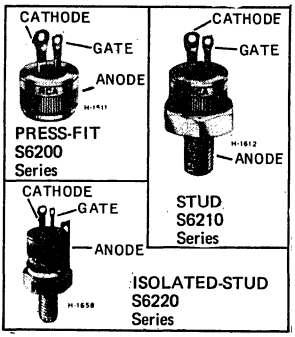
RCA
Solid State
Division

Thyristors
S6200 S6210 S6220 Series



20-Ampere Silicon Controlled Rectifiers

Press-Fit, Stud, and Isolated-Stud Packages

Package \ Voltage	100 V Types	200 V Types	400 V Types	600 V Types
Press-fit	S6200A (40749)	S6200B (40750)	S6200D (40751)	S6200M (40752)
Stud	S6210A (40753)	S6210B (40754)	S6210D (40755)	S6210M (40756)
Isolated-Stud	S6220A (40757)	S6220B (40758)	S6220D (40759)	S6220M (40760)

Numbers in parentheses are former RCA type numbers.

These RCA types are all-diffused, silicon controlled rectifiers (reverse-blocking triode thyristors) designed for power switching and voltage regulator applications and for heating, lighting and motor speed-control circuits.

These SCRs have an RMS on-state current rating ($I_{T\ [RMS]}$) of 20 A and have voltage ratings (V_{DROM}) of 100, 200, 400, and 600 volts.

Features:
- Low switching losses
- High di/dt and dv/dt capabilities
- Shorted-emitter gate-cathode construction
- Forward and reverse gate dissipation ratings
- All-diffused construction—assures exceptional uniformity and stability of characteristics
- Symmetrical gate-cathode construction—provides uniform current density, rapid electrical conduction, and efficient heat dissipation
- Low leakage currents, both forward and reverse
- Low forward voltage drop at high current levels
- Low thermal resistance

MAXIMUM RATINGS, *Absolute-Maximum Values:*		S6200A S6210A S6220A	S6200B S6210B S6220B	S6200D S6210D S6220D	S6200M S6210M S6220M	
NON-REPETITIVE PEAK REVERSE VOLTAGE Gate Open	V_{RSOM}	150	250	500	700	V
NON-REPETITIVE PEAK FORWARD VOLTAGE Gate Open	V_{DSOM}	150	250	500	700	V
REPETITIVE PEAK REVERSE VOLTAGE Gate Open	V_{RROM}	100	200	400	600	V
REPETITIVE PEAK OFF-STATE VOLTAGE Gate Open	V_{DROM}	100	200	400	600	V
PEAK SURGE (NON-REPETITIVE) ON-STATE CURRENT: For one cycle of applied principal voltage $T_C = 75^oC$	I_{TSM}					
50-Hz, (sinusoidal)		170				A
60-Hz, (sinusoidal)		200				A
For more than one full cycle of applied principal voltage		See Fig. 10				
ON-STATE CURRENT: For case temperature (T_C) = 75° C, conduction angle of 180°						
Average DC value	$I_{T(AV)}$	12.5				A
RMS value	$I_{T(RMS)}$	20				A
RATE-OF-CHANGE OF ON-STATE CURRENT: $V_{DM} = V_{(BO)O}$, I_{GT} = 200 mA, t_r = 0.5 μs (See Fig. 2.)	di/dt	200				A/μs
FUSING CURRENT (for SCR protection): T_J = −65 to 100°C, t = 1 to 8.3 ms	I^2t	170				A^2s
GATE POWER DISSIPATION: PEAK FORWARD (for 10 μs max.)	P_{GM}	40				W
AVERAGE (averaging time = 10 ms, max.)	$P_{G(AV)}$	0.5				W
PEAK REVERSE	P_{RGM}	See Fig. 5				

MAXIMUM RATINGS, *Absolute-Maximum Values:* *(Cont'd)*

	S6200A S6210A S6220A	S6200B S6210B S6220B	S6200D S6210D S6220D	S6200M S6210M S6220M	
TEMPERATURE RANGE:					
Storage	-65 to 150				°C
Operating (Case)	-65 to 100				°C
Soldering (10 s max. for terminals)	225				°C

