

# Silicon Controlled Rectifiers

## Reverse Blocking Triode Thyristors

... designed for industrial and consumer applications such as power supplies; battery chargers; temperature, motor, light and welder controls.

- Economical for a Wide Range of Uses
- High Surge Current —  $I_{TSM} = 350$  Amp
- Practical Level Triggering and Holding Characteristics — 4 and 5.2 mA (Typ) @  $T_C = 25^\circ\text{C}$
- Rugged Construction in Either Pressfit, Stud or Isolated Stud Package

**2N3870  
thru  
2N3873  
2N3896  
thru  
2N3899  
2N6171  
thru  
2N6174**

**SCRs  
35 AMPERES RMS  
100 thru 800 VOLTS**

### MAXIMUM RATINGS ( $T_C = 100^\circ\text{C}$ unless otherwise noted.)

Rating	Symbol	Value	Unit
*Peak Repetitive Forward or Reverse Blocking Voltage, Note 1 ( $T_J = -40$ to $+100^\circ\text{C}$ , 1/2 Sine Wave, 50 to 400 Hz, Gate Open)	$V_{RRM}$ or $V_{DRM}$	100 200 400 600	Volts
*Peak Non-Repetitive Forward or Reverse Blocking Voltage ( $t \leq 5$ ms)	$V_{RSM}$ or $V_{DSM}$	150 330 660 700	Volts
*Average On-State Current, Note 2 ( $T_C = -40$ to $+65^\circ\text{C}$ ) ( $T_C = +85^\circ\text{C}$ )	$I_{T(AV)}$	22 11	Amps
*Peak Non-Repetitive Surge Current (One cycle, 60 Hz) ( $T_C = +65^\circ\text{C}$ )	$I_{TSM}$	350	Amps
Circuit Fusing ( $T_C = -40$ to $+100^\circ\text{C}$ ) ( $t = 1$ to 8.30 ms)	$I^2t$	510	$\text{A}^2\text{s}$

\* Indicates JEDEC Registered Data.

Notes: 1. Ratings apply for zero or negative gate voltage. Devices shall not have a positive bias applied to the gate concurrently with a negative potential on the anode. Devices should not be tested with a constant current source for forward or reverse blocking capability such that the voltage applied exceeds the rated blocking voltage.

2. Isolated stud devices must be derated an additional 10 percent.



**CASE 174-04  
(TO-203)  
STYLE 1  
2N3870 thru 2N3873**



**CASE 175-03  
STYLE 1  
2N3896 thru 2N3899**



**CASE 311-02  
STYLE 1  
(Stud Isolated)  
2N6171 thru 2N6174**

**2N3870 thru 2N3873 • 2N3896 thru 2N3899 • 2N6171 thru 2N6174**

**MAXIMUM RATINGS** ( $T_C = 100^\circ\text{C}$  unless otherwise noted.)

Rating	Symbol	Value	Unit
*Peak Gate Power	PGM	20	Watts
*Average Gate Power	PG(AV)	0.5	Watt
*Peak Forward Gate Current	IGM	2	Amps
Peak Gate Voltage	VGM	10	Volts
*Operating Junction Temperature Range	T <sub>J</sub>	-40 to +100	°C
*Storage Temperature Range	T <sub>stg</sub>	-40 to +150	°C
Stud Torque	—	30	in. lb.

\*Indicates JEDEC Registered Data.

**\*THERMAL CHARACTERISTICS**

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case 2N3870 thru 2N3873, 2N3896 thru 2N3899 2N6171 thru 2N6174	R <sub>θJC</sub>	0.9 1	°C/W

\* Indicates JEDEC Registered Data.

