Qxx10xx & Qxx10xHx Series

10 Amp Standard & Alternistor (High Commutation) Triacs

Absolute Maximum Ratings — Standard Triac

Symbol	Parameter			Value	Unit
$I_{T(RMS)}$	RMS on-state current (full sine wave)	Qxx10Ry/Qxx10Ny	T_C = 95°C	10	A
		Qxx10Ly	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	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 = 200mA with ≤ 0.1µs rise time	f = 120 Hz	T_J = 125°C	70	A/µs
I_{GTM}	Peak gate trigger current	$t_p \le 10$ µs $I_{GT} \le I_{GTM}$	T_J = 125°C	1.8	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

Absolute Maximum Ratings — Alternistor Triac (3 Quadrants)

Symbol	Parameter			Value	Unit
$I_{T(RMS)}$	RMS on-state current (full sine wave)	Qxx10LHy	T_C = 90°C	10	A
		Qxx10RHy/Qxx10NHy	T_C = 95°C		
I_{TSM}	Non repetitive surge peak on-state current (full cycle, T_J initial = 25°C)	f = 50 Hz	t = 20 ms	110	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 = 120 Hz	T_J = 125°C	70	A/µs
I_{GTM}	Peak gate trigger current	$t_p \le 10$ µs $I_{GT} \le I_{GTM}$	T_J = 125°C	2.0	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

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

Symbol	Test Conditions	Quadrant		Qxx10x4	Qxx10x5	Unit
I_{GT}	V_D = 12V R_L = 60 Ω	I – II – III	MAX.	25	50	mA
		IV		50	75 (TYP)	
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	ALL	MIN.	0.2		V
I_H	I_T = 200mA		MAX.	35	50	mA
dv/dt	$V_D = V_{DRM}$ Gate Open T_J = 125°C	400V	MIN.	150	225	V/µs
		600V		100	200	
		800V		75	175	
	$V_D = V_{DRM}$ Gate Open T_J = 100°C	1000V		50	150	
(dv/dt)c	(di/dt)c = 5.4 A/ms T_J = 125°C		TYP.	2	4	V/µs
t_{gt}	I_G = 2 x IGT PW = 15µs I_T = 14.1 A(pk)		TYP.	3.0	3.0	µs

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

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Qxx10xx & Qxx10xHx Series

10 Amp Standard & Alternistor (High Commutation) Triacs

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

Symbol	Test Conditions	Quadrant		Value		Unit
				Qxx10xH2	Qxx10xH5	
I_{GT}	V_D=12V, R_L=60Ω	I-II-III	MAX	5	50	m A
V_{GT}			MAX	1.3	1.3	V
V_{GD}	V_D=V_{DRM}, R_L=3.3kΩ,T_J=125°C		MIN	0.2	0.2	V
I_H	Initial I_T=100mA		MAX	10	50	m A
dv/dt	V_D=V_{DRM}, Gate Open, T_J=125°C	400V	MIN.	-	750	V/us
		600V		-	650	
		800V		-	500	
	V_D=V_{DRM}, Gate Open, T_J=100°C	1000V		-	300	
	V_D=2/3V_{DRM}, Gate Open,T_J=125°C	800V		150	-	
(dv/dt)/c	(di/dt)/c=5.4 A/ms, T_J=125°C		TYP.	3.5	30	V/us
tgt	IG = 2 X IGT, PW=15µs, I_T=14.1A(pk)		TYP.	3	4	µs

Static Characteristics

Symbol	Test Conditions				Value	Unit
V_{TM}	I_{TM} = 14.1A t_p = 380 µs			MAX.	1.60	V
I_{DRM} I_{RRM}	V_{DRM} = V_{RRM}	T_J = 25°C	400 - 600V	MAX.	10	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)	Qxx10Ryy/Qxx10Nyy	1.3	°C/W
		Qxx10Lyy	2.6	
$R_{\Theta(J-A)}$	Junction to ambient (AC)	Qxx10Ryy	45	°C/W
		Qxx10Lyy	50	

