

# DATA SHEET

## **BT151U series C** Thyristors

Product specification

April 2004



## Thyristors

## BT151U series C

## GENERAL DESCRIPTION

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.

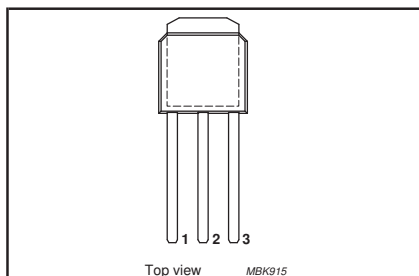
## QUICK REFERENCE DATA

| SYMBOL                           | PARAMETER                            | MAX.        | MAX.        | MAX.        | UNIT |
|----------------------------------|--------------------------------------|-------------|-------------|-------------|------|
|                                  | <b>BT151U-</b>                       | <b>500C</b> | <b>650C</b> | <b>800C</b> |      |
| $V_{\text{DRM}}, V_{\text{RRM}}$ | Repetitive peak off-state voltages   | 500         | 650         | 800         | V    |
| $I_{\text{T(AV)}}$               | Average on-state current             | 7.5         | 7.5         | 7.5         | A    |
| $I_{\text{T(RMS)}}$              | RMS on-state current                 | 12          | 12          | 12          | A    |
| $I_{\text{TSM}}$                 | Non-repetitive peak on-state current | 100         | 100         | 100         | A    |

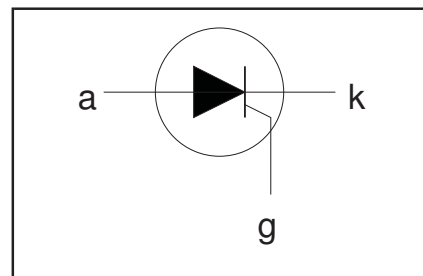
## PINNING - SOT533, (I-PAK)

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

## PIN CONFIGURATION



## SYMBOL



## LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 60134).

| SYMBOL                           | PARAMETER                                                    | CONDITIONS                                                                                             | MIN. | MAX.                             |                                  |                     | UNIT             |
|----------------------------------|--------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|------|----------------------------------|----------------------------------|---------------------|------------------|
| $V_{\text{DRM}}, V_{\text{RRM}}$ | Repetitive peak off-state voltages                           |                                                                                                        | -    | <b>-500C</b><br>500 <sup>1</sup> | <b>-650C</b><br>650 <sup>1</sup> | <b>-800C</b><br>800 | V                |
| $I_{\text{T(AV)}}$               | Average on-state current                                     | half sine wave; $T_{\text{mb}} \leq 104\text{ °C}$                                                     | -    | 7.5                              |                                  |                     | A                |
| $I_{\text{T(RMS)}}$              | RMS on-state current                                         | all conduction angles                                                                                  | -    | 12                               |                                  |                     | A                |
| $I_{\text{TSM}}$                 | Non-repetitive peak on-state current                         | half sine wave; $T_{\text{j}} = 25\text{ °C}$ prior to surge                                           | -    | 100                              |                                  |                     | A                |
|                                  |                                                              | $t = 10\text{ ms}$                                                                                     | -    | 110                              |                                  |                     | A                |
| $I^2t$                           | $I^2t$ for fusing                                            | $t = 8.3\text{ ms}$                                                                                    | -    | 50                               |                                  |                     | A <sup>2</sup> s |
| $di_{\text{T}}/dt$               | Repetitive rate of rise of on-state current after triggering | $t = 10\text{ ms}$                                                                                     | -    | 50                               |                                  |                     | A/ $\mu\text{s}$ |
|                                  |                                                              | $I_{\text{T}} = 20\text{ A}; I_{\text{G}} = 50\text{ mA}; di_{\text{G}}/dt = 50\text{ mA}/\mu\text{s}$ | -    | 50                               |                                  |                     |                  |
| $I_{\text{GM}}$                  | Peak gate current                                            |                                                                                                        | -    | 2                                |                                  |                     | A                |
| $V_{\text{RGM}}$                 | Peak reverse 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               |
| $T_{\text{j}}$                   | Junction temperature                                         |                                                                                                        | -    | 125                              |                                  |                     | °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 | -    | -    | 1.3  | K/W  |
| $R_{th\ j-a}$  | Thermal resistance<br>junction to ambient       |             | -    | 70   | -    | K/W  |

