

**Solid State  
Division**

# Thyristors

**2N3668 2N3670  
2N3669 2N4103**

## All-Diffused SCR's for Low-Cost Power-Control and Power-Switching Applications

RCA 2N3668\*, 2N3669\*, 2N3670\*, and 2N4103\* are all-diffused, three-junction, silicon controlled-rectifiers (SCR's<sup>▲</sup>). They are intended for use in power-control and power-switching applications requiring a blocking voltage capability of up to 600 volts and a forward-current capability of 12.5 amperes (rms value) or 8 amperes (average value) at a case temperature of 80°C.

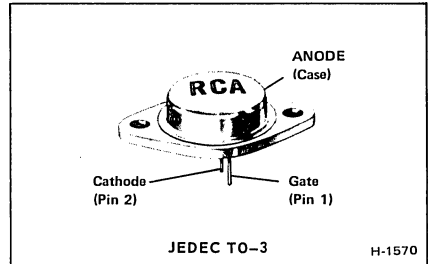
The 2N3668 is designed for low-voltage power supplies, the 2N3669 for direct operation from 120-volt line supplies, the 2N3670 for direct operation from 240-volt line supplies, and the 2N4103 for high-voltage power supplies.

\* Formerly Dev. Types TA2621, TA2598, TA2618, and TA2775, respectively.

▲ The silicon controlled-rectifier is also known as a reverse-blocking triode thyristor.

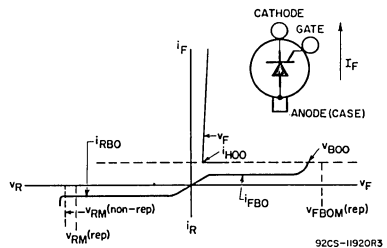
### FEATURES

- o Low switching losses
- o High di/dt and dv/dt capabilities
- o Shorted emitter gate-cathode construction
- o Forward and reverse gate dissipation ratings
- o Designed especially for high-volume systems
- o All-diffused construction — assures exceptional uniformity and stability of characteristics
- o Direct-soldered internal construction — assures exceptional resistance to fatigue
- o Symmetrical gate-cathode construction — provides uniform current density, rapid electrical conduction, and efficient heat dissipation
- o All-welded construction and hermetic sealing
- o Low leakage currents, both forward and reverse
- o Low forward voltage drop at high current levels
- o Low thermal resistance



2N3668	For Low-Voltage Power Supplies
2N3669	For 120-Volt Line Operation
2N3670	For 240-Volt Line Operation
2N4103	For High-Voltage Power Supplies

TYPICAL E-I CHARACTERISTIC OF SILICON CONTROLLED-RECTIFIER



**Absolute-Maximum Ratings, for Operation with Sinusoidal AC Supply Voltage at a Frequency between 50 and 400 Hz, and with Resistive or Inductive Load**

