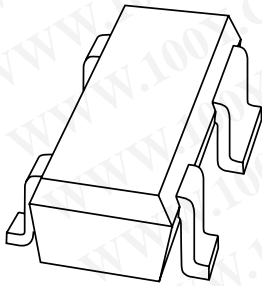


DATA SHEET



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BGA2003 Silicon MMIC amplifier

Product specification
Supersedes data of 1999 Feb 25

1999 Jul 23

Silicon MMIC amplifier

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FEATURES

- Low current
- Very high power gain
- Low noise figure
- Integrated temperature compensated biasing
- Control pin for adjustment bias current
- Supply and RF output pin combined.

APPLICATIONS

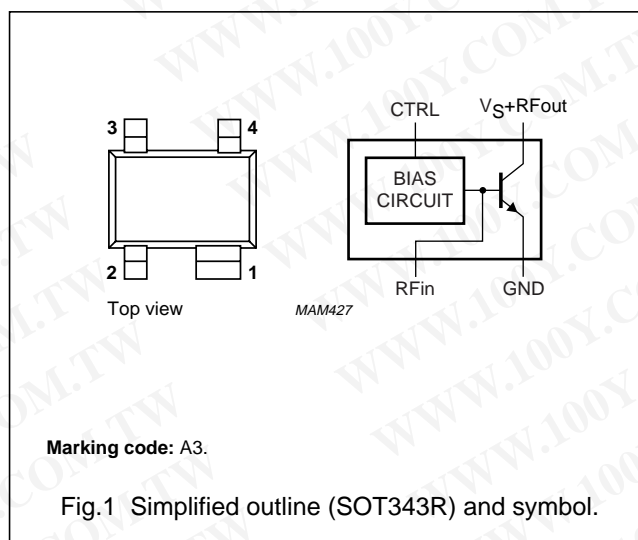
- RF front end
- Wideband applications, e.g. analog and digital cellular telephones, cordless telephones (PHS, DECT, etc.)
- Low noise amplifiers
- Satellite television tuners (SATV)
- High frequency oscillators.

DESCRIPTION

Silicon MMIC amplifier consisting of an NPN double polysilicon transistor with integrated biasing for low voltage applications in a plastic, 4-pin SOT343R package.

PINNING

| PIN | DESCRIPTION |
|-----|-----------------------------|
| 1 | GND |
| 2 | RF in |
| 3 | CTRL (bias current control) |
| 4 | $V_S + \text{RF out}$ |



QUICK REFERENCE DATA

| SYMBOL | PARAMETER | CONDITIONS | TYP. | MAX. | UNIT |
|--------|---------------------|--|------|------|------|
| V_S | DC supply voltage | RF input AC coupled | – | 4.5 | V |
| I_S | DC supply current | $V_{V_S\text{-OUT}} = 2.5 \text{ V}$; $I_{CTRL} = 1 \text{ mA}$; RF input AC coupled | 11 | – | mA |
| MSG | maximum stable gain | $V_{V_S\text{-OUT}} = 2.5 \text{ V}$; $f = 1800 \text{ MHz}$; $T_{amb} = 25 \text{ }^\circ\text{C}$ | 16 | – | dB |
| NF | noise figure | $V_{V_S\text{-OUT}} = 2.5 \text{ V}$; $f = 1800 \text{ MHz}$; $\Gamma_S = \Gamma_{opt}$ | 1.8 | – | dB |

Silicon MMIC amplifier

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LIMITING VALUES

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

| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | UNIT |
|------------|--------------------------------|--|------|------|------|
| V_S | supply voltage | RF input AC coupled | – | 4.5 | V |
| V_{CTRL} | voltage on control pin | | – | 2 | V |
| I_S | supply current (DC) | forced by DC voltage on RF input or I_{CTRL} | – | 30 | mA |
| I_{CTRL} | control current | | – | 3 | mA |
| P_{tot} | total power dissipation | $T_s \leq 100\text{ °C}$ | – | 135 | mW |
| T_{stg} | storage temperature | | –65 | +150 | °C |
| T_j | operating junction temperature | | – | 150 | °C |

THERMAL CHARACTERISTICS

| SYMBOL | PARAMETER | VALUE | UNIT |
|---------------|---|-------|------|
| $R_{th\ j-s}$ | thermal resistance from junction to soldering point | 350 | K/W |

CHARACTERISTICSRF input AC coupled; $T_j = 25\text{ °C}$; unless otherwise specified.

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|--------------|-------------------------------|--|------|------|------|------|
| I_S | supply current | $V_{VS-OUT} = 2.5\text{ V}$; $I_{CTRL} = 0.4\text{ mA}$ | 3 | 4.5 | 6 | mA |
| | | $V_{VS-OUT} = 2.5\text{ V}$; $I_{CTRL} = 1.0\text{ mA}$ | 8 | 11 | 15 | mA |
| MSG | maximum stable gain | $V_{VS-OUT} = 2.5\text{ V}$; $I_{VS-OUT} = 10\text{ mA}$; $f = 900\text{ MHz}$ | – | 24 | – | dB |
| | | $V_{VS-OUT} = 2.5\text{ V}$; $I_{VS-OUT} = 10\text{ mA}$; $f = 1800\text{ MHz}$ | – | 16 | – | dB |
| $ S_{21} ^2$ | insertion power gain | $V_{VS-OUT} = 2.5\text{ V}$; $I_{VS-OUT} = 10\text{ mA}$; $f = 900\text{ MHz}$ | 18 | 19 | – | dB |
| | | $V_{VS-OUT} = 2.5\text{ V}$; $I_{VS-OUT} = 10\text{ mA}$; $f = 1800\text{ MHz}$ | 13 | 14 | – | dB |
| S_{12} | isolation | $V_{VS-OUT} = 2.5\text{ V}$; $I_{VS-OUT} = 0$; $f = 900\text{ MHz}$ | – | 26 | – | dB |
| | | $V_{VS-OUT} = 2.5\text{ V}$; $I_{VS-OUT} = 0$; $f = 1800\text{ MHz}$ | – | 20 | – | dB |
| NF | noise figure | $V_{VS-OUT} = 2.5\text{ V}$; $I_{VS-OUT} = 10\text{ mA}$; $f = 900\text{ MHz}$; $\Gamma_S = \Gamma_{opt}$ | – | 1.8 | 2 | dB |
| | | $V_{VS-OUT} = 2.5\text{ V}$; $I_{VS-OUT} = 10\text{ mA}$; $f = 1800\text{ MHz}$; $\Gamma_S = \Gamma_{opt}$ | – | 1.8 | 2 | dB |
| $IP3_{(in)}$ | input intercept point; note 1 | $V_{VS-OUT} = 2.3\text{ V}$; $I_{VS-OUT} = 3.6\text{ mA}$; $f = 900\text{ MHz}$ | – | –6.5 | – | dBm |
| | | $V_{VS-OUT} = 2.3\text{ V}$; $I_{VS-OUT} = 3.5\text{ mA}$; $f = 1800\text{ MHz}$ | – | –4.8 | – | dBm |