Note: xx = voltage, x = package, y = sensitivity, yy = type & sensitivity

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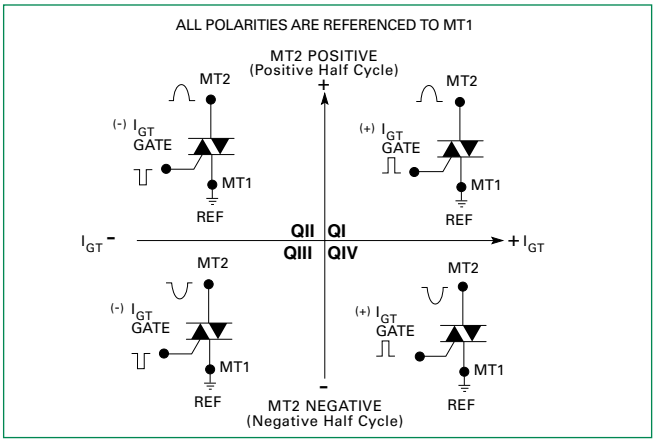
10 Amp Standard & Alternistor (High Commutation) Triacs

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

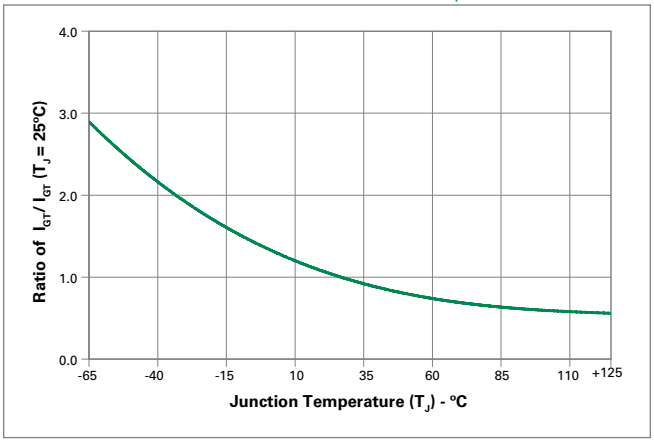


Figure 3:
Normalized DC Holding Current vs. Junction Temperature

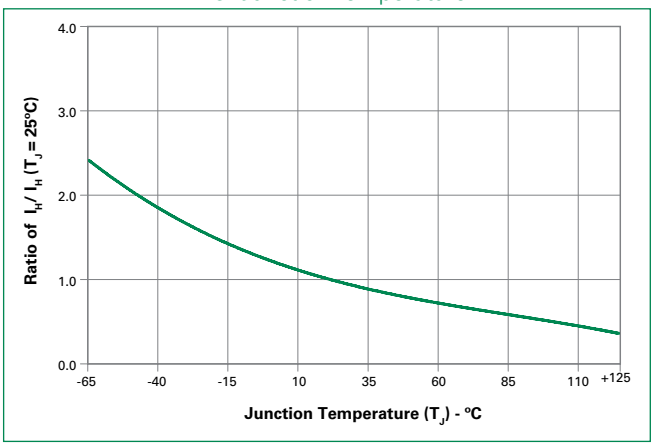


Figure 4:
Normalized DC Gate Trigger Voltage for All Quadrants vs. Junction Temperature

