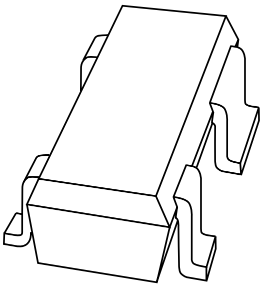
DATA SHEET



BGA2001
Silicon MMIC amplifier

Product specification
Supersedes data of 1999 Jul 23

1999 Aug 11

Philips Semiconductors

PHILIPS

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

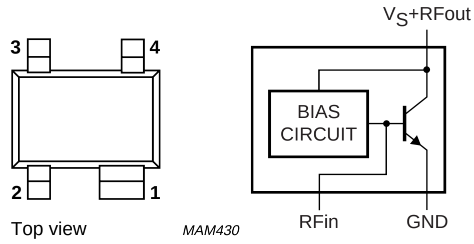
- RF front end
- Wideband applications, e.g. analog and digital cellular telephones, cordless telephones (PHS, DECT, etc.)
- Radar detectors
- Low noise amplifiers
- Satellite television tuners (SATV)
- High frequency oscillators.

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 + RFout



Marking code: A1.

Fig.1 Simplified outline (SOT343R) and symbol.

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

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	$T_s \leq 100$ °C	–	135	mW
T_{stg}	storage temperature		–65	+150	°C
T_j	operating junction temperature		–	150	°C

THERMAL CHARACTERISTICS

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

CHARACTERISTICS

RF input AC coupled; T_j = 25 °C; unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_S	supply current	$V_{VS\text{-}OUT}$ = 1 V	–	0.7	–	mA
		$V_{VS\text{-}OUT}$ = 2.5 V	3	4.5	6	mA
		$V_{VS\text{-}OUT}$ = 4.5 V	–	11	–	mA
MSG	maximum stable gain	$V_{VS\text{-}OUT}$ = 2.5 V; $I_{VS\text{-}OUT}$ = 4 mA; f = 900 MHz	–	22	–	dB
		$V_{VS\text{-}OUT}$ = 2.5 V; $I_{VS\text{-}OUT}$ = 4 mA; f = 1.8 GHz	–	19.5	–	dB
$\lvert s_{21}\rvert^2$	insertion power gain	$V_{VS\text{-}OUT}$ = 2.5 V; $I_{VS\text{-}OUT}$ = 4 mA; f = 900 MHz	–	18	–	dB
		$V_{VS\text{-}OUT}$ = 2.5 V; $I_{VS\text{-}OUT}$ = 4 mA; f = 1.8 GHz	–	14	–	dB
P_L	load power	at 1 dB gain compression point; $V_{VS\text{-}OUT}$ = 2.5 V; $I_{VS\text{-}OUT}$ = 4.4 mA; f = 900 MHz;	–	–2	–	dBm
NF	noise figure	$V_{VS\text{-}OUT}$ = 2.5 V; $I_{VS\text{-}OUT}$ = 4 mA; f = 900 MHz; $\Gamma_S = \Gamma_{opt}$	–	1.3	–	dB
		$V_{VS\text{-}OUT}$ = 2.5 V; $I_{VS\text{-}OUT}$ = 4 mA; f = 1.8 GHz; $\Gamma_S = \Gamma_{opt}$	–	1.3	–	dB
$IP3_{(in)}$	input intercept point; note 1	$V_{VS\text{-}OUT}$ = 2.5 V; $I_{VS\text{-}OUT}$ = 4.4 mA; f = 900 MHz	–	–7.4	–	dBm
		$V_{VS\text{-}OUT}$ = 2.5 V; $I_{VS\text{-}OUT}$ = 4.5 mA; f = 1800 MHz	–	–4.5	–	dBm

Note

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

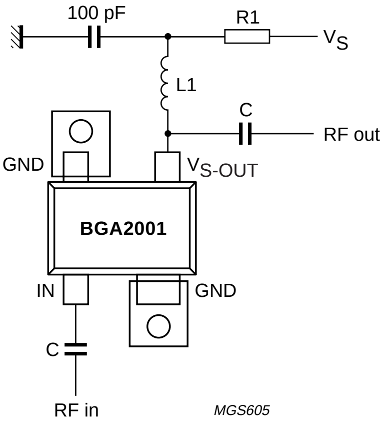


Fig.2 Typical application circuit.