Note

1. See application note RNR-T45-99-B-0514.

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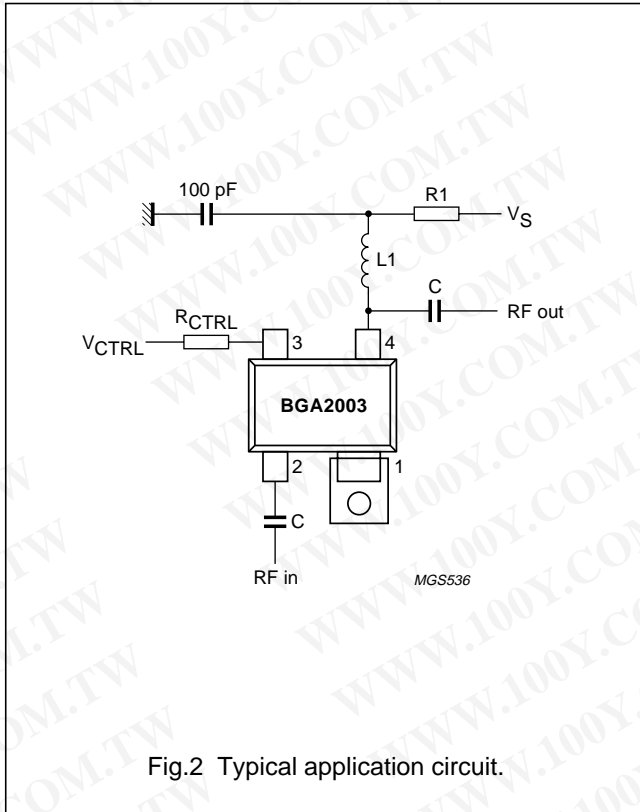


Fig.2 Typical application circuit.

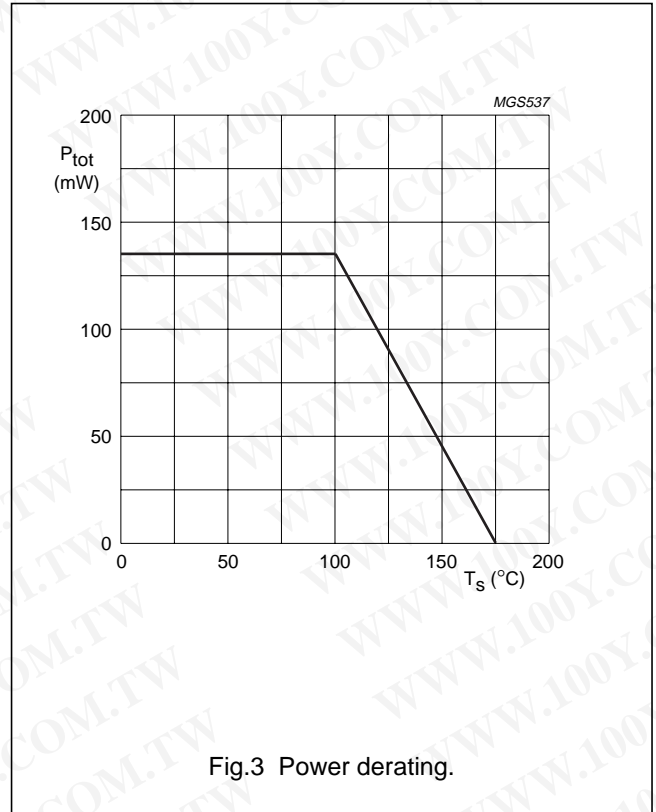


Fig.3 Power derating.

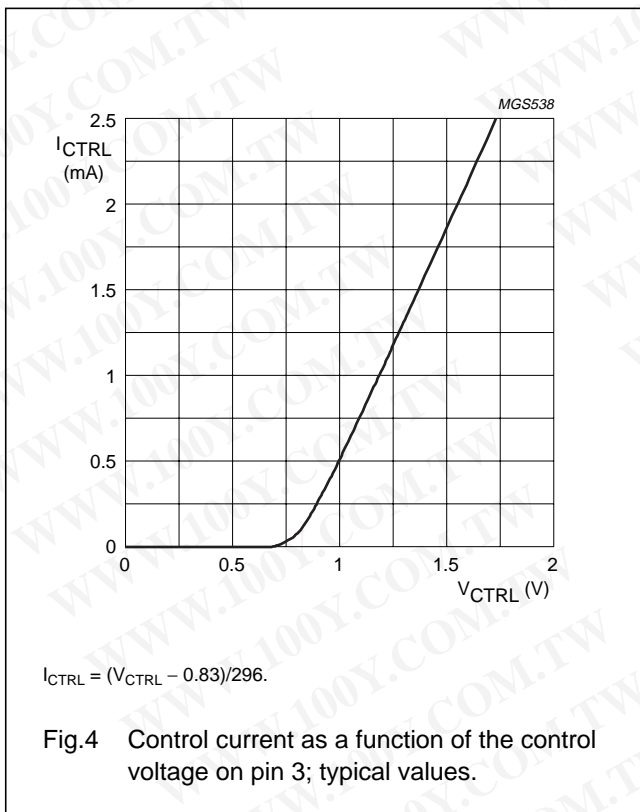


Fig.4 Control current as a function of the control voltage on pin 3; typical values.

