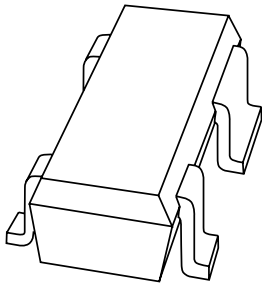


DATA SHEET



BFG21W UHF power transistor

Product specification
Supersedes data of 1997 Nov 21
File under Discrete Semiconductors, SC14

1998 Jul 06

UHF power transistor

BFG21W

FEATURES

- High power gain
- High efficiency
- 1.9 GHz operating area
- Linear and non-linear operation.

APPLICATIONS

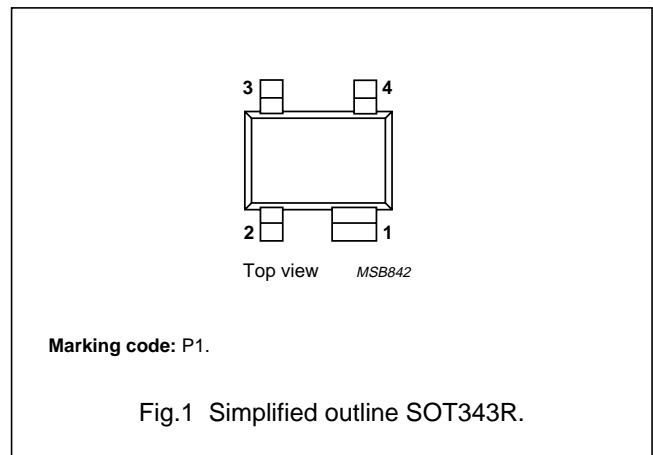
- Common emitter class-AB output stage in hand held radio equipment at 1.9 GHz such as DECT, PHS, etc.
- Driver for DCS1800, 1900.

DESCRIPTION

NPN double polysilicon bipolar power transistor with buried layer for low voltage medium power applications encapsulated in a plastic, 4-pin dual-emitter SOT343R package.

PINNING

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



QUICK REFERENCE DATA

RF performance at $T_s \leq 60 \text{ }^\circ\text{C}$ in a common emitter test circuit.

| MODE OF OPERATION | f (GHz) | V _{CE} (V) | P _L (dBm) | G _p (dB) | η_c (%) |
|--|---------|---------------------|----------------------|---------------------|--------------|
| Pulsed class-AB; $\delta < 1 : 2$; $t_p = 5 \text{ ms}$ | 1.9 | 3.6 | 26 | ≥ 10 | typ.55 |

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LIMITING VALUES

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

| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | UNIT |
|------------------|--------------------------------|--------------------------------|------|------|------|
| V _{CBO} | collector-base voltage | open emitter | – | 15 | V |
| V _{CEO} | collector-emitter voltage | open base | – | 4.5 | V |
| V _{EBO} | emitter-base voltage | open collector | – | 1 | V |
| I _C | collector current (DC) | | – | 500 | mA |
| P _{tot} | total power dissipation | T _s ≤ 60 °C; note 1 | – | 600 | mW |
| T _{stg} | storage temperature | | –65 | +150 | °C |
| T _j | operating junction temperature | | – | 150 | °C |

