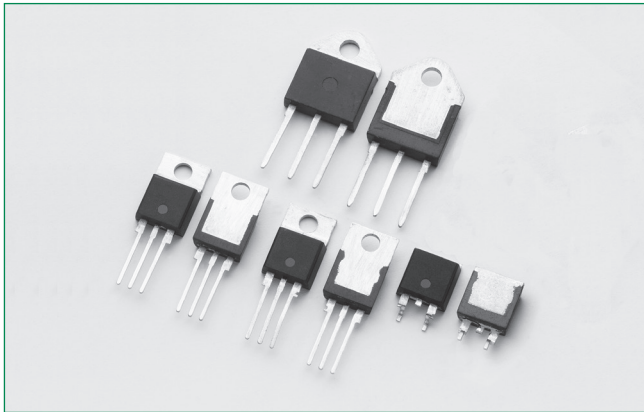


HQ6025xH5 Series



**Description**

The HQ6025xH5 is a 25 Amp bi-directional Alternistor Triac that is designed for AC switching and phase control applications that require a higher temperature environment. Alternistor type devices only operate in quadrants I, II, & are used in circuits requiring high dv/dt capability.

**Features & Benefits**

- 150°C maximum junction temperature
- RoHS-compliant
- Glass – passivated junctions
- Voltage capability up to 600 V
- Surge capability up to 300 A

**Agency Approval**

Agency	Agency File Number
	E71639*

\* - L and K Packages Only

**Applications**

Excellent for high-temperature environments applications where available heat-sinking is minimal such as heating and white goods. Internally constructed isolated packages are offered for ease of heat sinking with highest isolation voltage.

**Main Features**

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

**Additional Information**



Datasheet

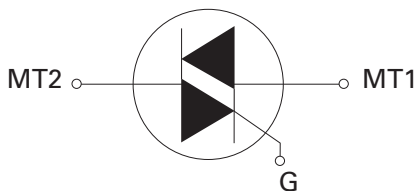


Resources



Samples

**Schematic Symbol**



### Absolute Maximum Ratings

Symbol	Parameter	Test Conditions	Value	Unit	
$I_{T(RMS)}$	RMS on-state current	HQ6025LH5 $T_C = 95^\circ\text{C}$	25	A	
		HQ6025RH5 HQ6025NH5 HQ6025KH5 $T_C = 102^\circ\text{C}$			
$I_{TSM}$	Peak non-repetitive surge current	-	full cycle; $f = 50\text{Hz}$ ; $T_J$ (initial) = $25^\circ\text{C}$	250	A
			full cycle; $f = 60\text{Hz}$ ; $T_J$ (initial) = $25^\circ\text{C}$	300	
$I^2t$	$I^2t$ Value for fusing	$t_p = 8.3\text{ms}$	373	$\text{A}^2\text{s}$	
$di/dt$	Critical rate-of-rise of on-state current	$f = 60\text{Hz}; T_J = 150^\circ\text{C}$	100	$\text{A}/\mu\text{s}$	
$I_{GTM}$	Peak gate current	$T_J = 150^\circ\text{C}$	2	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	$^\circ\text{C}$	

### Electrical Characteristics ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)

Symbol	Test Conditions	Quadrant	Value	Unit	
$I_{GT}$	$V_D = 12\text{V}$ $R_L = 60\ \Omega$	I – II – III	MAX.	50	mA
$V_{GT}$	$V_D = 12\text{V}$ $R_L = 60\ \Omega$	I – II – III	MAX.	1.3	V
$V_{GD}$	$V_D = V_{DRM}$ $R_L = 3.3\ \text{k}\Omega$ $T_J = 150^\circ\text{C}$	I – II – III	MIN.	0.2	V
$I_H$	$I_T = 400\text{mA}$ (initial)		MAX.	80	mA
$dv/dt$	$V_D = V_{DRM}$ ; gate open; $T_J = 150^\circ\text{C}$		MIN.	350	$\text{V}/\mu\text{s}$
$(dv/dt)_c$	$(di/dt)_c = 13.3\ \text{A}/\text{ms}$ ; $T_J = 150^\circ\text{C}$		MIN.	20	$\text{V}/\mu\text{s}$
$t_{gt}$	$I_G = 2 \times I_{GT}$ $PW = 15\ \mu\text{s}$ $I_T = 35.4\text{A}$		TYP.	3	$\mu\text{s}$