RATINGS	CONTROLLED-RECTIFIER TYPES				UNITS
	2N3668	2N3669	2N3670	2N4103	
Transient Peak Reverse Voltage (Non-Repetitive), $v_{RM}(non-rep)$ .....	150	330	660	700	volts
Peak Reverse Voltage (Repetitive), $v_{RM}(rep)$ .....	100	200	400	600	volts
Peak Forward Blocking Voltage (Repetitive), $v_{FBOM}(rep)$ .....	100	200	400	600	volts
Forward Current:					
For case temperature ( $T_C$ ) of +80° C					
Average DC value at a conduction angle of 180°, $I_{FAV}$ .....	8	8	8	8	amperes
RMS value, $I_{FRMS}$ .....	12.5	12.5	12.5	12.5	amperes
For other conditions, see Fig. 8					
Peak Surge Current, $i_{FM}(surge)$ :					
For one cycle of applied voltage .....	200	200	200	200	amperes
For one cycle of applied principal voltage					
60 Hz (sinusoidal), $T_C = 80^\circ C$ .....	200	200	200	200	amperes- amperes
50 Hz (sinusoidal), $T_C = 80^\circ C$ .....	170	170	170	170	
For more than one cycle of applied voltage .....	See Fig. 10	See Fig. 10	See Fig. 10	See Fig. 10	
Fusing Current (for SCR protection):					
$T_J = -40$ to $100^\circ C$ , $t = 1$ to $8.3$ ms, $I^2t$ .....	170	170	170	170	ampere <sup>2</sup> second
Rate of Change of Forward Current, $di/dt$ .....	200	200	200	200	amperes microsecond
$V_{FB} = v_{B00}(\text{min. value})$ $I_{GT} = 200\text{mA}$ , $0.5 \mu\text{s}$ rise time (See waveshapes of Fig. 1)					
Gate Power*:					
Peak, Forward or Reverse, for $10 \mu\text{s}$ duration, $P_{GM}$ .....	40	40	40	40	watts
(See Figs. 5 and 6)					
Average, $P_{GAV}$ .....	0.5	0.5	0.5	0.5	watt
Temperature:					
Storage, $T_{stg}$ .....	-40 to +125	-40 to +125	-40 to +125	-40 to +125	°C
Operating (Case), $T_C$ .....	-40 to +100	-40 to +100	-40 to +100	-40 to +100	°C

\* Any values of peak gate current or peak gate voltage to give the maximum gate power is permissible.

• Temperature reference point is within 1/8 in. (3.17 mm) of the center of the underside of unit.

WAVESHAPES OF  $di/dt$  RATING TEST

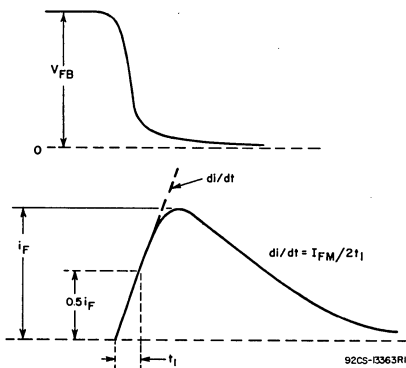


Fig. 1

WAVESHAPES OF CRITICAL  $dv/dt$  RATING TEST

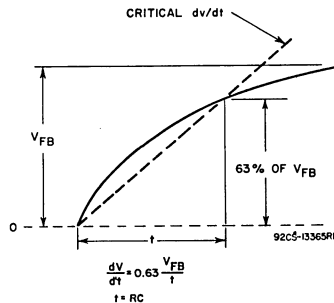


Fig. 2

Characteristics at Maximum Ratings (unless otherwise specified), and at Indicated Case Temperature ( $T_C$ )

