

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}	50 100 400 600 800	Volts
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.



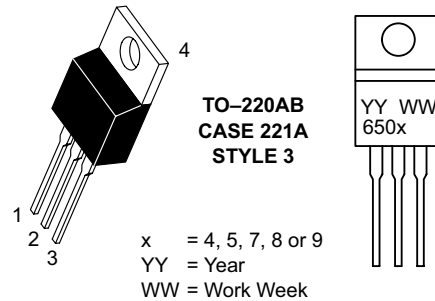
ON Semiconductor™

<http://onsemi.com>

SCRs
25 AMPERES RMS
50 thru 800 VOLTS



MARKING DIAGRAM



PIN ASSIGNMENT

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}	–	–	10	μA
$T_J = 25^{\circ}C$		–	–	2.0	mA
$T_J = 125^{\circ}C$		–	–		

ON CHARACTERISTICS

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

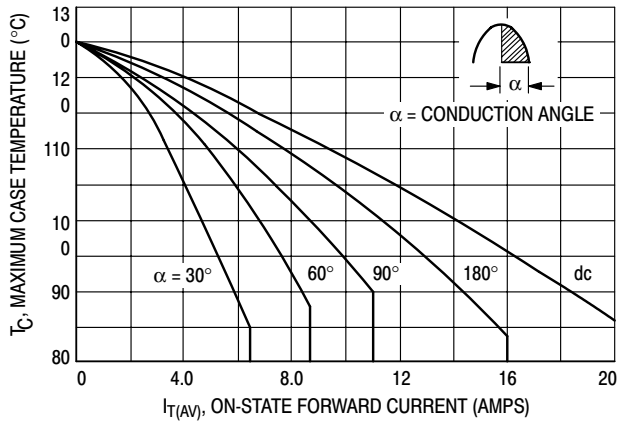
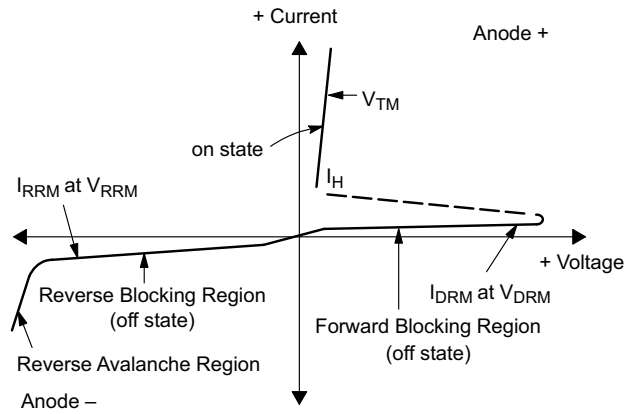


