

2N6504 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 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
- Device Marking: Logo, Device Type, e.g., 2N6504, Date Code

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

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

*Indicates JEDEC Registered Data

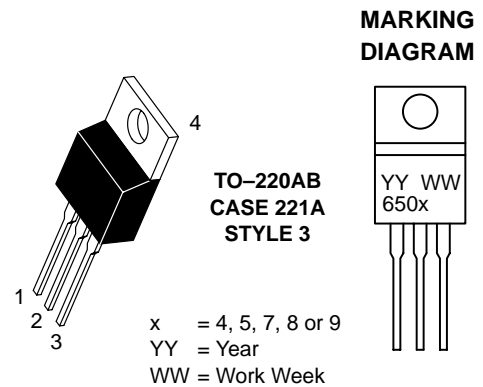
1. V_{DRM} and V_{RRM} for all types can be applied on a continuous basis. Ratings apply for zero or negative gate voltage; however, positive gate voltage shall not be applied concurrent with negative potential on the anode. Blocking voltages shall not be tested with a constant current source such that the voltage ratings of the devices are exceeded.



ON Semiconductor™

<http://onsemi.com>

SCRs
25 AMPERES RMS
50 thru 800 VOLTS



PIN ASSIGNMENT	
1	Cathode
2	Anode
3	Gate
4	Anode

ORDERING INFORMATION

Device	Package	Shipping
2N6504	TO220AB	500/Box
2N6505	TO220AB	500/Box
2N6507	TO220AB	500/Box
2N6508	TO220AB	500/Box
2N6509	TO220AB	500/Box

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

2N6504 Series

*THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.5	$^{\circ}C/W$
Maximum Lead Temperature for Soldering Purposes 1/8" from Case for 10 Seconds	T_L	260	$^{\circ}C$

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

Characteristic	Symbol	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

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

ON CHARACTERISTICS

*Forward On-State Voltage (Note 2.) ($I_{TM} = 50 \text{ A}$)	V_{TM}	–	–	1.8	Volts	
*Gate Trigger Current (Continuous dc) ($V_{AK} = 12 \text{ Vdc}, R_L = 100 \text{ Ohms}$)	I_{GT}	$T_C = 25^{\circ}C$	–	9.0	30	mA
		$T_C = -40^{\circ}C$	–	–	75	
*Gate Trigger Voltage (Continuous dc) ($V_{AK} = 12 \text{ Vdc}, R_L = 100 \text{ Ohms}, T_C = -40^{\circ}C$)	V_{GT}	–	1.0	1.5	Volts	
Gate Non-Trigger Voltage ($V_{AK} = 12 \text{ Vdc}, R_L = 100 \text{ Ohms}, T_J = 125^{\circ}C$)	V_{GD}	0.2	–	–	Volts	
*Holding Current ($V_{AK} = 12 \text{ Vdc}, \text{ Initiating Current} = 200 \text{ mA}, \text{ Gate Open}$)	I_H	$T_C = 25^{\circ}C$	–	18	40	mA
		$T_C = -40^{\circ}C$	–	–	80	
*Turn-On Time ($I_{TM} = 25 \text{ A}, I_{GT} = 50 \text{ mAdc}$)	t_{gt}	–	1.5	2.0	μs	
Turn-Off Time ($V_{DRM} = \text{rated voltage}$) ($I_{TM} = 25 \text{ A}, I_R = 25 \text{ A}$) ($I_{TM} = 25 \text{ A}, I_R = 25 \text{ A}, T_J = 125^{\circ}C$)	t_q		–	15	–	μs
			–	35	–	

DYNAMIC CHARACTERISTICS

Critical Rate of Rise of Off-State Voltage (Gate Open, Rated V_{DRM} , Exponential Waveform)	dv/dt	–	50	–	$V/\mu s$
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*Indicates JEDEC Registered Data.

