

Qxx25PH5-x & Qxx35PH5-x & Qxx40PH5-x Series



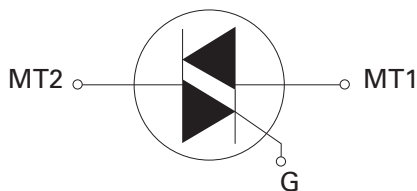
Agency Approval

Agency	Agency File Number
	E71639

Main Features

Symbol	Value	Unit
$I_{T(RMS)}$	25, 35, 40	A
V_{DRM}/V_{RRM}	400 & 600	V
I_{GT}	50	mA

Schematic Symbol



Description

25 Amp / 35Amp / 40Amp bi-directional 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 type devices only operate in quadrants I, II, & III and are used in circuits requiring high dv/dt capability.

Features & Benefits

- RoHS compliant
- Glass – passivated junctions
- Voltage capability up to 600 V
- Electrically isolated package “FASTPAK” is UL recognized for 2500Vrms

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 extremely inductive loads requiring highest commutation performance.

Internally constructed isolated packages are offered for ease of heat sinking with highest isolation voltage.

Absolute Maximum Ratings — Alternistor Triac (3 Quadrants)

Symbol	Parameter			Value	Unit
$I_{T(RMS)}$	RMS on-state current (full sine wave)	Qxx25PH5-x	$T_c = 71^{\circ}C$	25	A
		Qxx35PH5-x	$T_c = 90^{\circ}C$	35	
		Qxx40PH5-x	$T_c = 79^{\circ}C$	40	
I_{TSM}	Non repetitive surge peak on-state current (full cycle, T_j initial = $25^{\circ}C$)	Qxx25PH5-x	f = 50 Hz	208	A
			f = 60 Hz	250	
		Qxx35PH5-x Qxx40PH5-x	f = 50 Hz	300	A
			f = 60 Hz	350	
I^2t	I^2t Value for fusing	Qxx25PH5-x	$t_p = 8.3\text{ ms}$	260	A^2s
		Qxx35PH5-x Qxx40PH5-x		508	
di/dt	Critical rate of rise of on-state current ($I_g = 200mA$ with $\leq 0.1\mu s$ rise time)	Qxx25PH5-x	f = 60 Hz, $T_j = 125^{\circ}C$	100	$A/\mu s$
		Qxx35PH5-x Qxx40PH5-x		150	
I_{GTM}	Peak gate trigger current	Qxx25PH5-x	$T_j = 125^{\circ}C$ $t_p \leq 10\mu s$ $I_{GT} \leq I_{GTM}$	2	A
		Qxx35PH5-x Qxx40PH5-x		4	
$P_{G(AV)}$	Average gate power dissipation	Qxx25PH5-x	$T_j = 125^{\circ}C$	0.5	W
		Qxx35PH5-x Qxx40PH5-x		0.8	
T_{stg}	Storage temperature range			-40 to 150	$^{\circ}C$
T_j	Operating junction temperature range			-25 to 125	$^{\circ}C$

Electrical Characteristics ($T_J = 25^\circ\text{C}$, unless otherwise specified) — Alternistor Triac (3 Quadrants)

Symbol	Test Conditions	Quadrant		Value	Unit
I_{GT}	$V_D = 6\text{V}$ $T_J = 25^\circ\text{C}$ $I_T = 1\text{A}$	I – II – III	MAX.	50	mA
V_{GT}		I – II – III	MAX.	1.5	V
V_{GD}	$V_D = V_{DRM}$ $R_L = 3.3\text{ k}\Omega$ $T_J = 125^\circ\text{C}$	ALL	MIN.	0.2	V
I_H	$T_J = 25^\circ\text{C}$		TYP.	30	mA
			MAX.	50	mA
dv/dt	$V_D = V_{DRM}$ Gate Open $T_J = 125^\circ\text{C}$		MIN.	500	$\text{V}/\mu\text{s}$
$(dv/dt)_c$	$(di/dt)_c = 7.2\text{A/ms}$ $T_J = 125^\circ\text{C}$	Qxx25PH5-x	MIN.	20	$\text{V}/\mu\text{s}$
	$(di/dt)_c = 12.5\text{A/ms}$ $T_J = 125^\circ\text{C}$	Qxx35PH5-x Qxx40PH5-x	MIN.	20	
t_{gt}	$I_T = I_{T(RMS)}$ $I_G = 100\text{mA}$ $V_D = 1/2 V_{DRM}$ $diG/dt = 1\text{A}/\mu\text{s}$	Qxx25PH5-x	TYP.	3	μs
			MAX.	10	μs
		Qxx35PH5-x Qxx40PH5-x	TYP.	5	μs
			MAX.	10	μs

