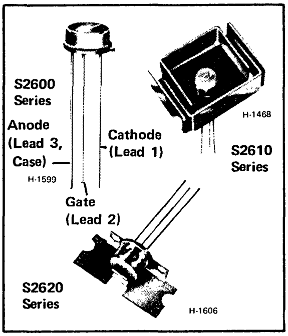
RCA

Solid State
Division

Thyristors

S2600 S2610 S2620 Series



7-Ampere "Low-Profile" Silicon Controlled Rectifiers

For Power Switching, Power Control, Power Crowbar, and Ignition Applications

Features:

- Forward and reverse gate ratings
- All-diffused center gate construction
- Low leakage currents, both forward and reverse
- Low forward voltage drop at high current levels
- High pulse-current capability for capacitor-discharge ignition circuits
- High dv/dt capability
- Low switching losses
- Low thermal resistance
- Sub-cycle surge capability curve

Package \ Voltage	200 V Types	400 V Types	600 V Types
"Low-Profile", TO-5	S2600B (40654)	S2600D (40655)	S2600M (40833)
"Low-Profile", TO-5 w/radiator	S2610B (40658)	S2610D (40659)	S2610M (40835)
"Low-Profile", TO-5 w/heat spreader	S2620B (40656)	S2620D (40657)	S2620M (40834)

Numbers in parentheses are former RCA type numbers.

The S2600, S2610, and S2620 series are all-diffused, silicon controlled rectifiers (reverse-blocking triode thyristors) for capacitor-discharge ignition systems, high-voltage generators, and power-switching and control applications.

S2600B, S2600D, and S2600M have a three-lead low-profile package (similar to the JEDEC TO-5). They may be used in capacitor-discharge ignition systems (battery or magneto types) for internal combustion engines, electronic igniters, and high-voltage generators. Other uses are power-control and power-switching circuits.

S2610B, S2610D, and S2610M have integral heat radiators; S2620B, S2620D, and S2620M have integral heat spreaders.

MAXIMUM RATINGS, *Absolute-Maximum Values:*
For Operation with Sinusoidal Supply Voltage at Frequencies up to 50/60 Hz and with Resistive or Inductive Load.

		S2600B S2610B S2620B	S2600D S2610D S2620D	S2600M S2610M S2620M	
NON-REPETITIVE PEAK REVERSE VOLTAGE• Gate open	V_{RSOM}	250	500	700	V
NON-REPETITIVE PEAK FORWARD 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
RMS ON-STATE CURRENT (Conduction angle = 180°)	$I_{T(RMS)}$		See Figs. 7-11		
PEAK SURGE (NON-REPETITIVE) ON-STATE CURRENT:	I_{TSM}				
For one cycle of applied princip l voltage					
60 Hz (sinusoidal)		100	100	100	A
50 Hz (sinusoidal)		85	85	85	A
For more than one cycle of applied principal voltage			See Fig. 12		
PEAK REPETITIVE ON-STATE CURRENT† (See Fig. 21): Duty factor = 0.1%, T_C = 75°C, Pulse duration = 5 μs (min.), 20 μs (max.)	I_{TRM}	100	100	100	A
RATE OF CHANGE OF ON-STATE CURRENT: $V_{DM} = V_{DROM}$, I_{GT} = 200 mA, t_r = 0.5 μs (See Fig. 1)	di/dt		200		A/μs
FUSING CURRENT (for SCR protection): T_J = −65 to 100°C, t = 1 to 8.3 ms	I^2t		40		A^2s

Continued on next page.

MAXIMUM RATINGS, (Cont'd).

For Operation with Sinusoidal Supply Voltage at Frequencies up to 50/60 Hz and with Resistive or Inductive Load.