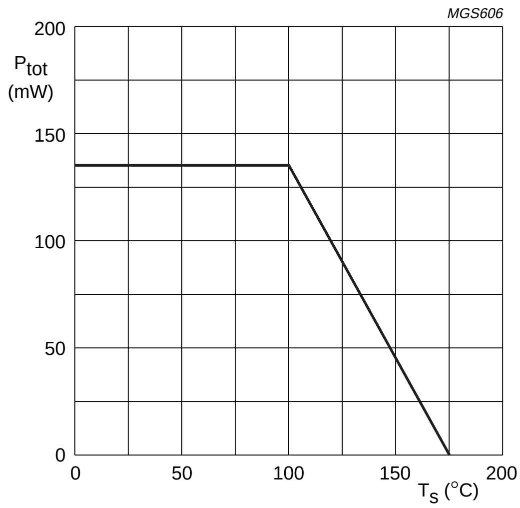
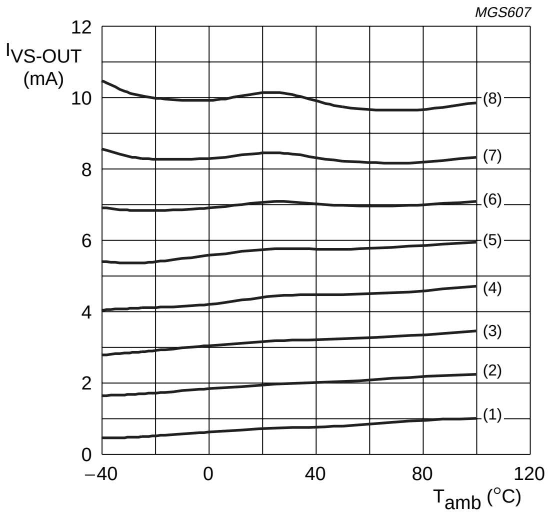


Fig.3 Power derating curve.



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

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

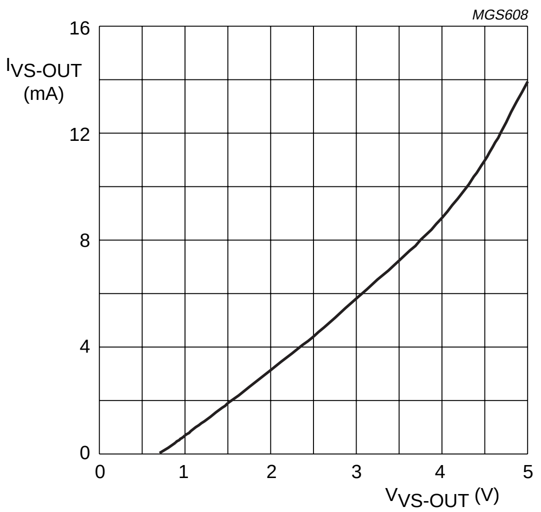
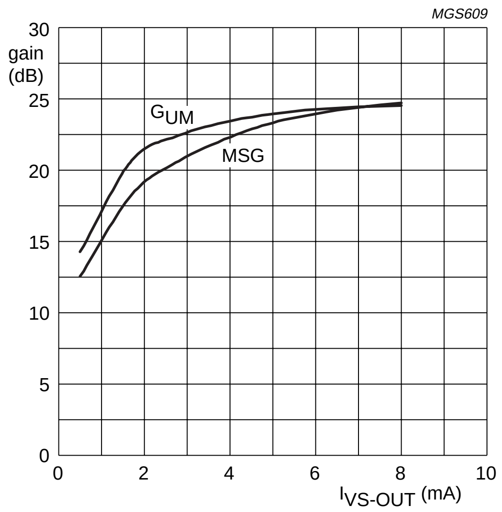
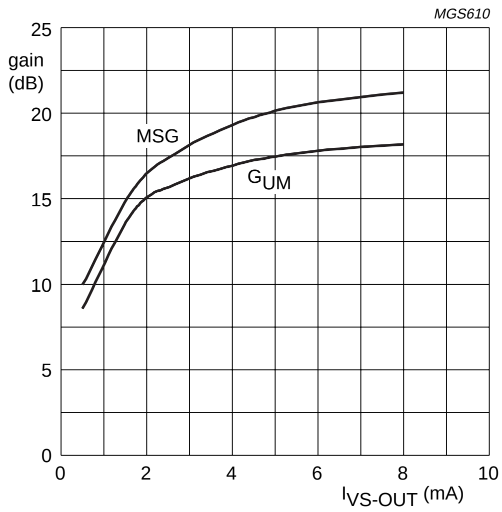


Fig.5 Bias current ($I_{VS\text{-}OUT}$) as a function of voltage at the output pin ($V_{VS\text{-}OUT}$); typical values.



