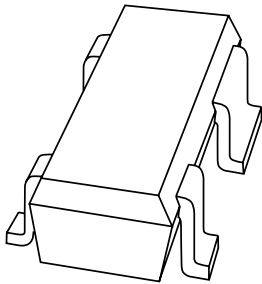


DATA SHEET



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

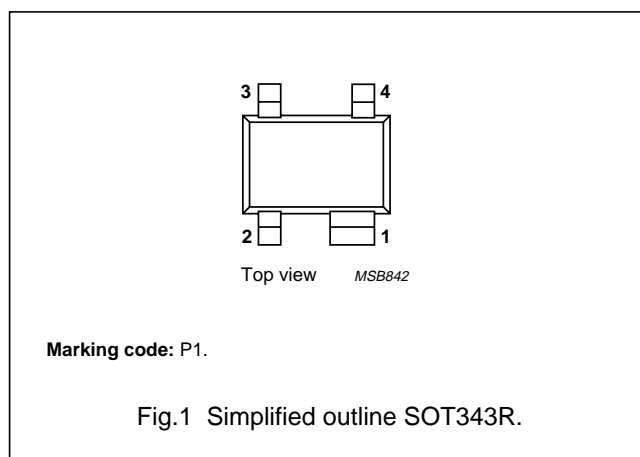
- Common emitter class-AB output stage in hand held radio equipment at 1.9 GHz such as DECT, PHS, etc.
- Driver for DCS1800, 1900.

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 |

UHF power transistor

BFG21W

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

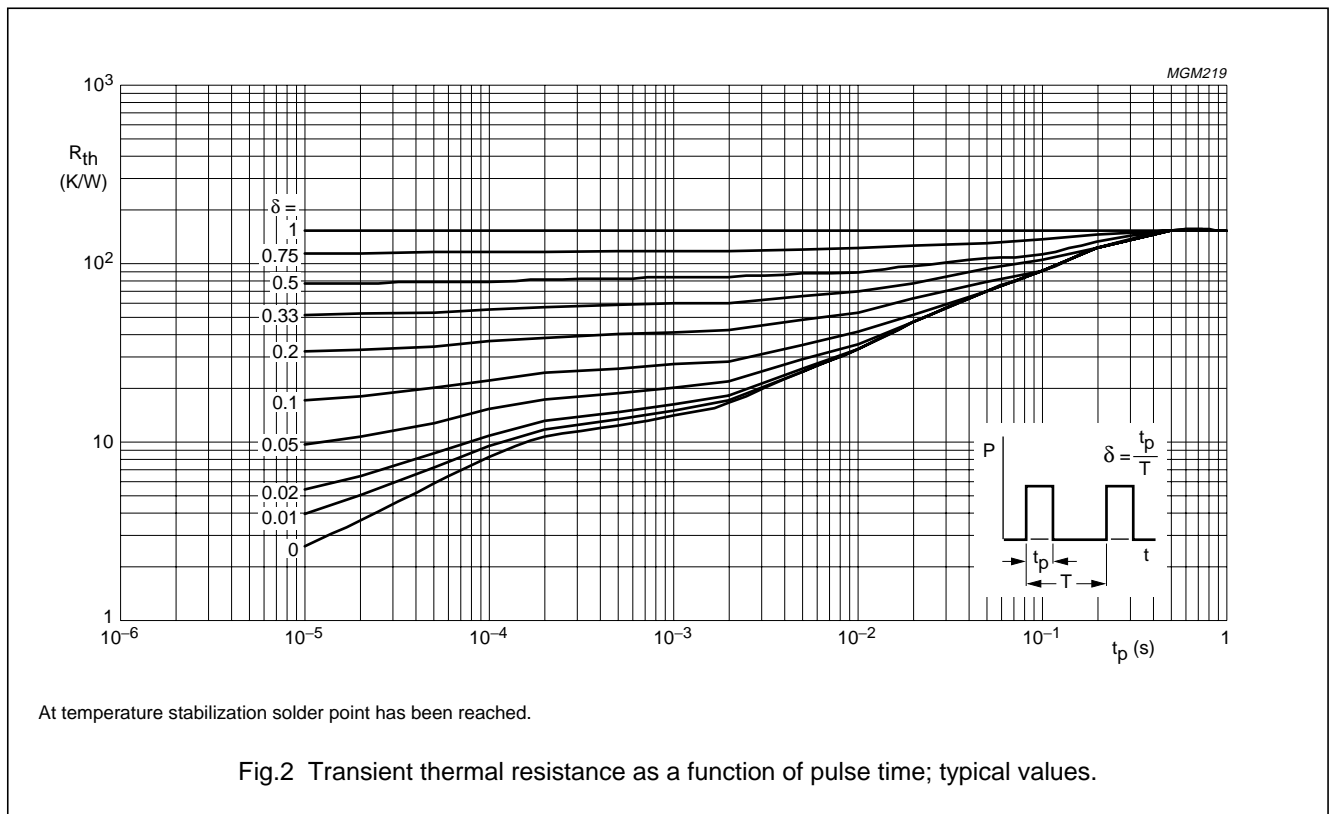
1. T_s is the temperature at the soldering point of the emitter pins.

