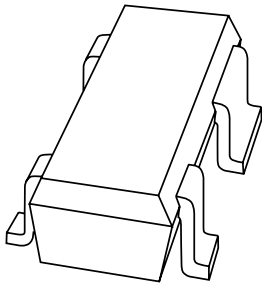


DATA SHEET



BGA2001 Silicon MMIC amplifier

Product specification
Supersedes data of 1999 Jul 23

1999 Aug 11

Silicon MMIC amplifier

BGA2001

FEATURES

- Low current, low voltage
- Very high power gain
- Low noise figure
- Integrated temperature compensated biasing
- Supply and RF output pin combined.

APPLICATIONS

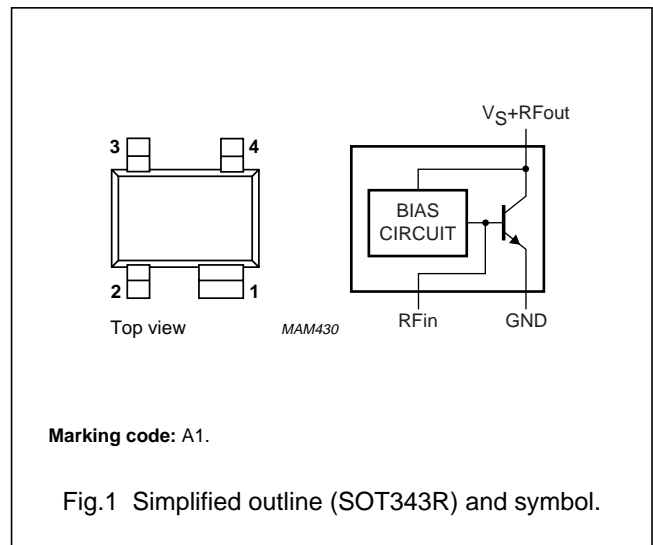
- RF front end
- Wideband applications, e.g. analog and digital cellular telephones, cordless telephones (PHS, DECT, etc.)
- Radar detectors
- Low noise amplifiers
- Satellite television tuners (SATV)
- High frequency oscillators.

DESCRIPTION

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

PINNING

| PIN | DESCRIPTION |
|-----|------------------|
| 1 | GND |
| 2 | RF in |
| 3 | GND |
| 4 | $V_S + RF_{out}$ |



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 | $V_{V_S-OUT} = 2.5$ V; RF input AC coupled | 4.5 | – | mA |
| MSG | maximum stable gain | $V_{V_S-OUT} = 2.5$ V; $f = 1.8$ GHz; $T_{amb} = 25$ °C | 19.5 | – | dB |
| NF | noise figure | $V_{V_S-OUT} = 2.5$ V; $f = 1.8$ GHz; $\Gamma_S = \Gamma_{opt}$ | 1.3 | – | dB |

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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 |
| I_S | supply current (DC) | forced by DC voltage on RF input | – | 30 | 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 |

CHARACTERISTICS

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

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---------------------|-------------------------------|---|------|------|------|------|
| I_S | supply current | $V_{VS-OUT} = 1\text{ V}$ | – | 0.7 | – | mA |
| | | $V_{VS-OUT} = 2.5\text{ V}$ | 3 | 4.5 | 6 | mA |
| | | $V_{VS-OUT} = 4.5\text{ V}$ | – | 11 | – | mA |
| MSG | maximum stable gain | $V_{VS-OUT} = 2.5\text{ V}$; $I_{VS-OUT} = 4\text{ mA}$; $f = 900\text{ MHz}$ | – | 22 | – | dB |
| | | $V_{VS-OUT} = 2.5\text{ V}$; $I_{VS-OUT} = 4\text{ mA}$; $f = 1.8\text{ GHz}$ | – | 19.5 | – | dB |
| $ s_{21} ^2$ | insertion power gain | $V_{VS-OUT} = 2.5\text{ V}$; $I_{VS-OUT} = 4\text{ mA}$; $f = 900\text{ MHz}$ | – | 18 | – | dB |
| | | $V_{VS-OUT} = 2.5\text{ V}$; $I_{VS-OUT} = 4\text{ mA}$; $f = 1.8\text{ GHz}$ | – | 14 | – | dB |
| P_L | load power | at 1 dB gain compression point; $V_{VS-OUT} = 2.5\text{ V}$; $I_{VS-OUT} = 4.4\text{ mA}$; $f = 900\text{ MHz}$; | – | –2 | – | dBm |
| NF | noise figure | $V_{VS-OUT} = 2.5\text{ V}$; $I_{VS-OUT} = 4\text{ mA}$; $f = 900\text{ MHz}$; $\Gamma_S = \Gamma_{opt}$ | – | 1.3 | – | dB |
| | | $V_{VS-OUT} = 2.5\text{ V}$; $I_{VS-OUT} = 4\text{ mA}$; $f = 1.8\text{ GHz}$; $\Gamma_S = \Gamma_{opt}$ | – | 1.3 | – | dB |
| IP3 _(in) | input intercept point; note 1 | $V_{VS-OUT} = 2.5\text{ V}$; $I_{VS-OUT} = 4.4\text{ mA}$; $f = 900\text{ MHz}$ | – | –7.4 | – | dBm |
| | | $V_{VS-OUT} = 2.5\text{ V}$; $I_{VS-OUT} = 4.5\text{ mA}$; $f = 1800\text{ MHz}$ | – | –4.5 | – | dBm |