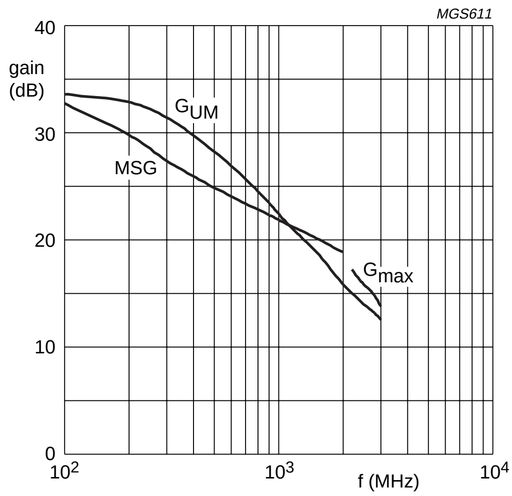
f = 900 MHz.

Fig.6 Gain as a function of bias current (I_{VS-OUT}); typical values.



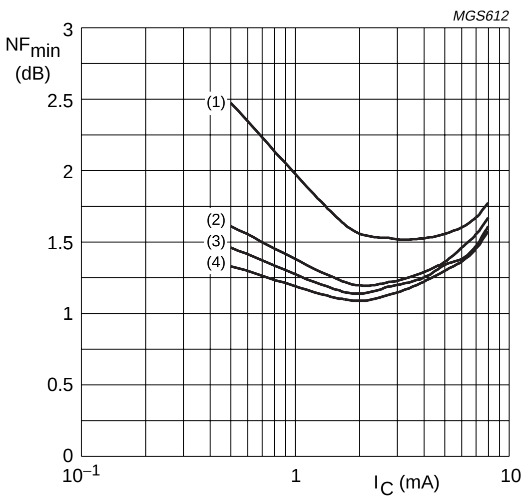
f = 1800 MHz.

Fig.7 Gain as a function of bias current (I_{VS-OUT}); typical values.



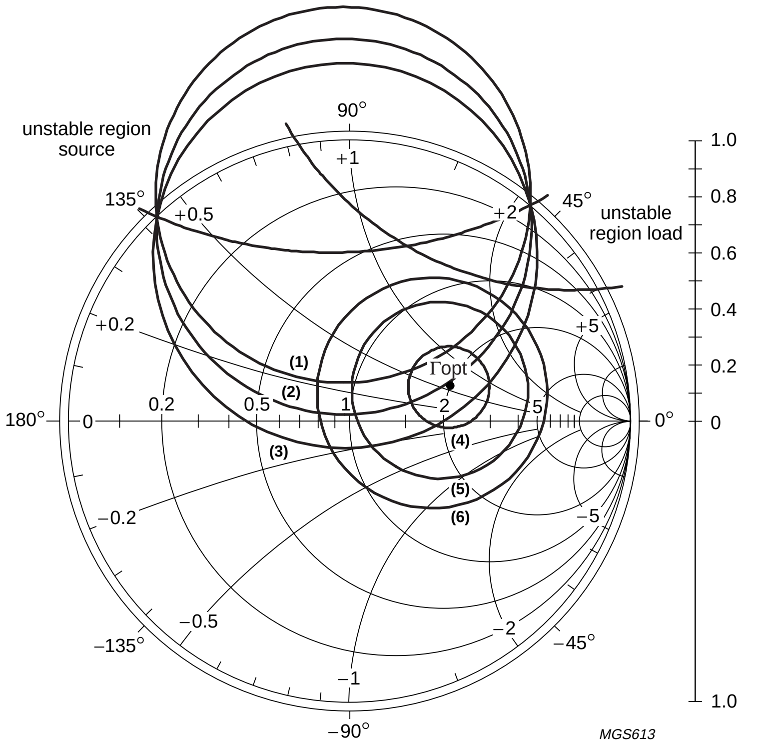
V_{VS-OUT} = 2.5 V; I_{VS-OUT} = 4 mA.

Fig.8 Gain as a function of frequency; typical values.



