

Thyristors

Silicon Controlled Rectifiers

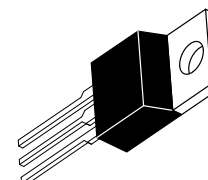
... designed primarily for half-wave ac control applications, such as motor controls, heating controls and power supply crowbar circuits.

- 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-04
(TO-220AB)
STYLE 3**

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

Rating	Symbol	Value	Unit
*Peak Forward and Reverse Blocking Voltage ⁽¹⁾ (Gate Open, $T_J = 25$ to 125°C)	V_{DRM} , V_{RRM}	50 100 200 400 600 800	Volts
Forward Current ($T_C = 85^\circ\text{C}$) (180° Conduction Angle)	$I_T(\text{RMS})$ $I_T(\text{AV})$	25 16	Amps
Peak Non-repetitive Surge Current — 8.3 ms (1/2 Cycle, Sine Wave) 1.5 ms	I_{TSM}	300 350	Amps
Forward Peak Gate Power	P_{GM}	20	Watts
Forward Average Gate Power	$P_{G(\text{AV})}$	0.5	Watt
Forward Peak Gate Current	I_{GM}	2	Amps
Operating Junction Temperature Range	T_J	-40 to $+125$	$^\circ\text{C}$
Storage Temperature Range	T_{stg}	-40 to $+150$	$^\circ\text{C}$

*THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.5	$^\circ\text{C/W}$

*Indicates JEDEC Registered Data.

1. V_{DRM} and V_{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.

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

REV 1

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 ($V_{AK} = \text{Rated } V_{DRM} \text{ or } V_{RRM}$, Gate Open) $T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$	I_{DRM}, I_{RRM}	— —	— —	10 2	μA mA
* Forward "On" Voltage ⁽¹⁾ ($I_{TM} = 50 \text{ A}$)	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	μs
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	— —	μs
Critical Rate of Rise of Off-State Voltage (Gate Open, Rated V_{DRM} , 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

