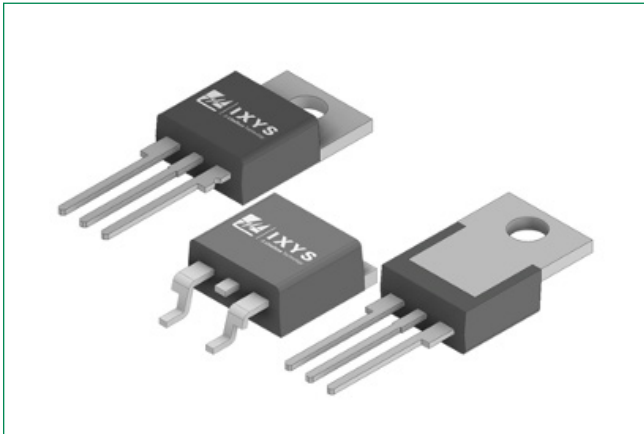


QJxx10xHx and QJxx10xx Series

10 A High Temperature Alternistor and Standard (High Communication) Triacs



Agency Approvals and Environmental

Environmental Approvals

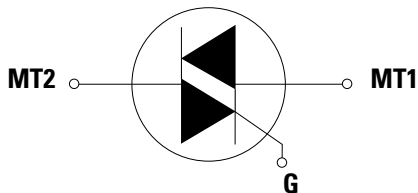


Note: UL recognition agency file number E71639 (L package only)

Main Features

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

Schematic Symbol



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 ITSM (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 quadrant I, II, and III, and offers high performance in applications requiring high commutation capability.

Features & Benefits

- Recognized to UL 1557 as an Electrically Isolated Semiconductor Device
- Glass-passivated junctions
- Surge capability up to 120 A and 60 Hz
- The L-package has an isolation rating of 2500 VRMS
- Solid-state switching eliminates arcing or contact bounce that creates voltage transients
- No contacts to wear out from reaction of switching events
- 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

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)	QJ8010LHy $T_c = 120^\circ\text{C}$	10	A
		QJ8010RHy QJ8010NHy $T_c = 130^\circ\text{C}$		
I_{TSM}	Non repetitive surge peak on-state current (full cycle, T_J initial = 25°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	A^2s
di/dt	Critical rate of rise of on-state current	f = 60 Hz, $T_J = 150^\circ\text{C}$	70	$\text{A}/\mu\text{s}$
I_{GTM}	Peak gate trigger current	$t_p = 20$ μs , $T_J = 150^\circ\text{C}$	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 μs	$V_{DRM}/V_{RRM} + 200$	V

Maximum Ratings – Standard Triac

Symbol	Parameter	Value	Unit	
V_{DSM}/V_{RSM}	Peak non-repetitive blocking voltage	Pulse Width = 100 μs 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_J initial = 25°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	A^2s
di/dt	Critical rate of rise of on-state current $I_G = 200\text{mA}$ with $\leq 0.1\mu\text{s}$ rise time	f = 60 Hz, $T_J = 150^\circ\text{C}$	70	$\text{A}/\mu\text{s}$
I_{GTM}	Peak gate trigger current	$t_p = 20$ μs , $T_J = 150^\circ\text{C}$	4	$\text{A}/\mu\text{s}$
$P_{G(AV)}$	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	$^\circ\text{C}$

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

Thermal Characteristics

Symbol	Parameter	Value	Unit	
$R_{\theta(J-C)}$	Thermal Resistance, junction-to-case (AC)	QJ8010RHy/QJ8010NHy QJ8010Ry/QJ8010Ny	1.2	$^\circ\text{C}/\text{W}$
		QJ8010LHy/QJ8010Ly	2.3	
$R_{\theta(J-A)}$	Thermal Resistance, junction-to-ambient (AC)	QJ8010RHy/QJ8010Ry	45	$^\circ\text{C}/\text{W}$
		QJ8010LHy/QJ8010Ly	90	