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

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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

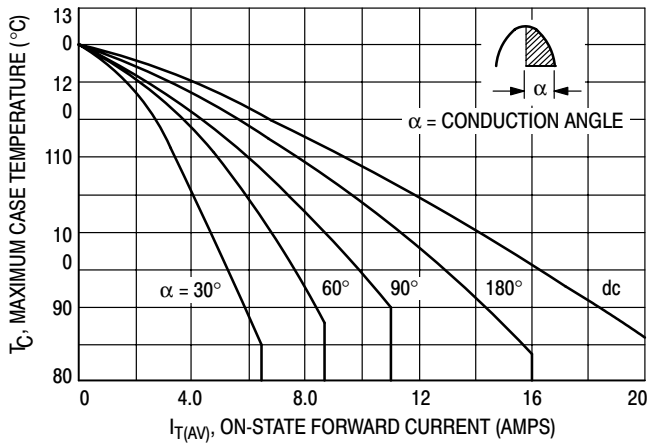
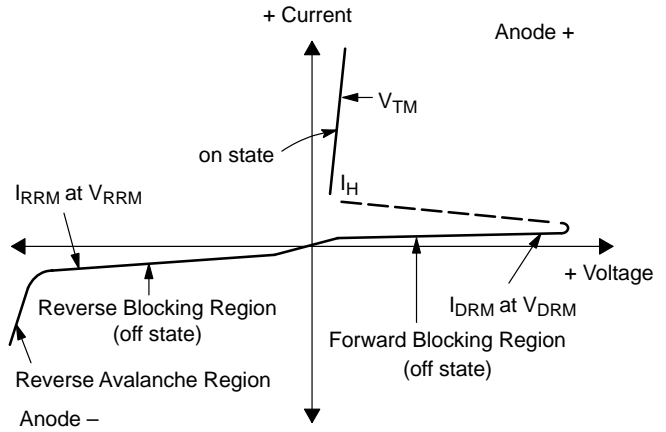


Figure 1. Average Current Derating

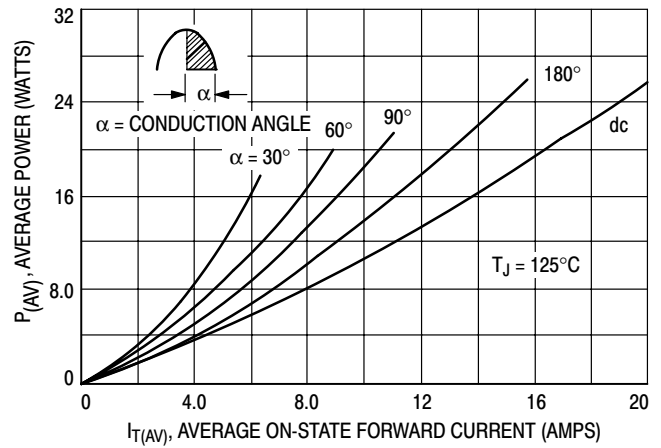


Figure 2. Maximum On-State Power Dissipation

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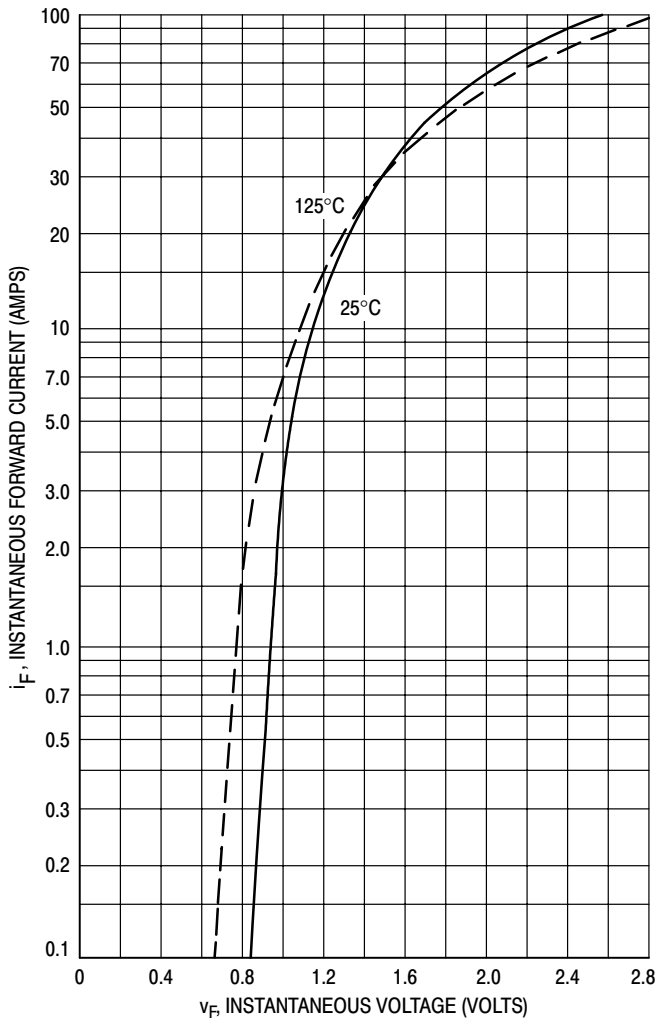


