## BTA20 Series

File Number **1298**

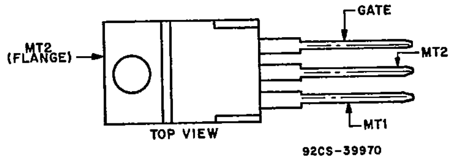
# 6-A Silicon Triacs

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 VERSAWATT plastic package.

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

| | BTA20C | BTA20D | BTA20E | BTA20M | BTA20N | |
|---|---|---|---|---|---|---|
| $V_{DROM}$•, Gate open, $T_J$ = -65 to 125°C | 300 | 400 | 500 | 600 | 800 | V |
| $I_{T(RMS)}$, $T_C$ = 75°C, $\theta$ = 360° | | | 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 µs (See Fig. 11) | | | 70 | | | A/µs |
| $I^2t$ (See Fig. 10) | | | | | | |
| t = 20 ms | | | 40 | | | $A^2s$ |
| t = 2.5 ms | | | 20 | | | $A^2s$ |
| t = 0.5 ms | | | 11 | | | $A^2s$ |
| $I_{GTM}$■ | | | | | | |
| For 1 µs max. | | | 4 | | | A |
| $P_{GM}$ (For 1 µs max., $I_{GTM} \leq 4$ A | | | 16 | | | W |
| $P_{G(AV)}$ | | | 0.35 | | | W |
| $T_{stg}$† | | | -65 to 150 | | | °C |
| $T_C$† | | | -65 to 125 | | | °C |
| $T_T$ (During Soldering): For 10 s max. (terminals and case) | | | 225 | | | °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 For All Types Unless Otherwise Specified Min. | Typ. | Max. | UNITS |
|---|---|---|---|---|
| $I_{DROM}$• Gate open, $T_J$ = 125°C, $V_{DROM}$ = Max. rated value | — | 0.1 | 2 | mA |
| $V_{TM}$• $i_T$ = 30 A (peak), $T_C$ = 25°C (See Fig. 6) | — | 2 | 3 | V |
| $I_{HO}$• Gate open, Initial principal current = 150 mA (dc) $v_D$ = 12 V, $T_C$ = 25°C | — | 100 | — | mA |
| For other case temperatures | | See Fig. 7 | | |
| dv/dt (Commutating)• $v_D$ = $V_{DROM}$, $I_{T(RMS)}$ = 6 A, commutating di/dt = 3.2 A/ms, gate unenergized, $T_C$ = 80°C (See Fig. 11) | 2 | 10 | — | V/µs |
| dv/dt• $v_D$ = $V_{DROM}$, exponential voltage rise, gate open, $T_C$ = 100°C: BTA20C | 40 | 275 | — | V/µs |
| BTA20D | 30 | 250 | — | V/µs |
| BTA20E | 20 | 225 | — | V/µs |
| BTA20M | 15 | 150 | — | V/µs |
| BTA20N | 10 | 50 | — | V/µs |
| $I_{GT}$•■ $v_D$ = 12 V (dc), $R_L$ = 30 Ω, $T_C$ = 25°C — Mode $I^+$, $V_{MT2}$ positive, $V_G$ positive | — | 25 | 80 | mA |
| Mode $III^-$, $V_{MT2}$ negative, $V_G$ negative | — | 25 | 80 | mA |
| For other case temperatures | | See Fig. 9 | | mA |
| $V_{GT}$•■ $v_D$ = 12 V (dc), $R_L$ = 30 Ω, $T_C$ = 25°C | — | 1.5 | 4 | V |
| For other case temperatures | | See Fig. 5 | | V |
| $v_D$ = $V_{DROM}$, $R_L$ = 125 Ω, $T_C$ = 100°C | 0.2 | — | — | V |
| $t_{gt}$ For $v_D$ = $V_{DROM}$, $I_G$ = 80 mA, $t_r$ = 0.1 µs, $i_T$ = 10 A (peak), $T_C$ = 25°C (See Fig. 13) | — | 1.6 | 2.5 | µs |
| $R_{\theta JC}$ | — | — | 2.2 | °C/W |
| $R_{\theta JA}$ | — | — | 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.

