Preferred Device

# **Silicon Controlled Rectifiers**

## **Reverse Blocking Thyristors**

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

## Features

- Glass Passivated Junctions with Center Gate Fire for Greater Parameter Uniformity and Stability
- Small, Rugged, Thermowatt Constructed for Low Thermal Resistance, High Heat Dissipation and Durability
- Blocking Voltage to 800 Volts
- 300 A Surge Current Capability
- Pb-Free Packages are Available\*



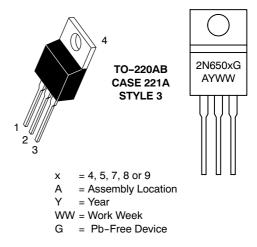
## **ON Semiconductor®**

http://onsemi.com

SCRs 25 AMPERES RMS 50 thru 800 VOLTS



MARKING DIAGRAM



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 6 of this data sheet.

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

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

#### **MAXIMUM RATINGS** ( $T_J = 25^{\circ}C$ unless otherwise noted)

Rating	Symbol	Value	Unit
*Peak Repetitive Off-State Voltage (Note 1) (Gate Open, Sine Wave 50 to 60 Hz, T <sub>J</sub> = 25 to 125°C) 2N6504 2N6505 2N6507 2N6508 2N6509	V <sub>DRM,</sub> V <sub>RRM</sub>	50 100 400 600 800	V
On-State Current RMS (180° Conduction Angles; T <sub>C</sub> = 85°C)	I <sub>T(RMS)</sub>	25	А
Average On-State Current (180° Conduction Angles; $T_C = 85^{\circ}C$ )	I <sub>T(AV)</sub>	16	А
Peak Non-repetitive Surge Current (1/2 Cycle, Sine Wave 60 Hz, $T_J = 100^{\circ}$ C)	I <sub>TSM</sub>	250	А
Forward Peak Gate Power (Pulse Width $\leq$ 1.0 $\mu$ s, T <sub>C</sub> = 85°C)	P <sub>GM</sub>	20	W
Forward Average Gate Power (t = 8.3 ms, $T_C = 85^{\circ}C$ )	P <sub>G(AV)</sub>	0.5	W
Forward Peak Gate Current (Pulse Width $\leq$ 1.0 $\mu$ s, T <sub>C</sub> = 85°C)	I <sub>GM</sub>	2.0	А
Operating Junction Temperature Range	TJ	-40 to +125	°C
Storage Temperature Range	T <sub>stg</sub>	-40 to +150	°C

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<sub>DRM</sub> and V<sub>RRM</sub> 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.

### THERMAL CHARACTERISTICS

Characteristic		Мах	Unit
*Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	1.5	°C/W
*Maximum Lead Temperature for Soldering Purposes 1/8 in from Case for 10 Seconds	ΤL	260	°C

#### ELECTRICAL CHARACTERISTICS (T<sub>C</sub> = 25°C unless otherwise noted.)

Characteristic	Symbol	Min	Тур	Max	Unit
OFF CHARACTERISTICS		•		-	
*Peak Repetitive Forward or Reverse Blocking Current ( $V_{AK}$ = Rated $V_{DRM}$ or $V_{RRM}$ , Gate Open) $T_J = 25^{\circ}C$ $T_J = 125^{\circ}C$	I <sub>DRM</sub> , I <sub>RRM</sub>		-	10 2.0	μA mA
ON CHARACTERISTICS					
*Forward On-State Voltage (Note 2) ( $I_{TM} = 50 \text{ A}$ )	V <sub>TM</sub>	-	-	1.8	V
	I <sub>GT</sub>		9.0 -	30 75	mA
*Gate Trigger Voltage (Continuous dc) (V <sub>AK</sub> = 12 Vdc, R <sub>L</sub> = 100 $\Omega$ , T <sub>C</sub> = -40°C)	V <sub>GT</sub>	-	1.0	1.5	V
Gate Non-Trigger Voltage (V <sub>AK</sub> = 12 Vdc, R <sub>L</sub> = 100 $\Omega$ , T <sub>J</sub> = 125°C)	V <sub>GD</sub>	0.2	-	-	V
*Holding Current $T_C = 25^{\circ}C$ (V <sub>AK</sub> = 12 Vdc, Initiating Current = 200 mA, Gate Open) $T_C = -40^{\circ}C$	lΗ		18 -	40 80	mA
*Turn-On Time (I <sub>TM</sub> = 25 A, I <sub>GT</sub> = 50 mAdc)	t <sub>gt</sub>	-	1.5	2.0	μs
Turn-Off Time ( $V_{DRM}$ = rated voltage) ( $I_{TM}$ = 25 A, $I_R$ = 25 A) ( $I_{TM}$ = 25 A, $I_R$ = 25 A, $T_J$ = 125°C)	tq		15 35		μs
YNAMIC CHARACTERISTICS	1	1	1	I	1

