parameter			Value	Unit
$I_{T(RMS)}$	RMS on-state current (full sine wave)	Qxx16LHy	T_C = 80°C	16	A
		Qxx16RHy Qxx16NHy	T_C = 90°C		
I_{TSM}	Non repetitive surge peak on-state current (full cycle, T_J initial = 25°C)	f = 50 Hz	t = 20 ms	167	A
		f = 60 Hz	t = 16.7 ms	200	
I^2t	I^2t Value for fusing		t_p = 8.3 ms	166	A^2s
di/dt	Critical rate of rise of on-state current	f = 120 Hz	T_J = 125°C	100	A/μs
I_{GTM}	Peak gate trigger current	t_p=20μs	T_J = 125°C	4	A
$P_{G(AV)}$	Average gate power dissipation		T_J = 125°C	0.5	W
T_{stg}	Storage temperature range			-40 to 150	°C
T_J	Operating junction temperature range			-40 to 125	°C

Note: xx = voltage/10, y = sensitivity

Electrical Characteristics (T_J = 25°C, unless otherwise specified) — Standard Triac

Symbol	Test Conditions	Quadrant		Value	Unit
I_{GT}	V_D = 12V R_L = 60 Ω	I – II – III	MAX.	50	mA
V_{GT}	V_D = 12V R_L = 60 Ω	I – II – III	MAX.	2.0	V
V_{GD}	V_D = V_{DRM} R_L = 3.3 kΩ T_J = 125°C	I – II – III	MIN.	0.2	V
I_H	I_T = 100mA		MAX.	70	mA
dv/dt	V_D = V_{DRM} Gate Open T_J = 125°C	400V	MIN.	275	V/μs
		600V		225	
		800V		200	
	V_D = V_{DRM} Gate Open T_J = 100°C	1000V		200	
(dv/dt)c	(di/dt)c = 8.1 A/ms T_J = 125°C		MIN.	4	V/μs
t_{gt}	I_G = 2 x I_{GT} PW = 15μs I_T = 22.6 A(pk)		TYP.	4	μs

Electrical Characteristics (T_J = 25°C, unless otherwise specified) — Alternistor Triac (3 Quadrants)

Symbol	Test Conditions		Quadrant	Qxx16xH2	Qxx16xH3	Qxx16xH4	Qxx16xH6	Unit
I_{GT}	V_D = 12V R_L = 60 Ω	I – II – III	MAX.	10	20	35	80	mA
V_{GT}	V_D = 12V R_L = 60 Ω	I – II – III	MAX.	1.3				V
V_{GD}	$V_D = V_{DRM}$ R_L = 3.3 kΩ T_J = 125°C	I – II – III	MIN.	0.2				V
I_H	I_T = 100mA		MAX.	15	35	50	70	mA
dv/dt	$V_D = V_{DRM}$ Gate Open T_J = 125°C	400V	MIN.	200	350	475	925	V/μs
		600V		150	250	400	850	
		800V		100	200	350	475	
	$V_D = V_{DRM}$ Gate Open T_J = 100°C	1000V		100	200	300	350	
(dv/dt)c	(di/dt)c = 8.6 A/ms T_J = 125°C		MIN.	2	20	25	30	V/μs
t_{gt}	I_G = 2 x I_{GT} PW = 15μs I_T = 22.6 A(pk)		TYP.	3	3	3	5	μs

Static Characteristics

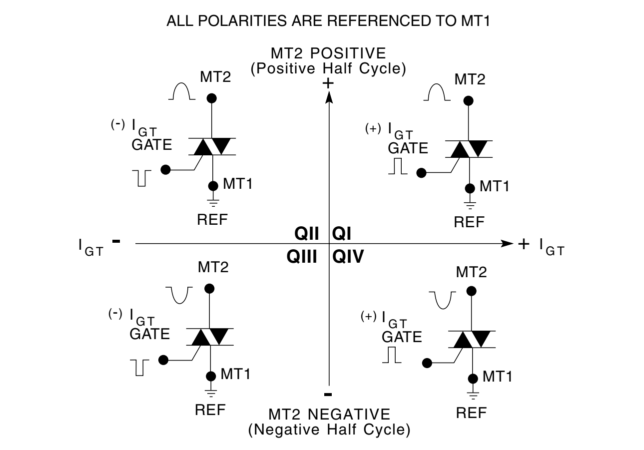
Symbol	Test Conditions				Value	Unit
V_{TM}	15A Device I_T = 21.2A t_p = 380μs			MAX	1.60	V
	16A Device I_T = 22.6A t_p = 380μs					
I_{DRM} I_{RRM}	$V_D = V_{DRM}$ / V_{RRM}	T_J = 25°C	400-1000V	MAX	5	μA
		T_J = 125°C	400-800V		2	mA
		T_J = 100°C	1000V		3	

