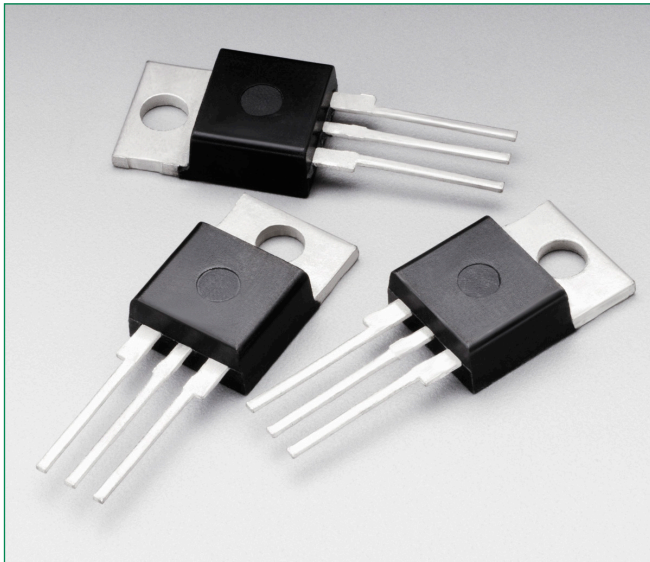


### 2N6394



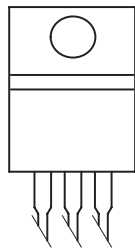
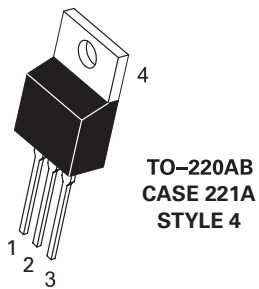
#### Description

Designed primarily for half-wave ac control applications, such as motor controls, heating controls and power supplies.

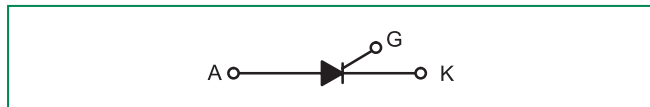
#### Features

- Glass Passivated Junctions for Greater Parameter Uniformity and Stability
- Small, Rugged, Thermowatt Construction for Low Thermal Resistance, High Heat Dissipation and Durability
- Gate Triggering Guaranteed in all Four Quadrants
- For 400 Hz Operation, Consult Factory
- 8.0 A Devices Available as 2N6344 thru 2N6349
- Pb-Free Package is Available

#### Pin Out



#### Functional Diagram



#### Additional Information



[Datasheet](#)



[Resources](#)



[Samples](#)

### Maximum Ratings † ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

Rating	Symbol	Value	Unit
Peak Repetitive Off-State Voltage (Note 1) ( $T_J = -40$ to $110^\circ\text{C}$ , Sine Wave, 50 to 60 Hz, Gate Open)	$V_{\text{DRM}}$ $V_{\text{RRM}}$	50 100 400 800	V
On-State RMS Current ( $180^\circ$ Conduction Angles; $T_C = 90^\circ\text{C}$ )	$I_{\text{T (RMS)}}$	12	A
Peak Non-Repetitive Surge Current (1/2 Cycle, Sine Wave, 60 Hz, $T_J = 90^\circ\text{C}$ )	$I_{\text{TSM}}$	100	A
Circuit Fusing Considerations ( $t = 8.3$ ms)	$I_{\text{2t}}$	40	A <sup>2</sup> s
Forward Peak Gate Power (Pulse Width $\leq 1.0$ $\mu\text{s}$ , $T_C = 90^\circ\text{C}$ )	$P_{\text{GM}}$	20	W
Forward Average Gate Power ( $t = 8.3$ ms, $T_C = 90^\circ\text{C}$ )	$P_{\text{G(AV)}}$	0.5	W
Forward Peak Gate Current (Pulse Width $\leq 1.0$ $\mu\text{s}$ , $T_C = 90^\circ\text{C}$ )	$I_{\text{GM}}$	2.0	A
Operating Junction Temperature Range	$T_J$	-40 to +125	$^\circ\text{C}$
Storage Temperature Range	$T_{\text{stg}}$	-40 to +125	$^\circ\text{C}$

† Indicates JEDEC Registered Data

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

- $V_{\text{DRM}}$  and  $V_{\text{RRM}}$  for all types can be applied on a continuous basis. Ratings apply for zero or negative gate voltage; however, positive gate voltage shall not be applied concurrent with negative potential on the anode. Blocking voltages shall not be tested with a constant current source such that the voltage ratings of the devices are exceeded.