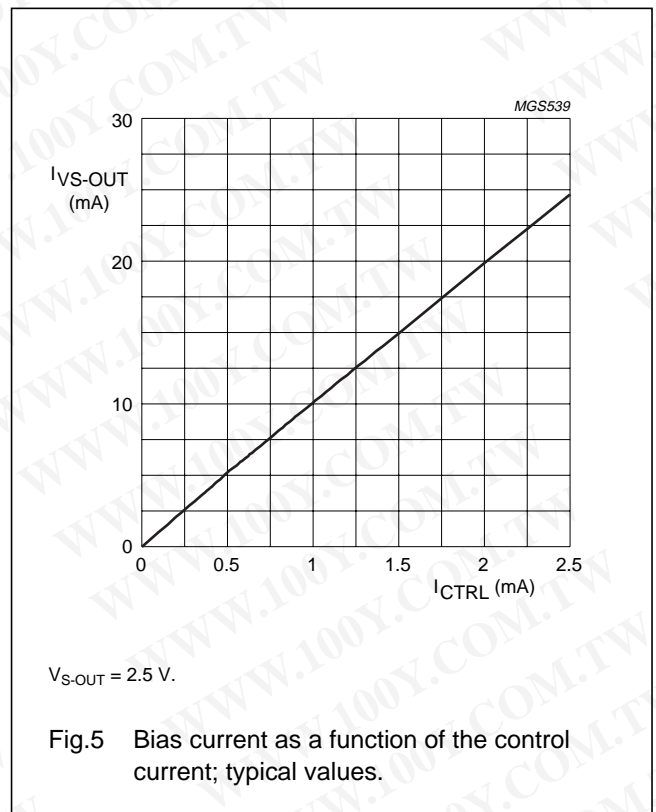
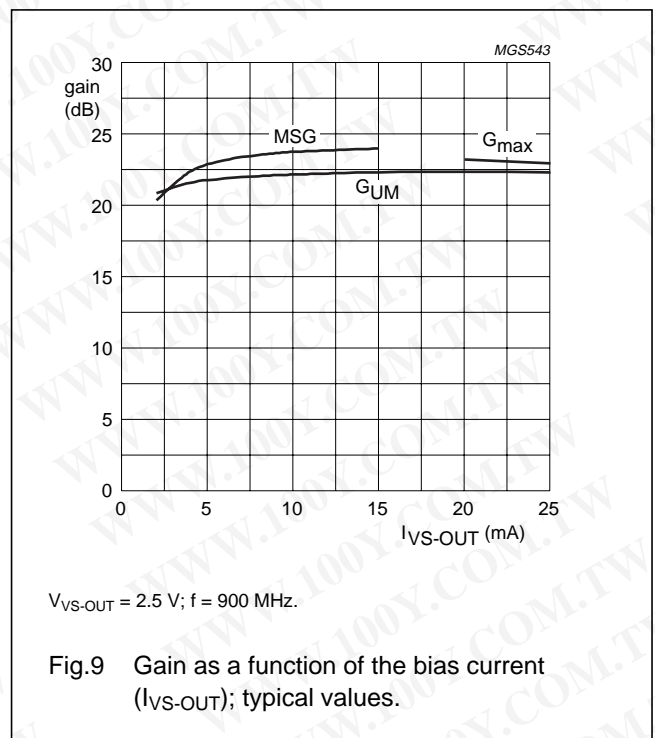
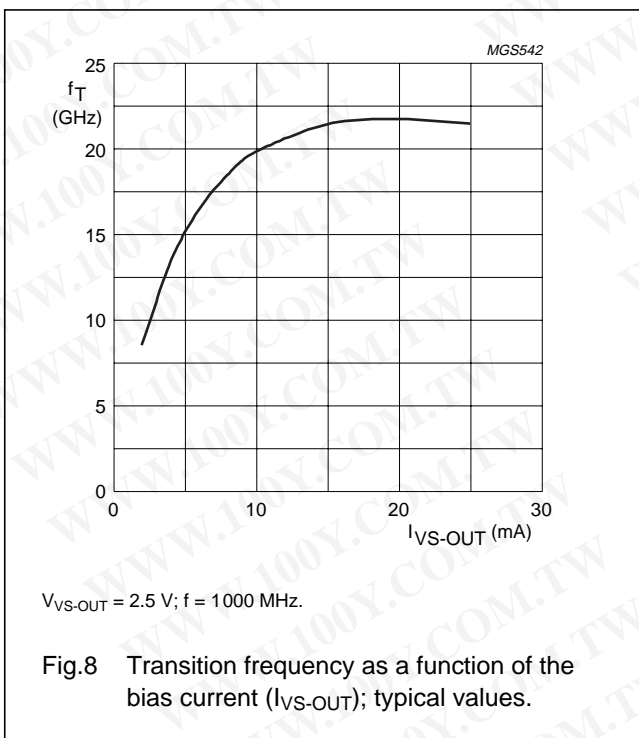
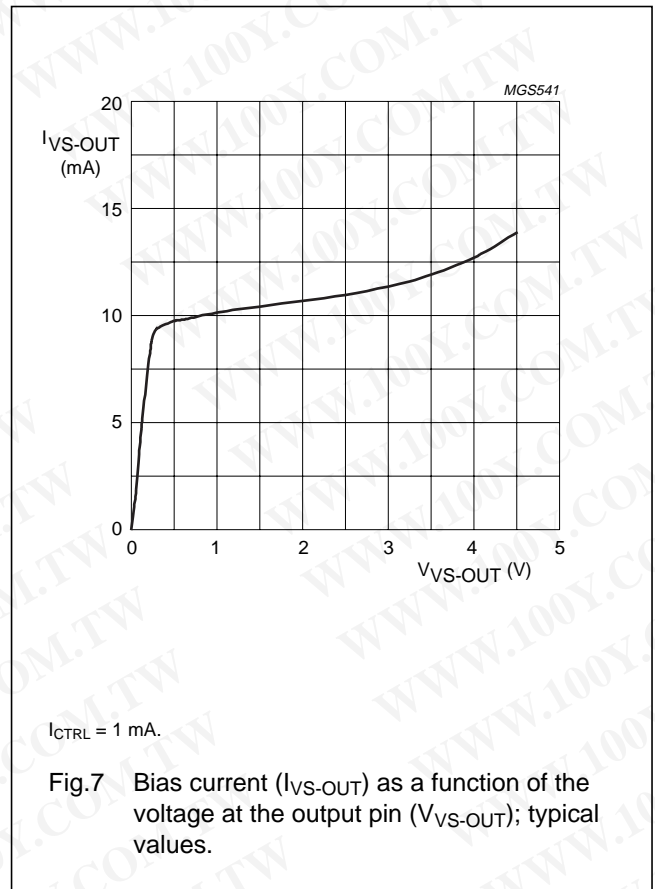
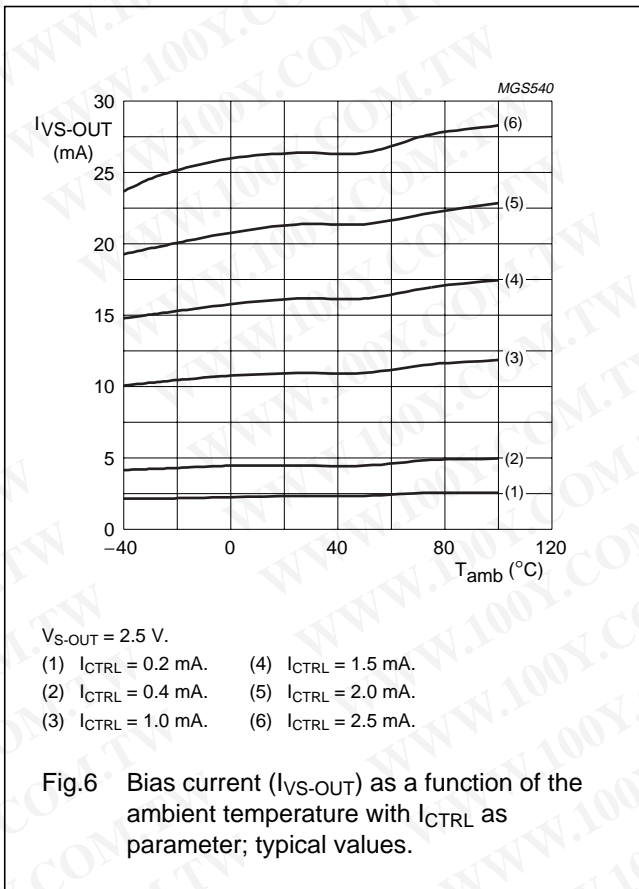


