

## Three quadrant triacs guaranteed commutation

## BTA204X series D, E and F

### GENERAL DESCRIPTION

Passivated guaranteed commutation triacs in a plastic full pack envelope, intended for use in motor control circuits or with other highly inductive loads. These devices balance the requirements of commutation performance and gate sensitivity. The "sensitive gate" E series and "logic level" D series are intended for interfacing with low power drivers, including micro controllers.

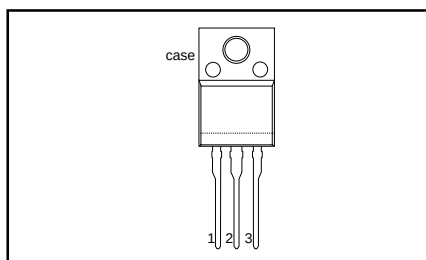
### QUICK REFERENCE DATA

| SYMBOL              | PARAMETER                                                              | MAX.                        | MAX.                        | MAX.                     | UNIT |
|---------------------|------------------------------------------------------------------------|-----------------------------|-----------------------------|--------------------------|------|
| $V_{\text{DRM}}$    | BTA204X-<br>BTA204X-<br>BTA204X-<br>Repetitive peak off-state voltages | 500D<br>500E<br>500F<br>500 | 600D<br>600E<br>600F<br>600 | -<br>800E<br>800F<br>800 | V    |
| $I_{\text{T(RMS)}}$ | RMS on-state current                                                   | 4                           | 4                           | 4                        | A    |
| $I_{\text{TSM}}$    | Non-repetitive peak on-state current                                   | 25                          | 25                          | 25                       | A    |

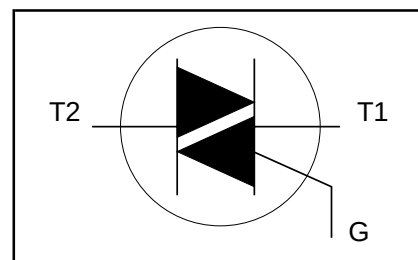
### PINNING - SOT186A

| 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             |
|---------------------|--------------------------------------|-----------------------------------------------------------------------------------------------------------------|------|--------------------------|--------------------------|-------------|------------------|
| $V_{\text{DRM}}$    | Repetitive peak off-state voltages   |                                                                                                                 | -    | -500<br>500 <sup>1</sup> | -600<br>600 <sup>1</sup> | -800<br>800 | V                |
| $I_{\text{T(RMS)}}$ | RMS on-state current                 | full sine wave;<br>$T_{\text{hs}} \leq 92^\circ\text{C}$                                                        | -    | 4                        |                          |             | A                |
| $I_{\text{TSM}}$    | Non-repetitive peak on-state current | full sine wave;<br>$T_{\text{j}} = 25^\circ\text{C}$ prior to surge                                             | -    | 25                       |                          |             | A                |
|                     |                                      | $t = 20\text{ ms}$                                                                                              | -    | 27                       |                          |             | A                |
|                     |                                      | $t = 16.7\text{ ms}$                                                                                            | -    | 3.1                      |                          |             | A <sup>2</sup> s |
|                     |                                      | $t = 10\text{ ms}$                                                                                              | -    | 100                      |                          |             | A/μs             |
| $I_{\text{GM}}$     | Peak gate current                    | $I_{\text{TM}} = 6\text{ A}$ ; $I_{\text{G}} = 0.2\text{ A}$ ;<br>$di_{\text{G}}/dt = 0.2\text{ A}/\mu\text{s}$ | -    | 2                        |                          |             | A                |
| $V_{\text{GM}}$     | Peak gate voltage                    |                                                                                                                 | -    | 5                        |                          |             | V                |
| $P_{\text{GM}}$     | Peak gate power                      |                                                                                                                 | -    | 5                        |                          |             | W                |
| $P_{\text{G(AV)}}$  | Average gate power                   | over any 20 ms period                                                                                           | -    | 0.5                      |                          |             | W                |
| $T_{\text{stg}}$    | Storage temperature                  |                                                                                                                 | -40  | 150                      |                          |             | °C               |
| $T_{\text{j}}$      | Operating junction temperature       |                                                                                                                 | -    | 125                      |                          |             | °C               |

<sup>1</sup> 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 6 A/μs.

