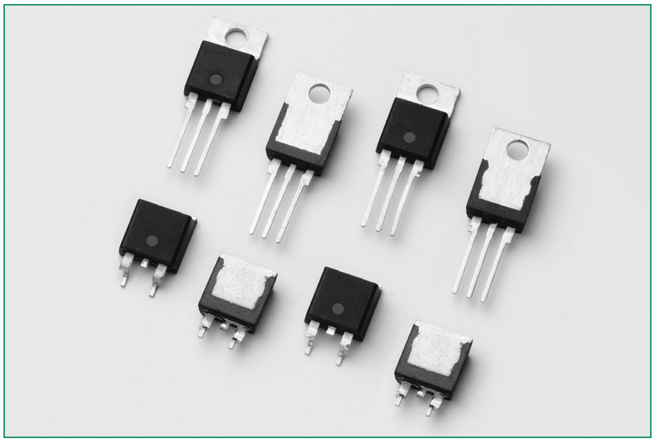
QJxx16xHx Series

16 Amp High Temperature Alternistor Triacs

HF RoHS



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

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.

Additional Information

Resources | Accessories | Samples

Agency Approval

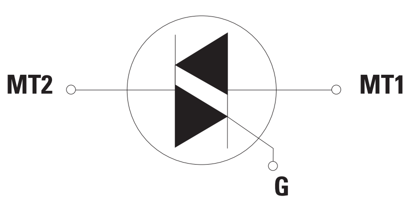
Agency	Agency File Number
UL	E71639*

* - 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

Schematic Symbol



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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 °C	16	A
		QJxx16RHy QJxx16NHy	T_C = 130 °C		
I_{TSM}	Non repetitive surge peak on-state current (Full cycle, T_J initial = 25°C)	f = 50Hz	t = 20 ms	167	A
		f = 60Hz	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 = 60Hz	T_J = 150 °C	100	A/μs
I_{GTM}	Peak gate trigger current	$t_p \le 10μs$; $I_{GT} \le I_{GTM}$	T_J = 150 °C	2.0	A
$P_{G(AV)}$	Average gate power dissipation		T_J = 150 °C	0.5	W
T_{stg}	Storage temperature range			-40 to 150	°C
T_J	Operating junction temperature range			-40 to 150	°C
V_{DSM} / V_{RSM}	Peak non-repetitive blocking voltage	Pulse Width =100μs	600V	V_{DRM}/V_{RRM}+100	V
V_{DSM} / V_{RSM}	Peak non-repetitive blocking voltage	Pulse Width =100μs	800V	V_{DRM}/V_{RRM}+200	V

xx = voltage/10, **y** = sensitivity

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

Symbol	Test Condition	Quadrant		QJxx16xH2	QJxx16xH3	QJxx16xH4	QJxx16xH5	QJxx16xH6	Unit
I_{GT}	V_D=12V R_L=60Ω	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=3.3KΩ T_J=150°C	I-II-III	MIN.	0.15					V
I_H	I_T=100mA		MAX.	15	35	50	50	70	mA
dv/dt	V_D=V_{DRM} Gate Open T_J=150°C	600V	MIN.	-	250	350	-	850	V/μs
		800V		-	-	400	500	-	
	V_D=2/3V_{DRM} Gate Open T_J=150°C	600V	MIN.	50	300	400	-	925	
		800V		-	600	700	700	-	
(dv/dt)c	(di/dt)c=8.6A/ms T_J=150°C		MIN.	2	20	25	30	30	V/μs
t_{gt}	I_G=2XI_{GT} PW=15s I_T=22.6A(pk)		TYP.	3	3	3	5	5	μs

Static Characteristics

Symbol	Test Conditions			Value	Unit
V_{TM}	I_T = 22.6A t_p = 380μs		MAX	1.60	V
I_{DRM} / I_{RRM}	@ V_{DRM} / V_{RRM}	T_J = 25°C	MAX	5	μA
		T_J = 150°C		4	mA