Fig.5 Bias current as a function of the control current; typical values.

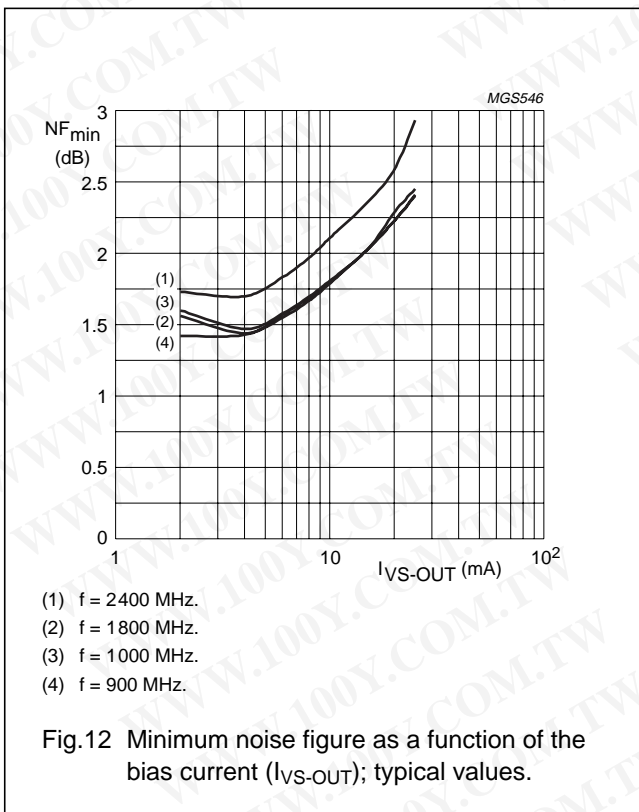
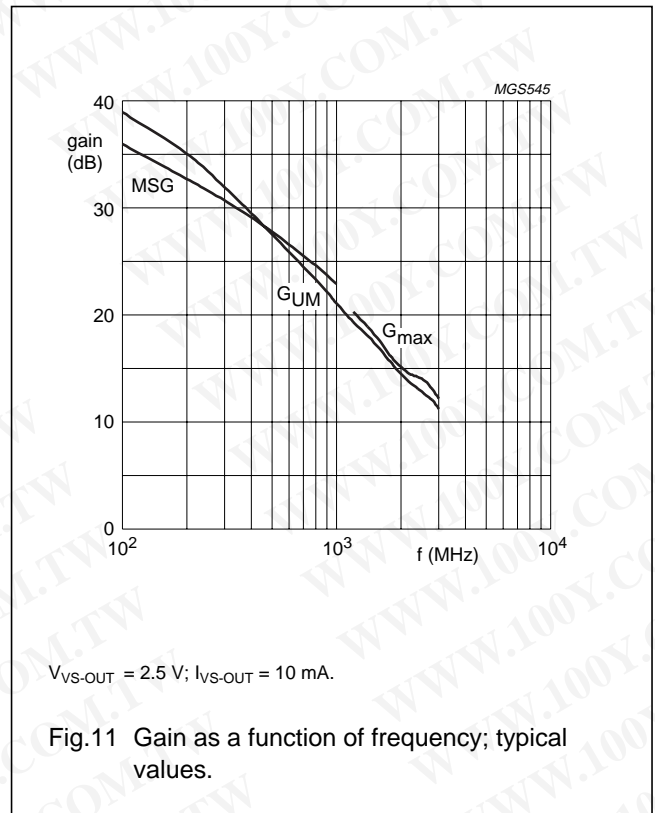