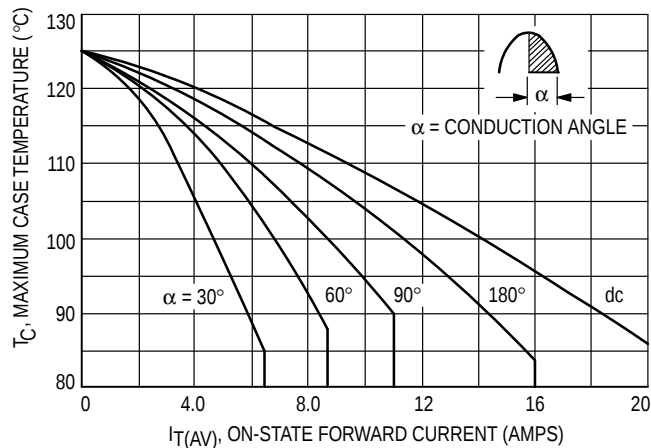


FIGURE 2 — MAXIMUM ON-STATE POWER DISSIPATION

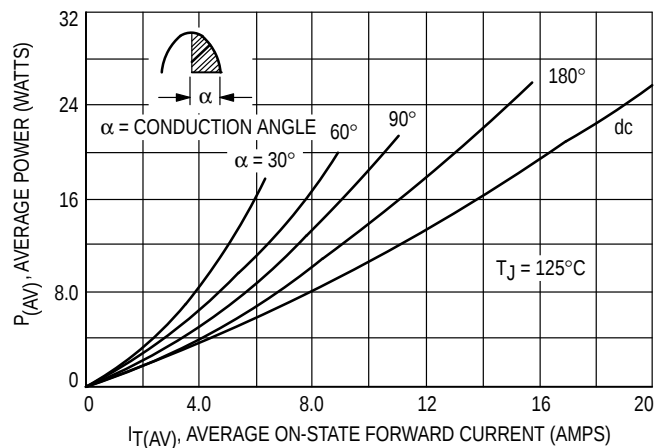


FIGURE 3 — MAXIMUM FORWARD VOLTAGE

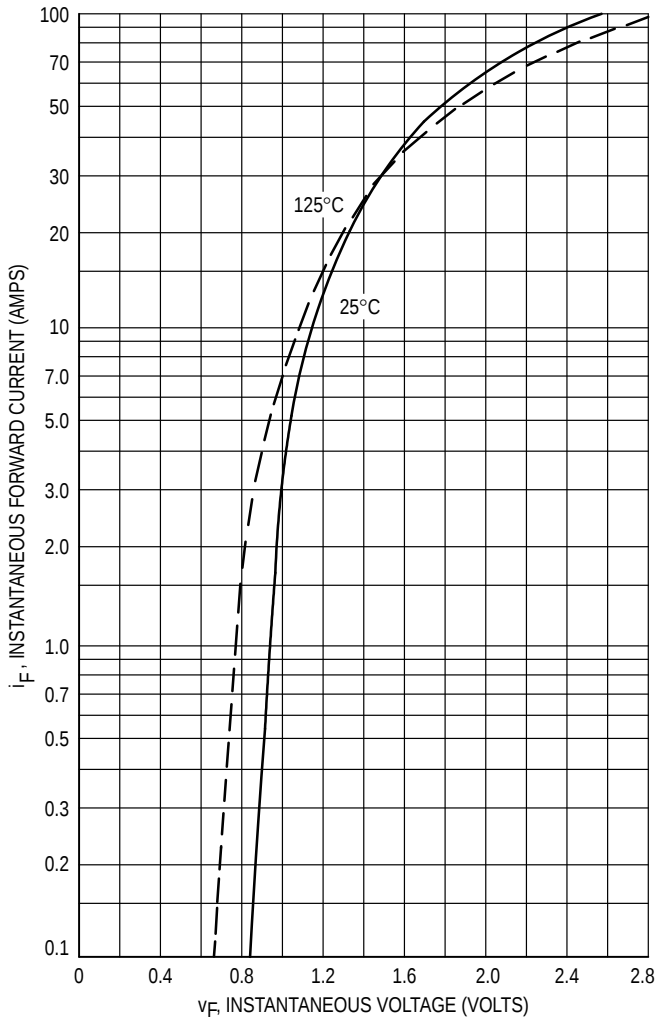