Figure 1. Average Current Derating

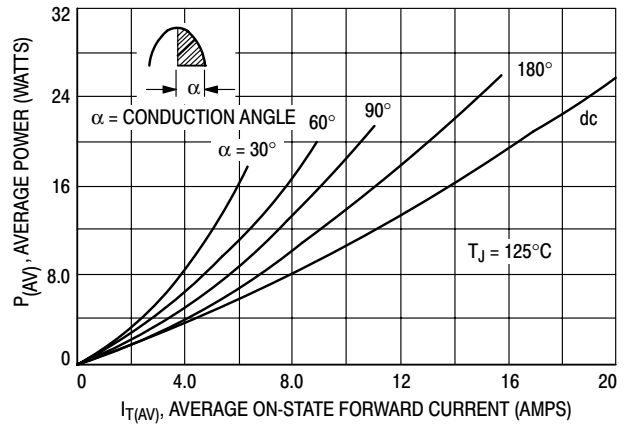


Figure 2. Maximum On-State Power Dissipation

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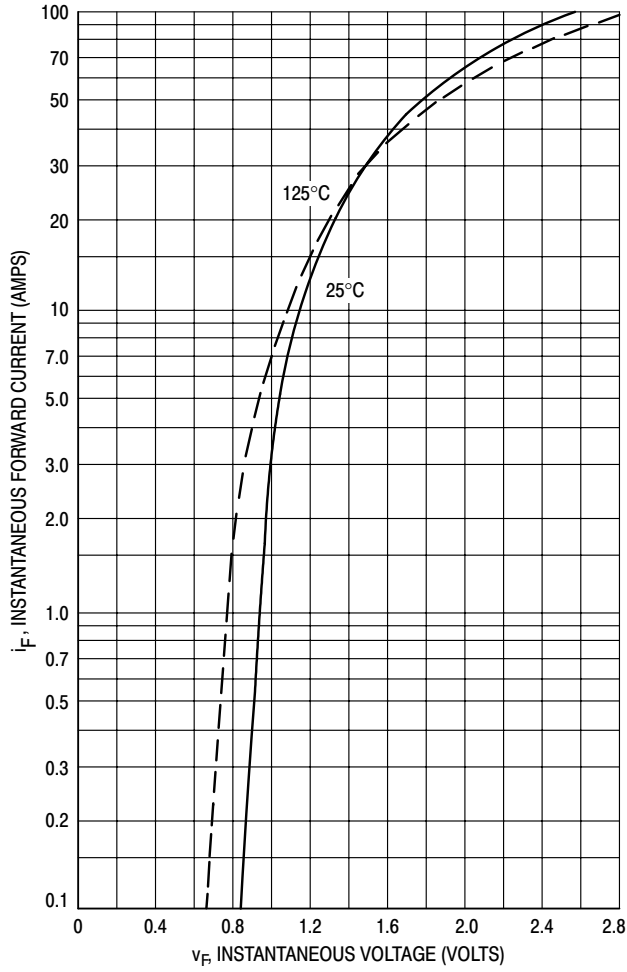


Figure 3. Typical On-State Characteristics

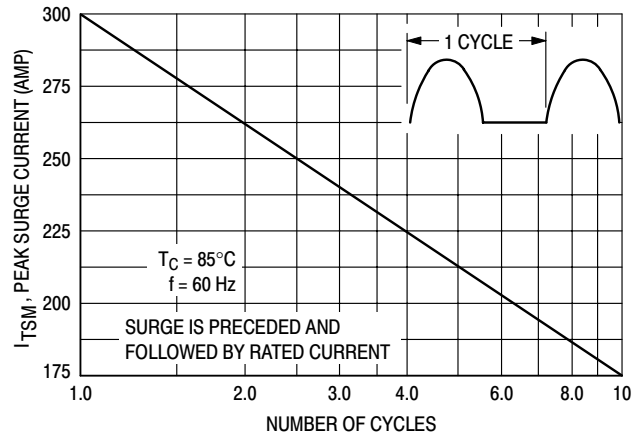


Figure 4. Maximum Non-Repetitive Surge Current

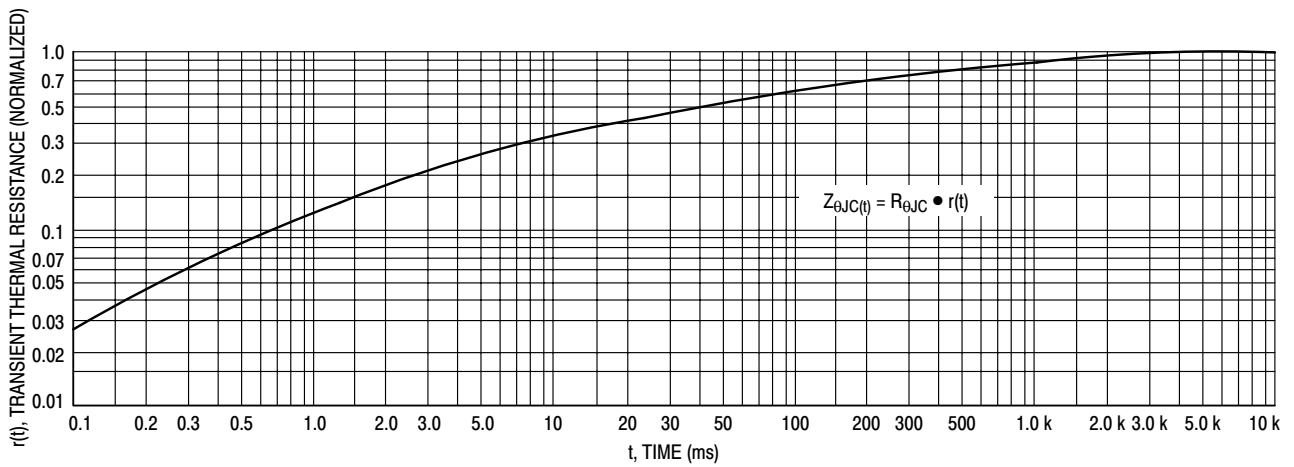


Figure 5. Thermal Response

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TYPICAL TRIGGER CHARACTERISTICS