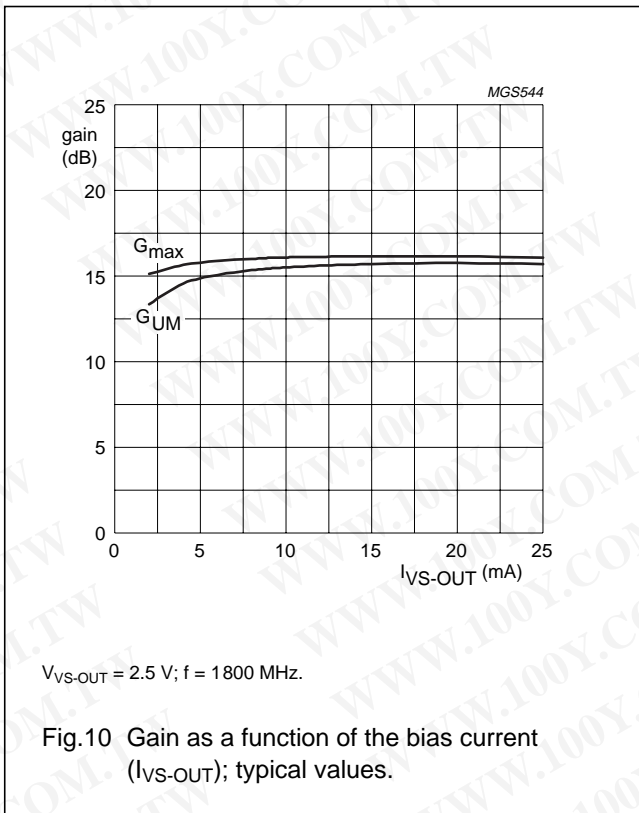
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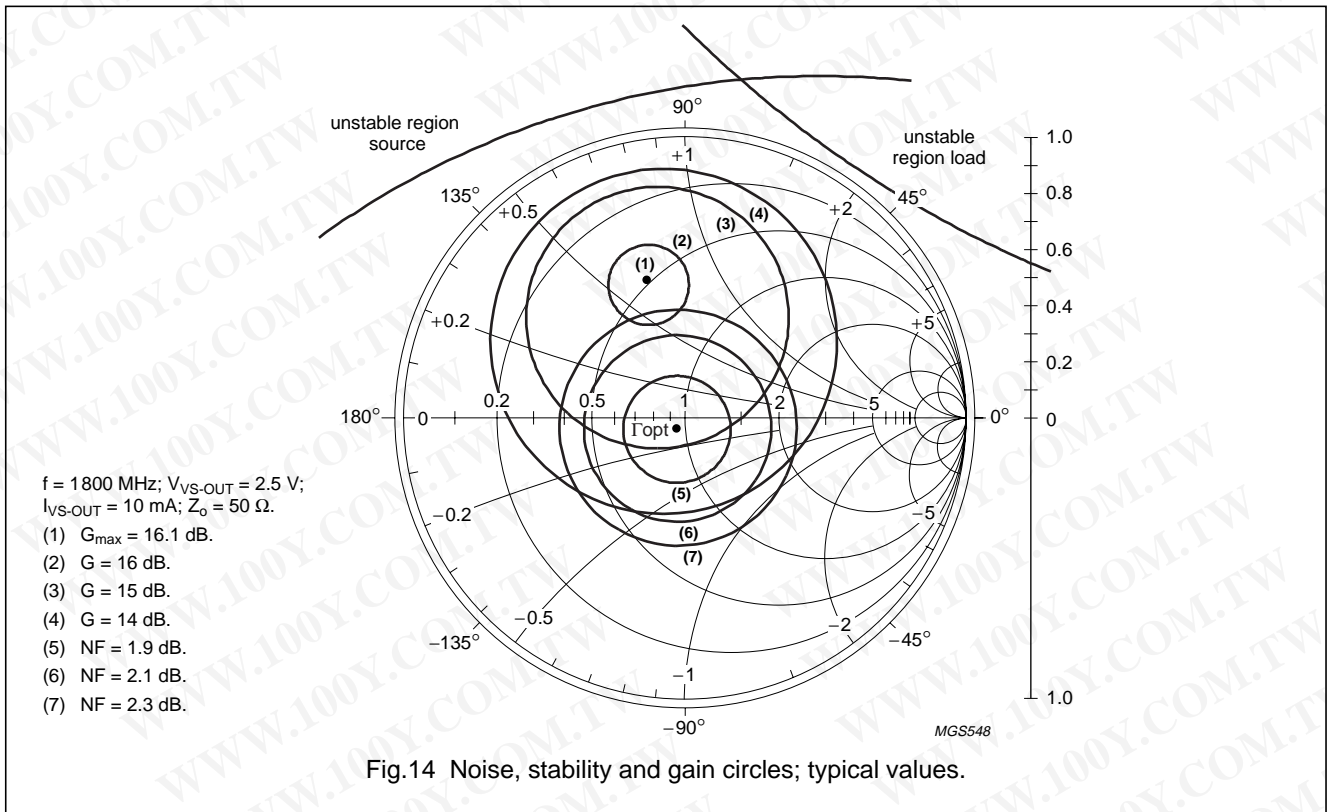
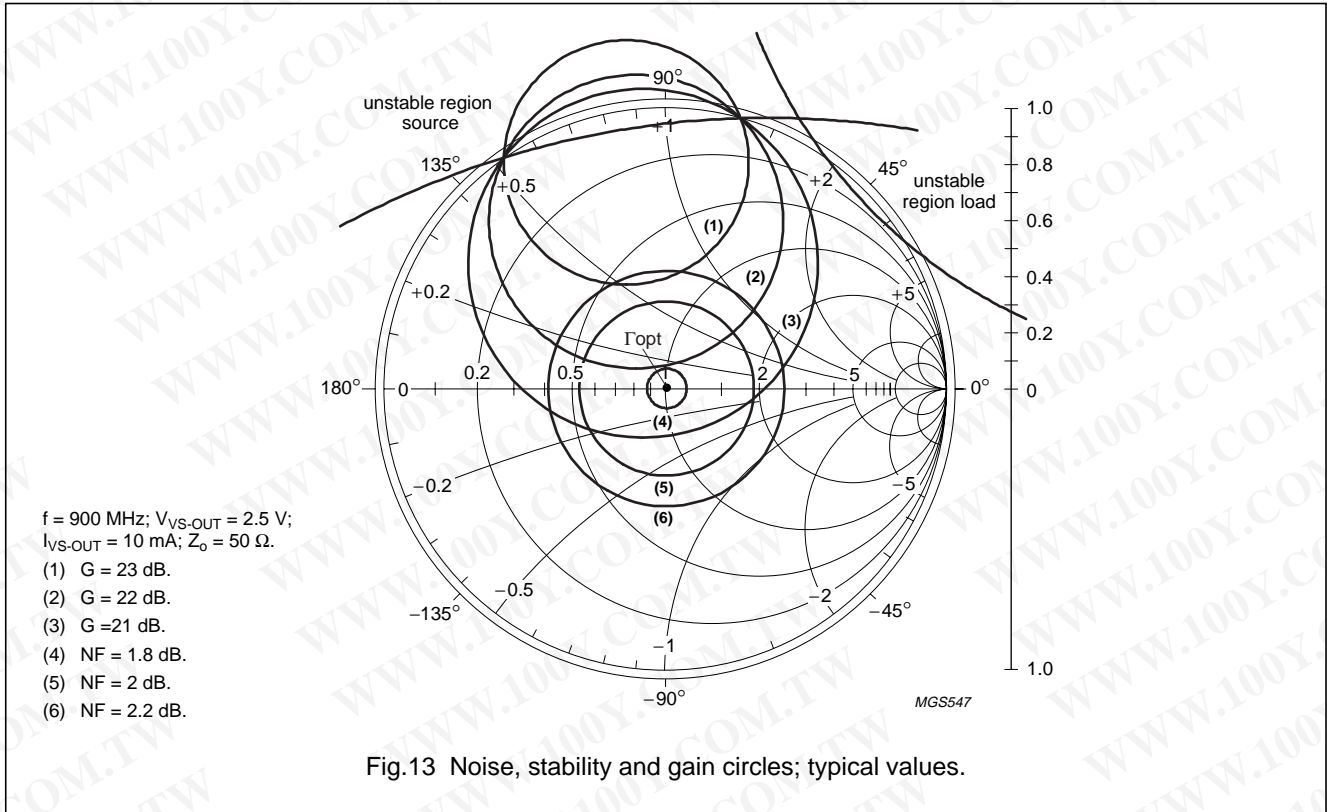
