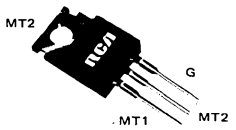
RCA
Solid State
Division

Thyristors

T2500 Series



JEDEC TO-220AB

H-1535

6-A Silicon Triacs

Three-Lead Plastic Types for
Power-Control and Power-Switching Applications

Features:

- 60-A Peak Surge Full-Cycle Current Ratings
- Low Switching Losses
- Shorted-Emitter, Center-Gate Design
- Low Thermal Resistance
- Package Design Facilitates Mounting on a Printed-Circuit Board

Voltage / Package	200 V Type	400 V Type
TO-220AB	T2500B (41014)	T2500D (41015)

Numbers in parentheses are former RCA type numbers.

Types T2500B and T2500D* are gate-controlled full-wave silicon triacs utilizing a plastic case with three leads to facilitate mounting on printed-circuit boards. They are intended for the control of ac loads in such applications as motor controls, heating controls, relay replacement, solenoid drivers, static switching, and power-switching systems.

These devices are designed to switch from an off-state to an on-state for either polarity of applied voltage with positive or negative gate triggering voltages. They have an on-state current rating of 6 amperes at a T_C of 80°C and repetitive off-state voltage ratings of 200 volts and 400 volts, respectively.

The unique plastic package design provides not only ease of mounting but also low terminal impedance, which allows operation at high case temperatures and permits reduced heat-sink size.

*Formerly RCA Dev. Nos. TA8504 and TA8505.

MAXIMUM RATINGS, *Absolute-Maximum Values:*

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

		T2500B	T2500D	
REPETITIVE PEAK OFF-STATE VOLTAGE:•				
Gate open, T_J = −65 to 100°C	V_{DROM}	200	400	V
RMS ON-STATE CURRENT (Conduction angle = 360°):				
Case temperature	$I_{T(RMS)}$			
T_C = 80°C		6		A
For other conditions		See *Fig. 3*		
PEAK SURGE (NON-REPETITIVE) ON-STATE CURRENT:				
For one cycle of applied principal voltage, T_C = 80°C	I_{TSM}			
60 Hz (sinusoidal)		60		A
50 Hz (sinusoidal)		50		A
For more than one cycle of applied principal voltage		See *Fig. 4*		
RATE OF CHANGE OF ON-STATE CURRENT:				
V_{DM} = V_{DROM}, I_{GT} = 200 mA, tr = 0.1 μs (See Fig. 16)	di/dt	70		A/μs
FUSING CURRENT (for Triac Protection):				
T_C = −65 to 100°C, t = 1.25 to 10 ms	I^2t	18		A^2s
PEAK GATE-TRIGGER CURRENT:▪				
For 10 μs max; see *Fig. 10*	I_{GTM}	4		A
GATE POWER DISSIPATION:				
Peak (For 1 μs max., $I_{GTM} \leq 4$ A; see *Fig. 10*)	P_{GM}	16		W
AVERAGE	$P_{G(AV)}$	0.2		W
TEMPERATURE RANGE:▲				
Storage	T_{stg}	−65 to 150		°C
Operating (Case)	T_C	−65 to 100		°C
TERMINAL TEMPERATURE (During soldering):				
For 10 s max. (terminals and case)	T_T	225		°C

• For either polarity of main terminal 2 voltage (V_{MT2}) with reference to main terminal 1.

▪ For either polarity of gate voltage (V_G) with reference to main terminal 1.