### Maximum Ratings † ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

Rating	Symbol	Value	Unit
Thermal Resistance, Junction to Case	$R_{\text{8JC}}$	2.0	$^\circ\text{C/W}$
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds	$T_L$	260	$^\circ\text{C}$

† Indicates JEDEC Registered Data..

### Electrical Characteristics - OFF ( $T_c = 25^\circ\text{C}$ unless otherwise noted; Electricals apply in both directions)

Characteristic	Symbol	Min	Typ	Max	Unit
†Peak Repetitive Blocking Current ( $V_{AK} = V_{DRM} = V_{RRM}$ ; Gate Open)	$T_J = 25^\circ\text{C}$ $I_{DRM}$	-	-	1.0	$\mu\text{A}$
	$T_J = 125^\circ\text{C}$ $I_{RRM}$	-	-	2.0	mA

### Electrical Characteristics - ON ( $T_c = 25^\circ\text{C}$ unless otherwise noted; Electricals apply in both directions)

Characteristic	Symbol	Min	Typ	Max	Unit
†Peak Forward On-State Voltage (Note 2) ( $I_{TM} = 24\text{ A Peak}$ )	$V_{TM}$	-	1.7	2.2	V
†Gate Trigger Voltage (Continuous DC), All Quadrants (Continuous dc) ( $V_D = 12\text{ Vdc}$ , $R_L = 100\text{ Ohms}$ )	$I_{GT}$	-	5.0	30	mA
†Gate Trigger Voltage (Continuous dc) ( $V_D = 12\text{ Vdc}$ , $R_L = 100\text{ Ohms}$ )	$V_{GT}$	-	0.7	1.5	V
Gate Non-Trigger Voltage ( $V_D = 12\text{ Vdc}$ , $R_L = 100\text{ Ohms}$ , $T_J = 125^\circ\text{C}$ )	$V_{GD}$	0.2	-	-	V
†Holding Current ( $V_D = 12\text{ Vdc}$ , Initiating Current = 200 mA, Gate Open)	$I_H$	-	6.0	50	mA
Turn-On Time ( $I_{TM} = 12\text{ A}$ , $I_{GT} = 40\text{ mAdc}$ , $V_D = \text{Rated } V_{DRM}$ )	$t_{gt}$	-	1.0	2.0	$\mu\text{s}$
Turn-Off Time ( $V_D = \text{Rated } V_{DRM}$ )  ( $I_{TM} = 12\text{ A}$ , $I_R = 12\text{ A}$ ) ( $I_{TM} = 12\text{ A}$ , $I_R = 12\text{ A}$ , $T_J = 125^\circ\text{C}$ )	$t_q$	-	-	15	$\mu\text{s}$
		-	-	35	

†Indicates JEDEC Registered Data

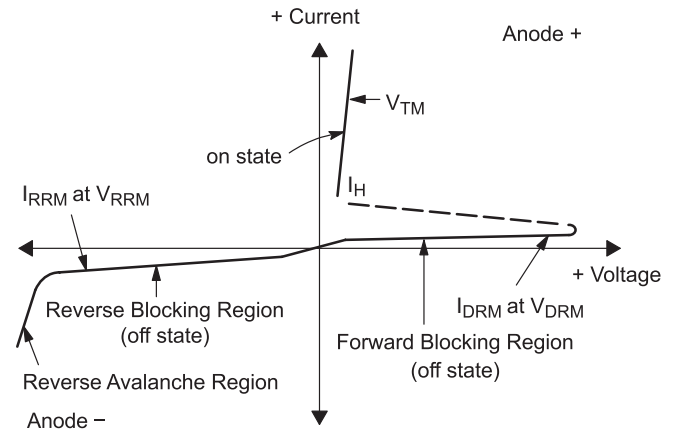
2. Pulse Test: Pulse Width  $\leq 300\text{ }\mu\text{sec}$ , Duty Cycle  $\leq 2\%$ .

