

# DATA SHEET

## **BFG10W/X** UHF power transistor

Product specification

1995 Sep 22



# UHF power transistor

# BFG10W/X

### FEATURES

- High efficiency
- Small size discrete power amplifier
- 900 MHz and 1.9 GHz operating areas
- Gold metallization ensures excellent reliability.

### APPLICATIONS

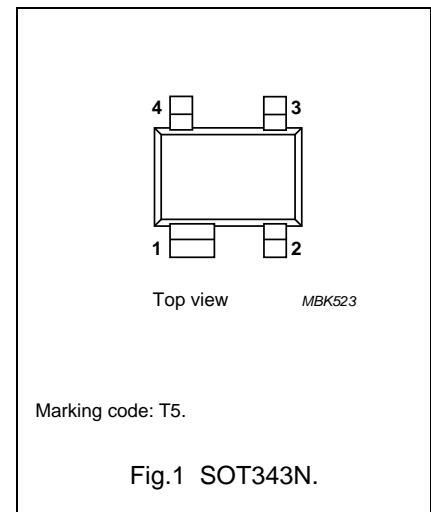
- Common emitter class-AB operation in hand-held radio equipment up to 1.9 GHz.

### DESCRIPTION

NPN silicon planar epitaxial transistor encapsulated in a plastic, 4-pin dual-emitter SOT343N package.

### PINNING

| PIN | DESCRIPTION |
|-----|-------------|
| 1   | collector   |
| 2   | emitter     |
| 3   | base        |
| 4   | emitter     |



### QUICK REFERENCE DATA

RF performance at  $T_{amb} = 25\text{ °C}$  in a common-emitter test circuit.

| MODE OF OPERATION  | f (GHz) | V <sub>CE</sub> (V) | P <sub>L</sub> (mW) | G <sub>p</sub> (dB) | η <sub>c</sub> (%) |
|--|---------|---------------------|---------------------|---------------------|--------------------|
| Pulsed, class-AB, duty cycle: < 1 : 2; t <sub>p</sub> = 10 ms  | 1.9     | 3.6                 | 200                 | ≥5                  | ≥50                |
| Pulsed, class-AB, duty cycle: < 1 : 8; t <sub>p</sub> = 4.6 ms | 0.9     | 6                   | 650                 | ≥10                 | ≥50                |
|  | 0.9     | 6                   | 360                 | ≥12.5               | ≥50                |

### LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134).

| SYMBOL             | PARAMETER                 | CONDITIONS                            | MIN. | MAX. | UNIT |
|--------------------|---------------------------|---------------------------------------|------|------|------|
| V <sub>CBO</sub>   | collector-base voltage    | open emitter                          | –    | 20   | V    |
| V <sub>CEO</sub>   | collector-emitter voltage | open base                             | –    | 10   | V    |
| V <sub>EBO</sub>   | emitter-base voltage      | open collector                        | –    | 2.5  | V    |
| I <sub>C</sub>     | collector current (DC)    |                                       | –    | 250  | mA   |
| I <sub>C(AV)</sub> | average collector current |                                       | –    | 250  | mA   |
| P <sub>tot</sub>   | total power dissipation   | up to T <sub>s</sub> = 102 °C; note 1 | –    | 400  | mW   |
| T <sub>stg</sub>   | storage temperature       |                                       | –65  | +150 | °C   |
| T <sub>j</sub>     | junction temperature      |                                       | –    | 175  | °C   |

### THERMAL CHARACTERISTICS

| SYMBOL              | PARAMETER   | CONDITIONS   | VALUE | UNIT |
|---------------------|---|--|-------|------|
| R <sub>th j-s</sub> | thermal resistance from junction to soldering point | up to T <sub>s</sub> = 102 °C; note 1; P <sub>tot</sub> = 400 mW | 180   | K/W  |

