

# Thyristors logic level

## BT169 series

### GENERAL DESCRIPTION

Passivated, sensitive gate thyristors in a plastic envelope, intended for use in general purpose switching and phase control applications. These devices are intended to be interfaced directly to microcontrollers, logic integrated circuits and other low power gate trigger circuits.

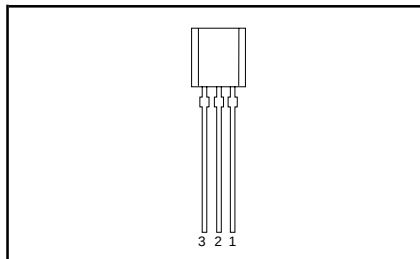
### QUICK REFERENCE DATA

| SYMBOL                   | PARAMETER                                          | MAX.<br>B | MAX.<br>D | MAX.<br>E | MAX.<br>G | UNIT |
|--------------------------|----------------------------------------------------|-----------|-----------|-----------|-----------|------|
| $V_{DRM}$ ,<br>$V_{RRM}$ | <b>BT169</b><br>Repetitive peak off-state voltages | 200       | 400       | 500       | 600       | V    |
| $I_{T(AV)}$              | Average on-state current                           | 0.5       | 0.5       | 0.5       | 0.5       | A    |
| $I_{T(RMS)}$             | RMS on-state current                               | 0.8       | 0.8       | 0.8       | 0.8       | A    |
| $I_{TSM}$                | Non-repetitive peak on-state current               | 8         | 8         | 8         | 8         | A    |

