2N6400 Series

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 V
- These are Pb−Free Devices

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 = 25°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

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.

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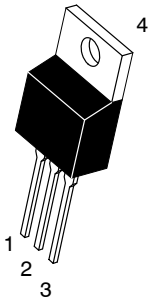
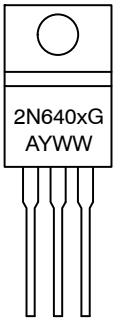
SCRs
16 AMPERES RMS
50 thru 800 VOLTS

MARKING DIAGRAM



TO−220AB
CASE 221A
STYLE 3



x	= 0, 1, 2, 3, 4 or 5
A	= Assembly Location
Y	= Year
WW	= Work Week
G	= Pb−Free Package

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.

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

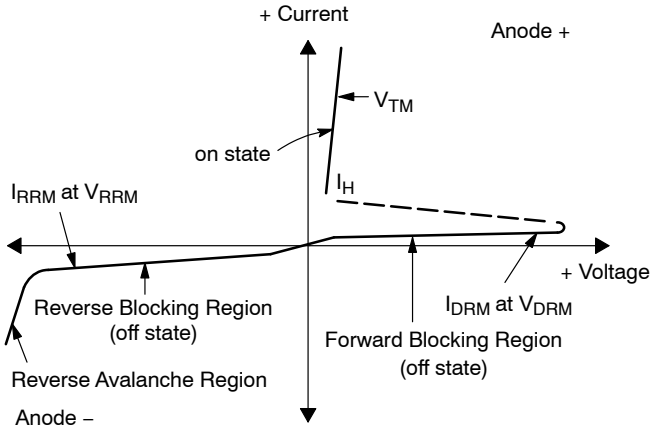
ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted.)

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)		I_{DRM}, I_{RRM}				
	T_J = 25°C		–	–	10	μA
	T_J = 125°C		–	–	2.0	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) (V_D = 12 Vdc, R_L = 100 Ω)	T_C = 25°C	I_{GT}	–	9.0	30	mA
	T_C = −40°C		–	–	60	
*Gate Trigger Voltage (Continuous dc) (V_D = 12 Vdc, R_L = 100 Ω)		V_{GT}				V
	T_C = 25°C		–	0.7	1.5	
	T_C = −40°C		–	–	2.5	
Gate Non−Trigger Voltage (V_D = 12 Vdc, R_L = 100 Ω), T_C = +125°C		V_{GD}	0.2	–	–	V
*Holding Current (V_D = 12 Vdc, Initiating Current = 200 mA, Gate Open)	T_C = 25°C	I_H	–	18	40	mA
	*T_C = −40°C		–	–	60	
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_q				μs
	T_C = 25°C		–	15	–	
	T_J = +125°C		–	35	–	
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