### Note to the Limiting values and Thermal characteristics

1. T<sub>s</sub> is the temperature at the soldering point of the collector pin.

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**CHARACTERISTICS**

T<sub>j</sub> = 25 °C (unless otherwise specified).

| SYMBOL               | PARAMETER                           | CONDITIONS  | MIN. | MAX. | UNIT |
|----------------------|-------------------------------------|---|------|------|------|
| V <sub>(BR)CBO</sub> | collector-base breakdown voltage    | open emitter; I <sub>C</sub> = 0.1 mA                                 | 20   | –    | V    |
| V <sub>(BR)CEO</sub> | collector-emitter breakdown voltage | open base; I <sub>C</sub> = 5 mA                                      | 10   | –    | V    |
| V <sub>(BR)EBO</sub> | emitter-base breakdown voltage      | open collector; I <sub>E</sub> = 0.1 mA                               | 2.5  | –    | V    |
| I <sub>CES</sub>     | collector cut-off current           | V <sub>CE</sub> = 6 V; V <sub>BE</sub> = 0                            | –    | 100  | μA   |
| h <sub>FE</sub>      | DC current gain                     | I <sub>C</sub> = 50 mA; V <sub>CE</sub> = 5 V                         | 25   | –    |      |
| C <sub>c</sub>       | collector capacitance               | I <sub>E</sub> = i <sub>e</sub> = 0; V <sub>CB</sub> = 6 V; f = 1 MHz | –    | 3    | pF   |
| C <sub>re</sub>      | feedback capacitance                | I <sub>C</sub> = 0; V <sub>CE</sub> = 6 V; f = 1 MHz                  | –    | 2    | pF   |