Thermal Resistances

Symbol	Parameter		Value	Unit
$R_{\Theta(J-C)}$	Junction to case (AC)	Qxx15Ry Qxx15Ny Qxx16RHy Qxx16NHy	1.7	°C/W
		Qxx15Ly Qxx16LHy	2.1	
$R_{\Theta(J-A)}$	Junction to ambient	Qxx15Ry Qxx16RHy	45	°C/W
		Qxx15Ly Qxx16LHy	50	

Note: xx = voltage/10; y = sensitivity

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

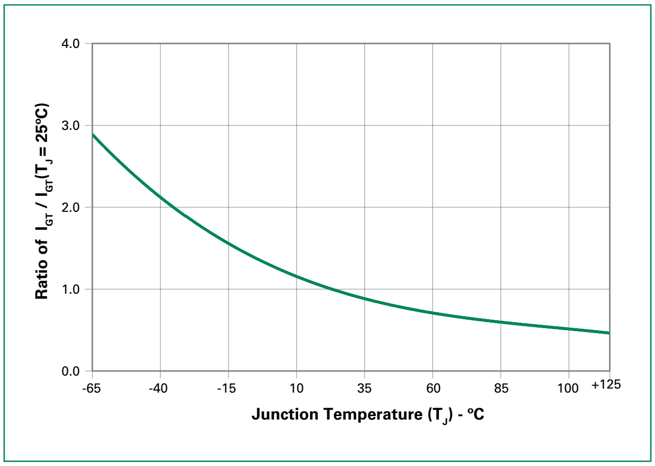


Figure 3: Normalized DC Holding Current vs. Junction Temperature

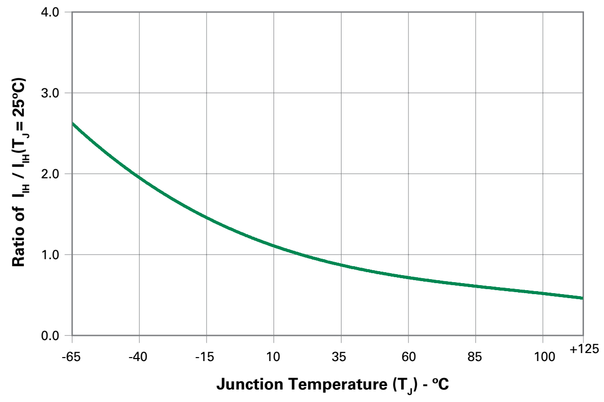


Figure 4: Normalized DC Gate Trigger Voltage for All Quadrants vs. Junction Temperature

