# Three quadrant triacs high commutation

# BTA208X-1000B

## GENERAL DESCRIPTION

Passivated high voltage, high commutation triac in a full pack, plastic envelope. This triac is intended for use in motor control circuits where high blocking voltage, high static and dynamic dV/dt and high dI/dt can occur. This device will commutate the full rated rms current at the maximum rated junction temperature, without the aid of a snubber.

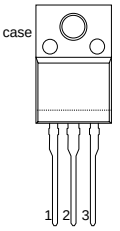
## QUICK REFERENCE DATA

| SYMBOL | PARAMETER | MAX. | UNIT |
|---|---|---|---|
| $V_{DRM}$ | Repetitive peak off-state voltages | 1000 | V |
| $I_{T(RMS)}$ | RMS on-state current | 8 | A |
| $I_{TSM}$ | Non-repetitive peak on-state current | 65 | A |

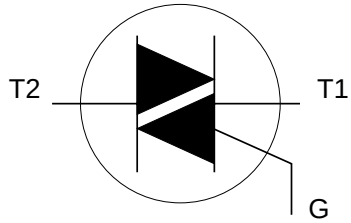
## PINNING - SOT186A

| 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 | | - | 1000 | V |
| $I_{T(RMS)}$ | RMS on-state current | full sine wave; $T_{hs} \leq 73$ ˚C | - | 8 | A |
| $I_{TSM}$ | Non-repetitive peak on-state current | full sine wave; $T_j = 25$ ˚C prior to surge | | | |
| | | t = 20 ms | - | 65 | A |
| | | t = 16.7 ms | - | 71 | A |
| $I^2t$ | $I^2t$ for fusing | t = 10 ms | - | 21 | $A^2s$ |
| $dI_T/dt$ | Repetitive rate of rise of on-state current after triggering | $I_{TM}$ = 12 A; $I_G$ = 0.2 A; $dI_G/dt$ = 0.2 A/µs | | 100 | A/µs |
| $I_{GM}$ | Peak gate current | | - | 2 | A |
| $V_{GM}$ | Peak gate voltage | | - | 5 | V |
| $P_{GM}$ | Peak gate power | | - | 5 | W |
| $P_{G(AV)}$ | Average gate power | over any 20 ms period | - | 0.5 | W |
| $T_{stg}$ | Storage temperature | | -40 | 150 | ˚C |
| $T_j$ | Operating junction temperature | | - | 125 | ˚C |

## ISOLATION LIMITING VALUE & CHARACTERISTIC

$T_{hs}$ = 25 ˚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 Hz; sinusoidal waveform; R.H. ≤ 65% ; clean and dustfree | - | - | 2500 | V |
| $C_{isol}$ | Capacitance from T2 to external heatsink | f = 1 MHz | - | 10 | - | pF |

## THERMAL RESISTANCES

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| $R_{th\ j\text{-}hs}$ | Thermal resistance junction to heatsink | full or half cycle | | | | |
| | | with heatsink compound | - | - | 4.5 | K/W |
| | | without heatsink compound | - | - | 6.5 | K/W |
| $R_{th\ j\text{-}a}$ | Thermal resistance junction to ambient | in free air | - | 55 | - | K/W |

## STATIC CHARACTERISTICS

$T_j$ = 25 ˚C unless otherwise stated

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| $I_{GT}$ | Gate trigger current[1] | $V_D$ = 12 V; $I_T$ = 0.1 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 V; $I_{GT}$ = 0.1 A | | | | |
| | | T2+ G+ | - | 31 | 60 | mA |
| | | T2+ G- | - | 34 | 90 | mA |
| | | T2- G- | - | 30 | 60 | mA |
| $I_H$ | Holding current | $V_D$ = 12 V; $I_{GT}$ = 0.1 A | - | 31 | 60 | mA |
| $V_T$ | On-state voltage | $I_T$ = 10 A | - | 1.3 | 1.65 | V |
| $V_{GT}$ | Gate trigger voltage | $V_D$ = 12 V; $I_T$ = 0.1 A | - | 0.7 | 1.5 | V |
| | | $V_D$ = 400 V; $I_T$ = 0.1 A; $T_j$ = 125 ˚C | 0.25 | 0.4 | - | V |
| $I_D$ | Off-state leakage current | $V_D = V_{DRM(max)}$; $T_j$ = 125 ˚C | - | 0.1 | 0.5 | mA |