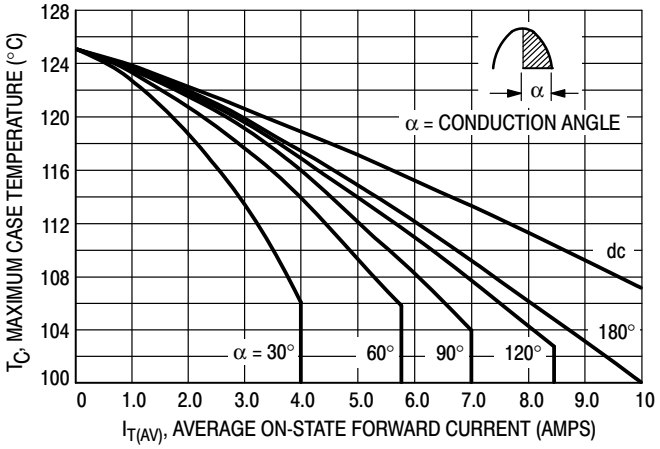


Figure 1. Average Current Derating

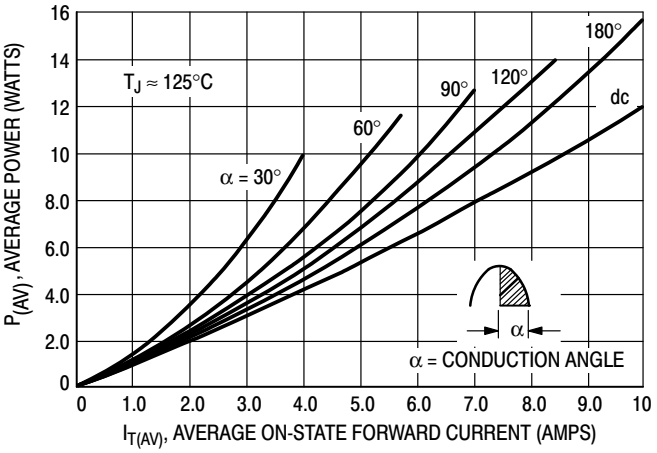


Figure 2. Maximum On−State Power Dissipation

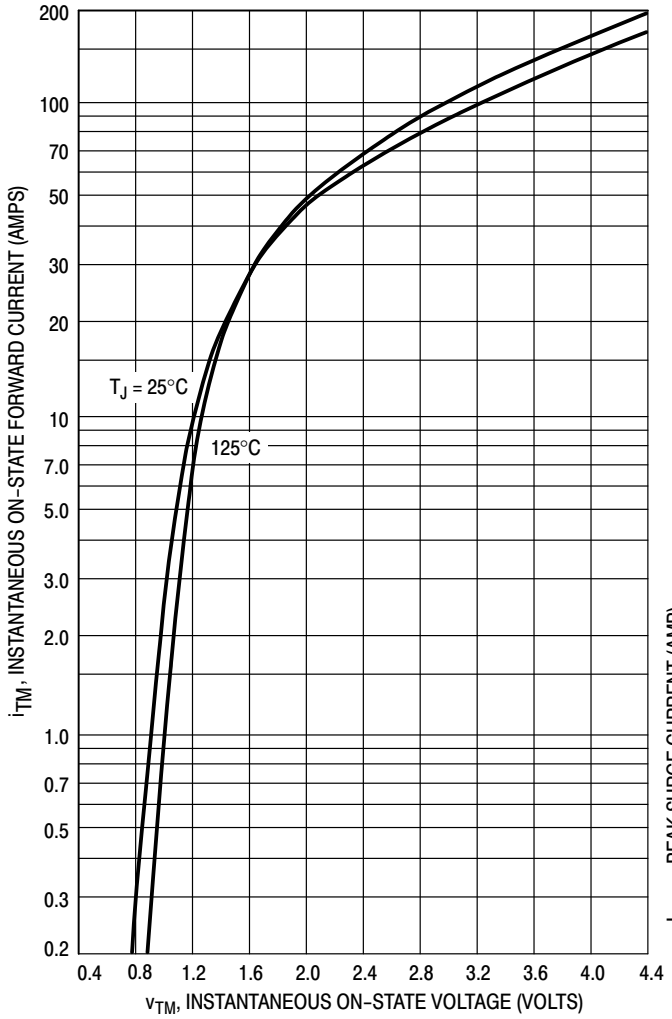


Figure 3. On−State Characteristics

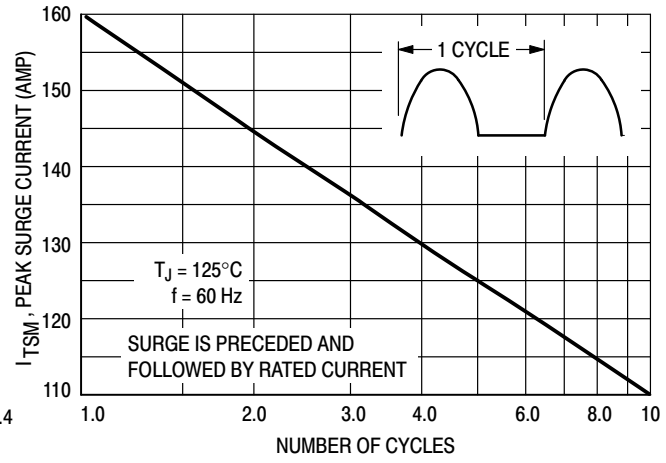


Figure 4. Maximum Non−Repetitive Surge Current

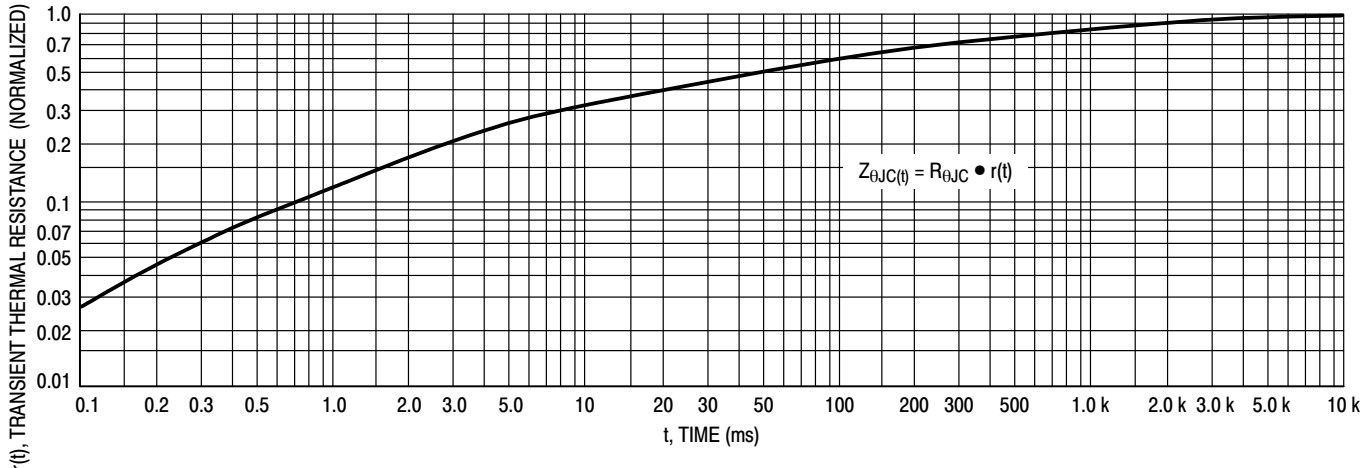


Figure 5. Thermal Response

TYPICAL CHARACTERISTICS