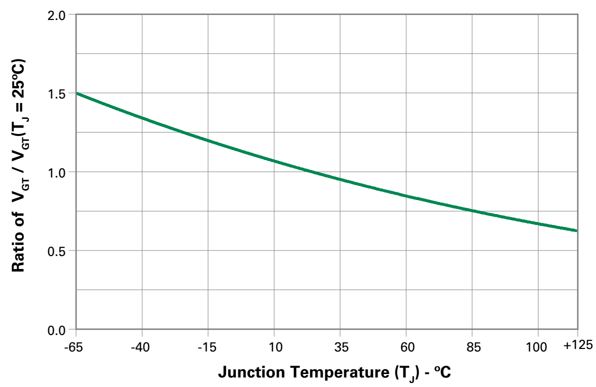


Figure 5: Power Dissipation (Typical) vs. RMS On-State Current

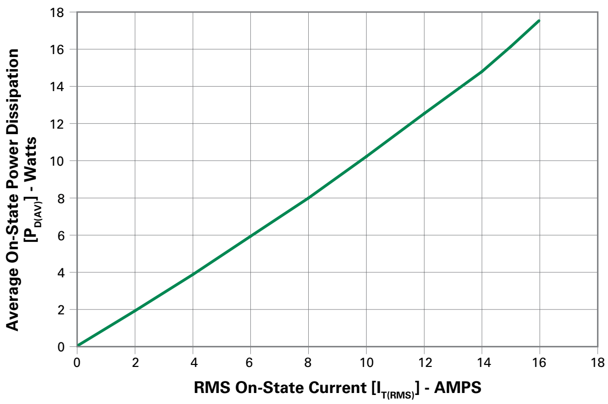


Figure 6: Maximum Allowable Case Temperature vs. On-State Current (15A devices)

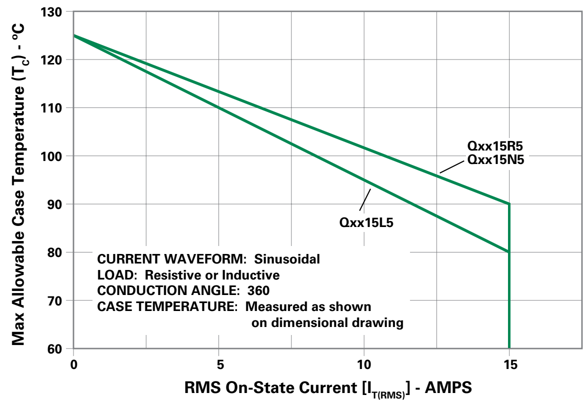


Figure 7: Maximum Allowable Case Temperature vs. On-State Current (16A devices)

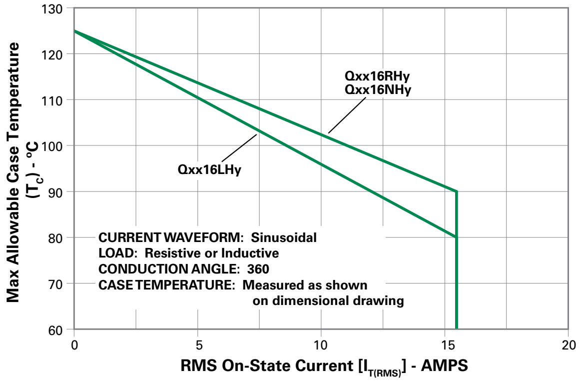


Figure 8: Maximum Allowable Ambient Temperature vs. On-State Current

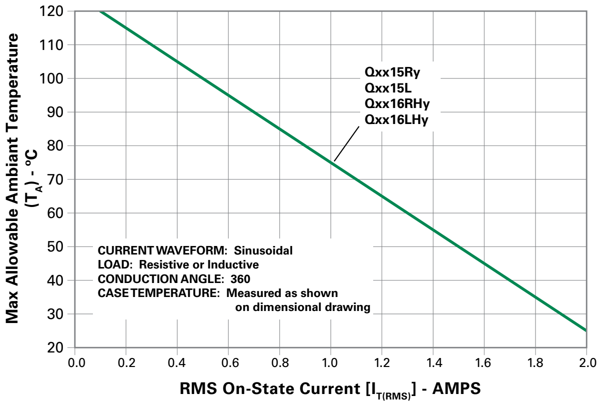


Figure 9: On-State Current vs. On-State Voltage (Typical)

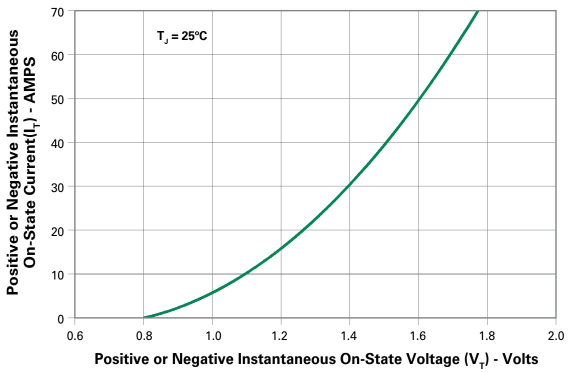
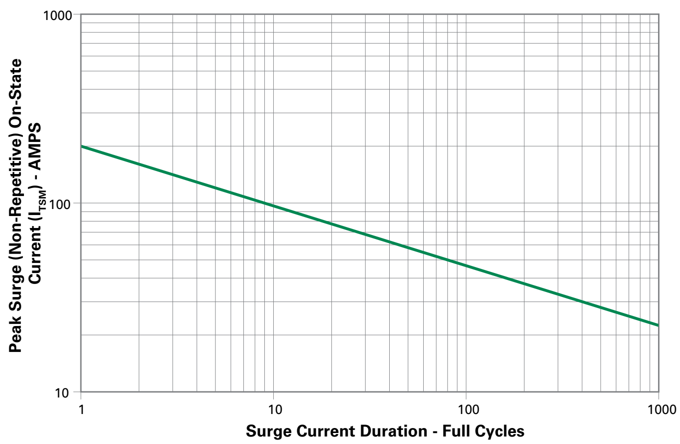