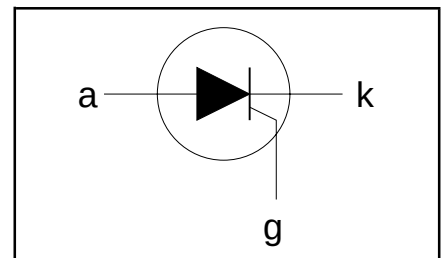
### PINNING - TO92 variant

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

### PIN CONFIGURATION



### SYMBOL



### LIMITING VALUES

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

| SYMBOL                | PARAMETER                                                    | CONDITIONS                                                                                                    | MIN. | MAX.                         |                              |                              |                              | UNIT             |
|-----------------------|--------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|------|------------------------------|------------------------------|------------------------------|------------------------------|------------------|
| $V_{DRM}$ , $V_{RRM}$ | Repetitive peak off-state voltages                           |                                                                                                               | -    | <b>B</b><br>200 <sup>1</sup> | <b>D</b><br>400 <sup>1</sup> | <b>E</b><br>500 <sup>1</sup> | <b>G</b><br>600 <sup>1</sup> | V                |
| $I_{T(AV)}$           | Average on-state current                                     | half sine wave;<br>$T_{lead} \leq 83^\circ\text{C}$                                                           | -    | 0.5                          |                              |                              |                              | A                |
| $I_{T(RMS)}$          | RMS on-state current                                         | all conduction angles                                                                                         | -    | 0.8                          |                              |                              |                              | A                |
| $I_{TSM}$             | Non-repetitive peak on-state current                         | $t = 10\text{ ms}$                                                                                            | -    | 8                            |                              |                              |                              | A                |
|                       |                                                              | $t = 8.3\text{ ms}$                                                                                           | -    | 9                            |                              |                              |                              | A                |
| $I^2t$                | $I^2t$ for fusing                                            | half sine wave;<br>$T_j = 25^\circ\text{C}$ prior to surge                                                    | -    | 0.32                         |                              |                              |                              | A <sup>2</sup> s |
| $di_T/dt$             | Repetitive rate of rise of on-state current after triggering | $t = 10\text{ ms}$<br>$I_{TM} = 2\text{ A}$ ; $I_G = 10\text{ mA}$ ;<br>$di_G/dt = 100\text{ mA}/\mu\text{s}$ | -    | 50                           |                              |                              |                              | A/ $\mu\text{s}$ |
| $I_{GM}$              | Peak gate current                                            |                                                                                                               | -    | 1                            |                              |                              |                              | A                |
| $V_{GM}$              | Peak gate voltage                                            |                                                                                                               | -    | 5                            |                              |                              |                              | V                |
| $V_{RGM}$             | Peak reverse gate voltage                                    |                                                                                                               | -    | 5                            |                              |                              |                              | V                |
| $P_{GM}$              | Peak gate power                                              |                                                                                                               | -    | 2                            |                              |                              |                              | W                |
| $P_{G(AV)}$           | Average gate power                                           | over any 20 ms period                                                                                         | -    | 0.1                          |                              |                              |                              | W                |
| $T_{stg}$             | Storage temperature                                          |                                                                                                               | -40  | 150                          |                              |                              |                              | $^\circ\text{C}$ |
| $T_j$                 | Operating junction temperature                               |                                                                                                               | -    | 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 |
|------------------|----------------------------------------|--------------------------------|------|------|------|------|
| $R_{th\ j-lead}$ | Thermal resistance junction to lead    |                                | -    | -    | 60   | K/W  |
| $R_{th\ j-a}$    | Thermal resistance junction to ambient | pcb mounted; lead length = 4mm | -    | 150  | -    | 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      | $V_D = 12\ \text{V}$ ; $I_T = 10\ \text{mA}$ ; gate open circuit                                         | -    | 50   | 200  | $\mu\text{A}$ |
| $I_L$      | Latching current          | $V_D = 12\ \text{V}$ ; $I_{GT} = 0.5\ \text{mA}$ ; $R_{GK} = 1\ \text{k}\Omega$                          | -    | 2    | 6    | $\text{mA}$   |
| $I_H$      | Holding current           | $V_D = 12\ \text{V}$ ; $I_{GT} = 0.5\ \text{mA}$ ; $R_{GK} = 1\ \text{k}\Omega$                          | -    | 2    | 5    | $\text{mA}$   |
| $V_T$      | On-state voltage          | $I_T = 1\ \text{A}$                                                                                      | -    | 1.2  | 1.35 | $\text{V}$    |
| $V_{GT}$   | Gate trigger voltage      | $V_D = 12\ \text{V}$ ; $I_T = 10\ \text{mA}$ ; gate open circuit                                         | -    | 0.5  | 0.8  | $\text{V}$    |
|            |                           | $V_D = V_{DRM(max)}$ ; $I_T = 10\ \text{mA}$ ; $T_j = 125\ ^\circ\text{C}$ ; gate open circuit           | 0.2  | 0.3  | -    | $\text{V}$    |
| $I_D, I_R$ | Off-state leakage current | $V_D = V_{DRM(max)}$ ; $V_R = V_{RRM(max)}$ ; $T_j = 125\ ^\circ\text{C}$ ; $R_{GK} = 1\ \text{k}\Omega$ | -    | 0.05 | 0.1  | $\text{mA}$   |