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.



UHF power transistor

BFG21W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified.

| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | UNIT |
|----------------------|-------------------------------------|---|------|------|------|
| V _{(BR)CBO} | collector-base breakdown voltage | open emitter; I _C = 0.1 mA | 15 | – | V |
| V _{(BR)CEO} | collector-emitter breakdown voltage | open base; I _C = 10 mA | 4.5 | – | V |
| V _{(BR)CER} | collector-emitter breakdown voltage | R _{BE} < 1 kΩ, I _C = 10 mA | 10 | – | V |
| V _{(BR)EBO} | emitter-base breakdown voltage | open collector; I _E = 0.1 mA | 1 | – | V |
| I _{CES} | collector leakage current | V _{CE} = 5 V; V _{BE} = 0 | – | 10 | μA |
| h _{FE} | DC current gain | I _C = 200 mA; V _{CE} = 2 V | 40 | 100 | |
| C _c | collector capacitance | I _E = i _e = 0; V _{CB} = 3 V; f = 1 MHz | – | 3 | pF |
| C _{re} | feedback capacitance | I _C = 0; V _{CB} = 3.6 V; f = 1 MHz | – | 1.5 | pF |
| f _T | transition frequency | I _C = 200 mA; V _{CE} = 3.6 V; f = 700 MHz | 18 | – | GHz |