		S2600B S2610B S2620B	S2600D S2610D S2620D	S2600M S2610M S2620M	
NON-REPETITIVE SUB-CYCLE SURGE CURRENT:					
T_C = 25°C, single pulse, I_{GT} = 50 mA, 10 μs square pulse			See Fig. 20		
GATE POWER DISSIPATION▲:					
PEAK FORWARD (for 1 μs max.)	P_{GM}	40	40	40	W
PEAK REVERSE	P_{RGM}		See Fig. 14		
AVERAGE (averaging time = 10 ms, max.)	$P_{G(AV)}$	0.5	0.5	0.5	W
TEMPERATURE RANGE♦:					
Storage	T_{stg}		-65 to +150		°C
Operating (case)	T_C		-65 to +100		°C
LEAD TEMPERATURE (During soldering)■:					
For 10 s max. for case or leads			225		°C

† When rms current exceeds 4 amperes (maximum rating for the anode lead), connection must be made to the case.

•These values do not apply if there is a positive gate signal. Gate must be open, terminated, or have negative bias.

▲Any values of peak gate current or peak gate voltage that yield the maximum gate power are permissible.

♦For information on the reference point of temperature measurement, see dimensional outlines.

■When these devices are soldered directly to the heat sink, a 60/40 solder should be used. Case heating time should be a minimum . . . sufficient to allow the solder to flow freely.

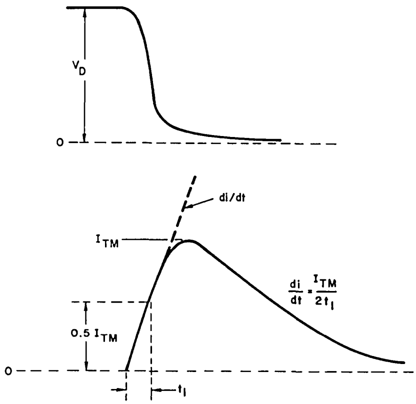


Fig. 1—Rate of change of on-state current with time (defining di/dt).

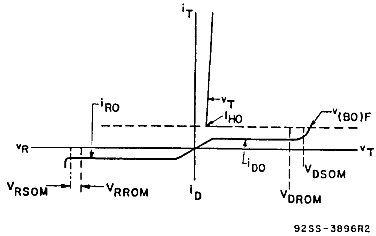


Fig. 2—Principal voltage-current characteristics.

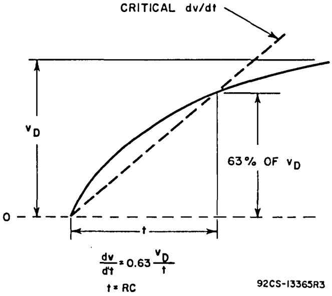


Fig. 3—Oscilloscope display of critical rate of rise of off-state voltage (critical dv/dt).

TERMINAL CONNECTIONS

S2600 SERIES

Lead 1 — Cathode
Lead 2 — Gate
Case, Lead 3 — Anode

S2610 SERIES

Lead 1 — Cathode
Lead 2 — Gate
Heat Radiator, Lead 3 — Anode

S2620 SERIES

Lead 1 — Cathode
Lead 2 — Gate
Heat Spreader, Lead 3 — Anode

ELECTRICAL CHARACTERISTICS, *At maximum ratings and at indicated case temperature (T_C) unless otherwise specified*