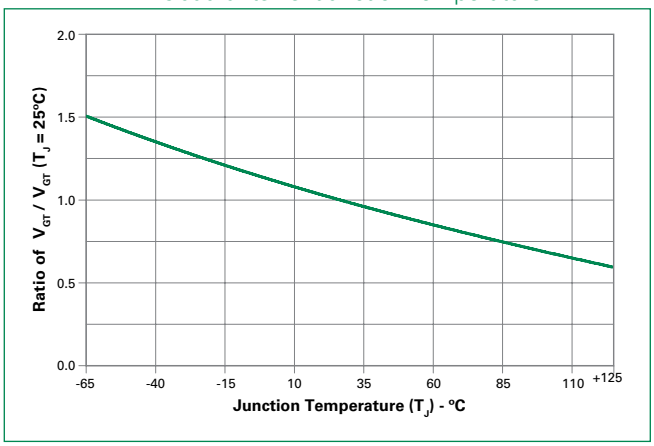


Figure 5:
Power Dissipation (Typical) vs. RMS On-State Current

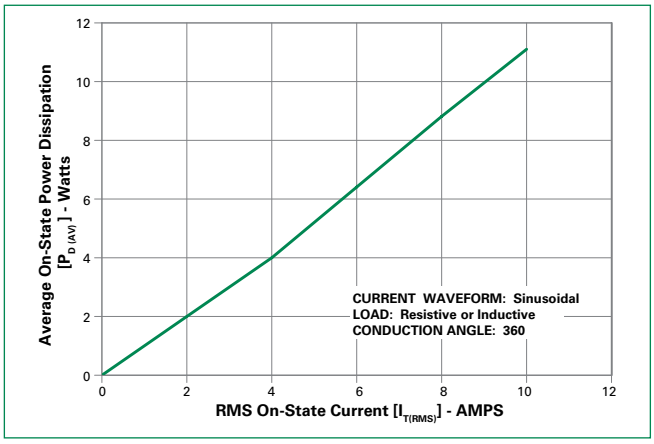
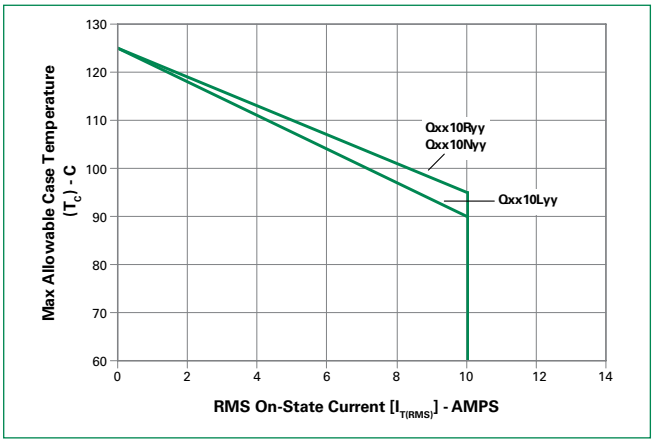


Figure 6:
Maximum Allowable Case Temperature vs. On-State Current



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Qxx10xx & Qxx10xHx Series
10 Amp Standard & Alternistor (High Commutation) Triacs

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

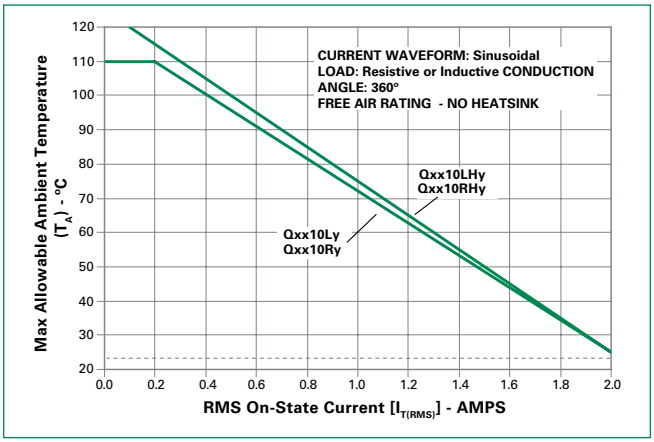


Figure 8:
On-State Current vs. On-State Voltage (Typical)

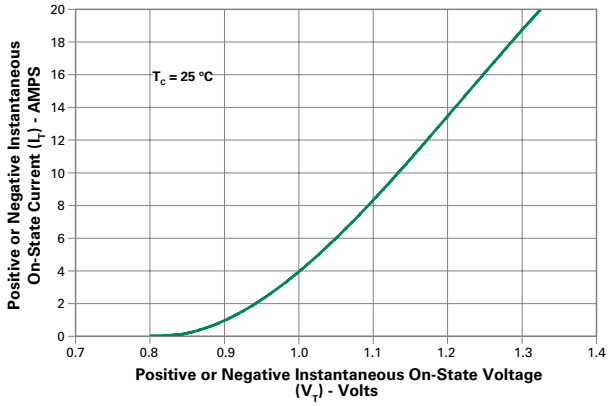
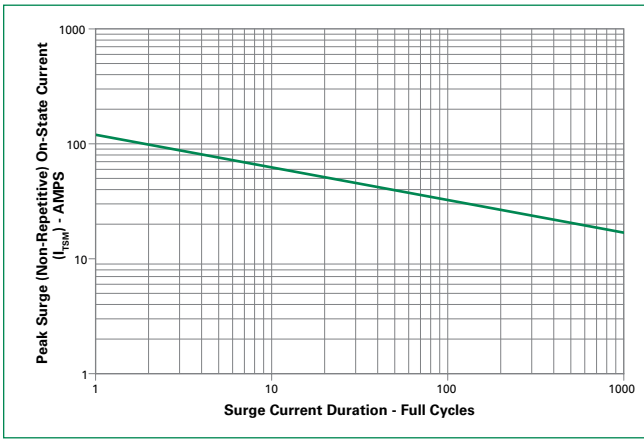