CHARACTERISTICS	CONTROLLED-RECTIFIER TYPES												UNITS
	2N3668			2N3669			2N3670			2N4103			
	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	
Peak Repetitive Blocking Voltage, $V_{DROM}$ At $T_C = +100^\circ\text{C}$ .....	100	—	—	200	—	—	400	—	—	600	—	—	volts
Peak Blocking Current, at $T_C = +100^\circ\text{C}$ :													
Forward, $I_{DOM}$ .....	—	0.2	2	—	0.25	2.5	—	0.3	3	—	0.35	4	mA
$V_D = V_{DROM}$													
Reverse, $I_{ROM}$ .....	—	0.05	1	—	0.1	1.25	—	0.2	1.5	—	0.3	3	mA
$V_R = V_{RROM}$													
Forward Voltage Drop, $v_F$ At a Forward Current of 25 amperes and a $T_C = +25^\circ\text{C}$ (See Fig. 11) .....	—	1.5	1.8	—	1.5	1.8	—	1.5	1.8	—	1.5	1.8	volts
DC Gate-Trigger Current, $I_{GT}$ : At $T_C = +25^\circ\text{C}$ (See Fig. 5) .....	1	20	40	1	20	40	1	20	40	1	20	40	mA(dc)
Gate-Trigger Voltage, $V_{GT}$ : At $T_C = +25^\circ\text{C}$ (See Fig. 5) .....	—	1.5	2	—	1.5	2	—	1.5	2	—	1.5	2	volts (dc)
Holding Current, $I_{HOO}$ : At $T_C = +25^\circ\text{C}$ .....	0.5	25	50	0.5	25	50	0.5	25	50	0.5	25	50	mA
Critical Rate of Applied Forward Voltage, Critical $dv/dt$ .....	10	100	—	10	100	—	10	100	—	10	100	—	volts/ microsecond
$V_{FB} = V_{BOO}$ (min. value), exponential rise, $T_C = +100^\circ\text{C}$ (See waveshape of Fig. 2)													
Turn-On Time, $t_{ON}$ (Delay Time + Rise Time) $V_{FB} = V_{BOO}$ (min. value), $i_F = 8$ amperes, $I_{GT} = 200$ mA, $0.1 \mu\text{s}$ rise time, $T_C = +25^\circ\text{C}$ (See waveshapes of Fig. 3)	0.75	1.25	—	0.75	1.25	—	0.75	1.25	—	0.75	1.25	—	microseconds
Turn-Off Time, $t_{OFF}$ (Reverse Recovery Time + Gate Recovery Time) .....	—	20	50	—	20	50	—	20	50	—	20	50	microseconds
$i_F = 8$ amperes, $50 \mu\text{s}$ pulse width, $dv_{FB}/dt = 20 \text{ V}/\mu\text{s}$ , $di_T/dt = 30 \text{ A}/\mu\text{s}$ , $I_{GT} = 200$ mA, $T_C = +80^\circ\text{C}$ (See waveshapes of Fig. 4)													
Thermal Resistance, Junction-to-Case .....	—	—	1.7	—	—	1.7	—	—	1.7	—	—	1.7	$^\circ\text{C}/\text{W}$