CHARACTERISTIC	SYMBOL	LIMITS						UNITS
		S2600 Series			S2610 Series S2620 Series			
		MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
PEAK OFF-STATE CURRENT: (Gate Open, T_C = +100°C) FORWARD, V_D = V_{DROM}	I_{DOM}	–	0.1	0.5	–	0.2	1.5	mA
REVERSE, V_R = V_{RROM}	I_{ROM}	–	0.05	0.5	–	0.1	1.5	mA
INSTANTANEOUS ON-STATE VOLTAGE: For i_T = 30 A and T_C = +25°C	v_T	–	1.9	2.6	–	1.9	2.6	V
DC GATE TRIGGER CURRENT: V_D = 12 V (DC), R_L = 30 Ω, T_C = +25°C	I_{GT}	–	6	15	–	6	15	mA
For other case temperatures		See Fig. 16						
DC GATE TRIGGER VOLTAGE: V_D = 12 V (DC), R_L = 30 Ω, T_C = +25°C	V_{GT}	–	0.65	1.5	–	0.65	1.5	V
For other case temperatures		See Fig. 17						
INSTANTANEOUS HOLDING CURRENT: Gate Open and T_C = +25°C	i_{HO}	–	9	20	–	9	20	mA
For other case temperatures		See Fig. 18						
CRITICAL RATE-OF-RISE OF OFF-STATE VOLTAGE: V_D = V_{DROM}, Exponential rise, T_C = +100°C (See Fig. 3)	dv/dt	20	200	–	20	200	–	V/µs
GATE CONTROLLED TURN-ON TIME: V_D = V_{DROM}, i_T = 4.5 A, I_{GT} = 200 mA, 0.1 µs rise time, T_C = +25°C (See Fig. 4)	t_{gt}	–	1	2	1	2	–	µs
CIRCUIT COMMUTATED TURN-OFF TIME: V_D = V_{DROM}, i_T = 2 A, Pulse Duration = 50 µs, dv/dt = 20V/µs, di/dt = -30A/µs, I_{GT} = 200 mA at turn on, T_C = +75°C (See Fig. 5)	t_q	–	15	50	–	15	50	µs
THERMAL RESISTANCE: Junction-to-Case	$R_{\theta JC}$	–	–	5	–	–	5	°C/W
Junction-to-Ambient (See dimensional outlines)	$R_{\theta JA}$	–	–	120	–	–	30 (S2610 Series)	°C/W
Junction-to-Heat Spreader (See dimensional outline)	$R_{\theta JHS}$	–	–	–	–	–	7 (S2620 Series)	°C/W

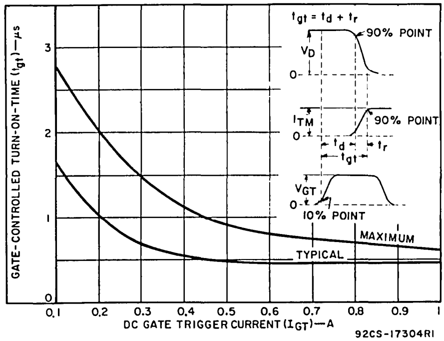


Fig. 4—Gate controlled turn-on time (t_{gt}) vs. gate trigger current.

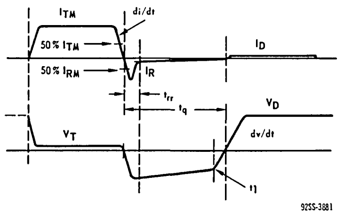


Fig. 5—Oscilloscope display for measurement of circuit commutated turn-off time (tq).

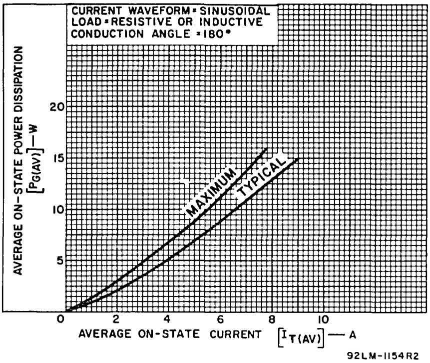


Fig. 6—Power dissipation vs. on-state current.

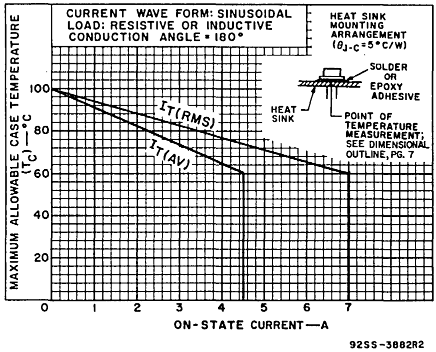


Fig. 7—Maximum allowable case temperature vs. on-state current for S2600 series.

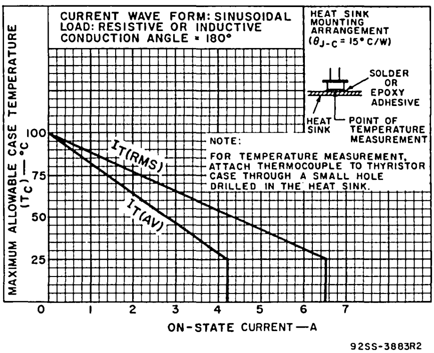


Fig. 8—Maximum allowable case temperature vs. on-state current for S2600 series.