## STATIC CHARACTERISTICS

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

| SYMBOL     | PARAMETER                 | CONDITIONS                                                          | MIN. | TYP. | MAX. | UNIT |
|------------|---------------------------|---------------------------------------------------------------------|------|------|------|------|
| $I_{GT}$   | Gate trigger current      | $V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$                          | -    | 2    | 15   | mA   |
| $I_L$      | Latching current          | $V_D = 12\text{ V}$ ; $I_{GT} = 0.1\text{ A}$                       | -    | 10   | 40   | mA   |
| $I_H$      | Holding current           | $V_D = 12\text{ V}$ ; $I_{GT} = 0.1\text{ A}$                       | -    | 7    | 20   | mA   |
| $V_T$      | On-state voltage          | $I_T = 23\text{ A}$                                                 | -    | 1.44 | 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 | $V_D = V_{DRM(max)}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 125\text{ °C}$ | 0.25 | 0.4  | -    | V    |
|            |                           | $V_D = V_{DRM(max)}$ ; $V_R = V_{RRM(max)}$ ; $T_j = 125\text{ °C}$ | -    | 0.1  | 0.5  | mA   |

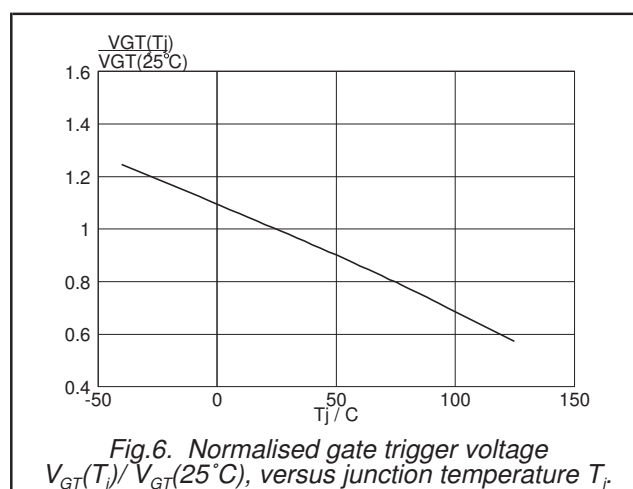
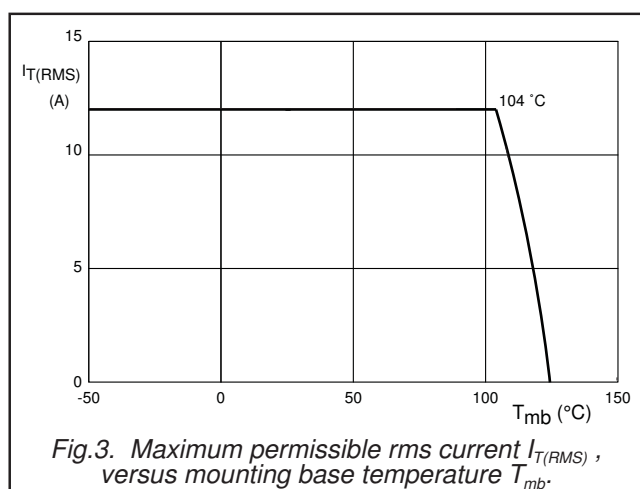
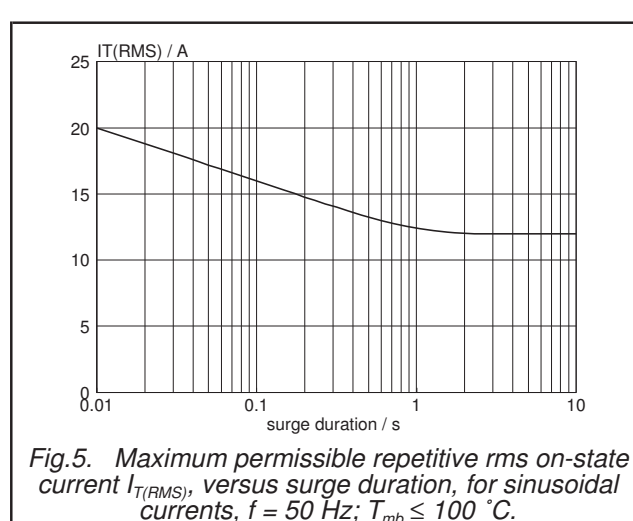
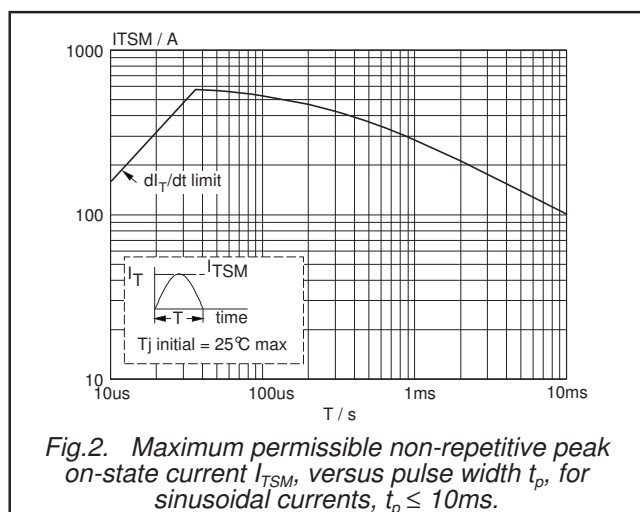
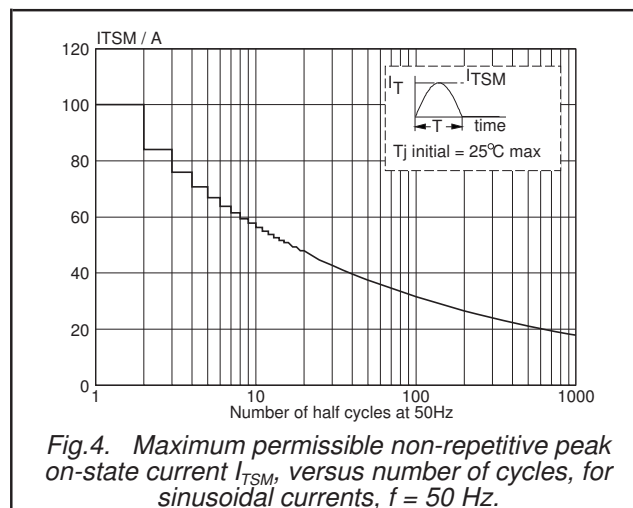
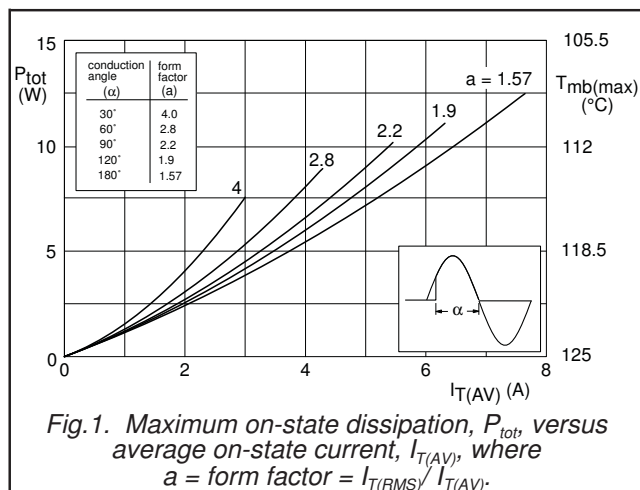
## DYNAMIC CHARACTERISTICS