Figure 10: Surge Peak On-State Current vs. Number of Cycles



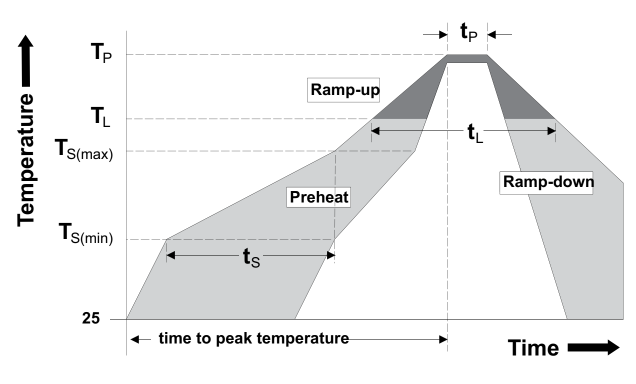
Supply Frequency: 60Hz Sinusoidal
Load: Resistive
RMS On-State [$I_{T(RMS)}$]: Max Rated Value at Specific Case Temperature

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.

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 secs
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
Terminal Material	Copper Alloy

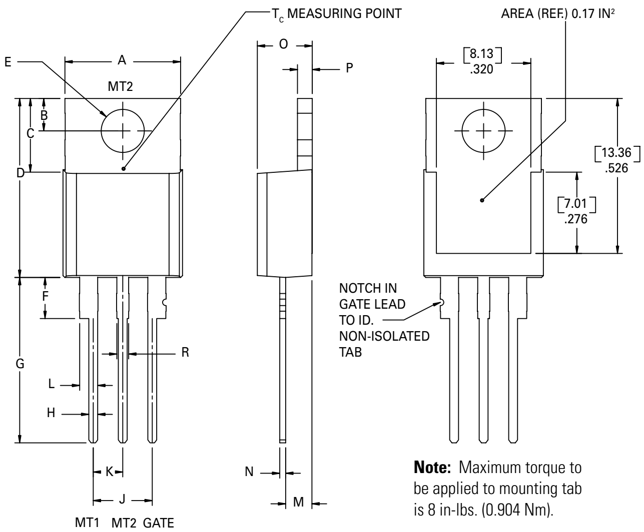
Design Considerations

Careful selection of the correct device 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 device 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 @ 125°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; 320V - 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

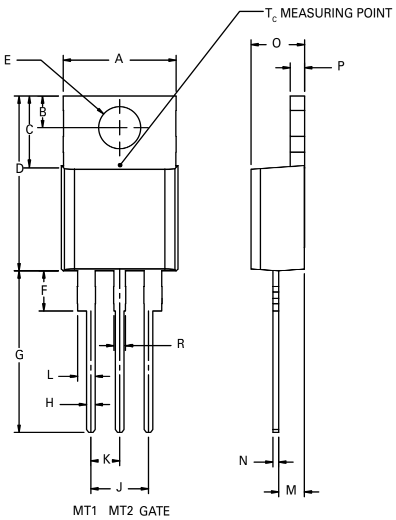
Dimensions — TO-220AB (R-Package) — Non-Isolated Mounting Tab Common with Center Lead

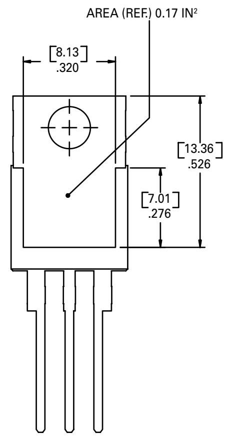


Note: Maximum torque to be applied to mounting tab is 8 in-lbs. (0.904 Nm).

