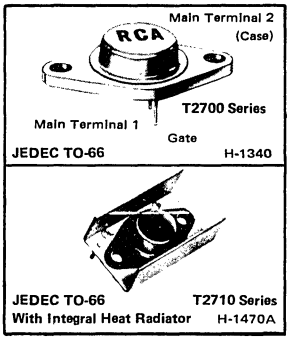
RCA
Solid State
Division

Thyristors
T2700 T2710 Series



6-Ampere Silicon Triacs

For Power-Control and Power-Switching Applications

Features:

- **Shorted-emitter construction . . . contains an internally diffused resistor between gate and Main Terminal 1**
- **Center gate construction . . . provides rapid uniform gate-current spreading for faster turn-on with substantially reduced heating effects**

Package \ Voltage	200 V Types	400 V Types
TO-66	T2700B (40429)	T2700D (40430)
TO-66 with Heat Radiator	T2710B (40502)	T2710D (40503)

Numbers in parentheses are former RCA type numbers.

RCA T2700- and T2710-series devices are gate-controlled full-wave silicon triacs. They are intended for the control of ac loads in applications such as heating controls, motor controls, light dimmers, and power switching systems.

These triacs are designed to switch from an off-state to an on-state condition for either polarity of applied voltage with positive or negative triggering voltages to the gate.

T2700B and T2700D are hermetically sealed types having an on-state current rating of 6 amperes at a case temperature of +75°C and repetitive off-state voltage ratings of 200 volts and 400 volts, respectively.

These devices are also available with integral heat radiators, as T2710B and T2710D, respectively.

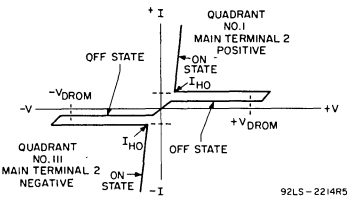


Fig. 1 — Principal voltage-current characteristic.

Maximum Ratings, *Absolute-Maximum Values:*

For Operation with Sinusoidal Supply Voltage at Frequencies of 50/60 Hz, and with Resistive or Inductive Load

	T2700B	T2700D	
	T2710B	T2710D	
REPETITIVE PEAK OFF-STATE VOLTAGE♦, V_{DROM}:			
Gate Open, For T_J = −65 to +100 °C	200	400	V
RMS ON-STATE CURRENT, $I_{t(rms)}$:			
For case temperature (T_C) of +75 °C and a conduction angle of 360°	6 (40429)	6 (40430)	A
For ambient temperatures (T_A) up to +100 °C and a conduction angle of 360°	See Fig. 16.		
PEAK SURGE (NON-REPETITIVE) ON-STATE CURRENT, I_{TSM}:			
For one cycle of applied principal voltage, T_C = 75°C			
60 Hz (sinusoidal)	100	100	A
50 Hz (sinusoidal)	85	85	A
For more than one full cycle of applied voltage	See Fig. 4.		
RATE OF CHANGE OF ON-STATE CURRENT: V_{DM} = V_{DROM}, I_{GT} = 200 mA, tr = 0.1 μs di/dt	100		A/μs
FUSING CURRENT (for triac protection, I^2t: T_J = −65 to 100°C, t = 1.25 to 10 ms	50	50	A^2s
PEAK GATE-TRIGGER CURRENT■, I_{GTM}: For 1 μs max.	4	4	A
GATE POWER DISSIPATION:■ PEAK, P_{GM} For 1 μs max. and $I_{GTM} \leq 4$ A (peak)	16	16	W
AVERAGE, $P_{G(AV)}$	0.2	0.2	W
TEMPERATURE RANGE♣: Storage	−65 to +150		°C
Operating (case)	−65 to +100		°C

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

■For either polarity of gate voltage (V_{GT}) with reference to main terminal 1.

♣For information on the reference point of temperature measurement, see *Dimensional Outline*.