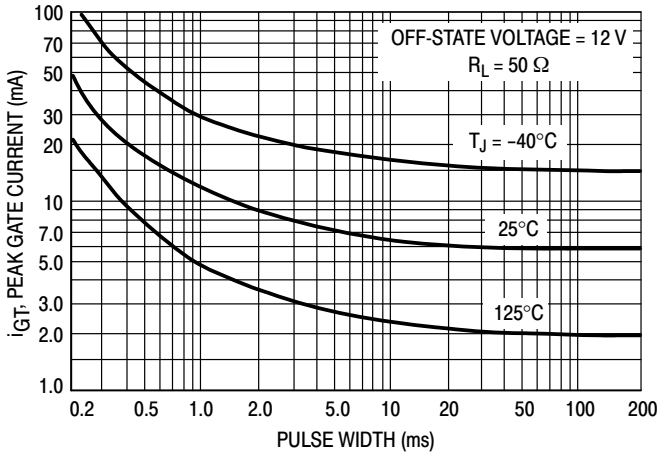


Figure 6. Typical Gate Trigger Current versus Pulse Width

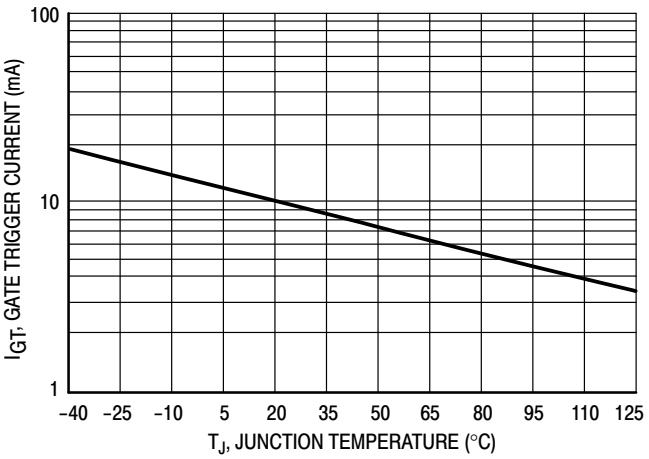


Figure 7. Typical Gate Trigger Current versus Junction Temperature

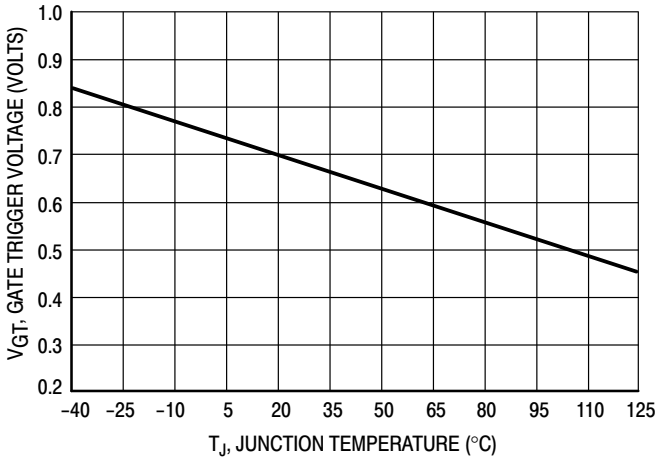


Figure 8. Typical Gate Trigger Voltage versus Junction Temperature

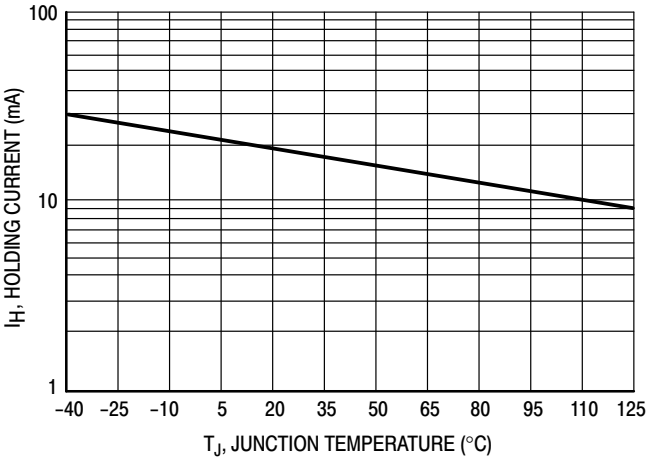


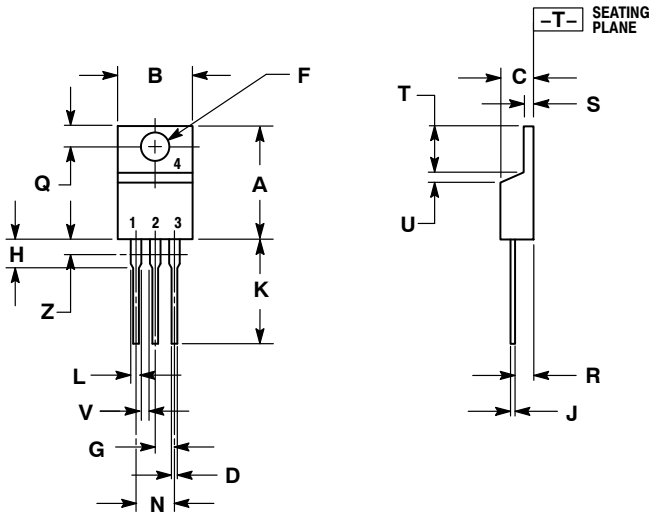
Figure 9. Typical Holding Current versus Junction Temperature

ORDERING INFORMATION

Device	Package	Shipping†
2N6400G	TO−220AB (Pb−Free)	500 Units / Box
2N6401G	TO−220AB (Pb−Free)	
2N6402G	TO−220AB (Pb−Free)	
2N6403G	TO−220AB (Pb−Free)	
2N6403TG	TO−220AB (Pb−Free)	50 Units / Rail
2N6404G	TO−220AB (Pb−Free)	500 Units / Box
2N6405G	TO−220AB (Pb−Free)	

PACKAGE DIMENSIONS

TO−220
CASE 221A−07
ISSUE O



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

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