## DYNAMIC CHARACTERISTICS

$T_j$ = 25 ˚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 ˚C; exponential waveform; gate open circuit | 1000 | 4000 | - | V/µs |
| $dI_{com}/dt$ | Critical rate of change of commutating current | $V_{DM}$ = 400 V; $T_j$ = 125 ˚C; $I_{T(RMS)}$ = 8 A; without snubber; gate open circuit | 15 | 38 | - | A/ms |
| $t_{gt}$ | Gate controlled turn-on time | $I_{TM}$ = 12 A; $V_D = V_{DRM(max)}$; $I_G$ = 0.1 A; $dI_G/dt$ = 5 A/µs | - | 2 | - | µs |

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

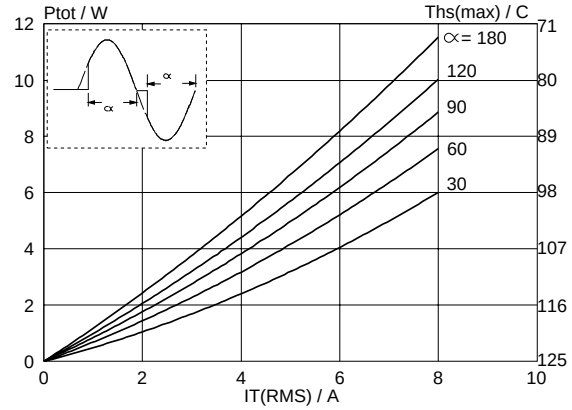



*Fig.1. Maximum on-state dissipation, $P_{tot}$, versus rms on-state current, $I_{T(RMS)}$, where α = conduction angle.*

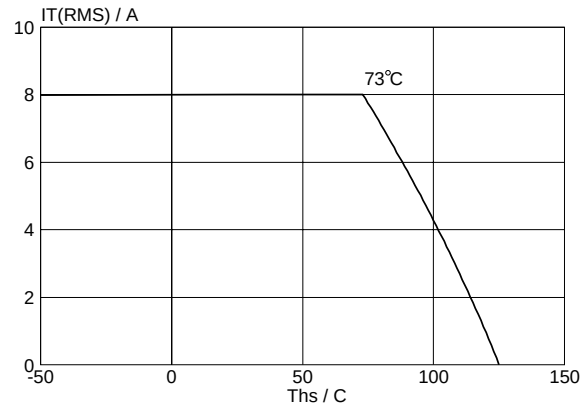



*Fig.4. Maximum permissible rms current $I_{T(RMS)}$ , versus heatsink temperature $T_{hs}$.*

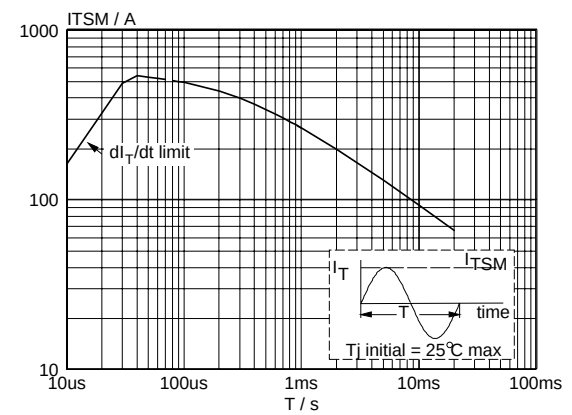



*Fig.2. Maximum permissible non-repetitive peak on-state current $I_{TSM}$, versus pulse width $t_p$, for sinusoidal currents, $t_p \leq 20ms$.*

