

## Thyristors

## BT152 series

## GENERAL DESCRIPTION

Glass passivated thyristors in a plastic envelope, intended for use in applications requiring high bidirectional blocking voltage capability and high thermal cycling performance. Typical applications include motor control, industrial and domestic lighting, heating and static switching.

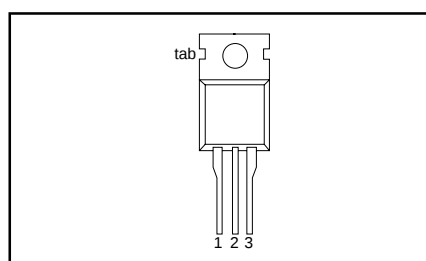
## QUICK REFERENCE DATA

| SYMBOL                 | PARAMETER                            | MAX.               | MAX.               | MAX.               | UNIT |
|------------------------|--------------------------------------|--------------------|--------------------|--------------------|------|
| $V_{DRM}$ <sup>1</sup> | Repetitive peak off-state voltages   | <b>400R</b><br>450 | <b>600R</b><br>650 | <b>800R</b><br>800 | V    |
| $V_{RRM}$              |                                      |                    |                    |                    |      |
| $I_{T(AV)}$            | Average on-state current             | 13                 | 13                 | 13                 | A    |
| $I_{T(RMS)}$           | RMS on-state current                 | 20                 | 20                 | 20                 | A    |
| $I_{TSM}$              | Non-repetitive peak on-state current | 200                | 200                | 200                | A    |

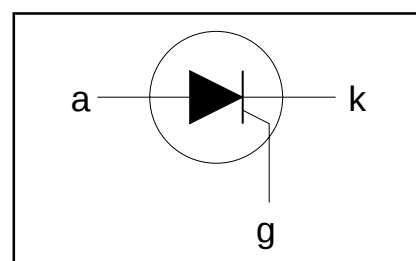
## PINNING - TO220AB

| PIN | DESCRIPTION |
|-----|-------------|
| 1   | cathode     |
| 2   | anode       |
| 3   | gate        |
| tab | anode       |

## 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                           |                                                                                      | -    | <b>-400R</b><br>450 <sup>1</sup> | <b>-600R</b><br>650 <sup>1</sup> | <b>-800R</b><br>800 | V                |
| $I_{T(AV)}$  | Average on-state current                                     | half sine wave; $T_{mb} \leq 103^\circ\text{C}$                                      | -    | 13                               |                                  |                     | A                |
| $I_{T(RMS)}$ | RMS on-state current                                         | all conduction angles                                                                | -    | 20                               |                                  |                     | A                |
| $I_{TSM}$    | Non-repetitive peak on-state current                         | half sine wave; $T_j = 25^\circ\text{C}$ prior to surge                              | -    | 200                              |                                  |                     | A                |
|              |                                                              | $t = 10\text{ ms}$                                                                   | -    | 200                              |                                  |                     | A                |
|              |                                                              | $t = 8.3\text{ ms}$                                                                  | -    | 220                              |                                  |                     | A                |
|              |                                                              | $t = 10\text{ ms}$                                                                   | -    | 200                              |                                  |                     | A                |
| $I^2t$       | $I^2t$ for fusing                                            |                                                                                      | -    | 200                              |                                  |                     | A <sup>2</sup> s |
| $di_T/dt$    | Repetitive rate of rise of on-state current after triggering | $I_{TM} = 50\text{ A}$ ; $I_G = 0.2\text{ A}$ ; $di_G/dt = 0.2\text{ A}/\mu\text{s}$ | -    | 200                              |                                  |                     | A/ $\mu\text{s}$ |
| $I_{GM}$     | Peak gate current                                            |                                                                                      | -    | 5                                |                                  |                     | A                |
| $V_{GM}$     | Peak gate voltage                                            |                                                                                      | -    | 5                                |                                  |                     | V                |
| $V_{RGM}$    | Peak reverse gate voltage                                    |                                                                                      | -    | 5                                |                                  |                     | V                |
| $P_{GM}$     | Peak gate power                                              |                                                                                      | -    | 20                               |                                  |                     | W                |
| $P_{G(AV)}$  | Average gate power                                           |                                                                                      | -    | 0.5                              |                                  |                     | W                |
| $T_{stg}$    | Storage temperature                                          |                                                                                      | -40  | 150                              |                                  |                     | $^\circ\text{C}$ |
| $T_j$        | Operating junction temperature                               | over any 20 ms period                                                                | -    | 125                              |                                  |                     | $^\circ\text{C}$ |

<sup>1</sup> Although not recommended, off-state voltages up to 800V may be applied without damage, but the thyristor may switch to the on-state. The rate of rise of current should not exceed 15 A/ $\mu\text{s}$ .