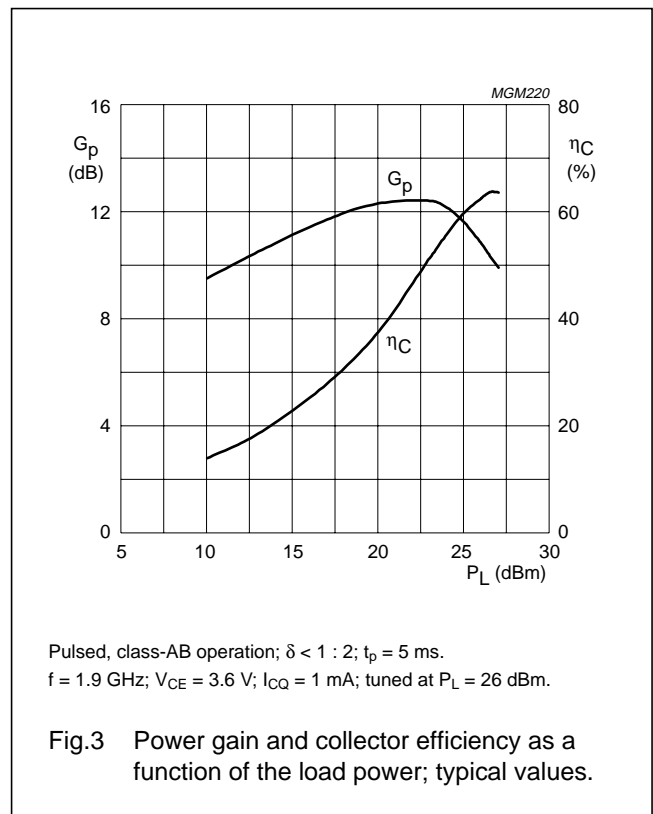
APPLICATION INFORMATION

RF performance at T_s ≤ 60 °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; δ < 1 : 2; t _p = 5 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 VSWR = 6 : 1 through all phases at 26 dBm output power under pulsed conditions: δ = 1 : 2; t_p = 5 ms; f = 1.9 GHz at V_{CE} = 4.5 V.



UHF power transistor

BFG21W

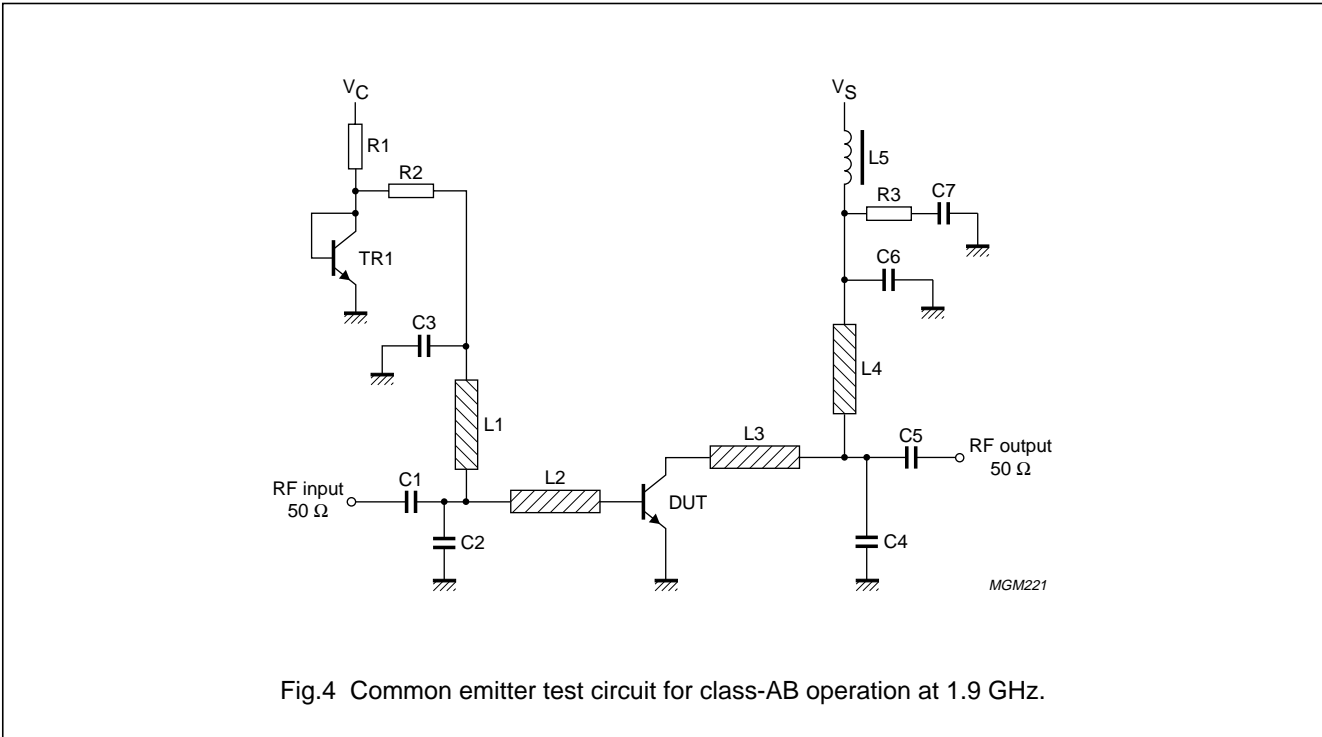


Fig.4 Common emitter test circuit for class-AB operation at 1.9 GHz.