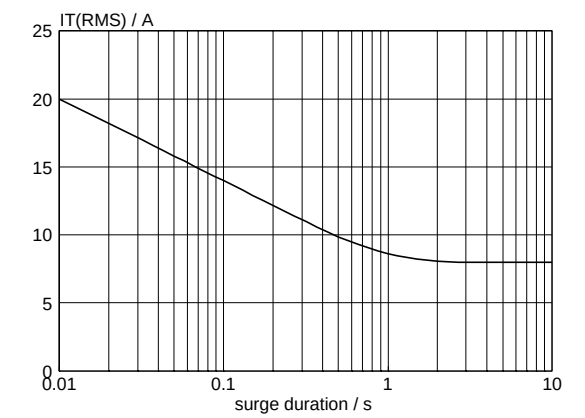



*Fig.5. Maximum permissible repetitive rms on-state current $I_{T(RMS)}$, versus surge duration, for sinusoidal currents, f = 50 Hz; $T_{hs} \leq 73˚C$.*

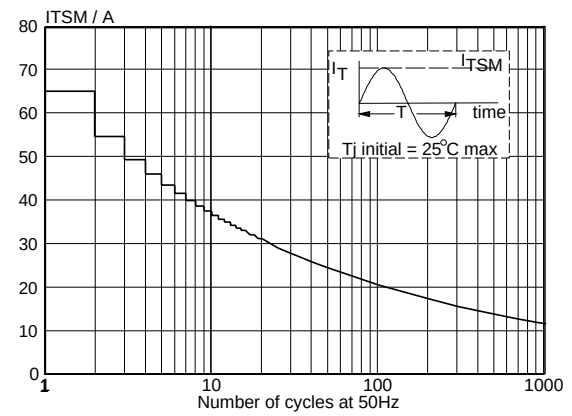



*Fig.3. Maximum permissible non-repetitive peak on-state current $I_{TSM}$, versus number of cycles, for sinusoidal currents, f = 50 Hz.*

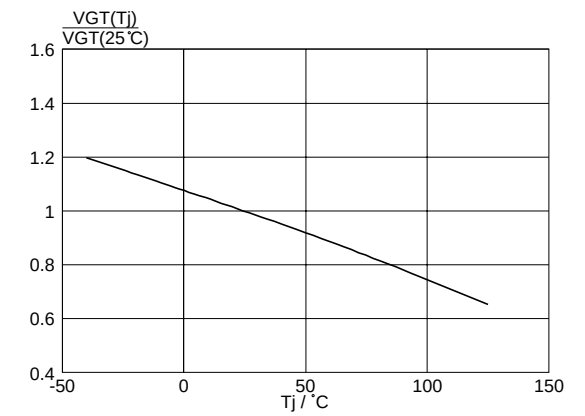



*Fig.6. Normalised gate trigger voltage $V_{GT}(T_j)/ V_{GT}(25˚C)$, versus junction temperature $T_j$.*

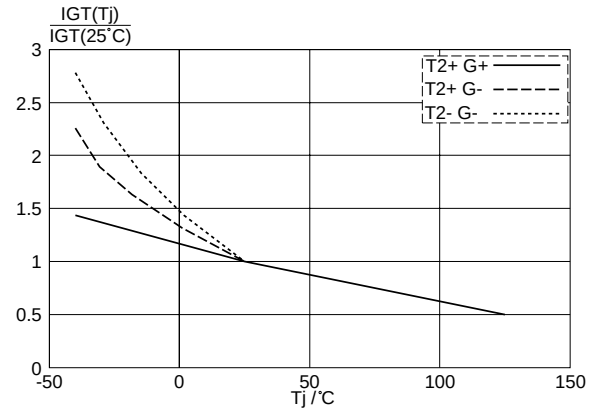



*Fig.7. Normalised gate trigger current $I_{GT}(T_j)/ I_{GT}(25˚C)$, versus junction temperature $T_j$.*