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## THERMAL RESISTANCES

| SYMBOL         | PARAMETER                                       | CONDITIONS  | MIN. | TYP. | MAX. | UNIT |
|----------------|-------------------------------------------------|-------------|------|------|------|------|
| $R_{th\ j-mb}$ | Thermal resistance<br>junction to mounting base | in free air | -    | -    | 1.1  | K/W  |
| $R_{th\ j-a}$  | Thermal resistance<br>junction to ambient       |             | -    | 60   | -    | K/W  |

## STATIC CHARACTERISTICS

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

| SYMBOL     | PARAMETER                 | CONDITIONS                                                                        | MIN. | TYP. | MAX. | UNIT |
|------------|---------------------------|-----------------------------------------------------------------------------------|------|------|------|------|
| $I_{GT}$   | Gate trigger current      | $V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$                                        | -    | 3    | 32   | mA   |
| $I_L$      | Latching current          | $V_D = 12\text{ V}$ ; $I_{GT} = 0.1\text{ A}$                                     | -    | 25   | 80   | mA   |
| $I_H$      | Holding current           | $V_D = 12\text{ V}$ ; $I_{GT} = 0.1\text{ A}$                                     | -    | 15   | 60   | mA   |
| $V_T$      | On-state voltage          | $I_T = 40\text{ A}$                                                               | -    | 1.4  | 1.75 | V    |
| $V_{GT}$   | Gate trigger voltage      | $V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$                                        | -    | 0.6  | 1.5  | V    |
| $I_D, I_R$ | Off-state leakage current | $V_D = V_{DRM(max)}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 125\text{ }^{\circ}\text{C}$ | 0.25 | 0.4  | -    | V    |
|            |                           | $V_D = V_{DRM(max)}$ ; $V_R = V_{RRM(max)}$ ; $T_j = 125\text{ }^{\circ}\text{C}$ | -    | 0.2  | 1.0  | mA   |