Figure 9:
Surge Peak On-State Current vs. Number of Cycles



SUPPLY FREQUENCY: 60 Hz Sinusoidal
LOAD: Resistive
RMS On-State Current: [$I_{T(RMS)}$]: Maximum Rated Value at Specified Case Temperature

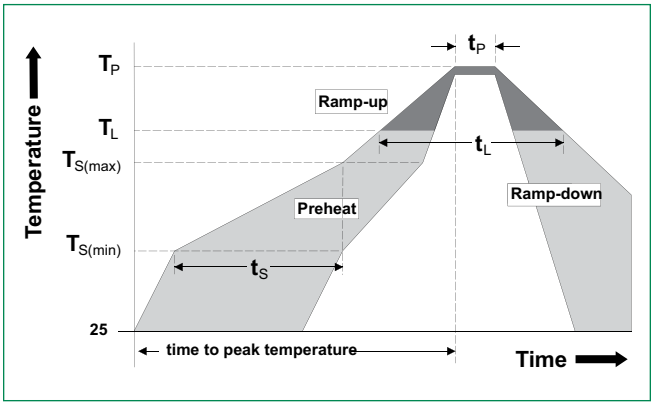
Notes:
1. Gate control may be lost during and immediately following surge current interval.
2. Overload may not be repeated until junction temperature has returned to steady-state rated value.

Qxx10xx & Qxx10xHx Series

10 Amp Standard & Alternistor (High Commutation) 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_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
	- Time (min to max) (t_s)	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 epoxy meeting flammabilty classification 94V-0.
Terminal Material	Copper Alloy

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

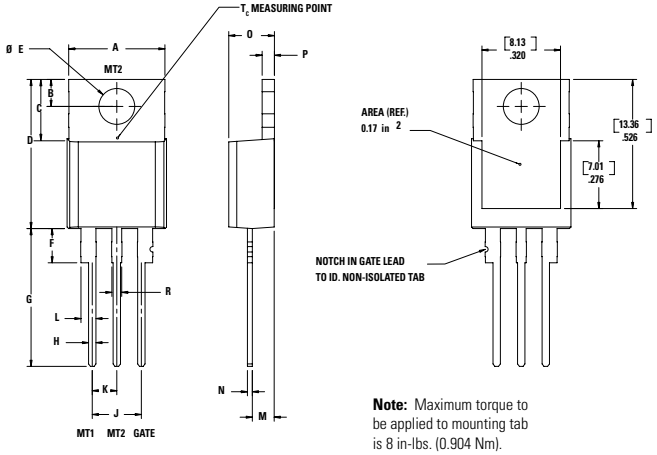
Design Considerations

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.

Qxx10xx & Qxx10xHx Series

10 Amp Standard & Alternistor (High Commutation) Triacs

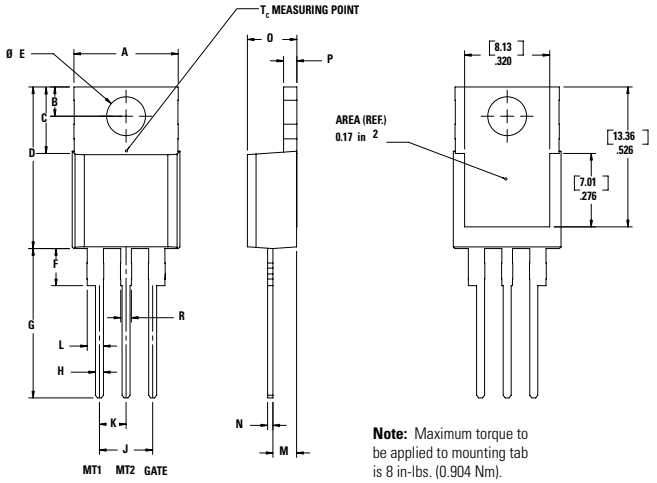
Dimensions - TO-220AB (R-Package) - Non-Isolated Mounting Tab Common with Center Lead