## TERMINAL CONNECTIONS

Pin 1 — Gate

Pin 2 — Cathode

Case, Mounting Flange — Anode

WAVESHAPE OF  $t_{on}$  RATING TEST

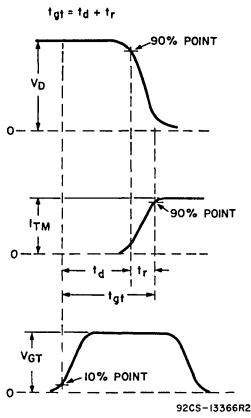


Fig. 3

WAVESHAPE OF  $t_{off}$  RATING TEST

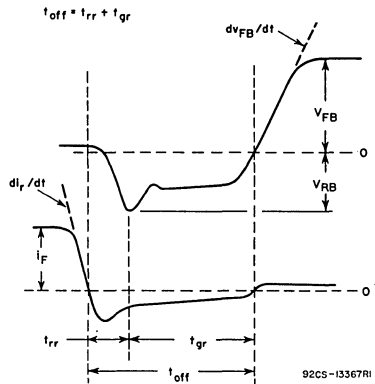


Fig. 4

FORWARD GATE CHARACTERISTICS

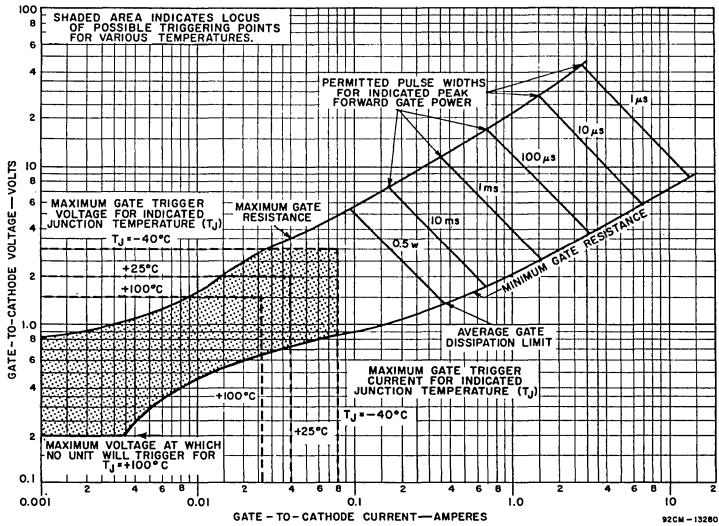


Fig. 5

REVERSE GATE CHARACTERISTICS

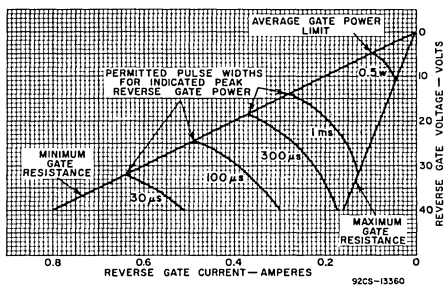


Fig. 6

TURN-ON TIME CHARACTERISTICS

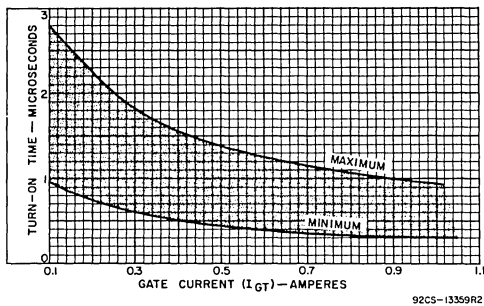


Fig. 7

RATING CHART (CASE TEMPERATURE)