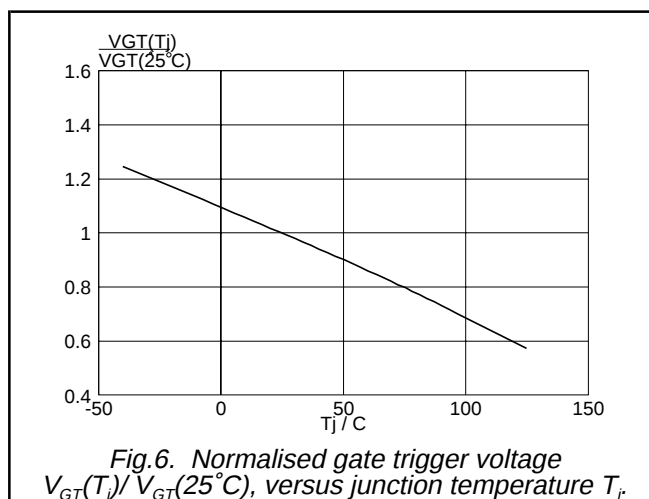
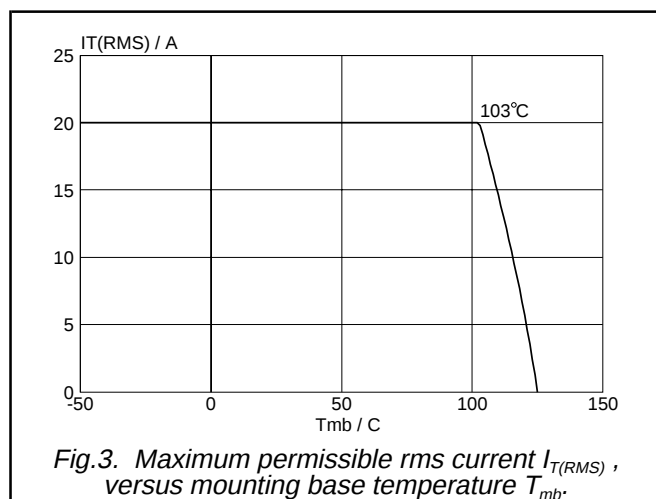
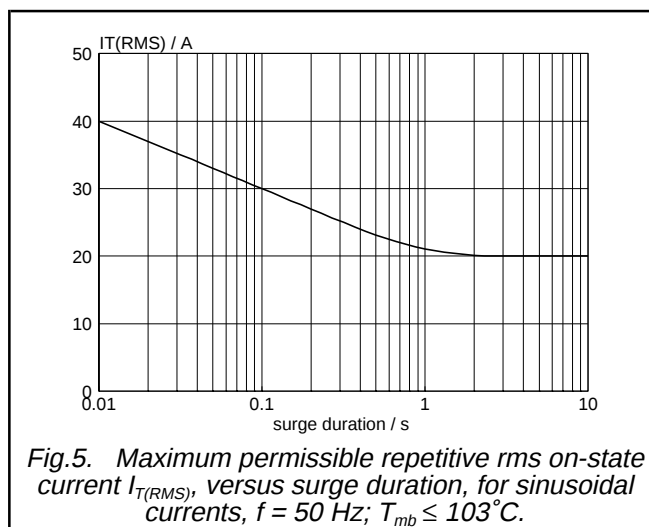
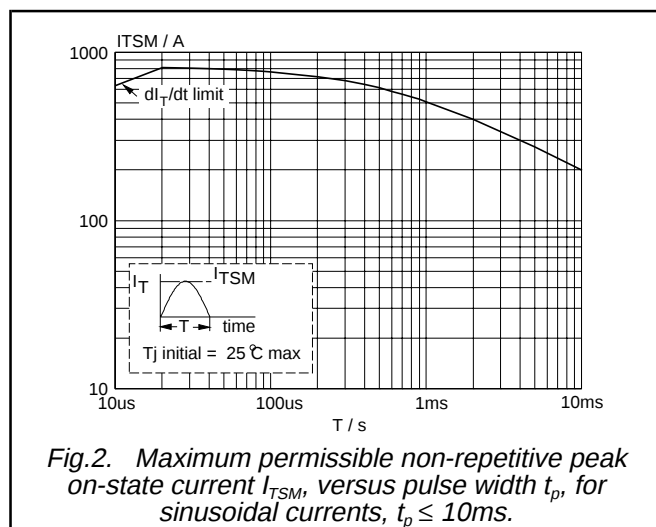
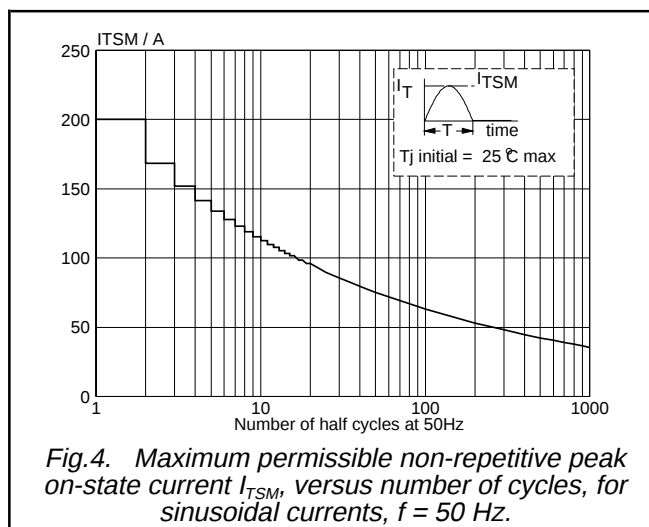
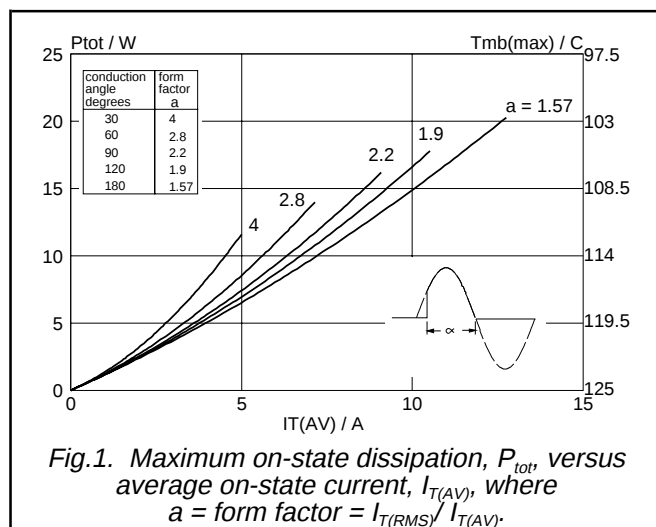
## DYNAMIC CHARACTERISTICS

