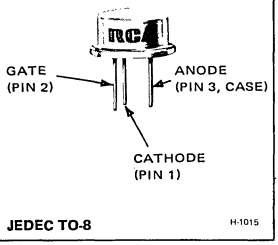
RCA
Solid State
Division

Thyristors

S2400 Series



JEDEC TO-8 H-1015

4.5-A Silicon Controlled Rectifiers For Capacitive-Discharge Systems

Features:

- 200-A surge current capability
- Low switching losses
- High di/dt and dv/dt capabilities
- Shorted-emitter gate-cathode construction
- Forward and reverse gate-dissipation ratings
- Low forward voltage drop at high current levels

Package \ Voltage	100 V Type	200 V Type	400 V Type	600 V Type
TO-66	S2400A (40942)	S2400B (40943)	S2400D (40944)	S2400M (40945)

Numbers in parentheses are former RCA type numbers.

These RCA types are all-diffused silicon controlled rectifiers (reverse-blocking triode thyristors) designed for high-peak-current low-average-current applications. Typical applications are ignition service, crowbars, and other capacitive-discharge systems.

These SCR's have an rms on-state current rating ($I_{T\,[RMS]}$) of 4.5 amperes and have voltage ratings (V_{DROM}) of 100, 200, 400, and 600 volts.

MAXIMUM RATINGS, *Absolute-Maximum Values:*

		S2400A	S2400B	S2400D	S2400M	
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
On-state current:						
T_C = 75°C, conduction angle = 180°						
RMS	$I_{T(RMS)}$	4.5				A
Average	$I_{T(AV)}$	3.3				A
For other conditions		See Fig.3				
Peak surge (non-repetitive) on-state current:	I_{TSM}					
For one cycle of applied principal voltage, T_C = 75°C						
50-Hz, sinusoidal		170				A
60-Hz, sinusoidal		200				A
For more than one full cycle of applied principal voltage		See Fig.4				
Rate of change of on-state current						
$V_D = V_{DROM}$, I_{GT} = 200 mA, t_r = 0.5 μs (See Fig.12)	di/dt	200				A/μs
Fusing current (for SCR protection):						
T_J = −40 to 100°C, t = 1.5 to 10 ms	I^2t	150				A^2s
Gate power dissipation:●						
Peak forward (for 1 μs max.)	P_{GM}	40				W
Peak reverse	P_{RGM}	See Fig.8				
Average (averaging time = 10 ms, max.)	$P_{G(AV)}$	0.5				W

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

		S2400A	S2400B	S2400D	S2400M	
Temperature range:■						
Storage	T_{stg}	———	−40 to 150	———		°C
Operating (case)	T_C	———	−40 to 100	———		°C
Pin temperature (during soldering):	T_P					
For 10 s max. (pins and case)		———	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.

■ Temperature measurement point is shown on the DIMENSIONAL OUTLINE.

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

CHARACTERISTIC	SYMBOL	LIMITS For All Types			UNITS
		Min.	Typ.	Max.	
Peak Off-State Current: (Gate open, T_C = 100°C)					
Forward at $V_D = V_{DROM}$	I_{DOM}	–	0.2	3	mA
Reverse at $V_R = V_{RROM}$	I_{ROM}	–	0.1	2	mA
Instantaneous On-State Voltage: i_T = 100 A, T_C = 25°C, See Fig.5	v_T	–	2.5	3	V
DC Gate Trigger Voltage: V_D = 12 V (dc), R_L = 30 Ω, T_C = 25°C	V_{GT}	–	1.1	2	V
For other conditions			See Fig.10		
DC Gate Trigger Current: V_D = 12 V (dc), R_L = 30 Ω, T_C = 25°C	I_{GT}	–	8	15	mA
For other conditions			See Fig.9		
DC Holding Current: Gate open, initial principal current = 150 mA, T_C = 25°C	I_{HO}	–	9	20	mA
For other conditions			See Fig.6		
Gate-Controlled Turn-On Time: (Delay Time + Rise Time) $V_D = V_{DROM}$, I_{GT} = 200 mA, t_r = 0.1 μs, i_T = 30 A (peak), T_C = 25°C (See Fig.11)	t_{gt}	–	1.6	2.5	μs
Circuit-Commutated Turn-Off Time: $V_D = V_{DROM}$, i_T = 18 A, pulse duration = 50 μs, dv/dt = 20 V/μs, di/dt = −30 A/μs, I_{GT} = 200 mA, T_C = 75°C See Fig.14	t_q	–	20	40	μs
Critical Rate of Rise of Off-State Voltage: $V_D = V_{DROM}$, exponential voltage rise, gate open, T_C = 100°C, See Fig.15	dv/dt	10	100	–	V/μs
Thermal Resistance: Steady-state					
Junction-to-case	$R_{\theta JC}$	–	–	5	°C/W
Junction-to-ambient	$R_{\theta JA}$	–	–	40	°C/W