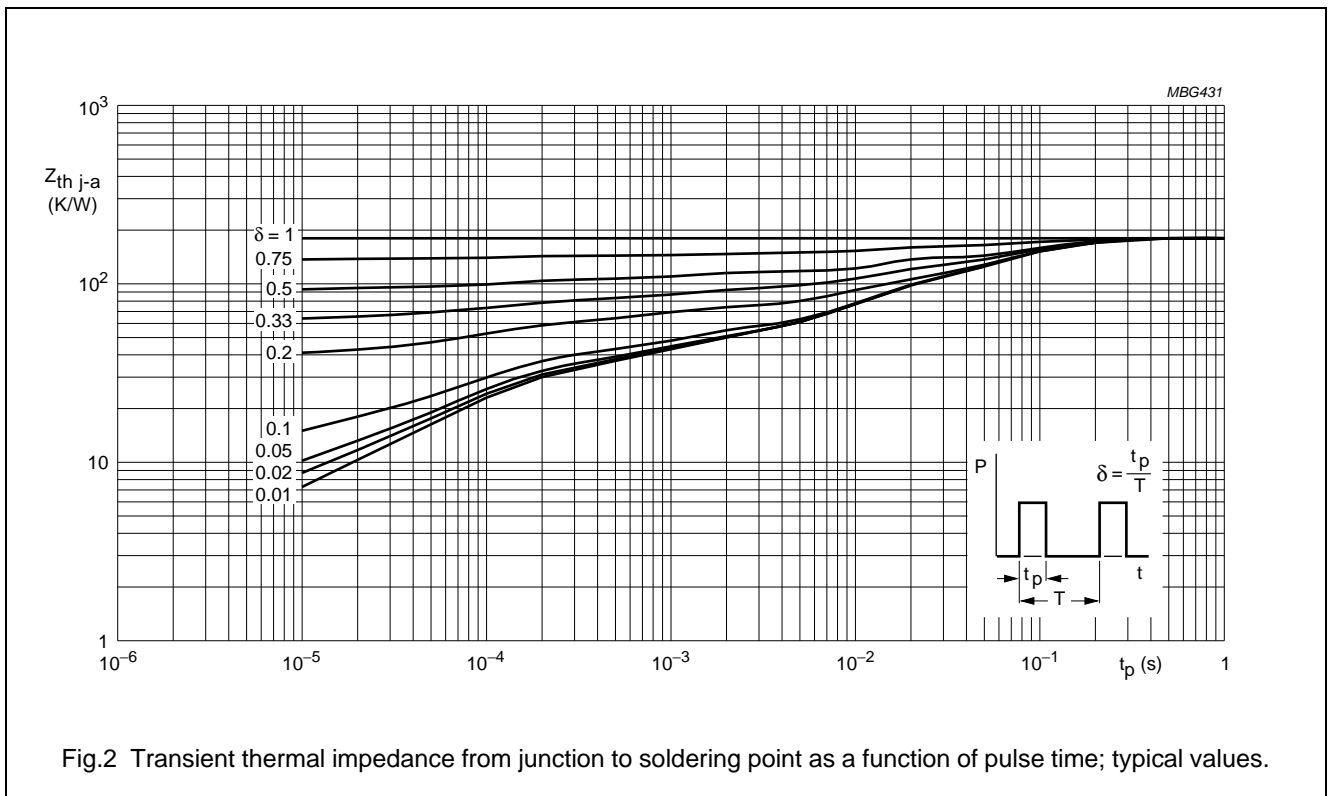
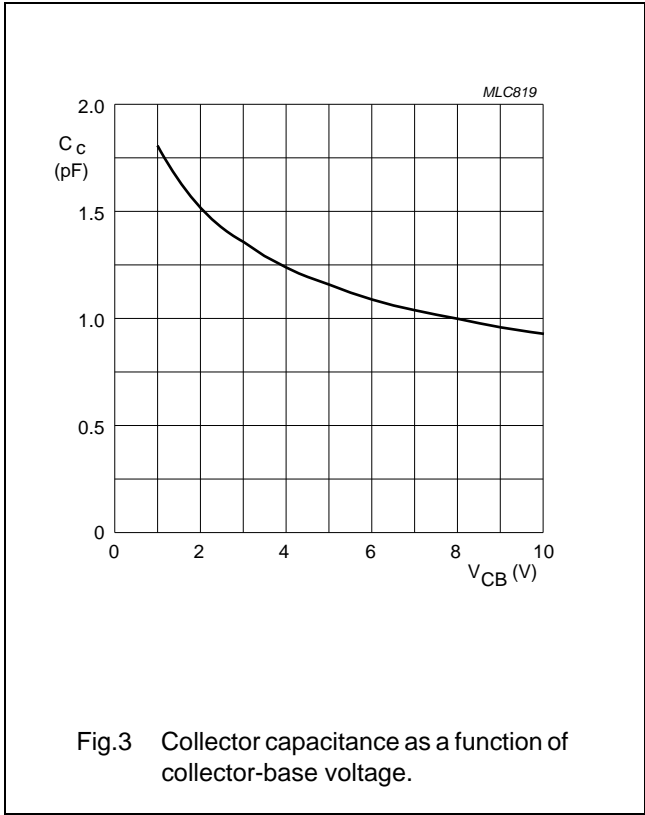


Fig.2 Transient thermal impedance from junction to soldering point as a function of pulse time; typical values.