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### ISOLATION LIMITING VALUE & CHARACTERISTIC

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

| SYMBOL     | PARAMETER                                                              | CONDITIONS                                                                                    | MIN. | TYP. | MAX. | UNIT |
|------------|------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|------|------|------|------|
| $V_{isol}$ | R.M.S. isolation voltage from all three terminals to external heatsink | $f = 50\text{--}60\text{ Hz}$ ; sinusoidal waveform;<br>$R.H. \leq 65\%$ ; 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 | -    | -    | 5.5  | K/W  |
| $R_{th\ j-a}$  | Thermal resistance junction to ambient  | without heatsink compound in free air     | -    | 55   | 7.2  | K/W  |

### STATIC CHARACTERISTICS

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

| SYMBOL   | PARAMETER                         | CONDITIONS                                                                           | MIN. | TYP. | MAX.        |             |             | UNIT |
|----------|-----------------------------------|--------------------------------------------------------------------------------------|------|------|-------------|-------------|-------------|------|
|          |                                   | <b>BTA204X-</b>                                                                      |      |      | <b>...D</b> | <b>...E</b> | <b>...F</b> |      |
| $I_{GT}$ | Gate trigger current <sup>2</sup> | $V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$<br>T2+ G+                                 | -    | -    | 5           | 10          | 25          | mA   |
|          |                                   | T2+ G-                                                                               | -    | -    | 5           | 10          | 25          | mA   |
|          |                                   | T2- G-                                                                               | -    | -    | 5           | 10          | 25          | mA   |
| $I_L$    | Latching current                  | $V_D = 12\text{ V}$ ; $I_{GT} = 0.1\text{ A}$<br>T2+ G+                              | -    | -    | 6           | 12          | 20          | mA   |
|          |                                   | T2+ G-                                                                               | -    | -    | 9           | 18          | 30          | mA   |
|          |                                   | T2- G-                                                                               | -    | -    | 6           | 12          | 20          | mA   |
| $I_H$    | Holding current                   | $V_D = 12\text{ V}$ ; $I_{GT} = 0.1\text{ A}$                                        | -    | -    | 6           | 12          | 20          | mA   |
| $V_T$    | On-state voltage                  | $I_T = 5\text{ A}$                                                                   | -    | 1.4  | 1.7         |             |             | V    |
| $V_{GT}$ | Gate trigger voltage              | $V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$                                           | -    | 0.7  | 1.5         |             |             | V    |
|          |                                   | $V_D = 400\text{ V}$ ; $I_T = 0.1\text{ A}$ ;<br>$T_j = 125\text{ }^{\circ}\text{C}$ | 0.25 | 0.4  | -           |             |             | V    |
| $I_D$    | Off-state leakage current         | $V_D = V_{DRM(max)}$ ;<br>$T_j = 125\text{ }^{\circ}\text{C}$                        | -    | 0.1  | 0.5         |             |             | mA   |

<sup>2</sup> Device does not trigger in the T2-, G+ quadrant.

