

3875081 G E SOLID STATE
Silicon Controlled Rectifiers

01E 17684 D T-25-13

2N3668-2N3670, 2N4103

File Number 116

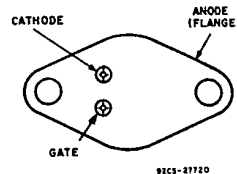
12.5-A Silicon Controlled Rectifiers

For Low-Cost Power-Control and Power-Switching Applications

Features:

- Low switching losses
- High di/dt and dv/dt capabilities
- Low leakage currents, both forward and reverse
- Low forward voltage drop at high current levels
- Low thermal resistance

TERMINAL DESIGNATIONS



JEDEC TO-204AA

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.

The 2N3668, 2N3669, 2N3670 and 2N4103 SCR's employ the hermetic JEDEC TO-204AA package.

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

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. 4)					
Peak Surge Current, $I_{FM}(surge)$	200	200	200	200	amperes
For one cycle of applied voltage					
For one cycle of applied principal voltage					
60 Hz (sinusoidal), $T_c = 80^\circ C$	200	200	200	200	amperes
50 Hz (sinusoidal), $T_c = 80^\circ C$	170	170	170	170	amperes
For more than one cycle of applied voltage	See Fig. 1	See Fig. 1	See Fig. 1	See Fig. 1	
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 ² second
Rate of Change of Forward Current, di/dt	200	200	200	200	amperes/microsecond
$V_{FB} = V_{BOO}$ (min. value)					
$I_{GT} = 200$ mA, 0.5 ns rise time					
Gate Power*:					
Peak, Forward or Reverse, for 10 ns duration, P_{GM}	40	40	40	40	watts
(See Figs. 7 and 9)					
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.

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ELECTRICAL CHARACTERISTICS

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_{DRM} At $T_C = +100^{\circ}\text{C}$	100	—	—	200	—	—	400	—	—	600	—	—	volts
Peak Blocking Current, at $T_C = +100^{\circ}\text{C}$: Forward, I_{BOM}	—	0.2	2	—	0.25	2.5	—	0.3	3	—	0.35	4	mA
$V_D = V_{DRM}$ Reverse, I_{ROM}	—	0.05	1	—	0.1	1.25	—	0.2	1.5	—	0.3	3	mA
$V_R = V_{RRM}$ Forward Voltage Drop, v_F At a Forward Current of 25 amperes and a $T_C = +25^{\circ}\text{C}$ (See Fig. 2)	—	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. 9)	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. 9)	—	1.5	2	—	1.5	2	—	1.5	2	—	1.5	2	volts (dc)
Holding Current, I_{HO} : 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/ micro-second
$V_{FB} = V_{B00}$ (min. value), exponential rise, $T_C = +100^{\circ}\text{C}$ Turn-On Time, t_{on} (Delay Time + Rise Time)	—	1.25	—	—	1.25	—	—	1.25	—	—	1.25	—	micro-seconds
$V_D = V_{DRM}$ $i_T = 8$ amperes, $I_G = 200$ mA, $0.1 \mu\text{s}$ rise time, $T_C = +25^{\circ}\text{C}$ Turn-Off Time, t_{off} , (Reverse Recovery Time + Gate Recovery Time)	—	20	50	—	20	50	—	20	50	—	20	50	micro-seconds
$I_F = 8$ amperes, 50 ns pulse width, $dv_{FB}/dt = 20 \text{ V}/\mu\text{s}$, $di/dt = 30 \text{ A}/\mu\text{s}$, $I_{GT} = 200$ mA, $T_C = +80^{\circ}\text{C}$ Thermal Resistance, Junction-to-Case	—	—	1.7	—	—	1.7	—	—	1.7	—	—	1.7	$^{\circ}\text{C}/\text{W}$

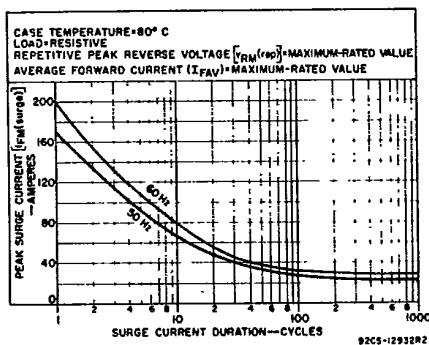


Fig. 1 - Peak surge current vs. surge current duration.