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

| SYMBOL    | PARAMETER                                     | CONDITIONS                                                                                                                                                                                       | MIN. | TYP. | MAX. | UNIT       |
|-----------|-----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|------------|
| $dV_D/dt$ | Critical rate of rise of<br>off-state voltage | $V_{DM} = 67\% V_{DRM(max)}$ ; $T_j = 125\text{ °C}$ ;<br>exponential waveform                                                                                                                   |      |      |      |            |
| $t_{gt}$  | Gate controlled turn-on<br>time               | Gate open circuit<br>$R_{GK} = 100\ \Omega$                                                                                                                                                      | 50   | 130  | -    | V/ $\mu$ s |
|           |                                               | $I_{TM} = 40\text{ A}$ ; $V_D = V_{DRM(max)}$ ; $I_G = 0.1\text{ A}$ ;<br>$dI_G/dt = 5\text{ A}/\mu$ s                                                                                           | 200  | 1000 | -    | V/ $\mu$ s |
| $t_q$     | Circuit commutated<br>turn-off time           | $V_D = 67\% V_{DRM(max)}$ ; $T_j = 125\text{ °C}$ ;<br>$I_{TM} = 20\text{ A}$ ; $V_R = 25\text{ V}$ ; $dI_{TM}/dt = 30\text{ A}/\mu$ s;<br>$dV_D/dt = 50\text{ V}/\mu$ s; $R_{GK} = 100\ \Omega$ | -    | 70   | -    | $\mu$ s    |