ELECTRICAL CHARACTERISTICS

At Maximum Ratings and at Indicated Case Temperature (T_C) Unless Otherwise Specified
(For Definitions of Terms and Symbols, See Page 6)

CHARACTERISTIC	SYMBOL	LIMITS												UNITS
		T2700B			T2710B			T2700D			T2710D			
		Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	
Peak Off-State Current:* Gate Open At T_J = +100 °C and V_{DROM} = Max. rated value	I_{DROM}	–	0.1	4	–	0.1	1.2	–	0.2	4	–	0.2	1.2	mA
Maximum On-State Voltage:* For i_T = 30A (peak) and T_C = +25 °C	v_{TM}	–	1.8	2.25	–	1.8	2.25	–	1.8	2.25	–	1.8	2.25	V
DC Holding Current:* Gate Open Initial principal current = 150 mA (DC) At T_C = +25 °C	I_{HO}	–	15	30	–	15	30	–	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 = +75 °C	dv/dt	3	10	–	–	–	–	3	10	–	–	–	–	V/μs
$I_{t(rms)}$ and T_A specified by curve A of Fig. 16		–	–	–	3	10	–	–	–	–	3	10	–	
$I_{t(rms)}$ and T_A specified by curve B of Fig. 16		–	–	–	4	12	–	–	–	–	4	12	–	
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	30	150	–	30	150	–	20	100	–	20	100	–	V/μs
DC Gate-Trigger Current:*† For V_D = 12 volts (DC), R_L = 12 Ω T_C = +25 °C, and specified triggering mode:														
I+ Mode: positive V_{MT2}, positive V_{GT}	I_{GT}	–	15	25	–	15	25	–	15	25	–	15	25	mA
III– Mode: negative V_{MT2}, negative V_{GT}		–	15	25	–	15	25	–	15	25	–	15	25	
I– Mode: positive V_{MT2}, negative V_{GT}		–	25	40	–	25	40	–	25	40	–	25	40	
III+ Mode: negative V_{MT2}, positive V_{GT}		–	25	40	–	25	40	–	25	40	–	25	40	
For other case temperatures		← See Fig. 12 & 13. →												
DC Gate-Trigger Voltage:*† For V_D = 12 volts (DC) and R_L = 12 Ω At T_C = +25 °C	V_{GT}	–	1	2.2	–	1	2.2	–	1	2.2	–	1	2.2	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	–	–	0.2	–	–	0.2	–	–	
Gate-Controlled Turn-On Time: (Delay Time + Rise Time) For $V_D = V_{DROM}$ and I_{GT} = 80 mA, 0.1 μs rise time, and i_T = 10 A (peak) At T_C = +25 °C	t_{gt}	–	2.2	–	–	2.2	–	–	2.2	–	–	2.2	–	μs
Thermal Resistance: Junction-to-Case (Steady-State)	$\theta_{J\text{-}C}$	–	–	4	–	–	–	–	–	4	–	–	–	°C/W
Junction-to-Case (Transient)		← See Fig. 15. →												
Junction-to-Ambient	$\theta_{J\text{-}A}$	–	–	–	See Fig. 16.			–	–	–	See Fig. 16.			

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

†For either polarity of gate voltage (V_{GT}) 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.

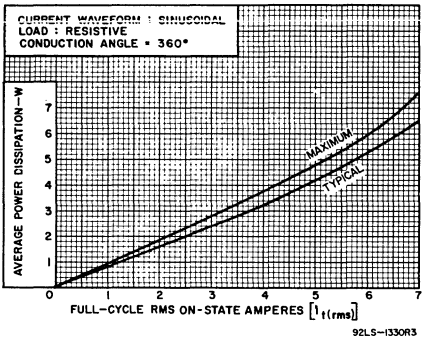


Fig. 2 — Power dissipation vs. on-state current.

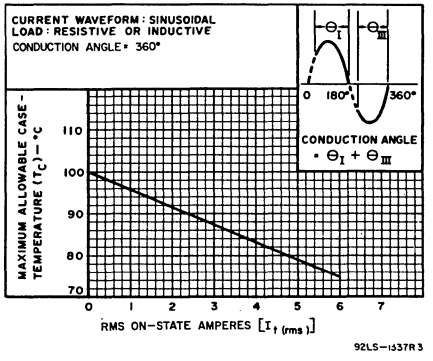


Fig. 3 — Allowable case temperature vs. on-state current.

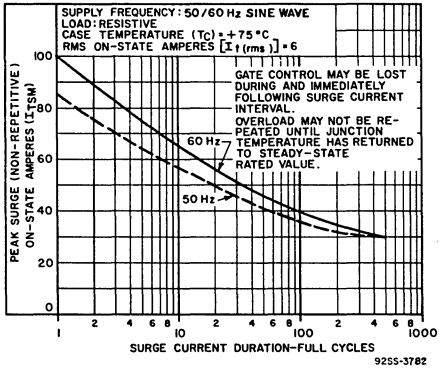


Fig. 4 — Peak surge on-state current vs. surge current duration.