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

| SYMBOL    | PARAMETER                                     | CONDITIONS                                                                                                                                                                                                                         | MIN. | TYP. | MAX. | UNIT             |
|-----------|-----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|------------------|
| $dV_D/dt$ | Critical rate of rise of<br>off-state voltage | $V_{DM} = 67\% V_{DRM(max)}$ ; $T_j = 125\text{ }^{\circ}\text{C}$ ;<br>exponential waveform gate open circuit                                                                                                                     | 200  | 300  | -    | V/ $\mu\text{s}$ |
| $t_{gt}$  | Gate controlled turn-on<br>time               | $V_D = V_{DRM(max)}$ ; $I_G = 0.1\text{ A}$ ; $dI_G/dt = 5\text{ A}/\mu\text{s}$ ;<br>$I_{TM} = 40\text{ A}$                                                                                                                       | -    | 2    | -    | $\mu\text{s}$    |
| $t_q$     | Circuit commutated<br>turn-off time           | $V_D = 67\% V_{DRM(max)}$ ; $T_j = 125\text{ }^{\circ}\text{C}$ ;<br>$I_{TM} = 50\text{ A}$ ; $V_R = 25\text{ V}$ ; $dI_{TM}/dt = 30\text{ A}/\mu\text{s}$ ;<br>$dV_D/dt = 50\text{ V}/\mu\text{s}$ ; $R_{GK} = 100\text{ }\Omega$ | -    | 70   | -    | $\mu\text{s}$    |