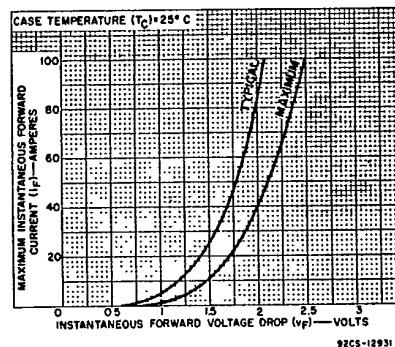


Fig. 2 - Instantaneous forward current vs. instantaneous forward voltage drop.

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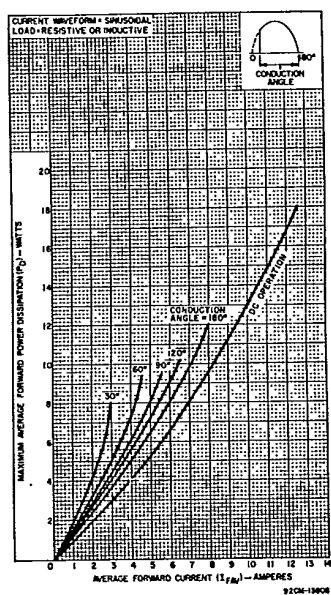


Fig. 3 — Power dissipation vs. forward current.

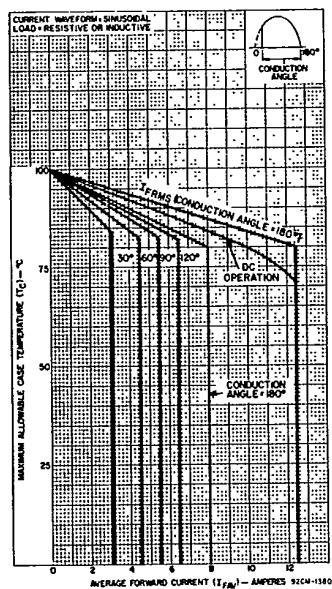


Fig. 4 — Maximum allowable case temperature vs. average forward current.

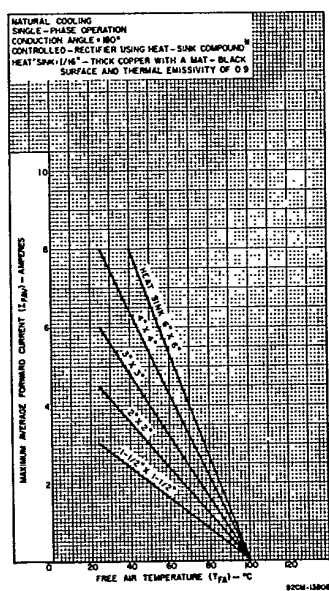


Fig. 5 — Natural-cooling operation guidance chart.

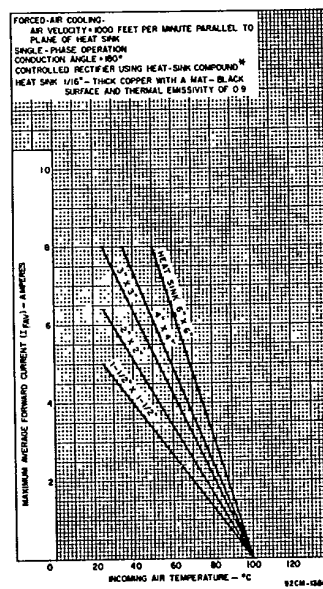


Fig. 6 — Forced-air cooling operation guidance chart.

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

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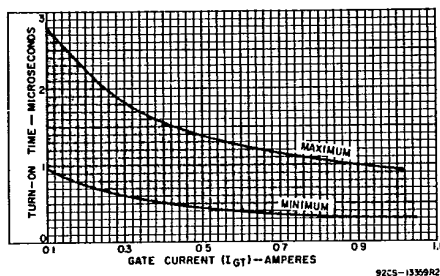


Fig. 7 — Turn-on time vs. gate current.