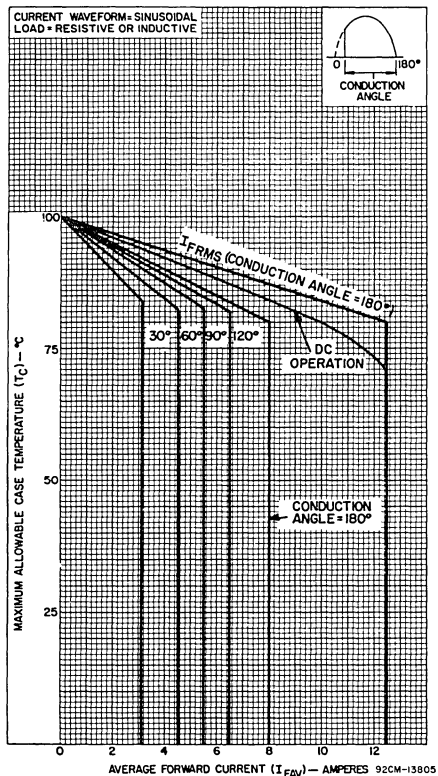


Fig. 8

POWER DISSIPATION

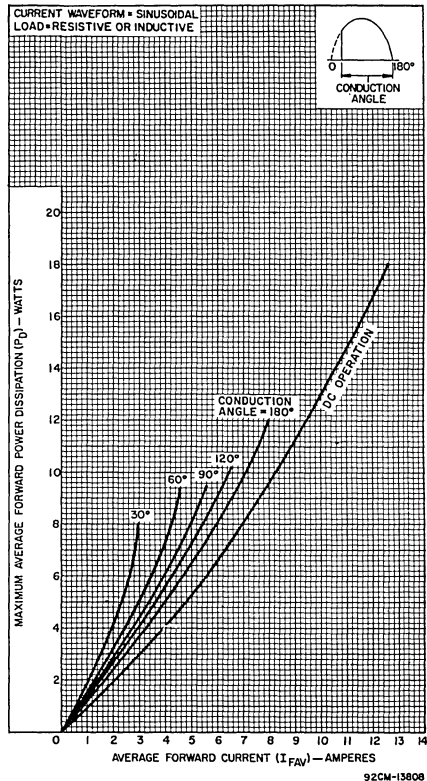


Fig. 9

**SURGE CURRENT RATING**

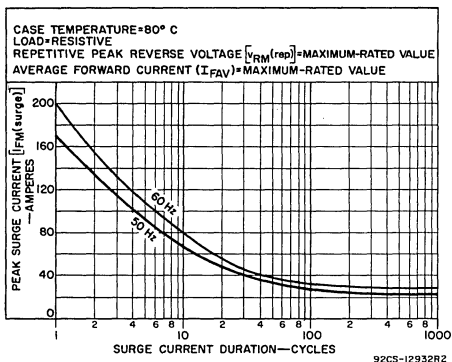


Fig. 10

**FORWARD CHARACTERISTICS**

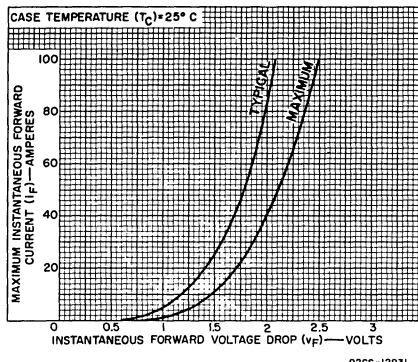


Fig. 11

**NATURAL-AIR COOLING OPERATION GUIDANCE CHART**

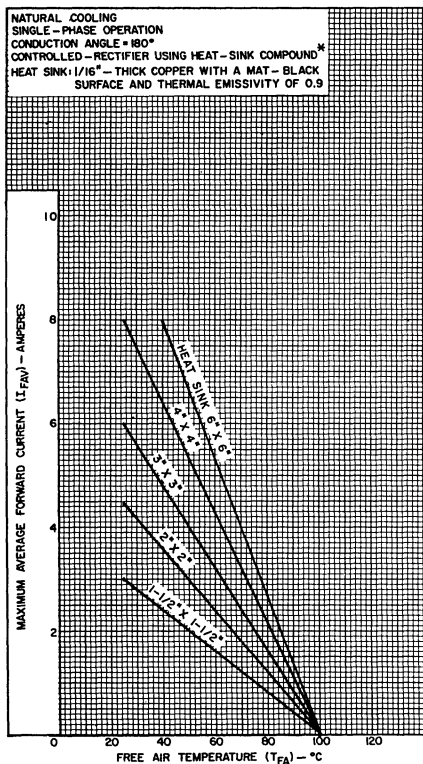


Fig. 12

**FORCED-AIR COOLING OPERATION GUIDANCE CHART**

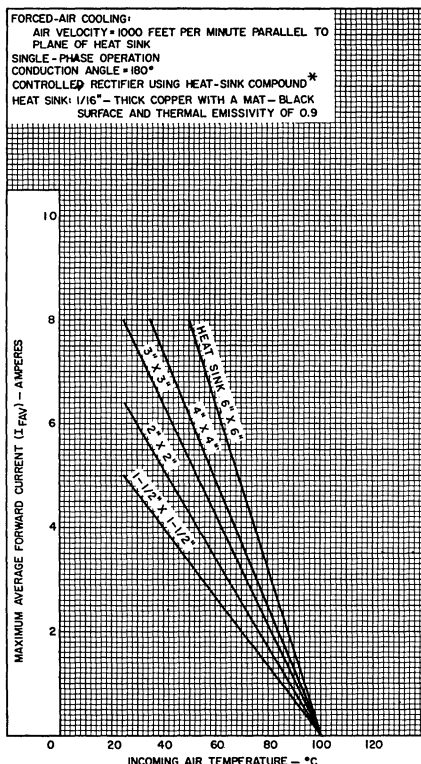


Fig. 13

\*Dow Corning 340 Silicon Heat Sink Compound, or Equivalent.