FIGURE 4 — MAXIMUM NON-REPETITIVE SURGE CURRENT

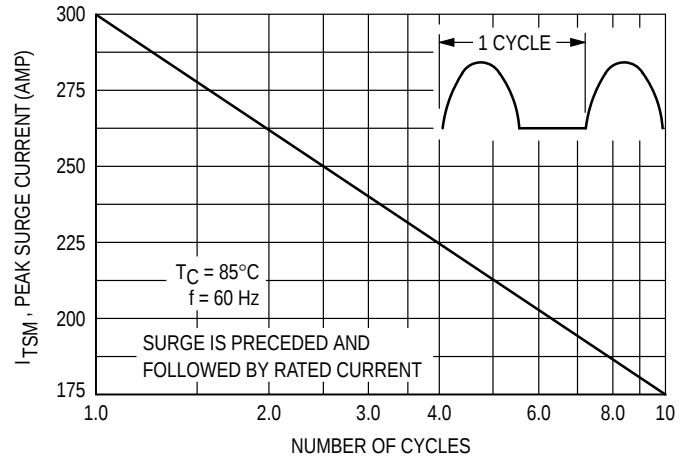


FIGURE 5 — CHARACTERISTICS AND SYMBOLS

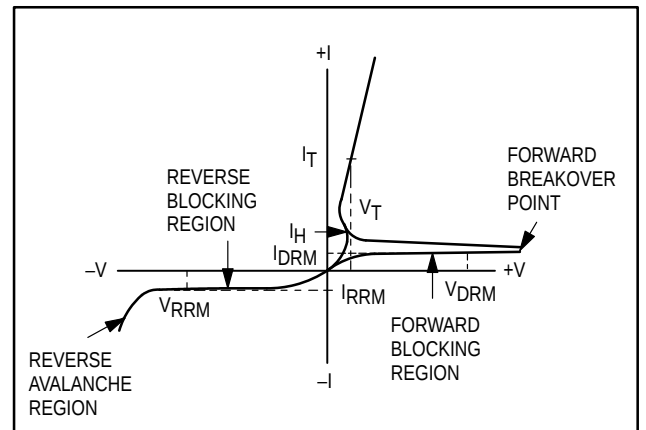
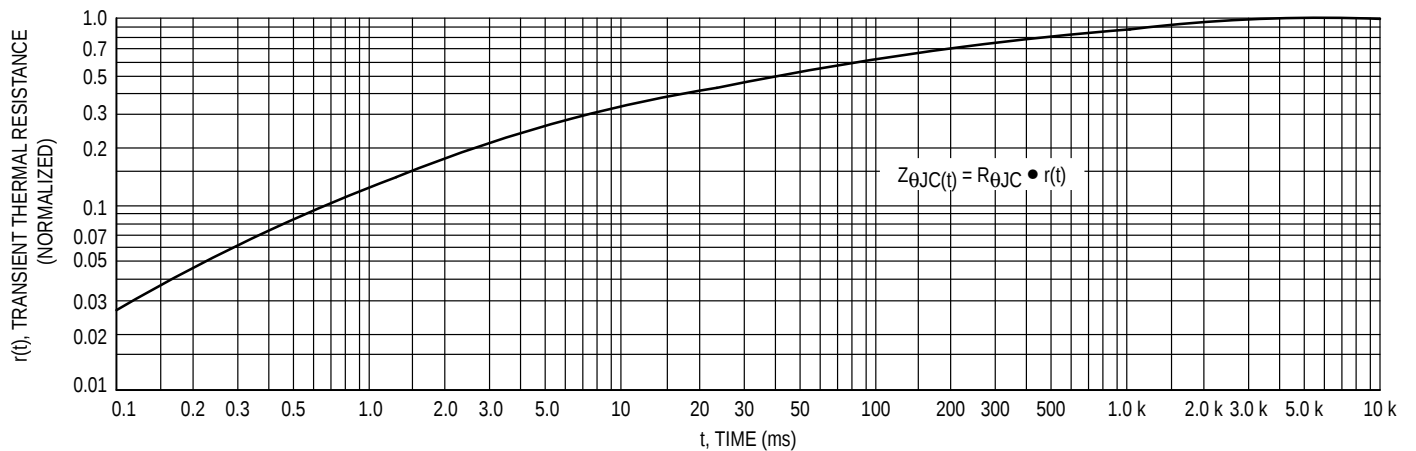


