RCA
Solid State
Division

Thyristors

S5210 Series

Cathode

Anode

Stud H-1612

10-A Silicon Controlled Rectifiers

For Inverter Applications

Features:

- Fast turn-off time — 8 μs max.
- High di/dt and dv/dt capabilities
- Shorted-emitter gate-cathode construction . . . contains an internally diffused resistor between gate and cathode
- Low thermal resistance
- Center gate construction . . . provides rapid uniform gate-current spreading for faster turn-on with substantially reduced heating effects

Package \ Voltage	200 V	400 V	600 V
Stud	S5210B	S5210D	S5210M

RCA-S5210-series types are all-diffused, silicon controlled rectifiers designed for high-frequency power-switching applications such as inverters, switching regulators, and high-current pulse applications. These types may be used at frequencies up to 25 kHz.

MAXIMUM RATINGS, *Absolute-Maximum Values:*

		S5210B	S5210D	S5210M	
NON-REPETITIVE PEAK REVERSE VOLTAGE:●					
Gate Open	V_{RSOM}	200	400	600	V
NON-REPETITIVE PEAK OFF-STATE VOLTAGE:●					
Gate Open	V_{DSOM}	250	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	$I_{T(RMS)}$	←	10	→	A
Average	$I_{T(AV)}$	←	6.3	→	A
PEAK SURGE (NON-REPETITIVE) ON-STATE CURRENT:					
For one full cycle of applied principal voltage 60 Hz (sinusoidal)	I_{TSM}	←	90	→	A
RATE OF CHANGE OF ON-STATE CURRENT:					
$V_D = V_{DROM}$, I_{GT} = 50 mA, t_r = 0.1 μs (See Fig. 6)	di/dt	←	200	→	A/μs
FUSING CURRENT (for SCR protection):					
T_J = −40 to 100°C, t = 1 to 8.3 ms	I^2t	←	35	→	A^2s
GATE POWER DISSIPATION:■					
Peak Forward (for 10 μs max.)	P_{GM}	←	13	→	W
Average (averaging time = 10 ms max.)	$P_{G(AV)}$	←	0.5	→	W
TEMPERATURE RANGE:▲					
Storage	T_{stg}	←	−40 to 150	→	°C
Operating (Case)	T_C	←	−40 to 100	→	°C
TERMINAL TEMPERATURE (During Soldering):					
For 10 s max. (terminals and case)	T_T	←	225	→	°C
STUD TORQUE:	τ_s				
Recommended		←	35	→	in-lb
Maximum (DO NOT EXCEED)		←	50	→	in-lb

●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.

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

CHARACTERISTIC	SYMBOL	LIMITS FOR ALL TYPES Except as Specified			UNITS
		Min.	Typ.	Max.	
Peak Off-State Current: (Gate open, T_C = 100°C)					
Forward Current (I_{DOM}) at $V_D = V_{DROM}$	I_{DOM}	–	–	3	mA
Reverse Current (I_{ROM}) at $V_R = V_{RROM}$	I_{ROM}	–	–	3	mA
Instantaneous On-State Voltage: i_T = 30 A (peak), T_C = 25°C	v_T	–	2.2	3	V
For other conditions		See Fig. 4			
Instantaneous Holding Current: Gate open, T_C = 25°C	i_{HO}	–	20	50	mA
Critical Rate of Rise of Off-State Voltage (See Fig. 7): $V_D = V_{DROM}$, exponential voltage rise, Gate open, T_C = 80°C	dv/dt	100	250	–	V/μs
DC Gate Trigger Current: V_D = 12 V (dc), R_L = 30 Ω, T_C = 25°C	I_{GT}	–	15	40	mA
DC Gate Trigger Voltage: V_D = 12 V (dc), R_L = 30 Ω, T_C = 25°C	V_{GT}	–	1.8	3.5	V
Gate Controlled Turn-On Time: (Delay Time + Rise Time) For $V_{DX} = V_{DROM}$, I_{GT} = 300 mA, t_r = 0.1 μs, I_T = 2 A (peak), T_C = 25°C (See Fig. 5)	t_{gt}	–	0.7	–	μs
Circuit Commutated Turn-Off Time: $V_{DX} = V_{DROM}$, i_T = 10 A, pulse duration = 50 μs, dv/dt = 100 V/μs, –di/dt = –10 A/μs, I_{GT} = 100 mA, V_{GT} = 0 V (at turn-off), T_C = 80°C (See Figs. 8 & 9)	t_q	–	–	8	μs
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	–	–	1.5	°C/W

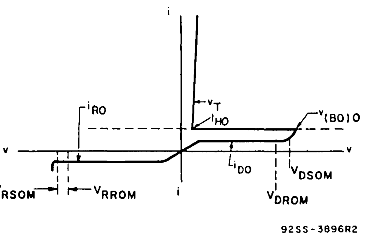

Fig. 1— Principal voltage-current characteristic.