### Static Characteristics

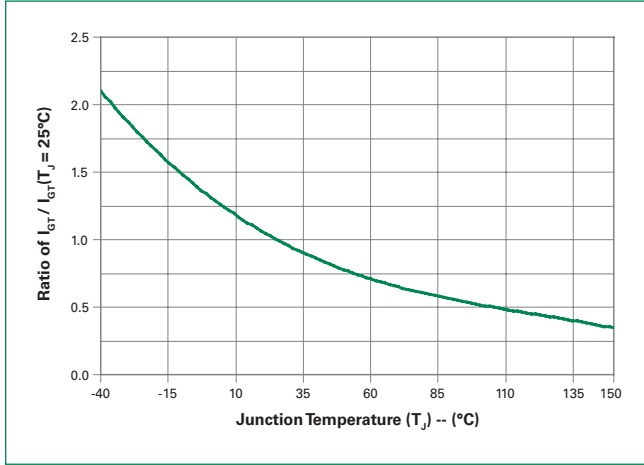
Symbol	Test Conditions	Value	Unit	
$V_{TM}$	$I_T = 35.4\text{A}$ ; $t_p = 380\ \mu\text{s}$	MAX.	1.4	V
$I_{DRM}/I_{RRM}$	$V_{DRM}/V_{RRM}$	$T_J = 25^\circ\text{C}$	5	$\mu\text{A}$
		$T_J = 150^\circ\text{C}$	6000	

### Thermal Resistances

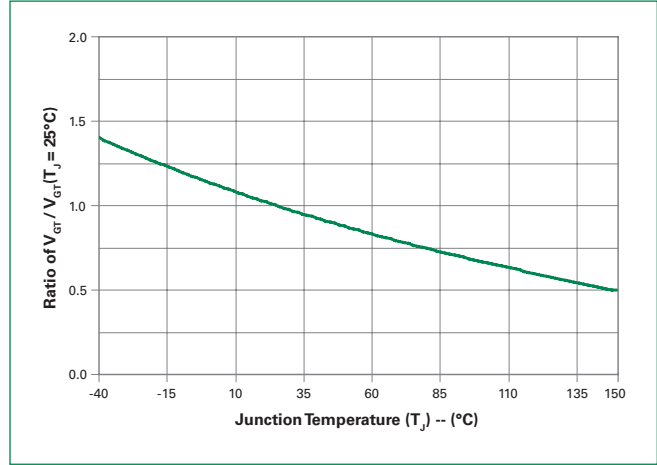
Symbol	Parameter	Value	Unit
$R_{\theta(J-C)}$	Junction to case (AC)	HQ6025LH5	2.0
		HQ6025RH5 HQ6025NH5	0.86
		HQ6025KH5	1.35
$R_{\theta(J-A)}$	Junction to ambient	HQ6025LH5	50
		HQ6025RH5	45

Note: xx = voltage

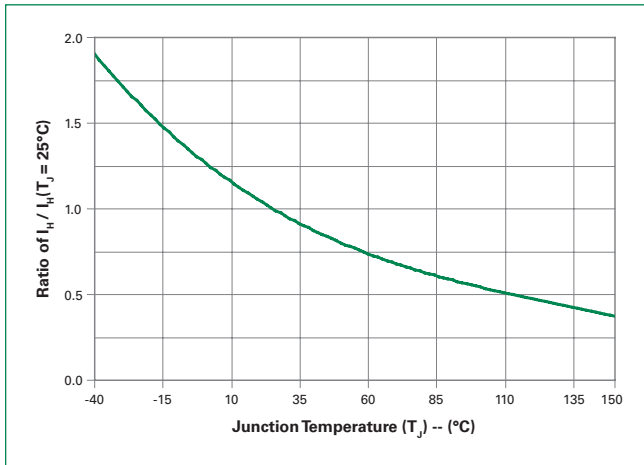
**Figure 1: Normalized DC Gate Trigger Current vs. Junction Temperature**