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

Characteristic	Symbol	Min	Typ	Max *	Unit
*Peak Forward or Reverse Blocking Current (Rated V <sub>DRM</sub> or V <sub>RRM</sub> , gate open, T <sub>J</sub> = 100°C) 2N3870, 2N3896, 2N6171 2N3871, 2N3897, 2N6172 2N3872, 2N3898, 2N6173 2N3873, 2N3899, 2N6174 (Rated V <sub>DRM</sub> or V <sub>RRM</sub> , gate open, T <sub>J</sub> = 25°C) All Devices	I <sub>DRM</sub> , I <sub>RRM</sub>	— — — — —	1 1 1 1 —	2 2.5 3 4 10	mA    μA
*Peak On-State Voltage (I <sub>TM</sub> = 69 A Peak)	V <sub>TM</sub>	—	1.5	1.85	Volts
*Gate Trigger Current (Continuous dc) (V <sub>D</sub> = 12 V, R <sub>L</sub> = 24 ohms)	I <sub>GT</sub>	— —	9 4	80 40	mA
*Gate Trigger Voltage (Continuous dc) (V <sub>D</sub> = 12 V, R <sub>L</sub> = 24 ohms)	V <sub>GT</sub>	— —	0.9 0.69	3 1.6	Volts
*Holding Current (Gate Open) (V <sub>D</sub> = 12 V, I <sub>TM</sub> = 200 mA)	I <sub>H</sub>	— —	14 5.2	90 50	mA
*Gate Controlled Turn-On Time (t <sub>d</sub> + t <sub>r</sub> ) (I <sub>TM</sub> = 41 Adc, V <sub>D</sub> = rated V <sub>DRM</sub> , I <sub>GT</sub> = 40 mAdc, Rise Time ≤ 0.05 μs, Pulse Width = 10 μs)	t <sub>gt</sub>	—	—	1.5	μs
Circuit Commutated Turn-Off Time (I <sub>TM</sub> = 10 A, I <sub>R</sub> = 10 A) (I <sub>TM</sub> = 10 A, I <sub>R</sub> = 10 A, T <sub>C</sub> = 100°C)	t <sub>q</sub>	— —	25 35	— —	μs
Forward Voltage Application Rate (T <sub>C</sub> = 100°C, V <sub>D</sub> = Rated V <sub>DRM</sub> )	dv/dt	—	50	—	V/μs

\*Indicates JEDEC Registered Data.