▲ 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 T2500B MIN.	T2500B TYP.	T2500B MAX.	T2500D MIN.	T2500D TYP.	T2500D MAX.	UNITS
Peak Off-State Current:* Gate Open, V_{DROM} = Max. rated value At T_J = 100°C	I_{DROM}	–	0.1	2	–	0.1	2	mA
Maximum On-State Voltage:* For i_T = 30 A (peak) and T_C = 25°C	v_{TM}	–	1.7	2	–	1.7	2	V
DC Holding Current:* Gate Open Initial principal current = 150 mA (dc) At T_C = 25°C	I_{HO}	–	15	30	–	15	30	mA
For other case temperatures		← See Fig. 8. →						
Critical Rate of Rise of Commutation Voltage:*♦ For $v_D = V_{DROM}$, $I_{T(RMS)}$ = 6 A, Commutating di/dt = 3.2 A/ms, and gate unenergized At T_C = 80°C	dv/dt	4	10	–	4	10	–	V/μs
Critical Rate of Rise of Off-State Voltage:* For $v_D = V_{DROM}$, exponential voltage rise, and gate open At T_C = 100°C	dv/dt	100	300	–	75	250	–	V/μs
For other case temperatures		← See Fig.9 →						
DC Gate-Trigger Current:*† For v_D = 12 V (dc), R_L = 12 Ω T_C = 25°C, and specified triggering mode:								
I^+ Mode (V_{MT2} positive, V_G positive)	I_{GT}	–	10	25	–	10	25	mA
III^- Mode (V_{MT2} negative, V_G negative)		–	15	25	–	15	25	
I^- Mode (V_{MT2} positive, V_G negative)		–	20	60	–	20	60	
III^+ Mode (V_{MT2} negative, V_G positive)		–	30	60	–	30	60	
For other case temperatures		← See Figs. 12 and 13 →						
DC Gate-Trigger Voltage:*† For v_D = 12 V (dc) and R_L = 12 Ω At T_C = 25°C	V_{GT}	–	1.25	2.5	–	1.25	2.5	V
For other case temperatures		← See Fig. 14. →						
For $v_D = V_{DROM}$ and R_L = 125 Ω At T_C = 100°C		0.2	–	–	0.2	–	–	
Gate-Controlled Turn-On Time (Delay Time + Rise Time): For $v_D = V_{DROM}$, I_{GT} = 160 mA, rise time = 0.1 μs, and i_T = 10 A (peak) At T_C = 25°C (See Fig.15.)	t_{gt}	–	1.6	2.5	–	1.6	2.5	μs
Thermal Resistance: Junction-to-Case	$R_{\theta JC}$	–	–	2.7	–	–	2.7	°C/W
Junction-to-Ambient	$R_{\theta JA}$	–	–	60	–	–	60	°C/W

*For either polarity of main terminal 2 voltage (V_{MT2}) with reference to main terminal 1.

†For either polarity of gate voltage (V_G) with reference to main terminal 1.

♦Variants of these devices having dv/dt characteristics selected specifically for inductive loads are available on special order; for additional information, contact your RCA Representative or your RCA Distributor.

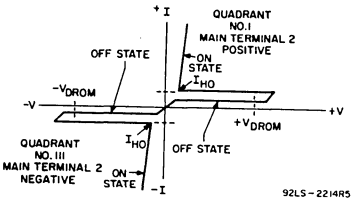


Fig. 1—Principal voltage-current characteristic.

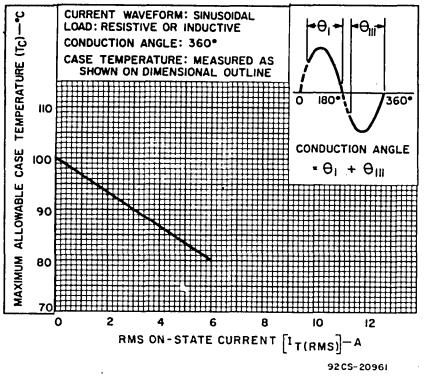


Fig. 3—Allowable case temperature vs. on-state current.

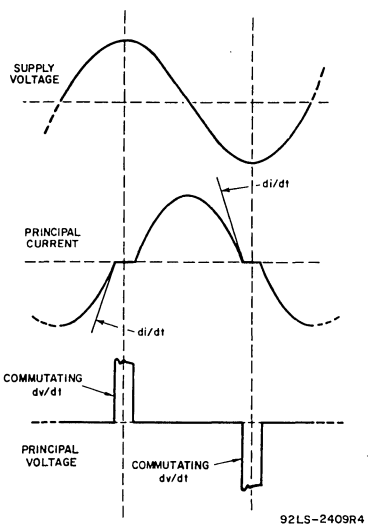


Fig. 5—Oscilloscope display of commutating dv/dt.

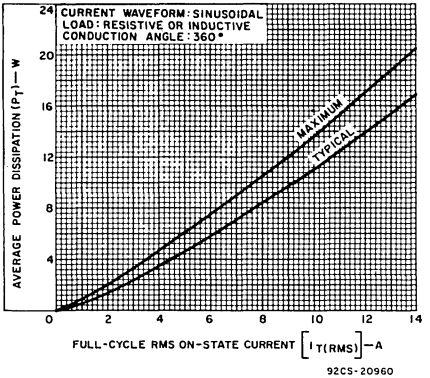


Fig. 2—Power dissipation vs. on-state current.