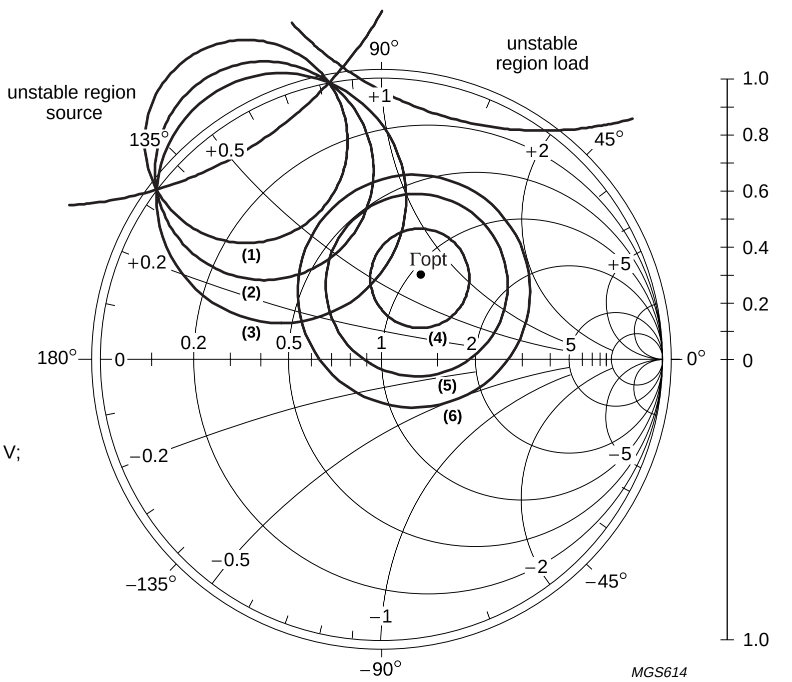
(1) f = 2400 MHz
(2) f = 1000 MHz
(3) f = 900 MHz
(4) f = 1800 MHz.

Fig.9 Minimum noise figure as a function of bias current (I_{VS-OUT}); typical values.



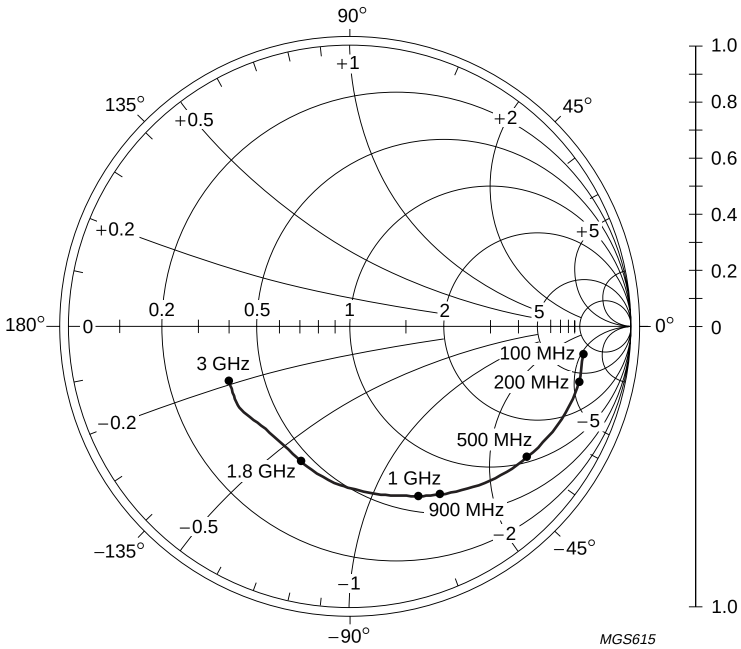
f = 900 MHz; $V_{VS\text{-}OUT}$ = 2.5 V;
$I_{VS\text{-}OUT}$ = 4 mA; Z_o = 50 Ω.
(1) G = 22 dB
(2) G = 21 dB
(3) G = 20 dB
(4) NF = 1.3 dB
(5) NF = 1.5 dB
(6) NF = 1.7 dB.