Figure 3. Typical On-State Characteristics

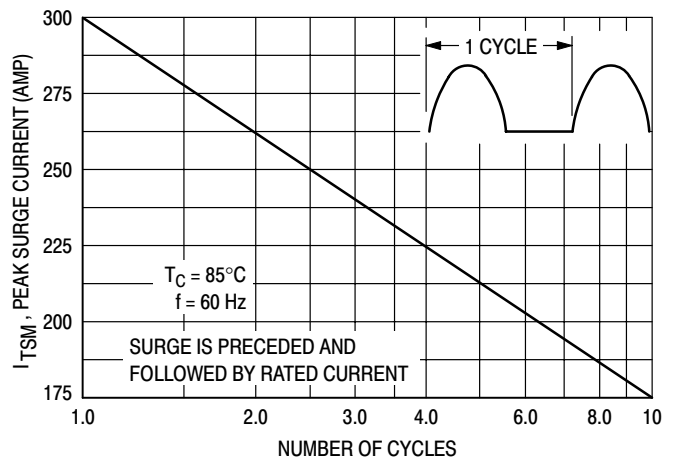


Figure 4. Maximum Non-Repetitive Surge Current

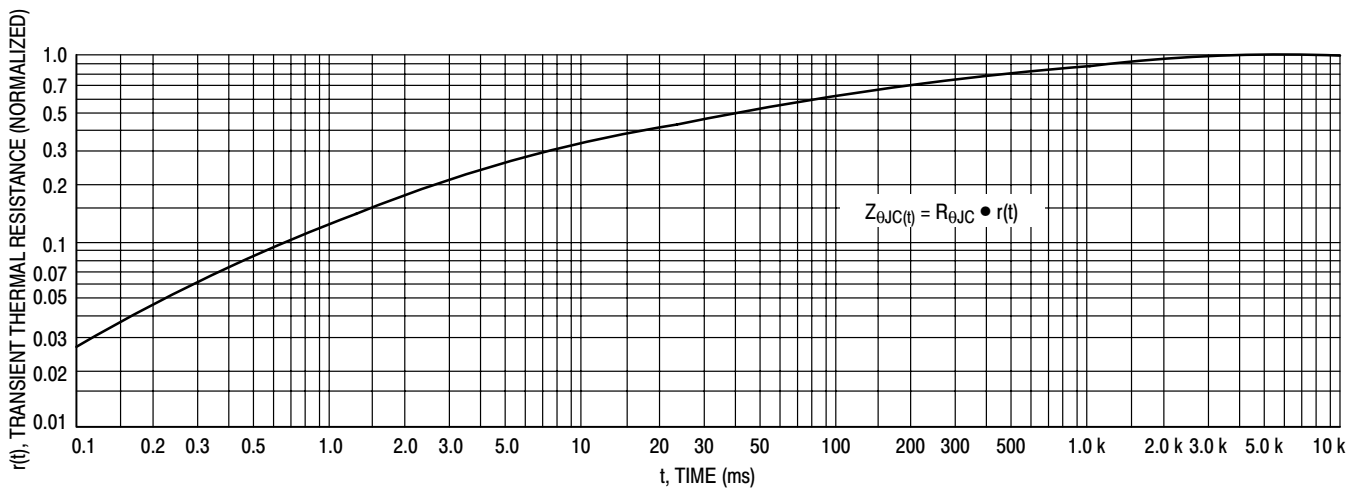


Figure 5. Thermal Response

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TYPICAL TRIGGER CHARACTERISTICS