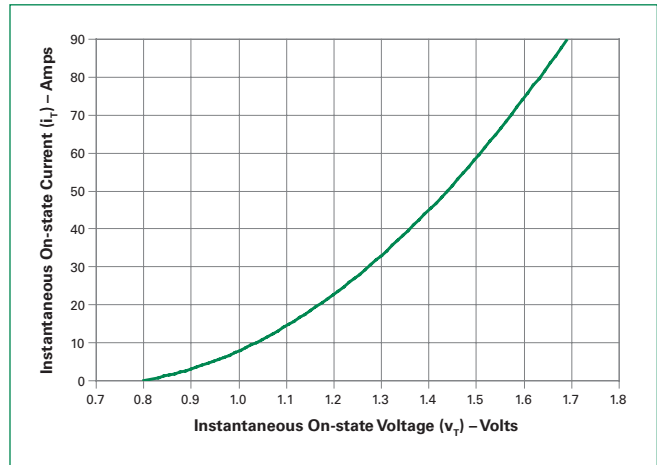
**Figure 2: Normalized DC Gate Trigger Voltage vs. Junction Temperature**



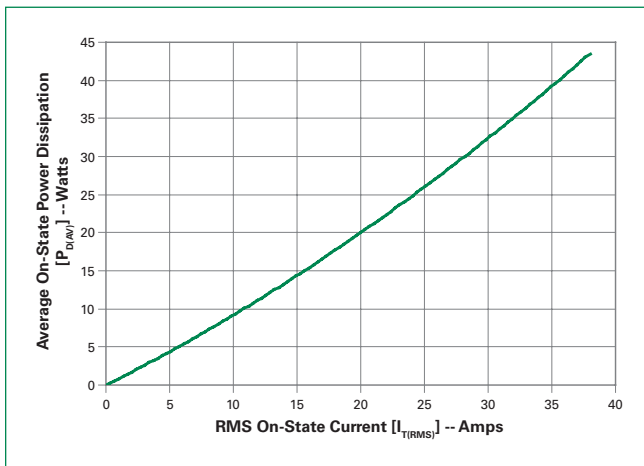
**Figure 3: Normalized DC Holding Current vs. Junction Temperature**



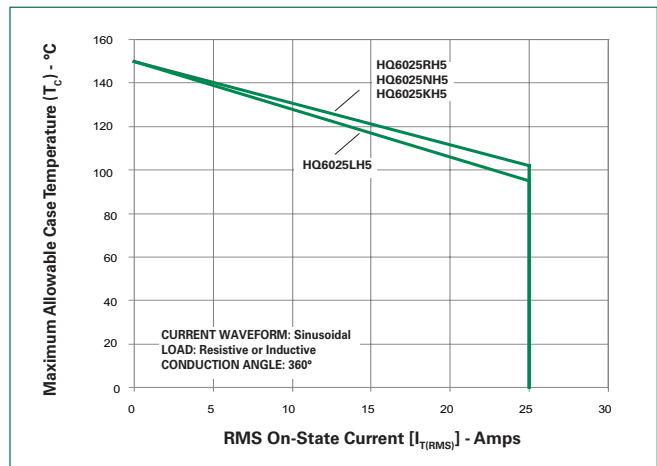
**Figure 4: On-State Current vs. On-State Voltage (Typical)**



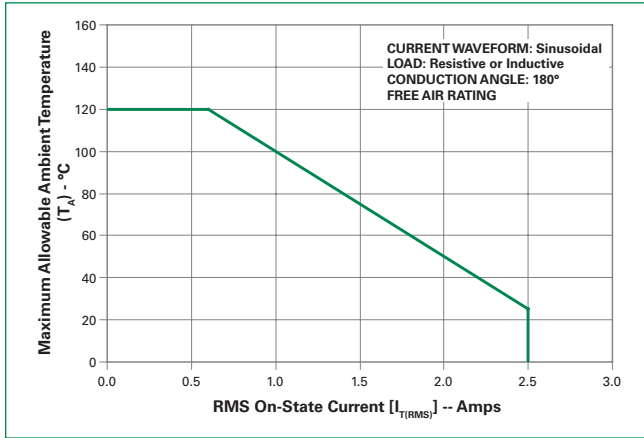
**Figure 5: Power Dissipation (Typical) vs. RMS On-State Current**