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

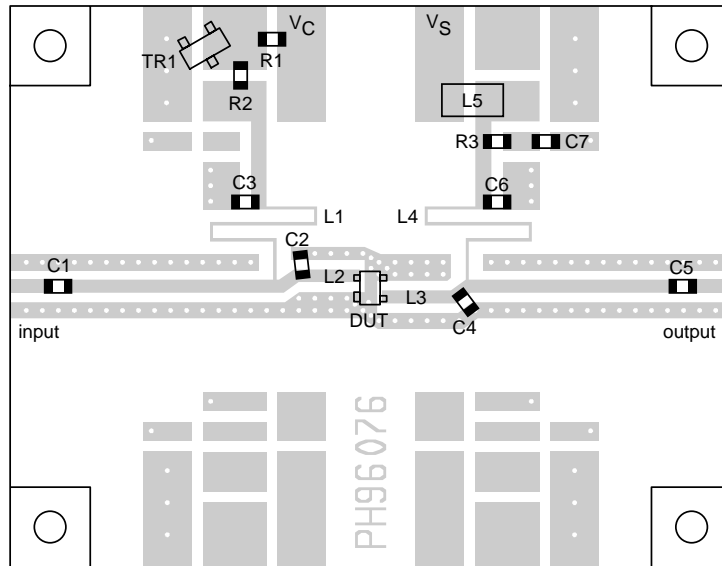
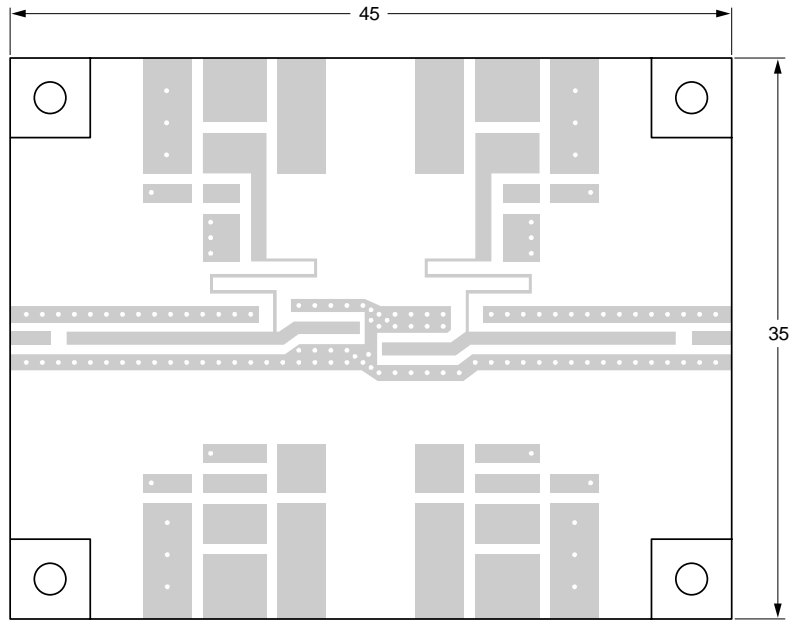
| COMPONENT | DESCRIPTION | VALUE | DIMENSIONS | CATALOGUE No. |
|-----------|---|--------------|--------------|----------------|
| C1, C5 | multilayer ceramic chip capacitor; note 1 | 24 pF | | |
| C2 | multilayer ceramic chip capacitor; note 1 | 3.3 pF | | |
| C3, C6 | multilayer ceramic chip capacitor, 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 .

