2N6400 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 supplies; or wherever half−wave silicon gate−controlled, solid−state devices are needed.

Features

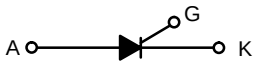
- Glass Passivated Junctions with Center Gate Geometry for Greater Parameter Uniformity and Stability
- Small, Rugged, Thermowatt Construction for Low Thermal Resistance, High Heat Dissipation and Durability
- Blocking Voltage to 800 Volts
- Pb−Free Packages are Available*

*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

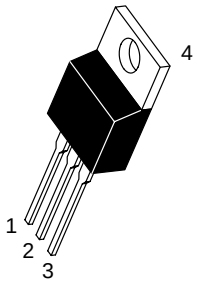
ON Semiconductor®

http://onsemi.com

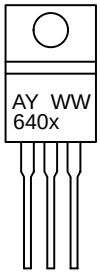
SCRs
16 AMPERES RMS
50 thru 800 VOLTS



MARKING DIAGRAM



TO−220AB
CASE 221A
STYLE 3



x = 0, 1, 2, 3, 4 or 5
A = Assembly Location
Y = Year
WW = Work Week

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 5 of this data sheet.

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

MAXIMUM RATINGS* (T_J = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Peak Repetitive Off−State Voltage (Note 1) (T_J = −40 to 125°C, Sine Wave 50 to 60 Hz; Gate Open) 2N6400 2N6401 2N6402 2N6403 2N6404 2N6405	V_{DRM}, V_{RRM}	 50 100 200 400 600 800	V
On-State Current RMS (180° Conduction Angles; T_C = 100°C)	$I_{T(RMS)}$	16	A
Average On-State Current (180° Conduction Angles; T_C = 100°C)	$I_{T(AV)}$	10	A
Peak Non-repetitive Surge Current (1/2 Cycle, Sine Wave 60 Hz, T_J = 90°C)	I_{TSM}	160	A
Circuit Fusing Considerations (t = 8.3 ms)	I^2t	145	A^2s
Forward Peak Gate Power (Pulse Width ≤ 1.0 μs, T_C = 100°C)	P_{GM}	20	W
Forward Average Gate Power (t = 8.3 ms, T_C = 100°C)	$P_{G(AV)}$	0.5	W
Forward Peak Gate Current (Pulse Width ≤ 1.0 μs, T_C = 100°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

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

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

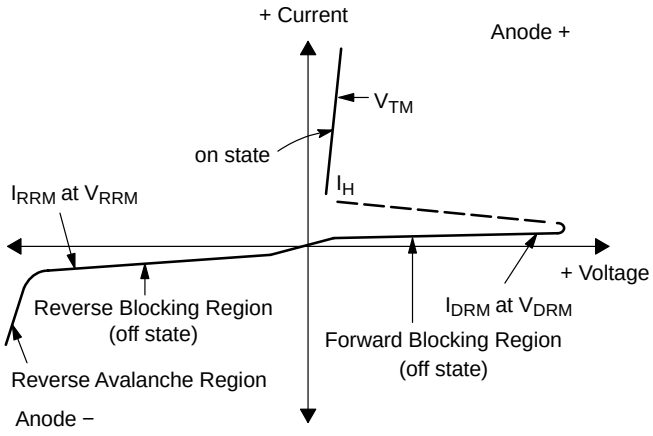
ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted.)

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					
*Peak Forward On−State Voltage (I_{TM} = 32 A Peak, Pulse Width ≤ 1 ms, Duty Cycle ≤ 2%)	V_{TM}	−	−	1.7	V
*Gate Trigger Current (Continuous dc) T_C = 25°C (V_D = 12 Vdc, R_L = 100 Ω) T_C = −40°C	I_{GT}	− −	9.0 −	30 60	mA
*Gate Trigger Voltage (Continuous dc) (V_D = 12 Vdc, R_L = 100 Ω) T_C = 25°C T_C = −40°C	V_{GT}	 − −	 0.7 −	 1.5 2.5	V
Gate Non−Trigger Voltage (V_D = 12 Vdc, R_L = 100 Ω), T_C = +125°C	V_{GD}	0.2	−	−	V
*Holding Current T_C = 25°C (V_D = 12 Vdc, Initiating Current = 200 mA, Gate Open) *T_C = −40°C	I_H	− −	18 −	40 60	mA
Turn-On Time (I_{TM} = 16 A, I_{GT} = 40 mAdc, V_D = Rated V_{DRM})	t_{gt}	−	1.0	−	μs
Turn-Off Time (I_{TM} = 16 A, I_R = 16 A, V_D = Rated V_{DRM}) T_C = 25°C T_J = +125°C	t_q	 − −	 15 35	 − −	μs
DYNAMIC CHARACTERISTICS					
Critical Rate−of−Rise of Off-State Voltage (V_D = Rated V_{DRM}, Exponential Waveform) T_J = +125°C	dv/dt	−	50	−	V/μs

*Indicates JEDEC Registered Data.

