

DATA SHEET

BTA212X series B
Three quadrant triacs
high commutation

Product specification

September 1997



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BTA212X series B

GENERAL DESCRIPTION

Glass passivated high commutation triacs in a full pack, plastic envelope intended for use in circuits where high static and dynamic dV/dt and high dI/dt can occur. These devices will commutate the full rated rms current at the maximum rated junction temperature, without the aid of a snubber.

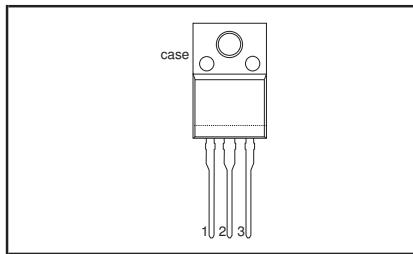
QUICK REFERENCE DATA

| SYMBOL | PARAMETER | MAX. | MAX. | MAX. | UNIT |
|--------------|---|-------------|-------------|-------------|------|
| V_{DRM} | BTA212X- Repetitive peak off-state voltages | 500B 500 | 600B 600 | 800B 800 | V |
| $I_{T(RMS)}$ | RMS on-state current | 12 | 12 | 12 | A |
| I_{TSM} | Non-repetitive peak on-state current | 95 | 95 | 95 | A |

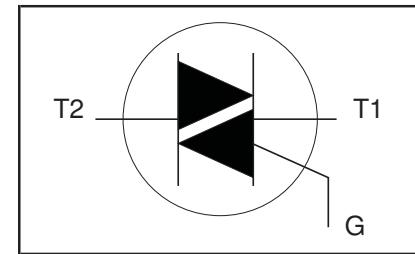
PINNING - SOT186A

| PIN | DESCRIPTION |
|------|-----------------|
| 1 | main terminal 1 |
| 2 | main terminal 2 |
| 3 | gate |
| case | isolated |

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134).

| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | | | UNIT |
|---|---|---|------------------|--------------------------|--------------------------|-------------|--|
| V_{DRM} | Repetitive peak off-state voltages | | - | -500 500 ¹ | -600 600 ¹ | -800 800 | V |
| $I_{T(RMS)}$ | RMS on-state current | full sine wave; $T_{hs} \leq 56^\circ\text{C}$ | - | 12 | | | A |
| I_{TSM} | Non-repetitive peak on-state current | full sine wave; $T_j = 25^\circ\text{C}$ prior to surge | | | | | |
| I^2t dl_T/dt | I^2t for fusing Repetitive rate of rise of on-state current after triggering | $t = 20\text{ ms}$ $t = 16.7\text{ ms}$ $t = 10\text{ ms}$ $I_{TM} = 20\text{ A}$; $I_G = 0.2\text{ A}$; $dl_G/dt = 0.2\text{ A}/\mu\text{s}$ | - - - - | 95 105 45 100 | | | A A A ² s A/ μs |
| I_{GM} V_{GM} P_{GM} $P_{G(AV)}$ | Peak gate current Peak gate voltage Peak gate power Average gate power | over any 20 ms period | - - - - | 2 5 5 0.5 | | | A V W W |
| T_{stg} T_j | Storage temperature Operating junction temperature | | -40 | 150 125 | | | °C °C |

¹ Although not recommended, off-state voltages up to 800V may be applied without damage, but the triac may switch to the on-state. The rate of rise of current should not exceed 15 A/ μs .

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ISOLATION LIMITING VALUE & CHARACTERISTIC

 $T_{hs} = 25^\circ\text{C}$ unless otherwise specified

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|------------|--|---|------|------|------|------|
| V_{isol} | R.M.S. isolation voltage from all three terminals to external heatsink | $f = 50-60\text{ Hz}$; sinusoidal waveform; $R.H. \leq 65\%$; clean and dustfree | - | | 2500 | V |
| C_{isol} | Capacitance from T2 to external heatsink | $f = 1\text{ MHz}$ | - | 10 | - | pF |

