BGA2002

MMIC amplifier

Rev. 4 — 9 February 2011 Product data sheet

1. Product profile

1.1 General description

Silicon Monolithic Microwave Integrated Circuit (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.

1.2 Features and benefits

- Low current, low voltage
- Very high power gain
- Low noise figure
- Integrated temperature compensated biasing
- Supply and RF output pin combined
- AEC-Q100 qualified, see Section 8.1

1.3 Applications

- LNB IF amplifiers
- General purpose low noise wideband amplifier for frequencies between DC and 2.2 GHz
- High frequency oscillators
- High frequency oscillators
- Satellite televisions tuners (SATV)
- High frequency oscillators

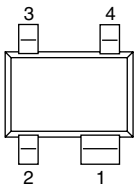
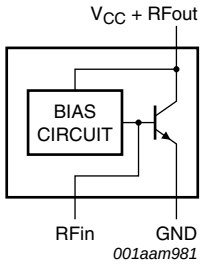
1.4 Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CC}	supply voltage	RF input AC coupled	-	-	4.5	V
I_{CC}	supply current	V_{bias} = 2.5 V; RF input AC coupled	3	4.5	6	mA
MSG	maximum stable gain	V_{bias} = 2.5 V; f = 1.8 GHz; T_{amb} = 25 °C	-	19.5	-	dBm
NF	noise figure	V_{bias} = 2.5 V; f = 1.8 GHz; $\Gamma_S = \Gamma_{opt}$	-	1.3	-	dBm

2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
1	GND		
2, 5	RFin		
3	GND		
4	V_{CC} + RFout		

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BGA2002	-	plastic surface mounted package; reverse pinning; 4 leads	SOT343R

4. Marking

Table 4. Marking

Type number	Marking code	Description
BGA2002	A2*	* = p: made in Hong Kong
		* = t: made in Malaysia

5. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CC}	supply voltage	RF input AC coupled	-	4.5	V
I_{CC}	supply current	forced by DC voltage on RF input	-	30	mA
P_{tot}	total power dissipation	T_{sp} = 100 °C	-	135	mW
T_{stg}	storage temperature		–65	+150	°C
T_j	junction temperature		-	150	°C

6. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Typ	Unit
$R_{th(j-sp)}$	thermal resistance from junction to solder point	P_{tot} = 135 mW; T_{sp} = 100 °C	350	K/W

7. Characteristics

Table 7. Characteristics

V_{bias} = 2.5 V; I_{bias} = 4 mA; T_{amb} = 25 °C; unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{CC}	supply current	V_{bias} = 1 V	-	0.7	-	mA
		V_{bias} = 2.5 V	3	4.5	6	mA
		V_{bias} = 4.5 V	-	11	-	mA
MSG	maximum stable gain	f = 900 MHz	-	22	-	dB
		f = 1800 MHz	-	19.5	-	dB
$\|S21\|^2$	insertion power gain	f = 900 MHz	-	18	-	dB
		f = 900 MHz	-	14	-	dB
$P_{L(1dB)}$	output power at 1 dB gain compression	I_{bias} = 4.4 mA; f = 900 MHz	-	–2	-	dBm
NF	noise figure	$\Gamma_S = \Gamma_{opt}$; f = 900 MHz	-	1.3	-	dB
		$\Gamma_S = \Gamma_{opt}$; f = 1800 MHz	-	1.3	-	dB
$IP3_I$	input third-order intercept point	I_{bias} = 4.4 mA; f = 900 MHz	-	–7.4	-	dBm
		I_{bias} = 4.4 mA; f = 1800 MHz	-	–4.5	-	dBm

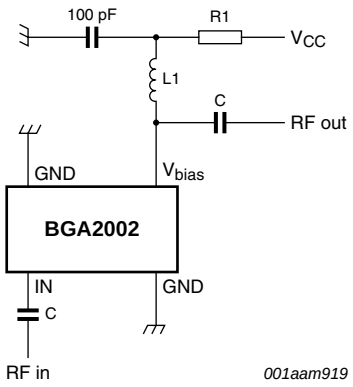


Fig 1. Typical application circuit

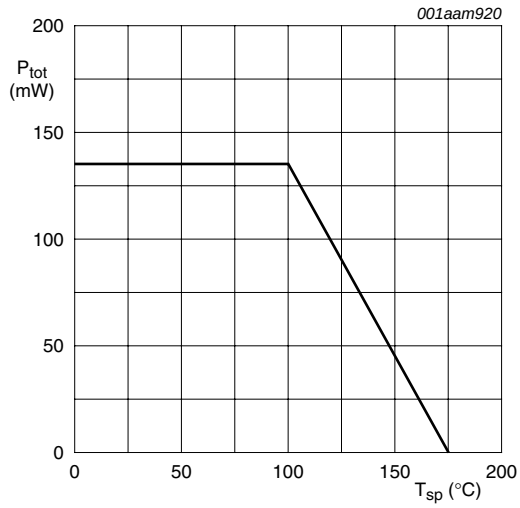
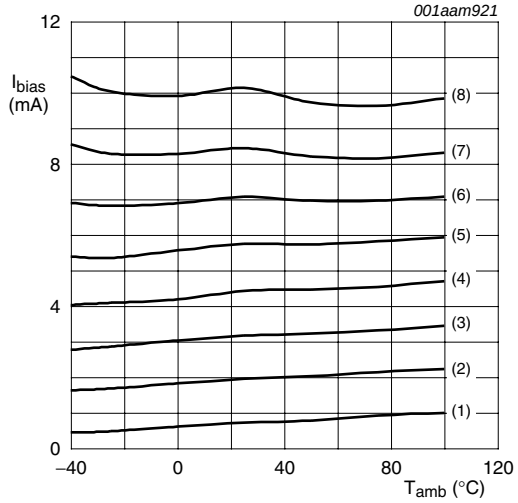


