

# Thyristors

## Silicon Controlled Rectifiers

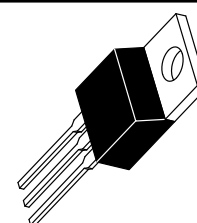
... designed primarily for half-wave ac control applications, such as motor controls, heating controls and power supply crowbar circuits.

- 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

**2N6504**  
**thru**  
**2N6509\***

\*Motorola preferred devices

**SCRs**  
**25 AMPERES RMS**  
**50 thru 800 VOLTS**



**CASE 221A-07**  
**(TO-220AB)**  
**STYLE 3**

### MAXIMUM RATINGS (T<sub>J</sub> = 25°C unless otherwise noted.)

Rating	Symbol	Value	Unit
* Peak Forward and Reverse Blocking Voltage <sup>(1)</sup> (Gate Open, T <sub>J</sub> = 25 to 125°C)	V <sub>DRM</sub> , V <sub>RRM</sub>	50 100 400 600 800	Volts
Forward Current (T <sub>C</sub> = 85°C) (180° Conduction Angle)	I <sub>T(RMS)</sub> I <sub>T(AV)</sub>	25 16	Amps
Peak Non-repetitive Surge Current — 8.3 ms (1/2 Cycle, Sine Wave) 1.5 ms	I <sub>TSM</sub>	300 350	Amps
Forward Peak Gate Power	P <sub>GM</sub>	20	Watts
Forward Average Gate Power	P <sub>G(AV)</sub>	0.5	Watt
Forward Peak Gate Current	I <sub>GM</sub>	2	Amps
Operating Junction Temperature Range	T <sub>J</sub>	-40 to +125	°C
Storage Temperature Range	T <sub>stg</sub>	-40 to +150	°C

### \*THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	R <sub>θJC</sub>	1.5	°C/W

\*Indicates JEDEC Registered Data.

1. 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.

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

REV 2

## 2N6504 thru 2N6509

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

Characteristic	Symbol	Min	Typ	Max	Unit
* Peak Forward or Reverse Blocking Current ( $V_{AK} = \text{Rated } V_{DRM} \text{ or } V_{RRM}, \text{ Gate Open}$ ) $T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$	$I_{DRM}, I_{RRM}$	— —	— —	10 2	$\mu\text{A}$ mA
* Forward "On" Voltage <sup>(1)</sup> ( $I_{TM} = 50 \text{ A}$ )	$V_{TM}$	—	—	1.8	Volts
* Gate Trigger Current (Continuous dc) (Anode Voltage = 12 Vdc, $R_L = 100 \text{ Ohms}$ ) $T_C = 25^\circ\text{C}$ $T_C = -40^\circ\text{C}$	$I_{GT}$	— —	— 25	40 75	mA
* Gate Trigger Voltage (Continuous dc) (Anode Voltage = 12 Vdc, $R_L = 100 \text{ Ohms}, T_C = -40^\circ\text{C}$ )	$V_{GT}$	—	1	1.5	Volts
Gate Non-Trigger Voltage (Anode Voltage = Rated $V_{DRM}, R_L = 100 \text{ Ohms}, T_J = 125^\circ\text{C}$ )	$V_{GD}$	0.2	—	—	Volts
* Holding Current (Anode Voltage = 12 Vdc, $T_C = -40^\circ\text{C}$ )	$I_H$	—	35	40	mA
* Turn-On Time ( $I_{TM} = 25 \text{ A}, I_{GT} = 50 \text{ mAdc}$ )	$t_{gt}$	—	1.5	2	$\mu\text{s}$
Turn-Off Time ( $V_{DRM} = \text{rated voltage}$ ) ( $I_{TM} = 25 \text{ A}, I_R = 25 \text{ A}$ ) ( $I_{TM} = 25 \text{ A}, I_R = 25 \text{ A}, T_J = 125^\circ\text{C}$ )	$t_q$	— —	15 35	— —	$\mu\text{s}$
Critical Rate of Rise of Off-State Voltage (Gate Open, Rated $V_{DRM}, \text{ Exponential Waveform}$ )	$dv/dt$	—	50	—	$\text{V}/\mu\text{s}$

\*Indicates JEDEC Registered Data.