THERMAL RESISTANCES

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|----------------|---|---|------|------|------|------|
| $R_{th\ j-hs}$ | Thermal resistance junction to heatsink | full or half cycle with heatsink compound | - | - | 4.0 | K/W |
| $R_{th\ j-a}$ | Thermal resistance junction to ambient | without heatsink compound in free air | - | 55 | 5.5 | K/W |

STATIC CHARACTERISTICS

 $T_j = 25^\circ\text{C}$ unless otherwise stated

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|----------|-----------------------------------|---|------|------|------|------|
| I_{GT} | Gate trigger current ² | $V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$ | | | | |
| | | $T2+ G+$ | 2 | 18 | 50 | mA |
| | | $T2+ G-$ | 2 | 21 | 50 | mA |
| | | $T2- G-$ | 2 | 34 | 50 | mA |
| I_L | Latching current | $V_D = 12\text{ V}$; $I_{GT} = 0.1\text{ A}$ | | | | |
| | | $T2+ G+$ | - | 31 | 60 | mA |
| | | $T2+ G-$ | - | 34 | 90 | mA |
| | | $T2- G-$ | - | 30 | 60 | mA |
| I_H | Holding current | $V_D = 12\text{ V}$; $I_{GT} = 0.1\text{ A}$ | | | | |
| V_T | On-state voltage | $I_T = 17\text{ A}$ | | | | |
| V_{GT} | Gate trigger voltage | $V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$ | | | | |
| I_D | Off-state leakage current | $V_D = 400\text{ V}$; $I_T = 0.1\text{ A}$; $T_j = 125^\circ\text{C}$ | 0.25 | 0.4 | - | V |
| | | $V_D = V_{DRM(max)}$; $T_j = 125^\circ\text{C}$ | - | 0.1 | 0.5 | V |
| | | | | | | mA |

DYNAMIC CHARACTERISTICS

 $T_j = 25^\circ\text{C}$ unless otherwise stated

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---------------|--|---|------|------|------|------------|
| dV_D/dt | Critical rate of rise of off-state voltage | $V_{DM} = 67\% V_{DRM(max)}$; $T_j = 125^\circ\text{C}$; exponential waveform; gate open circuit | 1000 | 4000 | - | V/ μ s |
| dl_{com}/dt | Critical rate of change of commutating current | $V_{DM} = 400\text{ V}$; $T_j = 125^\circ\text{C}$; $I_{T(RMS)} = 12\text{ A}$; without snubber; gate open circuit | - | 24 | - | A/ms |
| t_{gt} | Gate controlled turn-on time | $I_{TM} = 12\text{ A}$; $V_D = V_{DRM(max)}$; $I_G = 0.1\text{ A}$; $dl_G/dt = 5\text{ A}/\mu\text{s}$ | - | 2 | - | μ s |

² Device does not trigger in the T2-, G+ quadrant.

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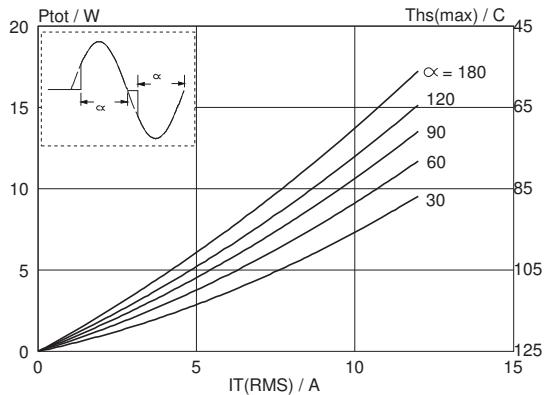


Fig.1. Maximum on-state dissipation, P_{tot} , versus rms on-state current, $I_{T(RMS)}$, where α = conduction angle.