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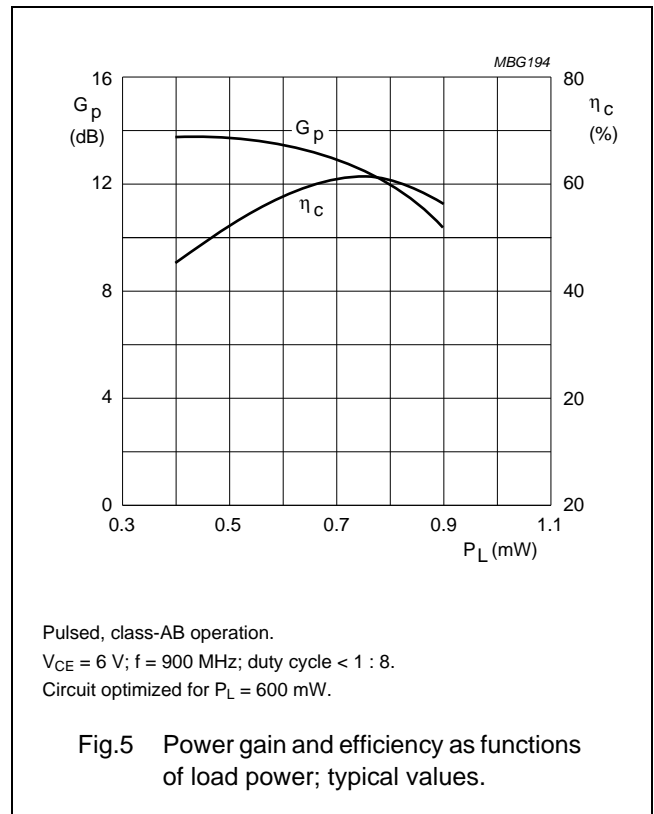
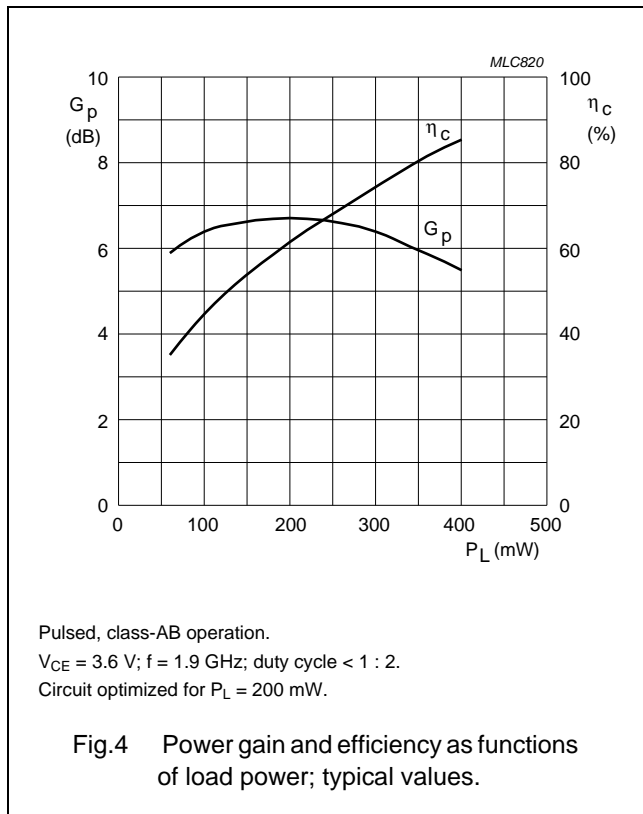
APPLICATION INFORMATION

RF performance at  $T_{amb} = 25\text{ }^{\circ}\text{C}$  in a common-emitter test circuit.

| MODE OF OPERATION   | f (GHz) | V <sub>CE</sub> (V) | P <sub>L</sub> (mW) | G <sub>p</sub> (dB) | η <sub>c</sub> (%) |
|---|---------|---------------------|---------------------|---------------------|--------------------|
| Pulsed, class-AB, duty cycle: < 1 : 2; t <sub>p</sub> = 10 ms | 1.9     | 3.6                 | 200                 | ≥5; typ. 7          | ≥50; typ. 60       |
| Pulsed, class-AB, duty cycle: < 1 : 8; t <sub>p</sub> = 5 ms  | 0.9     | 6                   | 650                 | ≥10                 | ≥50                |
|   | 0.9     | 6                   | 360                 | ≥12.5               | ≥50                |

Ruggedness in class-AB operation

The BFG10W/X is capable of withstanding a load mismatch corresponding to VSWR = 6 : 1 through all phases under pulsed conditions up to a supply voltage of 8.6 V under the conditions: 900 MHz; 650 mW; t<sub>p</sub> = 4.6 ms; duty cycle of 1 : 8 and up to a supply voltage of 5.5 V under the conditions: 1.9 GHz; 200 mW; t<sub>p</sub> = 10 ms; duty cycle of 1 : 2.