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	2.67	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	0.965	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	14.61
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	0.965	1.22

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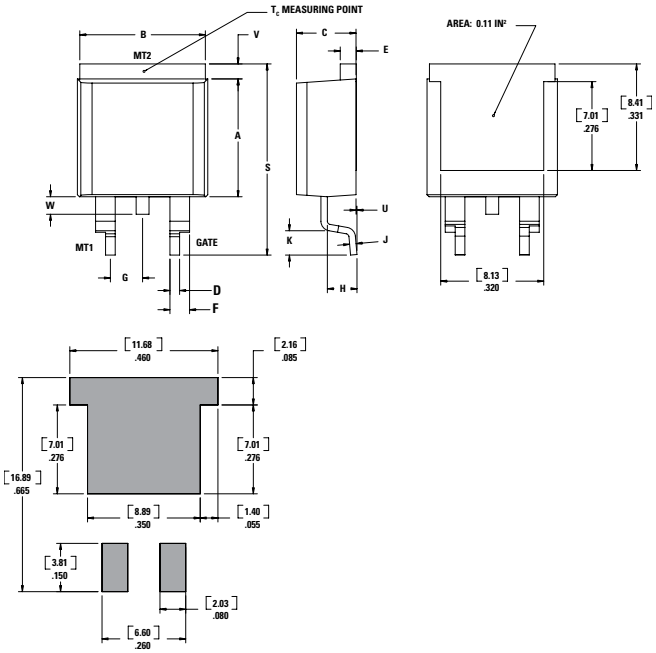
Qxx10xx & Qxx10xHx Series

10 Amp Standard & Alternistor (High Commutation) 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	1.016	1.78

Product Selector

Part Number	Voltage (xx)				Gate Sensitivity Quadrants		Type	Package
	400V	600V	800V	1000V	I – II – III	IV		
Qxx10LH2	-	-	X	-	5 mA	-	Alternistor Triac	TO-220L
Qxx10RH2	-	-	X	-	5 mA	-	Alternistor Triac	TO-220R
Qxx10NH2	-	-	X	-	5 mA	-	Alternistor Triac	TO-263 D2-PAK
Qxx10L4	X	X	X	X	25 mA	50 mA	Standard Triac	TO-220L
Qxx10R4	X	X	X	X	25 mA	50 mA	Standard Triac	TO-220R
Qxx10N4	X	X	X	X	25 mA	50 mA	Standard Triac	TO-263 D²-PAK
Qxx10L5	X	X	X	X	50 mA	-	Standard Triac	TO-220L
Qxx10R5	X	X	X	X	50 mA	TYP. 75 mA	Standard Triac	TO-220R
Qxx10N5	X	X	X	X	50 mA	TYP. 75 mA	Standard Triac	TO-263 D²-PAK
Qxx10LH5	X	X	X	X	50 mA	TYP. 75 mA	Alternistor Triac	TO-220L
Qxx10RH5	X	X	X	X	50 mA	-	Alternistor Triac	TO-220R
Qxx10NH5	X	X	X	X	50 mA	-	Alternistor Triac	TO-263 D²-PAK

Packing Options

Part Number	Marking	Weight	Packing Mode	Base Quantity
Qxx10L/RyyTP	Qxx10L/Ryy	2.2 g	Tube Pack	1000 (50 per tube)
Qxx10NyyTP	Qxx10Nyy	1.6 g	Tube	1000 (50 per tube)
Qxx10NyyRP	Qxx10Nyy	1.6 g	Embossed Carrier	500