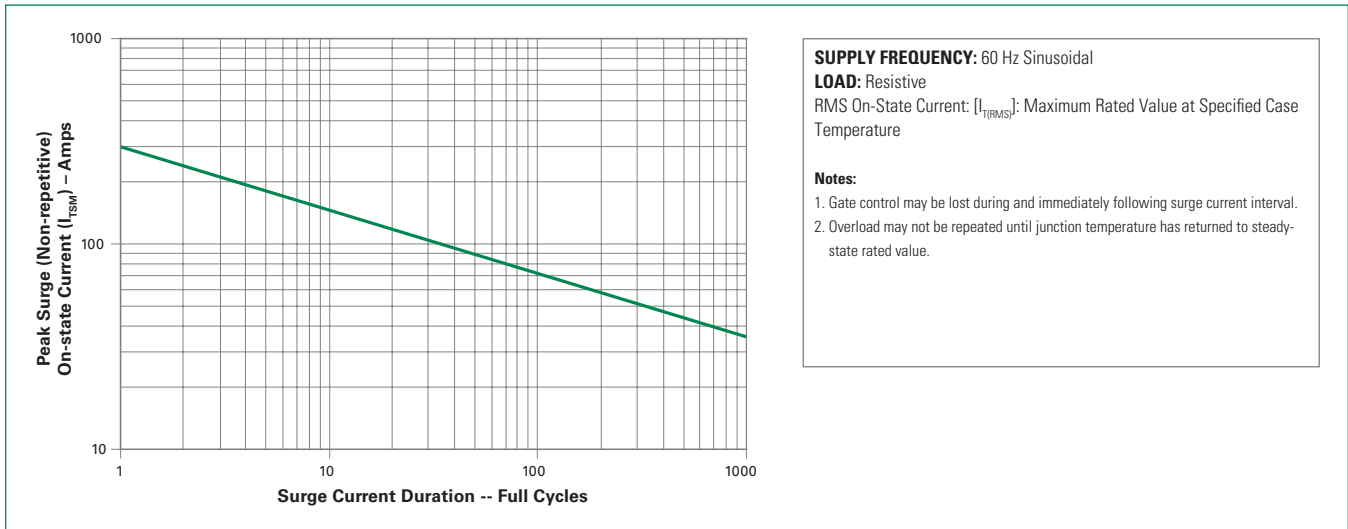
**Figure 6: Maximum Allowable Case Temperature vs. RMS On-State Current**



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

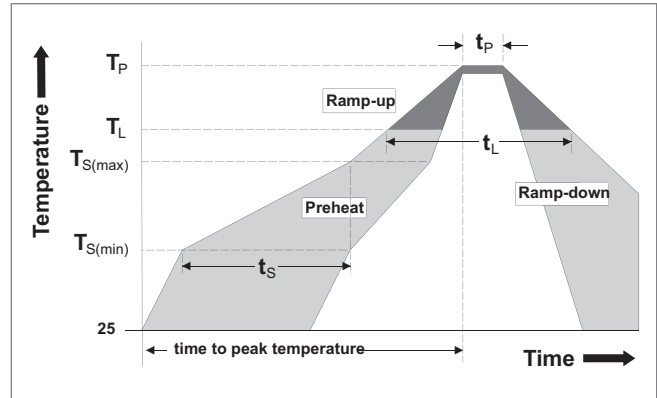


**Figure 8: Surge Peak On-State Current vs. Number of Cycles**



### Soldering Parameters

<b>Reflow Condition</b>		Pb – Free assembly
<b>Pre Heat</b>	- Temperature Min ( $T_{s(min)}$ )	150°C
	- Temperature Max ( $T_{s(max)}$ )	200°C
	- Time (min to max) ( $t_s$ )	60 – 180 secs
<b>Average ramp up rate (Liquidus Temp) (<math>T_L</math>) to peak</b>		5°C/second max
<b><math>T_{s(max)}</math> to <math>T_L</math> - Ramp-up Rate</b>		5°C/second max
<b>Reflow</b>	- Temperature ( $T_L$ ) (Liquidus)	217°C
	- Temperature ( $t_L$ )	60 – 150 seconds
<b>Peak Temperature (<math>T_p</math>)</b>		260 <sup>+0/-5</sup> °C
<b>Time within 5°C of actual peak Temperature (<math>t_p</math>)</b>		20 – 40 seconds
<b>Ramp-down Rate</b>		5°C/second max
<b>Time 25°C to peak Temperature (<math>T_p</math>)</b>		8 minutes Max.
<b>Do not exceed</b>		280°C