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

FIGURE 1 — AVERAGE CURRENT DERATING

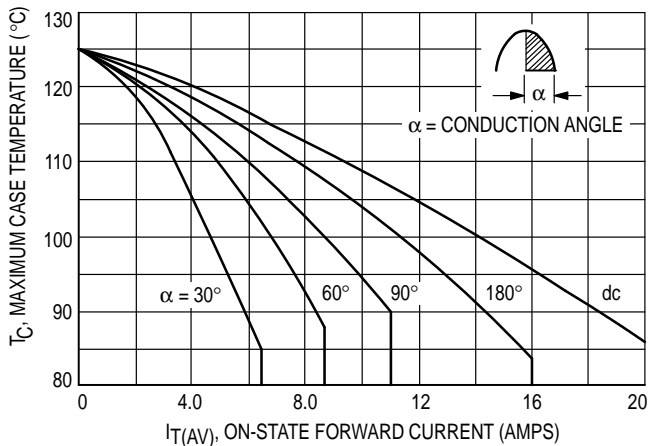


FIGURE 2 — MAXIMUM ON-STATE POWER DISSIPATION

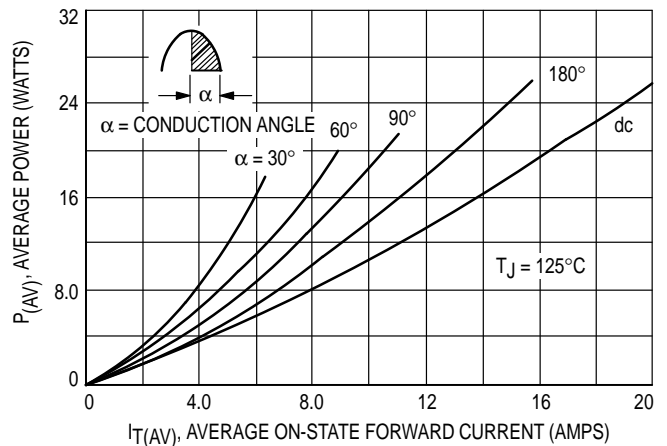


FIGURE 3 — MAXIMUM FORWARD VOLTAGE