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



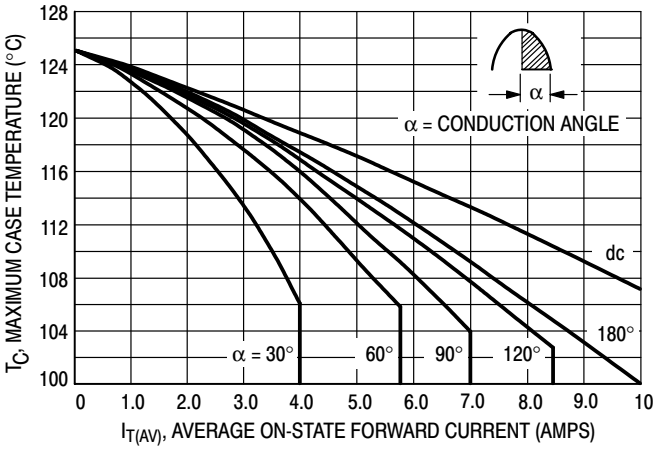


Figure 1. Average Current Derating

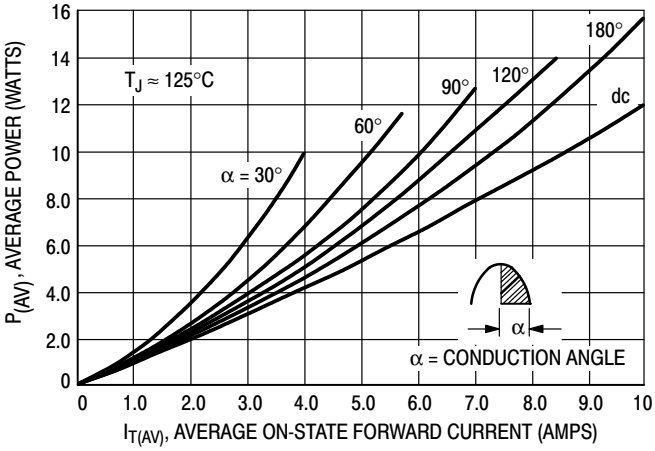


Figure 2. Maximum On−State Power Dissipation

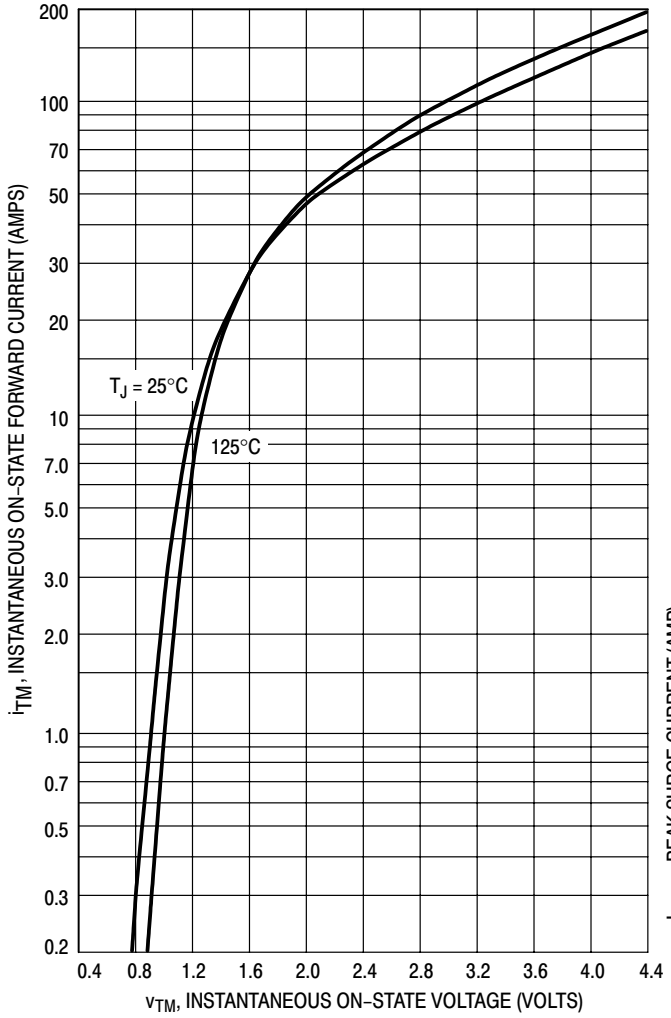


Figure 3. On−State Characteristics

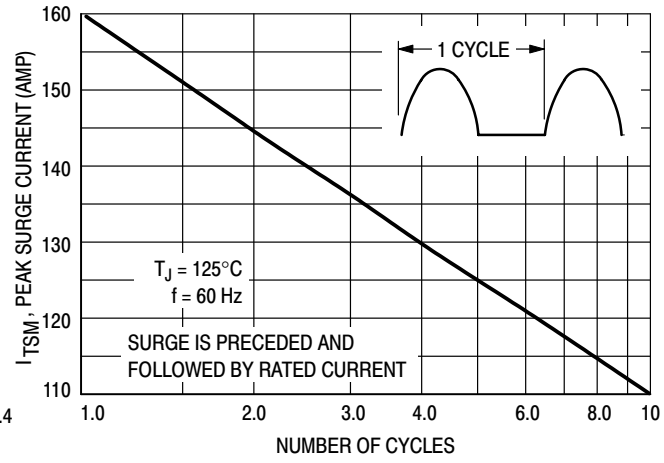


Figure 4. Maximum Non−Repetitive Surge Current

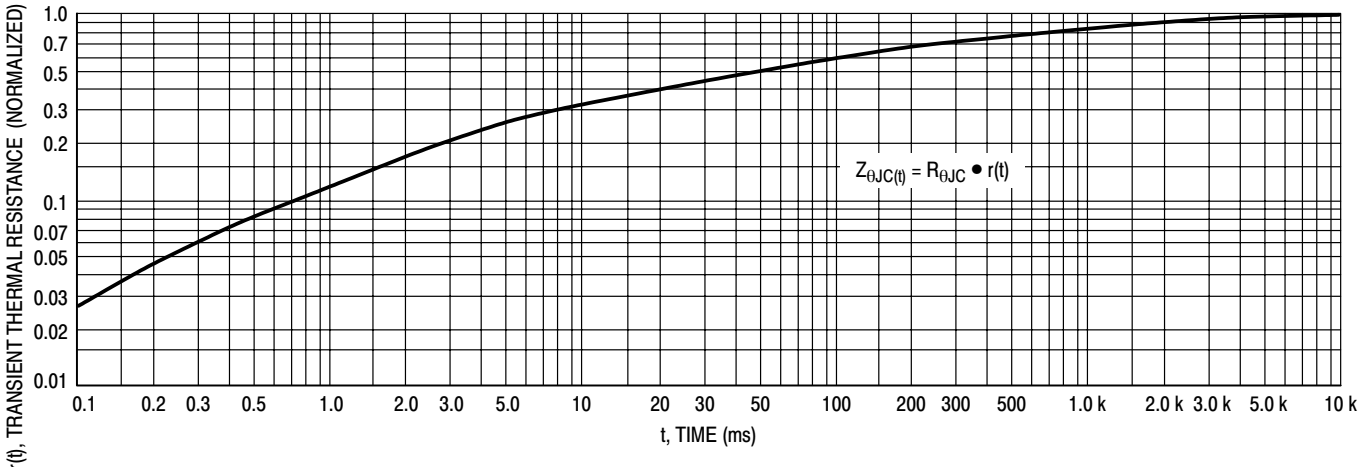


Figure 5. Thermal Response

TYPICAL CHARACTERISTICS

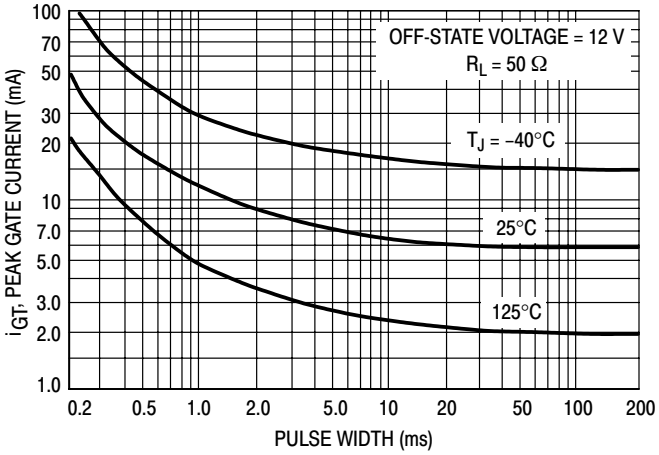


Figure 6. Typical Gate Trigger Current versus Pulse Width