ELECTRICAL CHARACTERISTICS

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

CHARACTERISTIC	SYMBOL	LIMITS - ALL TYPES Min.	Typ.	Max.	UNITS
Instantaneous Forward Breakover Voltage: (Gate open, T_C = 100 °C)					
S6200A, S6210A, S6220A	$V_{(BO)O}$	100	–	–	V
S6200B, S6210B, S6220B		200	–	–	
S6200D, S6210D, S6220D		400	–	–	
S6200M, S6210M, S6220M		600	–	–	
Peak Off-State Current: (Gate open, T_C = 100 °C)					
Forward, $V_{DO} = V_{DROM}$	I_{DOM}	–	0.2	3	mA
Reverse, $V_{RO} = V_{RROM}$	I_{RROM}	–	0.1	2	
Instantaneous On-State Voltage: For i_T = 100 A, T_C = 25 °C	v_T	–	1.9	2.4	V
DC Gate Trigger Current: V_D = 12 V (DC), R_L = 30 Ω, T_C = 25 °C	I_{GT}	–	8	15	mA
At other case temperatures			See Fig. 11		
DC Gate Trigger Voltage: V_D = 12 V (DC), R_L = 30 Ω, T_C = 25 °C	V_{GT}		1.1	2	V
At other case temperatures			See Fig. 12		
Instantaneous Holding Current: Gate open, T_C = 25 °C	I_{HO}		9	20	mA
At other case temperatures			See Fig. 15		
Critical Rate-of-Rise of Off-State Voltage: ($V_{DO} = V_{(BO)O}$ Min. value, Exponential rise, T_C = 100°C, See Fig 5)	dv dt				V/μs
S6200A, S6200D, S6210A, S6210D, S6220A, S6220D		10	100	–	
S6200B, S6210B, S6220B		10	150	–	
S6200M, S6210M, S6220M		10	75	–	
Gate Controlled Turn-On Time: $V_D = V_{(BO)O}$ Min. value, i_T = 30 A, I_{GT} = 200 mA, 0.1 μs rise time, T_C = 25°C See Fig. 9	t_{gt}	–	2	–	μs
Circuit Commutated Turn-Off Time: $V_D = V_{F(BO)O}$ Min. value, i_T = 18 A, Pulse Duration = 50 μs, **dv/dt = 20 V/μs, di/dt = –30 A/μs, T_C = 75°C** See Fig. 4	t_q	–	20	40	μs
Thermal Resistance:					
Junction-to-Case **(press-fit, stud packages)**	$R_{\theta JC}$	–	–	1.2	°C/W
Junction-to-Isolated Stud **(Isolated-stud package)**	$R_{\theta JIS}$	–	–	1.4	

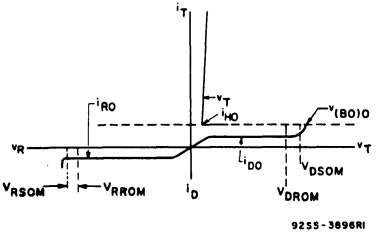


Fig. 1—Principal voltage-current characteristic.

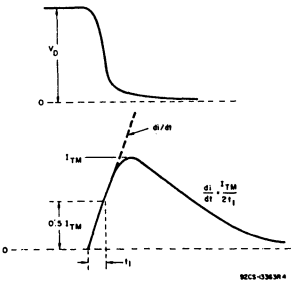


Fig. 2—Rate of change of on-state current with time (defining di/dt).

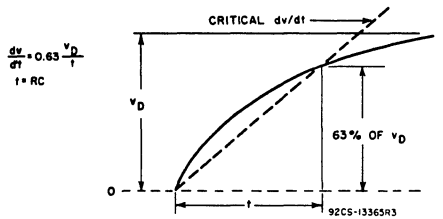


Fig. 3—Rate of rise of off-state voltage with time (defining dv/dt).