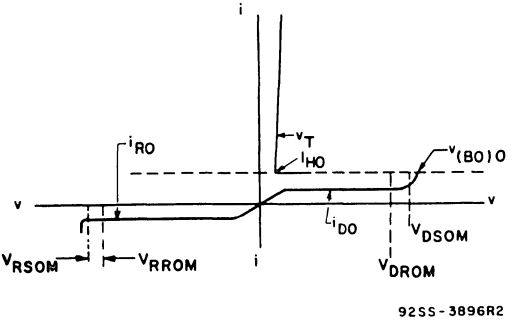


Fig. 1—Principal voltage-current characteristics.

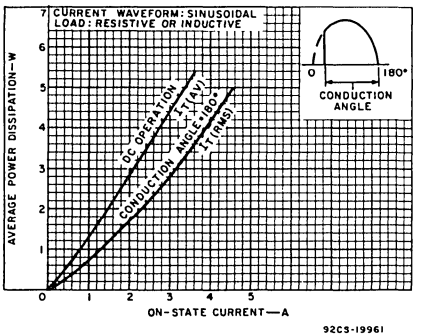


Fig. 2—Power dissipation vs. on-state current.

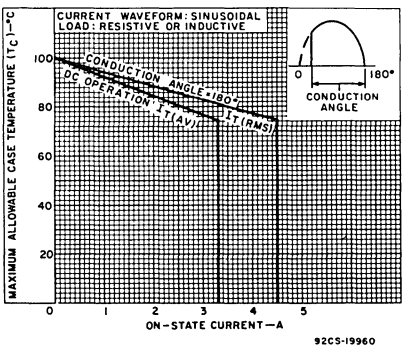


Fig. 3—Maximum allowable case temperature vs. on-state current.

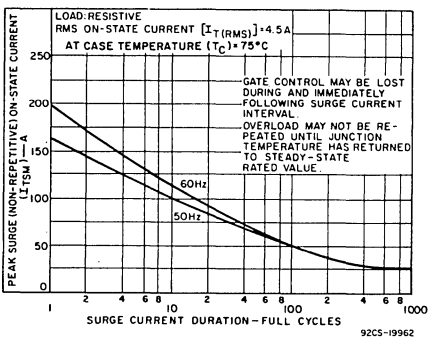


Fig. 4—Peak surge on-state current vs. surge current duration.

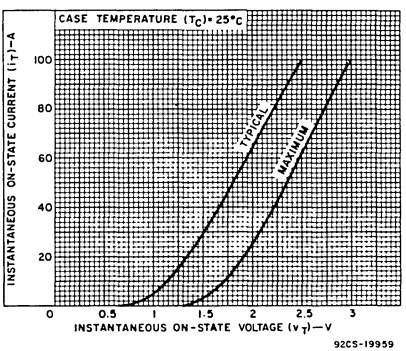


Fig. 5—Instantaneous on-state current vs. on-state voltage.

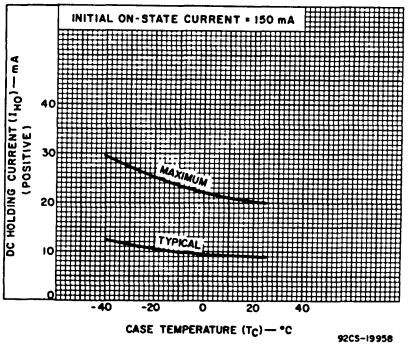


Fig. 6—DC holding current vs. case temperature.

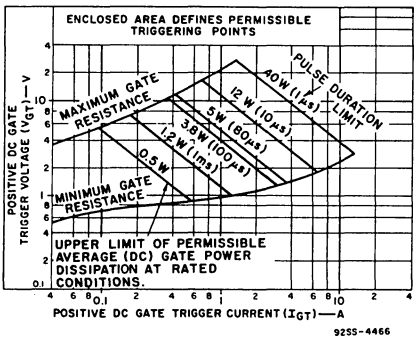


Fig. 7—Gate pulse characteristics for forward triggering mode.