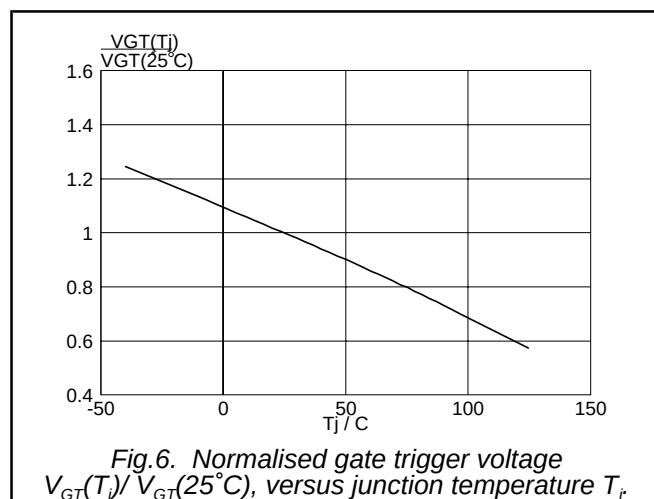
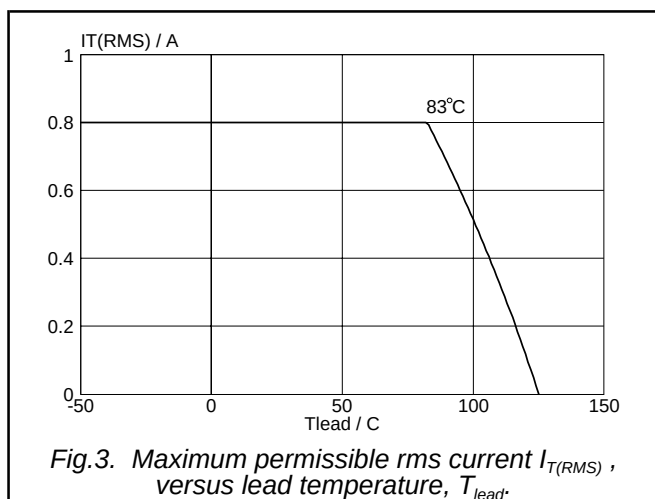
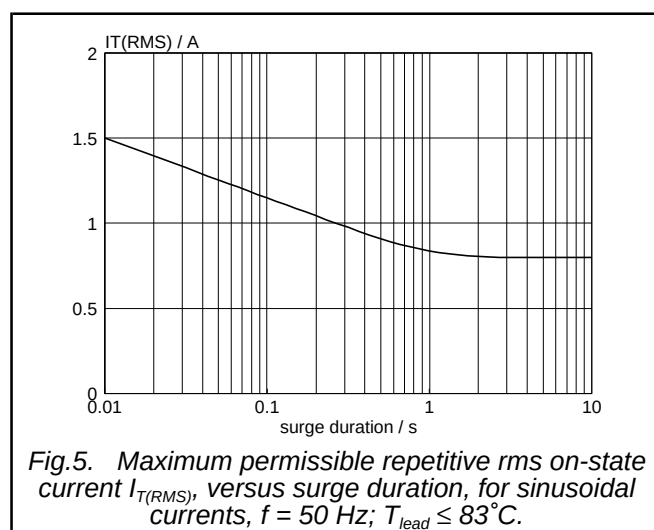
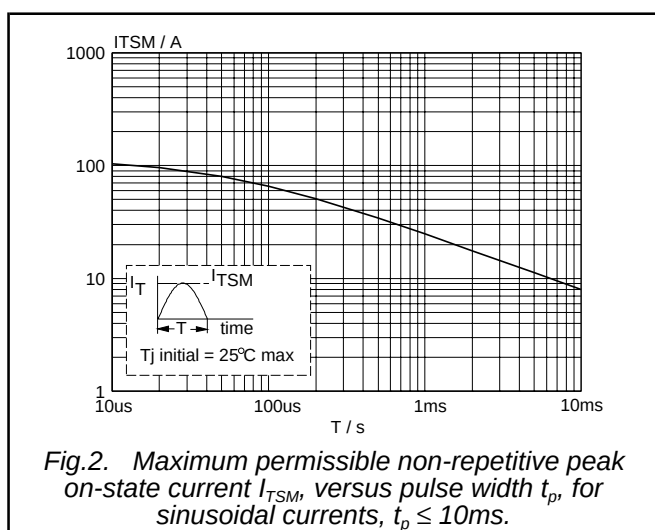
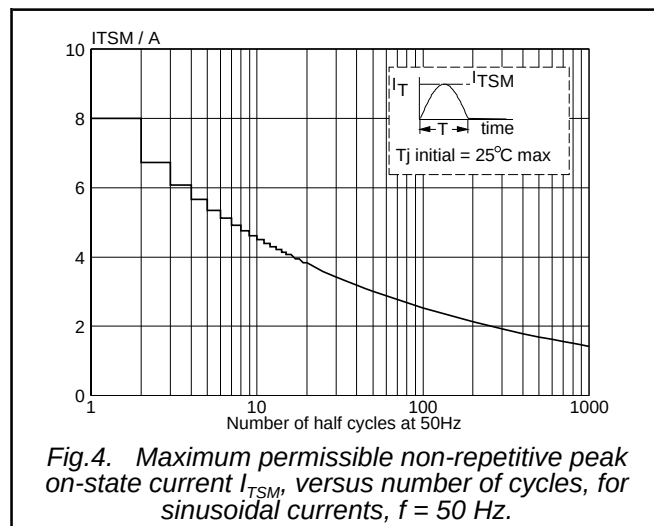
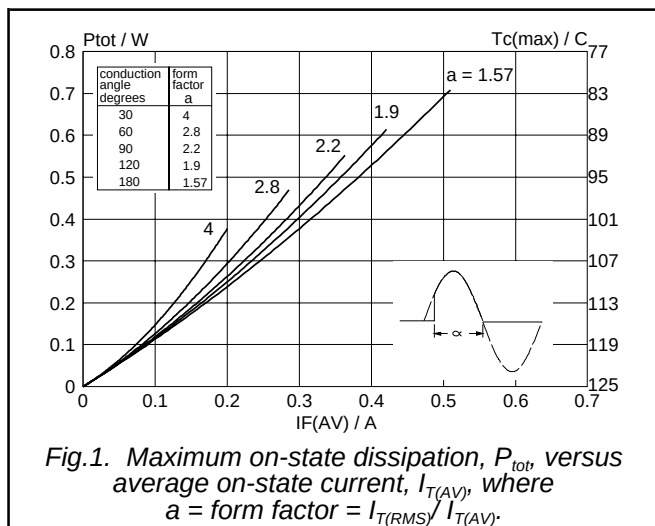
### DYNAMIC CHARACTERISTICS