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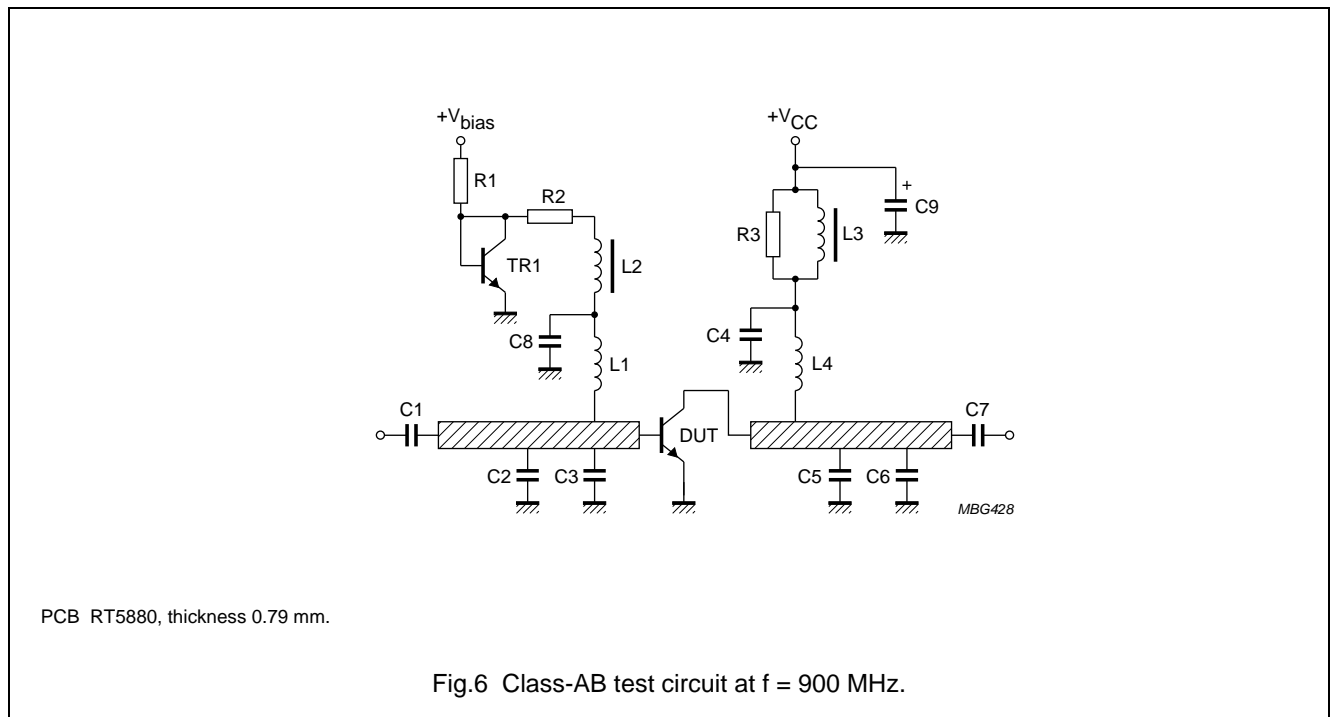
BFG10W/X