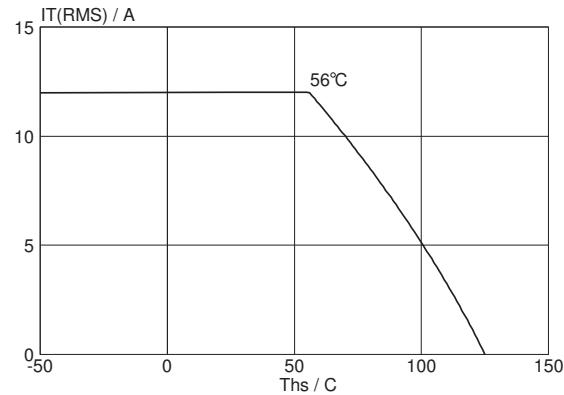


Fig.4. Maximum permissible rms current $I_{T(RMS)}$, versus heatsink temperature Ths .

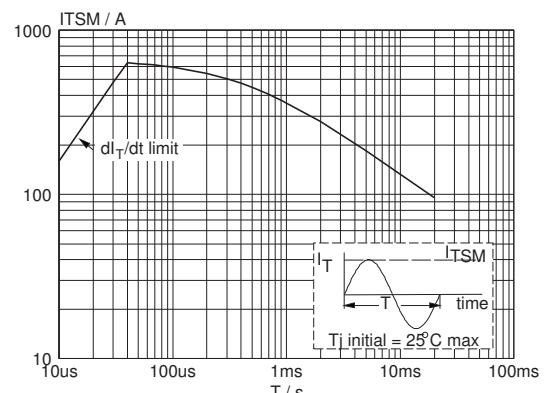


Fig.2. Maximum permissible non-repetitive peak on-state current I_{TSM} , versus pulse width t_p , for sinusoidal currents, $t_p \leq 20\text{ms}$.

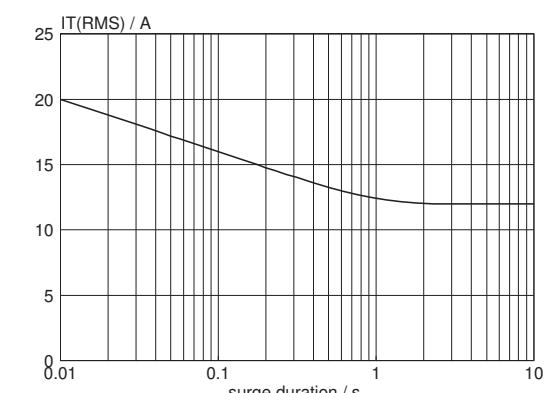


Fig.5. Maximum permissible repetitive rms on-state current $I_{T(RMS)}$, versus surge duration, for sinusoidal currents, $f = 50\text{ Hz}$; $Ths \leq 56^{\circ}\text{C}$.

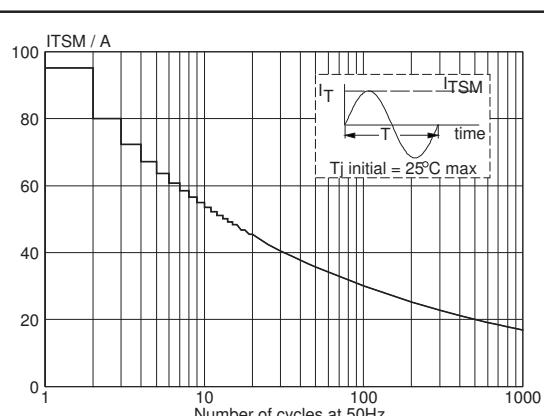


Fig.3. Maximum permissible non-repetitive peak on-state current I_{TSM} , versus number of cycles, for sinusoidal currents, $f = 50\text{ Hz}$.

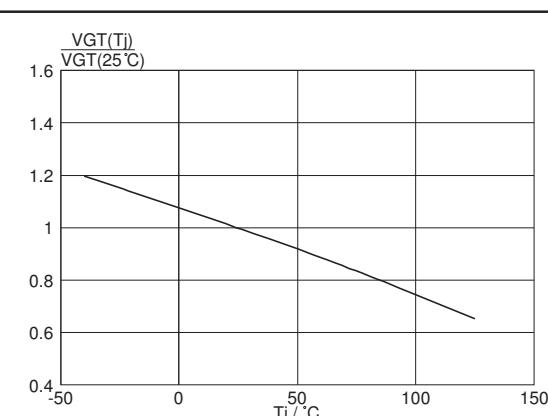


Fig.6. Normalised gate trigger voltage $V_{GT}(T_j)/V_{GT}(25^{\circ}\text{C})$, versus junction temperature T_j .

