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.

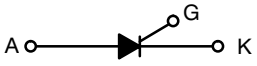
Features

- 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*

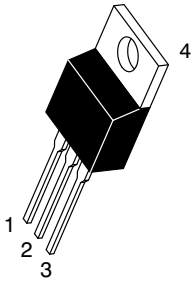
ON Semiconductor®

http://onsemi.com

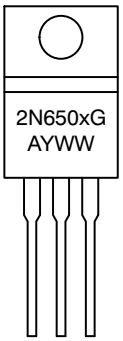
SCRs
25 AMPERES RMS
50 thru 800 VOLTS



MARKING DIAGRAM



TO−220AB
CASE 221A
STYLE 3



x = 4, 5, 7, 8 or 9
A = Assembly Location
Y = Year
WW = Work Week
G = Pb−Free Device

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°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) 2N6504 2N6505 2N6507 2N6508 2N6509	V_{DRM}, V_{RRM}	 50 100 400 600 800	V
On-State Current RMS (180° Conduction Angles; T_C = 85°C)	$I_{T(RMS)}$	25	A
Average On-State Current (180° Conduction Angles; T_C = 85°C)	$I_{T(AV)}$	16	A
Peak Non-repetitive Surge Current (1/2 Cycle, Sine Wave 60 Hz, T_J = 100°C)	I_{TSM}	250	A
Forward Peak Gate Power (Pulse Width ≤ 1.0 μs, T_C = 85°C)	P_{GM}	20	W
Forward Average Gate Power (t = 8.3 ms, T_C = 85°C)	$P_{G(AV)}$	0.5	W
Forward Peak Gate Current (Pulse Width ≤ 1.0 μs, T_C = 85°C)	I_{GM}	2.0	A
Operating Junction Temperature Range	T_J	−40 to +125	°C
Storage Temperature Range	T_{stg}	−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.

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.

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	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	T_L	260	°C

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted.)

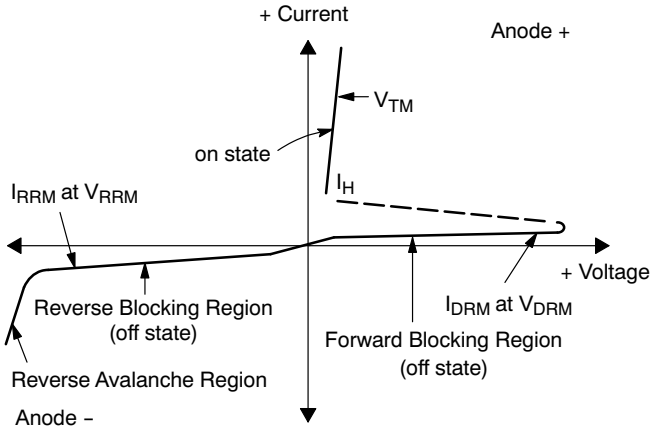
Characteristic		Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
*Peak Repetitive Forward or Reverse Blocking Current (V_{AK} = Rated V_{DRM} or V_{RRM}, Gate Open)	 T_J = 25°C T_J = 125°C	I_{DRM}, I_{RRM}	 − −	 − −	 10 2.0	 μA mA
ON CHARACTERISTICS						
*Forward On−State Voltage (Note 2) (I_{TM} = 50 A)		V_{TM}	−	−	1.8	V
*Gate Trigger Current (Continuous dc) (V_{AK} = 12 Vdc, R_L = 100 Ω)	T_C = 25°C T_C = −40°C	I_{GT}	− −	9.0 −	30 75	mA
*Gate Trigger Voltage (Continuous dc) (V_{AK} = 12 Vdc, R_L = 100 Ω, T_C = −40°C)		V_{GT}	−	1.0	1.5	V
Gate Non-Trigger Voltage (V_{AK} = 12 Vdc, R_L = 100 Ω, T_J = 125°C)		V_{GD}	0.2	−	−	V
*Holding Current (V_{AK} = 12 Vdc, Initiating Current = 200 mA, Gate Open)	T_C = 25°C T_C = −40°C	I_H	− −	18 −	40 80	mA
*Turn-On Time (I_{TM} = 25 A, I_{GT} = 50 mAdc)		t_{gt}	−	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)		t_q	 − −	 15 35	 − −	μs
DYNAMIC CHARACTERISTICS						
Critical Rate of Rise of Off-State Voltage (Gate Open, Rated V_{DRM}, Exponential Waveform)		dv/dt	−	50	−	V/μs

*Indicates JEDEC Registered Data.

2. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.

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



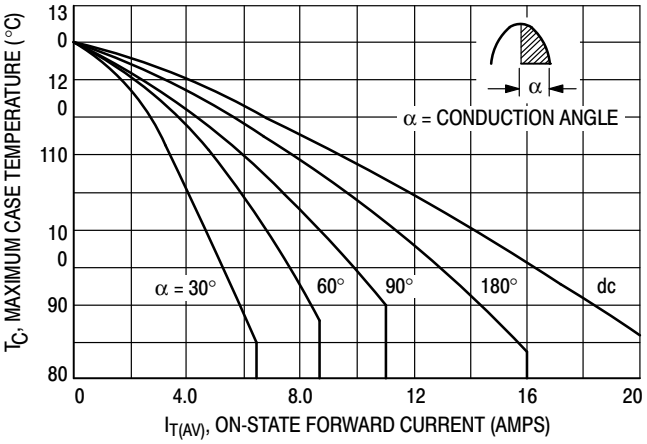


Figure 1. Average Current Derating

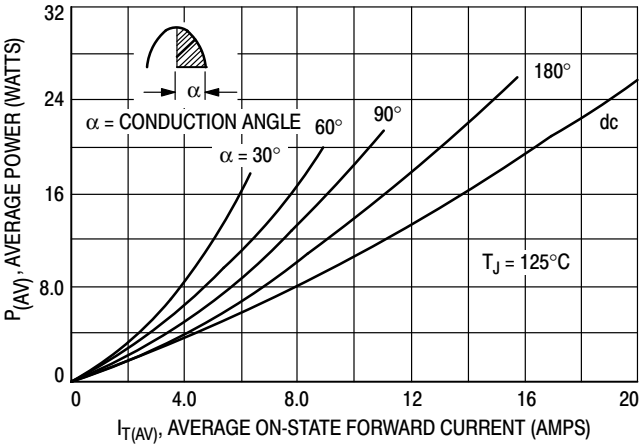


Figure 2. Maximum On–State Power Dissipation

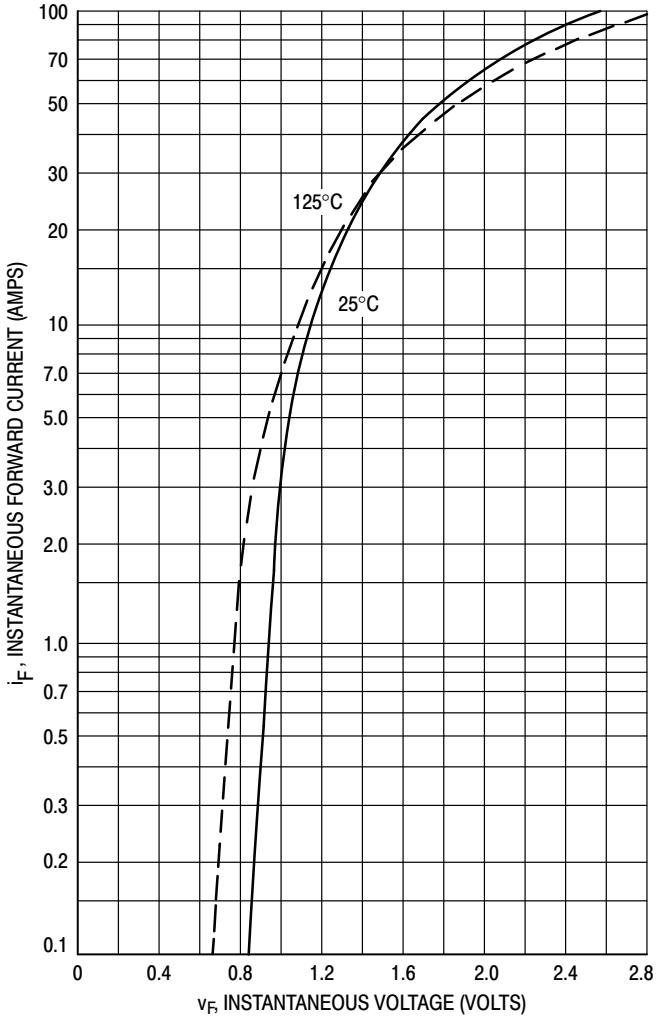


Figure 3. Typical On−State Characteristics

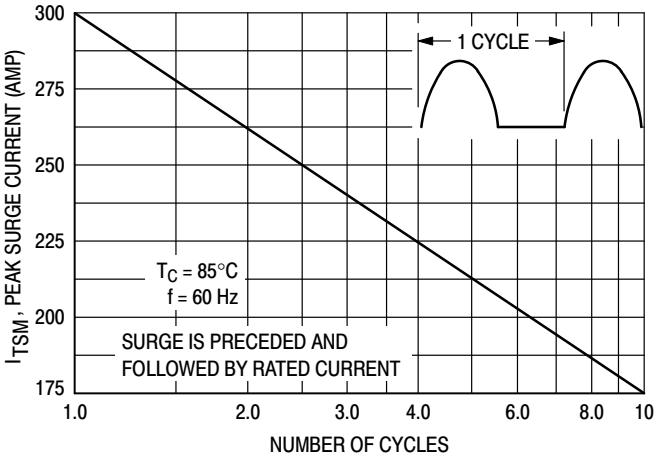


Figure 4. Maximum Non−Repetitive Surge Current

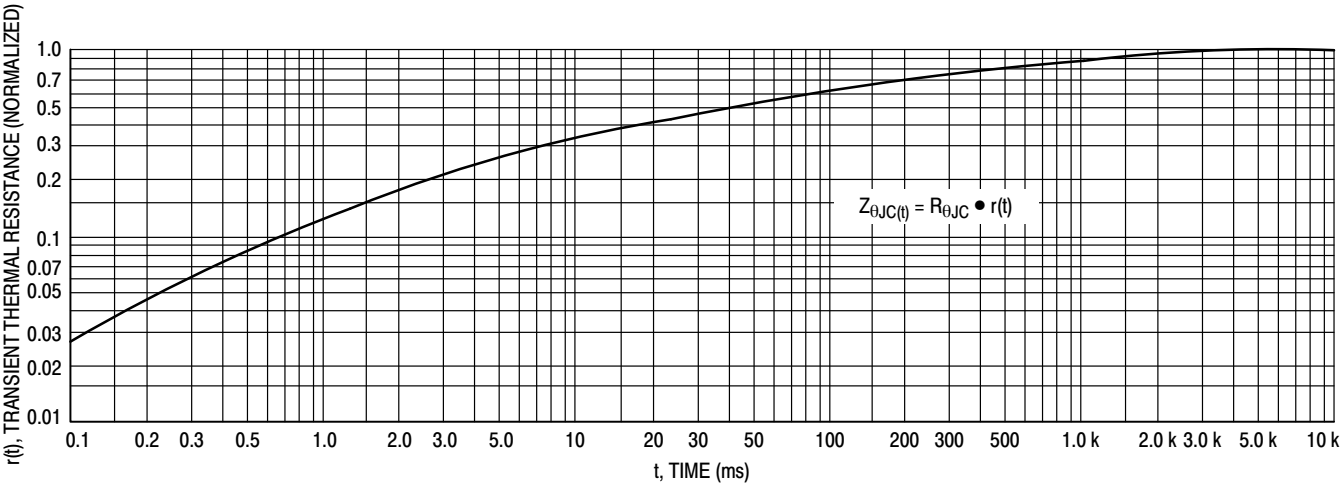


