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Silicon Controlled Rectifiers

S3700 Series

File Number 306

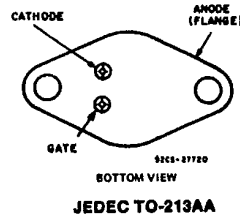
5-A Silicon Controlled Rectifiers

For Inverter Applications

Features:

- 600V, 125°C T_J operating
- High dv/dt and di/dt capability
- Low switching losses
- High pulse-current capability
- Low forward and reverse leakage
- SIPOS oxide glass multilayer passivation system
- Advanced unisurface construction
- Precise ion-implanted diffusion source

TERMINAL DESIGNATIONS



The RCA-S3700-series types are all-diffused, silicon controlled rectifiers (reverse-blocking triode thyristors) designed for inverter applications such as ultrasonics, choppers, regulated power supplies; induction heaters, and

fluorescent lighting. These types may be used at frequencies up to 25 kHz.

The S3700 series employ a hermetic JEDEC TO-213AA package.

MAXIMUM RATINGS, Absolute-Maximum Values:

	S3700B	S3700D	S3700M	
Non-repetitive peak reverse voltage:■				
Gate Open V _{RSOM}	300	500	700	V
Non-repetitive peak off-state voltage:■				
Gate Open V _{DSOM}	300	500	700	V
Repetitive peak reverse voltage:■				
Gate Open V _{RROM}	200	400	600	V
Repetitive peak off-state voltage:■				
Gate Open V _{DROM}	200	400	600	V
On-state current:				
T _C = 85°C; conduction angle = 180°:				
RMS I _{T(RMS)}		5		A
Average I _{T(AV)}		3.2		A
For other conditions		See Figs. 3 & 4		
Peak surge (non-repetitive) on-state current:				
For one full cycle of applied principal voltage, T _C = 85°C				
60 Hz (sinusoidal)		80		A
50 Hz (sinusoidal)		65		A
For more than one full cycle of applied principal voltage		See Fig. 5		
Rate of change of on-state current				
V _D = V _{DROM} , I _{GT} = 50 mA, t _r = 0.1 μs di/dt		200		A/μs
Fusing current (for SCR protection):				
T _J = -40 to 100°C, t = 1 to 8.3 ms I _{2t}		25		A
Gate power dissipation:*				
Peak Forward (for 10 μs max., See Fig. 7) P _{GM}		13		W
Peak Reverse (for 10 μs max., See Fig. 8) P _{GRM}		13		W
Average (averaging time = 10 ms max.) P _{GM(AV)}		0.5		W
Temperature Range:†				
Storage T _{stg}		-40 to 150		°C
Operating (Case) T _C		-40 to 125		°C
Pin Temperature (During soldering):				
At distances ≥ 1/32 in. (0.8 mm) from seating plane				
for 10 s max. T _P		225		°C

■ These values do not apply if there is a positive gate signal. Gate must be open or negatively biased.
 * Any product of gate current and gate voltage which results in a gate power less than the maximum is permitted.
 † For temperature measurement reference point, see *Dimensional Outline*.

S3700 Series

ELECTRICAL CHARACTERISTICS

At Maximum Ratings Unless Otherwise Specified and at Indicated Case Temperature (T_C)

CHARACTERISTIC	SYMBOL	LIMITS			UNITS
		FOR ALL TYPES Except as Specified			
		MIN.	TYP.	MAX.	
Peak Off-State Current: (Gate open, $T_C = 125^\circ\text{C}$) Forward Current (I_{DOM}) at $V_D = V_{DROM}$ Reverse Current (I_{ROM}) at $V_R = V_{RROM}$	I_{DOM} I_{ROM}	- -	0.5 0.3	3 1.5	mA
Instantaneous On-State Voltage: $i_T = 30\text{ A (peak)}$, $T_C = 25^\circ\text{C}$ For other conditions	V_T	-	2.2	3 See Fig. 6	V
Instantaneous Holding Current: Gate open, $T_C = 25^\circ\text{C}$	I_{HO}	-	20	50	mA
Critical Rate of Rise of Off-State Voltage: $V_D = V_{DROM}$, exponential voltage rise, Gate open, $T_C = 125^\circ\text{C}$	dv/dt	100	250	-	V/ μs
DC Gate Trigger Current: $V_D = 12\text{ V (dc)}$, $R_L = 30\ \Omega$, $T_C = 25^\circ\text{C}$ For other conditions	I_{GT}	-	15	40 See Fig. 7	mA
DC Gate Trigger Voltage: $V_D = 12\text{ V (dc)}$, $R_L = 30\ \Omega$, $T_C = 25^\circ\text{C}$ For other conditions	V_{GT}	-	1.8	3.5 See Fig. 7	V
Gate Controlled Turn-On Time: (Delay Time + Rise Time) For $V_{DX} = V_{DROM}$, $I_{GT} = 300\text{ mA}$, $t_r = 0.1\ \mu\text{s}$, $I_T = 2\text{ A (peak)}$, $T_C = 25^\circ\text{C}$ (See Fig. 10)	t_{gt}	-	0.7	-	μs
Circuit Commutated Turn-Off Time: $V_{DX} = V_{DROM}$, $i_T = 2\text{ A}$, pulse duration = $50\ \mu\text{s}$, $dv/dt = 100\text{ V}/\mu\text{s}$, $-di/dt = -10\text{ A}/\mu\text{s}$, $I_{GT} = 100\text{ mA}$, $V_{GT} = 0\text{ V}$ (at turn-off), $T_C = 80^\circ\text{C}$ (See Fig. 13)	t_q	-	4	6	μs
Thermal Resistance: Junction-to-Case	$R_{\theta JC}$	-	4	8	$^\circ\text{C}/\text{W}$
Junction-to-Ambient	$R_{\theta JA}$	-	-	40	$^\circ\text{C}/\text{W}$

