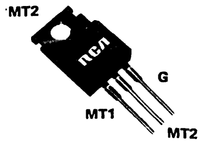
RCA
Solid State
Division

Thyristors
T2801 Series



JEDEC TO-220AB H-1535

6-A Silicon Triacs

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

Features:

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

Package \ Voltage	200 V Type	300 V Type	400 V Type	500 V Type
TO-220AB	T2801B	T2801C	T2801D	T2801E

The RCA-T2801 series triacs are gate-controlled full-wave silicon switches 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, light dimmers, heating controls, 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, 300, 400, and 500 volts.

These devices are characterized for I^+, III^- gate-triggering modes only and should suit a wide range of applications that employ diac or anode on/off triggering.

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

MAXIMUM RATINGS, *Absolute-Maximum Values:*

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

		T2801B	T2801C	T2801D	T2801E	
REPETITIVE PEAK OFF-STATE VOLTAGE:•						
Gate open, T_J = −65 to 100°C	V_{DROM}	200	300	400	500	V
RMS ON-STATE CURRENT (Conduction angle = 360°):	$I_{T(RMS)}$					
Case temperature						
T_C = 80°C▲		6				A
For other conditions		See Fig. 3				
PEAK SURGE (NON-REPETITIVE) ON-STATE CURRENT:	I_{TSM}					
For one cycle of applied principal voltage						
60 Hz (sinusoidal), T_C = 80°C		80				A
50 Hz (sinusoidal), T_C = 80°C		65				A
For more than one 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 = 0.1 μs (See Fig. 11)	di/dt	70				A/μs
FUSING CURRENT (for triac protection):						
T_J = −65 to 100°C, t = 1.25 to 10 ms	I^2t	35				A^2s
PEAK GATE-TRIGGER CURRENT:■						
For 1 μs max., See Fig. 5	I_{GTM}	4				A

• 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*.

MAXIMUM RATINGS (Cont'd)

GATE POWER DISSIPATION:			
Peak (For 1 μs max., $I_{GTM} \leq 4$ A, See Fig. 5	P_{GM}	16	W
AVERAGE	$P_{G(AV)}$	0.35	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

ELECTRICAL CHARACTERISTICS, *At Maximum Ratings Unless Otherwise Specified, and at Indicated Temperature*

CHARACTERISTIC	SYMBOL	LIMITS For All Types Except as Specified			UNITS
		MIN.	TYP.	MAX.	
Peak Off-State Current:● Gate open, $T_J = 100°C$, V_{DROM} = Max. rated value	I_{DROM}	–	0.1	2	mA
Maximum On-State Voltage:● For $i_T = 30$ A (peak), $T_C = 25°C$ (See Fig. 6)	v_{TM}	–	2	3	V
DC Holding Current:● Gate open, Initial principal current = 150 mA (dc) $v_D = 12$ V, $T_C = 25°C$	I_{HO}	–	100	–	mA
For other case temperatures		See Fig. 7			
Critical Rate-of-Rise of Commutation Voltage:●▲ For $v_D = V_{DROM}$, $I_{T(RMS)} = 6$ A, commutating di/dt = 4.3 A/ms, gate unenergized, $T_C = 80°C$ (See Fig. 12)	dv/dt	2	10	–	V/μs
Critical Rate-of-Rise of Off-State Voltage:● For $v_D = V_{DROM}$, exponential voltage rise, gate open, $T_C = 100°C$:					
T2801B	dv/dt	50	300	–	V/μs
T2801C		40	275	–	
T2801D		30	250	–	
T2801E		20	225	–	
DC Gate-Trigger Current:●■ (Mode, V_{MT2}, V_G) For $v_D = 12$ V (dc), $R_L = 12\ \Omega$, $T_C = 25°C$: I^+ positive positive	I_{GT}	–	25	80	mA
III^- negative negative		–	25	80	
For other case temperatures		See Fig. 9			
DC Gate-Trigger Voltage:●■ For $v_D = 12$ V (dc), $R_L = 12\ \Omega$, $T_C = 25°C$	V_{GT}	–	1.5	4	V
For other case temperatures		See Fig. 10			
For $v_D = V_{DROM}$, $R_L = 125\ \Omega$, $T_C = 100°C$		0.2	–	–	
Gate-Controlled Turn-On Time: (Delay Time + Rise Time) For $v_D = V_{DROM}$, $I_{GT} = 80$ mA, $t_r = 0.1$ μs, $i_T = 10$ A (peak), $T_C = 25°C$ (See Fig. 13)	t_{gt}	–	2.2	–	μs
Thermal Resistance: Junction-to-Case	$R_{\theta JC}$	–	–	2.2	°C/W
Junction-to-Ambient	$R_{\theta JA}$	–	–	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.