### Physical Specifications

<b>Terminal Material</b>	Copper Alloy
<b>Terminal Finish</b>	100% Matte Tin Plated
<b>Body Material</b>	UL Recognized epoxy meeting flammability classification 94V-0

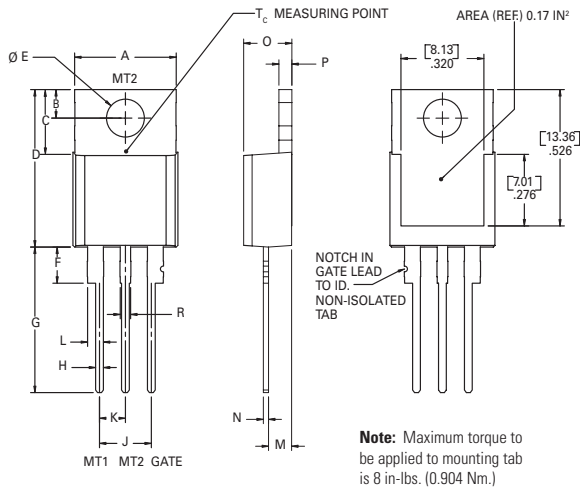
### Design Considerations

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

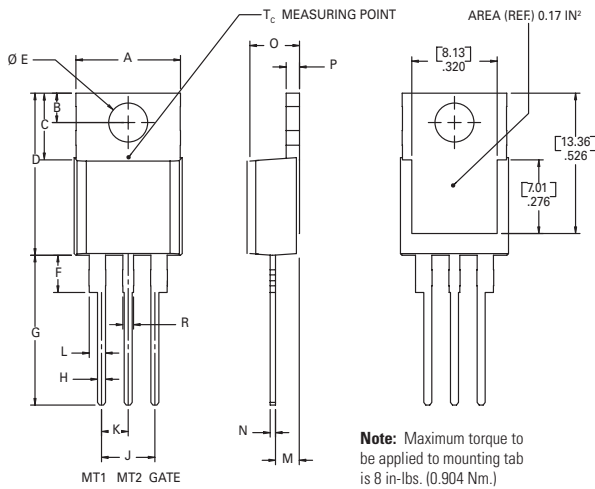
Test	Specifications and Conditions
<b>High Temperature Voltage Blocking</b>	MIL-STD-750: Method 1040, Condition A Rated $V_{RRM}$ : 150°C, 1008 hours
<b>Temperature Cycling</b>	MIL-STD-750: Method 1051 -40°C to 150°C, 15-minute dwell, 100 cycles
<b>Biased Temp &amp; Humidity</b>	EIA/JEDEC: JESD22-A101 320VDC, 85°C, 85%RH, 1008 hours
<b>High Temp. Storage</b>	MIL-STD-750: Method 1031 150°C, 1008 hours
<b>Low-Temp Storage</b>	-40°C, 1008 hours
<b>Resistance to Solder Heat</b>	MIL-STD-750: Method 2031 260°C, 10 seconds
<b>Solderability</b>	ANSI/J-STD-002, Category 3, Test A
<b>Lead Bend</b>	MIL-STD-750: Method 2036, Condition E

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



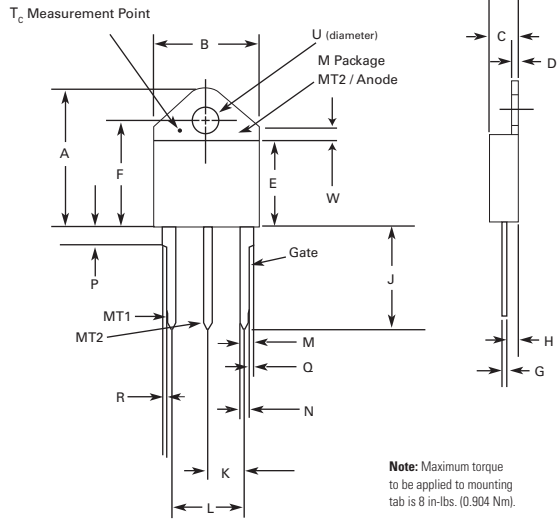
Dimension	Inches		Millimeters	
	Min	Max	Min	Max
A	0.380	0.420	9.65	10.67
B	0.105	0.115	2.67	2.92
C	0.230	0.250	5.84	6.35
D	0.590	0.620	14.99	15.75
E	0.142	0.147	3.61	3.73
F	0.110	0.130	2.79	3.30
G	0.540	0.575	13.72	14.61
H	0.025	0.035	0.64	0.89
J	0.195	0.205	4.95	5.21
K	0.095	0.105	2.41	2.67
L	0.060	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	0.97	1.22