QJxx10xHx and QJxx10xx Series

10 A High Temperature Alternistor and Standard (High Communication) Triacs

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

Symbol	Description	Conditions	QJ8010xH3			QJ8010xH4			QJ8010xH5			Unit	
			MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX		
I _{GT}	DC Gate Trigger Current	V _D = 12 V, R _L = 60 Ω	I-II-III	-	-	10	-	-	35	-	-	50	mA
V _{GT}	DC Gate Trigger Voltage	V _D = 12 V, R _L = 60 Ω	I-II-III	-	-	1.3	-	-	1.3	-	-	1.3	V
V _{GD}	Gate Non-trigger Voltage	V _D = V _{DRM} , R _L = 3.3 kΩ, T _J = 150 °C	I-II-III	0.2	-	-	0.2	-	-	0.2	-	-	V
I _H	Holding Current	I _T = 100 mA		-	-	15	-	-	40	-	-	50	mA
dv/dt	Critical Rate-of-rise of Off-stage Voltage	V _D = V _{DRM} , Gate Open, T _J = 150 °C		150	-	-	450	-	-	700	-	-	V/μs
		V _D = 2/3 V _{DRM} , Gate Open, T _J = 150 °C		200	-	-	600	-	-	1000	-	-	
(dv/dt) _c		(di/dt) _c = 6.5 A/ms, T _J = 150 °C		10	-	-	20	-	-	30	-	-	V/μs
t _{gt}	Turn-on Time	I _G = 2 × I _{GT} , P _W = 15μs, I _T = 14.1 A(pk)		-	4	-	-	-	7	-	-	9	-

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

Symbol	Description	Conditions	Quadrant	Value		Unit	
				Qxx10x4	Qxx10x5		
I _{GT}	DC Gate Trigger Current	V _D = 12V R _L = 60 Ω	I – II – III IV	MAX.	25 50	50 50	mA
V _{GT}	DC Gate Trigger Voltage	V _D = 12V R _L = 60 Ω	ALL	MAX.	1.3		V
V _{GD}	Gate Non-trigger Voltage	V _D = V _{DRM} R _L = 3.3 kΩ T _J = 150°C	ALL	MIN.	0.2		V
I _H	Holding Current	I _T = 100mA		MAX.	35	50	mA
dv/dt	Critical Rate-of-rise of Off-stage Voltage	V _D = V _{DRM} Gate Open T _J = 150°C	800V	MIN.	600	1000	V/μs
		V _D = 2/3 V _{DRM} Gate Open T _J = 150°C			800	1200	
(dv/dt) _c		(di/dt) _c = 6.5 A/ms T _J = 150°C		TYP.	3	4	V/μs
t _{gt}	Turn-on Time	I _G = 2 × I _{GT} P _W = 15μs I _T = 14.1 A(pk)	I – II – III IV	TYP.	1-2-6 10	1-2-6 11	μs

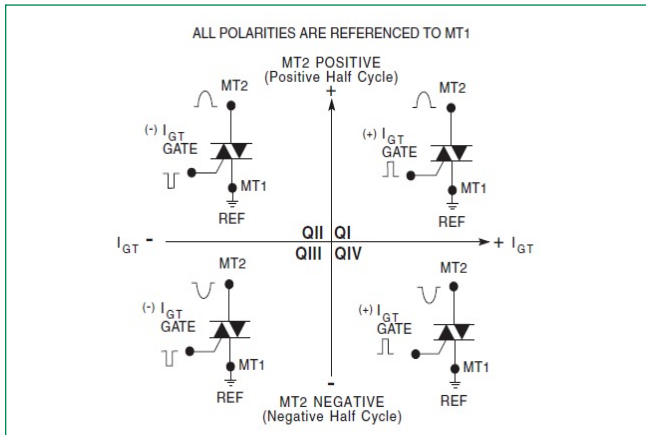
Static Characteristics

Symbol	Description	Conditions	Maximum Value	Unit
V _{TM}	Peak On-state Voltage	I _{TM} = 14.1A t _p = 380 μs	1.60	V
I _{DRM} /I _{RRM}	Off-state Current, Peak Repetitive	V _D = V _{DRM} = V _{RRM} , T _J = 25°C	10	μA
		V _D = V _{DRM} = V _{RRM} , T _J = 150°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