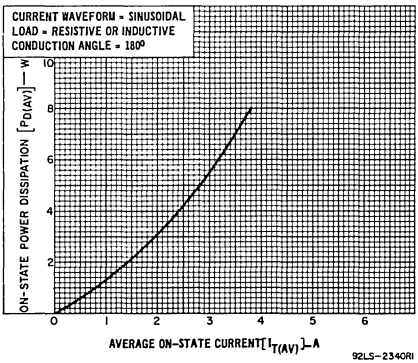

Fig. 2— Power dissipation vs. average on-state current.

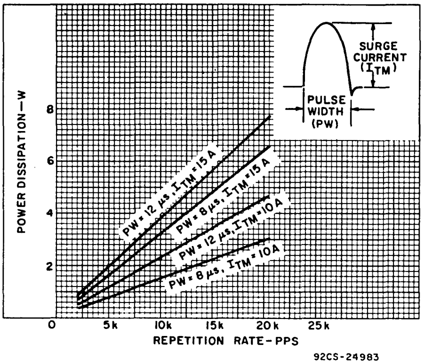

Fig. 3— Dissipation vs. repetition rate.

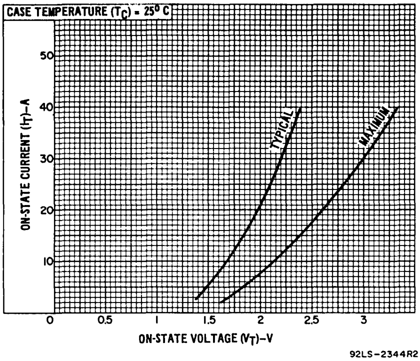

Fig. 4— Instantaneous on-state current vs. on-state voltage.

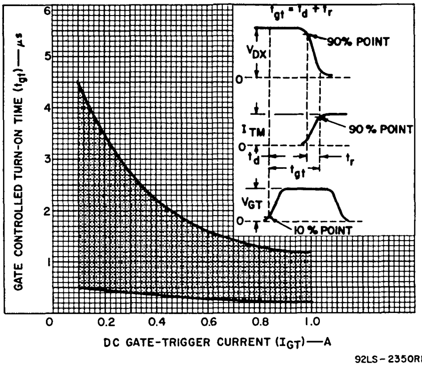

Fig. 5— Turn-on time vs. gate-trigger current.

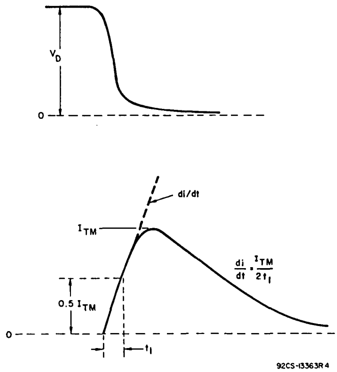

Fig. 6— Rate-of-change of on-state current with time (defining di/dt).

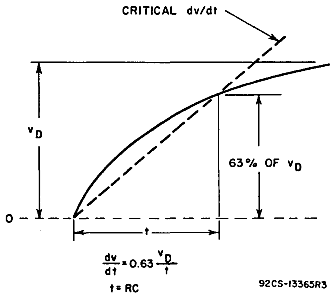

Fig. 7— Rate-of-rise of off-state voltage with time (defining dv/dt).

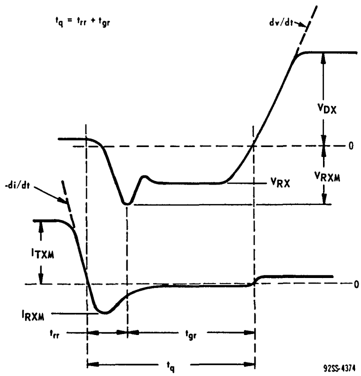

Fig. 8— Relationship between off-state voltage, reverse voltage, on-state current, and reverse current showing reference points defining turn-off time (t_q).

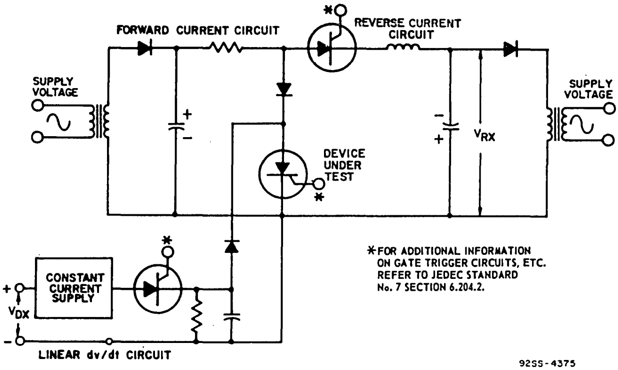

Fig. 9— Circuit used to measure turn-off time (t_q), rectangular pulse.

TERMINAL CONNECTIONS

No. 1 — Gate
No. 2 — Cathode
No. 3 — Anode