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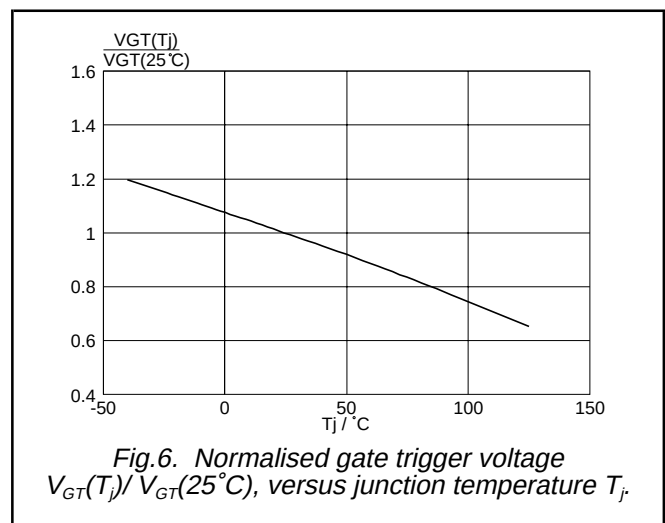
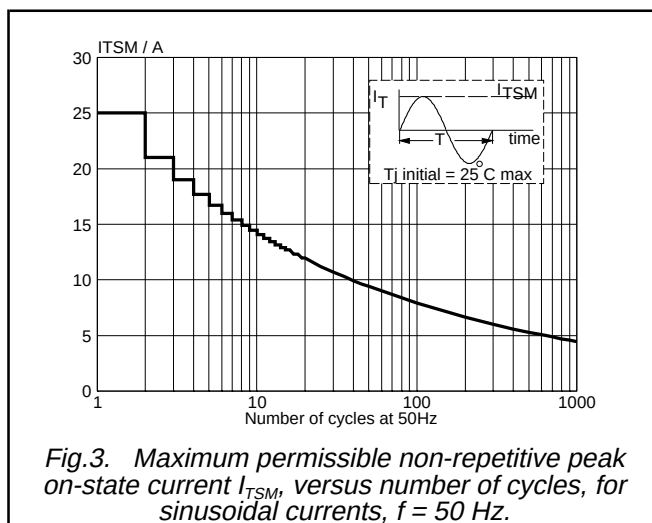
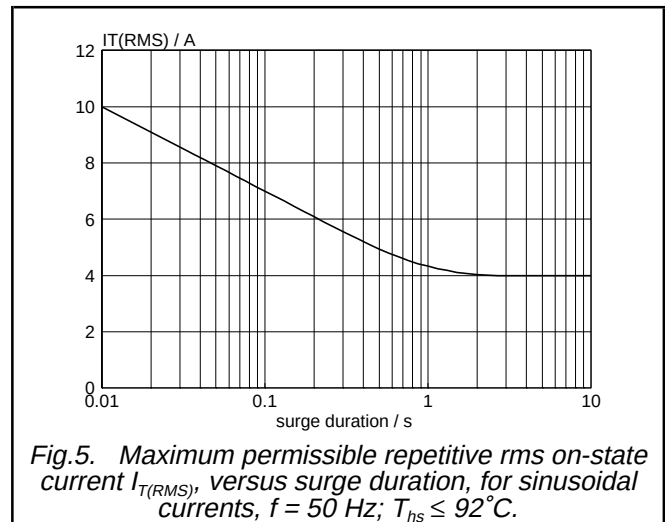
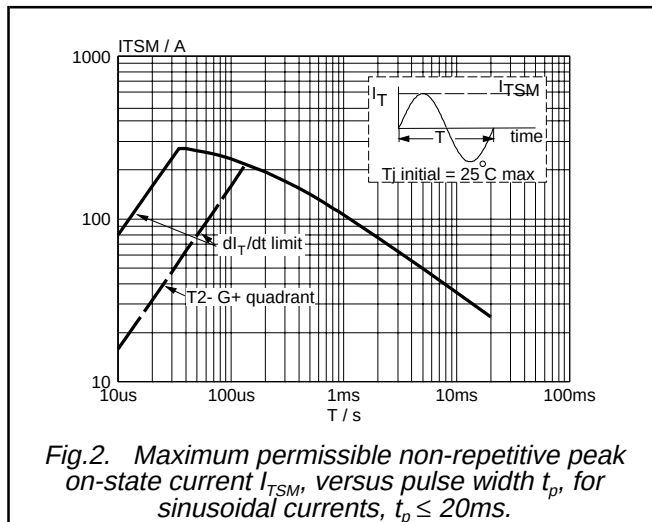
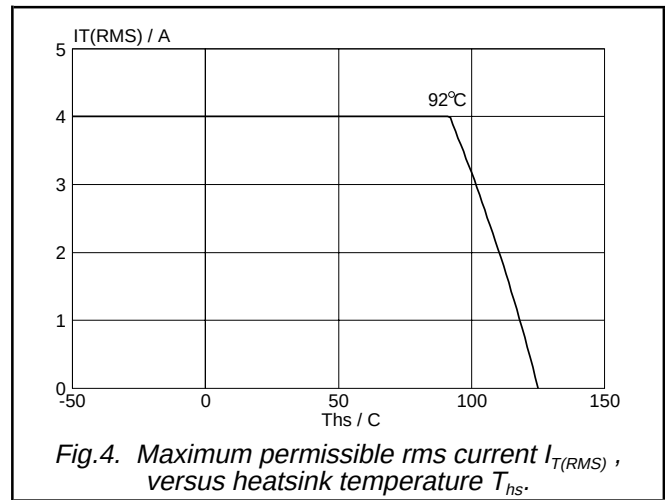
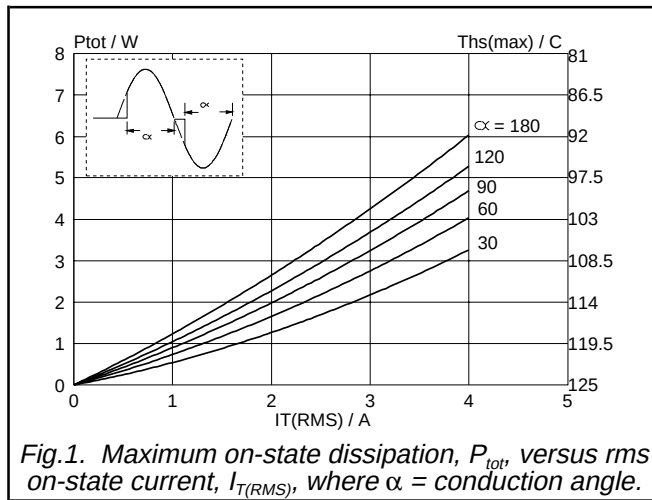
### DYNAMIC CHARACTERISTICS