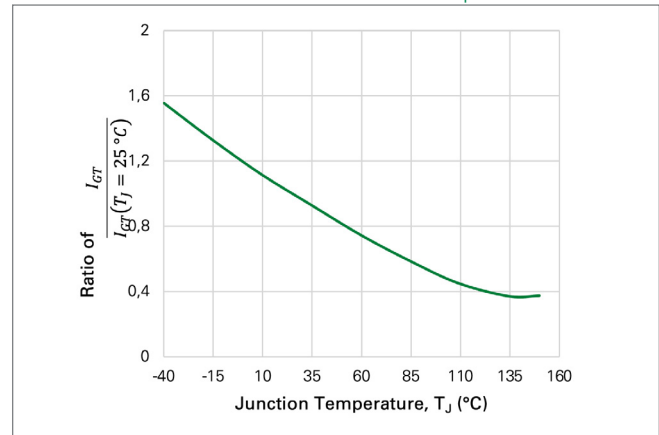


Figure 3:
Normalized DC Holding Current vs. Junction Temperature

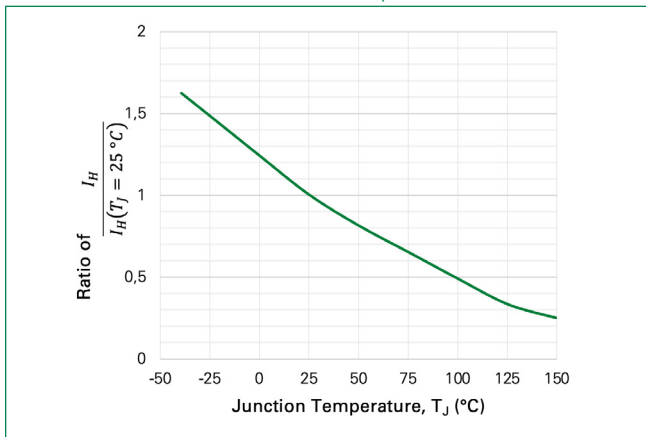


Figure 4:
Normalized DC Gate Trigger Voltage for All Quadrants vs. Junction Temperature