UHF power transistor

BFG21W



MGM222

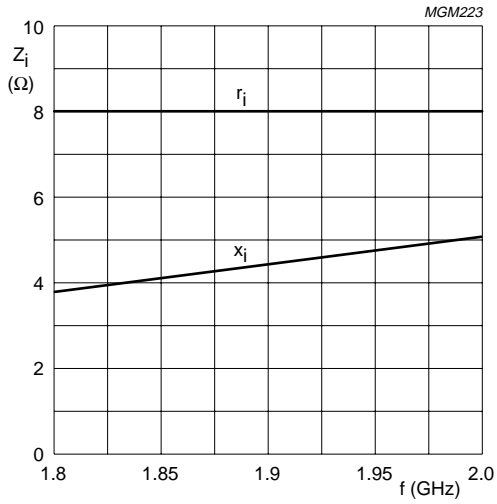
Dimensions in mm.

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.

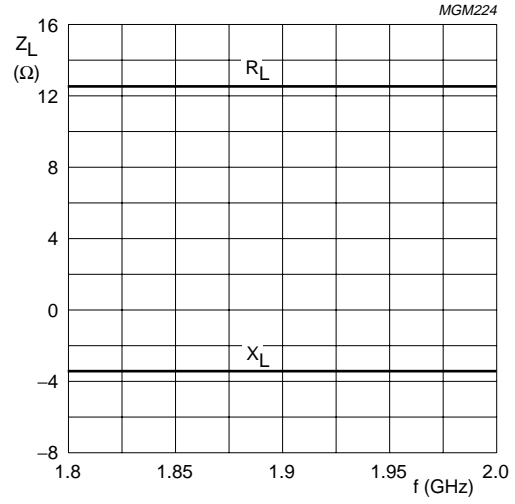
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$V_{CE} = 3.6$ V; $I_{CQ} = 1$ mA; $P_L = 26$ dBm; $T_s \leq 60$ °C.

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.

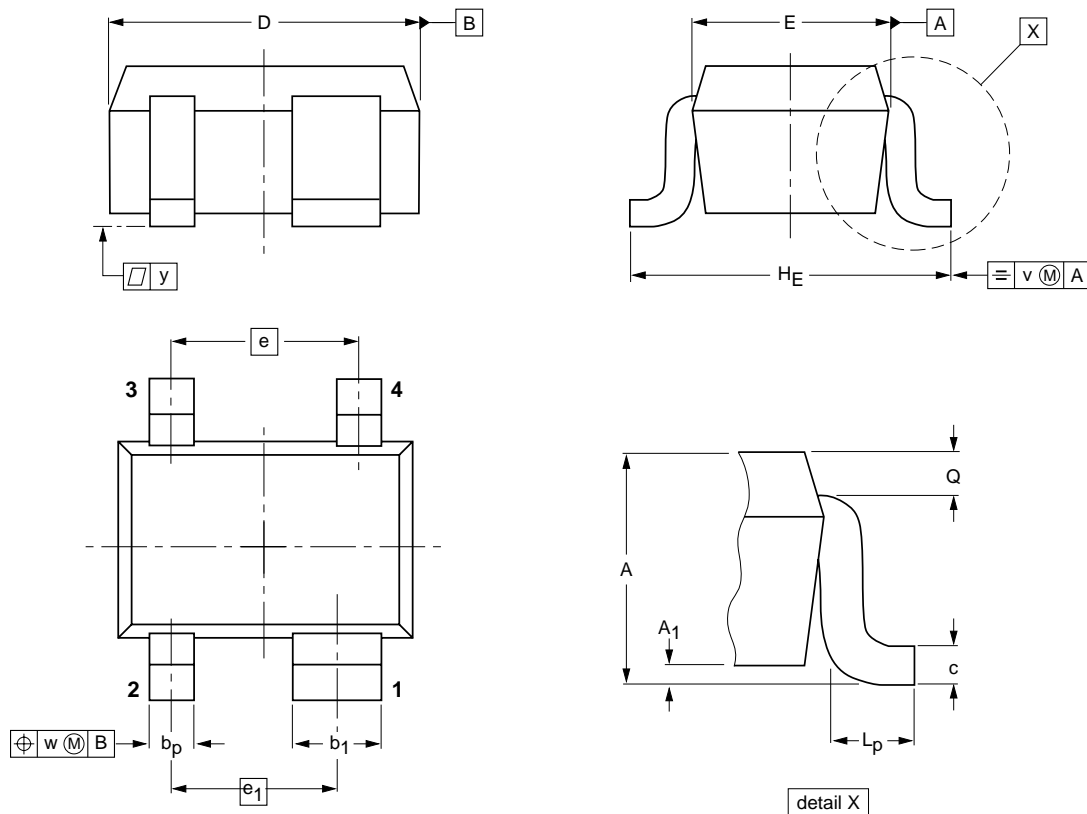
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PACKAGE OUTLINE