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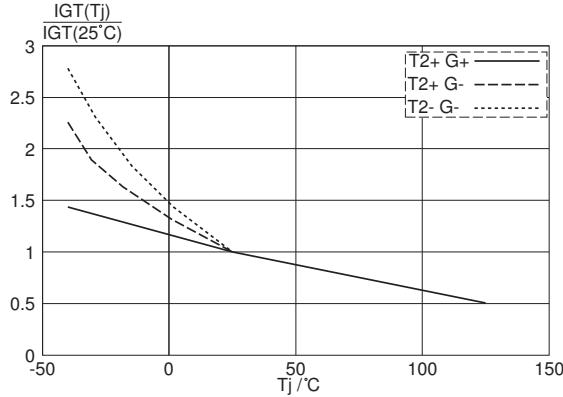


Fig.7. Normalised gate trigger current $I_{GT}(T_j)/I_{GT}(25^\circ C)$, versus junction temperature T_j .

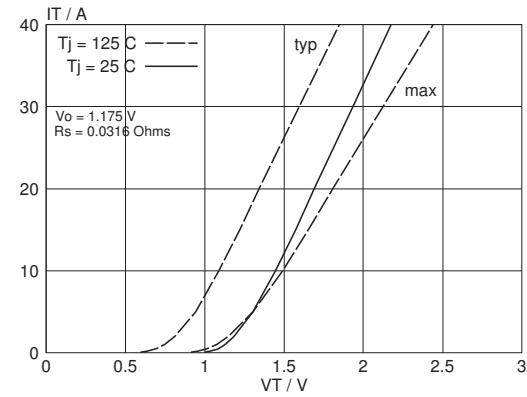


Fig.10. Typical and maximum on-state characteristic.

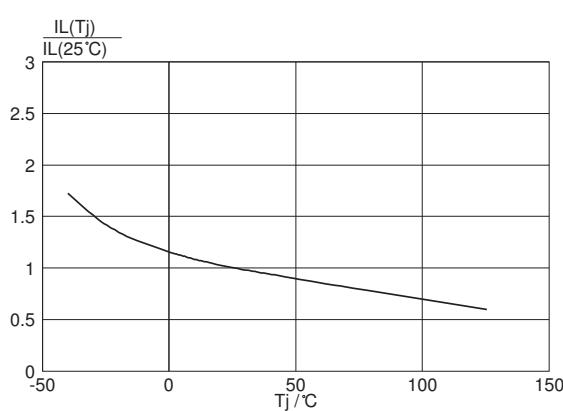


Fig.8. Normalised latching current $I_L(T_j)/I_L(25^\circ C)$, versus junction temperature T_j .

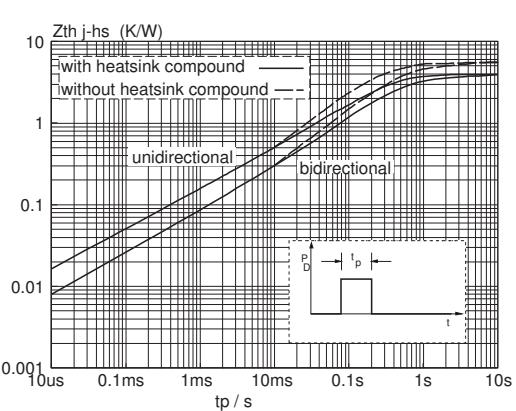


Fig.11. Transient thermal impedance $Z_{th\ j-hs}$, versus pulse width t_p .