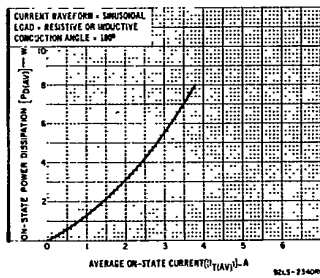


Fig. 1—Power dissipation vs. average on-state current.

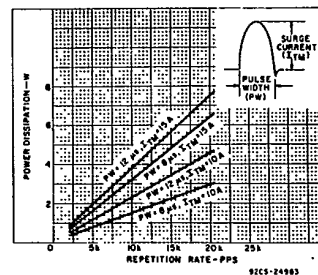


Fig. 2—Dissipation vs. repetition rate.

S3700 Series

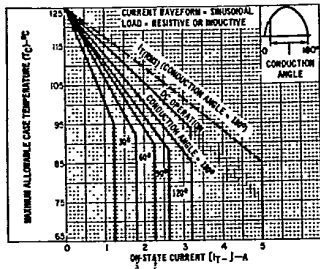


Fig. 3—Maximum allowable case temperature vs. on-state current.

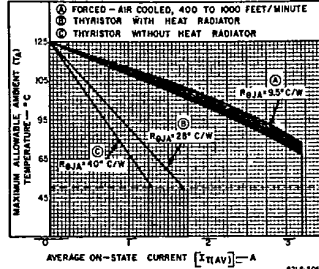


Fig. 4—Maximum allowable ambient temperature vs. average on-state current.

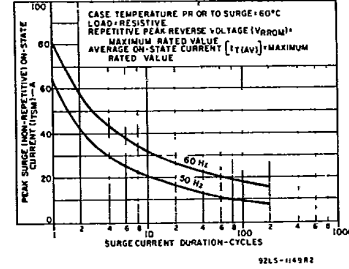


Fig. 5—Peak surge on-state current vs. surge-current duration.

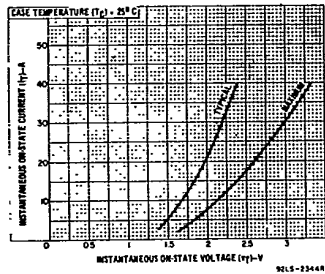


Fig. 6—Instantaneous on-state current vs. on-state voltage.

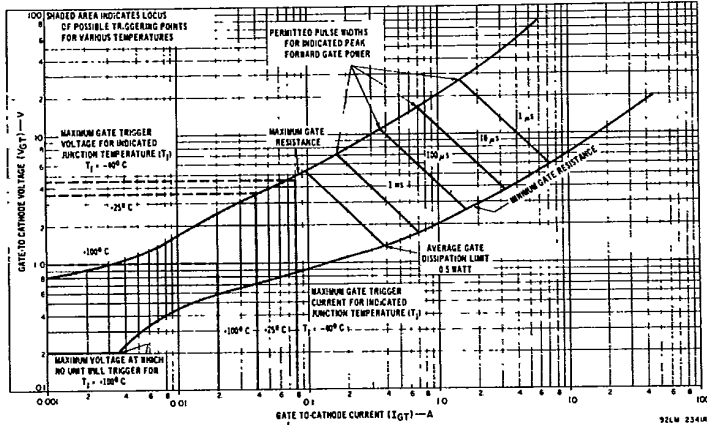


Fig. 7—Gate-trigger characteristics and limiting conditions for determination of permissible gate-trigger pulses.

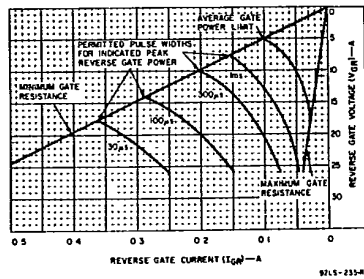


Fig. 8—Reverse-gate voltage vs. reverse-gate current.

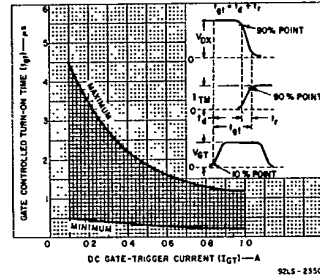


Fig. 9—Turn-on time vs. gate-trigger current.