Thermal Resistances

Symbol	Parameter		Value	Unit
$R_{\Theta(J-C)}$	Junction to case (AC)	QJxx16RHy QJxx16NHy	0.90	°C/W
		QJxx16LHy	1.8	
$R_{\Theta(J-A)}$	Junction to ambient	QJxx16RHy QJxx16NHy	45	°C/W
		QJxx16LHy	50	

xx = voltage/10, **y** = sensitivity

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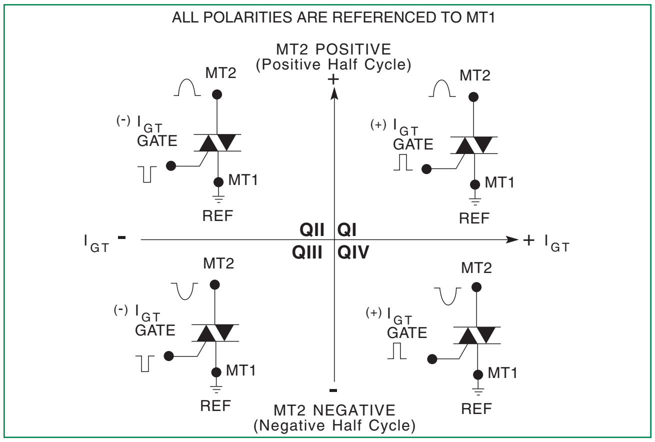
Figure 1:
Definition of Quadrants



Note: Alternistors will not operate in QIV

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

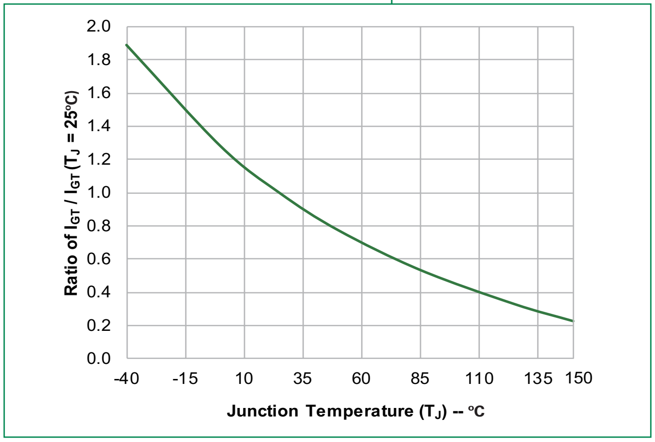


Figure 3:
Normalized DC Holding Current vs. Junction Temperature

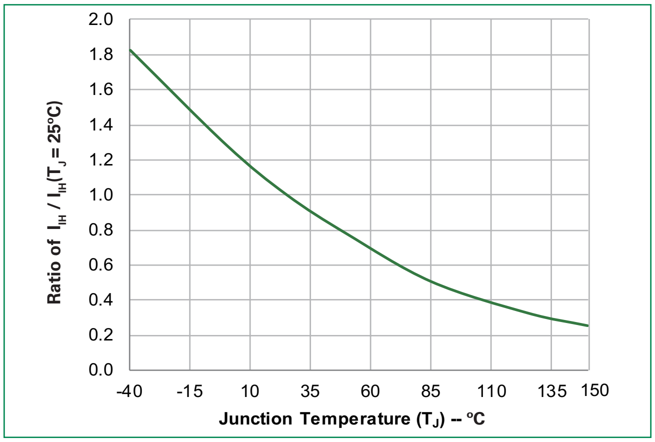


Figure 4:
Normalized DC gate trigger current for Quadrants I, II, and III vs Junction Temperature

