

Triacs

**BTA20 Series**

File Number **1298**

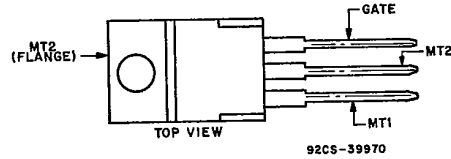
**6-A Silicon Triacs**

For Power-Control and Power-Switching Applications

**Features:**

- 800V, 125 Deg. C  $T_J$  Operating
- High  $dv/dt$  and  $di/dt$  Capability
- Low Switching Losses
- High Pulse Current Capability
- Low Forward and Reverse Leakage
- Sipos Oxide Glass Multilayer Passivation System
- Advanced Unisurface Construction
- Precise Ion Implanted Diffusion Source

**TERMINAL DESIGNATIONS**



**JEDEC TO-220AB**

The RCA BTA20-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 10 amperes at a  $T_C$  of 75°C and repetitive off-state voltage ratings of 200, 300, 400, 500, 600, and 800 volts.

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

All these types are supplied in the JEDEC TO-220AB VER-SAWATT plastic package.

**MAXIMUM RATINGS, Absolute-Maximum Values:**

	BTA20C	BTA20D	BTA20E	BTA20M	BTA20N	
$V_{DROM}^*$ , Gate open, $T_J = -65$ to $125^\circ C$ .....	300	400	500	600	800	V
$I_{T(RMS)}$ , $T_C = 75^\circ C$ , $\theta = 360^\circ$ .....			6			A
$I_{TSM}$ (for 1 full cycle) 60 Hz (sinusoidal) .....			80			A
50 Hz (sinusoidal) .....			75			A
$di/dt$						
$V_D = V_{DROM}$ , $I_G = 200$ mA, $t_r = 0.1 \mu s$ (See Fig. 11) .....			70			A/ $\mu s$
$i^2t$ (See Fig. 10)						
$t = 20$ ms .....			40			A $^2s$
$t = 2.5$ ms .....			20			A $^2s$
$t = 0.5$ ms .....			11			A $^2s$
$I_{GTM}^{\ddagger}$						
For 1 $\mu s$ max. ....			4			A
$P_{GM}$ (For 1 $\mu s$ max., $I_{GTM} \leq 4$ A) .....			16			W
$P_{G(AV)}$ .....			0.35			W
$T_{stg}^{\dagger}$ .....			-65 to 150			$^\circ C$
$T_C^{\dagger}$ .....			-65 to 125			$^\circ C$
$T_r$ (During Soldering):						
For 10 s max. (terminals and case) .....			225			$^\circ C$

\*For either polarity of main terminal 2 voltage ( $V_{MT2}$ ) with reference to main terminal 1.  
 †For either polarity to gate voltage ( $V_G$ ) with reference to main terminal 1.  
 ‡For temperature measurement reference point, see Dimensional Outline.

**BTA20 Series**

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

CHARACTERISTIC	LIMITS			UNITS
	For All Types Unless Otherwise Specified			
	Min.	Typ.	Max.	
$I_{DROM}^*$ Gate open, $T_J = 125^\circ\text{C}$ , $V_{DROM} = \text{Max. rated value}$ .....	—	0.1	2	mA
$V_{TM}^*$ $I_T = 30\text{ A (peak)}$ , $T_C = 25^\circ\text{C}$ (See Fig. 6) .....	—	2	3	V
$I_{HC}^*$ Gate open, Initial principal current = 150 mA (dc) $V_D = 12\text{ V}$ , $T_C = 25^\circ\text{C}$ .....	—	100	—	mA
For other case temperatures .....				See Fig. 7
$dv/dt$ (Commutating)* $V_D = V_{DROM}$ , $I_{T(RMS)} = 6\text{ A}$ , commutating $di/dt = 3.2\text{ A/ms}$ , gate unenergized, $T_C = 80^\circ\text{C}$ (See Fig. 11) .....	2	10	—	V/ $\mu\text{s}$
$dv/dt^*$ $V_D = V_{DROM}$ , exponential voltage rise, gate open, $T_C = 100^\circ\text{C}$ :				
BTA20C .....	40	275	—	V/ $\mu\text{s}$
BTA20D .....	30	250	—	
BTA20E .....	20	225	—	
BTA20M .....	15	150	—	
BTA20N .....	10	50	—	
$I_{GT}^{*\blacksquare}$ $V_D = 12\text{ V (dc)}$ Mode $V_{MT2}$ $V_G$ $R_L = 30\ \Omega$ $I^+$ positive      positive .....	—	25	80	mA
$T_C = 25^\circ\text{C}$ $III^-$ negative      negative .....	—	25	80	
For other case temperatures .....				
$V_{GT}^{*\blacksquare}$ $V_D = 12\text{ V (dc)}$ , $R_L = 30\ \Omega$ , $T_C = 25^\circ\text{C}$ .....	—	1.5	4	V
For other case temperatures .....				
$v_D = V_{DROM}$ , $R_L = 125\ \Omega$ , $T_C = 100^\circ\text{C}$ .....	0.2	—	—	
$t_{gt}$ For $V_D = V_{DROM}$ , $I_G = 80\text{ mA}$ , $t_r = 0.1\ \mu\text{s}$ , $I_T = 10\text{ A (peak)}$ , $T_C = 25^\circ\text{C}$ (See Fig. 13) .....	—	1.6	2.5	$\mu\text{s}$
$R_{\theta JC}$ .....	—	—	2.2	$^\circ\text{C/W}$
$R_{\theta JA}$ .....	—	—	60	