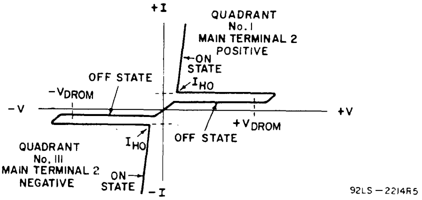


Fig. 1 — Principal voltage-current characteristic.

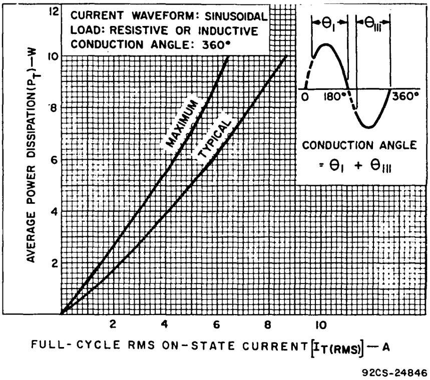


Fig. 2 — Power dissipation vs. on-state current.

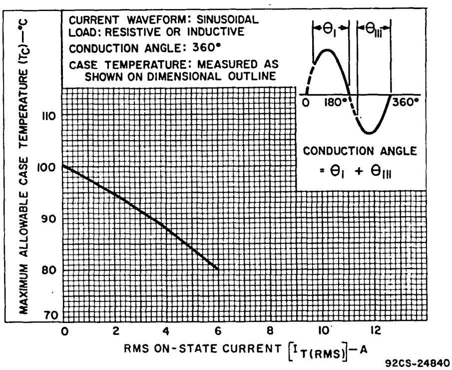


Fig. 3 — Allowable case temperature vs. on-state current.

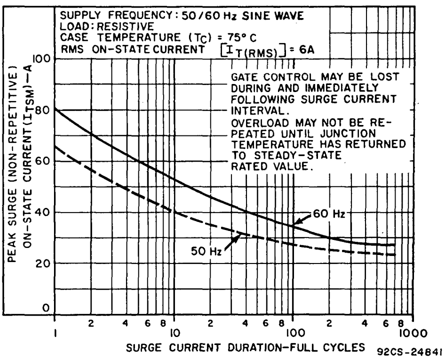


Fig. 4 — Peak surge on-state current vs. surge current duration.

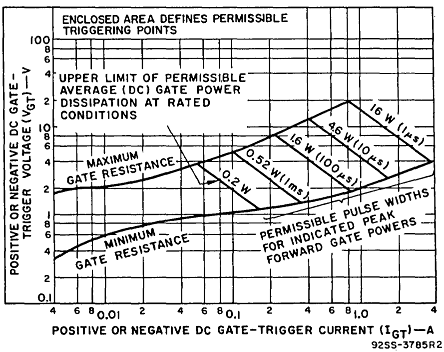


Fig. 5 — Gate pulse characteristics for all triggering modes.

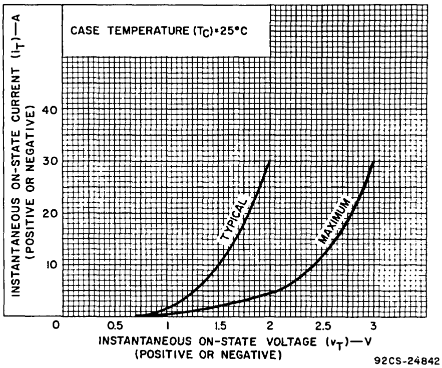


Fig. 6 — On-state current vs. on-state voltage.

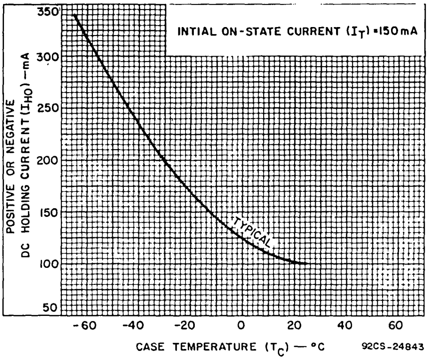


Fig. 7 — DC holding current vs. case temperature.

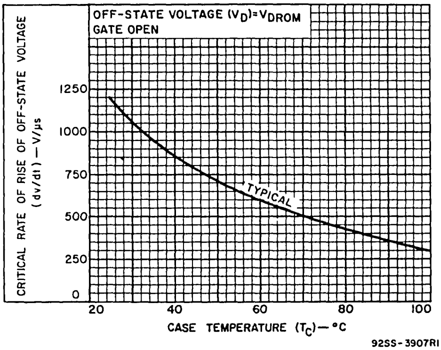


Fig. 8 — Typical critical rate-of-rise of off-state voltage vs. case temperature.