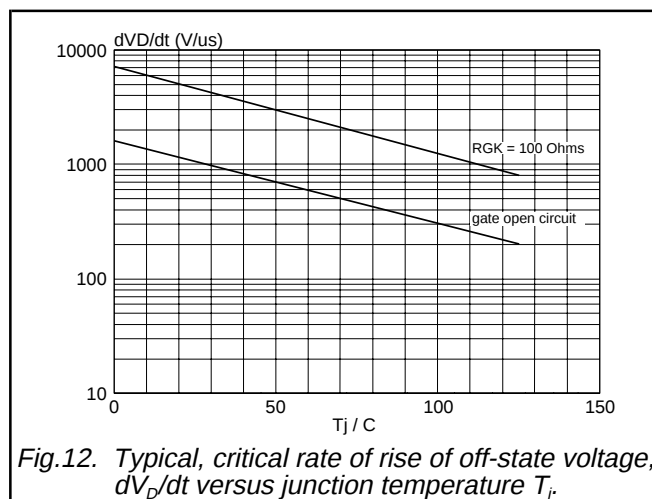
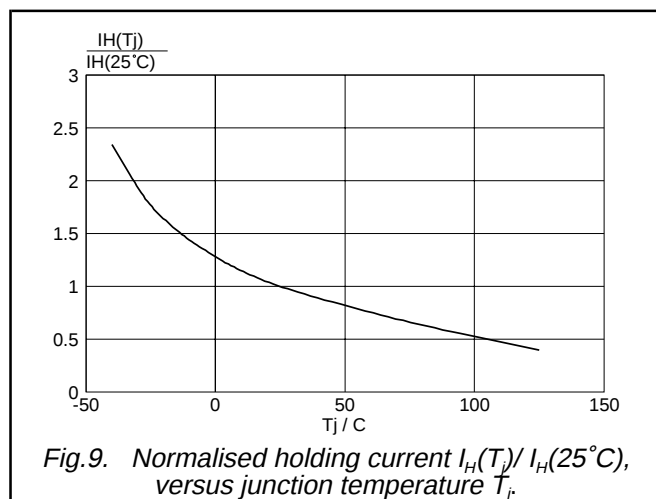
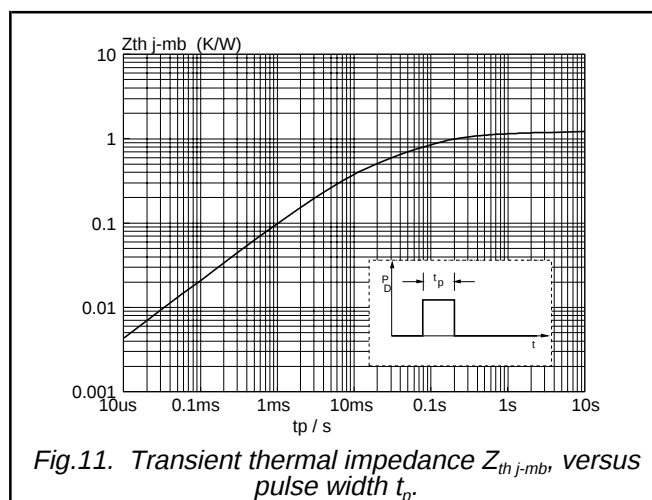
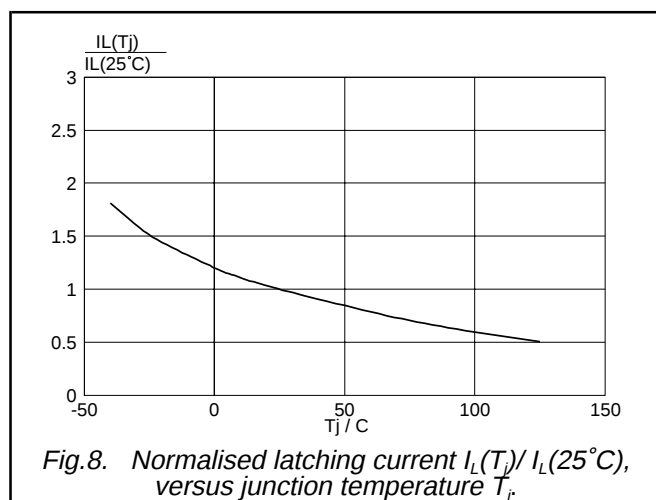
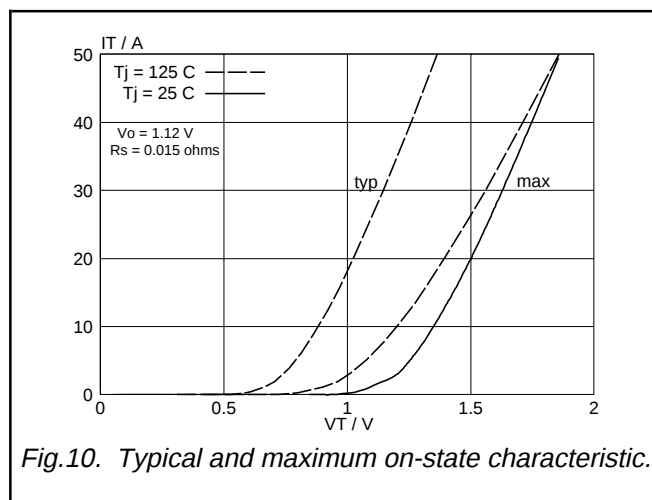
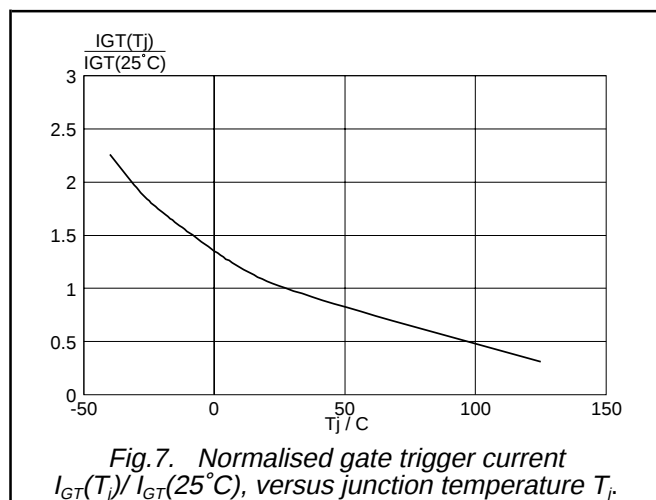
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## MECHANICAL DATA

