

# 2N6394 Series

Preferred Device

## Silicon Controlled Rectifiers Reverse Blocking Thyristors

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

### Features

- Glass Passivated Junctions with Center Gate Geometry for Greater Parameter Uniformity and Stability
- Small, Rugged, Thermowatt Construction for Low Thermal Resistance, High Heat Dissipation and Durability
- Blocking Voltage to 800 V
- Pb-Free Packages are Available\*

### MAXIMUM RATINGS<sup>†</sup> ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

Rating	Symbol	Value	Unit
Peak Repetitive Off-State Voltage (Note 1) ( $T_J = -40$ to $125^\circ\text{C}$ , 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 ( $t = 8.3$ ms)	$I^2t$	40	$\text{A}^2\text{s}$
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 $+150$	$^\circ\text{C}$

### MAXIMUM RATINGS<sup>†</sup> ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

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

<sup>†</sup>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.

1.  $V_{\text{DRM}}$  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.

\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



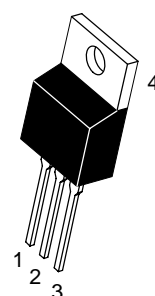
ON Semiconductor®

<http://onsemi.com>

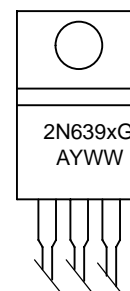
SCRs  
12 AMPERES RMS  
50 thru 800 VOLTS



### MARKING DIAGRAM



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

### PIN ASSIGNMENT

	PIN ASSIGNMENT
1	Cathode
2	Anode
3	Gate
4	Anode

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 4 of this data sheet.

Preferred devices are recommended choices for future use and best overall value.

## 2N6394 Series

### ELECTRICAL CHARACTERISTICS ( $T_C = 25^\circ\text{C}$ unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
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#### OFF CHARACTERISTICS

†Peak Repetitive Forward or Reverse Blocking Current ( $V_{AK} = \text{Rated } V_{DRM} \text{ or } V_{RRM}$ , Gate Open)	$I_{DRM}, I_{RRM}$	–	–	10	$\mu\text{A}$
$T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$		–	–	2.0	$\text{mA}$

#### ON CHARACTERISTICS

†Peak Forward On-State Voltage (Note 2) ( $I_{TM} = 24 \text{ A Peak}$ )	$V_{TM}$	–	1.7	2.2	V
†Gate Trigger Current (Continuous dc) ( $V_D = 12 \text{ Vdc}$ , $R_L = 100 \text{ Ohms}$ )	$I_{GT}$	–	5.0	30	$\text{mA}$
†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 $\text{mA}$ , Gate Open)	$I_H$	–	6.0	50	$\text{mA}$
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 35	–	$\mu\text{s}$

#### DYNAMIC CHARACTERISTICS

Critical Rate-of-Rise of Off-State Voltage Exponential ( $V_D = \text{Rated } V_{DRM}$ , $T_J = 125^\circ\text{C}$ )	$dv/dt$	–	50	–	$\text{V}/\mu\text{s}$
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†Indicates JEDEC Registered Data

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

### Voltage Current Characteristic of SCR

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

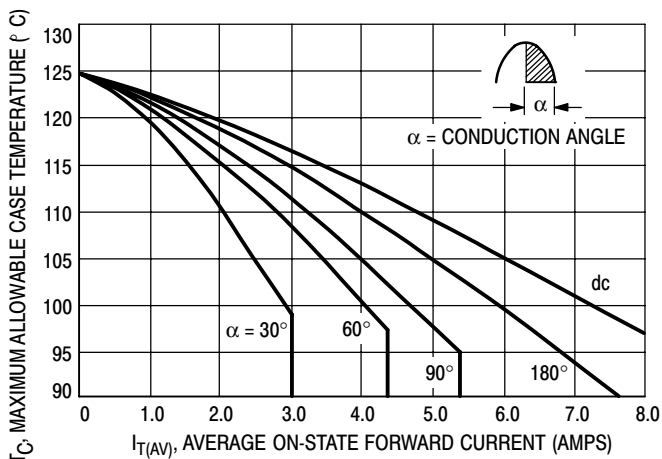
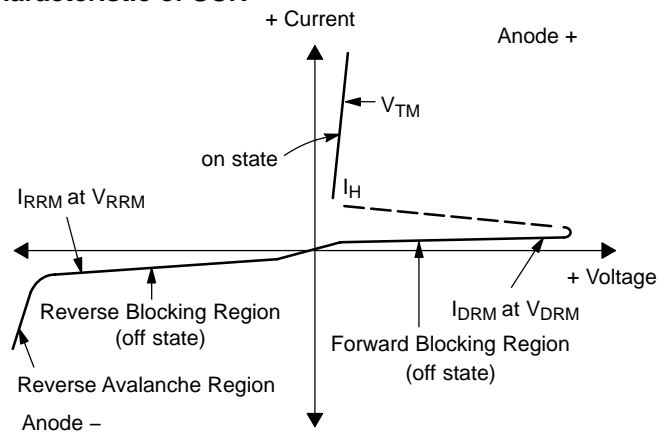