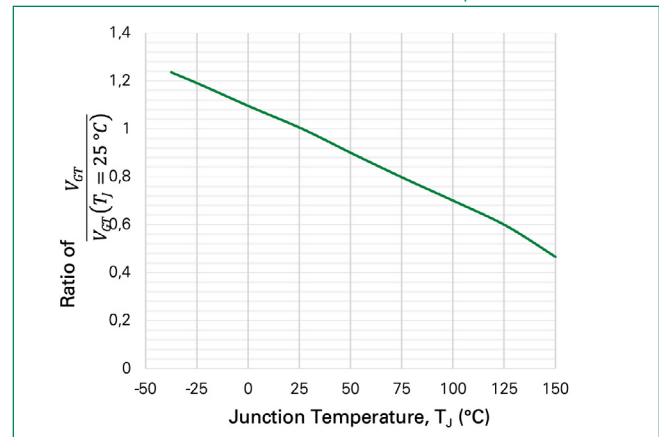


Figure 5:
Power Dissipation (Typical) vs. RMS On-State Current

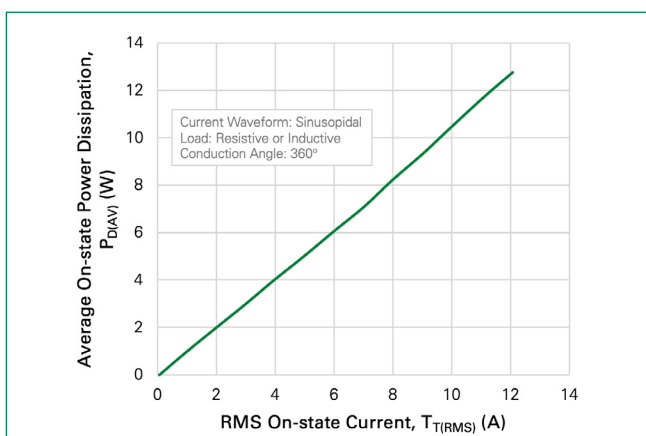
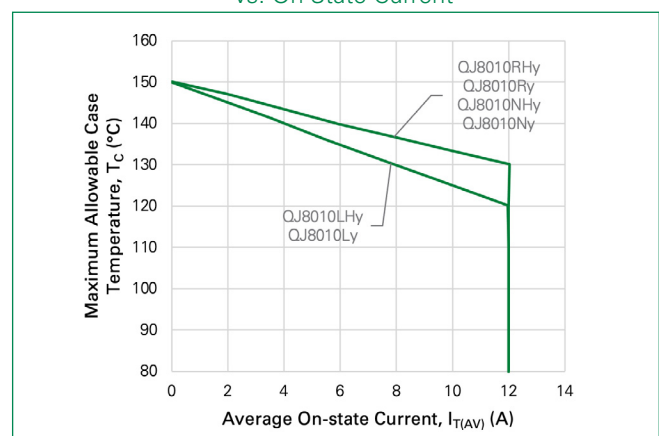


Figure 6:
Maximum Allowable Case Temperature vs. On-State Current



QJxx10xHx and QJxx10xx Series

10 A High Temperature Alternistor and Standard (High Communication) Triacs

Figure 7:

Typical On-state Current vs. On-state Voltage

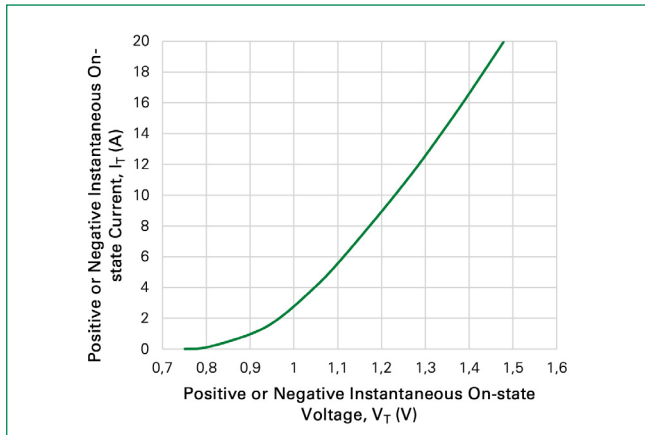
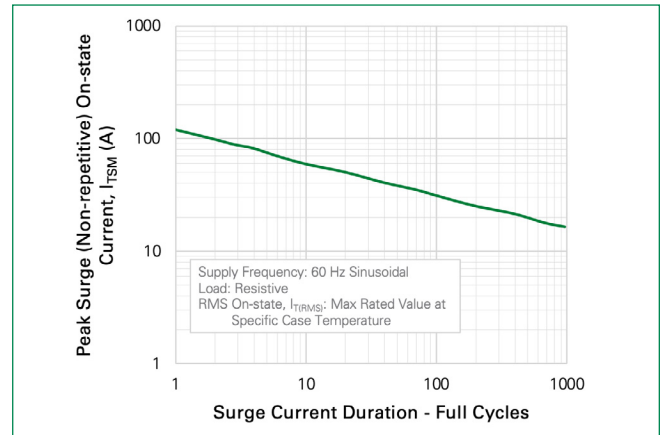


Figure 8:

Surge Peak On-state Current vs. Number of Cycles



Notes:

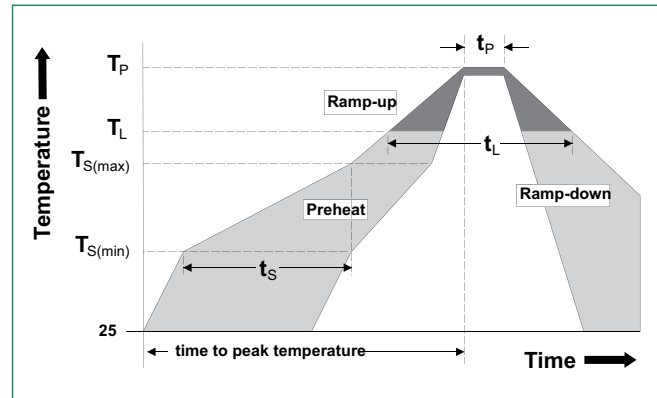
1. Gate control may be lost during and immediately following surge current interval.
2. Overload may not be repeated until junction temperature has returned to steady-state rated value

QJxx10xHx and QJxx10xx Series

10 A High Temperature Alternistor and Standard (High Communication) Triacs

Soldering Parameters

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_p)	60 to 180 s
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
	- Time (min to max) (t_s)	60 to 150 seconds
Peak Temperature (T_p)	260 °C (± 5 °C)	
Time within 5°C of actual peak Temperature (t_p)	20 to 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 epoxy meeting flammability classification 94V-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.

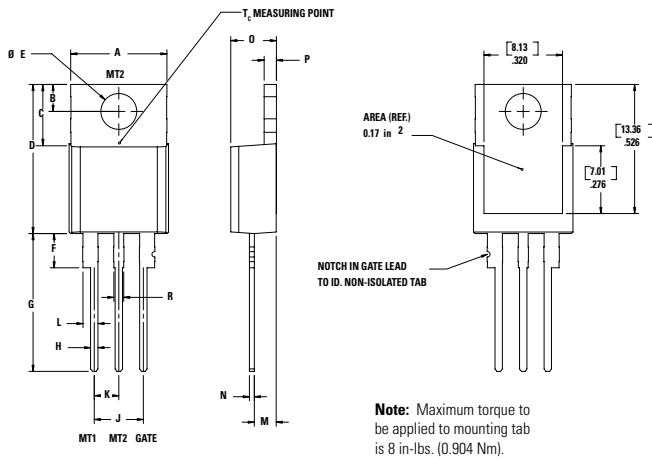
Environmental Specifications

Test	Specifications and Conditions
AC Blocking	MIL-STD-750, M-1040, Cond A Applied Peak AC voltage @ 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

QJxx10xHx and QJxx10xx Series

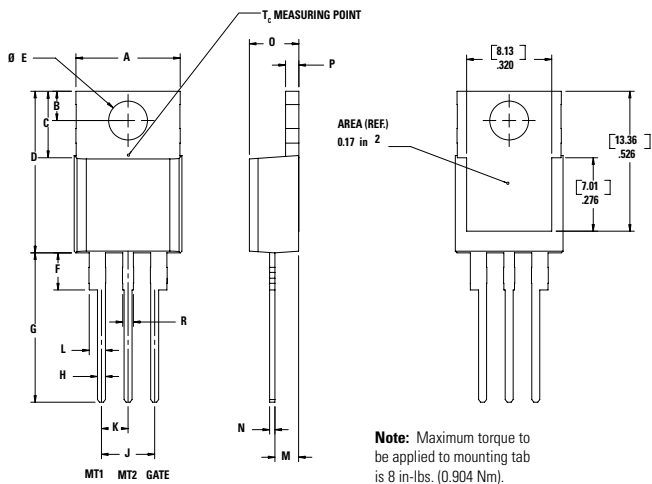
10 A High Temperature Alternistor and Standard (High Communication) Triacs