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

**BTA20 Series**

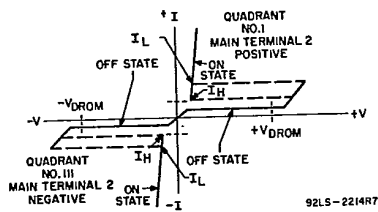


Fig. 1 — Principal voltage-current characteristic.

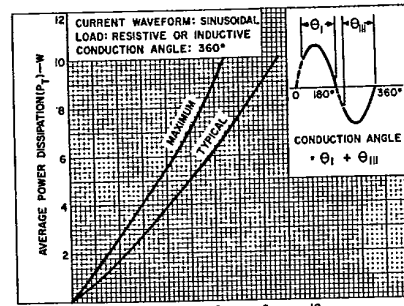


Fig. 2 — Power dissipation vs. on-state current.

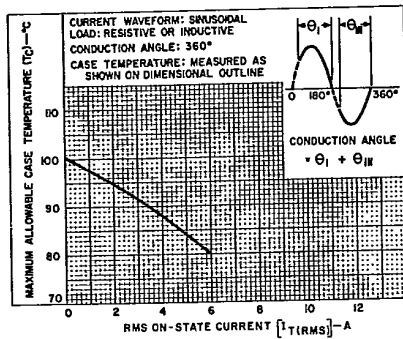


Fig. 3 — Allowable case temperature vs. on-state current.

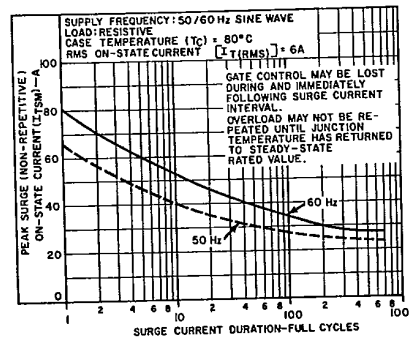


Fig. 4 — Peak surge on-state current vs. surge current duration.

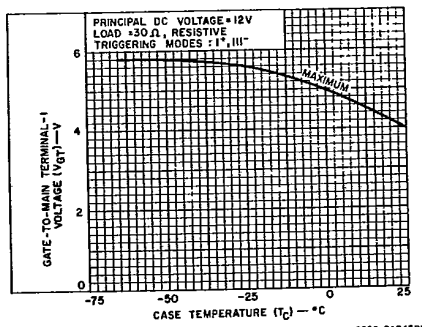


Fig. 5 — DC gate-trigger voltage vs. case temperature.

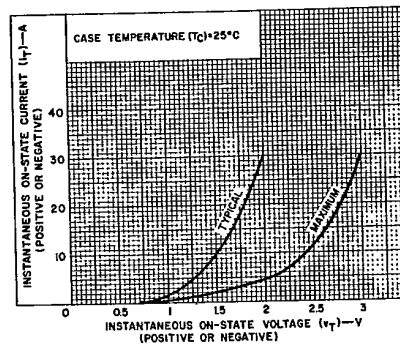
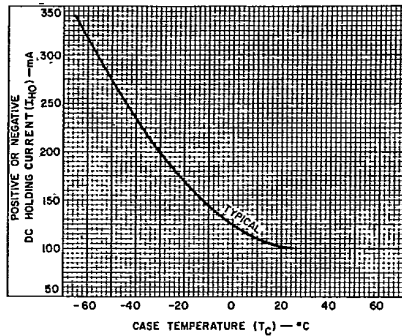


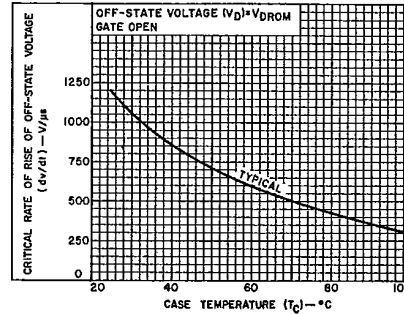
Fig. 6 — On-state current vs. on-state voltage.