Note

1. See application note: RNR-T45-99-B-0513.

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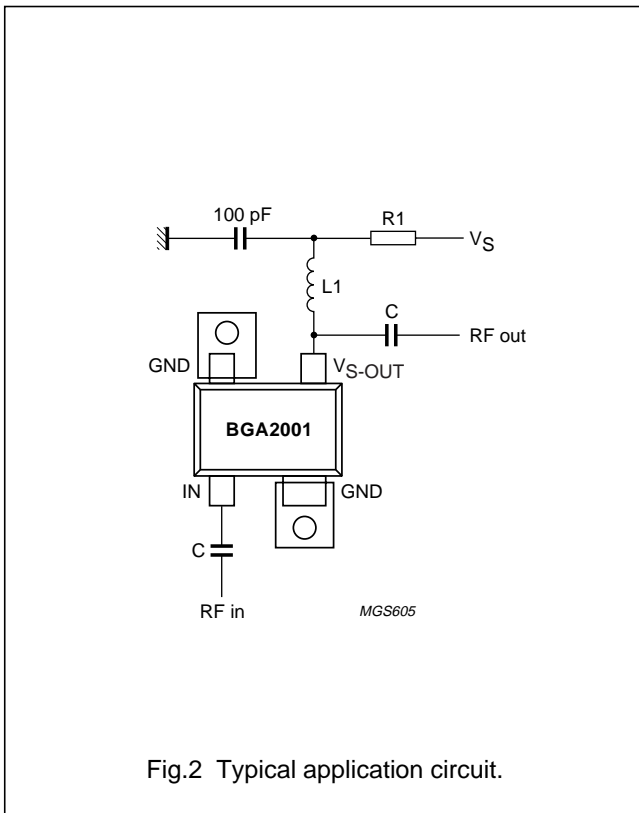


Fig.2 Typical application circuit.

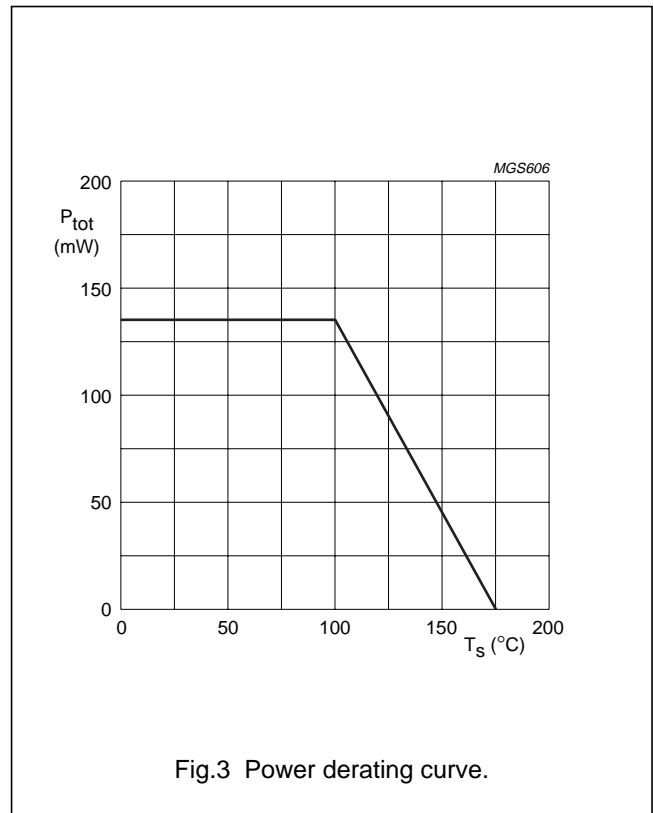
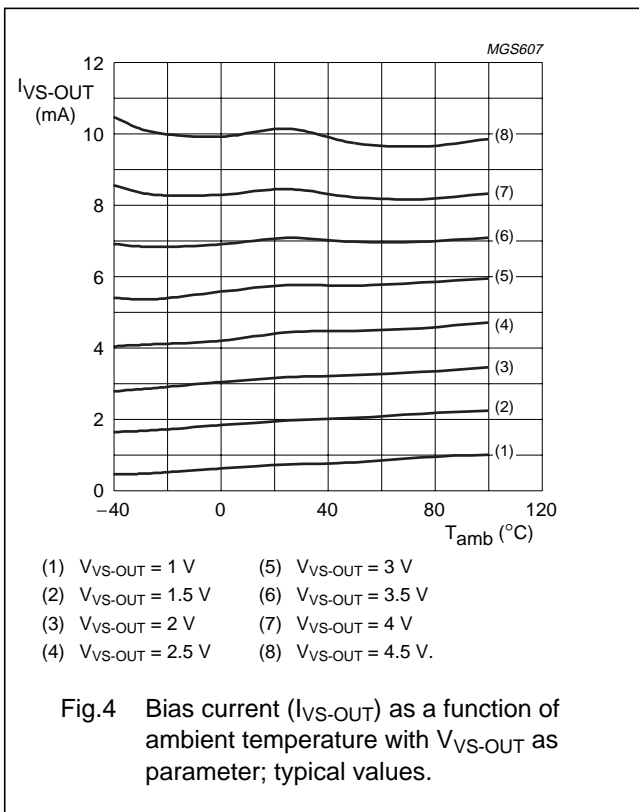