FIGURE 6 — THERMAL RESPONSE



TYPICAL TRIGGER CHARACTERISTICS

FIGURE 7 — GATE TRIGGER CURRENT

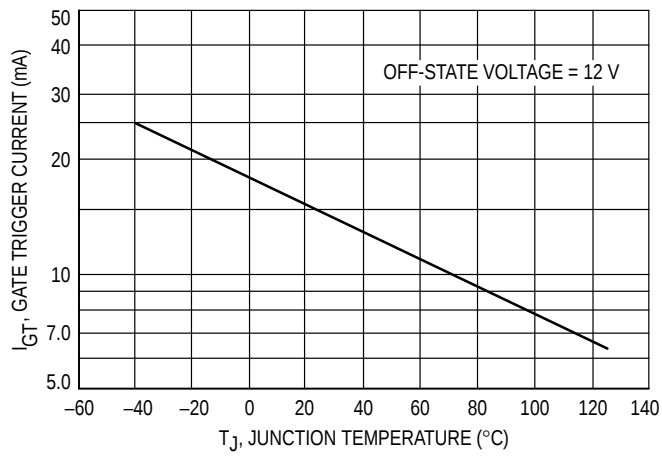


FIGURE 8 — GATE TRIGGER VOLTAGE

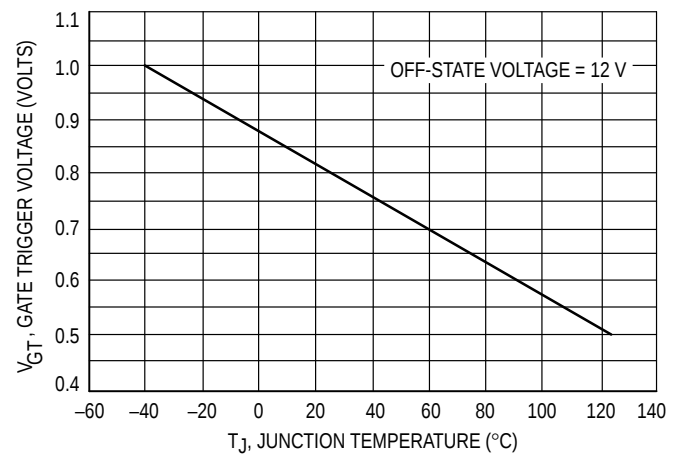
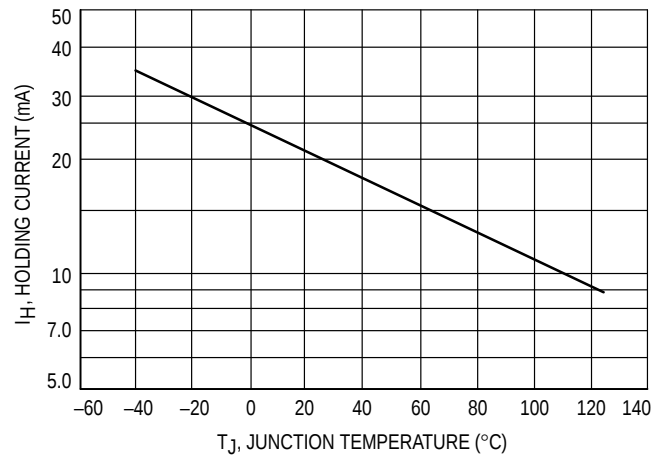
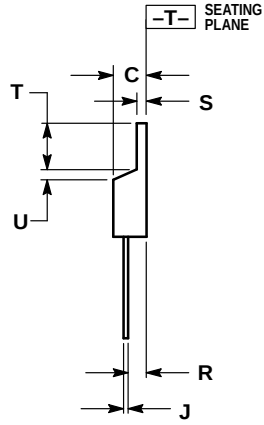
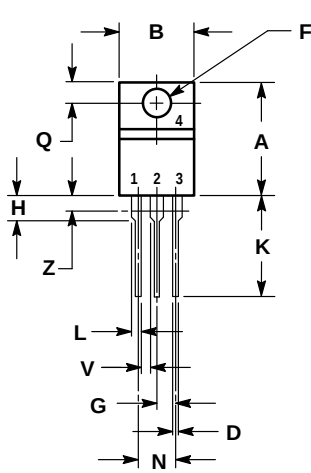


FIGURE 9 — HOLDING CURRENT



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	0.055	1.15	1.39
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-04
(TO-220AB)

Motorola reserves the right to make changes without further notice to any products herein. Motorola makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Motorola assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters can and do vary in different applications. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. Motorola does not convey any license under its patent rights nor the rights of others. Motorola products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Motorola product could create a situation where personal injury or death may occur. Should Buyer purchase or use Motorola products for any such unintended or unauthorized application, Buyer shall indemnify and hold Motorola and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Motorola was negligent regarding the design or manufacture of the part. Motorola and  are registered trademarks of Motorola, Inc. Motorola, Inc. is an Equal Opportunity/Affirmative Action Employer.

Literature Distribution Centers:

USA: Motorola Literature Distribution; P.O. Box 20912; Phoenix, Arizona 85036.

EUROPE: Motorola Ltd.; European Literature Centre; 88 Tanners Drive, Blakelands, Milton Keynes, MK14 5BP, England.

JAPAN: Nippon Motorola Ltd.; 4-32-1, Nishi-Gotanda, Shinagawa-ku, Tokyo 141, Japan.

ASIA PACIFIC: Motorola Semiconductors H.K. Ltd.; Silicon Harbour Center, No. 2 Dai King Street, Tai Po Industrial Estate, Tai Po, N.T., Hong Kong.