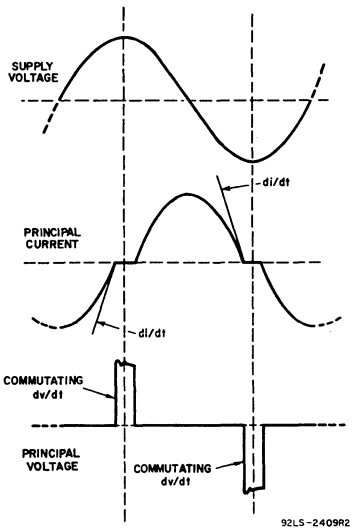


Fig. 5 — Oscilloscope display of commutating dv/dt.

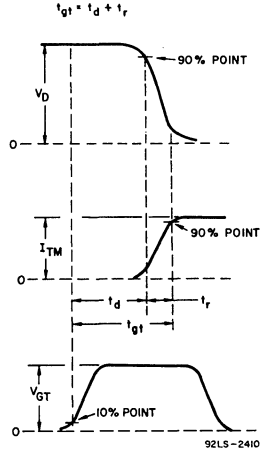


Fig. 6 — Oscilloscope display for measurement of gate-controlled turn-on time (t_{gt}).

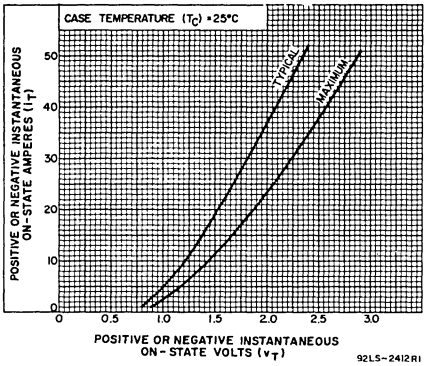


Fig. 7 — On-state current vs. on-state voltage.

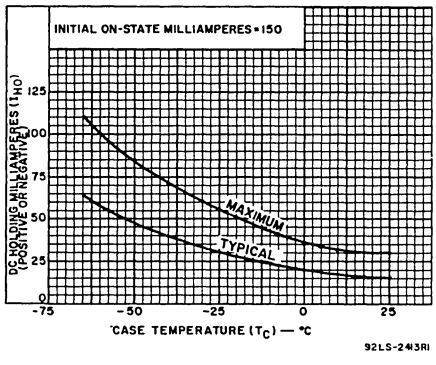


Fig. 8 — DC holding current for either direction of on-state current vs. case temperature.

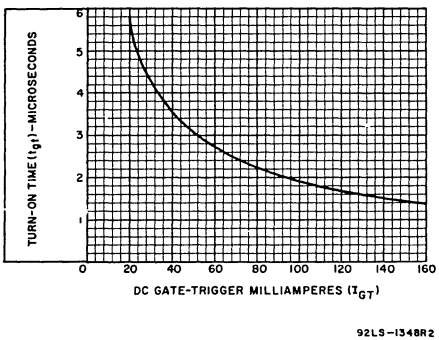


Fig. 9 — Typical turn-on time vs. gate-trigger current.

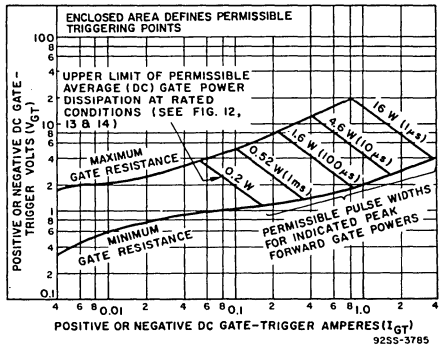


Fig. 10 — Gate pulse characteristics for all triggering modes.

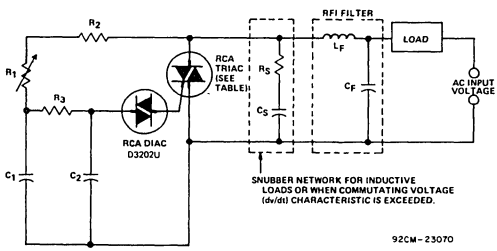


Fig. 11 — Typical phase-control circuit for lamp dimming, heat control, and universal-motor speed control.