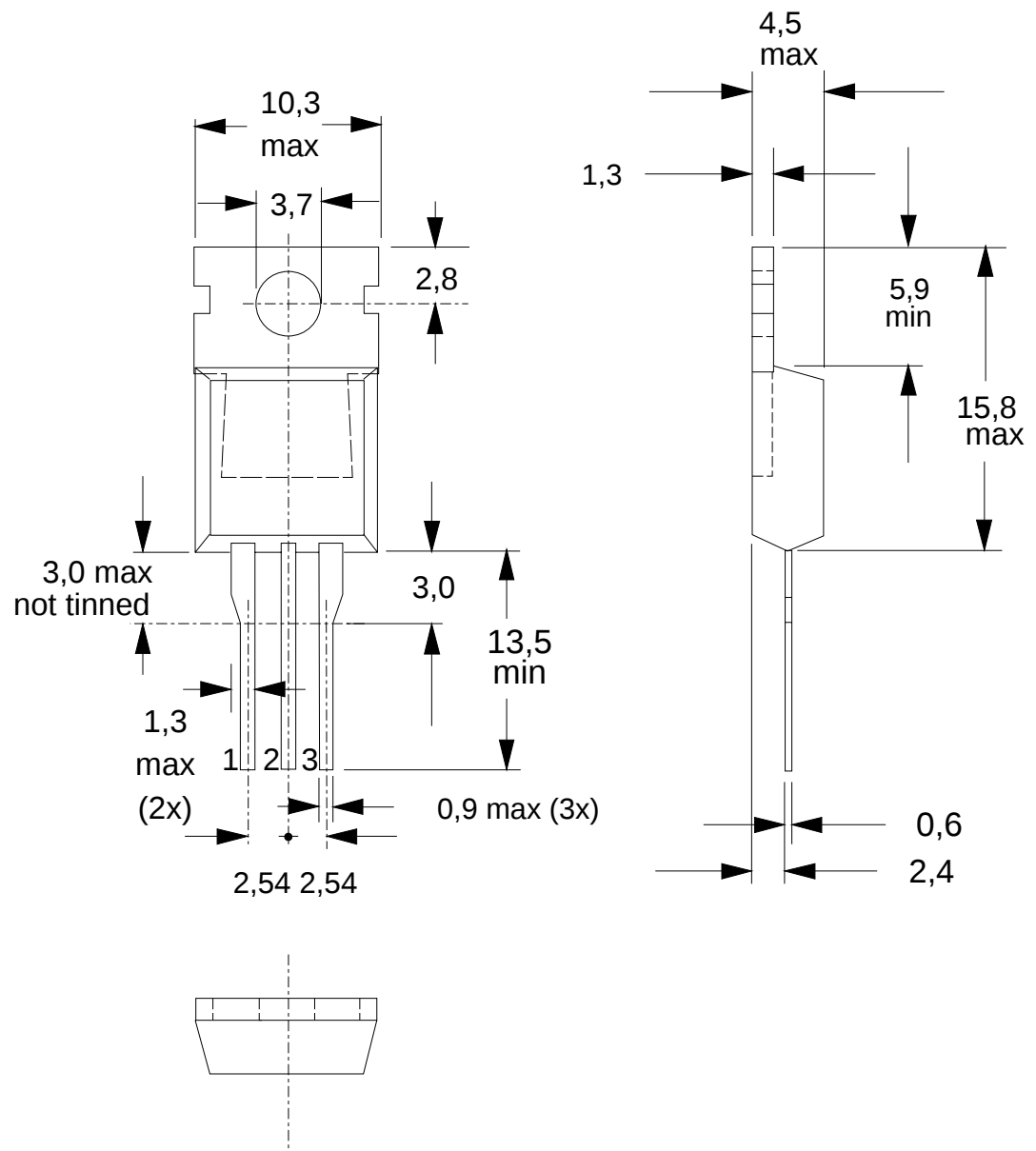
*Dimensions in mm**Net Mass: 2 g*

Fig.13. TO220AB; pin 2 connected to mounting base.

**Notes**

1. Refer to mounting instructions for TO220 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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