Static Characteristics

Symbol	Test Conditions			Value	Unit
V_{TM}	$I_{TM} = 35.4A \ t_p = 380 \mu s$	Qxx25PH5-x	MAX.	1.4	V
	$I_{TM} = 49.5A \ t_p = 380 \mu s$	Qxx35PH5-x		1.4	
	$I_{TM} = 56.5A \ t_p = 380 \mu s$	Qxx40PH5-x		1.6	
I_{DRM} I_{RRM}	$V_D = V_{DRM}/V_{RRM}$	$T_J = 25^\circ C$	Qxx25PH5-x	10	μA
			Qxx35PH5-x Qxx40PH5-x	20	
		$T_J = 125^\circ C$	Qxx25PH5-x	2	mA
			Qxx35PH5-x Qxx40PH5-x	5	

Thermal Resistances

Symbol	Parameter		Value	Unit
$R_{\theta(J-C)}$	Junction to case (AC)	Qxx25PH5-x	2.15	$^\circ C/W$
		Qxx35PH5-x Qxx40PH5-x	1.01	

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

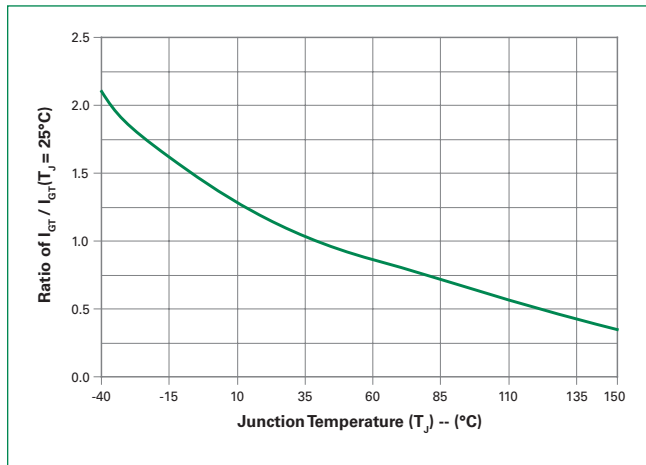


Figure 2: Normalized DC Gate Trigger Voltage vs. Junction Temperature

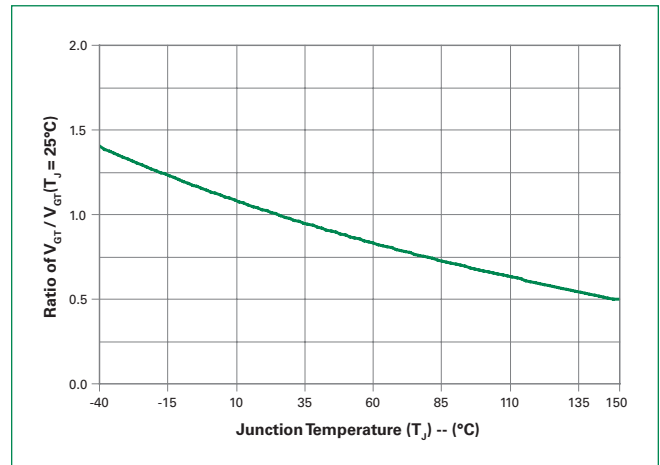


Figure 3: Normalized DC Holding Current vs. Junction Temperature

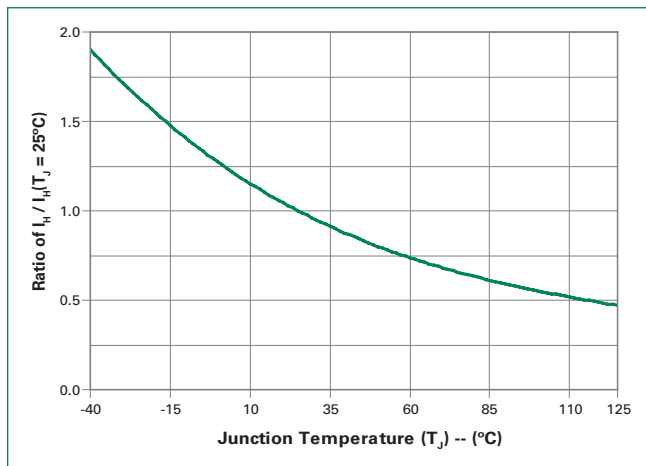


Figure 4: On-State Current vs. On-State Voltage (Typical)