Fig.3 Power derating curve.



- (1) $V_{VS-OUT} = 1\text{ V}$
- (2) $V_{VS-OUT} = 1.5\text{ V}$
- (3) $V_{VS-OUT} = 2\text{ V}$
- (4) $V_{VS-OUT} = 2.5\text{ V}$
- (5) $V_{VS-OUT} = 3\text{ V}$
- (6) $V_{VS-OUT} = 3.5\text{ V}$
- (7) $V_{VS-OUT} = 4\text{ V}$
- (8) $V_{VS-OUT} = 4.5\text{ V}$

Fig.4 Bias current (I_{VS-OUT}) as a function of ambient temperature with V_{VS-OUT} as parameter; typical values.

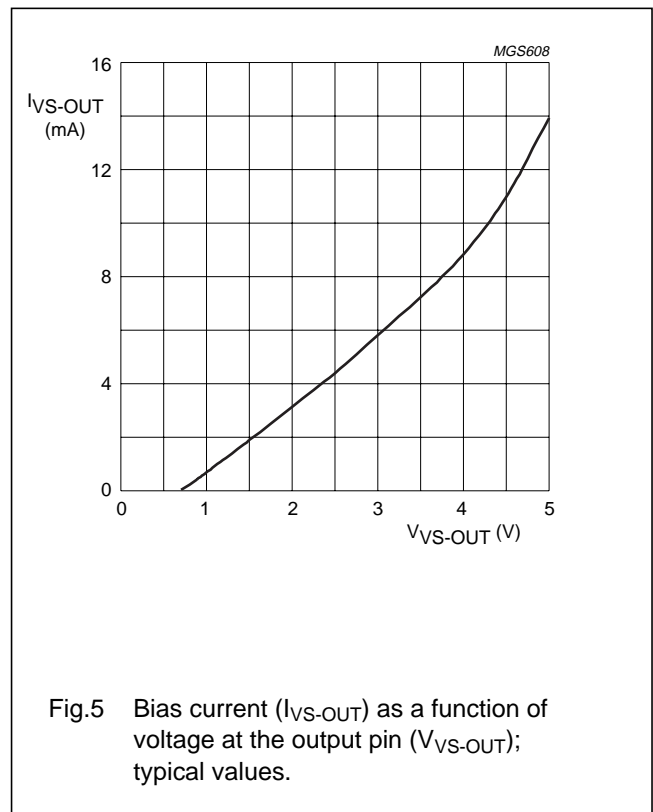
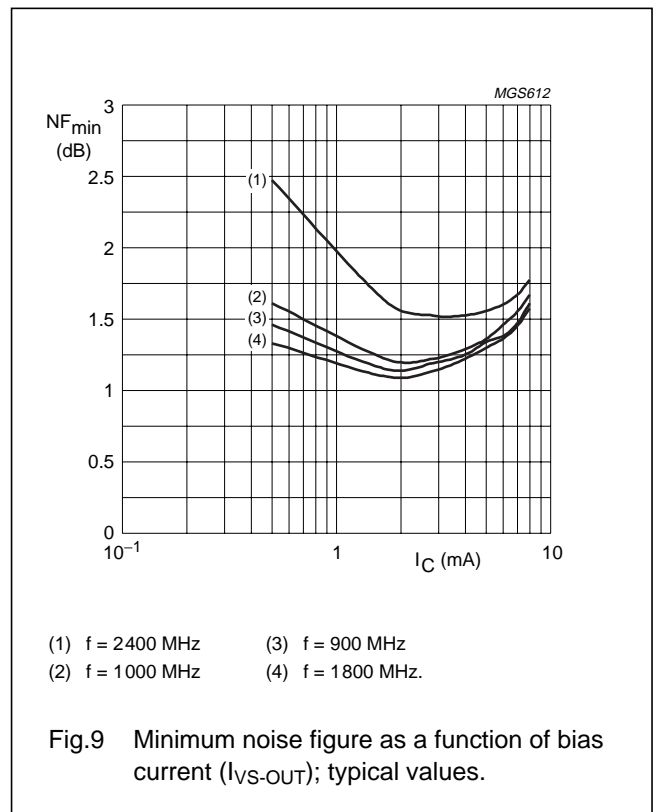
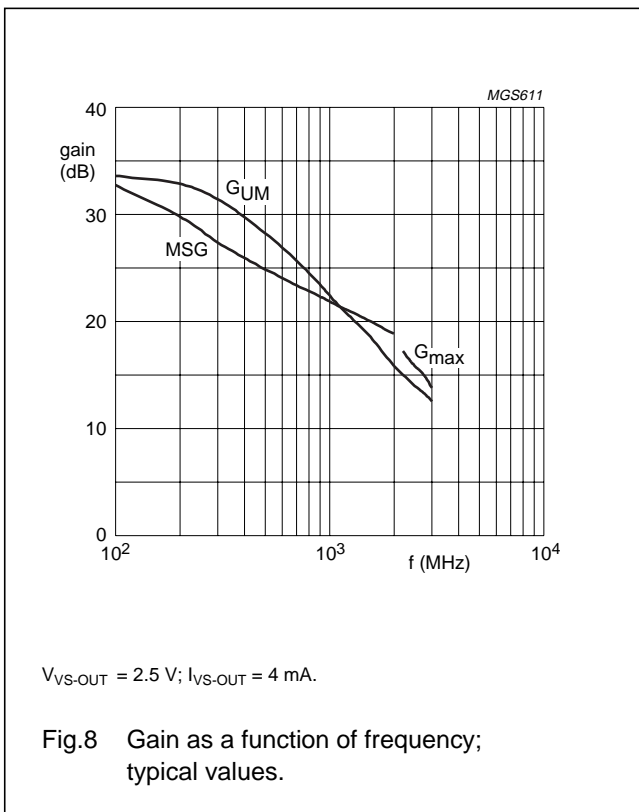
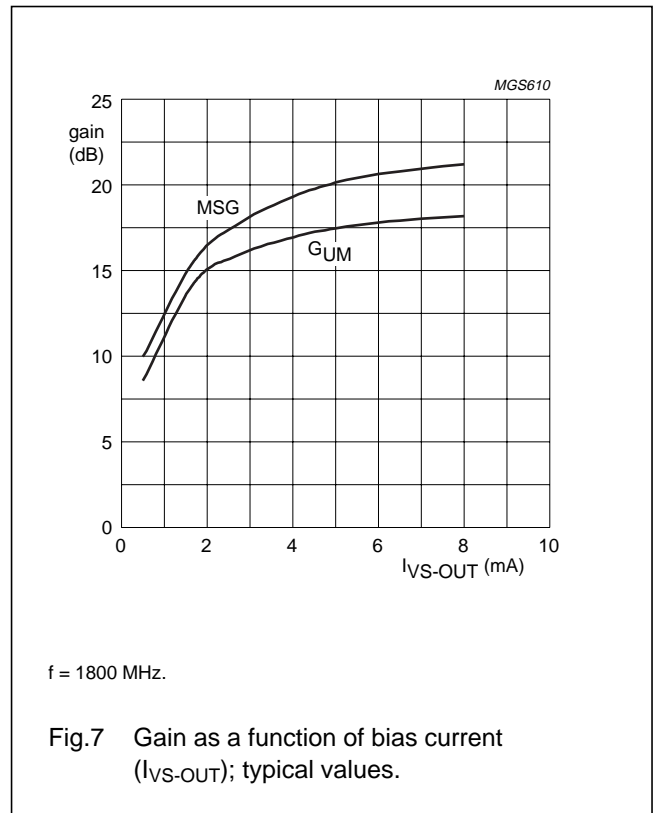
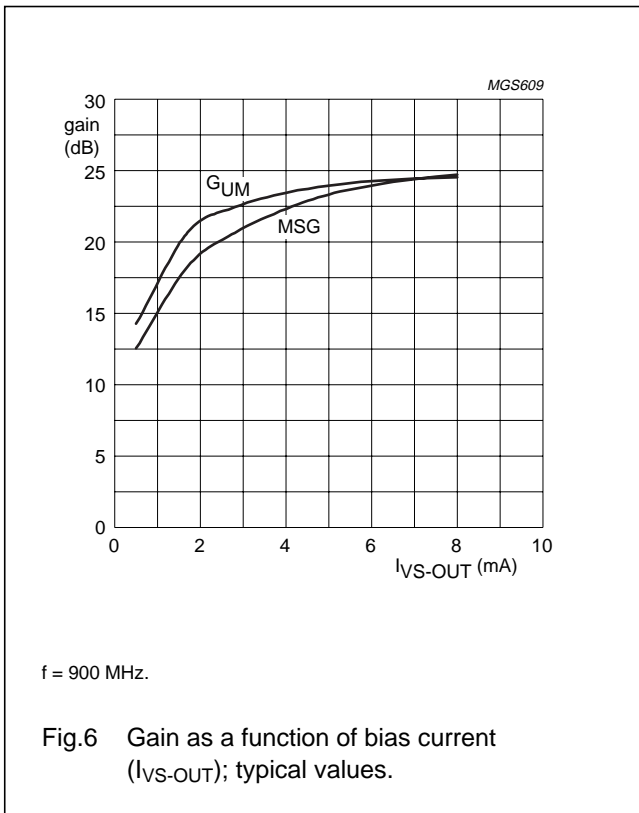