Note

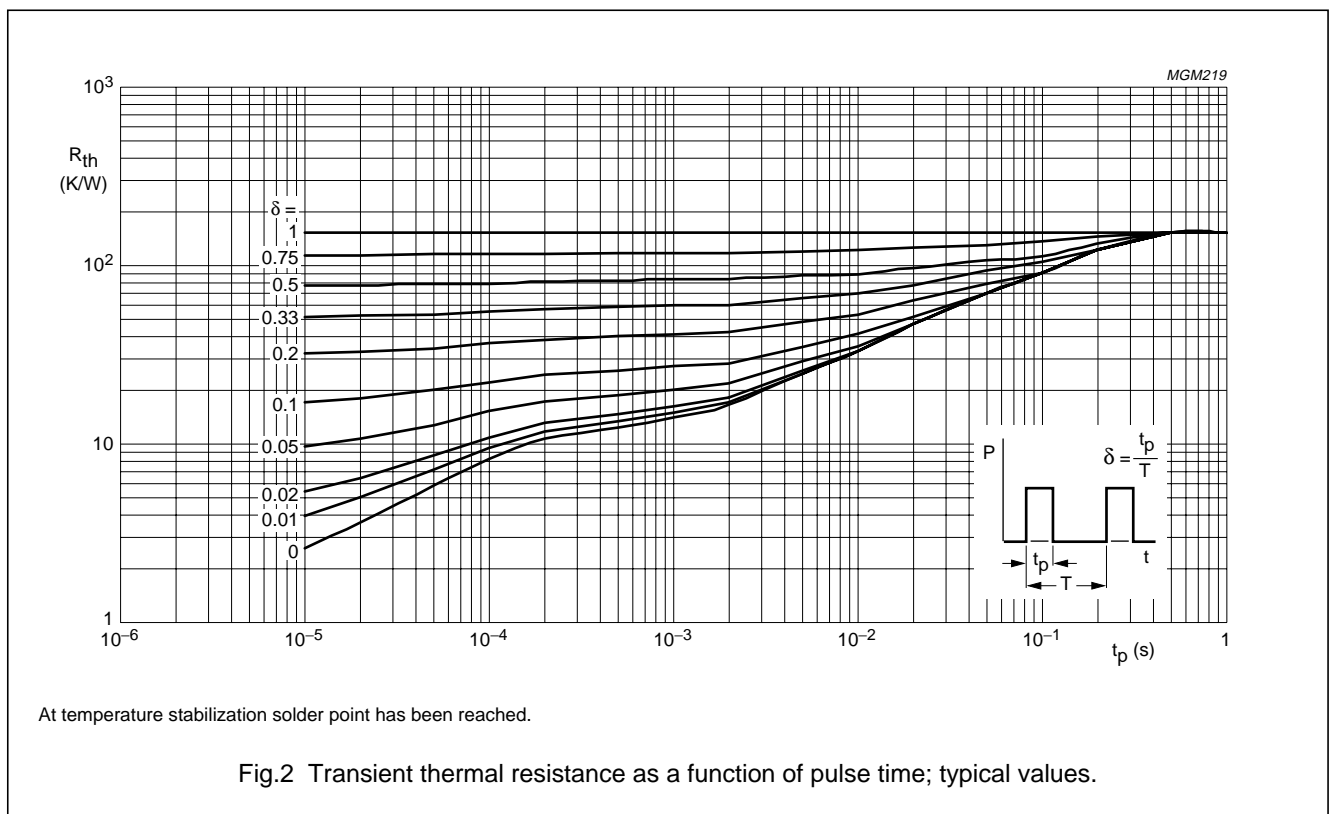
1. T_s is the temperature at the soldering point of the emitter pins.

THERMAL CHARACTERISTICS

| SYMBOL | PARAMETER | CONDITIONS | VALUE | UNIT |
|---------------------|---|---|-------|------|
| R _{th j-s} | thermal resistance from junction to soldering point | T _s ≤ 60 °C; P _{tot} = 600 mW; note 1 | 150 | K/W |

Note

1. T_s is the temperature at the soldering point of the emitter pins.



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CHARACTERISTICS

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

| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | UNIT |
|---------------|-------------------------------------|--|------|------|---------------|
| $V_{(BR)CBO}$ | collector-base breakdown voltage | open emitter; $I_C = 0.1\text{ mA}$ | 15 | – | V |
| $V_{(BR)CEO}$ | collector-emitter breakdown voltage | open base; $I_C = 10\text{ mA}$ | 4.5 | – | V |
| $V_{(BR)CER}$ | collector-emitter breakdown voltage | $R_{BE} < 1\text{ k}\Omega$, $I_C = 10\text{ mA}$ | 10 | – | V |
| $V_{(BR)EBO}$ | emitter-base breakdown voltage | open collector; $I_E = 0.1\text{ mA}$ | 1 | – | V |
| I_{CES} | collector leakage current | $V_{CE} = 5\text{ V}$; $V_{BE} = 0$ | – | 10 | μA |
| h_{FE} | DC current gain | $I_C = 200\text{ mA}$; $V_{CE} = 2\text{ V}$ | 40 | 100 | |
| C_c | collector capacitance | $I_E = i_e = 0$; $V_{CB} = 3\text{ V}$; $f = 1\text{ MHz}$ | – | 3 | pF |
| C_{re} | feedback capacitance | $I_C = 0$; $V_{CB} = 3.6\text{ V}$; $f = 1\text{ MHz}$ | – | 1.5 | pF |
| f_T | transition frequency | $I_C = 200\text{ mA}$; $V_{CE} = 3.6\text{ V}$; $f = 700\text{ MHz}$ | 18 | – | GHz |