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

| SYMBOL        | PARAMETER                                      | CONDITIONS                                                                                                                                                     | MIN.        |             |             | TYP. | MAX. | UNIT             |
|---------------|------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------|-------------|------|------|------------------|
|               |                                                | <b>BTA204X-</b>                                                                                                                                                | <b>...D</b> | <b>...E</b> | <b>...F</b> |      |      |                  |
| $dV_D/dt$     | Critical rate of rise of off-state voltage     | $V_{DM} = 67\% V_{DRM(max)}$ ;<br>$T_j = 125\text{ }^{\circ}\text{C}$ ; exponential waveform; gate open circuit                                                | 20          | 30          | 50          | -    | -    | V/ $\mu\text{s}$ |
| $dI_{com}/dt$ | Critical rate of change of commutating current | $V_{DM} = 400\text{ V}$ ; $T_j = 125\text{ }^{\circ}\text{C}$ ;<br>$I_{T(RMS)} = 4\text{ A}$ ;<br>$dV_{com}/dt = 20\text{ V}/\mu\text{s}$ ; gate open circuit  | 1.0         | 2.0         | 2.5         | -    | -    | A/ms             |
| $dI_{com}/dt$ | Critical rate of change of commutating current | $V_{DM} = 400\text{ V}$ ; $T_j = 125\text{ }^{\circ}\text{C}$ ;<br>$I_{T(RMS)} = 4\text{ A}$ ;<br>$dV_{com}/dt = 0.1\text{ V}/\mu\text{s}$ ; gate open circuit | 5.0         | -           | -           | -    | -    | A/ms             |
| $t_{gt}$      | Gate controlled turn-on time                   | $I_{TM} = 12\text{ A}$ ; $V_D = V_{DRM(max)}$ ;<br>$I_G = 0.1\text{ A}$ ; $dI_G/dt = 5\text{ A}/\mu\text{s}$                                                   | -           | -           | -           | 2    | -    | $\mu\text{s}$    |