Fig.5 Bias current (I_{VS-OUT}) as a function of voltage at the output pin (V_{VS-OUT}); typical values.

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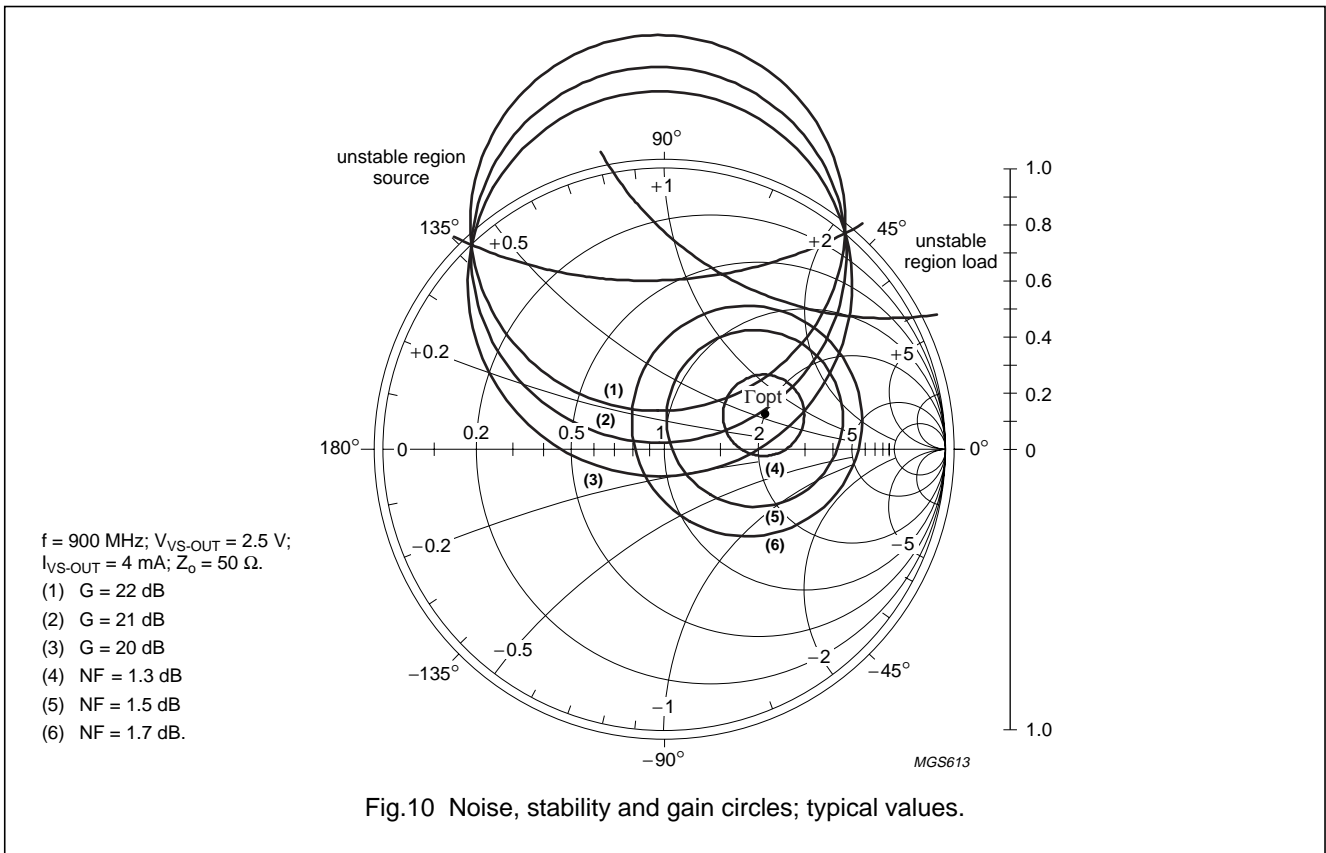


Fig.10 Noise, stability and gain circles; typical values.