Critical Rate of Rise of Off-State Voltage (Gate Open, Rated $V_{DRM}$ , Exponential Waveform)	dv/dt	1	50	-	V/µs

\*Indicates JEDEC Registered Data.

2. Pulse Test: Pulse Width  $\leq$  300  $\mu s,$  Duty Cycle  $\leq$  2%.

## Voltage Current Characteristic of SCR

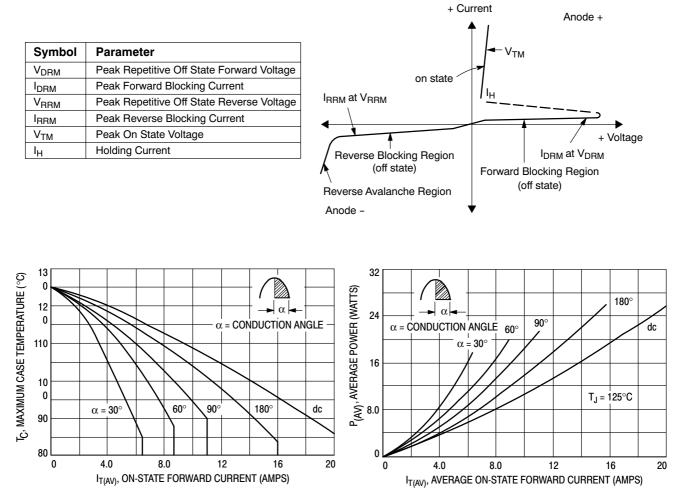


Figure 1. Average Current Derating

Figure 2. Maximum On-State Power Dissipation

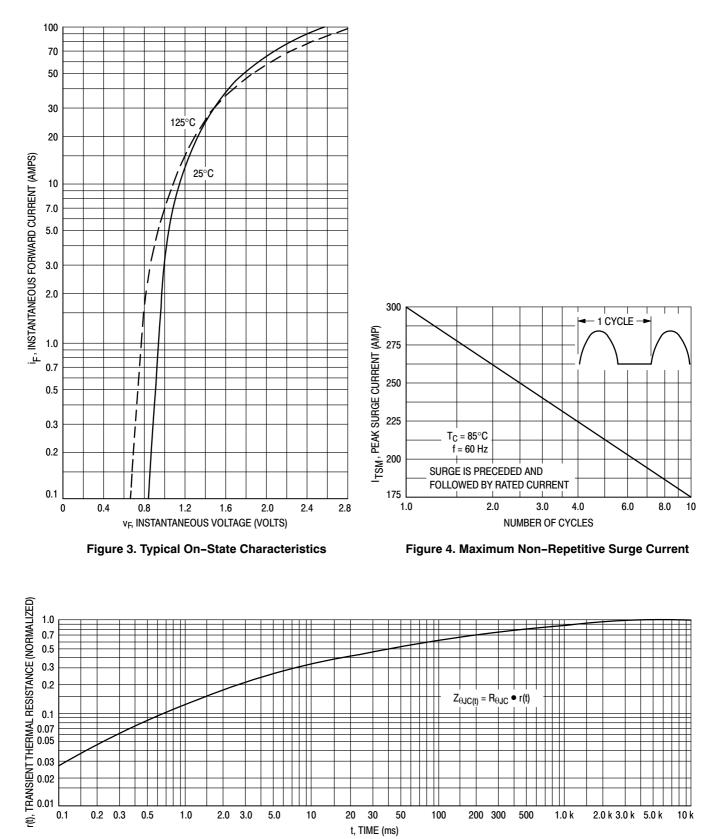
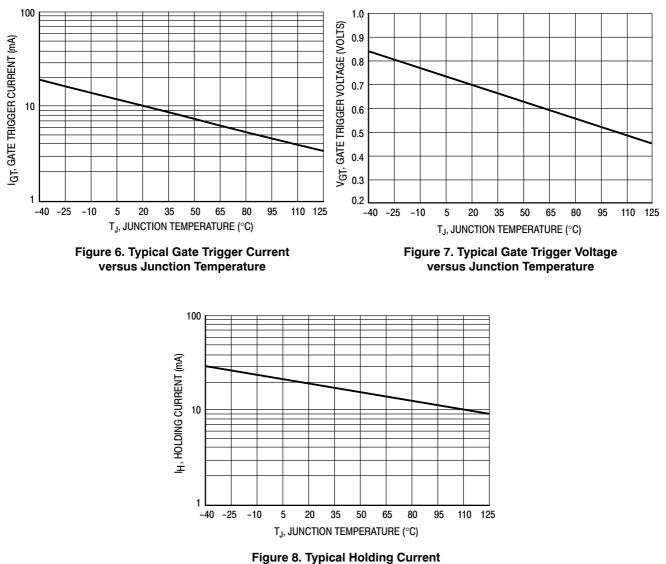


Figure 5. Thermal Response

## **TYPICAL TRIGGER CHARACTERISTICS**



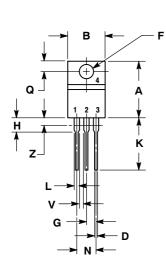
versus Junction Temperature

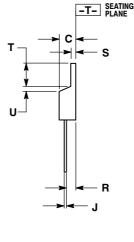
### **ORDERING INFORMATION**

Device	Package	Shipping
2N6504	TO-220AB	
2N6504G	TO-220AB (Pb-Free)	500 Units / Box
2N6505	TO-220AB	SOU UTILS / BOX
2N6505G	TO-220AB (Pb-Free)	
2N6505T	TO-220AB	
2N6505TG	TO-220AB (Pb-Free)	50 Units / Rail
2N6507	TO-220AB	
2N6507G	TO-220AB (Pb-Free)	500 Units / Box
2N6507T	TO-220AB	
2N6507TG	TO-220AB (Pb-Free)	50 Units / Rail
2N6508	TO-220AB	
2N6508G	TO-220AB (Pb-Free)	500 Units / Box
2N6508TG	TO-220AB (Pb-Free)	50 Units / Rail
2N6509	TO-220AB	
2N6509G	TO-220AB (Pb-Free)	500 Units / Box
2N6509T	TO-220AB	
2N6509TG	TO-220AB (Pb-Free)	50 Units / Rail

#### PACKAGE DIMENSIONS

#### **TO-220AB** CASE 221A-07 ISSUE AA





NOTES

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.

2. CONTROLLING DIMENSION: INCH.

DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

	INCHES MILLIMETE		IETERS	
DIM	MIN	MAX	MIN	MAX
Α	0.570	0.620	14.48	15.75
В	0.380	0.405	9.66	10.28
С	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
Н	0.110	0.155	2.80	3.93
ſ	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
Ν	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
Т	0.235	0.255	5.97	6.47
U	0.000	0.050	0.00	1.27
۷	0.045		1.15	
Ζ		0.080		2.04

STYLE 3:

PIN 1. CATHODE 2. ANODE GATE 3.

4. ANODE

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Authorized Distributor

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