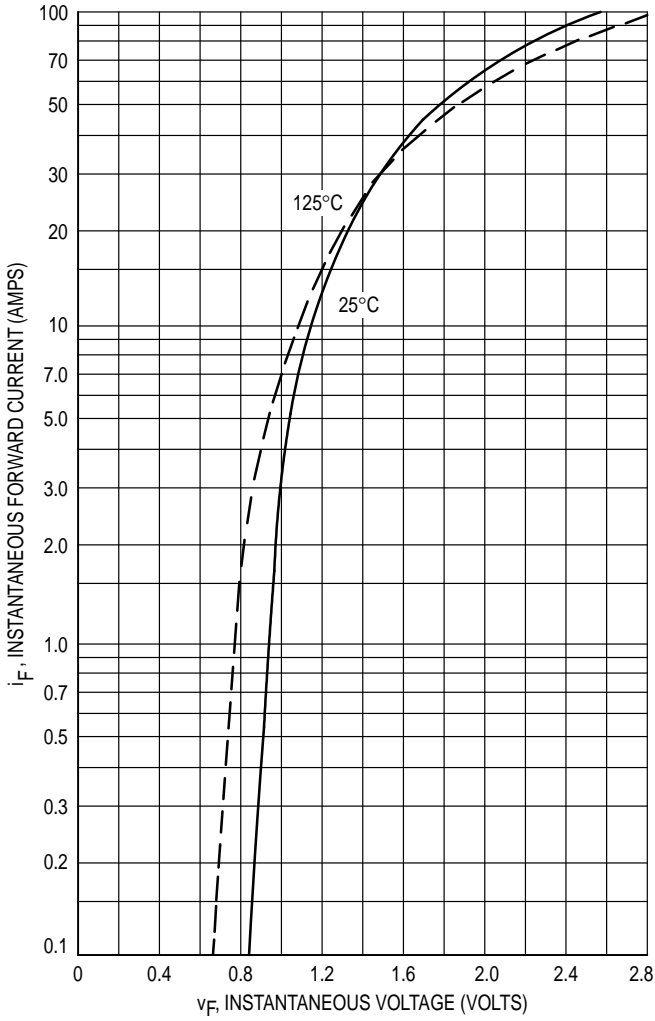


FIGURE 4 — MAXIMUM NON-REPETITIVE SURGE CURRENT

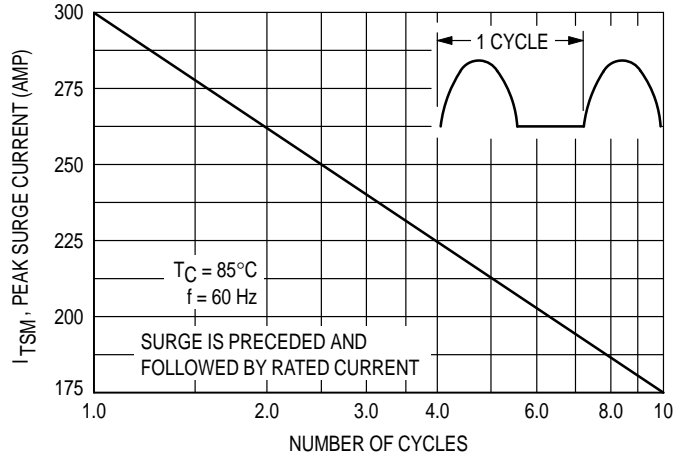


FIGURE 5 — CHARACTERISTICS AND SYMBOLS

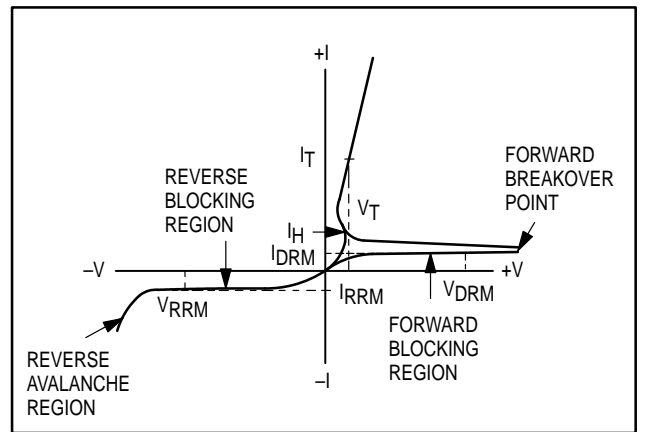
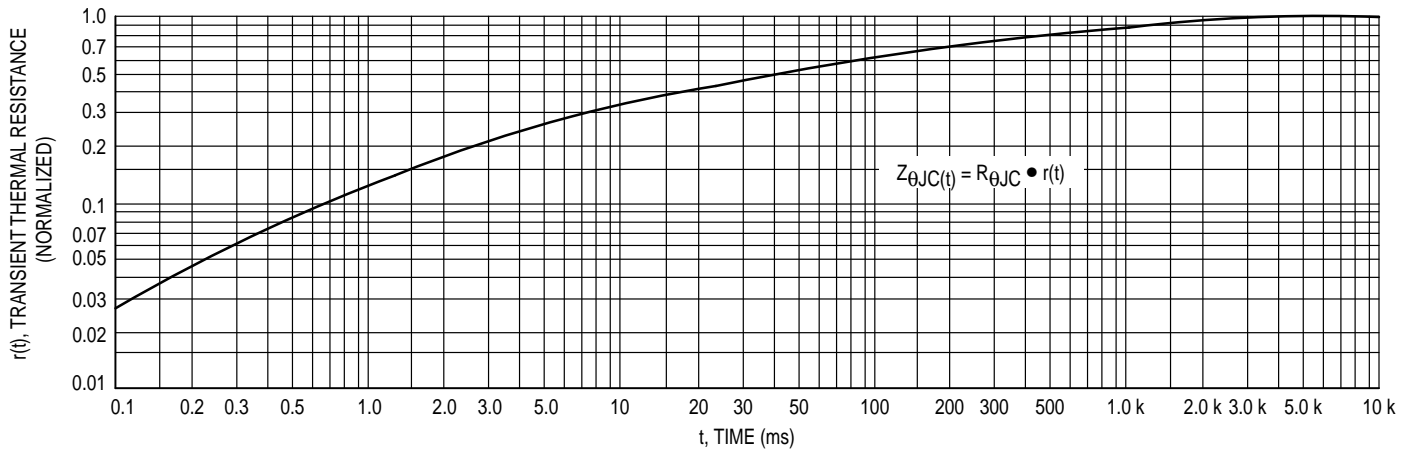