### Dynamic Characteristics

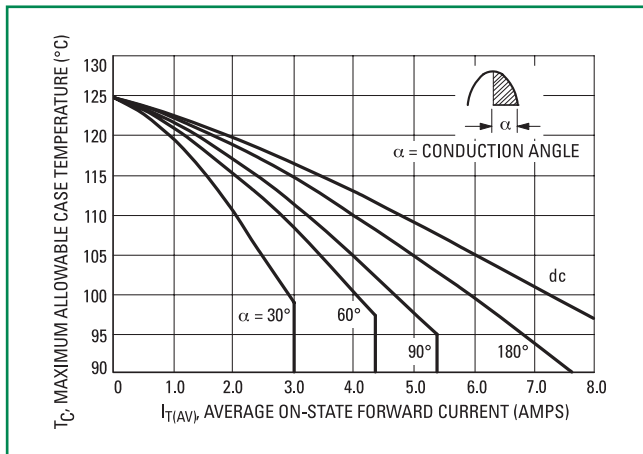
Characteristic	Symbol	Min	Typ	Max	Unit
Critical Rate-of-Rise of Off-State Voltage Exponential ( $V_D = \text{Rated } V_{DRM}$ , $T_J = 125^\circ\text{C}$ )	$dv/dt(c)$	-	50	-	$\text{V}/\mu\text{s}$

### Voltage Current Characteristic of SCR

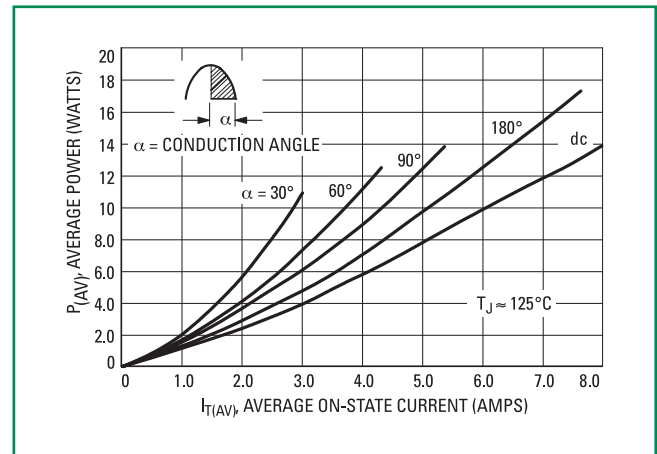
Symbol	Parameter
$V_{DRM}$	Peak Repetitive Forward Off State Voltage
$I_{DRM}$	Peak Forward Blocking Current
$V_{RRM}$	Peak Repetitive Reverse Off State Voltage
$I_{RRM}$	Peak Reverse Blocking Current
$V_{TM}$	Maximum On State Voltage
$I_H$	Holding Current