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. | |
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| 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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Philips Semiconductors – a worldwide company

Argentina: see South America

Australia: 34 Waterloo Road, NORTH RYDE, NSW 2113,
Tel. +61 2 9805 4455, Fax. +61 2 9805 4466

Austria: Computerstr. 6, A-1101 WIEN, P.O. Box 213, Tel. +43 160 1010,
Fax. +43 160 101 1210

Belarus: Hotel Minsk Business Center, Bld. 3, r. 1211, Volodarski Str. 6,
220050 MINSK, Tel. +375 172 200 733, Fax. +375 172 200 773

Belgium: see The Netherlands

Brazil: see South America

Bulgaria: Philips Bulgaria Ltd., Energoproject, 15th floor,
51 James Bourchier Blvd., 1407 SOFIA,
Tel. +359 2 689 211, Fax. +359 2 689 102

Canada: PHILIPS SEMICONDUCTORS/COMPONENTS,
Tel. +1 800 234 7381

China/Hong Kong: 501 Hong Kong Industrial Technology Centre,
72 Tat Chee Avenue, Kowloon Tong, HONG KONG,
Tel. +852 2319 7888, Fax. +852 2319 7700

Colombia: see South America

Czech Republic: see Austria

Denmark: Prags Boulevard 80, PB 1919, DK-2300 COPENHAGEN S,
Tel. +45 32 88 2636, Fax. +45 31 57 0044

Finland: Sinikalliontie 3, FIN-02630 ESPOO,
Tel. +358 9 615800, Fax. +358 9 61580920

France: 51 Rue Carnot, BP317, 92156 SURESNES Cedex,
Tel. +33 1 40 99 6161, Fax. +33 1 40 99 6427

Germany: Hammerbrookstraße 69, D-20097 HAMBURG,
Tel. +49 40 23 53 60, Fax. +49 40 23 536 300

Greece: No. 15, 25th March Street, GR 17778 TAVROS/ATHENS,
Tel. +30 1 4894 339/239, Fax. +30 1 4814 240

Hungary: see Austria

India: Philips INDIA Ltd, Band Box Building, 2nd floor,
254-D, Dr. Annie Besant Road, Worli, MUMBAI 400 025,
Tel. +91 22 493 8541, Fax. +91 22 493 0966

Indonesia: PT Philips Development Corporation, Semiconductors Division,
Gedung Philips, Jl. Buncit Raya Kav.99-100, JAKARTA 12510,
Tel. +62 21 794 0040 ext. 2501, Fax. +62 21 794 0080

Ireland: Newstead, Clonskeagh, DUBLIN 14,
Tel. +353 1 7640 000, Fax. +353 1 7640 200

Israel: RAPAC Electronics, 7 Kehilat Saloniki St, PO Box 18053,
TEL AVIV 61180, Tel. +972 3 645 0444, Fax. +972 3 649 1007

Italy: PHILIPS SEMICONDUCTORS, Piazza IV Novembre 3,
20124 MILANO, Tel. +39 2 6752 2531, Fax. +39 2 6752 2557

Japan: Philips Bldg 13-37, Kohnan 2-chome, Minato-ku,
TOKYO 108-8507, Tel. +81 3 3740 5130, Fax. +81 3 3740 5077

Korea: Philips House, 260-199 Itaewon-dong, Yongsan-ku, SEOUL,
Tel. +82 2 709 1412, Fax. +82 2 709 1415