2N3870 thru 2N3873 • 2N3896 thru 2N3899 • 2N6171 thru 2N6174

FIGURE 1 - AVERAGE CURRENT DERATING

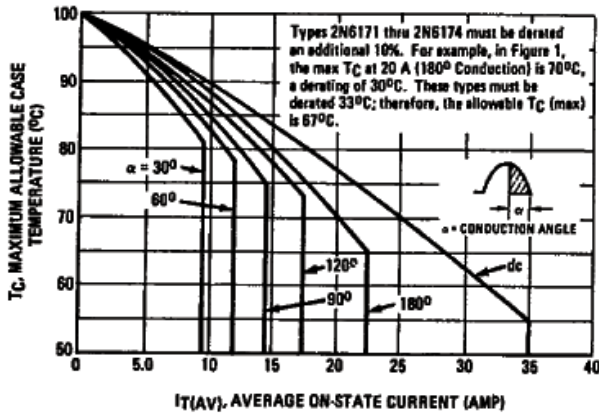


FIGURE 2 - ON-STATE POWER DISSIPATION

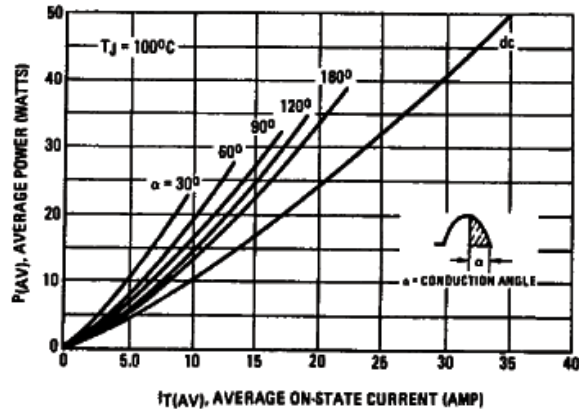


FIGURE 3 - ON-STATE CHARACTERISTICS

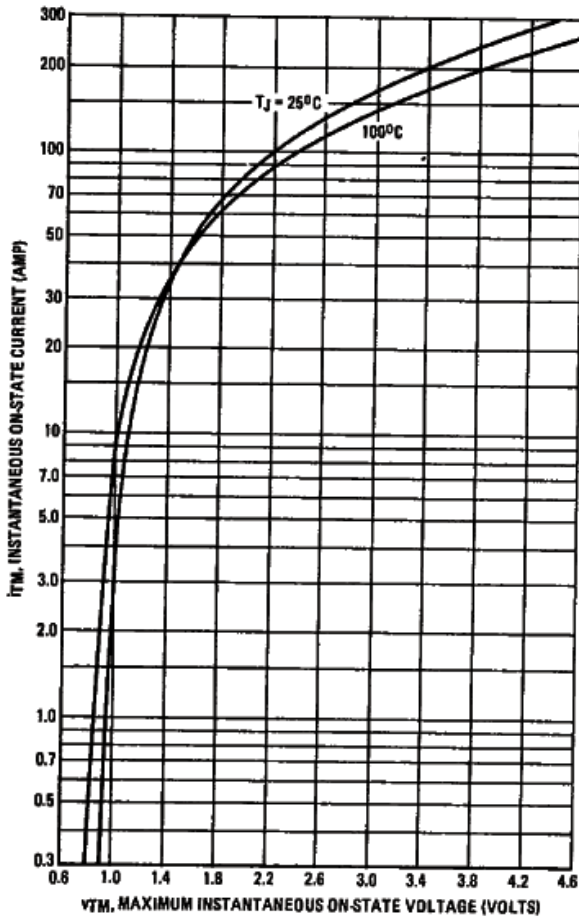
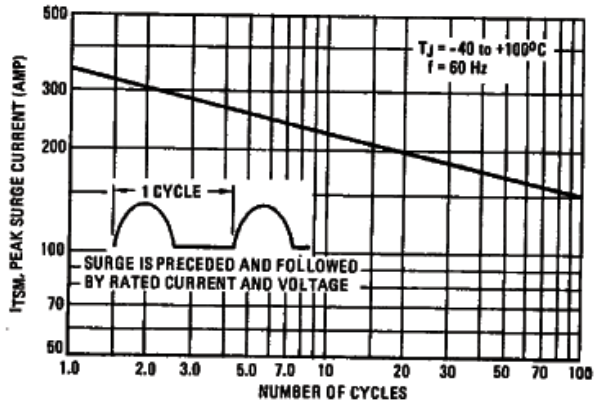