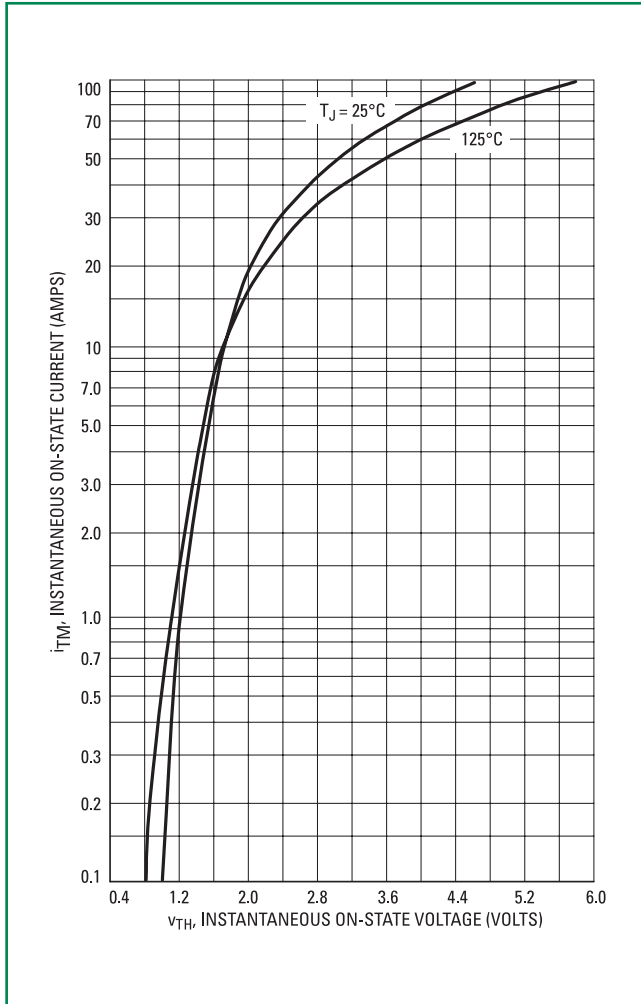
**Figure 1. Current Derating**



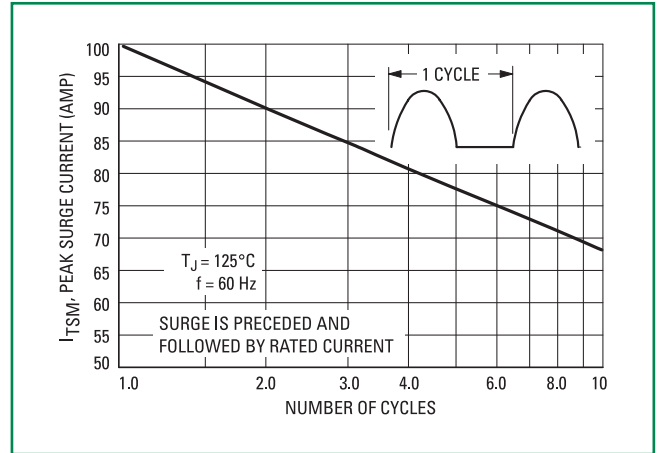
**Figure 2. Maximum On-State Characteristics**