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



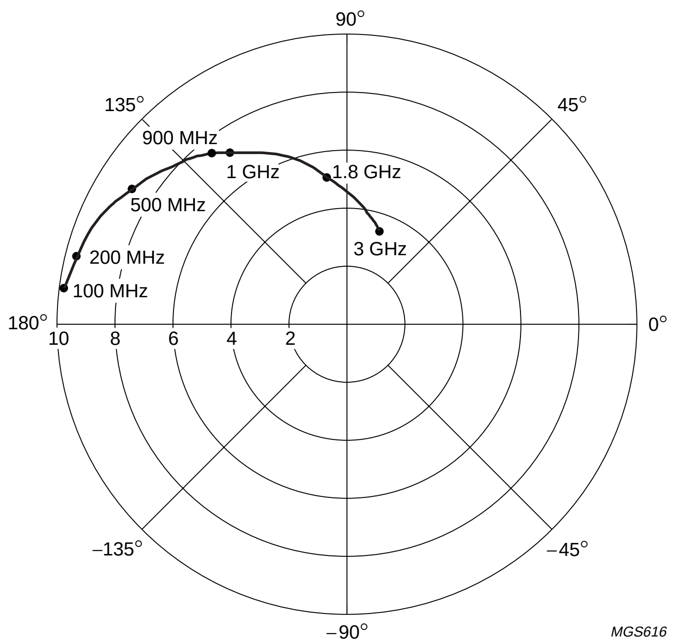
f = 1800 MHz; $V_{VS\text{-}OUT}$ = 2.5 V;
$I_{VS\text{-}OUT}$ = 4 mA; Z_o = 50 Ω.
(1) G = 19 dB
(2) G = 18 dB
(3) G = 17 dB
(4) NF = 1.3 dB
(5) NF = 1.5 dB
(6) NF = 1.7 dB.

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



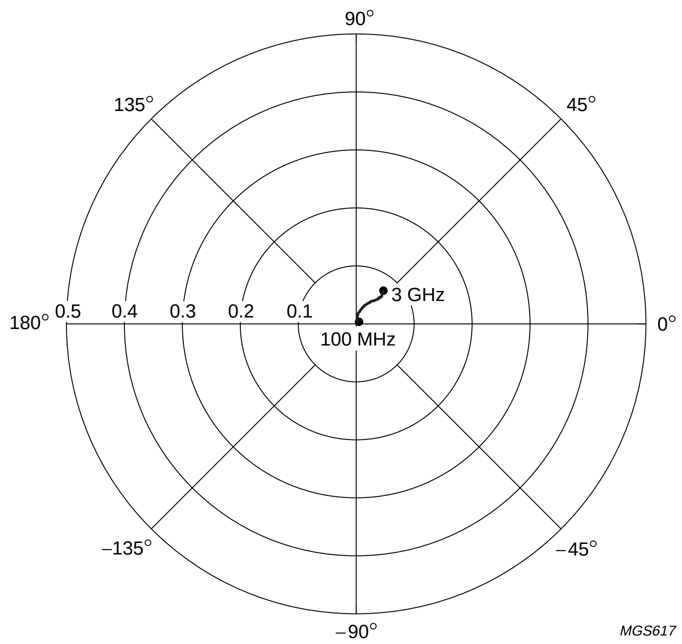
$V_{VS\text{-}OUT}$ = 2.5 V; $I_{VS\text{-}OUT}$ = 4 mA; Z_o = 50 Ω.

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



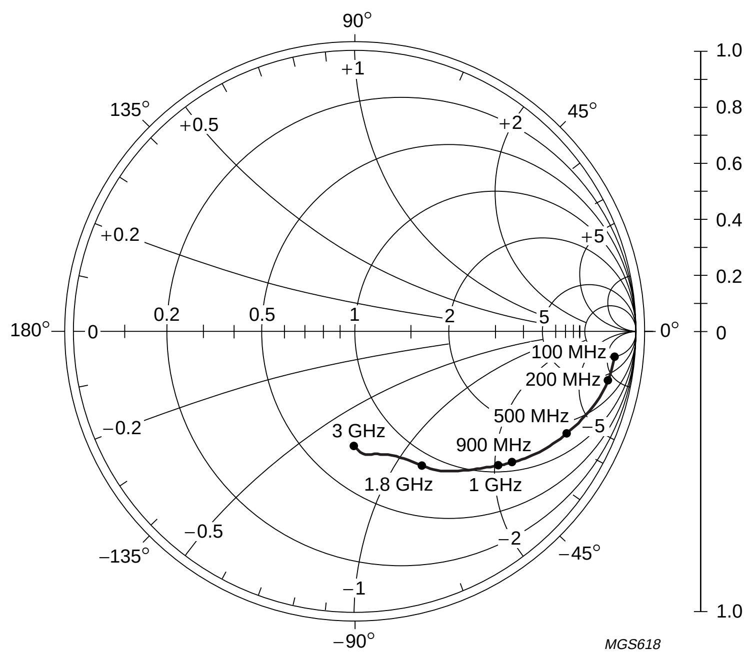
$V_{VS\text{-}OUT}$ = 2.5 V; $I_{VS\text{-}OUT}$ = 4 mA; Z_o = 50 Ω.