**BTA20 Series**



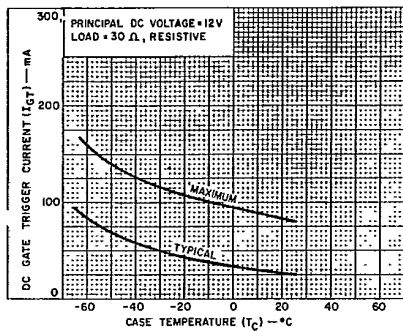
92CS-24843RI

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



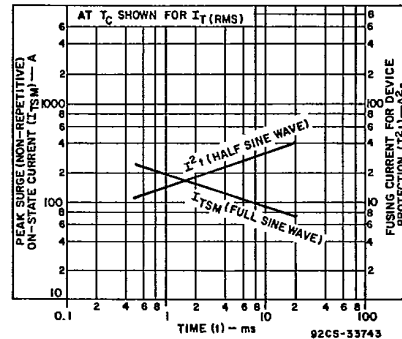
92SS-3907RI

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



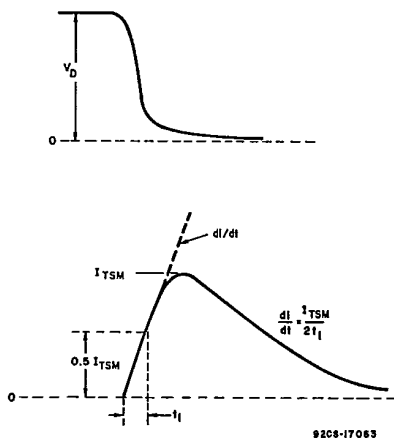
92CS-24844RI

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



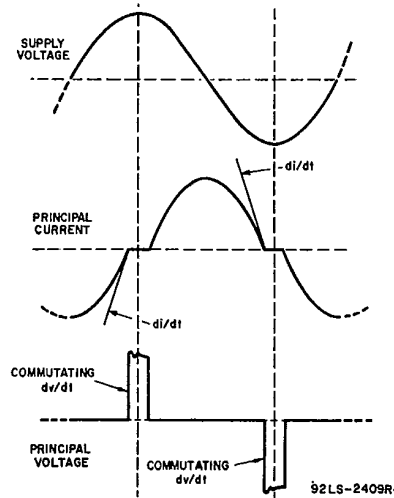
92CS-3374S

Fig. 10 — Peak surge on-state current and fusing current vs. time.



92CS-1708S

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



92LS-2409R4

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

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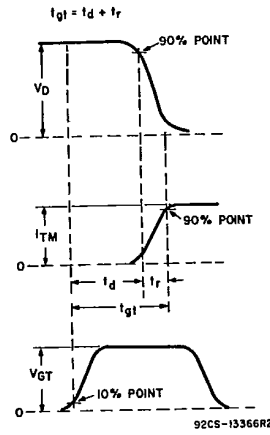
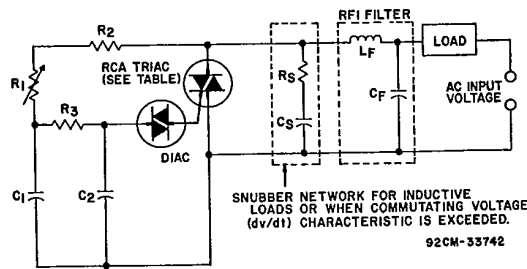


Fig. 13 — Relationship between off-state voltage, on-state current, and gate-trigger voltage showing reference points for definition of turn-on time ( $t_{qi}$ ).



AC INPUT VOLTAGE	120 V 60 Hz	240 V 60 Hz	240 V 50 Hz	
C1	0.1 $\mu$ F 200 V	0.1 $\mu$ F 400 V	0.1 $\mu$ F 400 V	
C2	0.1 $\mu$ F 100 V	0.1 $\mu$ F 100 V	0.1 $\mu$ F 100 V	
R1	100 k $\Omega$ 1/2 W	200 k $\Omega$ 1/2 W	250 k $\Omega$ 1/2 W	
R2	2.2 k $\Omega$ 1/2 W	3.3 k $\Omega$ 1/2 W	3.3 k $\Omega$ 1/2 W	
R3	15 k $\Omega$ 1/2 W	15 k $\Omega$ 1/2 W	15 k $\Omega$ 1/2 W	
SNUBBER NETWORK FOR 6 A (RMS)* INDUCTIVE LOAD	CS	0.058 $\mu$ F 200 V	0.1 $\mu$ F 400 V	0.1 $\mu$ F 400 V
	RS	1.2 k $\Omega$ 1/2 W	1 k $\Omega$ 1/2 W	1 k $\Omega$ 1/2 W
RFI FILTER	CF*	0.1 $\mu$ F 200 V	0.1 $\mu$ F 400 V	0.1 $\mu$ F 400 V
	LF*	100 $\mu$ H	200 $\mu$ H	200 $\mu$ H
RCA TRIACS	BTA20C	BTA20D BTA20E	BTA20D BTA20E	

\*For other RMS current values refer to RCA Application Note AN-4745.  
\*Typical values for lamp dimming circuits.

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