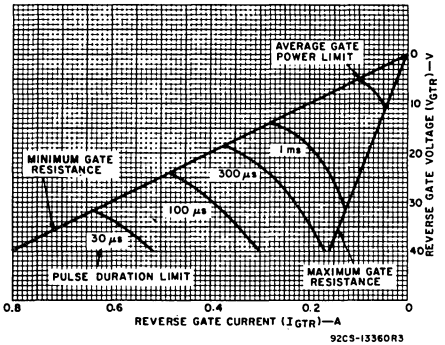


Fig. 8—Reverse gate voltage vs. reverse gate current.

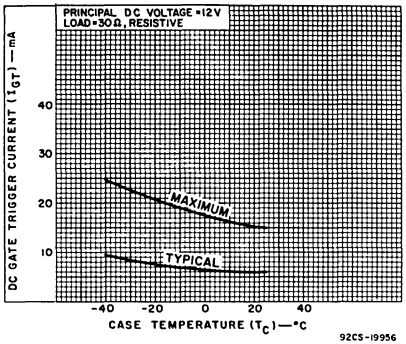


Fig. 9—DC gate-trigger current (forward) vs. case temperature.

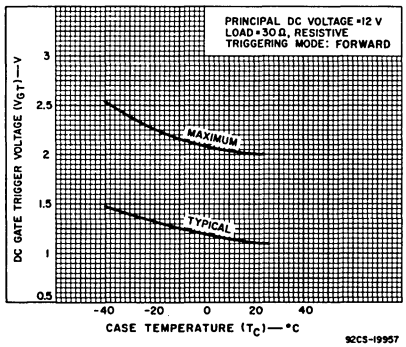


Fig. 10—DC gate-trigger voltage (forward) vs. case temperature.

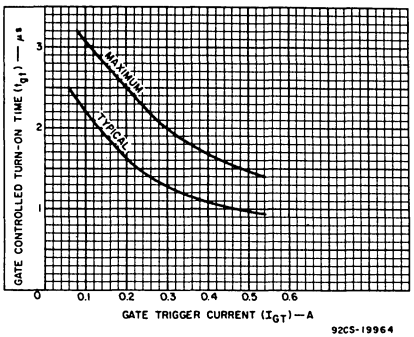


Fig. 11—Gate-controlled turn-on time vs. gate-trigger current.

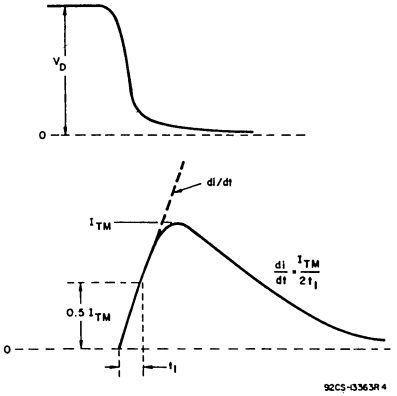


Fig. 12—Rate of change of on-state current with time (defining di/dt).

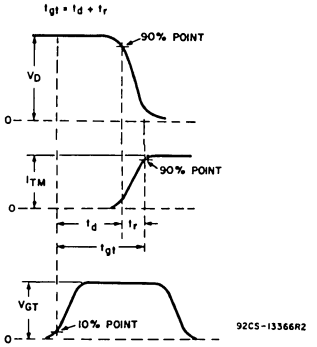


Fig. 13—Relationship between off-state voltage, on-state current, and gate-trigger voltage showing reference points for definition of turn-on time (t_{gt}).

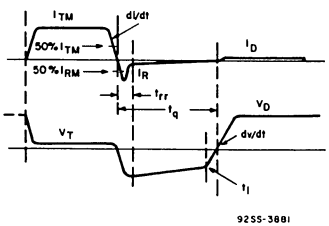


Fig. 14—Relationship between instantaneous on-state current and voltage showing reference points for definition of circuit-commutated turn-off time (t_q).

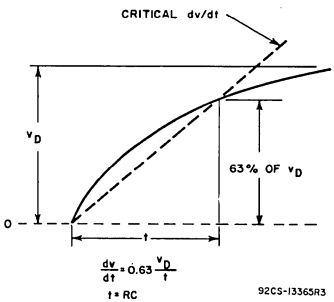


Fig. 15—Rate of rise of off-state voltage with time (defining criitcal dv/dt).

TERMINAL CONNECTIONS

Pin 1 – Cathode
Pin 2 – Gate
Case, Pin 3 – Anode