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



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

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

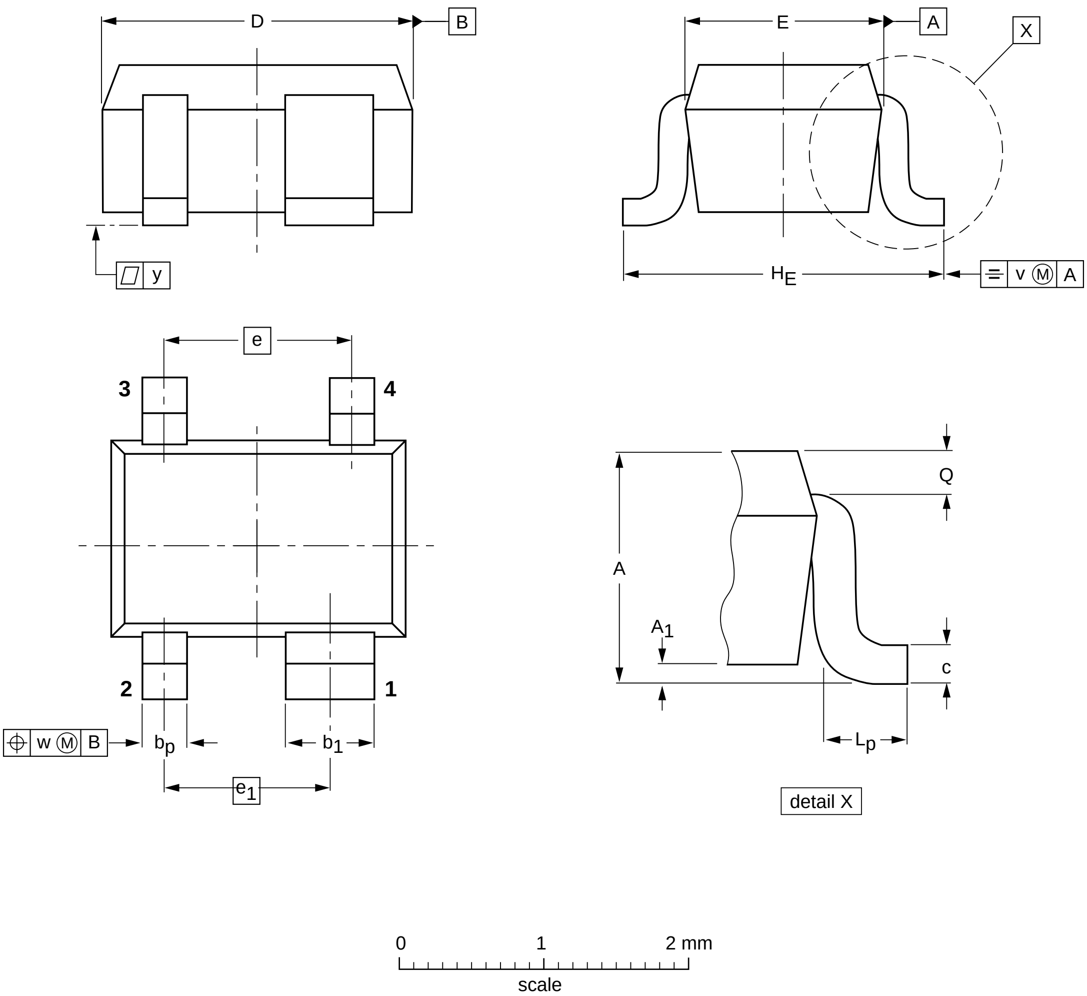


$V_{VS\text{-}OUT}$ = 2.5 V; $I_{VS\text{-}OUT}$ = 4 mA; Z_o = 50 Ω.

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

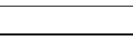
PACKAGE OUTLINE

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

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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