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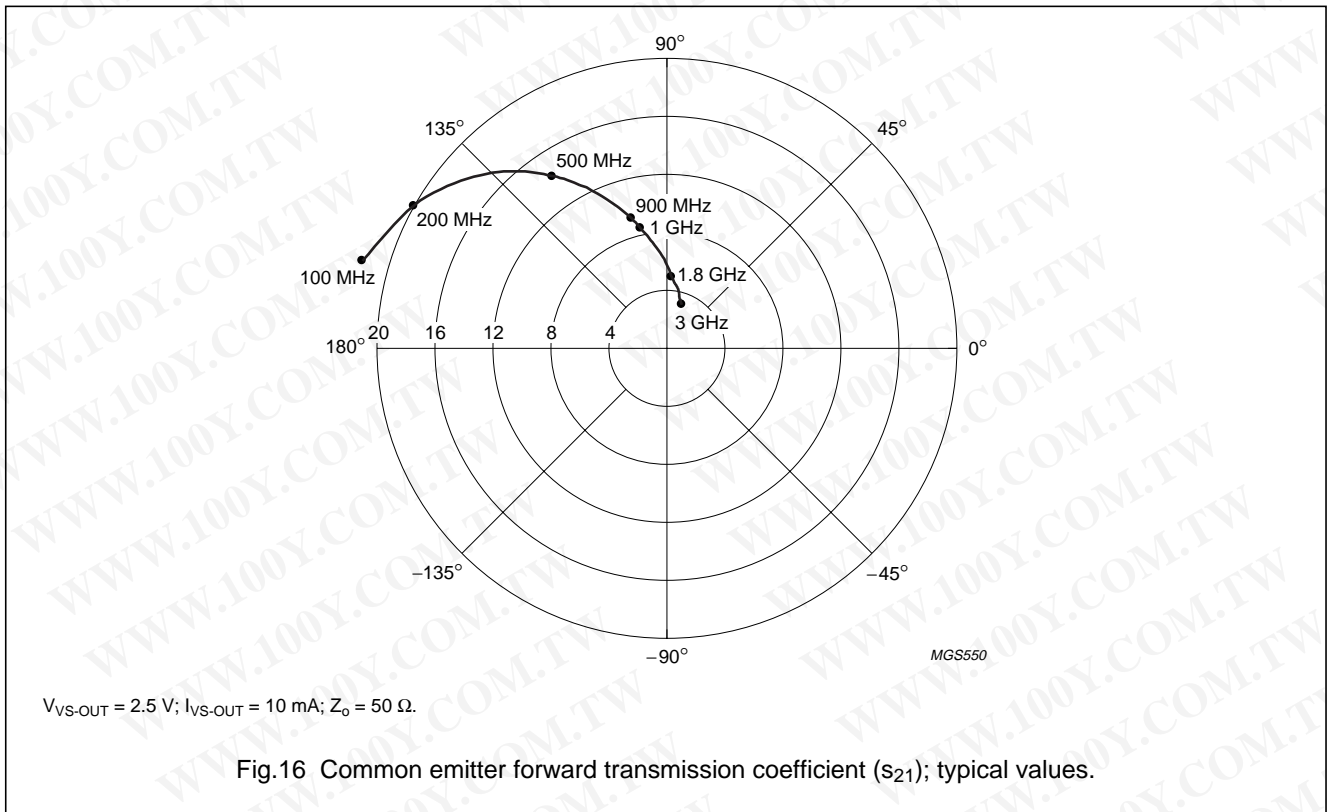
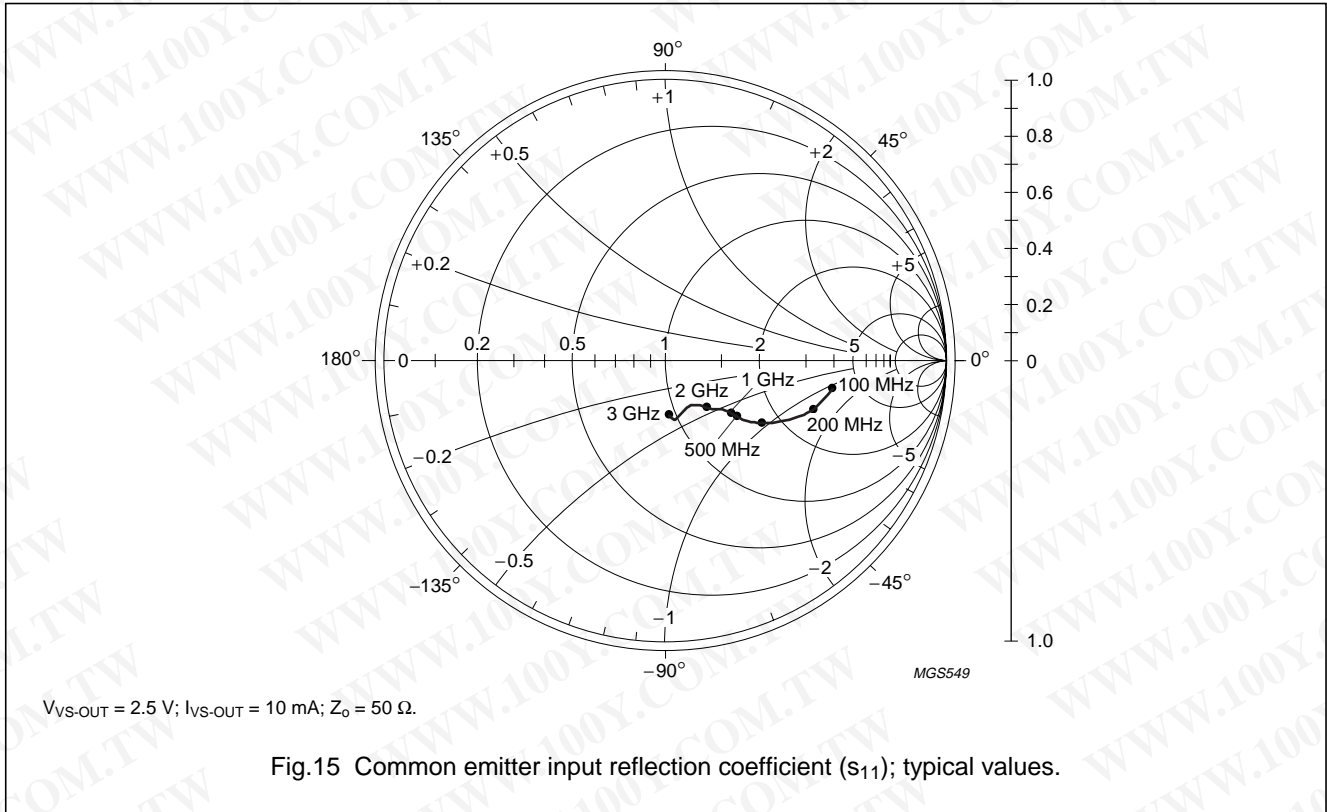
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