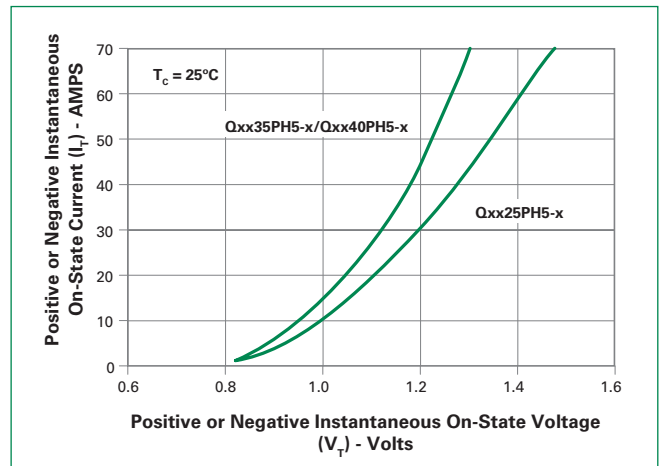


Figure 5: Power Dissipation (Typical) vs. RMS On-State Current

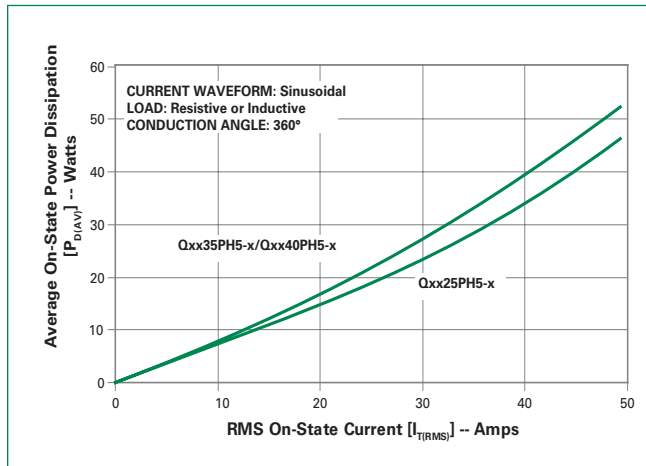


Figure 6: Maximum Allowable Case Temperature vs. RMS On-State Current

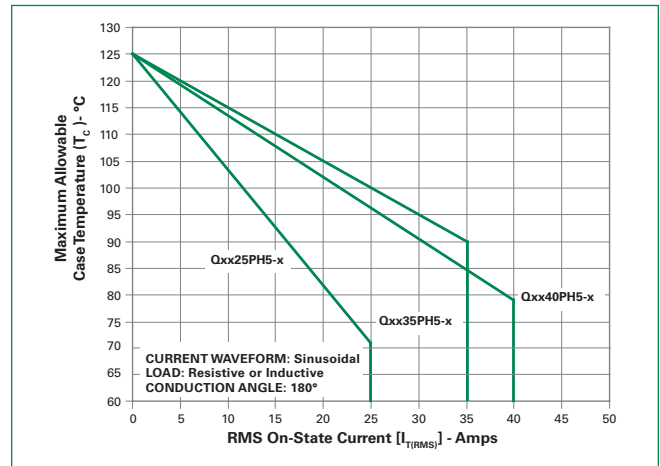
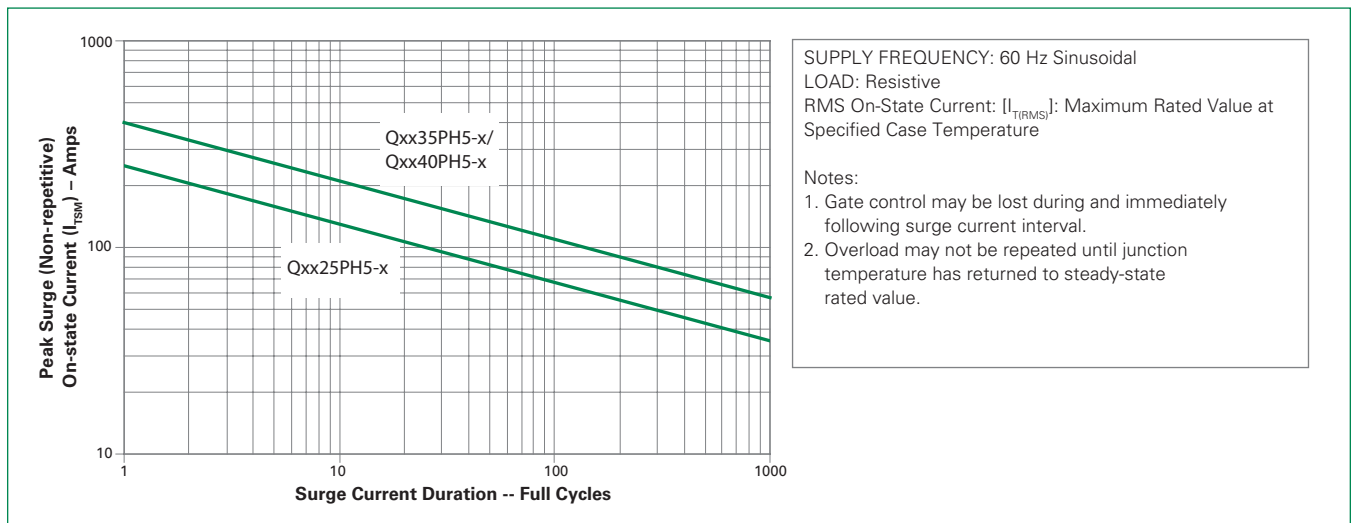


Figure 7: Surge Peak On-State Current vs. Number of Cycles