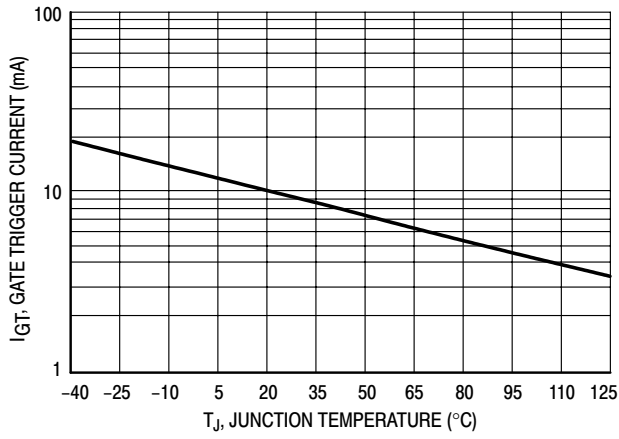


Figure 6. Typical Gate Trigger Current versus Junction Temperature

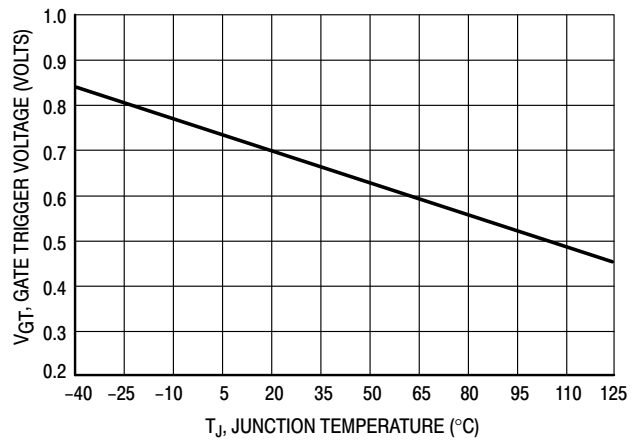


Figure 7. Typical Gate Trigger Voltage versus Junction Temperature

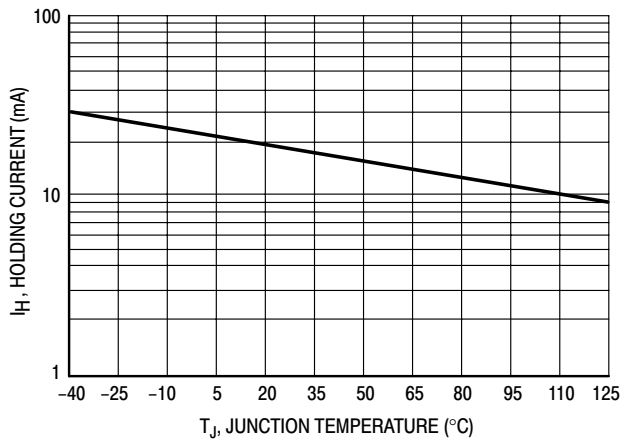
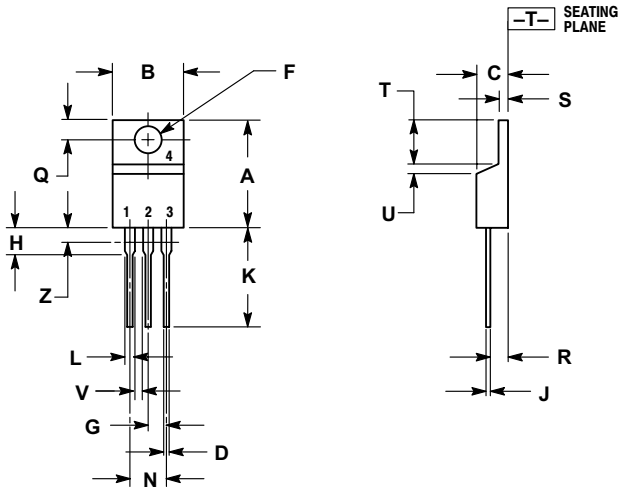


Figure 8. Typical Holding Current versus Junction Temperature

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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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