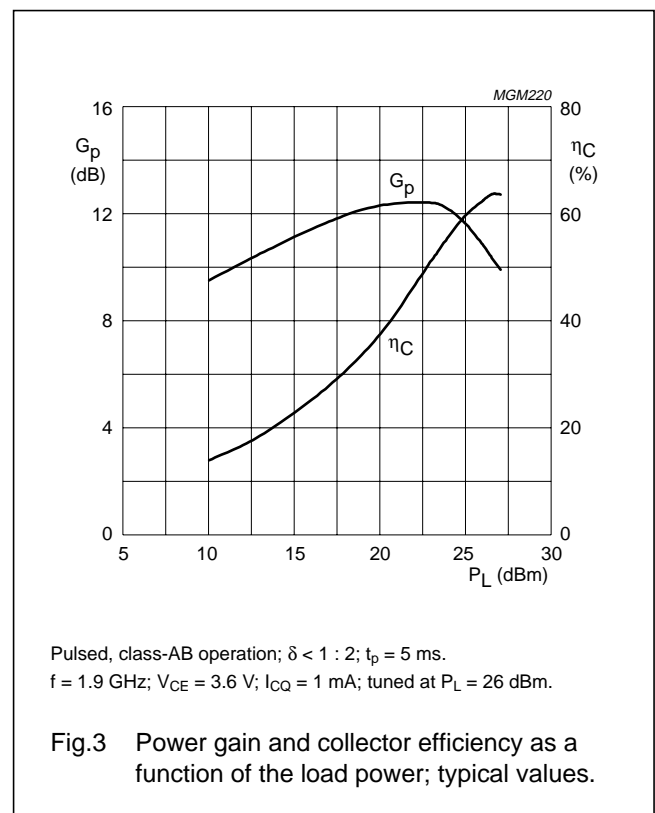
APPLICATION INFORMATION

RF performance at $T_s \leq 60\text{ }^\circ\text{C}$ in a common emitter test circuit (see Figs 4 and 5).

| MODE OF OPERATION | f (GHz) | V_{CE} (V) | I_{CQ} (mA) | P_L (dBm) | G_p (dB) | η_c (%) |
|--|---------|--------------|---------------|-------------|------------|--------------|
| Pulsed; class-AB; $\delta < 1 : 2$; $t_p = 5\text{ ms}$ | 1.9 | 3.6 | 1 | 26 | ≥ 10 | typ. 55 |

Ruggedness in class-AB operation

The transistor is capable of withstanding a load mismatch corresponding to $V_{SWR} = 6 : 1$ through all phases at 26 dBm output power under pulsed conditions: $\delta = 1 : 2$; $t_p = 5\text{ ms}$; $f = 1.9\text{ GHz}$ at $V_{CE} = 4.5\text{ V}$.