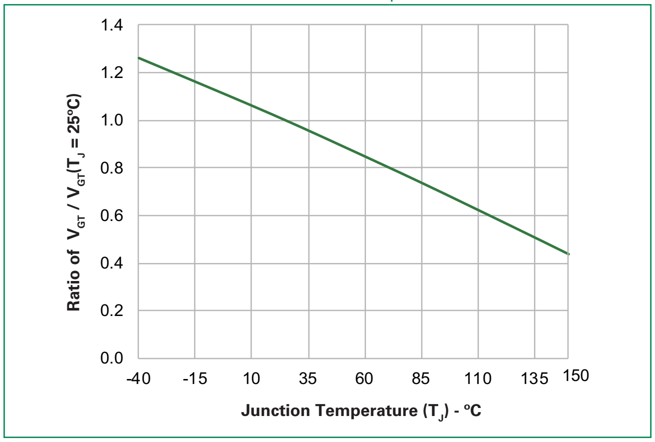


Figure 5:
Power Dissipation (Typical) vs. RMS On-State Current

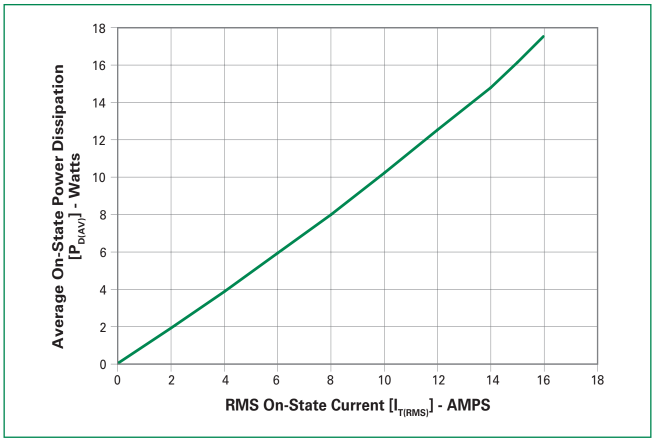


Figure 6:
On-State Current vs. On-State Voltage (Typical)

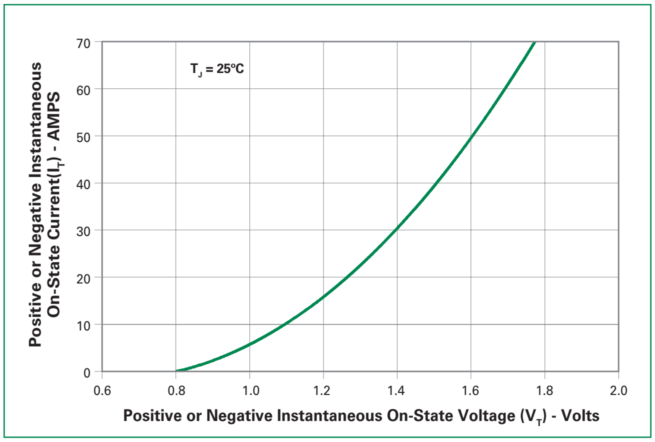


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Figure 7: Maximum Allowable Case Temperature vs. RMS On-State Current

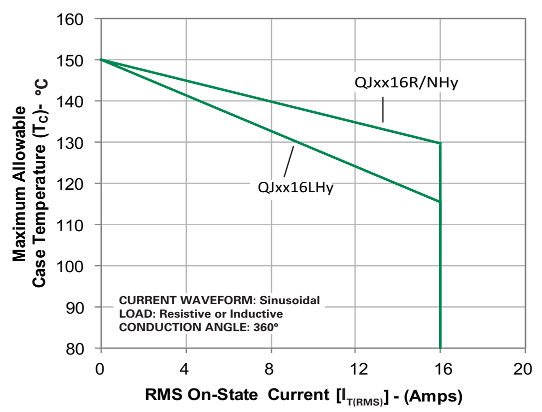
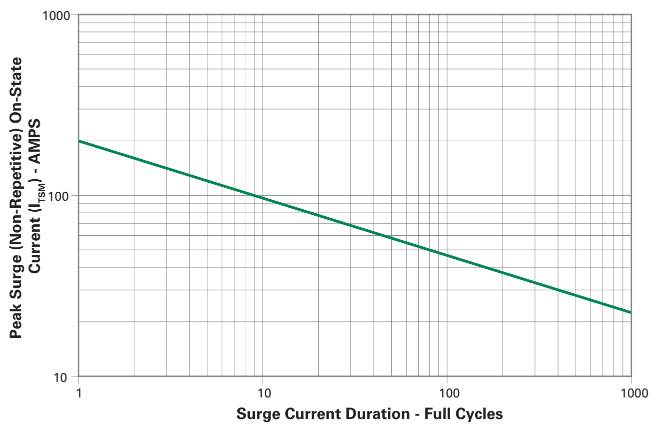