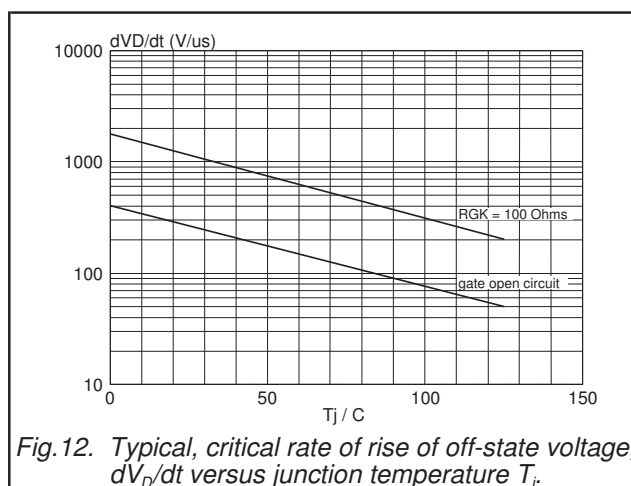
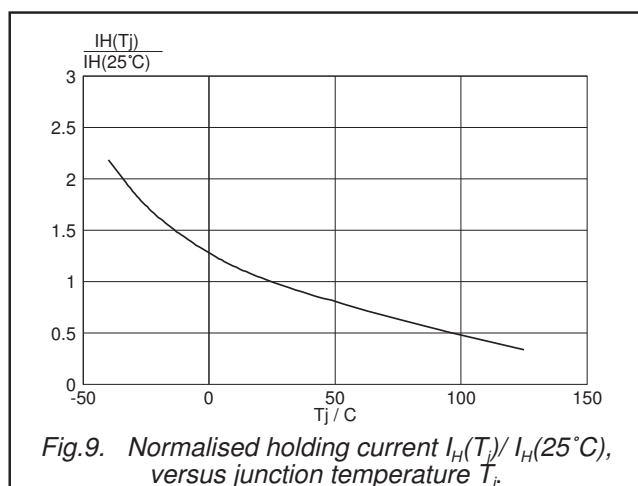
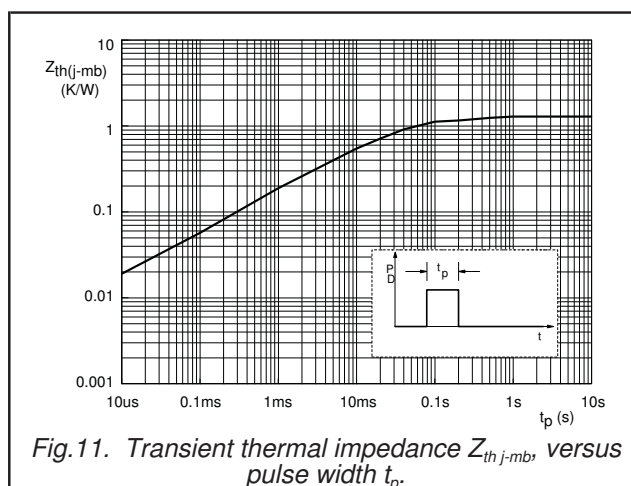
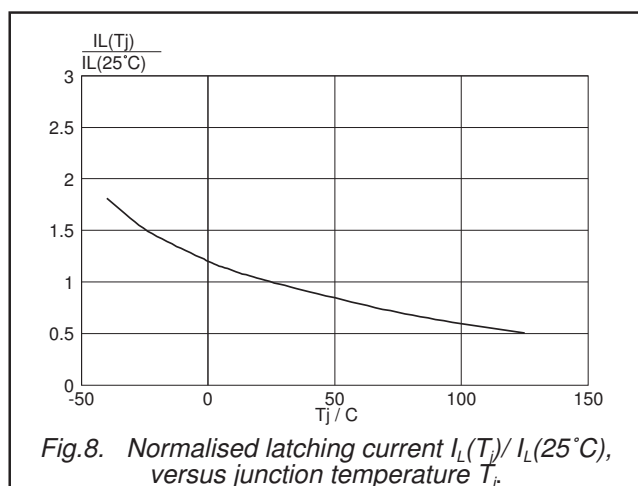
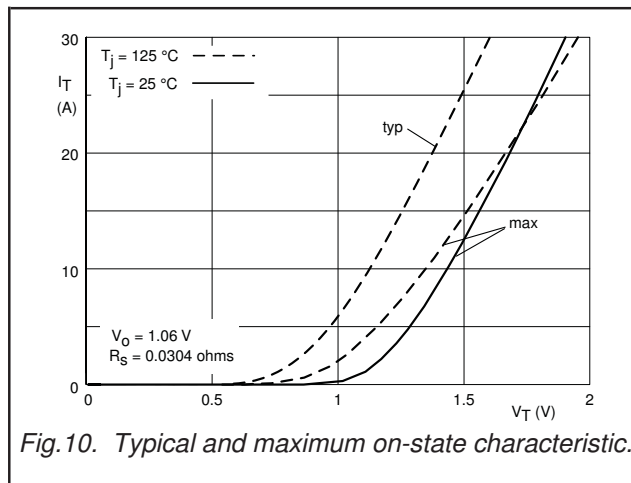
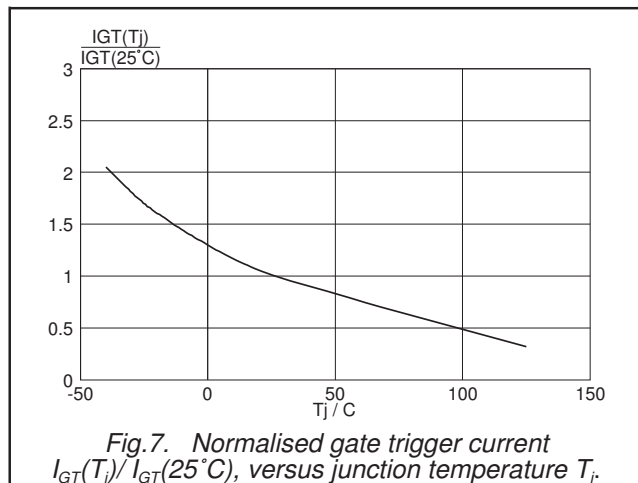
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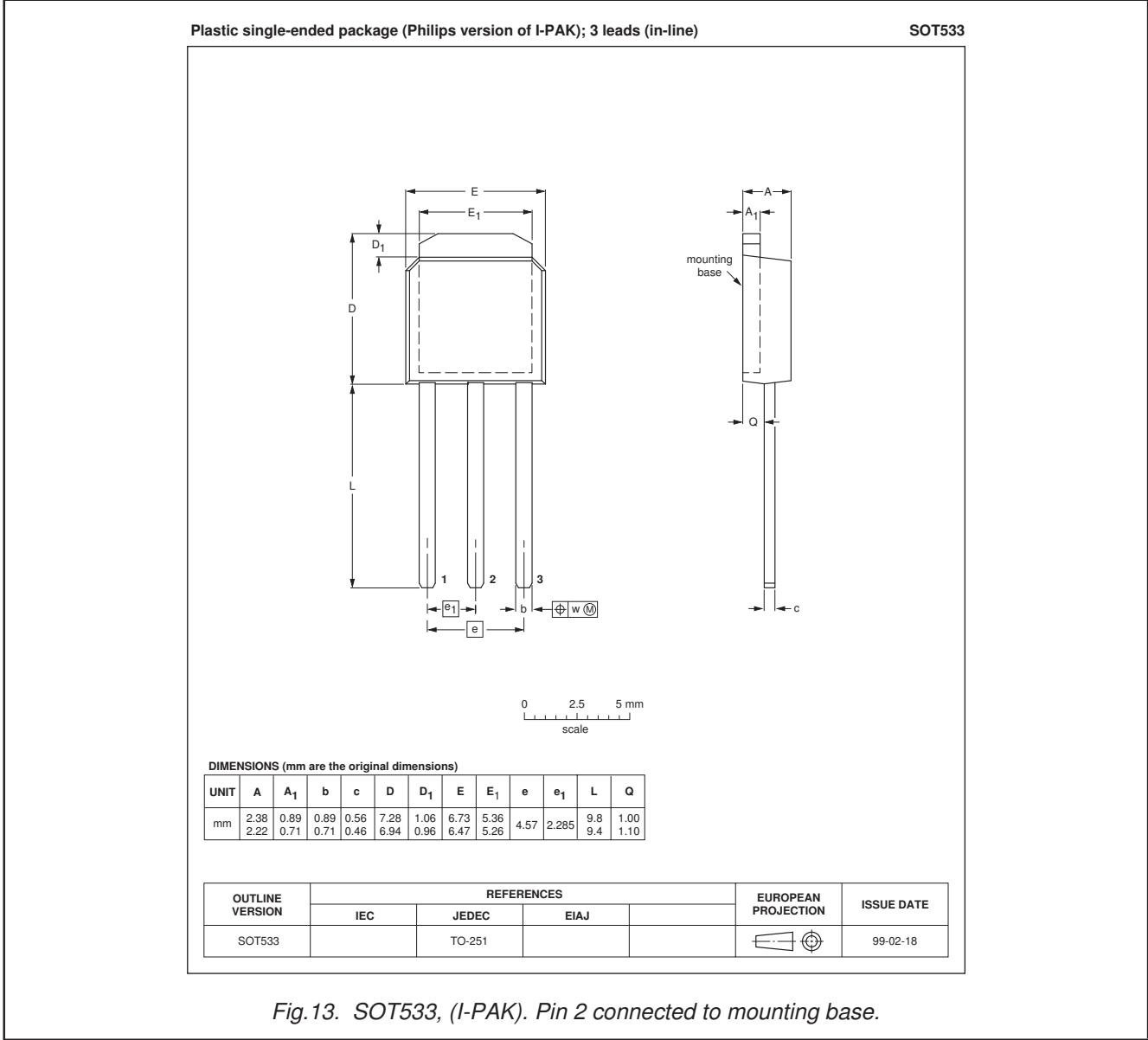
## BT151U series C



Thyristors

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MECHANICAL DATA



## Legal information

### DATA SHEET STATUS

| DOCUMENT STATUS <sup>(1)</sup> | PRODUCT STATUS <sup>(2)</sup> | DEFINITION                                                                            |
|--------------------------------|-------------------------------|---------------------------------------------------------------------------------------|
| Objective data sheet           | Development                   | This document contains data from the objective specification for product development. |
| 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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