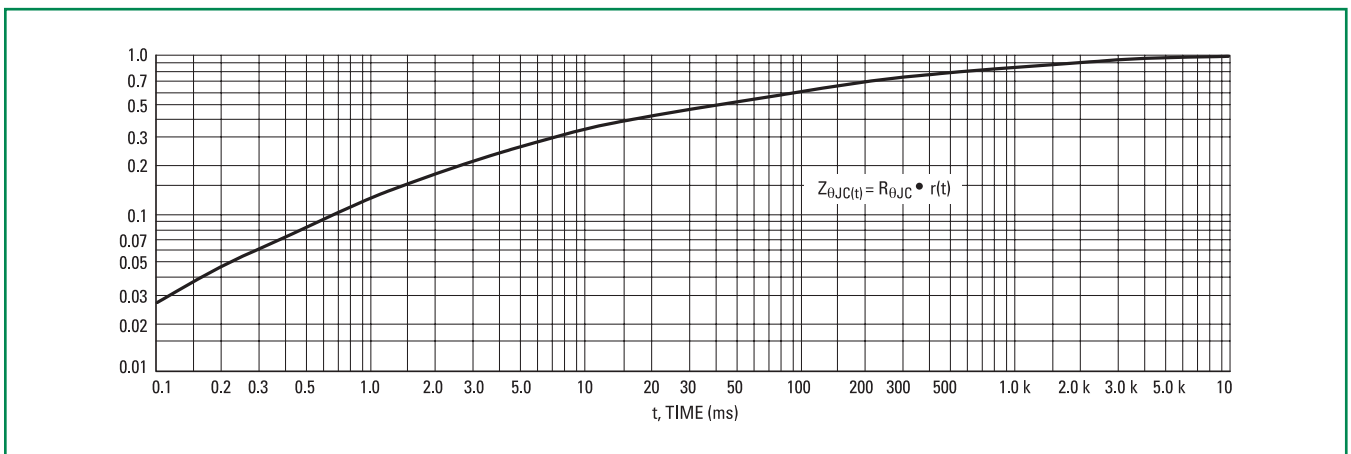
**Figure 3. On-State Characteristics**



**Figure 4. Maximum Non-Repetitive Surge Current**

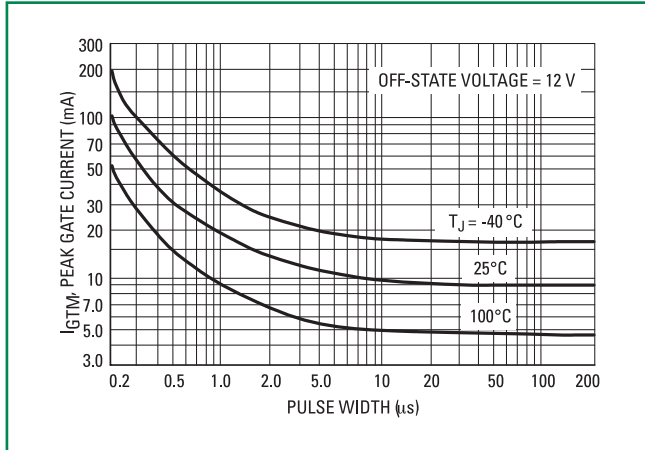


**Figure 5. Typical Thermal Response**

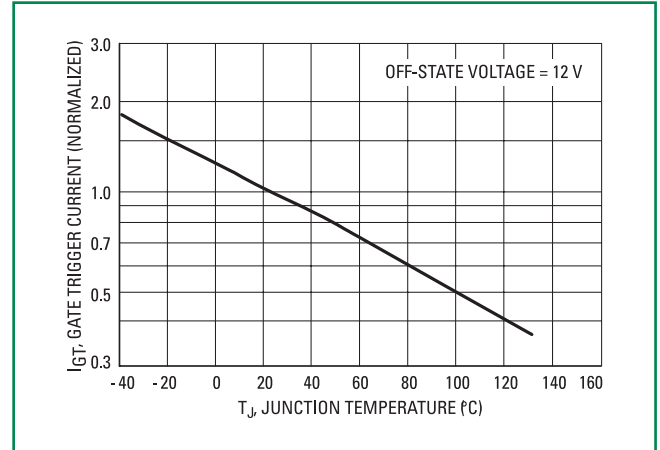


### Typical Characteristics

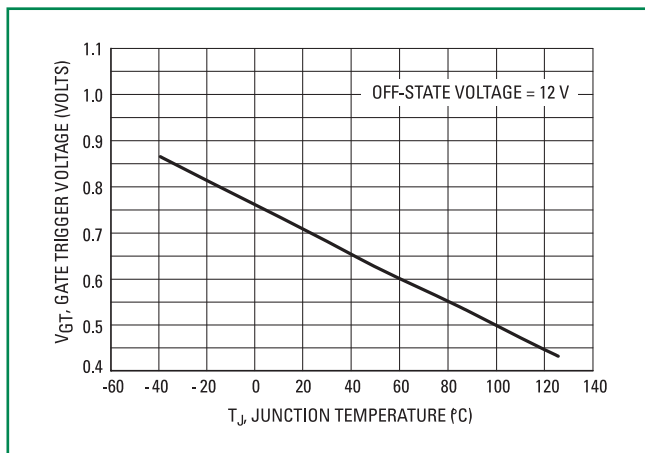
**Figure 6. Typical Gate Trigger Current vs. Pulse Width**