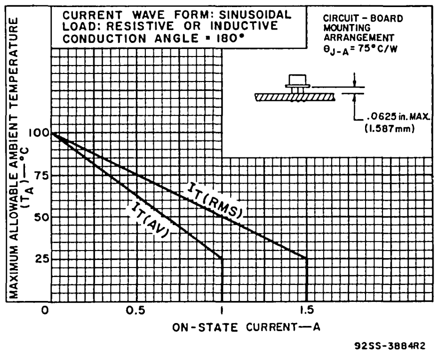


Fig. 9—Maximum allowable ambient temperature vs. on-state current for 2600 series.

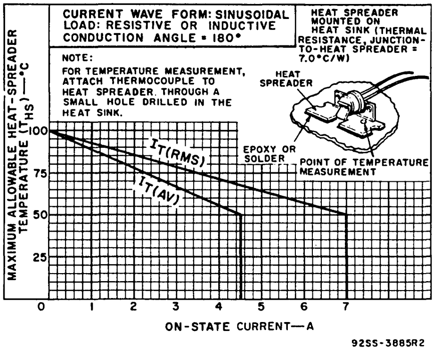


Fig. 10—Maximum allowable heat-speader temperature vs. on-state current for S2620 series.

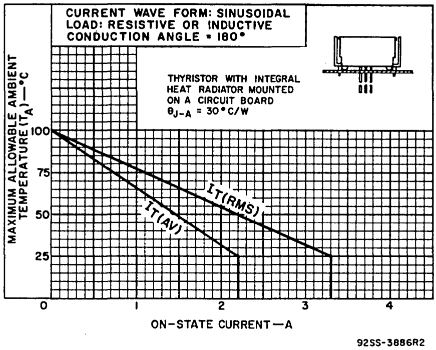


Fig. 11—Maximum allowable ambient temperature vs. on-state current for S2610 series.

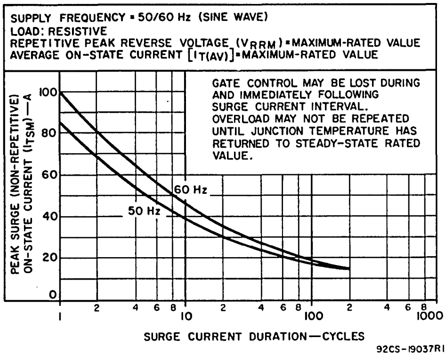


Fig. 12—Peak surge on-state current vs. surge current duration for all types.

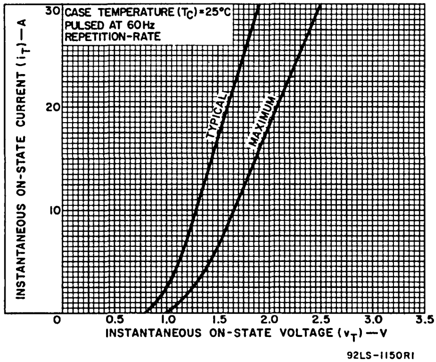


Fig. 13—Instantaneous on-state current vs. on-state voltage for all types.

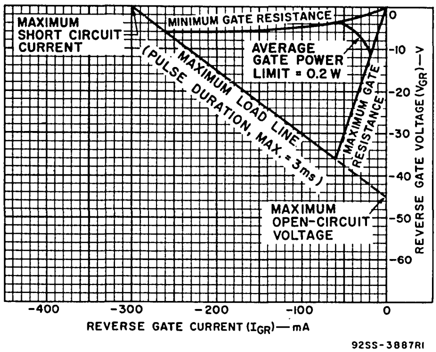


Fig. 14—Reverse gate voltage vs. reverse gate current.