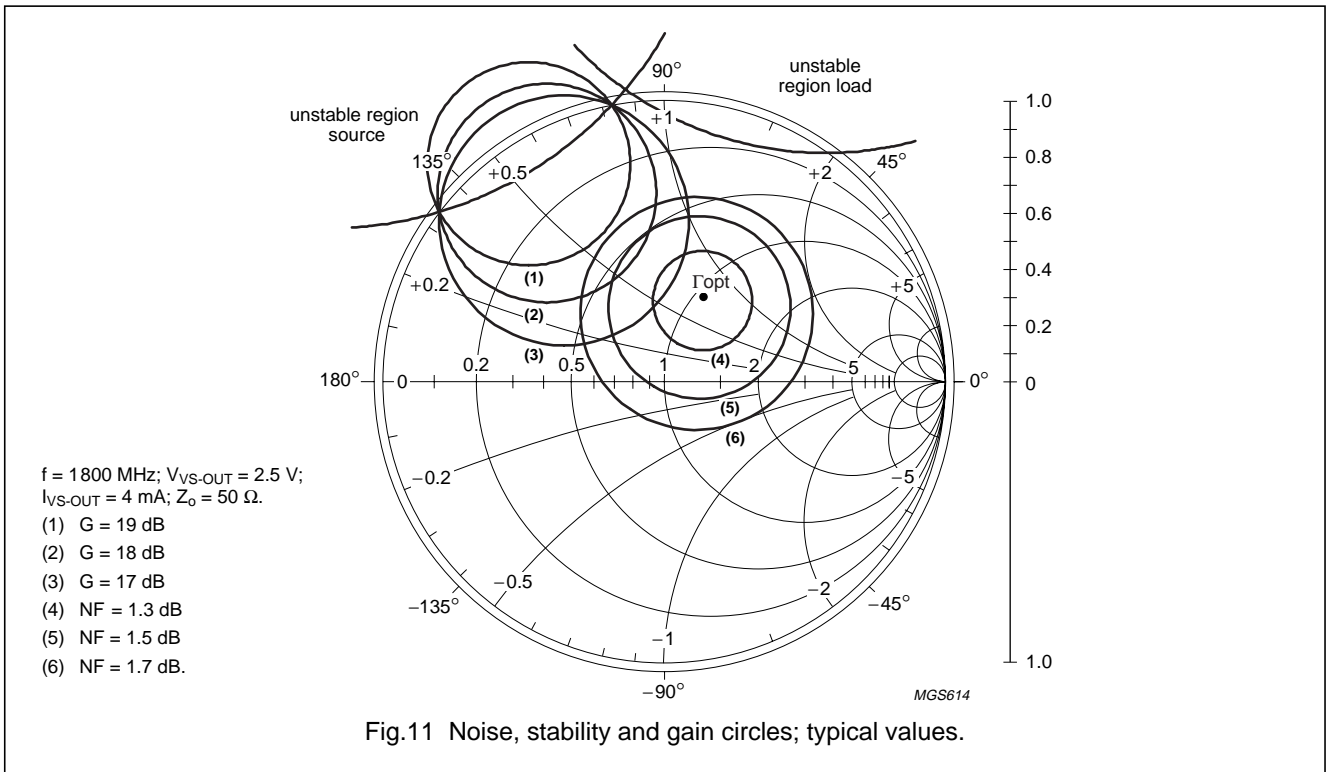
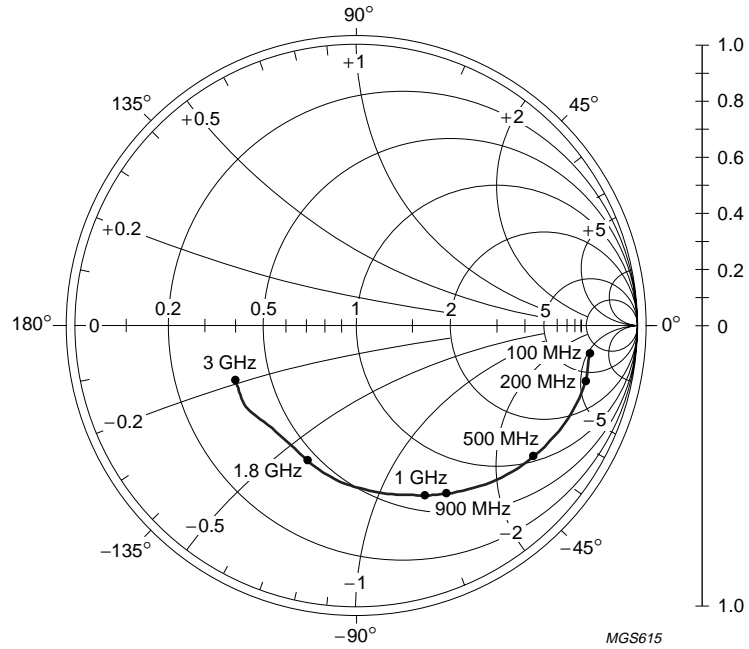