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

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

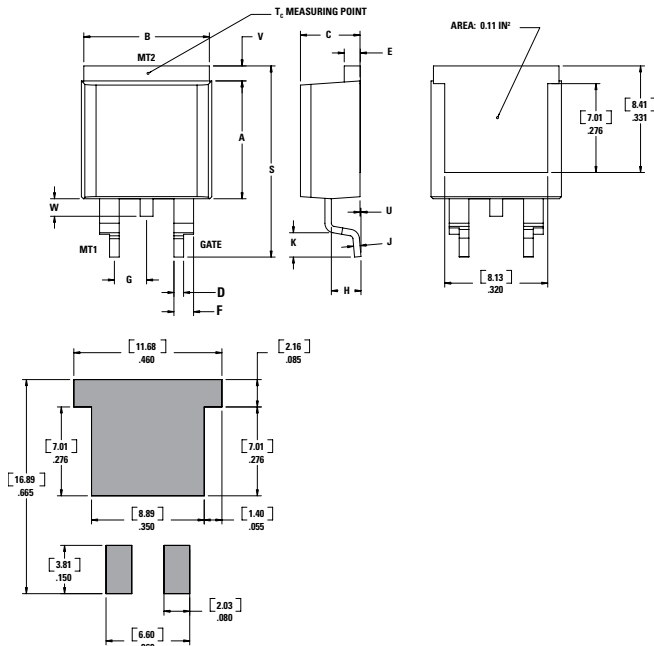


Dimension	Millimeters		Inches	
	Min	Max	Min	Max
A	0.380	0.420	9.65	10.67
B	0.105	0.115	2.67	2.92
C	0.230	0.250	5.84	6.35
D	0.590	0.620	14.99	15.75
E	0.142	0.147	3.61	3.73
F	0.110	0.130	2.79	3.30
G	0.540	0.575	13.72	14.61
H	0.025	0.035	0.64	0.89
J	0.195	0.205	4.95	5.21
K	0.095	0.105	2.41	2.67
L	0.060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

QJxx10xHx and QJxx10xx Series

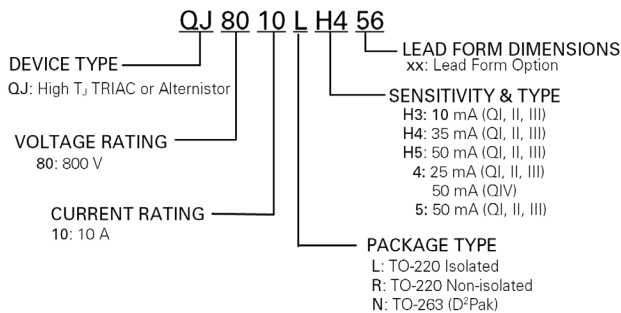
10 A High Temperature Alternistor and Standard (High Communication) Triacs

Dimensions - TO-263AB (N-Package) - D2-PAK Surface Mount

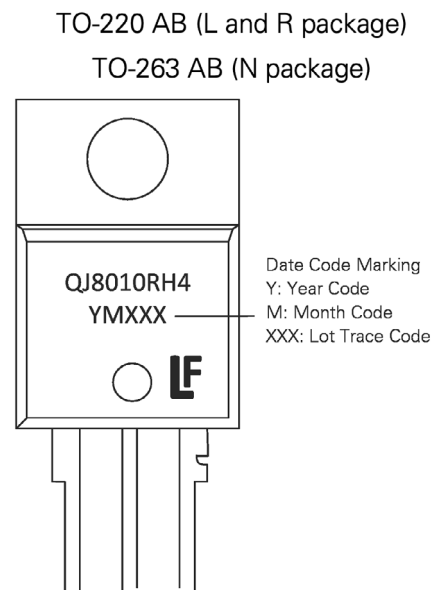


Dimension	Inches		Millimeters	
	Min	Max	Min	Max
A	0.360	0.370	9.14	9.40
B	0.380	0.420	9.65	10.67
C	0.178	0.188	4.52	4.78
D	0.025	0.035	0.64	0.89
E	0.045	0.060	1.14	1.52
F	0.060	0.075	1.52	1.91
G	0.095	0.105	2.41	2.67
H	0.092	0.102	2.34	2.59
J	0.018	0.024	0.46	0.61
K	0.090	0.110	2.29	2.79
S	0.590	0.625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