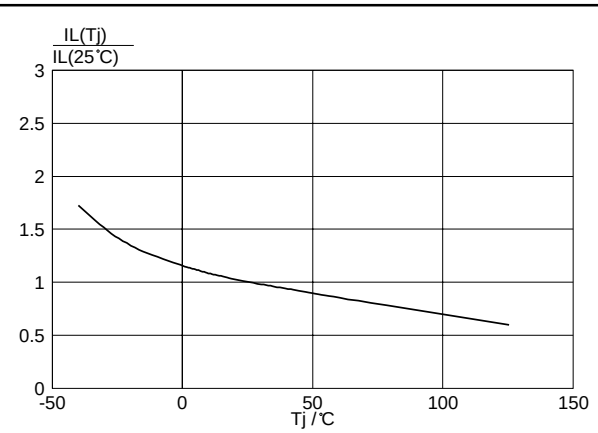



*Fig.8. Normalised latching current $I_L(T_j)/ I_L(25˚C)$, versus junction temperature $T_j$.*

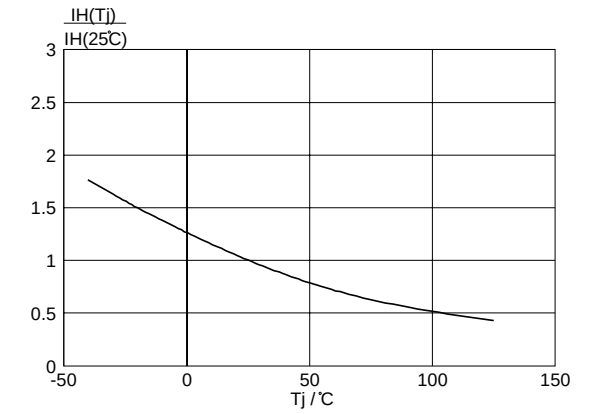



*Fig.9. Normalised holding current $I_H(T_j)/ I_H(25˚C)$, versus junction temperature $T_j$.*

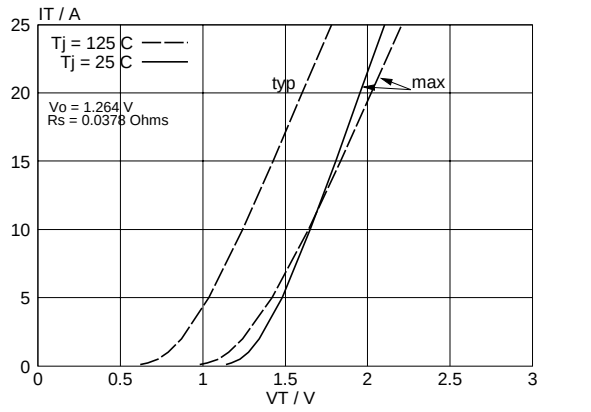



*Fig.10. Typical and maximum on-state characteristic.*

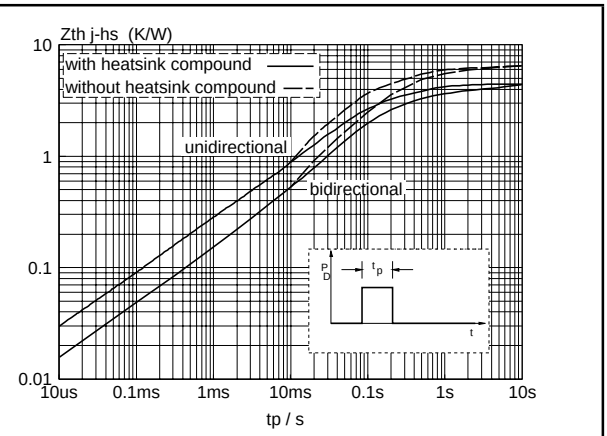



*Fig.11. Transient thermal impedance $Z_{th\ j\text{-}hs}$, versus pulse width $t_p$.*