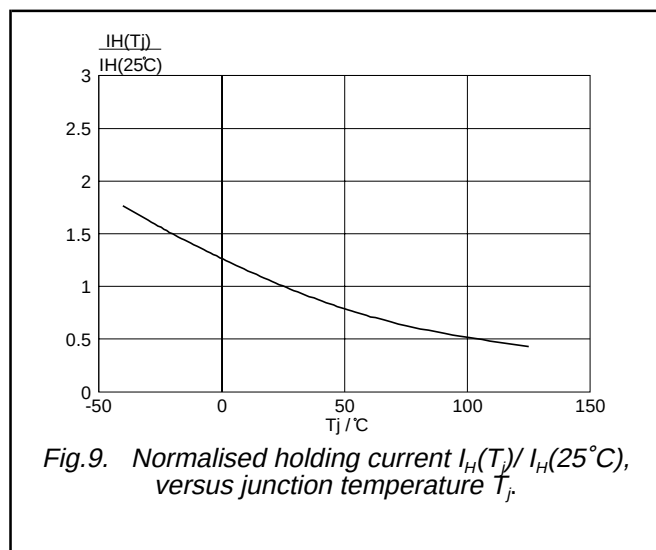
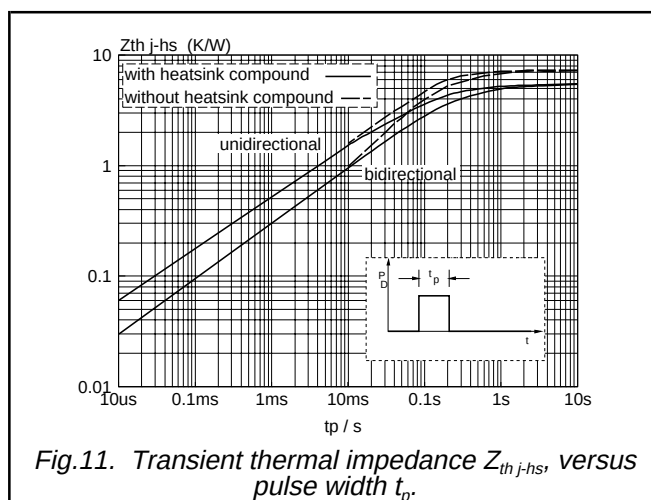
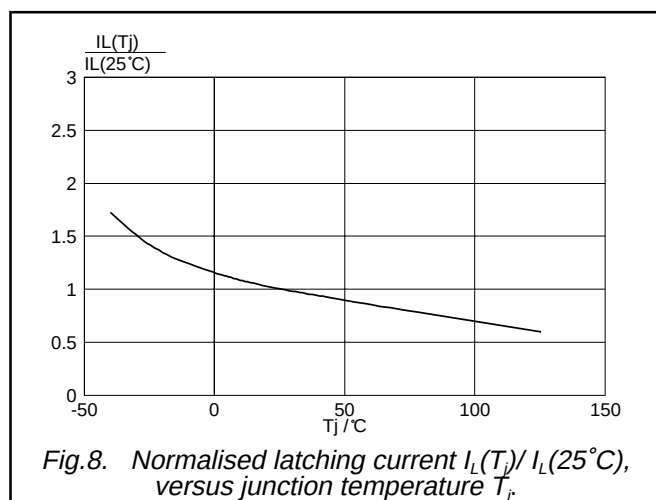
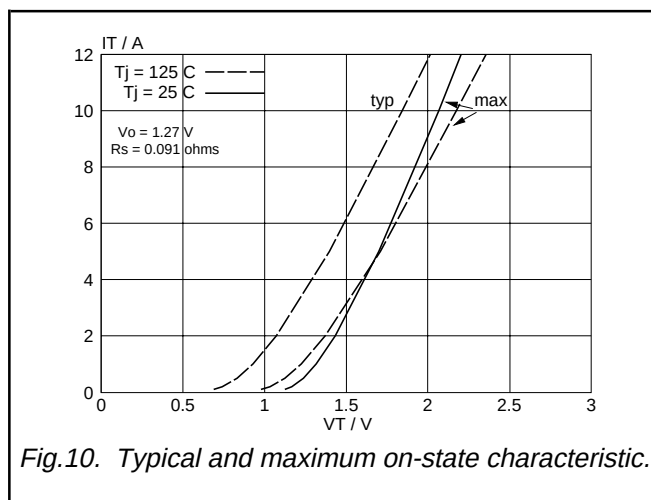
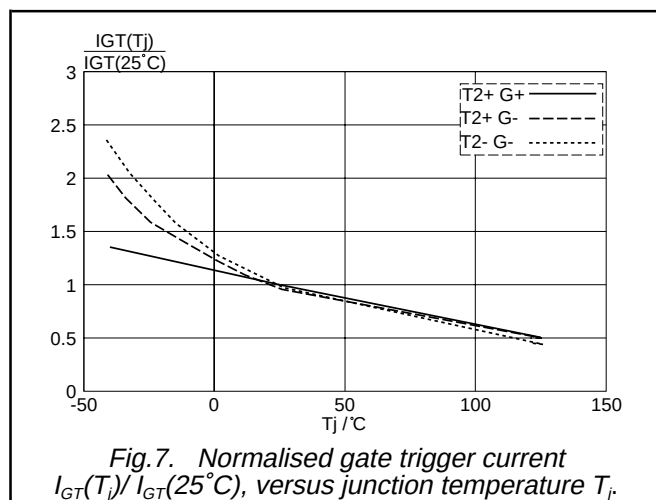
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### MECHANICAL DATA