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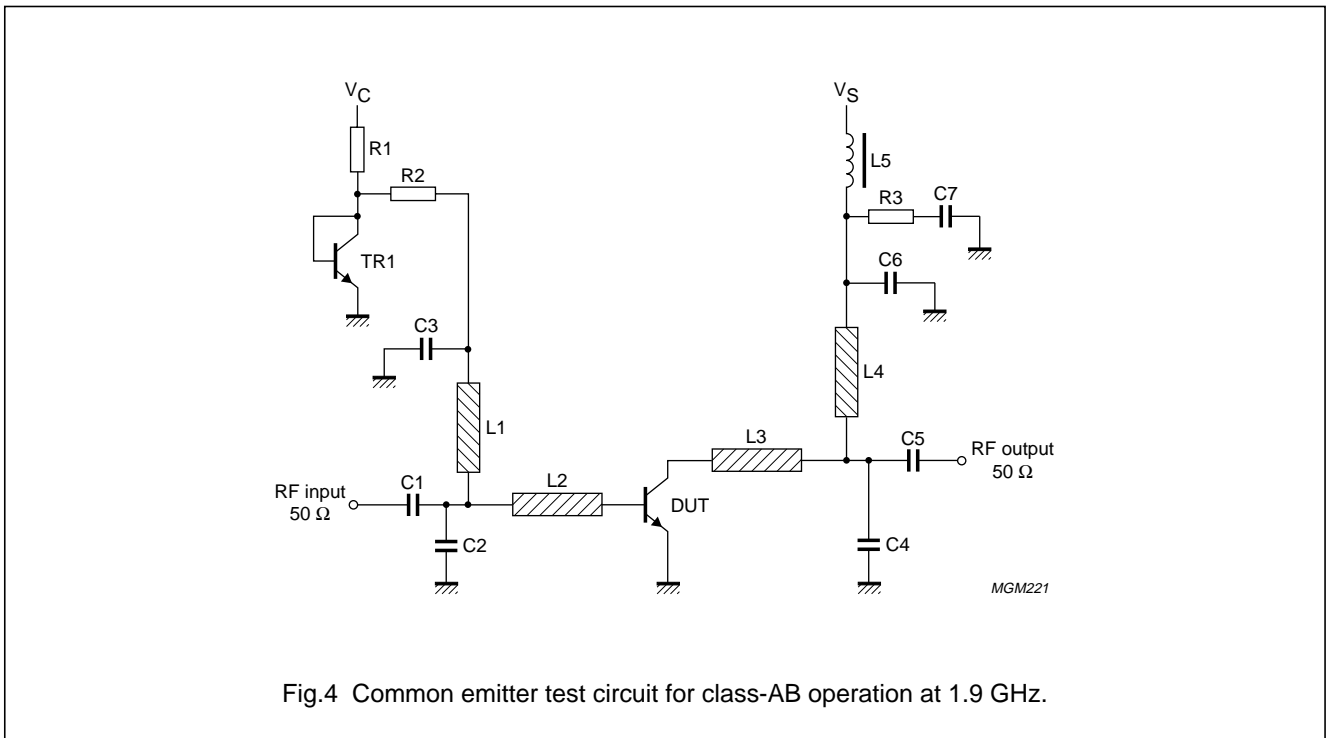


Fig.4 Common emitter test circuit for class-AB operation at 1.9 GHz.

List of components used in test circuit (see Figs 4 and 5)

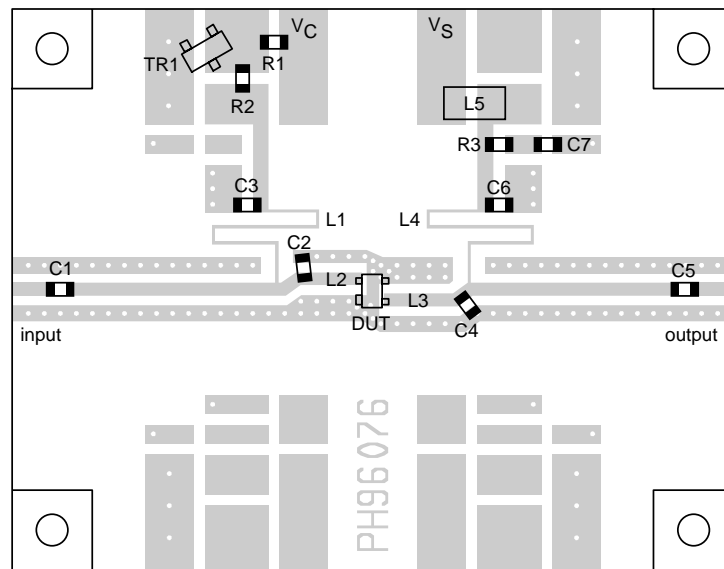
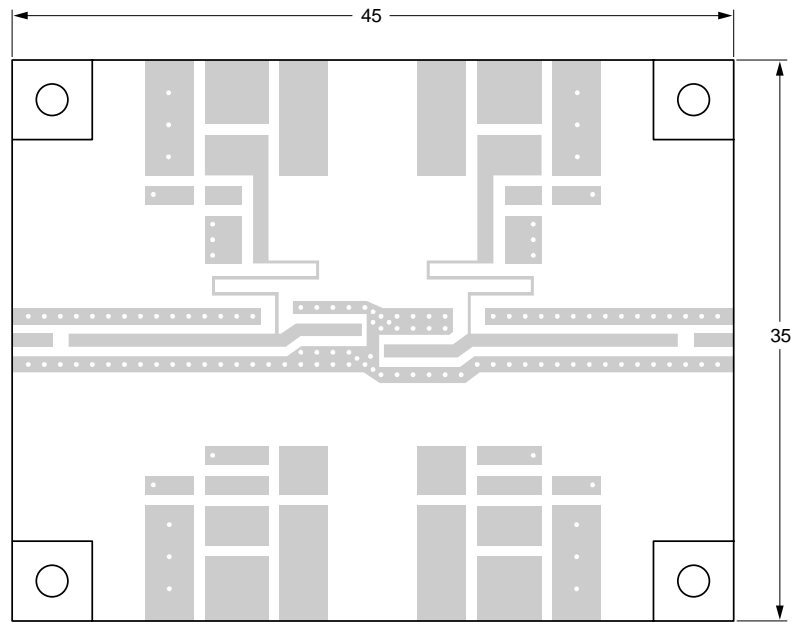
| COMPONENT | DESCRIPTION | VALUE | DIMENSIONS | CATALOGUE No. |
|-----------|---|--------------|--------------|----------------|
| C1, C5 | multilayer ceramic chip capacitor; note 1 | 24 pF | | |
| C2 | multilayer ceramic chip capacitor; note 1 | 3.3 pF | | |
| C3, C6 | multilayer ceramic chip capacitor, note 1 | 15 pF | | |
| C4 | multilayer ceramic chip capacitor; note 1 | 2.4 pF | | |
| C7 | multilayer ceramic chip capacitor; note 1 | 1 nF | | |
| L1, L4 | stripline; note 2 | 100 Ω | 18 × 0.2 mm | |
| L2 | stripline; note 2 | 50 Ω | 3.2 × 0.8 mm | |
| L3 | stripline; note 2 | 50 Ω | 4.6 × 0.8 mm | |
| L5 | Grade 4S2 Ferroxcube chip bead | | | 4330 030 36300 |
| R1 | metal film resistor | 220 Ω; 0.4 W | | |
| R2, R3 | metal film resistor | 10 Ω; 0.4 W | | |
| TR1 | NPN transistor | BC817 | | 9335 895 20215 |