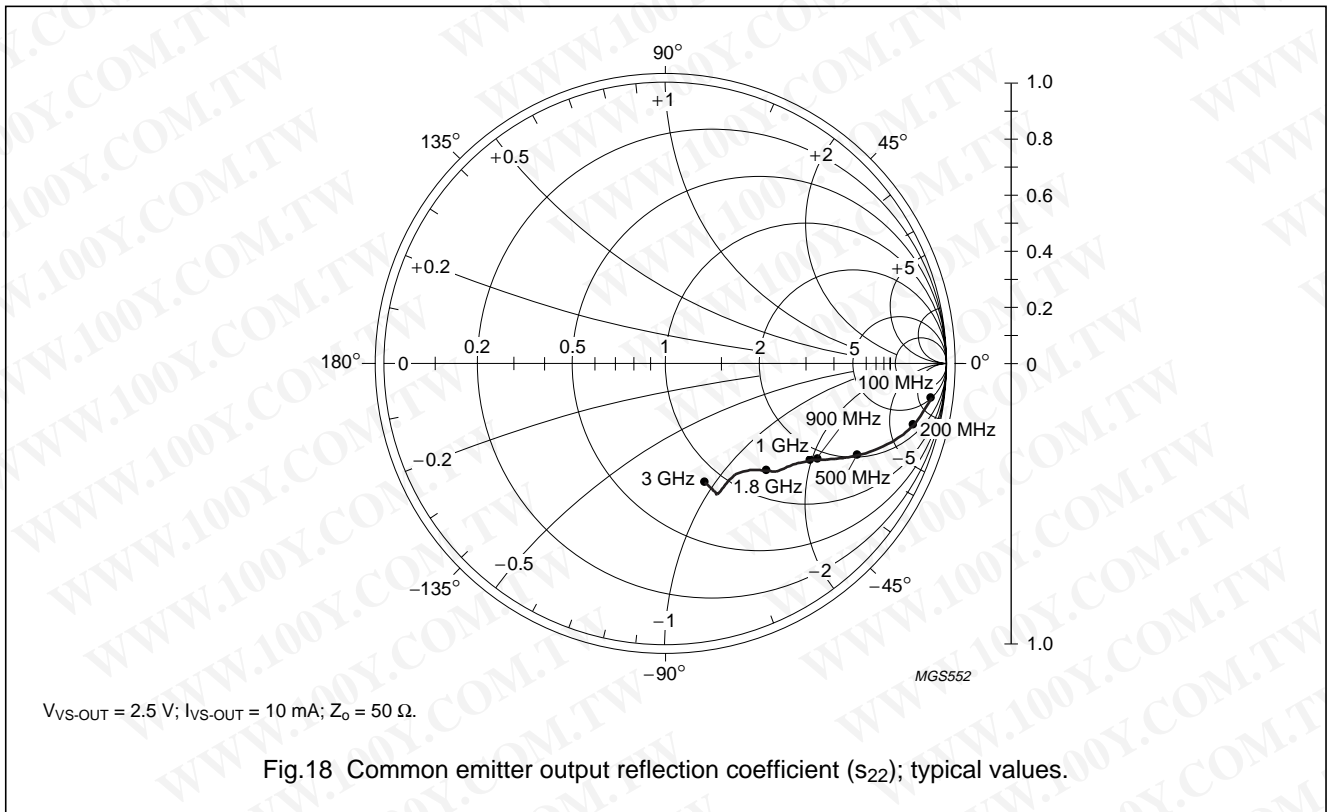
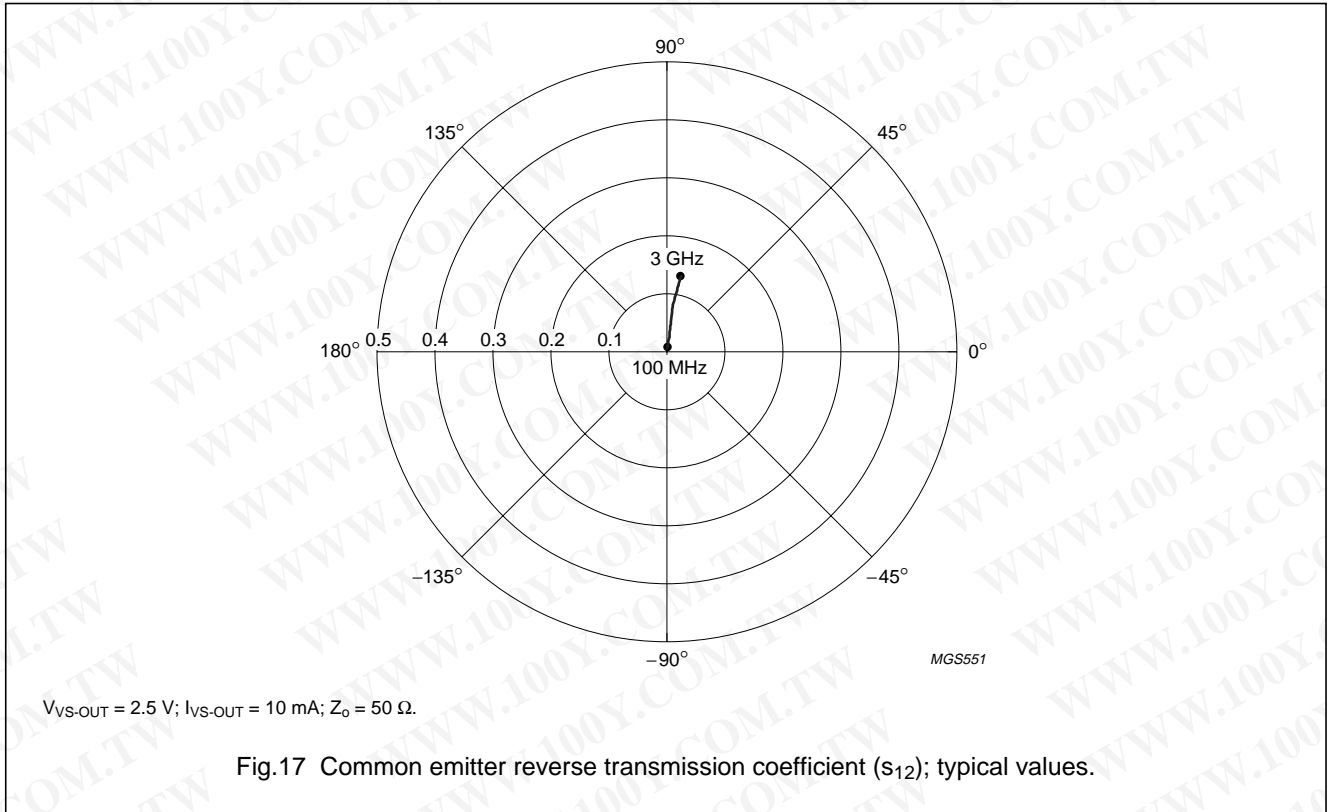
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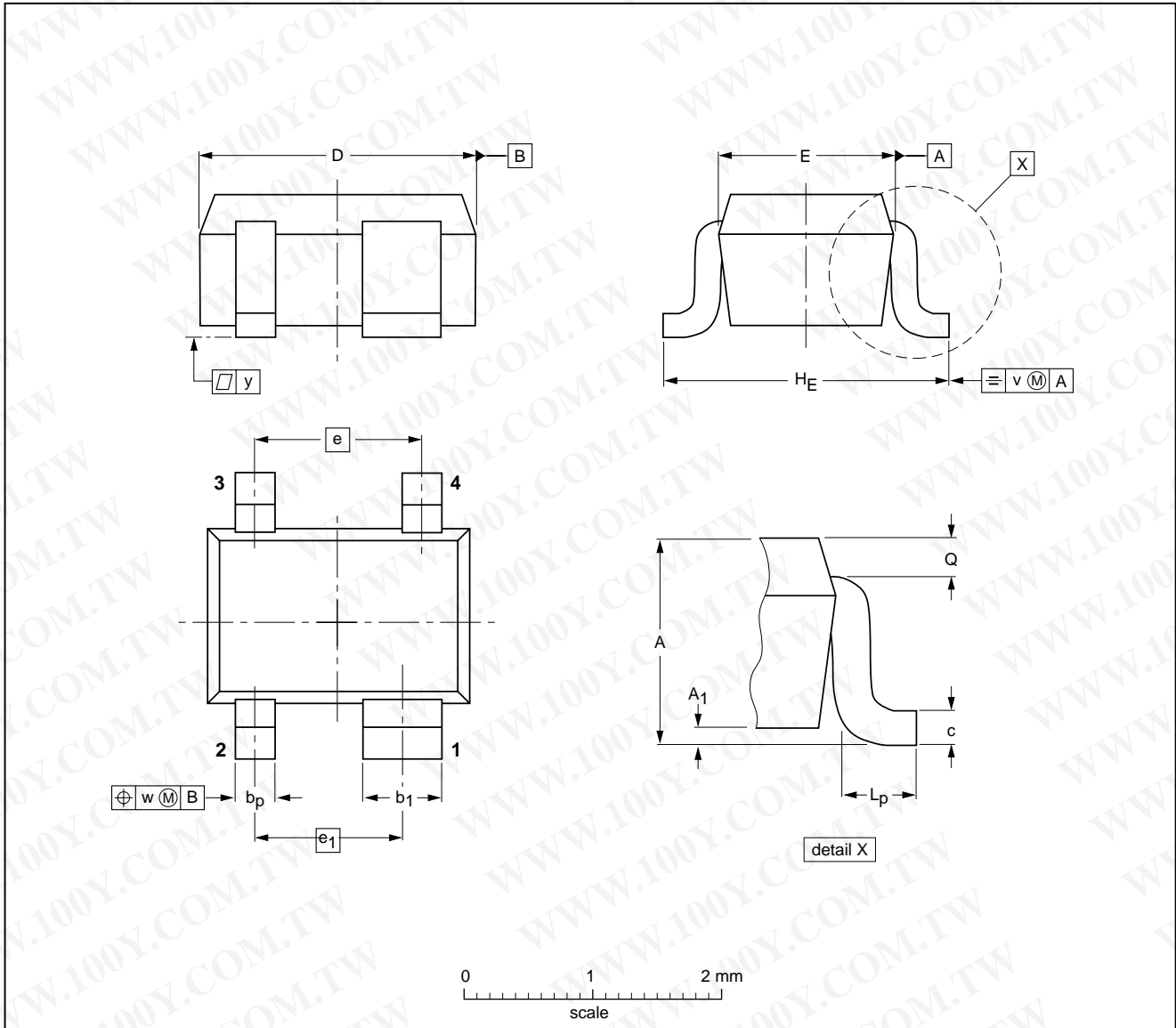
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PACKAGE OUTLINE

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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