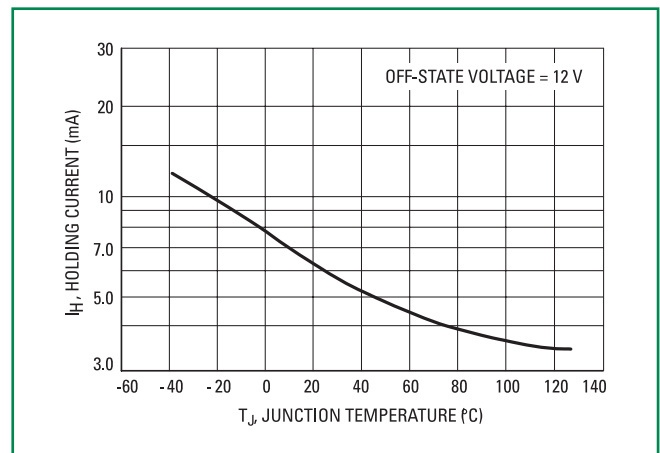
**Figure 7. Typical Gate Trigger Current vs. Temperature**



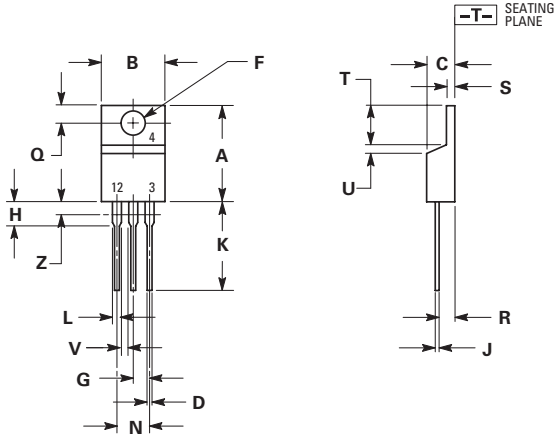
**Figure 8. Typical Gate Trigger Voltage vs. Temperature**



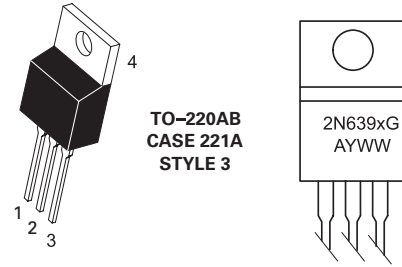
**Figure 9. Typical Holding Current vs. Temperature**



### Dimensions



### Part Marking System



TO-220AB  
CASE 221A  
STYLE 3

2N639x = Device Code  
x = 4, 5, 7, or 9  
G = Pb-Free Package  
A = Assembly Location  
Y = Year  
WW = Work Week

Dim	Inches		Millimeters	
	Min	Max	Min	Max
A	0.570	0.620	14.48	15.75
B	0.380	0.405	9.66	10.28
C	0.160	0.190	4.07	4.82
D	0.025	0.035	0.64	0.88
F	0.142	0.147	3.61	3.73
G	0.095	0.105	2.42	2.66
H	0.110	0.155	2.80	3.93
J	0.014	0.022	0.36	0.55
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.15	1.52
N	0.190	0.210	4.83	5.33
Q	0.100	0.120	2.54	3.04
R	0.080	0.110	2.04	2.79
S	0.045	0.055	1.15	1.39
T	0.235	0.255	5.97	6.47
U	0.000	0.050	0.00	1.27
V	0.045	---	1.15	---
Z	---	0.080	---	2.04

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

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### Pin Assignment

1	Cathode
2	Anode
3	Gate
4	Anode

### Ordering Information

Device	Package	Shipping
2N6394G	TO-220AB (Pb-Free)	500 Units / Box
2N6394TG		50 Units / Box
2N6395G		500 Units / Box
2N6397G		500 Units / Box
2N6397TG		50 Units / Box
2N6399G		500 Units / Box
2N6399TG		50 Units / Box