Notes

1. American Technical Ceramics type 100A or capacitor of same quality.
2. The striplines are on a double copper-clad printed-circuit board with PTFE fibre-glass dielectric ($\epsilon_r = 6.15$, $\tan \delta = 0.0019$); thickness 0.64 mm, copper cladding = 35 μm .

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MGM222

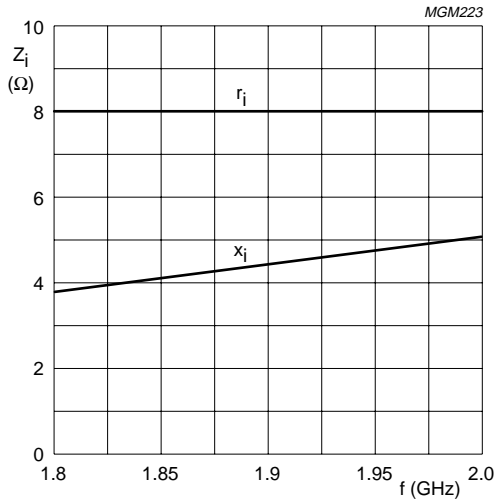
Dimensions in mm.

The components are situated on one side of the copper-clad PTFE fibre-glass board, the other side is unetched and serves as a ground plane. Earth connections from the component side to the ground plane are made by through metallization.

Fig.5 Printed-circuit board and component lay-out for 1.9 GHz class-AB test-circuit in Fig.4.

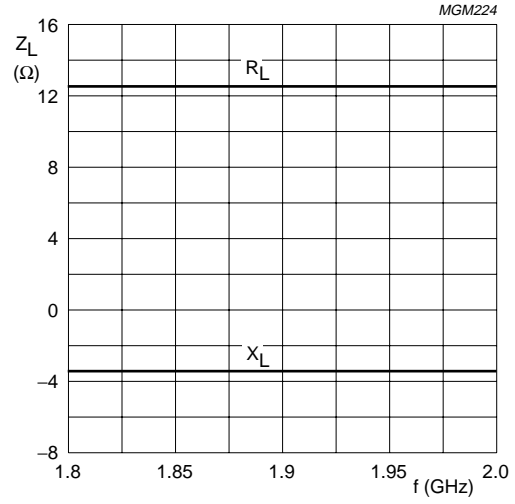
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$V_{CE} = 3.6$ V; $I_{CQ} = 1$ mA; $P_L = 26$ dBm; $T_s \leq 60$ °C.

Fig.6 Input impedance as function of frequency (series components); typical values.



$V_{CE} = 3.6$ V; $I_{CQ} = 1$ mA; $P_L = 26$ dBm; $T_s \leq 60$ °C.