List of components (see Fig.6)

| COMPONENT  | DESCRIPTION                          | VALUE              | DIMENSIONS    | CATALOGUE No.  |
|------------|--------------------------------------|--------------------|---------------|----------------|
| TR1        | bias transistor, BC548 or equivalent | note 1             |               |                |
| C1, C4, C7 | capacitor; notes 2 and 3             | 120 pF             |               |                |
| C2         | capacitor; note 2                    | 6.8 pF             |               |                |
| C3         | capacitor; note 2                    | 0.5 pF             |               |                |
| C5         | capacitor; note 2                    | 1.2 pF             |               |                |
| C6         | capacitor; note 2                    | 1.9 pF             |               |                |
| C8         | Philips multilayer capacitor         | 1 nF, 10 V         |               |                |
| C9         | Philips capacitor                    | 1500 $\mu$ F, 10 V |               | 2222 032 14152 |
| L1         | 6 turns enamelled 0.7 mm copper wire |                    | length 3.5 mm |                |
| L4         | 2 turns enamelled 0.7 mm copper wire |                    | length 3 mm   |                |
| L2, L3     | RF choke, Philips                    |                    |               | 4312 020 36690 |
| R1         | metal film resistor                  | 275 $\Omega$       |               |                |
| R2         | metal film resistor                  | 100 $\Omega$       |               |                |
| R3         | metal film resistor                  | 10 $\Omega$        |               |                |

Notes

1.  $V_{BE}$  at 1 mA must be 0.65 V.
2. American Technical Ceramics type 100A or capacitor of same quality.
3. Resonant at 1900 MHz.



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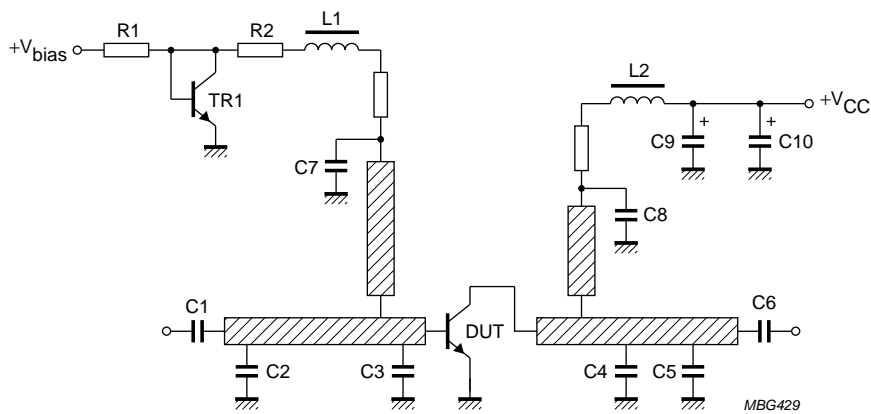
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List of components (see Fig.6)

| COMPONENT      | DESCRIPTION                          | VALUE              | DIMENSIONS | CATALOGUE No.  |
|----------------|--------------------------------------|--------------------|------------|----------------|
| TR1            | bias transistor, BC548 or equivalent | note 1             |            |                |
| C1, C6, C7, C8 | capacitor; notes 2 and 3             | 24 pF              |            |                |
| C2             | capacitor; note 2                    | 0.4 pF             |            |                |
| C3             | capacitor; note 2                    | 2.4 pF             |            |                |
| C4             | capacitor; note 2                    | 0.5 pF             |            |                |
| C5             | capacitor; note 2                    | 1.2 pF             |            |                |
| C9, C10        | Philips capacitor                    | 1500 $\mu$ F, 10 V |            | 2222 032 14152 |
| L1, L2         | RF choke, Philips                    |                    |            | 4330 030 36301 |
| R1, R2         | metal film resistor                  | 75 $\Omega$        |            |                |
| R3, R4         | metal film resistor                  | 10 $\Omega$        |            |                |

Notes

1.  $V_{BE}$  at 1 mA must be 0.65 V.
2. American Technical Ceramics type 100A or capacitor of same quality.
3. Resonant at 1900 MHz.



PCB RT5880, thickness 0.79 mm.

Fig.7 Class-AB test circuit at  $f = 1.9$  GHz.