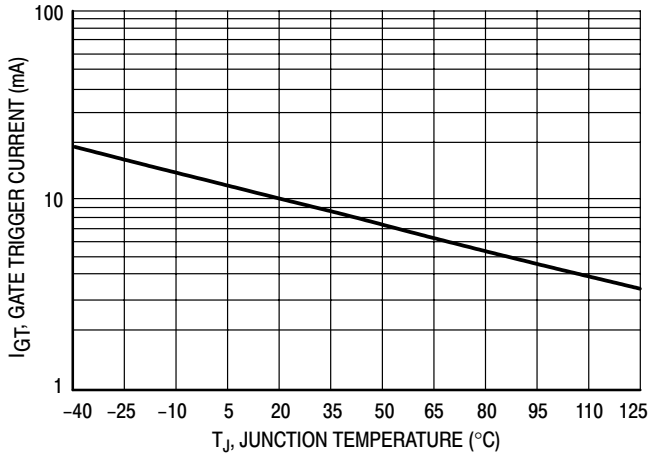


Figure 6. Typical Gate Trigger Current versus Junction Temperature

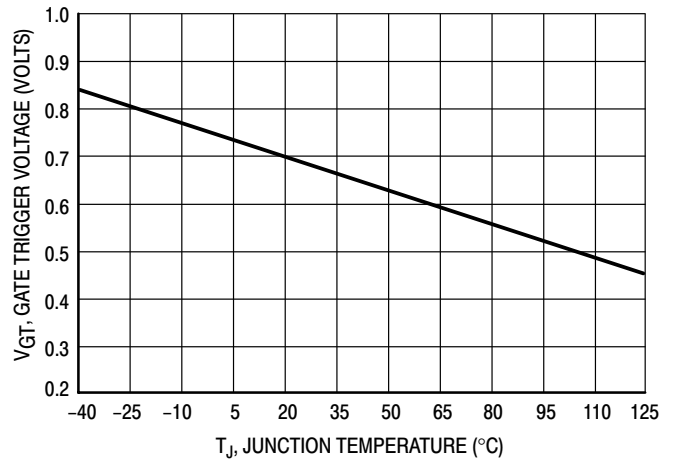


Figure 7. Typical Gate Trigger Voltage versus Junction Temperature

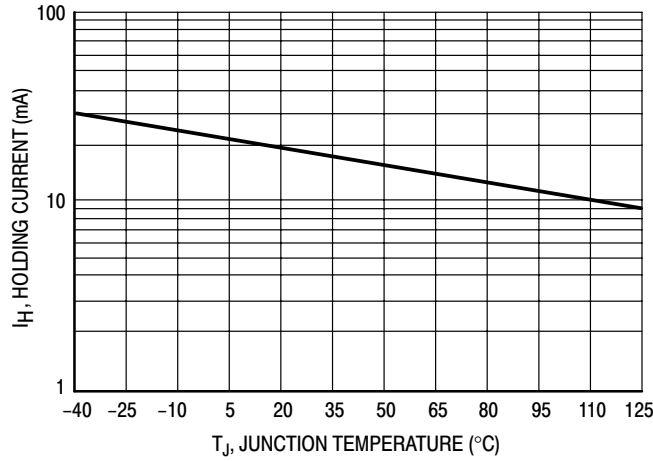
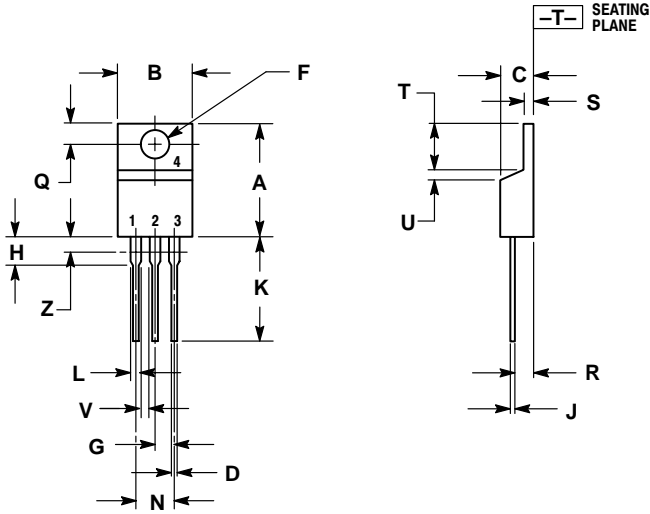


Figure 8. Typical Holding Current versus Junction Temperature

2N6504 Series

PACKAGE DIMENSIONS

TO-220AB
CASE 221A-07
ISSUE AA



- 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

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

Notes

2N6504 Series

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