Physical Specifications

Terminal Finish	100% Nickel-plated
Lead Material	Copper Alloy

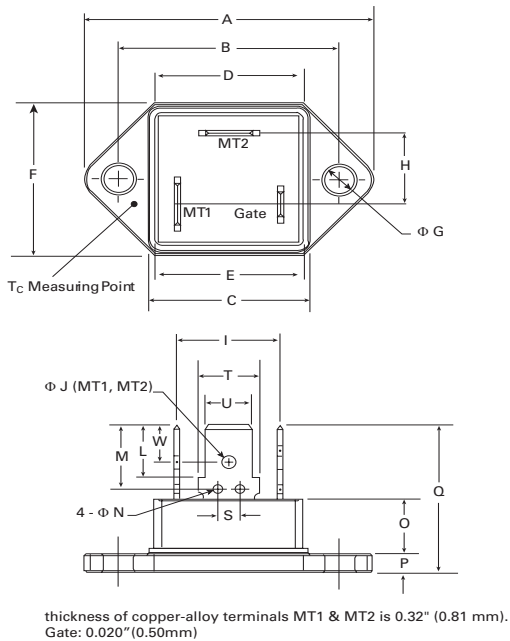
Design Considerations

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
Biased Temp & Humidity	EIA/JEDEC: JESD22-A101 320VDC, 85°C, 85%RH, 1008 hours
High Temp. Storage	MIL-STD-750: Method 1031 150°C, 1008 hours
Low-Temp Storage	-40°C, 1008 hours