Note: xx = voltage, yy = type & sensitivity

Qxx10xx & Qxx10xHx Series

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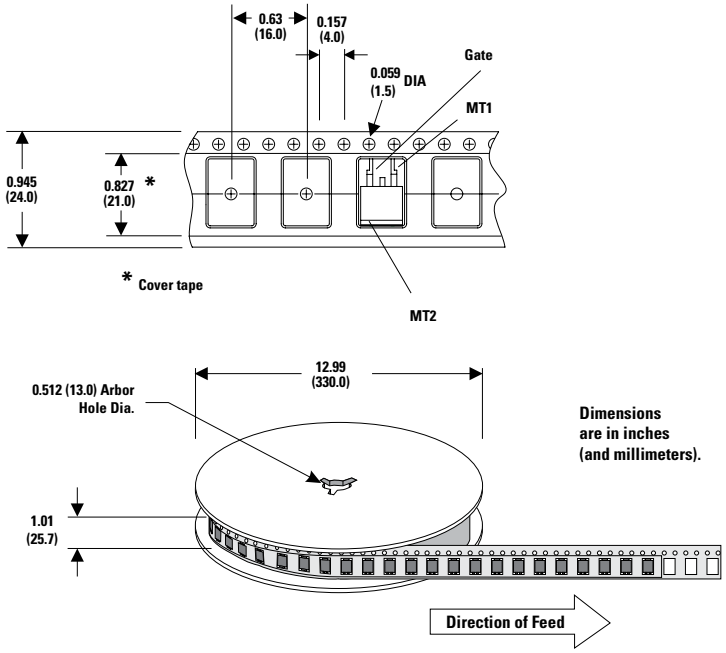
TO-263 Embossed Carrier Reel Pack (RP) Specifications

Meets all EIA-481-2 Standards



Part Numbering System

Q 60 10 L H5 56

DEVICE TYPE
Q: Triac or Alternistor

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

CURRENT RATING
10: 10A

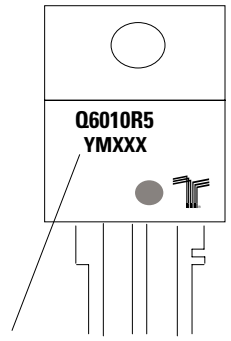
PACKAGE TYPE
L: TO-220 Isolated
R: TO-220 Non-Isolated
N: TO-263 (D^2Pak)

SENSITIVITY
Standard Triac:
4: 25 mA (QI, II, III)
50 mA (QIV)
5: 50 mA (QI, II, III)
Alternistor Triac:
H2: 5mA(QI, II, II)
H5: 50mA (QI, II, III)

LEAD FORM DIMENSIONS
xx: Lead Form Option

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

Revised: GD. 05/10/21

Mouser Electronics

Authorized Distributor

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

Littelfuse:

Q4010L4 Q4010R5 Q4010R4 Q4010L5 Q4004F311 Q4004F312 Q2004F341 Q4004F321 Q2010R5 Q4015R567 Q4016RH667 Q2004F411 Q4010RH5 Q2010RH5 Q6010RH5 Q8010R5 Q2004V4 Q6004V3 Q8010RH5 Q2004F441 Q2004F41 Q2004F42 Q8010L5 Q8010R4 Q8010L4 Q6025K681 QK010LH5 Q2008F443 Q6X8E3 Q6X8E4 Q4006R455 Q6010L5 Q4025L659 Q4025L658 Q2004F32 Q4004F32 Q4004F31 Q8010LH568 Q6008R567 Q4010L555 Q6010L555 Q6010L568 Q4010L553 QK010L5 QK010L4 QK010R5 QK010R4 Q6040K781 Q6010F51 Q2010R4 Q2010L4 Q2010L5 Q4010R552 Q6025J681 Q6010R4 Q6010R5 Q6010L4 Q4X8E4 Q4X8E3 Q4010LH5 Q6010LH5 Q2010LH5 Q2006F441 Q8010LH5 Q6016RH657 Q6010L568RP Q6010NH5TP Q6010NH5RP Q2010NH5RP Q6010N4RP Q2010N4RP Q8010N4RP Q4010N4RP QK010N4RP Q2010N4TP Q6010N4TP Q4010N4TP Q8010N4TP QK010N4TP Q4010R5_ Q4010R5TP Q8010R5TP Q6010L555TP QK010NH5TP QK010NH5RP Q4010NH5RP Q4010NH5TP Q8010NH5TP Q8010NH5RP QK010N5TP Q8010N5TP Q4010N5TP Q2010N5TP Q6010N5TP Q4010N5RP Q8010N5RP Q6010N5RP Q2010N5RP QK010N5RP Q2012LH2