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	5.84	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

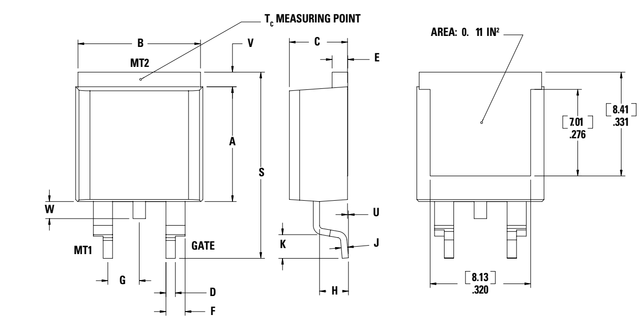


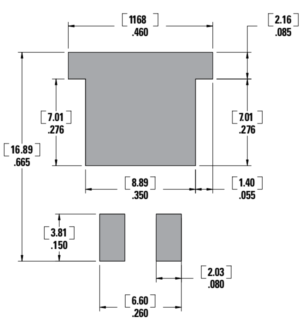


Note: Maximum torque to be applied to mounting tab is 8 in-lbs. (0.904 Nm).

Dimension	Inches		Millimeters	
	Min	Max	Min	Max
A	0.380	0.420	9.65	10.67
B	0.105	0.115	2.67	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

Product Selector

Part Number	Voltage				Gate Sensitivity Quadrants	Type	Package
	400V	600V	800V	1000V	I – II – III		
Qxx15L5	X	X	X	X	50 mA	Standard Triac	TO-220L
Qxx15R5	X	X	X	X	50 mA	Standard Triac	TO-220R
Qxx15N5	X	X	X	X	50 mA	Standard Triac	TO-263 D²-PAK
Qxx16LH2	X	X	X	X	10 mA	Alternistor Triac	TO-220L
Qxx16RH2	X	X	X	X	10 mA	Alternistor Triac	TO-220R
Qxx16NH2	X	X	X	X	10 mA	Alternistor Triac	TO-263 D²-PAK
Qxx16LH3	X	X	X	X	20 mA	Alternistor Triac	TO-220L
Qxx16RH3	X	X	X	X	20 mA	Alternistor Triac	TO-220R
Qxx16NH3	X	X	X	X	20 mA	Alternistor Triac	TO-263 D²-PAK
Qxx16LH4	X	X	X	X	35 mA	Alternistor Triac	TO-220L
Qxx16RH4	X	X	X	X	35 mA	Alternistor Triac	TO-220R
Qxx16NH4	X	X	X	X	35 mA	Alternistor Triac	TO-263 D²-PAK
Qxx16LH6	X	X	X	X	80 mA	Alternistor Triac	TO-220L
Qxx16RH6	X	X	X	X	80 mA	Alternistor Triac	TO-220R
Qxx16NH6	X	X	X	X	80 mA	Alternistor Triac	TO-263 D²-PAK