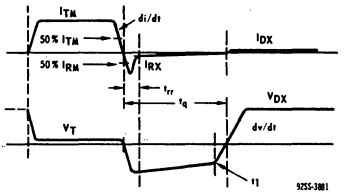


Fig. 4—Relationship between on-state current, reverse current, on-state voltage, and off-state voltage showing reference points for definition of turn-off time (t_q).

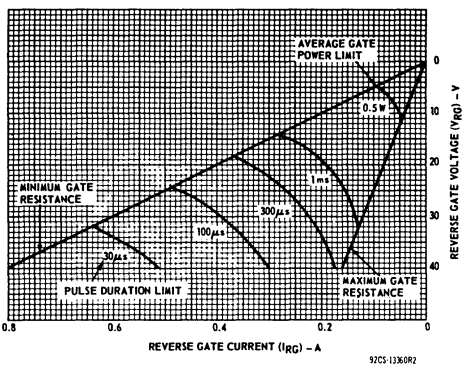


Fig. 5—Reverse gate voltage vs. reverse gate current.

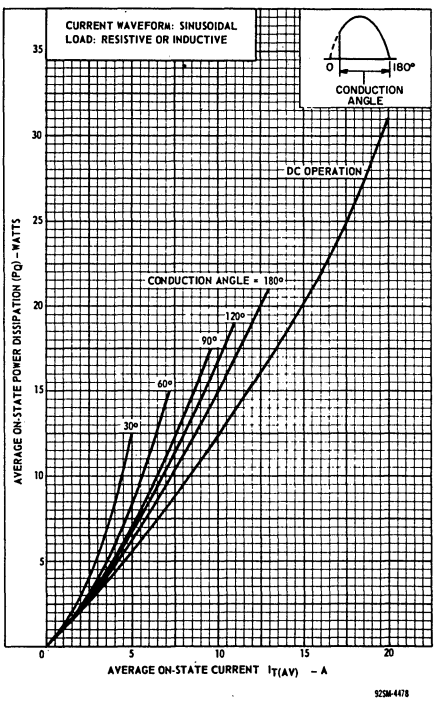


Fig. 6—Power dissipation vs. on-state current.

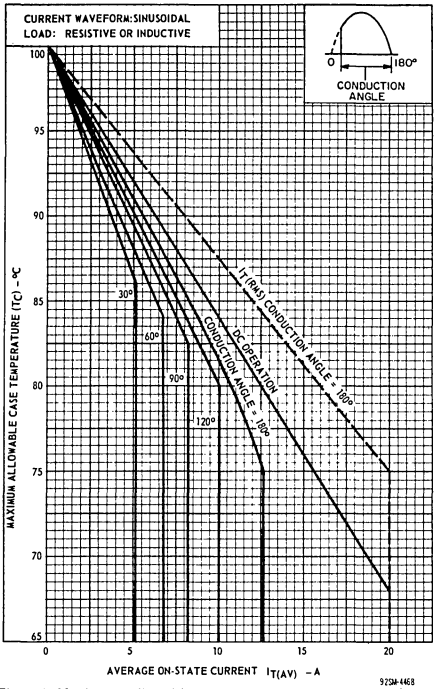


Fig. 7—Maximum allowable case temperature vs. average forward current for stud and press-fit.

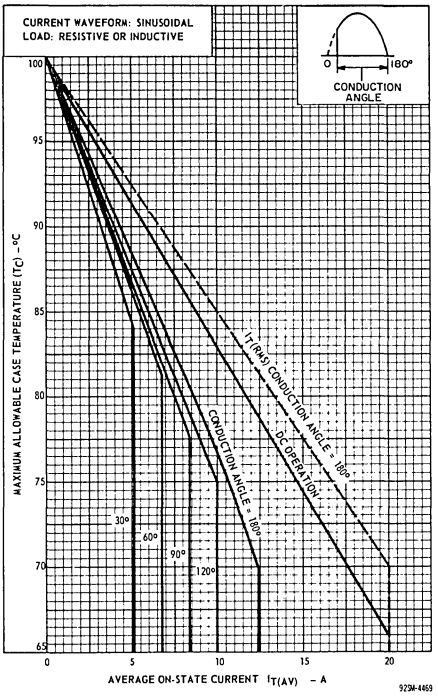


Fig. 8—Maximum allowable case temperature vs. average forward current for isolated stud.