## BTA20 Series

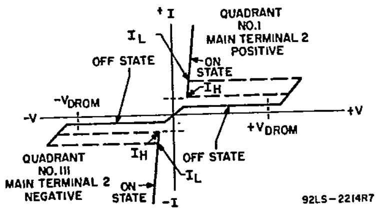



*Fig. 1 — Principal voltage-current characteristic.*

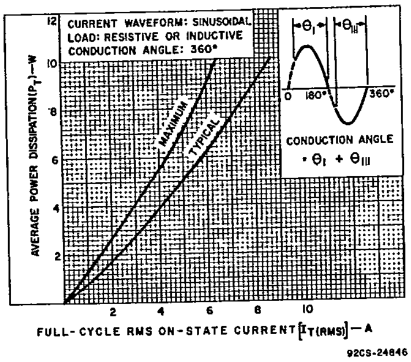



*Fig. 2 — Power dissipation vs. on-state current.*

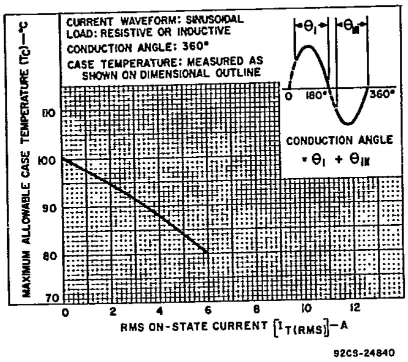



*Fig. 3 - Allowable case temperature vs. on-state current.*

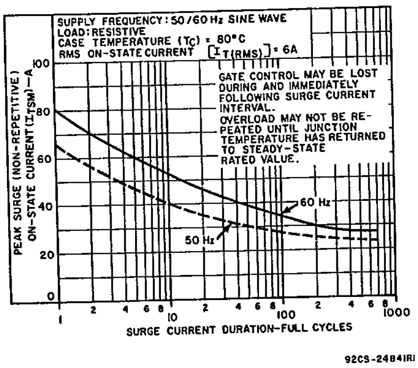



*Fig. 4 — Peak surge on-state current vs. surge current duration.*

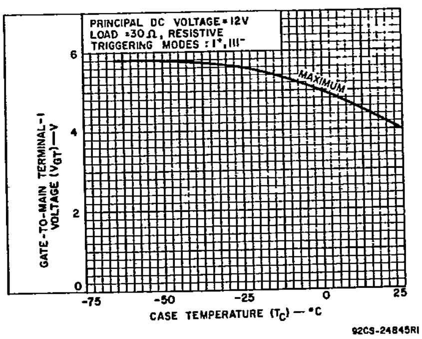



*Fig. 5 — DC gate-trigger voltage vs. case temperature.*

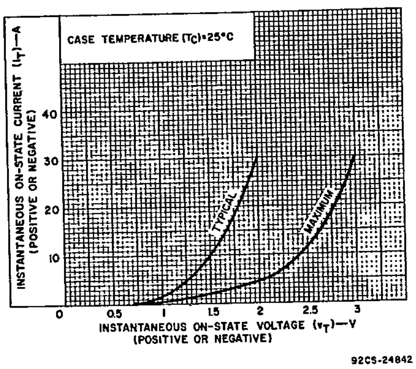



*Fig. 6 — On-state current vs. on-state voltage.*

## BTA20 Series

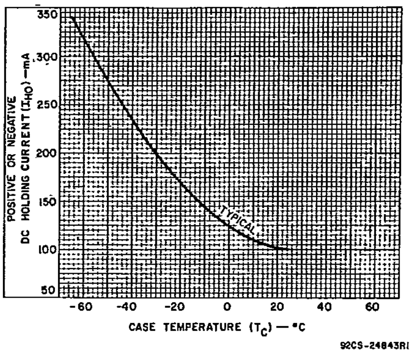



Fig. 7 — DC holding current vs. case temperature.