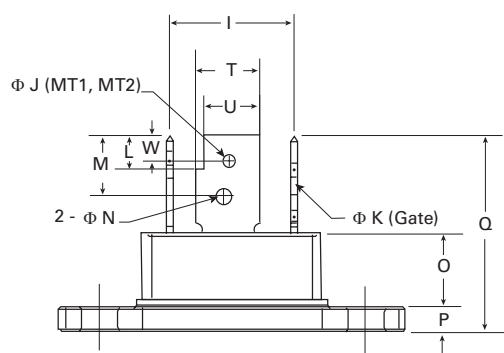
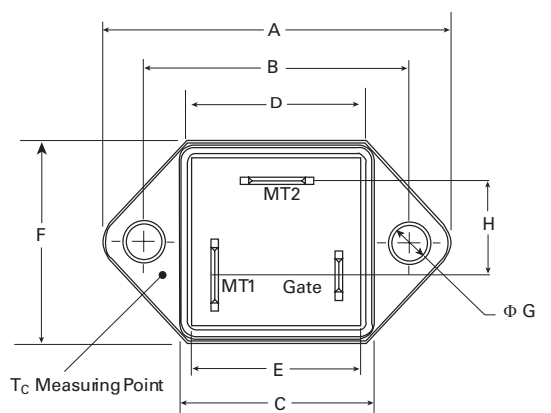
Dimensions — TO-3 (P Package) Fastpak C— Isolated Mounting Tab



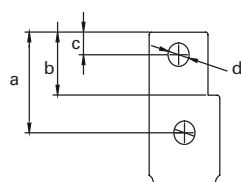
Dimension	Inches		Millimeters	
	Min	Max	Min	Max
A	1.531	1.539	38.90	39.10
B	1.177	1.185	29.90	30.10
C	0.850	0.858	21.60	21.80
D	0.783	0.791	19.90	20.10
E	0.783	0.799	20.10	20.30
F	0.882	0.890	22.40	22.60
G	0.161	0.169	4.10	4.30
H	0.417	0.433	10.60	11.00
I	0.539	0.555	13.70	14.10
J	0.079	0.087	2.00	2.20
L	0.307	0.317	7.85	8.05
M	0.380	0.388	9.65	9.85
N	0.047	0.055	1.20	1.40
O	0.318	0.327	8.10	8.30
P	0.098	0.106	2.50	2.70
Q	0.846	0.886	21.50	22.50
S	0.114	0.122	2.90	3.10
T (MT1)	0.321	0.329	8.15	8.35
T (MT2)	0.321	0.329	8.15	8.35
T (Gate)	0.220	0.228	5.60	5.80
U (MT1)	0.246	0.254	6.25	6.45
U (MT2)	0.246	0.254	6.25	6.45
U (Gate)	0.183	0.190	4.65	4.85
W	0.175	0.183	4.45	4.65
a	0.380	0.388	9.65	9.85
b	0.246	0.254	6.25	6.45
c	0.120	0.128	3.05	3.25
d	0.057	0.065	1.45	1.65

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

Dimensions — TO-3 (P Package) Fastpak D— Isolated Mounting Tab



thickness of three copper-alloy terminals MT1, MT2 is 0.032" (0.81 mm).
Gate: 0.020" (0.50mm)

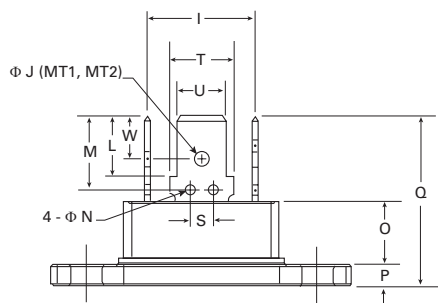
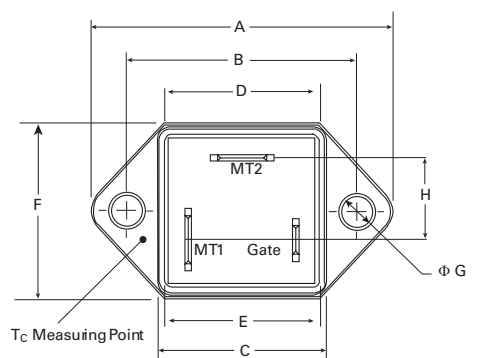