$T_j = 25\ ^\circ\text{C}$  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; $R_{GK} = 1\ \text{k}\Omega$                                                                                                          | 500  | 800  | -    | $\text{V}/\mu\text{s}$ |
| $t_{gt}$  | Gate controlled turn-on time               | $I_{TM} = 2\ \text{A}$ ; $V_D = V_{DRM(max)}$ ; $I_G = 10\ \text{mA}$ ; $dI_G/dt = 0.1\ \text{A}/\mu\text{s}$                                                                                                            | -    | 2    | -    | $\mu\text{s}$          |
| $t_q$     | Circuit commutated turn-off time           | $V_D = 67\% V_{DRM(max)}$ ; $T_j = 125\ ^\circ\text{C}$ ; $I_{TM} = 1.6\ \text{A}$ ; $V_R = 35\ \text{V}$ ; $dI_{TM}/dt = 30\ \text{A}/\mu\text{s}$ ; $dV_D/dt = 2\ \text{V}/\mu\text{s}$ ; $R_{GK} = 1\ \text{k}\Omega$ | -    | 100  | -    | $\mu\text{s}$          |

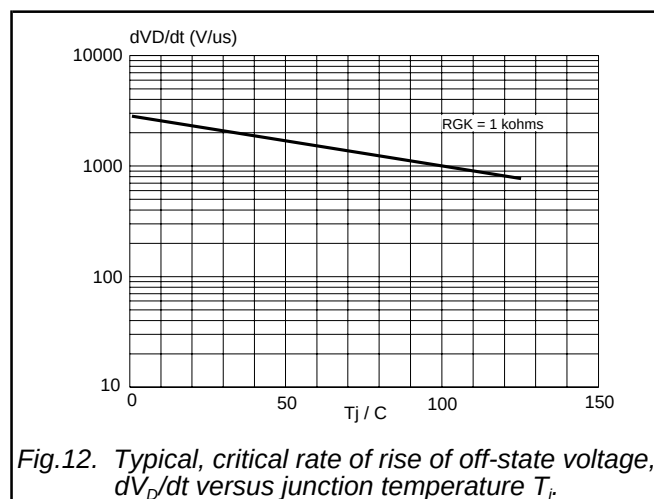
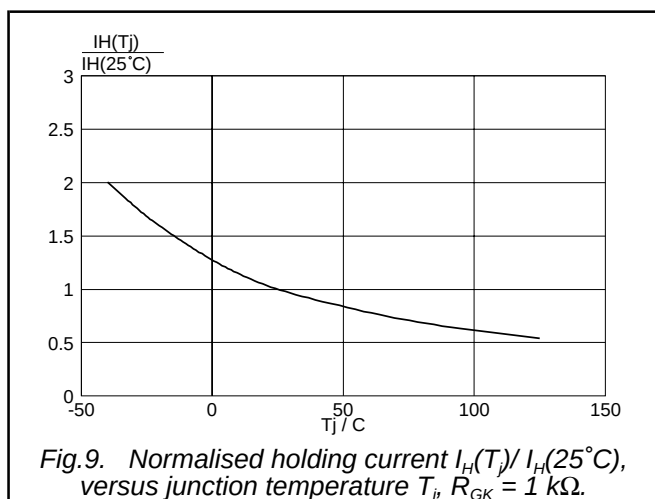
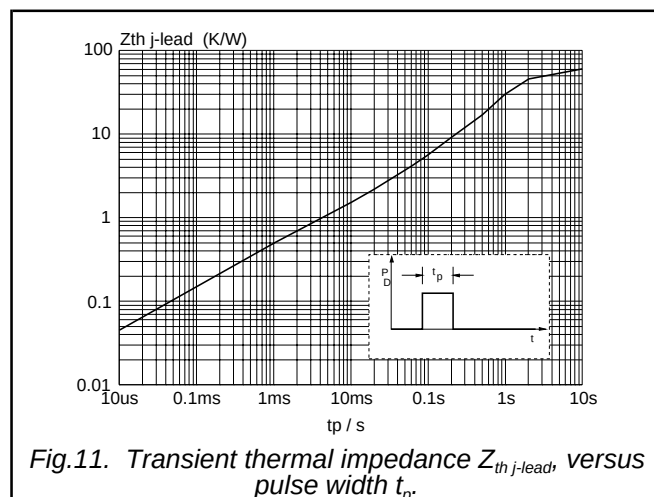
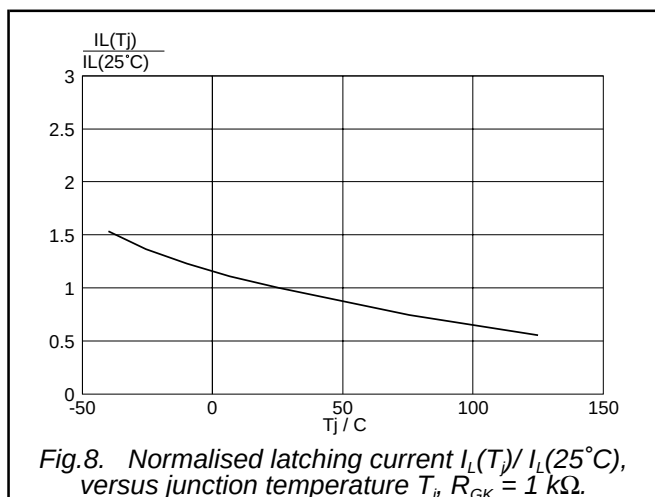
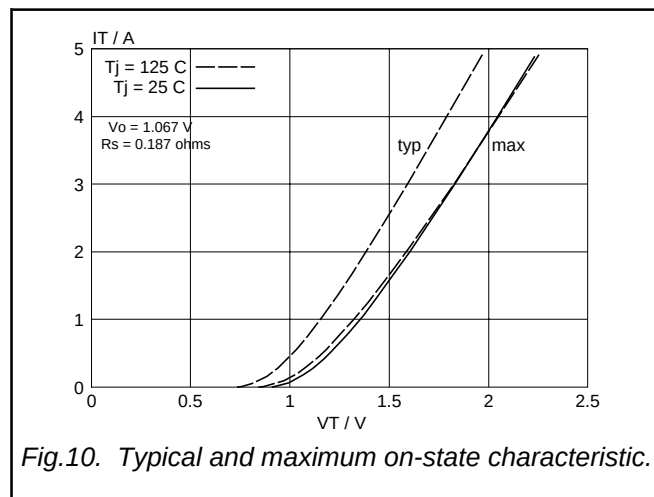
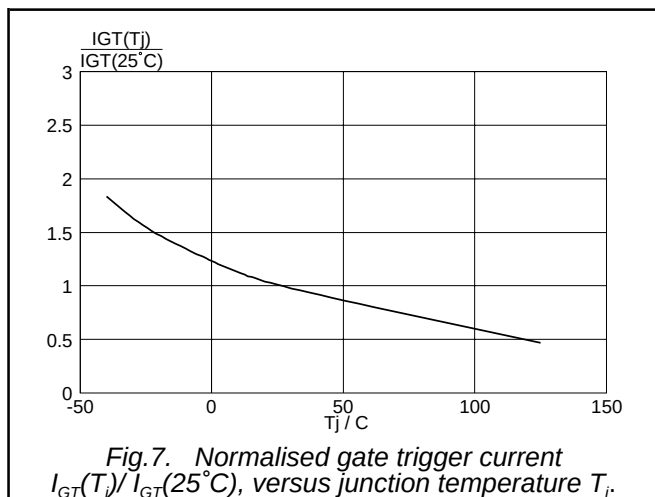
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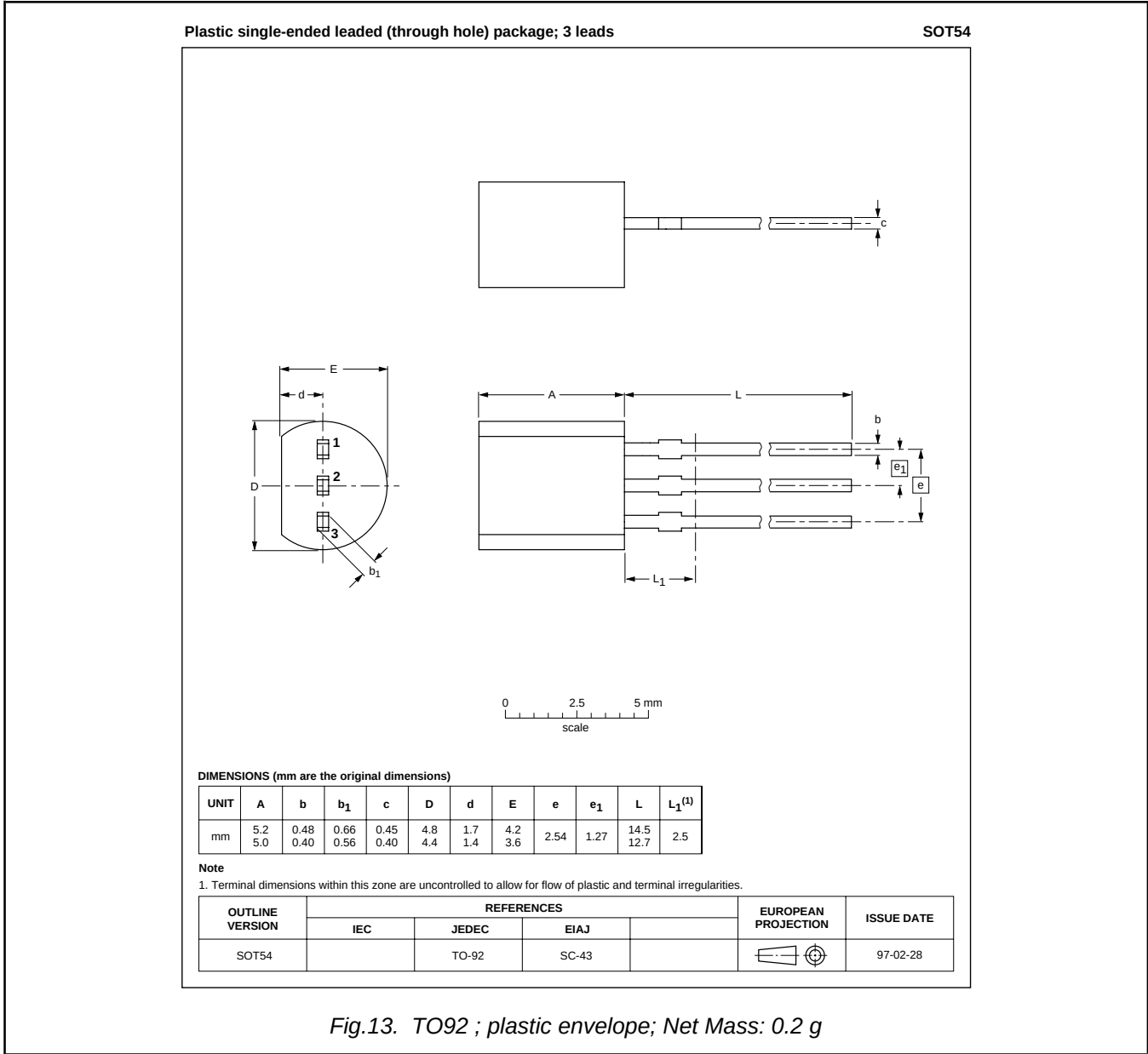
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MECHANICAL DATA



Notes

1. Epoxy meets UL94 V0 at 1/8".

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### DEFINITIONS

| DATA SHEET STATUS                                                                                                                                                                                                                                                                                                                                                                                                                                          |                             |                                                                                                                                                                                                                                                                                                                       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DATA SHEET STATUS <sup>2</sup>                                                                                                                                                                                                                                                                                                                                                                                                                             | PRODUCT STATUS <sup>3</sup> | 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                                     |
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| <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>                                                                                                                                                                                                                                                                                                                                                                                                                             |                             |                                                                                                                                                                                                                                                                                                                       |
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