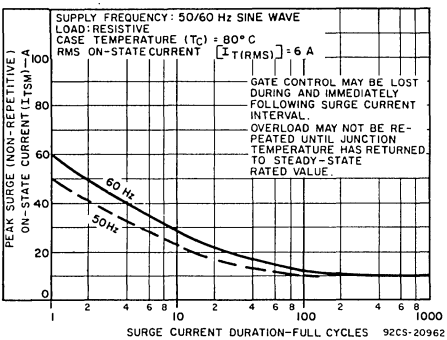


Fig. 4—Peak surge on-state current vs. surge current duration.

$t_{gt} = t_d + t_r$

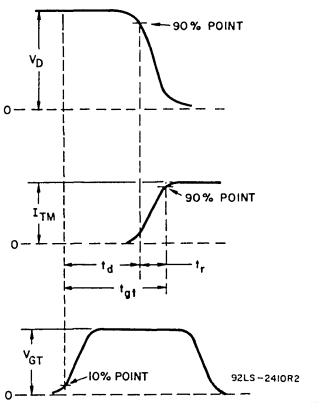


Fig. 6—Oscilloscope display for measurement of gate-controlled turn-on time (t_{gt}).

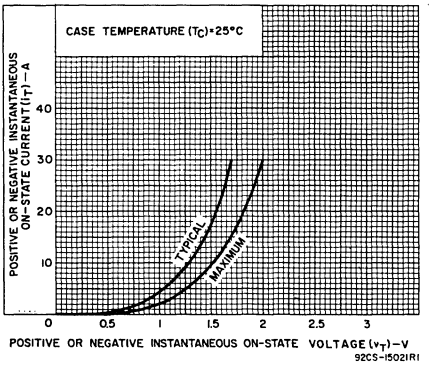


Fig. 7—On-state current vs. on-state voltage.

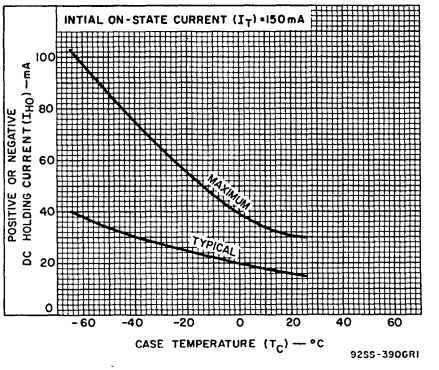


Fig. 8—DC holding current for either direction of on-state current vs. case temperature.

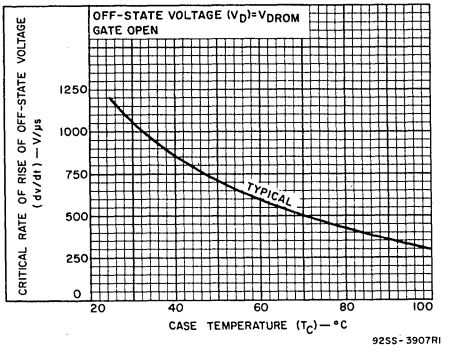


Fig. 9—Critical rate of rise of off-state voltage vs. case temperature.

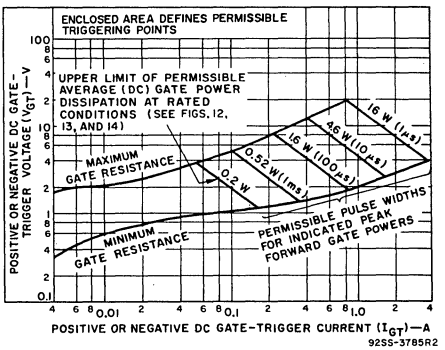
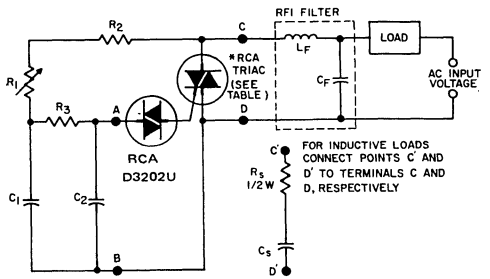


Fig. 10—Gate pulse characteristics for all triggering modes.