GATE

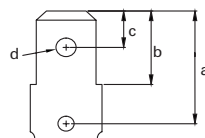
Dimension	Inches		Millimeters	
	Min	Max	Min	Max
A	1.531	1.539	38.90	39.10
B	1.177	1.185	29.90	30.10
C	0.850	0.858	21.60	21.80
D	0.783	0.791	19.90	20.10
E	0.783	0.799	20.10	20.30
F	0.882	0.890	22.40	22.60
G	0.161	0.169	4.10	4.30
H	0.417	0.433	10.60	11.00
I	0.539	0.555	13.70	14.10
J	0.063	0.071	1.60	1.80
L	0.177	0.185	4.50	4.70
M	0.285	0.293	7.25	7.45
N	0.094	0.102	2.40	2.60
O	0.318	0.327	8.10	8.30
P	0.098	0.106	2.50	2.70
Q	0.846	0.886	21.50	22.50
T (MT1)	0.321	0.329	8.15	8.35
T (MT2)	0.321	0.329	8.15	8.35
T (Gate)	0.220	0.228	5.60	5.80
U (MT1)	0.246	0.254	6.25	6.45
U (MT2)	0.246	0.254	6.25	6.45
U (Gate)	0.183	0.190	4.65	4.85
W	0.061	0.069	1.55	1.75
a	0.285	0.293	7.25	7.45
b	0.177	0.185	4.50	4.70
c	0.061	0.069	1.55	1.75
d	0.063	0.071	1.60	1.80

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

Dimensions — TO-3 (P Package) Fastpak E— Isolated Mounting Tab



thickness of all three copper-alloy terminals MT1 & MT2 & Gate is 0.32" (0.81 mm).

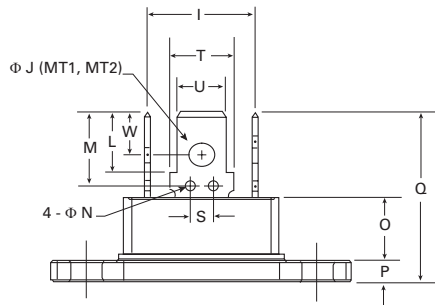
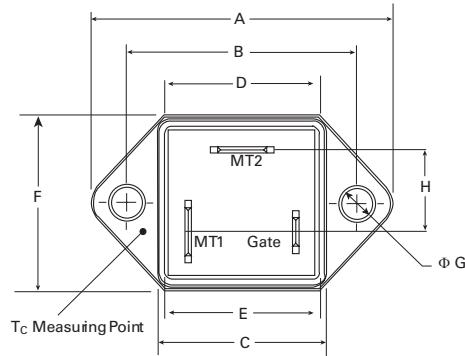


GATE

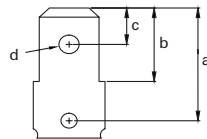
Dimension	Inches		Millimeters	
	Min	Max	Min	Max
A	1.531	1.539	38.90	39.10
B	1.177	1.185	29.90	30.10
C	0.850	0.858	21.60	21.80
D	0.783	0.791	19.90	20.10
E	0.783	0.799	20.10	20.30
F	0.882	0.890	22.40	22.60
G	0.161	0.169	4.10	4.30
H	0.417	0.433	10.60	11.00
I	0.539	0.555	13.70	14.10
J	0.079	0.087	2.00	2.20
L	0.307	0.317	7.85	8.05
M	0.380	0.388	9.65	9.85
N	0.047	0.055	1.20	1.40
O	0.318	0.327	8.10	8.30
P	0.098	0.106	2.50	2.70
Q	0.846	0.886	21.50	22.50
S	0.114	0.122	2.90	3.10
T (MT1)	0.321	0.329	8.15	8.35
T (MT2)	0.321	0.329	8.15	8.35
T (Gate)	0.220	0.228	5.60	5.80
U (MT1)	0.246	0.254	6.25	6.45
U (MT2)	0.246	0.254	6.25	6.45
U (Gate)	0.183	0.190	4.65	4.85
W	0.175	0.183	4.45	4.65
a	0.380	0.388	9.65	9.85
b	0.246	0.254	6.25	6.45
c	0.120	0.128	3.05	3.25
d	0.047	0.055	1.20	1.40