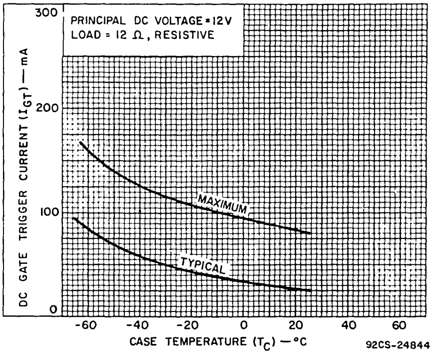


Fig. 9 — DC gate-trigger current (for I^+ and III^- triggering modes) vs. case temperature.

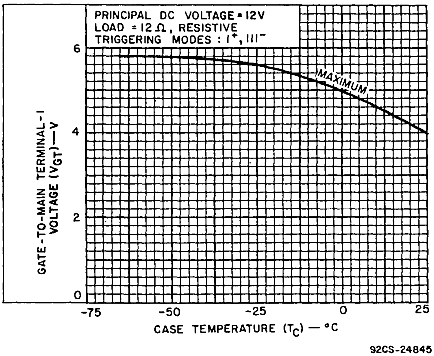


Fig. 10 — DC gate-trigger voltage vs. case temperature.

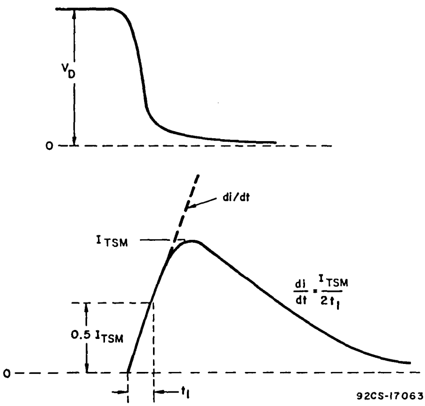


Fig. 11 — Rate-of-change of on-state current with time (defining di/dt).

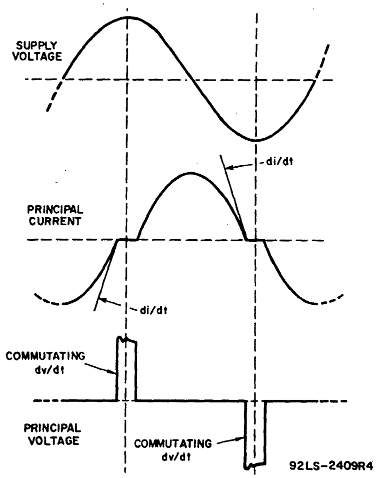


Fig. 12 – Relationship between supply voltage and principal current (inductive load) showing reference points for definition of commutating voltage (dv/dt).

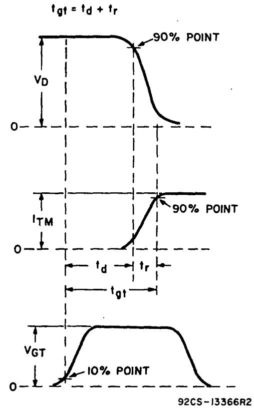


Fig. 13 – Relationship between off-state voltage, on-state current, and gate-trigger voltage showing reference points for definition of turn-on time (t_{gt}).

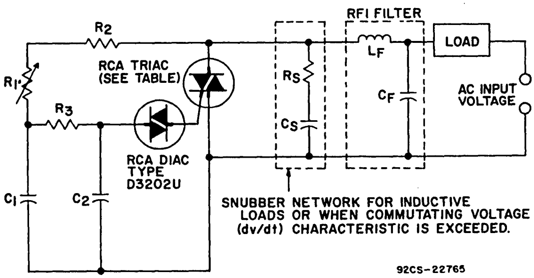


Fig. 14 – Typical phase-control circuit for lamp dimming, heat control, and universal-motor speed control.

AC INPUT VOLTAGE		120 V 60 Hz	240 V 60 Hz	240 V 50 Hz
C_1		0.1 μF 200 V	0.1 μF 400 V	0.1 μF 400 V
C_2		0.1 μF 100 V	0.1 μF 100 V	0.1 μF 100 V
R_1		100 kΩ ½ W	200 kΩ ½ W	250 kΩ ½ W
R_2		2.2 kΩ ½ W	3.3 kΩ ½ W	3.3 kΩ ½ W
R_3		15 kΩ ½ W	15 kΩ ½ W	15 kΩ ½ W
SNUBBER NETWORK FOR 6 A (RMS)• INDUCTIVE LOAD	C_S	0.068 μF 200 V	0.1 μF 400 V	0.1 μF 400 V
	R_S	1.2 kΩ ½ W	1 kΩ ½ W	1 kΩ ½ W
RFI FILTER	C_F•	0.1 μF 200 V	0.1 μF 400 V	0.1 μF 400 V
	L_F•	100 μH	200 μH	200 μH
RCA TRIACS		T2801B T2801C	T2801D T2801E	T2801D T2801E

• For other RMS Current values refer to RCA Application Note AN-4745.

• Typical values for Lamp dimming circuits.

TERMINAL CONNECTIONS

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