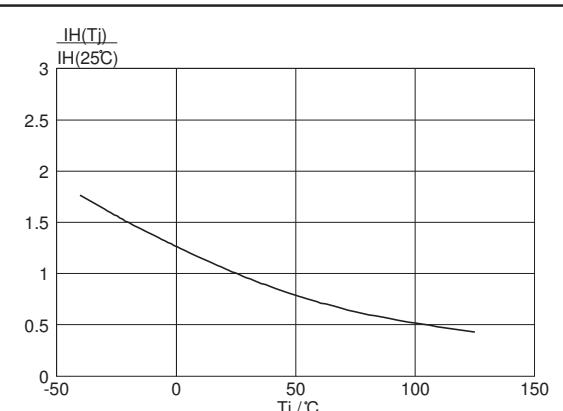


Fig.9. Normalised holding current $I_H(T_j)/I_H(25^\circ C)$, versus junction temperature T_j .

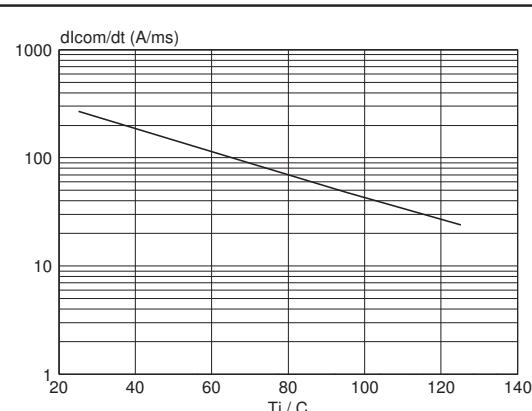


Fig.12. Typical critical rate of change of commutating current dl_{com}/dt versus junction temperature.

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MECHANICAL DATA

Dimensions in mm

Net Mass: 2 g

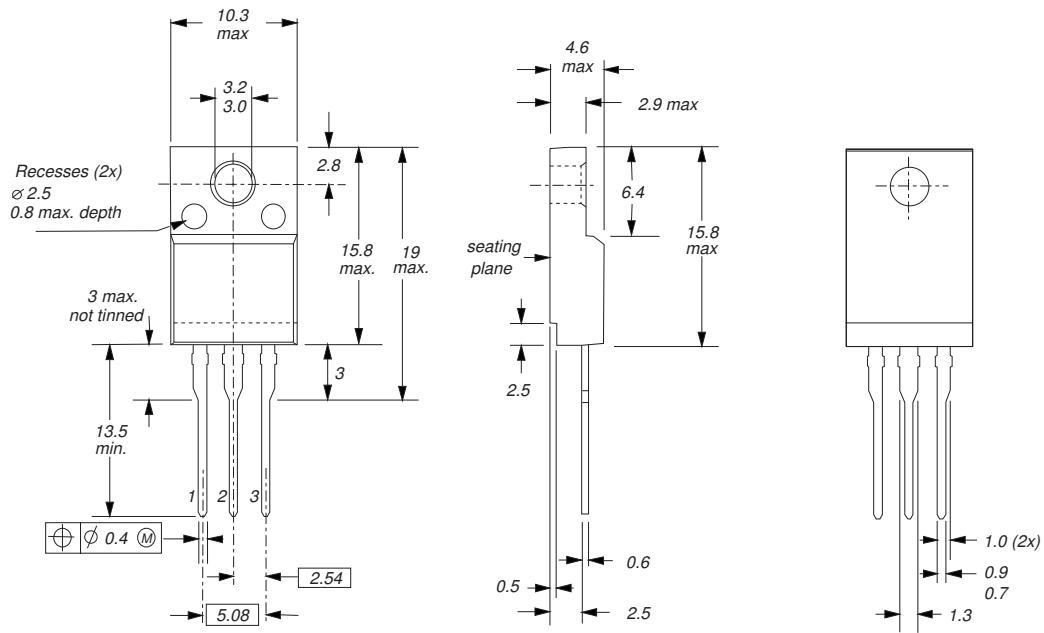


Fig.13. SOT186A; The seating plane is electrically isolated from all terminals.

Notes

1. Refer to mounting instructions for F-pack envelopes.
2. Epoxy meets UL94 V0 at 1/8".

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|--------------------------------|-------------------------------|---|
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| Preliminary data sheet | Qualification | This document contains data from the preliminary specification. |
| Product data sheet | Production | This document contains the product specification. |

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