AC INPUT VOLTAGE		120 V 60 Hz	240 V 60 Hz	240 V 50 Hz
C_1		0.1 μF 200 V	0.05 μF 400 V	0.05 μF 400 V
C_2		0.1 μF 100 V	0.1 μF 100 V	0.1 μF 100 V
R_1		100 KΩ 1/2 W	200 KΩ 1 W	200 KΩ 1 W
R_2		1 KΩ 1/2 W	7.5 KΩ 2 W	7.5 KΩ 2 W
R_3		15 KΩ 1/2 W	7.5 KΩ 2 W	7.5 KΩ 2 W
SNUBBER NETWORK	C_S	0.1 μF 200 V	0.1 μF 400 V	0.1 μF 400 V
	R_S	47 Ω 1/2 W	47 Ω 1/2 W	47 Ω 1/2 W
RFI FILTER	C_F*	0.1 μF 200 V	0.1 μF 400 V	0.1 μF 400 V
	L_F*	100 μH	100 μH	100 μH
RCA TRIACS		T2700B T2710B	T2700D T2710D	T2700D T2710D

*Typical values for lamp dimming circuits.

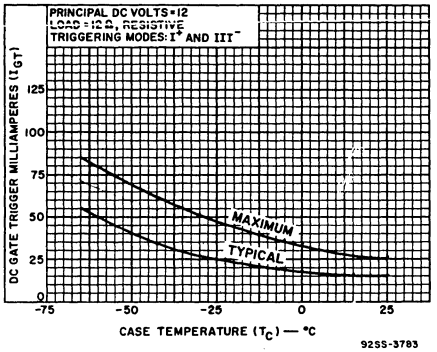


Fig. 12 — DC gate-trigger current (for I^+ and III^- triggering modes) vs. case temperature.

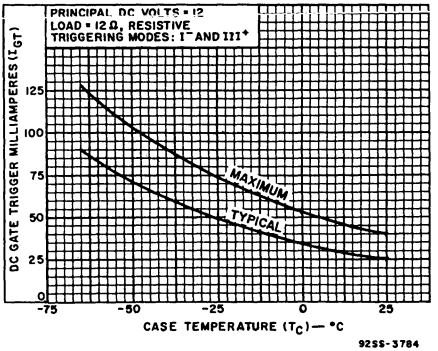


Fig. 13 — DC gate-trigger current (for I^- and III^+ triggering modes) vs. case temperature.

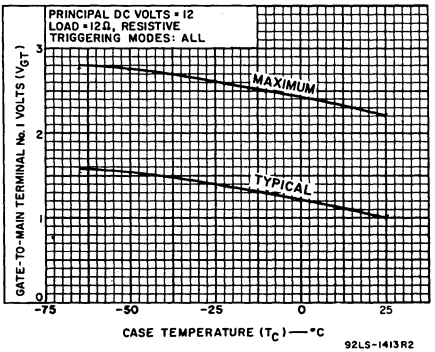


Fig. 14 — DC gate-trigger voltage vs. case temperature.

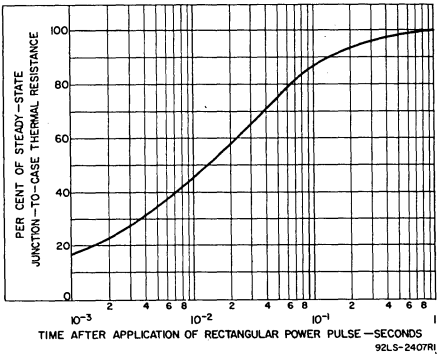


Fig. 15 — Transient thermal resistance (junction-to-case vs. time).

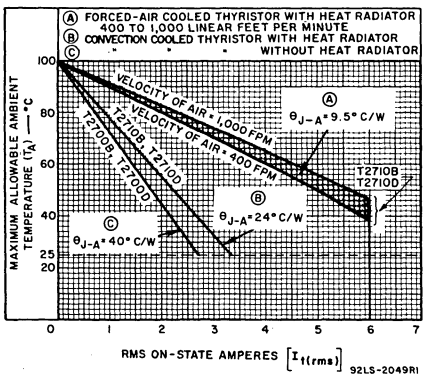


Fig. 16 — Maximum allowable ambient temperature vs. on-state current.

TERMINAL CONNECTIONS

Pin No. 1 -- Gate
Pin No. 2 — Main Terminal 1
Case/Heat Radiator — Main Terminal 2