Fig.11 Noise, stability and gain circles; typical values.

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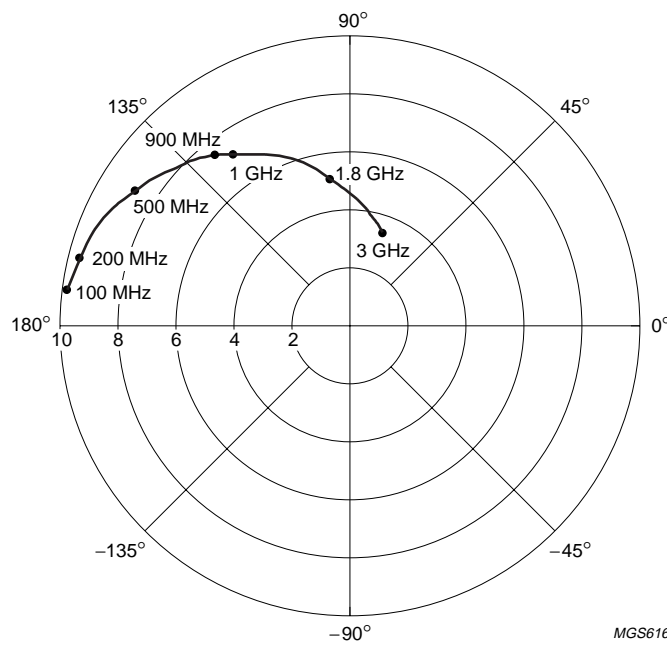
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$V_{VS-OUT} = 2.5\text{ V}$; $I_{VS-OUT} = 4\text{ mA}$; $Z_0 = 50\ \Omega$.

MG5615

Fig.12 Common emitter input reflection coefficient (s_{11}); typical values.



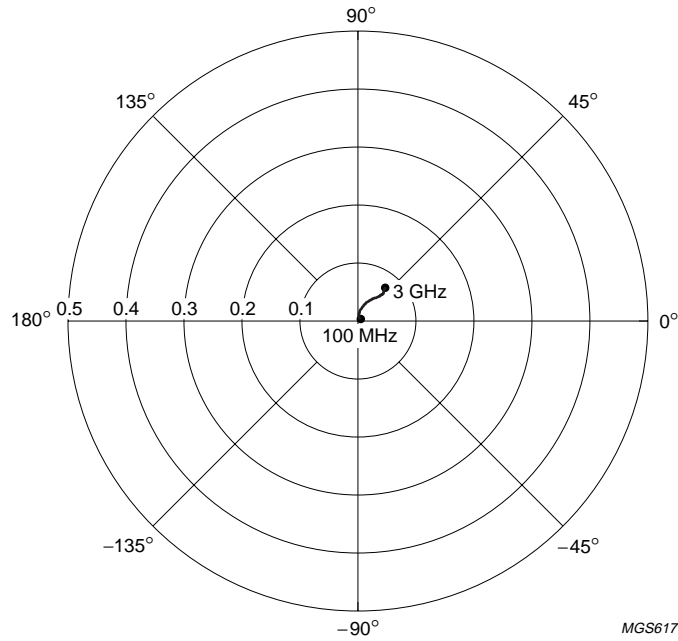
$V_{VS-OUT} = 2.5\text{ V}$; $I_{VS-OUT} = 4\text{ mA}$; $Z_0 = 50\ \Omega$.

MG5616

Fig.13 Common emitter forward transmission coefficient (s_{21}); typical values.