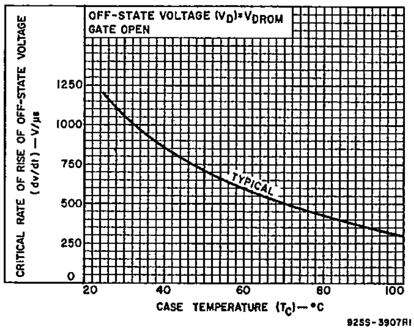



Fig. 8 — Critical rate-of-rise of off-state voltage vs. case temperature.

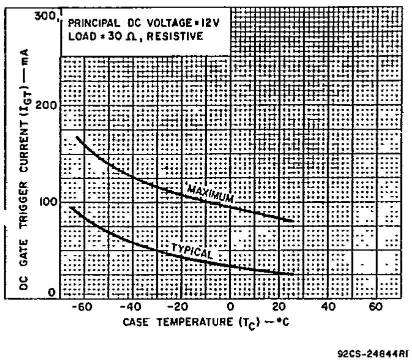



Fig. 9 — DC gate-trigger current (for $I^+$ and $III^-$ triggering modes) vs. case temperature.

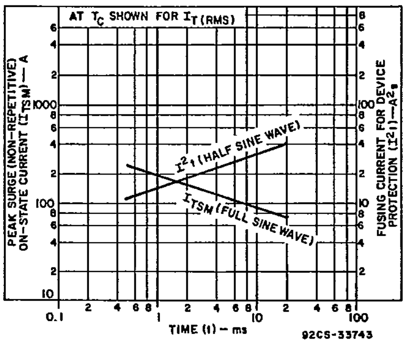
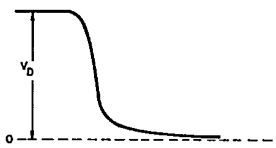



Fig. 10 — Peak surge on-state current and fusing current vs. time.



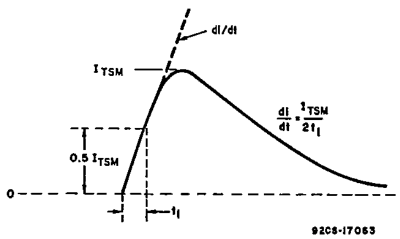




Fig. 11 — Rate of change of on-state current with time (defining di/dt).

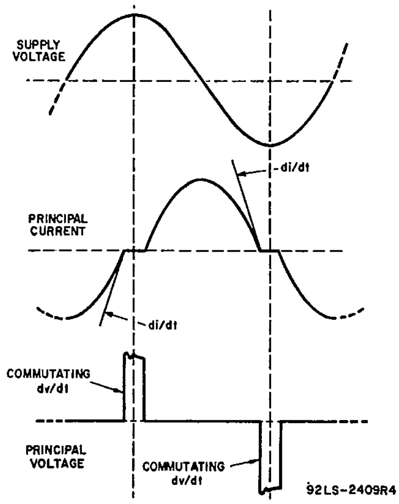



Fig. 12 — Relationship between supply voltage and principal current (inductive load) showing reference points for definition of commutating voltage (dv/dt).

## BTA20 Series

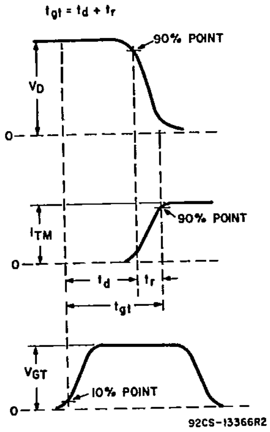
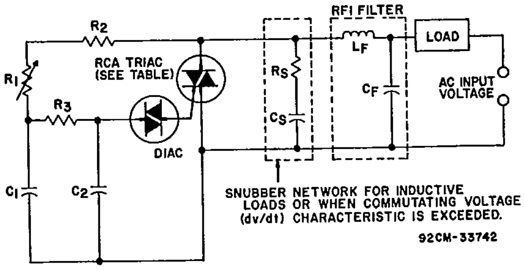



*Fig. 13 — Relationship between off-state voltage, on-state current, and gate-trigger voltage showing reference points for definition of turn-on time ($t_{gt}$).*




| 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 | | 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.*