RCA
Solid State
Division

Thyristors

2N3668 2N3670 2N3669 2N4103

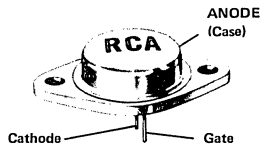
All-Diffused SCR's for Low-Cost Power-Control and Power-Switching Applications

RCA 2N3668*, 2N3669*, 2N3670*, and 2N4103* are all-diffused, three-junction, silicon controlled-rectifiers (SCR's▲). 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.



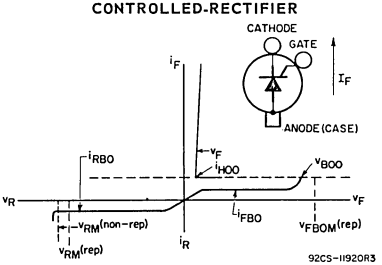
JEDEC TO-3 H-1570

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

FEATURES

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

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°C	200	200	200	200	amperes
50 Hz (sinusoidal), T_C = 80°C	170	170	170	170	amperes
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°C, t = 1 to 8.3 ms, I^2t	170	170	170	170	ampere^2 second
Rate of Change of Forward Current, di/dt	200	200	200	200	amperes microsecond
V_{FB} = v_{BOO}(min. value) I_{GT} = 200mA, 0.5 μs rise time (See waveshapes of Fig. 1)					
Gate Power*:					
Peak, Forward or Reverse, for 10 μs duration, P_{GM} (See Figs. 5 and 6)	40	40	40	40	watts
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.

WAVESHAPE OF di/dt RATING TEST

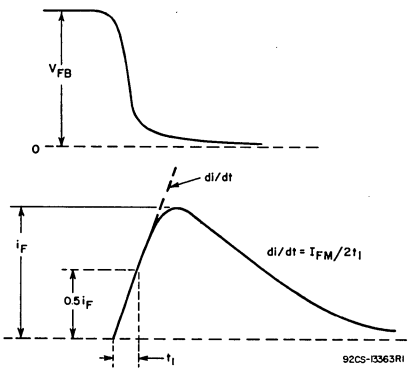


Fig. 1

WAVESHAPE OF CRITICAL dv/dt RATING TEST

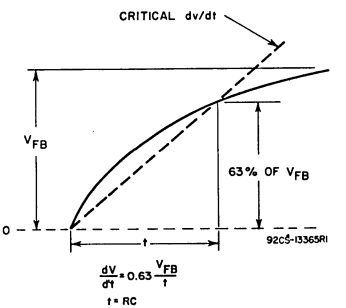


Fig. 2

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°C	100	—	—	200	—	—	400	—	—	600	—	—	volts
Peak Blocking Current, at T_C = +100°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°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°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°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°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°C (See waveshape of Fig. 2)													
Turn-On Time, t_{on}, (Delay Time + Rise Time)	0.75	1.25	—	0.75	1.25	—	0.75	1.25	—	0.75	1.25	—	microseconds
V_{FB} = v_{BOO} (min. value), i_F = 8 amperes, I_{GT} = 200 mA, 0.1 μs rise time, T_C = +25°C (See waveshapes of Fig. 3)													
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 μs pulse width, dv_{FB}/dt = 20 v/μs, di_r/dt = 30 A/μs, I_{GT} = 200 mA, T_C = +80°C (See waveshapes of Fig. 4)													
Thermal Resistance, Junction-to-Case	—	—	1.7	—	—	1.7	—	—	1.7	—	—	1.7	°C/W