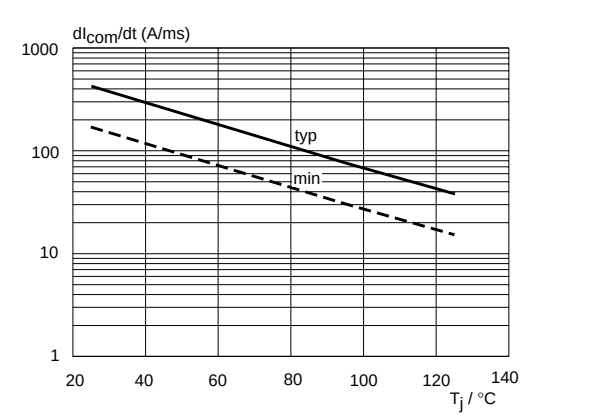



*Fig.12. Typical, critical rate of change of commutating current $dI_{com}/dt$ versus junction temperature.*

## MECHANICAL DATA

*Dimensions in mm*

*Net Mass: 2 g*

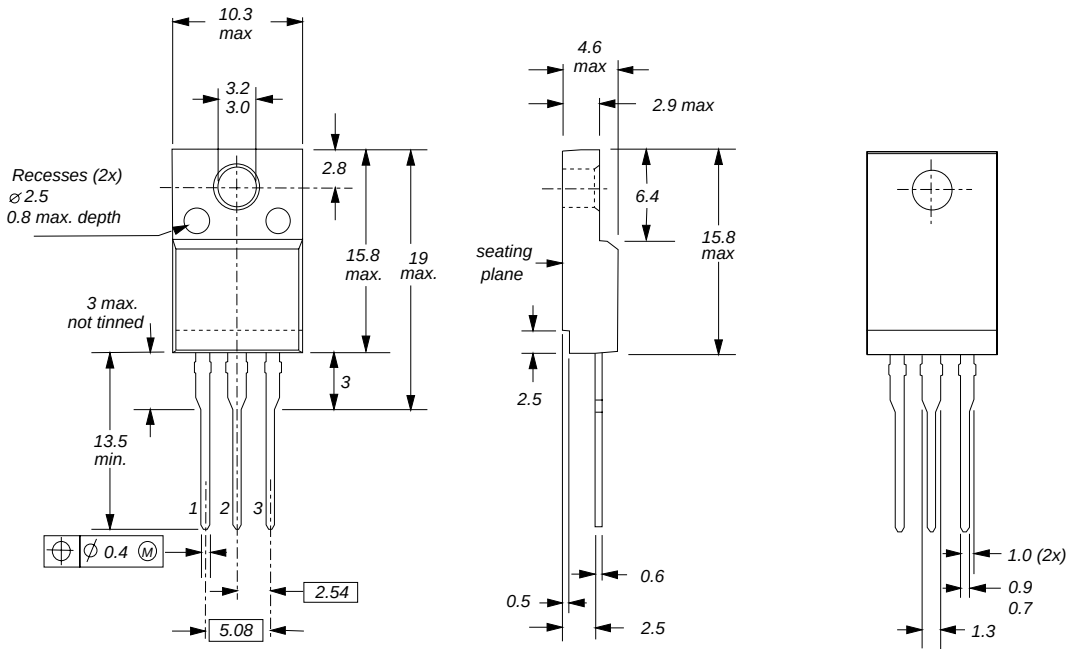



*Fig.13. SOT186A; The seating plane is electrically isolated from all terminals.*

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

## DEFINITIONS

| DATA SHEET STATUS | | |
|---|---|---|
| **DATA SHEET STATUS**[2] | **PRODUCT STATUS**[3] | **DEFINITIONS** |
| Objective data | Development | This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice |
| Preliminary data | Qualification | This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product |
| Product data | Production | This data sheet contains data from the product specification. Philips Semiconductors reserves the right to make changes at any time in order to improve the design, manufacturing and supply. Changes will be communicated according to the Customer Product/Process Change Notification (CPCN) procedure SNW-SQ-650A |
| **Limiting values** | | |
| Limiting values are given in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of this specification is not implied. Exposure to limiting values for extended periods may affect device reliability. | | |
| **Application information** | | |
| Where application information is given, it is advisory and does not form part of the specification. | | |



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