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



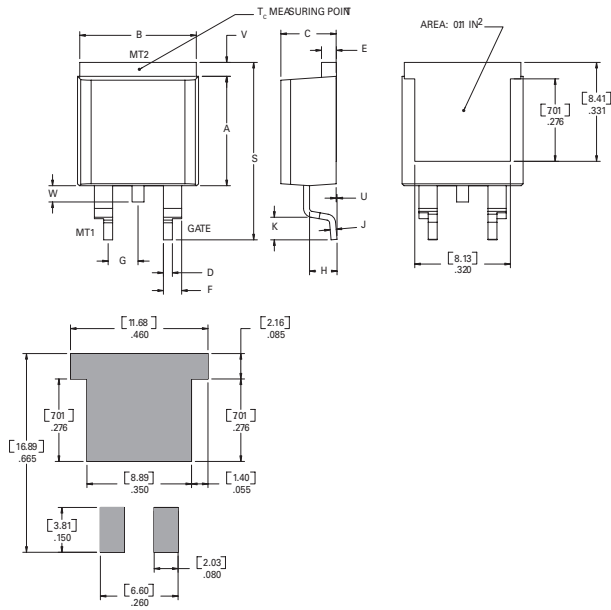
Dimension	Inches		Millimeters	
	Min	Max	Min	Max
A	0.380	0.420	9.65	10.67
B	0.105	0.115	2.67	2.92
C	0.230	0.250	5.84	6.35
D	0.590	0.620	14.99	15.75
E	0.142	0.147	3.61	3.73
F	0.110	0.130	2.79	3.30
G	0.540	0.575	13.72	14.61
H	0.025	0.035	0.64	0.89
J	0.195	0.205	4.95	5.21
K	0.095	0.105	2.41	2.67
L	0.060	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	0.97	1.22

**Dimensions — TO-218AC (K Package) — Isolated Mounting Tab**



Dimension	Inches		Millimeters	
	Min	Max	Min	Max
A	0.810	0.835	20.57	21.21
B	0.610	0.630	15.49	16.00
C	0.178	0.188	4.52	4.78
D	0.055	0.070	1.40	1.78
E	0.487	0.497	12.37	12.62
F	0.635	0.655	16.13	16.64
G	0.022	0.029	0.56	0.74
H	0.075	0.095	1.91	2.41
J	0.575	0.625	14.61	15.88
K	0.211	0.219	5.36	5.56
L	0.422	0.437	10.72	11.10
M	0.058	0.068	1.47	1.73
N	0.045	0.055	1.14	1.40
P	0.095	0.115	2.41	2.92
Q	0.008	0.016	0.20	0.41
R	0.008	0.016	0.20	0.41
U	0.159	0.163	4.04	4.14
W	0.085	0.095	2.17	2.42