Malaysia: No. 76 Jalan Universiti, 46200 PETALING JAYA, SELANGOR,
Tel. +60 3 750 5214, Fax. +60 3 757 4880

Mexico: 5900 Gateway East, Suite 200, EL PASO, TEXAS 79905,
Tel. +9-5 800 234 7381

Middle East: see Italy

Netherlands: Postbus 90050, 5600 PB EINDHOVEN, Bldg. VB,
Tel. +31 40 27 82785, Fax. +31 40 27 88399

New Zealand: 2 Wagener Place, C.P.O. Box 1041, AUCKLAND,
Tel. +64 9 849 4160, Fax. +64 9 849 7811

Norway: Box 1, Manglerud 0612, OSLO,
Tel. +47 22 74 8000, Fax. +47 22 74 8341

Pakistan: see Singapore

Philippines: Philips Semiconductors Philippines Inc.,
106 Valero St. Salcedo Village, P.O. Box 2108 MCC, MAKATI,
Metro MANILA, Tel. +63 2 816 6380, Fax. +63 2 817 3474

Poland: Ul. Lukiska 10, PL 04-123 WARSZAWA,
Tel. +48 22 612 2831, Fax. +48 22 612 2327

Portugal: see Spain

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Russia: Philips Russia, Ul. Usatcheva 35A, 119048 MOSCOW,
Tel. +7 095 755 6918, Fax. +7 095 755 6919

Singapore: Lorong 1, Toa Payoh, SINGAPORE 319762,
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Slovakia: see Austria

Slovenia: see Italy

South Africa: S.A. PHILIPS Pty Ltd., 195-215 Main Road Martindale,
2092 JOHANNESBURG, P.O. Box 7430 Johannesburg 2000,
Tel. +27 11 470 5911, Fax. +27 11 470 5494

South America: Al. Vicente Pinzon, 173, 6th floor,
04547-130 SÃO PAULO, SP, Brazil,
Tel. +55 11 821 2333, Fax. +55 11 821 2382

Spain: Balmes 22, 08007 BARCELONA,
Tel. +34 93 301 6312, Fax. +34 93 301 4107

Sweden: Kottbygatan 7, Akalla, S-16485 STOCKHOLM,
Tel. +46 8 5985 2000, Fax. +46 8 5985 2745

Switzerland: Allmendstrasse 140, CH-8027 ZÜRICH,
Tel. +41 1 488 2741 Fax. +41 1 488 3263

Taiwan: Philips Semiconductors, 6F, No. 96, Chien Kuo N. Rd., Sec. 1,
TAIPEI, Taiwan Tel. +886 2 2134 2865, Fax. +886 2 2134 2874

Thailand: PHILIPS ELECTRONICS (THAILAND) Ltd.,
209/2 Sanpavuth-Bangna Road Prakanong, BANGKOK 10260,
Tel. +66 2 745 4090, Fax. +66 2 398 0793

Turkey: Talatpasa Cad. No. 5, 80640 GÜLTEPE/ISTANBUL,
Tel. +90 212 279 2770, Fax. +90 212 282 6707

Ukraine: PHILIPS UKRAINE, 4 Patrice Lumumba str., Building B, Floor 7,
252042 KIEV, Tel. +380 44 264 2776, Fax. +380 44 268 0461

United Kingdom: Philips Semiconductors Ltd., 276 Bath Road, Hayes,
MIDDLESEX UB3 5BX, Tel. +44 181 730 5000, Fax. +44 181 754 8421

United States: 811 East Arques Avenue, SUNNYVALE, CA 94088-3409,
Tel. +1 800 234 7381

Uruguay: see South America

Vietnam: see Singapore

Yugoslavia: PHILIPS, Trg N. Pasica 5/v, 11000 BEOGRAD,
Tel. +381 11 625 344, Fax. +381 11 635 777

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International Marketing & Sales Communications, Building BE-p, P.O. Box 218,
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