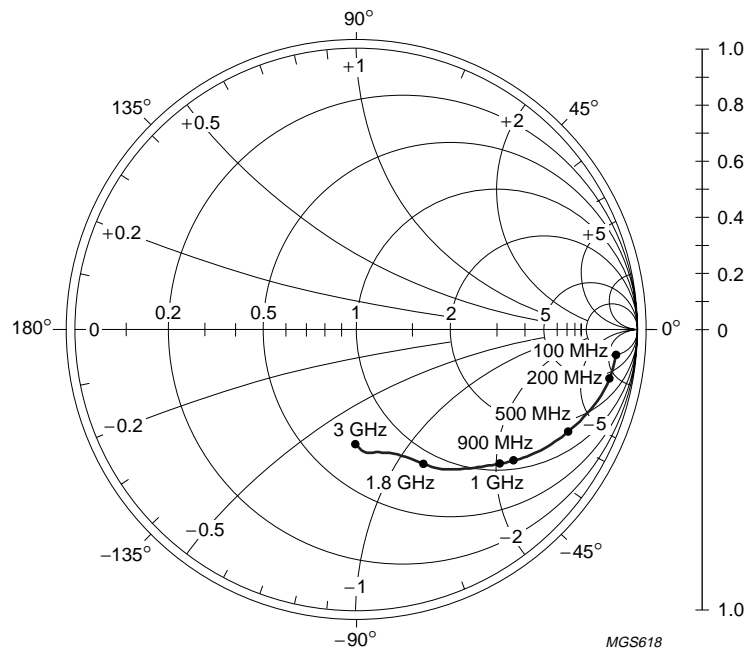
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$V_{VS-OUT} = 2.5\text{ V}$; $I_{VS-OUT} = 4\text{ mA}$; $Z_o = 50\ \Omega$.

Fig.14 Common emitter reverse transmission coefficient (s_{12}); typical values.



$V_{VS-OUT} = 2.5\text{ V}$; $I_{VS-OUT} = 4\text{ mA}$; $Z_o = 50\ \Omega$.

Fig.15 Common emitter output reflection coefficient (s_{22}); typical values.

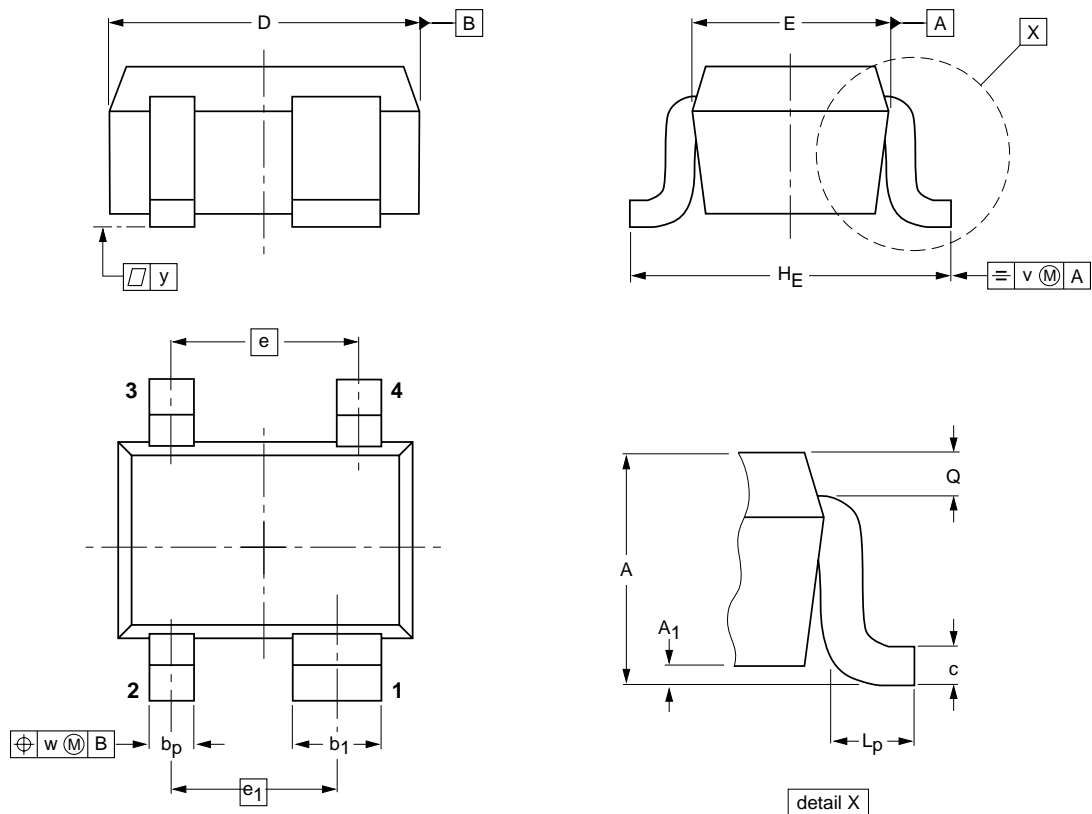
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PACKAGE OUTLINE

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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