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

Dimensions — TO-3 (P Package) Fastpak W— Isolated Mounting Tab



thickness of all three copper-alloy terminals MT1 & MT2 & Gate is 0.32" (0.81 mm).



GATE

Dimension	Inches		Millimeters	
	Min	Max	Min	Max
A	1.531	1.539	38.90	39.10
B	1.177	1.185	29.90	30.10
C	0.850	0.858	21.60	21.80
D	0.783	0.791	19.90	20.10
E	0.783	0.799	20.10	20.30
F	0.882	0.890	22.40	22.60
G	0.161	0.169	4.10	4.30
H	0.417	0.433	10.60	11.00
I	0.539	0.555	13.70	14.10
J	0.154	0.161	3.90	4.10
L	0.307	0.317	7.85	8.05
M	0.380	0.388	9.65	9.85
N	0.047	0.055	1.20	1.40
O	0.318	0.327	8.10	8.30
P	0.098	0.106	2.50	2.70
Q	0.846	0.886	21.50	22.50
S	0.114	0.122	2.90	3.10
T (MT1)	0.321	0.329	8.15	8.35
T (MT2)	0.321	0.329	8.15	8.35
T (Gate)	0.220	0.228	5.60	5.80
U (MT1)	0.281	0.289	7.15	7.35
U (MT2)	0.281	0.289	7.15	7.35
U (Gate)	0.183	0.190	4.65	4.85
W	0.175	0.183	4.45	4.65
a	0.380	0.388	9.65	9.85
b	0.246	0.254	6.25	6.45
c	0.120	0.128	3.05	3.25
d	0.047	0.055	1.20	1.40

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

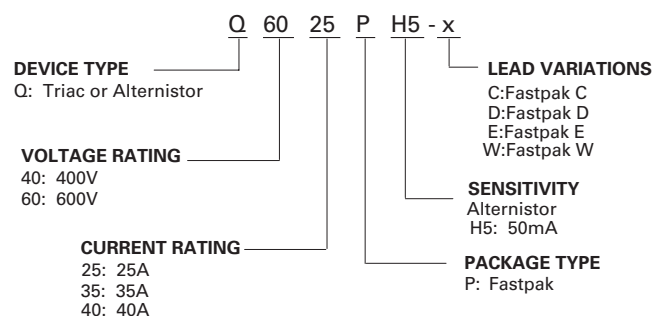
Product Selector

Part Number	Voltage		Gate Sensitivity Quadrants I - II - III	Type	Package
	400V	600V			
Q4025PH5-x	X		50 mA	Alternistor Triac	Fastpak
Q6025PH5-x		X	50 mA	Alternistor Triac	Fastpak
Q4035PH5-x	X		50 mA	Alternistor Triac	Fastpak
Q6035PH5-x		X	50 mA	Alternistor Triac	Fastpak
Q4040PH5-x	X		50 mA	Alternistor Triac	Fastpak
Q6040PH5-x		X	50 mA	Alternistor Triac	Fastpak

Packing Options

Part Number	Marking	Weight	Packing Mode	Base Quantity
Q4025PH5-x	Q4025PH5	2.20g	Bulk	120
Q6025PH5-x	Q6025PH5	2.20g	Bulk	120
Q4035PH5-x	Q4035PH5	2.20g	Bulk	120
Q6035PH5-x	Q6035PH5	2.20g	Bulk	120
Q4040PH5-x	Q4040PH5	2.20g	Bulk	120
Q6040PH5-x	Q6040PH5	2.20g	Bulk	120

Part Numbering System



Part Marking System