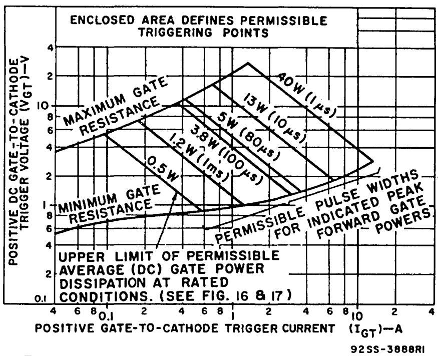


Fig. 15—Gate pulse characteristics for forward triggering mode.

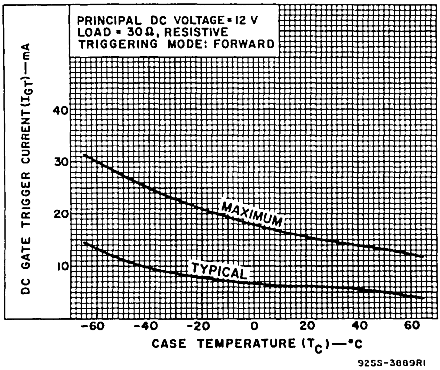


Fig. 16—DC gate-trigger current (forward) vs. case temperature.

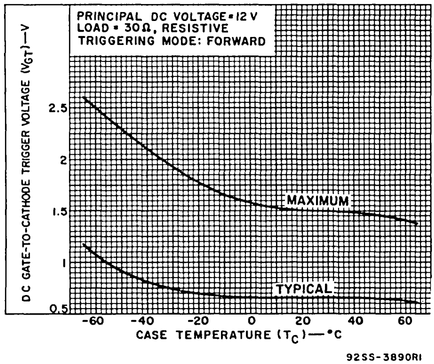


Fig. 17—DC gate-trigger voltage vs. case temperature.

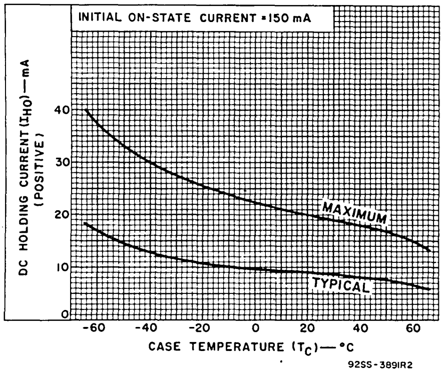


Fig. 18—DC holding current (positive) vs. case temperature.

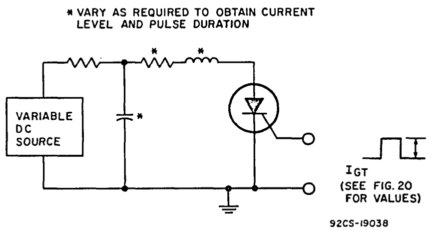


Fig. 19—Sub-cycle surge capability test circuit.

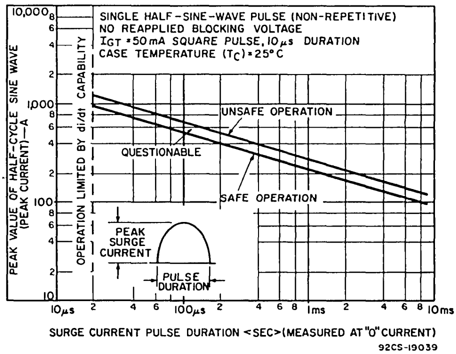


Fig. 20—Sub-cycle surge capability.

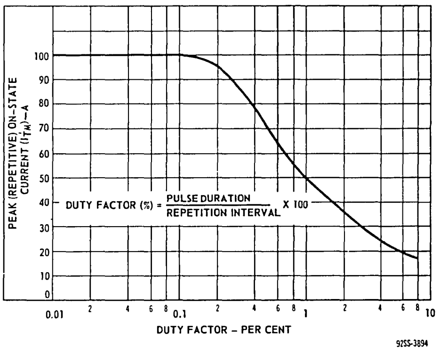


Fig. 21—Derating curve for peak pulse current (repetitive) vs. duty factor for the ignition circuit.