FIGURE 4 - MAXIMUM NON-REPETITIVE SURGE CURRENT



2N3870 thru 2N3873 • 2N3896 thru 2N3899 • 2N6171 thru 2N6174

FIGURE 5 -- TYPICAL THERMAL RESPONSE

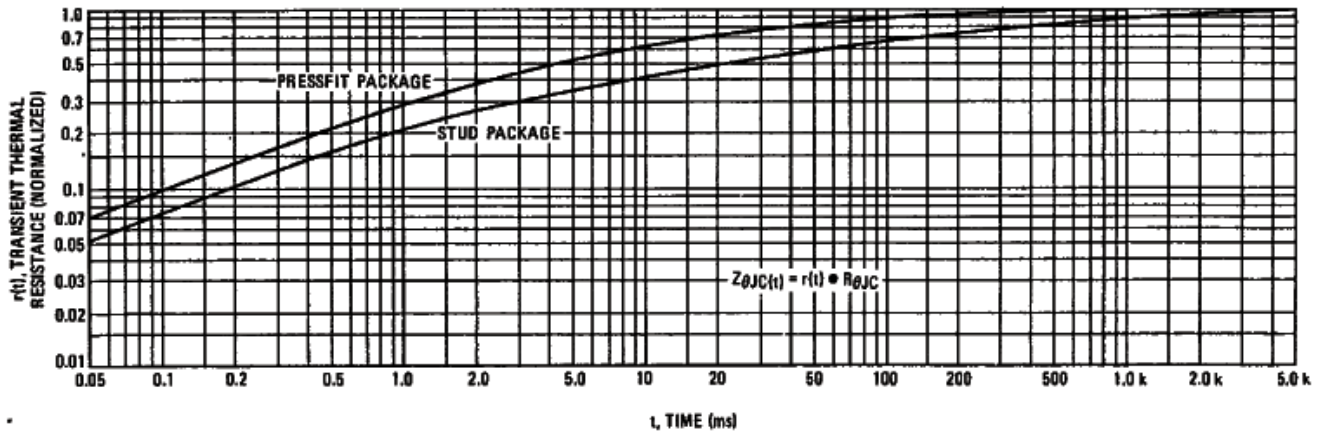


FIGURE 6 -- PULSE TRIGGER CURRENT

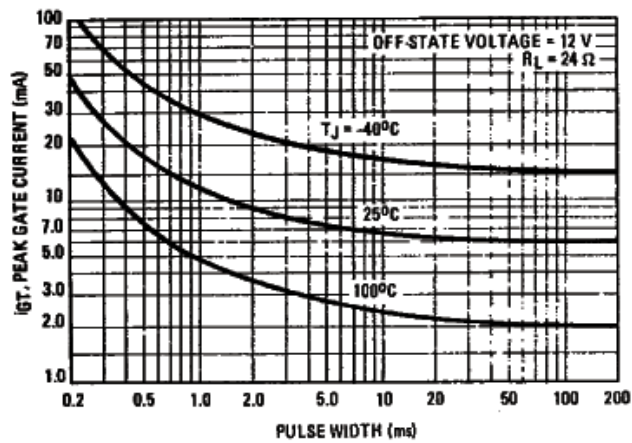


FIGURE 7 -- GATE TRIGGER CURRENT

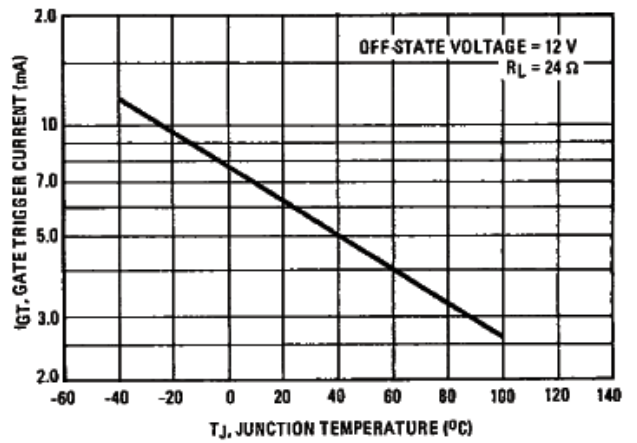


FIGURE 8 -- GATE TRIGGER VOLTAGE

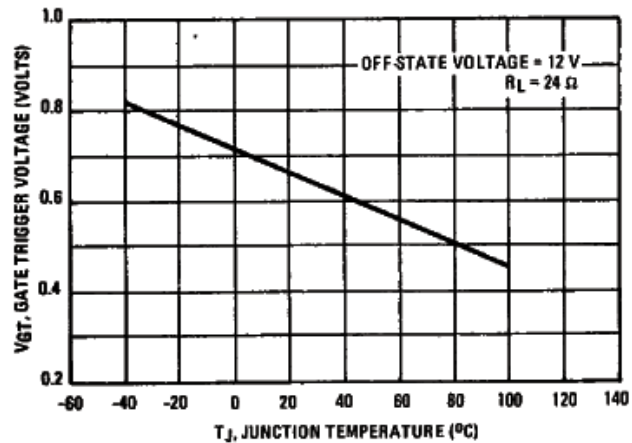


FIGURE 9 -- HOLDING CURRENT