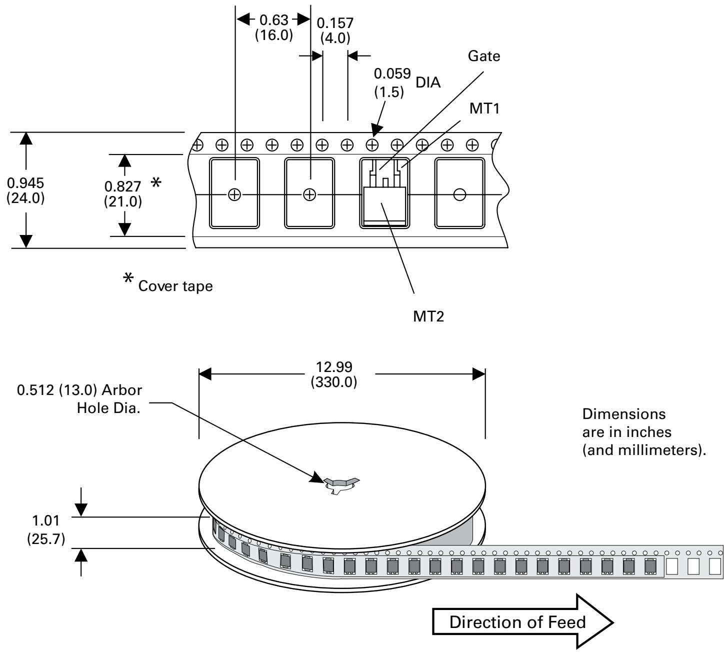
Packing Options

Part Number	Marking	Weight	Packing Mode	Base Quantity
Qxx15L/RyTP	Qxx15L/Ry	2.2 g	Tube Pack	1000 (50 per tube)
Qxx15NyTP	Qxx15Ny	1.6 g	Tube	1000 (50 per tube)
Qxx15NyRP	Qxx15Ny	1.6 g	Embossed Carrier	500
Qxx16L/RHyTP	Qxx16L/RHy	2.2 g	Tube Pack	1000 (50 per tube)
Qxx16NHyTP	Qxx16NHy	1.6 g	Tube	1000 (50 per tube)
Qxx16NHyRP	Qxx16NHy	1.6 g	Embossed Carrier	500

Note: xx = Voltage/10; y = Sensitivity

TO-263 Embossed Carrier Reel Pack (RP)

Meets all EIA-481-2 Standards



Part Numbering System

Q 60 16 L H4 56

DEVICE TYPE
Q: Triac or Alternistor

VOLTAGE RATING
40: 400V
60: 600V
80: 800V
K0: 1000V

CURRENT RATING
15: 15A
16: 16A

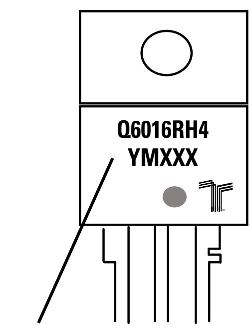
LEAD FORM DIMENSIONS
xx: Lead Form Option

SENSITIVITY & TYPE
Standard Triac
5: 50mA (QI, II, III)
Alternistor Triac
H2: 10mA (QI, II, III)
H3: 20mA (QI, II, III)
H4: 35mA (QI, II, III)
H6: 80mA (QI, II, III)

PACKAGE TYPE
L: TO-220 Isolated
R: TO-220 Non-Isolated
N: TO-263 (D^2-Pak)

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

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

Littelfuse:

QK016RH4 QK015R5 QK016RH6 QK016RH3 QK015L5 Q8016LH3 Q8016LH4 Q8016LH6 Q2015R5 Q2015L5 Q2016RH3 Q6016RH3 Q6016RH4 Q4016RH3 Q4016RH6 Q2016RH4 Q4016RH4 Q2016RH6 Q6016RH6 Q8008DH4 Q6015R5 QK016LH3 QK016LH4 QK016LH6 Q4015R5 Q4015L5 Q8016RH3 Q8016RH6 Q8016RH4 Q6016LH653 Q6016LH4 Q4016LH6 Q2016LH4 Q6016LH6 Q6016LH3 Q2016LH3 Q4016LH3 Q2016LH6 Q4016LH4 Q8008VH4 Q6015L5 Q8015L5 Q6015L558 Q6015L552 Q6015L556 Q4015L558 Q4015L556 Q4015L559 Q4015L555 Q4015L553 Q8015R5 Q4015N5RP Q8015N5RP Q6015N5RP Q2015N5RP QK015N5RP Q8015N5TP Q4015N5TP Q6015N5TP QK015N5TP Q6016LH651 QK016NH3RP QK016NH3TP QK016NH4TP QK016NH4RP Q8016RH4TP Q4015L5TP Q8015L5TP Q6015L5TP Q6016RH4TP Q6016LH6TP Q8016NH4TP Q8016NH4RP Q4016NH4TP Q4016NH4RP Q2016NH4RP Q2016NH4TP Q6016NH4TP Q6016NH4RP Q6016NH6TP Q6016NH6RP Q2016NH6RP Q2016NH6TP Q8016NH6TP Q8016NH6RP Q6015R5TP Q4016NH6TP Q4016NH6RP QK016NH6TP QK016NH6RP Q8016NH3RP Q8016NH3TP Q4016NH3RP Q4016NH3TP Q2016NH3TP Q2016NH3RP Q6016NH3RP Q6016NH3TP Q2015N5TP Q6016LH4TP