Fig. 9—Gate controlled turn-on time (t_{gt}) vs. gate-trigger current.

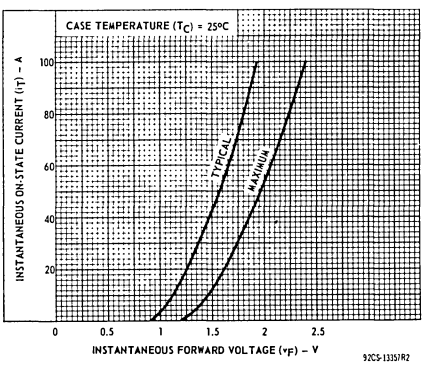


Fig. 10—Instantaneous on-state current vs. on-state voltage.

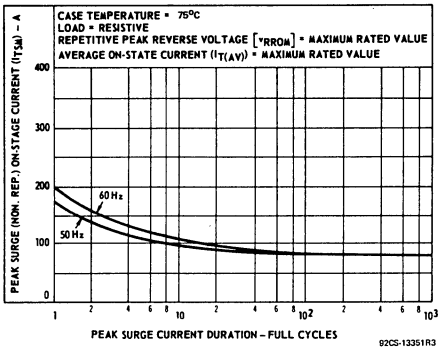


Fig. 11—Peak surge on-state current vs. surge current duration.

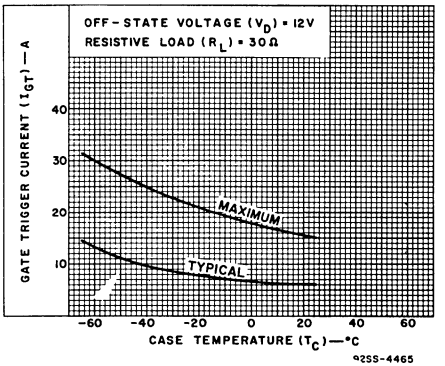


Fig. 12—DC gate-trigger current (forward) vs. case temperature.

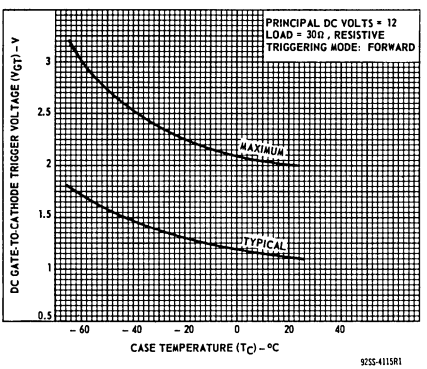


Fig. 13—DC gate-trigger voltage vs. case temperature.

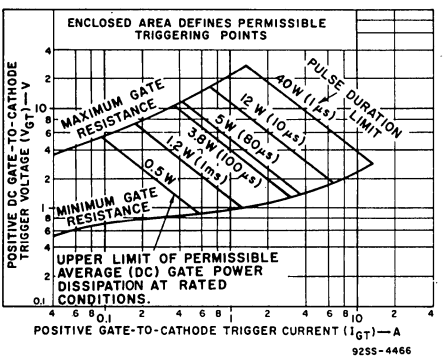


Fig. 14—Typical forward-biased gate trigger characteristics.

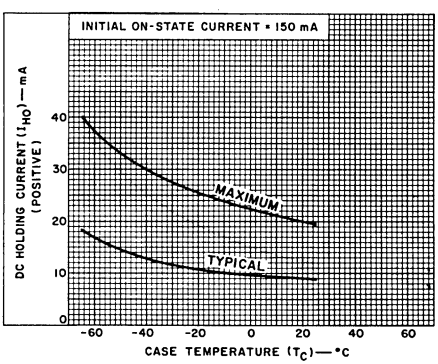


Fig. 15—DC holding current vs. case temperature.

TERMINAL CONNECTIONS

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