Fig.7 Load impedance as a function of frequency (series components); typical values.

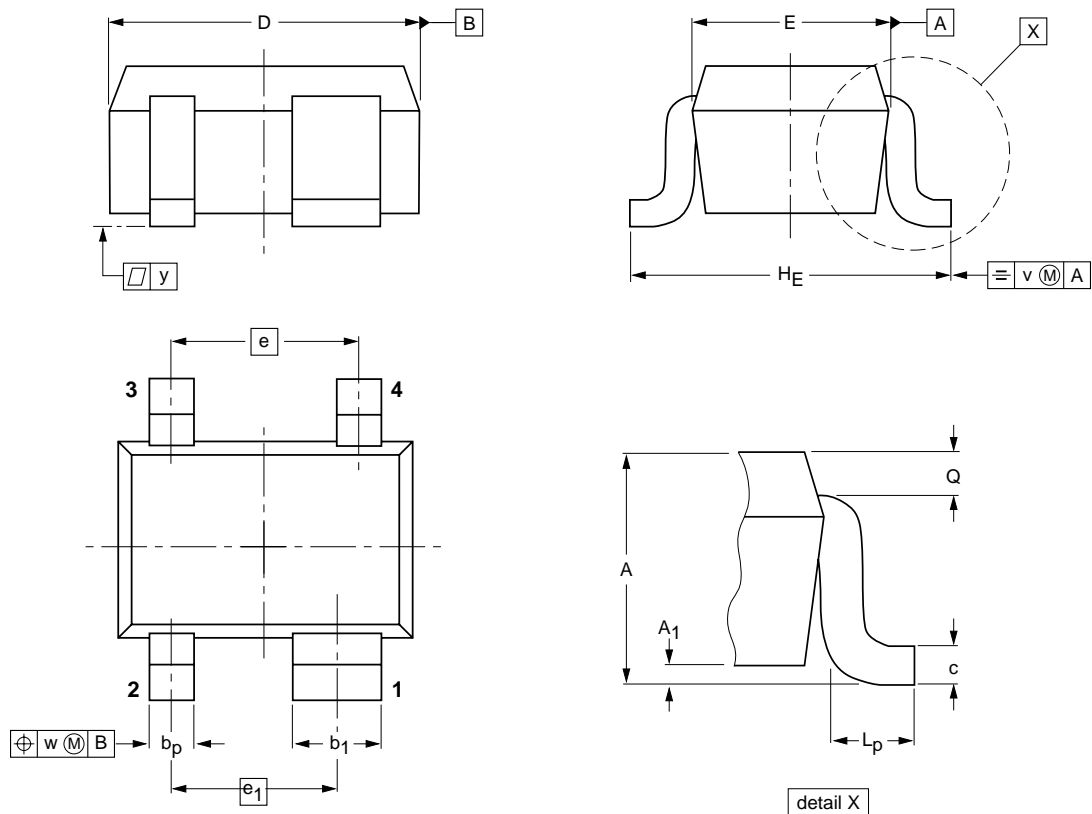
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PACKAGE OUTLINE

Plastic surface mounted package; reverse pinning; 4 leads

SOT343R



DIMENSIONS (mm are the original dimensions)

| UNIT | A | A ₁ max | b _p | b ₁ | c | D | E | e | e ₁ | H _E | L _p | Q | v | w | y |
|------|------------|-----------------------|----------------|----------------|--------------|------------|--------------|-----|----------------|----------------|----------------|--------------|-----|-----|-----|
| mm | 1.1 0.8 | 0.1 | 0.4 0.3 | 0.7 0.5 | 0.25 0.10 | 2.2 1.8 | 1.35 1.15 | 1.3 | 1.15 | 2.2 2.0 | 0.45 0.15 | 0.23 0.13 | 0.2 | 0.2 | 0.1 |

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|--------------------|------------|-------|------|--|------------------------|------------|
| | IEC | JEDEC | EIAJ | | | |
| SOT343R | | | | | | 97-05-21 |

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DEFINITIONS

| Data Sheet Status | |
|---|---|
| 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. |
| Limiting values | |
| Limiting values given are 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 the specification is not implied. Exposure to limiting values for extended periods may affect device reliability. | |
| Application information | |
| Where application information is given, it is advisory and does not form part of the specification. | |

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NOTES

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Printed in The Netherlands

125104/00/03/pp12

Date of release: 1998 Jul 06

Document order number: 9397 750 03971

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