Figure 1. Current Derating

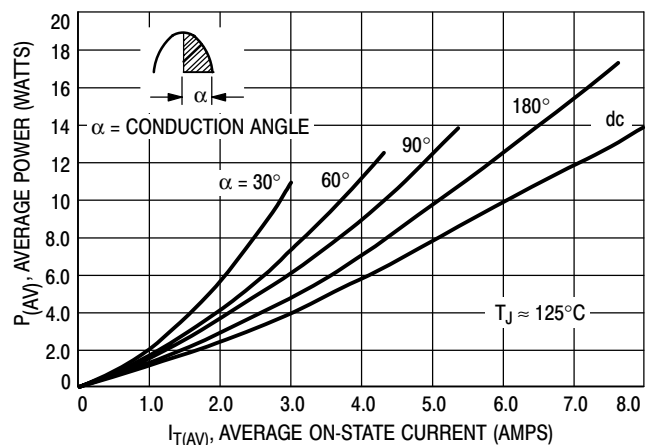


Figure 2. Maximum On-State Power Dissipation

## 2N6394 Series

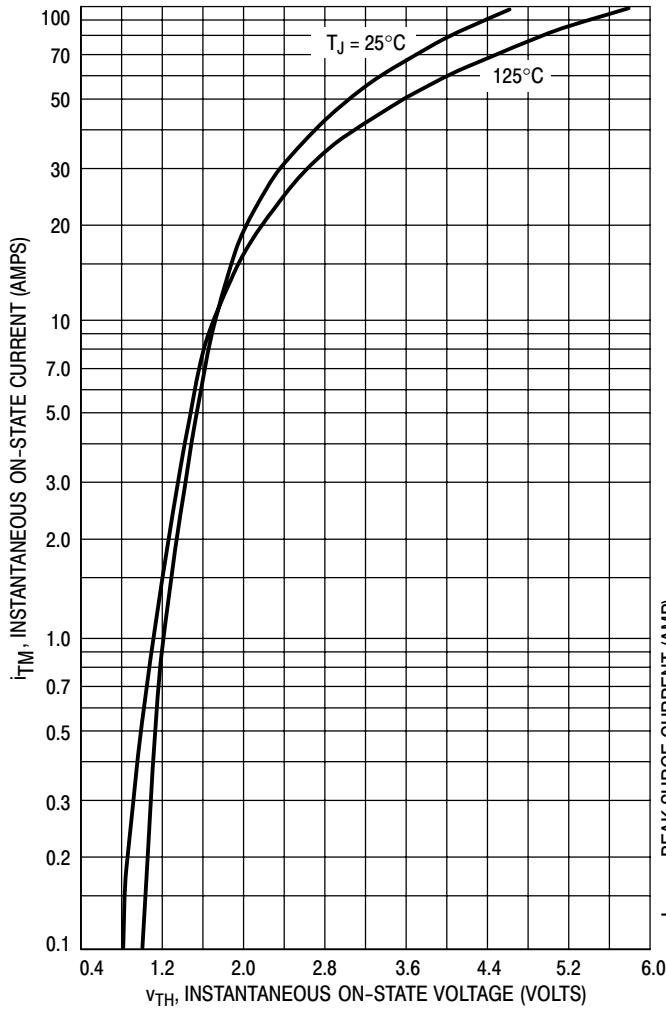


Figure 3. On-State Characteristics

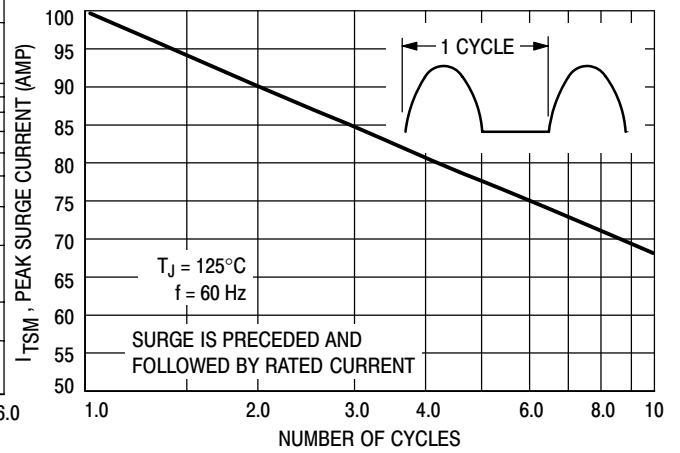


Figure 4. Maximum Non-Repetitive Surge Current

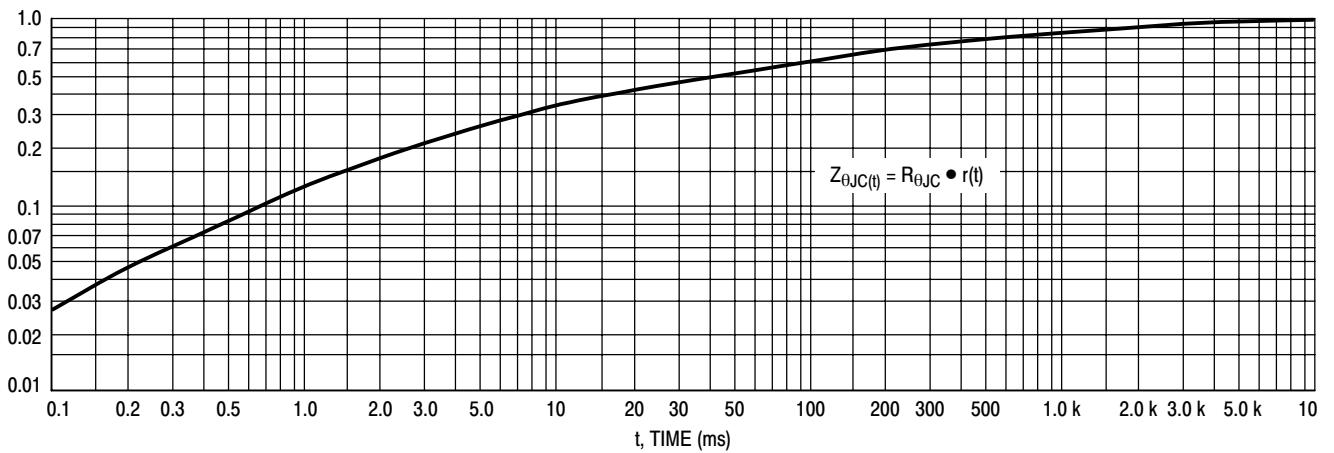


Figure 5. Thermal Response

## 2N6394 Series

### TYPICAL CHARACTERISTICS

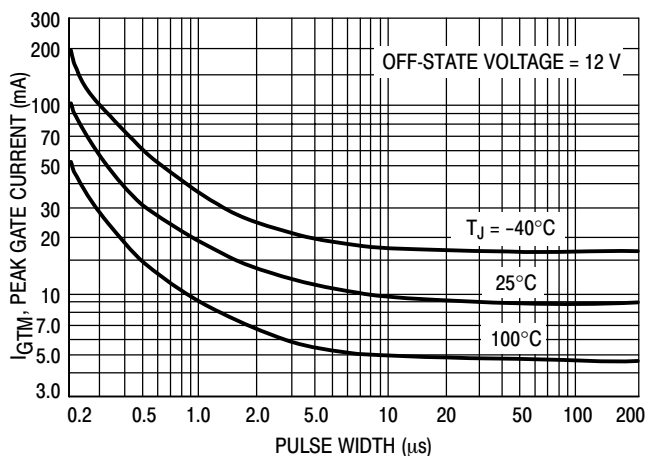


Figure 6. Typical Gate Trigger Current versus Pulse Width

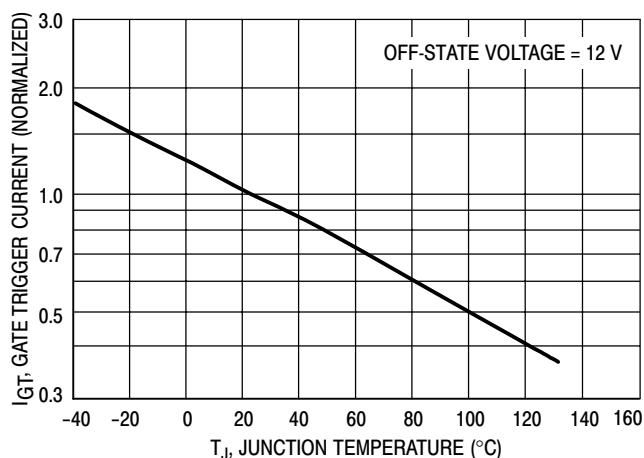