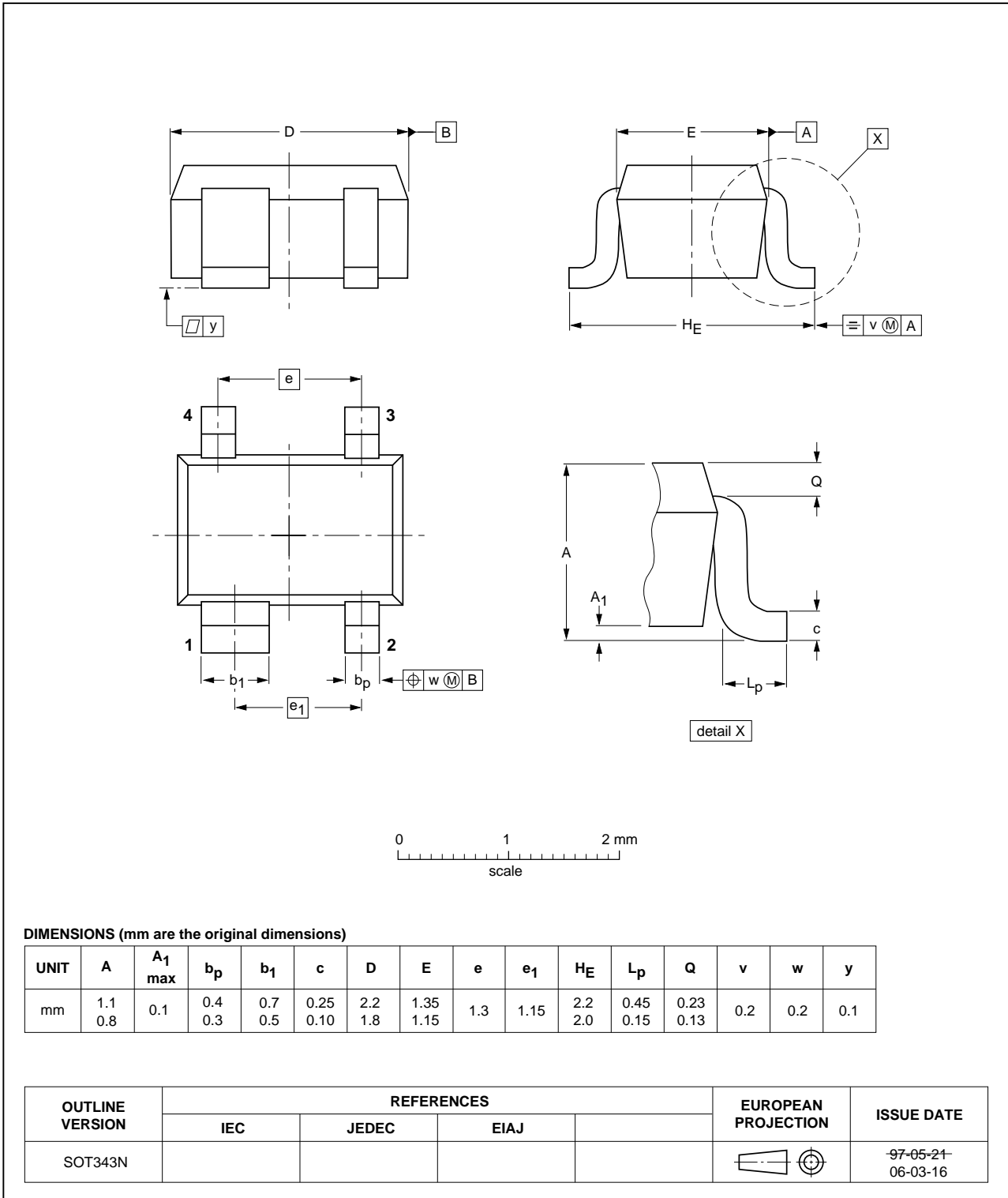
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PACKAGE OUTLINE

Plastic surface-mounted package; 4 leads

SOT343N





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## 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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