Figure 8: Surge Peak On-State Current vs. Number of Cycles

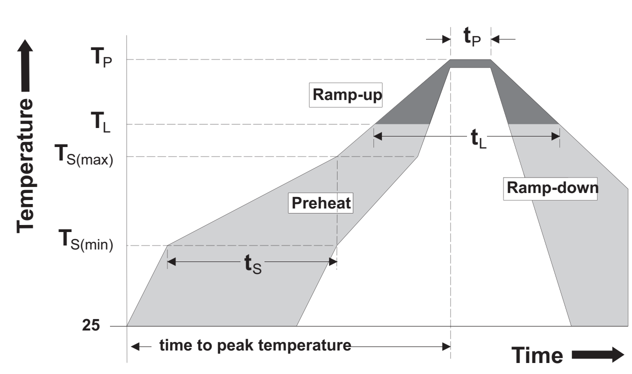


Supply Frequency: 60Hz Sinusoidal
Load: Resistive
RMS On-State [$I_{T(RMS)}$]: Max Rated Value at Specific Case Temperature

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 – 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



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Physical Specifications

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

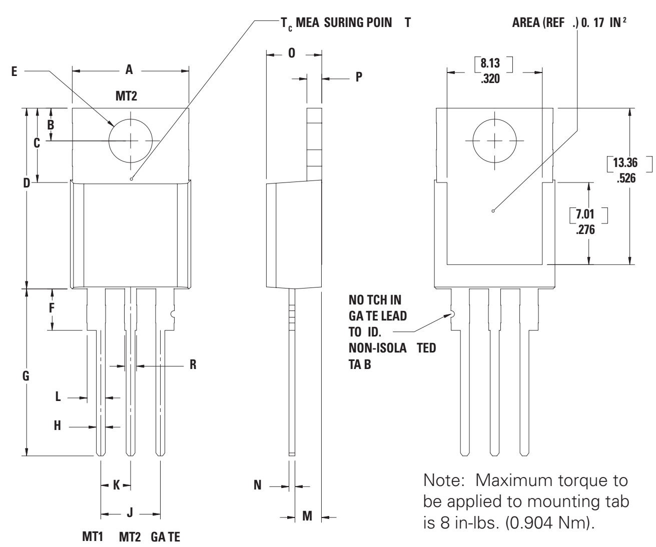
Design Considerations

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



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

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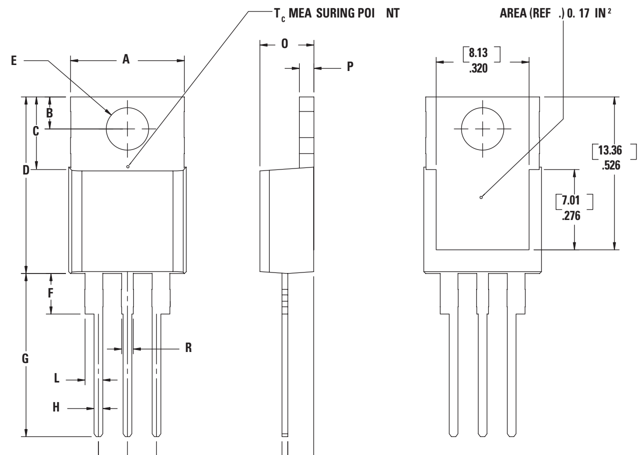
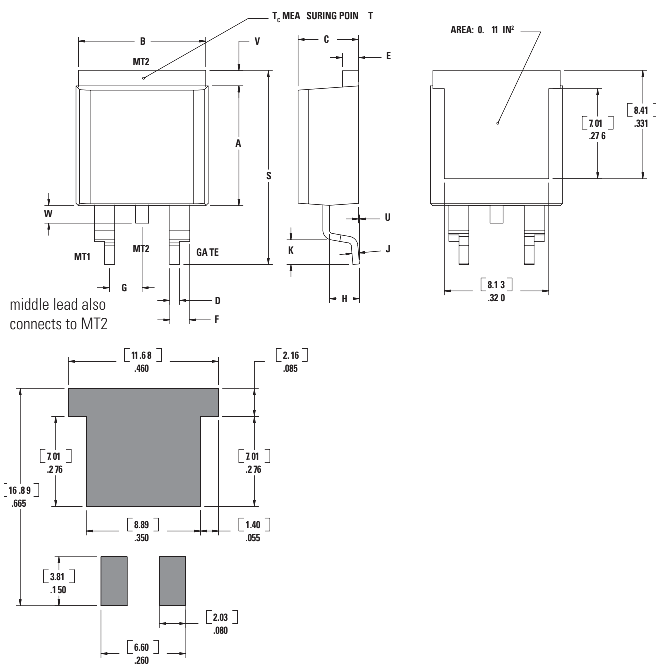
Dimensions — TO-220AB (L-Package) — Isolated Mounting Tab