Figure 5. Thermal Response

TYPICAL TRIGGER CHARACTERISTICS

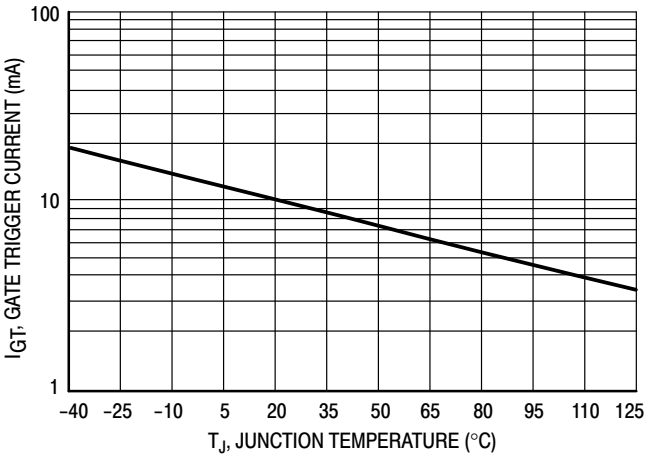


Figure 6. Typical Gate Trigger Current versus Junction Temperature

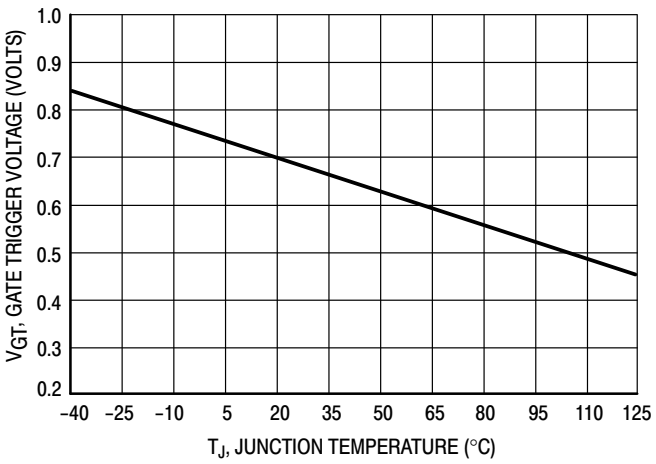


Figure 7. Typical Gate Trigger Voltage versus Junction Temperature

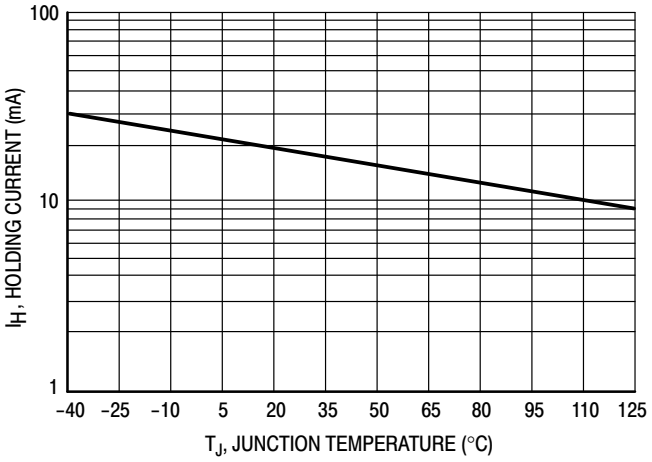


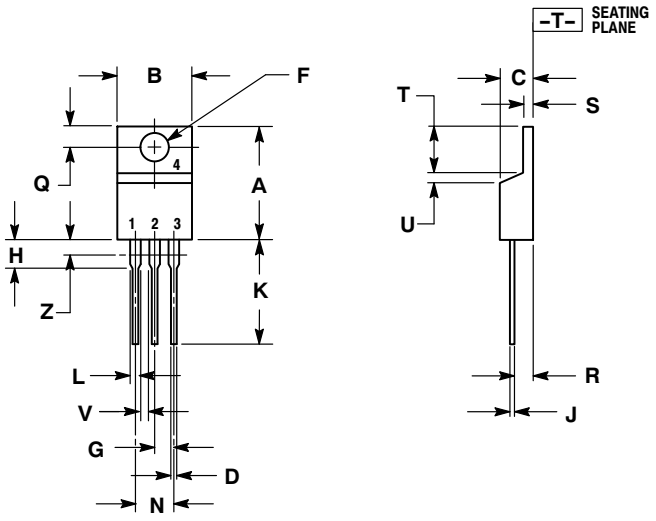
Figure 8. Typical Holding Current versus Junction Temperature

ORDERING INFORMATION

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

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.

	INCHES		MILLIMETERS	
DIM	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

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
Phone: 303−675−2175 or 800−344−3860 Toll Free USA/Canada
Fax: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800−282−9855 Toll Free USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
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