Part Numbering System



Part Marking System



QJxx10xHx and QJxx10xx Series

10 A High Temperature Alternistor and Standard (High Communication) Triacs

Product Selector

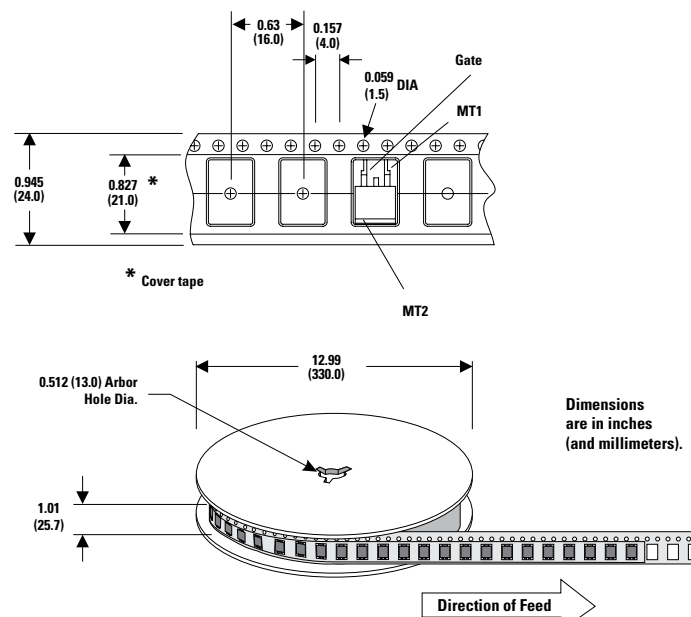
Part Number	Gate Sensitivity Quadrants		Type	Package
	I – II – III	IV		
QJ8010LH3	10 mA	-	Alternistor Triac	TO-220L
QJ8010RH3	10 mA	-	Alternistor Triac	TO-220R
QJ8010NH3	10 mA	-	Alternistor Triac	TO-263 D ² PAK
QJ8010LH4	35 mA	-	Alternistor Triac	TO-220L
QJ8010RH4	35 mA	-	Alternistor Triac	TO-220R
QJ8010NH4	35 mA	-	Alternistor Triac	TO-263 D ² PAK
QJ8010LH5	50 mA	-	Alternistor Triac	TO-220L
QJ8010RH5	50 mA	-	Alternistor Triac	TO-220R
QJ8010NH5	50 mA	-	Alternistor Triac	TO-263 D ² PAK
QJ8010L4	25 mA	50 mA	Standard Triac	TO-220L
QJ8010R4	25 mA	50 mA	Standard Triac	TO-220R
QJ8010N4	25 mA	50 mA	Standard Triac	TO-263 D ² PAK
QJ8010L5	50 mA	TYP 75 mA	Standard Triac	TO-220L
QJ8010R5	50 mA	TYP 75 mA	Standard Triac	TO-220R
QJ8010N5	50 mA	TYP 75 mA	Standard Triac	TO-263 D ² PAK

Packing Options

Part Number	Marking	Weight	Packing Mode	M.O.Q
QJ8010RH _y TP	QJ8010RH _y	2.2 g	Tube Pack	1000 (50 per tube)
QJ8010LH _y TP	QJ8010LH _y	2.2 g	Tube Pack	1000 (50 per tube)
QJ8010NH _y TP	QJ8010NH _y	1.6 g	Tube Pack	1000 (50 per tube)
QJ8010NH _y RP	QJ8010NH _y	1.6 g	Embossed Carrier	500
QJ8010L _y TP	QJ8010L _y	2.2 g	Tube Pack	1000 (50 per tube)
QJ8010R _y TP	QJ8010R _y	2.2 g	Tube Pack	1000 (50 per tube)
QJ8010N _y TP	QJ8010N _y	1.6 g	Tube Pack	1000 (50 per tube)
QJ8010N _y RP	QJ8010N _y	1.6 g	Embossed Carrier	500

TO-263 Embossed Carrier Reel Pack (RP) Specifications

Meets all EIA-481-2 Standards



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