**Dimensions — TO-263AB (N-Package) — D<sup>2</sup> -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

**Product Selector**

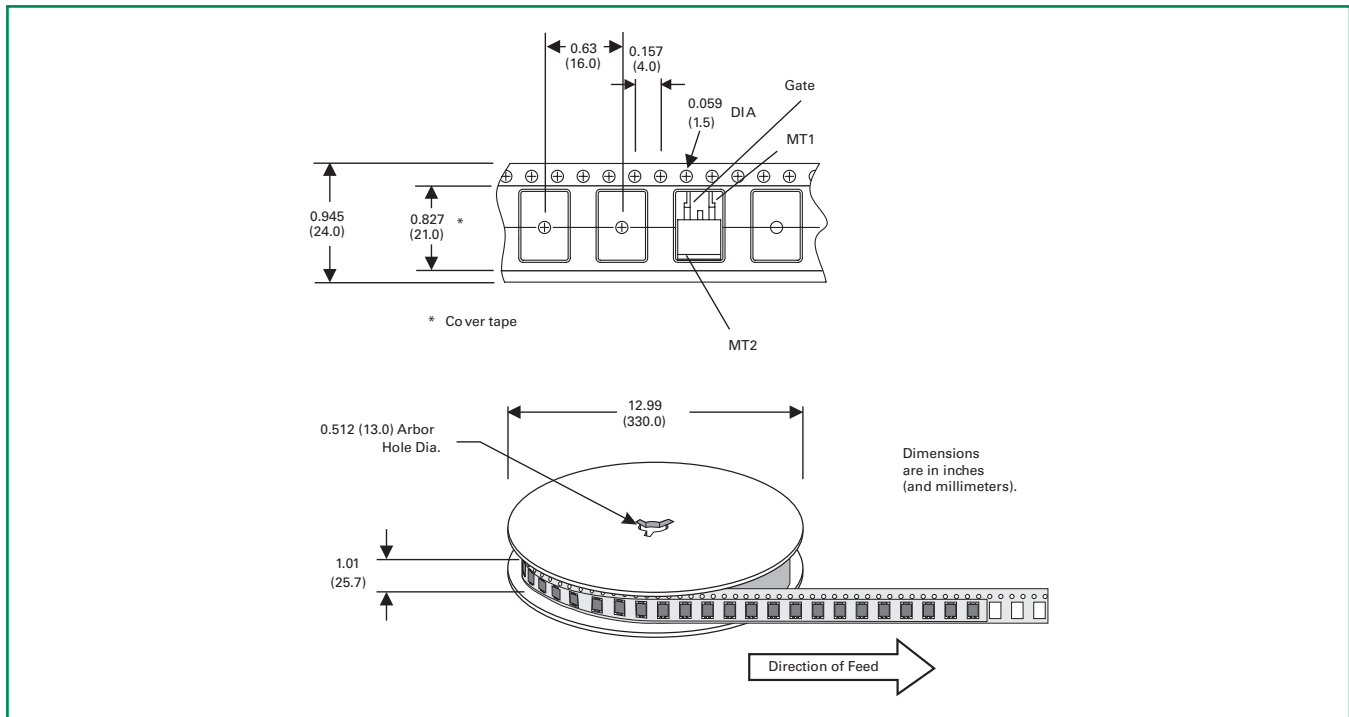
Part Number	Voltage				Gate Sensitivity	Package
	400V	600V	800V	1000V		
HQ6025RH5	-	X	-	-	50 mA	TO-220R
HQ6025NH5	-	X	-	-	50 mA	TO-263
HQ6025LH5	-	X	-	-	50 mA	TO-220L
HQ6025KH5	-	X	-	-	50 mA	TO-218K

**Packing Options**

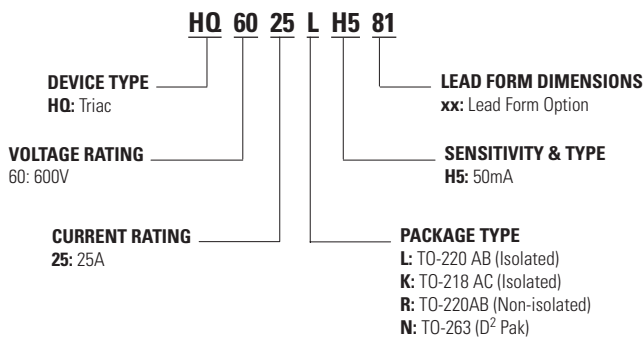
Part Number	Marking	Weight	Packing Mode	Base Quantity
HQ6025RH5TP	HQ6025RH5	2.2g	Tube	1000 (50 per tube)
HQ6025NH5TP	HQ6025NH5	1.6g	Tube	1000 (50 per tube)
HQ6025NH5RP	HQ6025NH5	1.6g	Embossed Carrier	500
HQ6025LH5TP	HQ6025LH5	2.2g	Tube	1000 (50 per tube)
HQ6025KH5TP	HQ6025KH5	4.4g	Tube	250 (25 per tube)

**TO-263 Embossed Carrier Reel Pack (RP) Specifications**

Meets all EIA-481-2 Standards

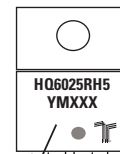


**Part Numbering System**



**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

TO-218AC - (K Package)



Date Code Marking  
Y: Year Code  
M: Month Code  
L: Location Code  
XX: Lot Serial Code