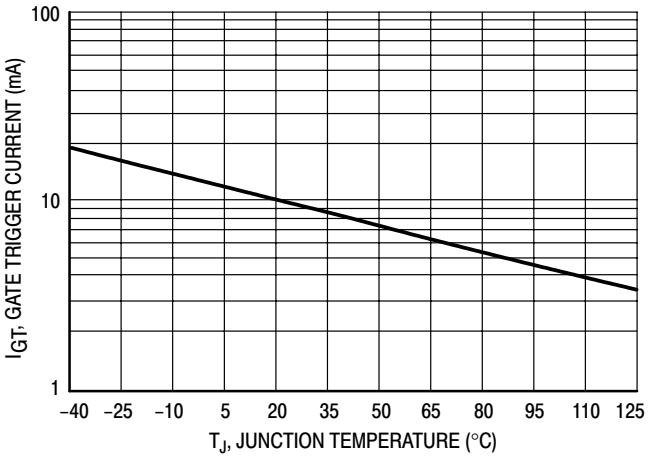


Figure 7. Typical Gate Trigger Current versus Junction Temperature

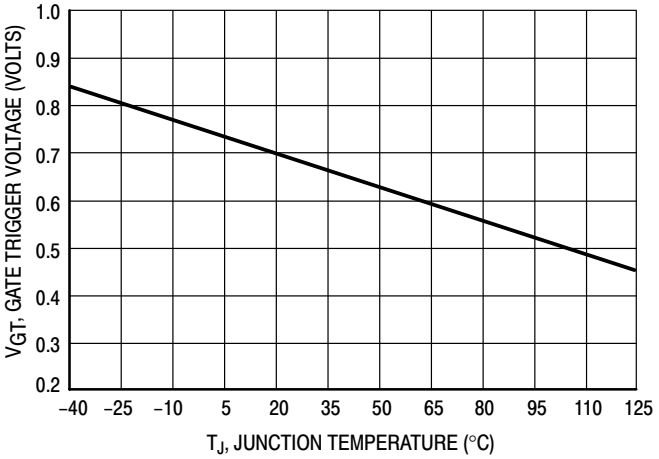


Figure 8. Typical Gate Trigger Voltage versus Junction Temperature

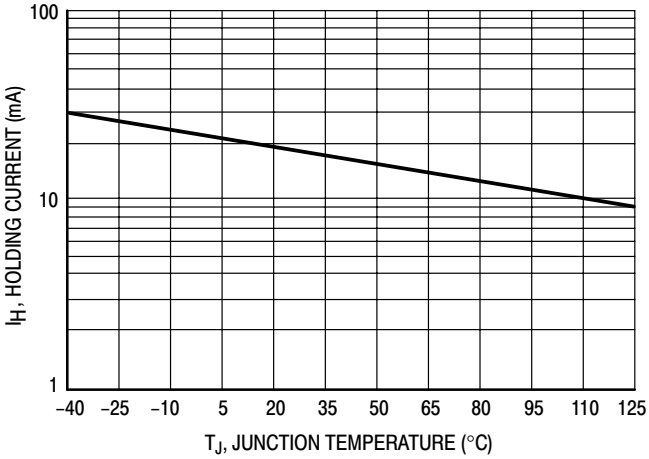


Figure 9. Typical Holding Current versus Junction Temperature

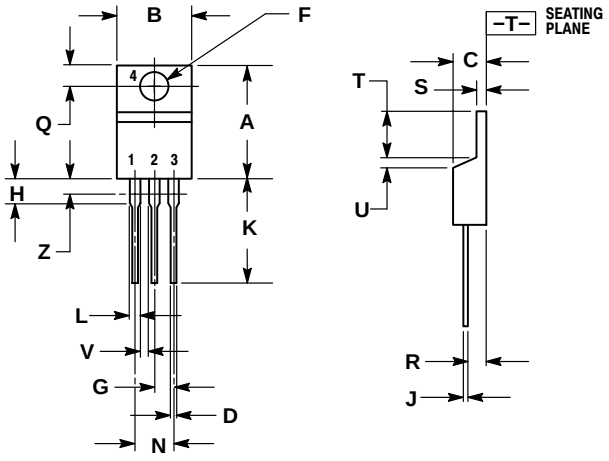
ORDERING INFORMATION

Device	Package	Shipping†
2N6400	TO−220AB	500 Units / Box
2N6401	TO−220AB	
2N6401G	TO−220AB (Pb−Free)	
2N6402	TO−220AB	
2N6403	TO−220AB	
2N6404	TO−220AB	
2N6405	TO−220AB	
2N6405G	TO−220AB (Pb−Free)	

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

PACKAGE DIMENSIONS

TO−220AB
CASE 221A−09
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	0.018	0.025	0.46	0.64
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 61312, Phoenix, Arizona 85082−1312 USA
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Phone: 81−3−5773−3850

ON Semiconductor Website: http://onsemi.com

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For additional information, please contact your local Sales Representative.

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