TERMINAL CONNECTIONS

Pin 1 — Gate
Pin 2 — Cathode
Case, Mounting Flange — Anode

WAVESHAPE OF t_{on} RATING TEST

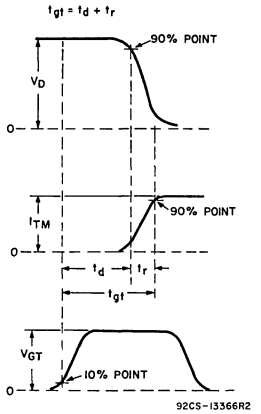


Fig. 3

WAVESHAPE OF t_{off} RATING TEST

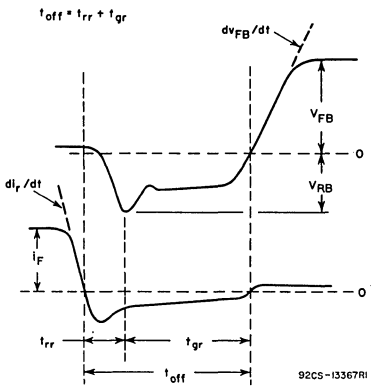


Fig. 4

FORWARD GATE CHARACTERISTICS

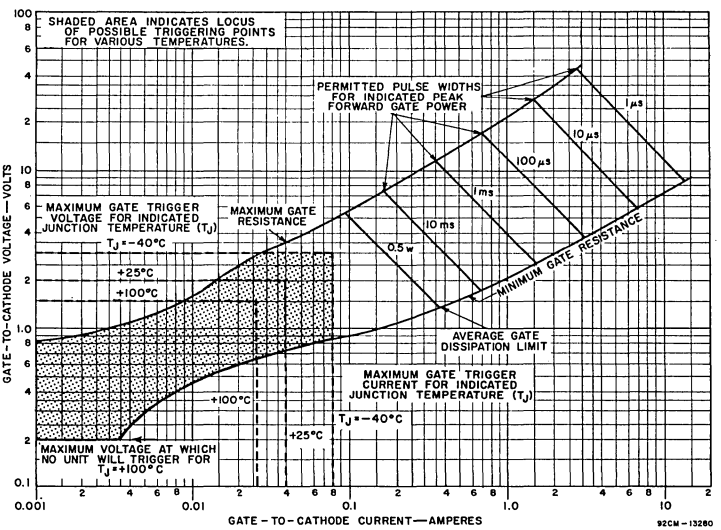


Fig. 5

REVERSE GATE CHARACTERISTICS

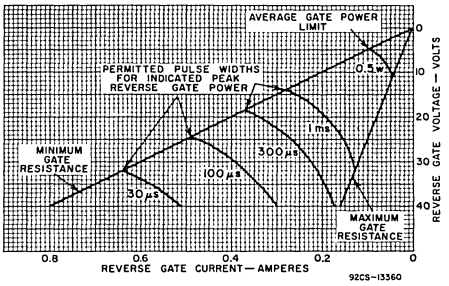


Fig. 6

TURN-ON TIME CHARACTERISTICS

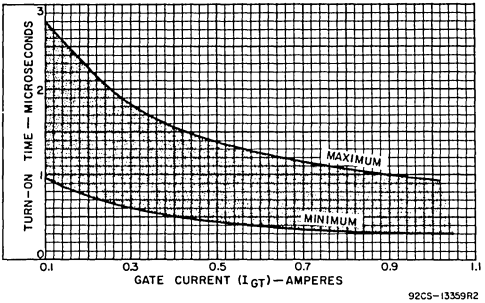


Fig. 7

RATING CHART (CASE TEMPERATURE)