Figure 7. Typical Gate Trigger Current versus Temperature

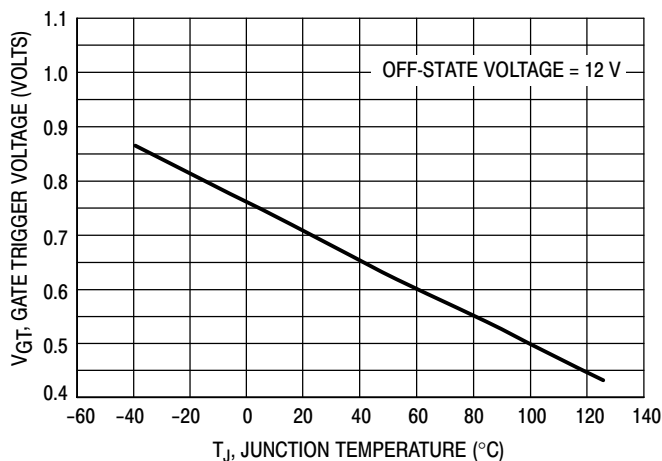


Figure 8. Typical Gate Trigger Voltage versus Temperature

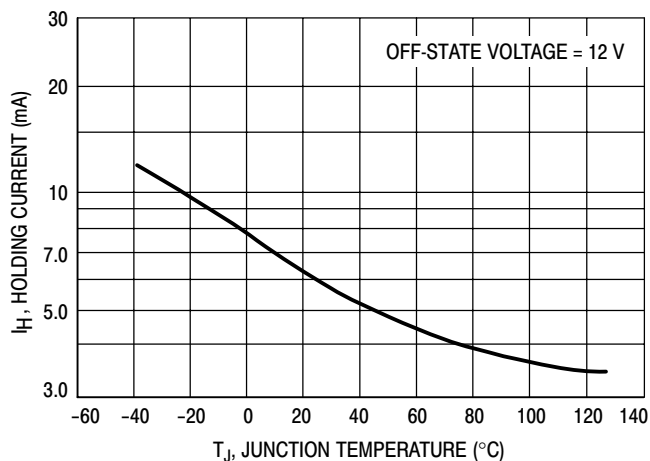


Figure 9. Typical Holding Current versus Temperature

### ORDERING INFORMATION

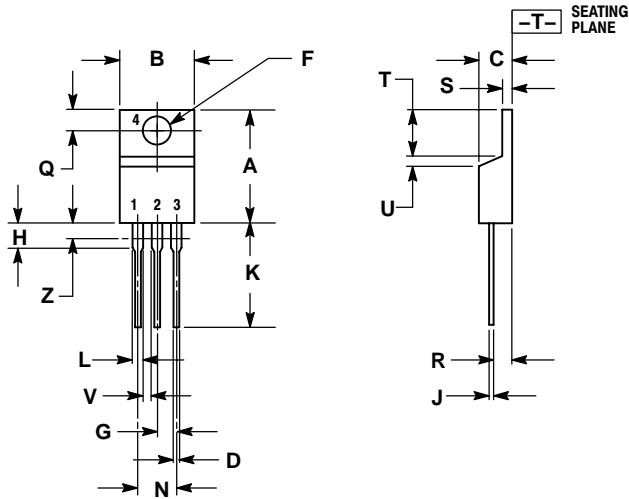
Device	Package	Shipping**
2N6394	TO-220AB	500 Units / Bulk
2N6394G	TO-220AB (Pb-Free)	500 Units / Bulk
2N6395	TO-220AB	500 Units / Bulk
2N6395G	TO-220AB (Pb-Free)	500 Units / Bulk
2N6397	TO-220AB	500 Units / Bulk
2N6397G	TO-220AB (Pb-Free)	500 Units / Bulk
2N6399	TO-220AB	500 Units / Bulk
2N6399G	TO-220AB (Pb-Free)	500 Units / Bulk

\*\*For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

## 2N6394 Series

### PACKAGE DIMENSIONS

TO-220AB  
CASE 221A-09  
ISSUE AD




#### NOTES:

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.

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	0.018	0.025	0.46	0.64
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

#### STYLE 3:

- PIN 1: CATHODE  
2. ANODE  
3. GATE  
4. ANODE

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