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



middle lead also connects to MT2

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

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Product Selector

Part Number	Voltage			Gate Sensitivity Quadrants	Type	Package
	400V	600V	800V	I – II – III		
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 D²-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 D²-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 D²-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 D²-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 D²-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

QJ 60 16 L H4 56

Component Type
QJ: High T_J TRIAC or Alternistor

Voltage Rating
40: 400V
60: 600V
80: 800V

Current Rating
16: 16A

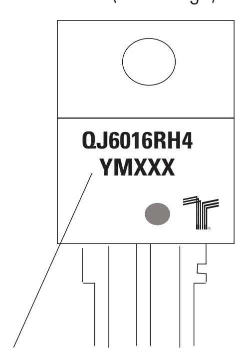
Package Type
L: TO-220 Isolated
R: TO-220 Non-Isolated
N: TO-263 (D²-Pak)

Lead Form Dimensions
xx: Lead Form Option

Sensitivity & Type
Alternistor Triac
H2: 10mA (QI, II, III)
H3: 20mA (QI, II, III)
H4: 35mA (QI, II, III)
H5: 50mA (QI, II, III)
H6: 80mA (QI, II, III)

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

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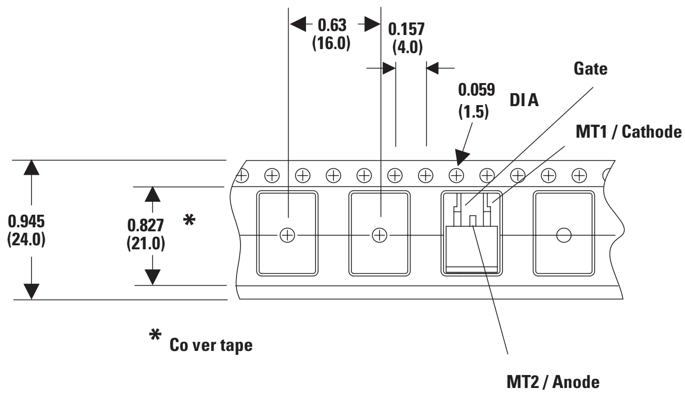
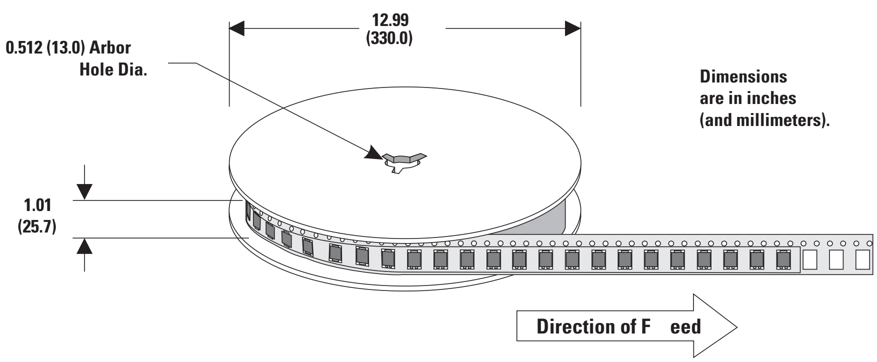
TO-263 Embossed Carrier Reel Pack (RP)
Meets all EIA-481-2 Standards





Revised: TK. 02/23/23