Dimensions in mm

Net Mass: 2 g

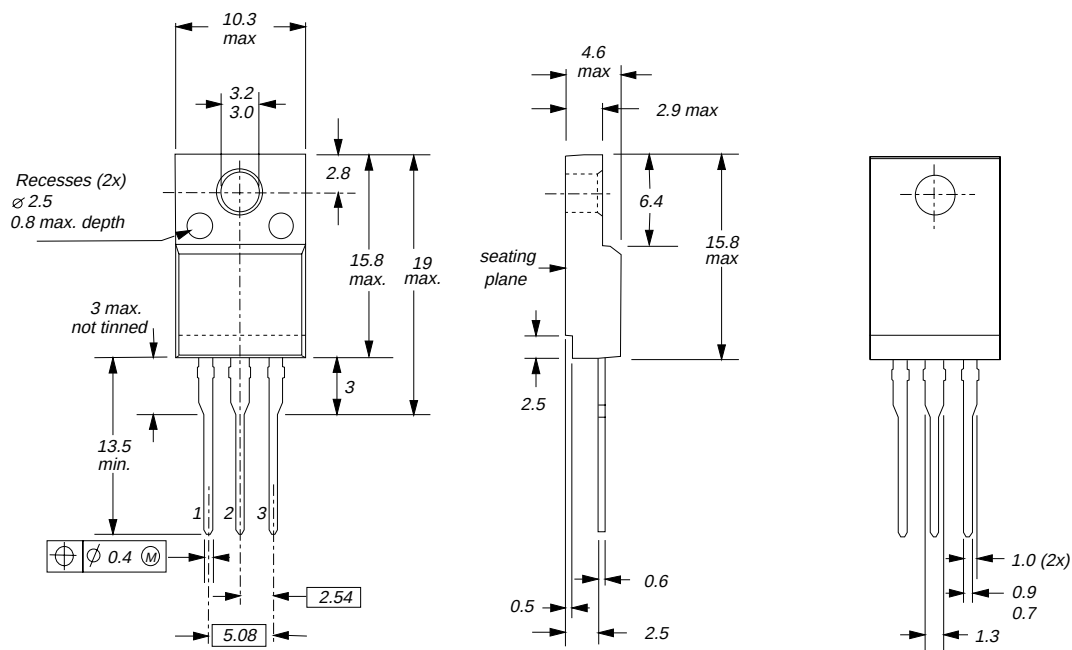


Fig.12. SOT186A; The seating plane is electrically isolated from all terminals.

#### Notes

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

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### DEFINITIONS

|                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| <b>Data sheet status</b>                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                       |
| Objective specification                                                                                                                                                                                                                                                                                                                                                                                                                                    | This data sheet contains target or goal specifications for product development.       |
| Preliminary specification                                                                                                                                                                                                                                                                                                                                                                                                                                  | This data sheet contains preliminary data; supplementary data may be published later. |
| Product specification                                                                                                                                                                                                                                                                                                                                                                                                                                      | This data sheet contains final product specifications.                                |
| <b>Limiting values</b>                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                       |
| 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. |                                                                                       |
| <b>Application information</b>                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                       |
| Where application information is given, it is advisory and does not form part of the specification.                                                                                                                                                                                                                                                                                                                                                        |                                                                                       |
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