AC INPUT VOLTAGE	C_1	C_2	R_1	R_2	R_3	RFI FILTER L_F* (typ.)	RFI FILTER C_F* (typ.)	RCA TYPES
120 V 60 Hz	0.1 μF 200 V	0.1 μF 100 V	100 KΩ ½ W	2.2 KΩ ½ W	15 KΩ ½ W	100 μH	0.1 μF 200V	T2500B
240 V 50 Hz	0.1 μF 400 V	0.1 μF 100 V	250 KΩ 1 W	3.3 KΩ ½ W	15 KΩ ½ W	200 μH	0.1 μF 400 V	T2500D
240 V 60 Hz	0.1 μF 400 V	0.1 μF 100 V	200 KΩ 1 W	3.3 KΩ ½ W	15 KΩ ½ W	200 μH	0.1 μF 400 V	T2500D

*Typical values for lamp-dimming circuits.

	120V	240 V
C_S	0.047 μF/200 V	0.047 μF/400 V
R_S	1.8 KΩ	1.8 KΩ

92CS-20963R1

Fig. 11 — Typical phase-control circuit for lamp dimming, heat controls, and universal motor speed controls.

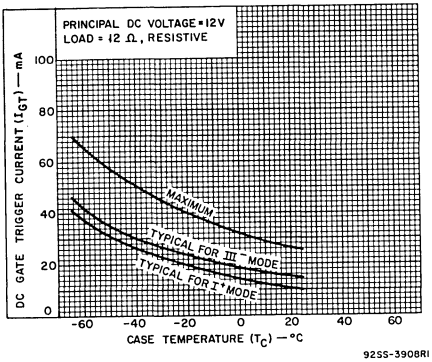


Fig. 12—DC gate-trigger current (for I^+ and III^- triggering modes) vs. case temperature.

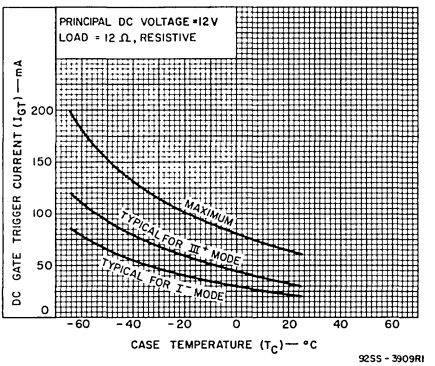


Fig. 13—DC gate-trigger current (for I^- and III^+ triggering modes) vs. temperature.

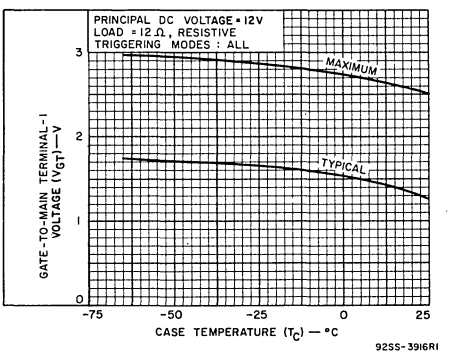


Fig. 14—DC gate-trigger voltage vs. case temperature.

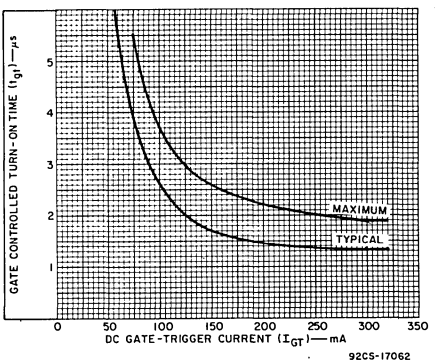


Fig. 15—Typical turn-on time vs. gate-trigger current.

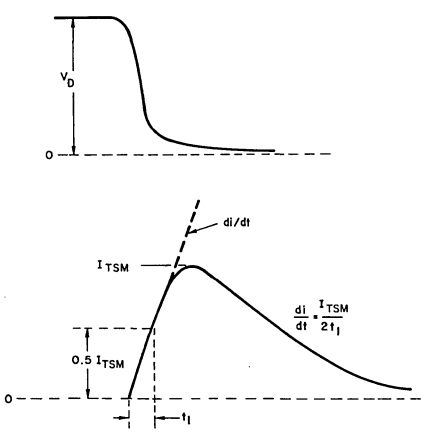


Fig. 16—Rate-of-change of on-state current with time (defining di/dt).

TERMINAL CONNECTIONS

Lead No. 1—Main Terminal 1
Lead No. 2—Main Terminal 2
Lead No. 3—Gate
Mounting Flange—Main Terminal 2