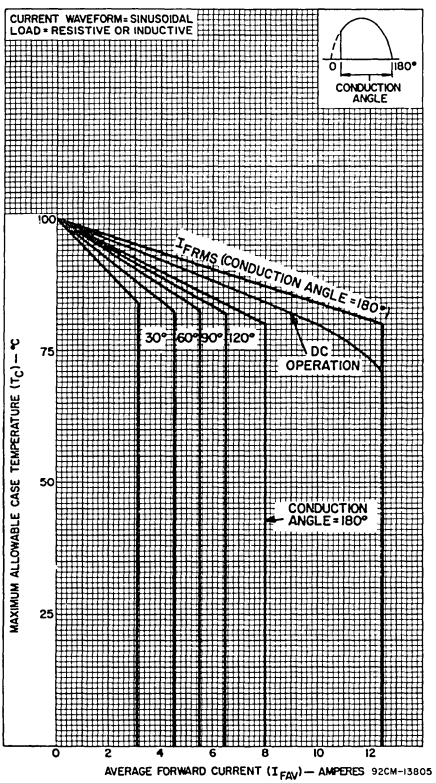


Fig. 8

POWER DISSIPATION

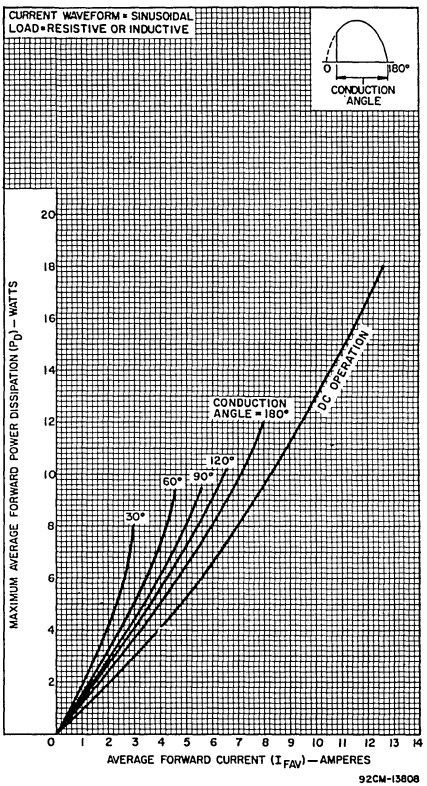


Fig. 9

SURGE CURRENT RATING

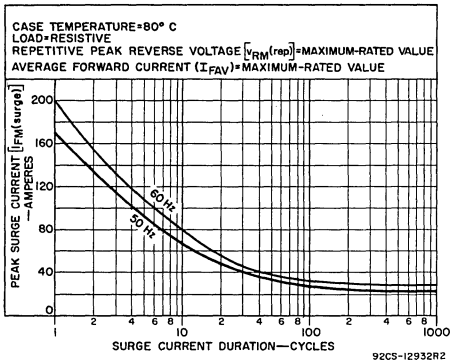


Fig. 10

FORWARD CHARACTERISTICS

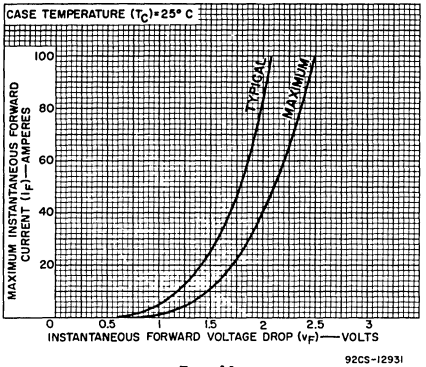


Fig. 11

NATURAL-AIR COOLING OPERATION GUIDANCE CHART

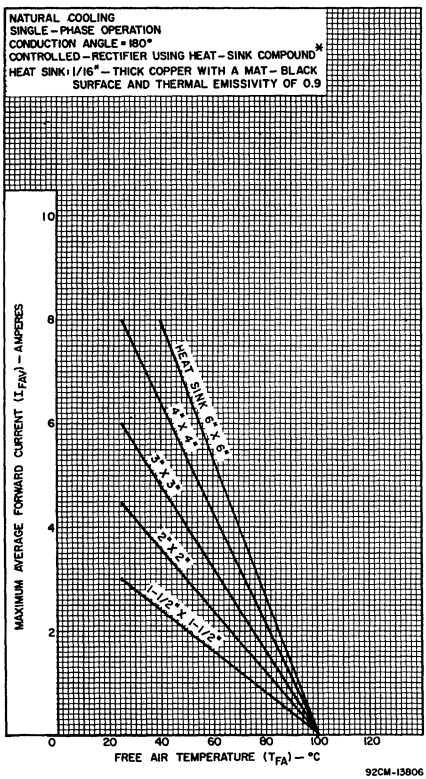


Fig. 12

FORCED-AIR COOLING OPERATION GUIDANCE CHART

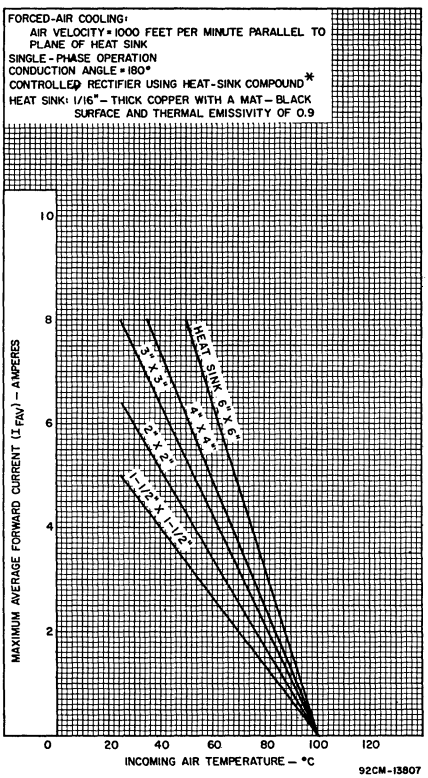


Fig. 13

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