FIGURE 6 — THERMAL RESPONSE



TYPICAL TRIGGER CHARACTERISTICS

FIGURE 7 — GATE TRIGGER CURRENT

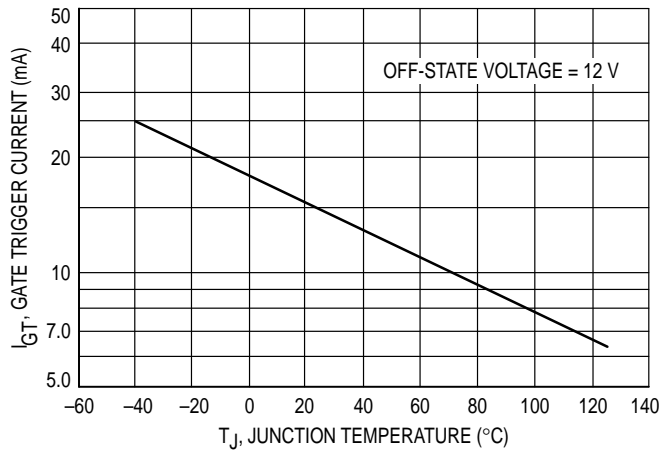


FIGURE 8 — GATE TRIGGER VOLTAGE

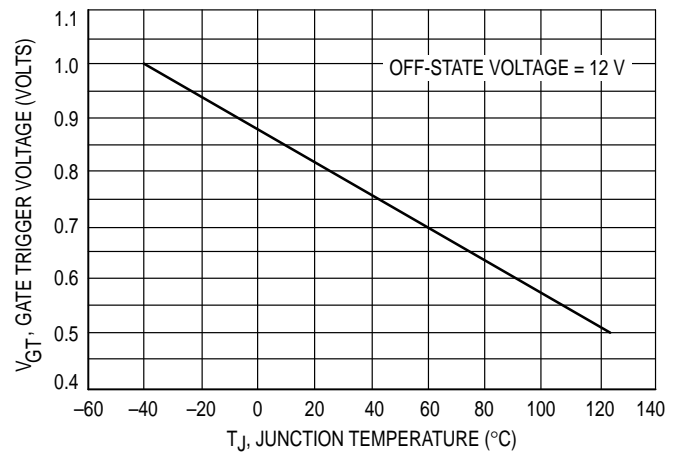
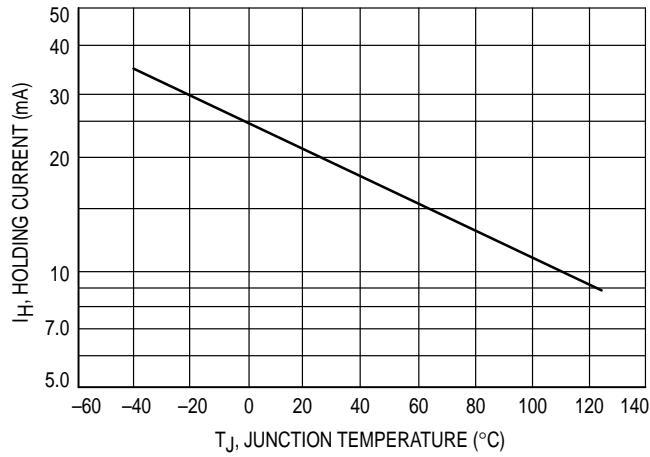
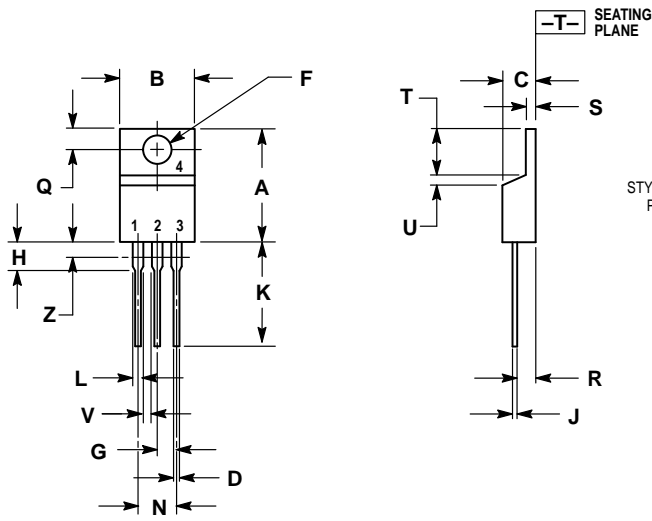


FIGURE 9 — HOLDING CURRENT



PACKAGE DIMENSIONS




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

- 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	0.014	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

CASE 221A-07  
(TO-220AB)  
ISSUE Z

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