Fig 2. Power derating curve



(1) V_{bias} = 1 V
(2) V_{bias} = 1.5 V
(3) V_{bias} = 2 V
(4) V_{bias} = 2.5 V
(5) V_{bias} = 3 V
(6) V_{bias} = 3.5 V
(7) V_{bias} = 4 V
(8) V_{bias} = 4.5 V

Fig 3. Bias current as a function of ambient temperature; typical values

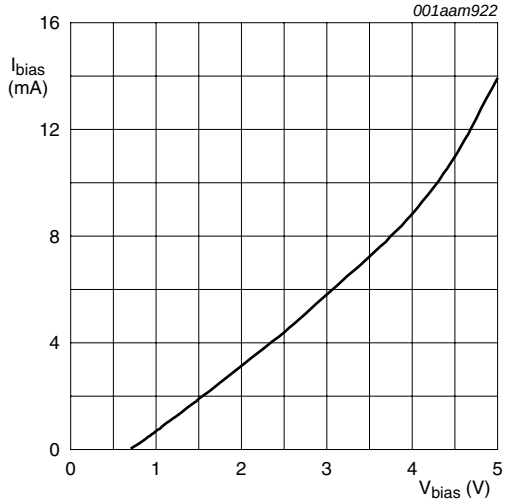
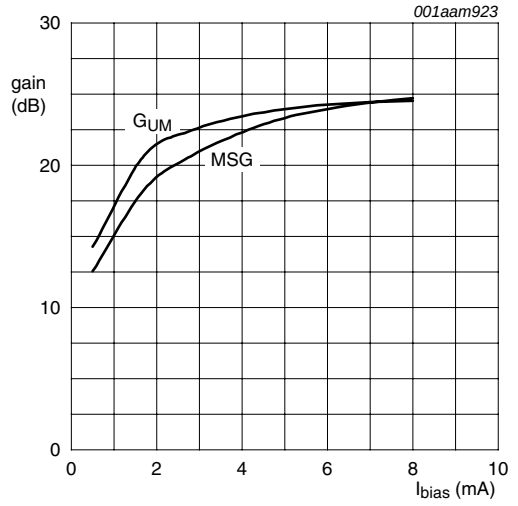
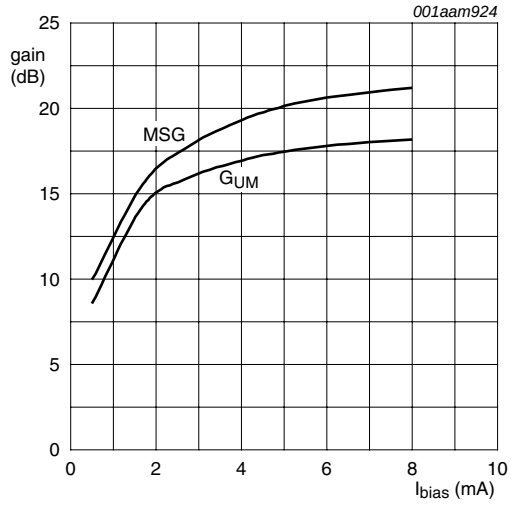


Fig 4. Bias current as a function of voltage at the output pin; typical values



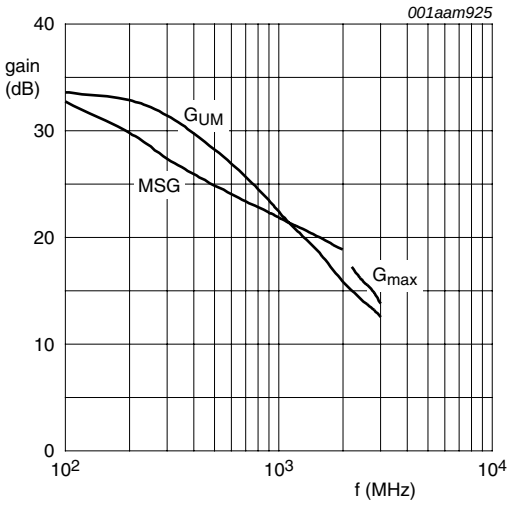
f = 900 MHz.

Fig 5. Gain as a function of bias current; typical values



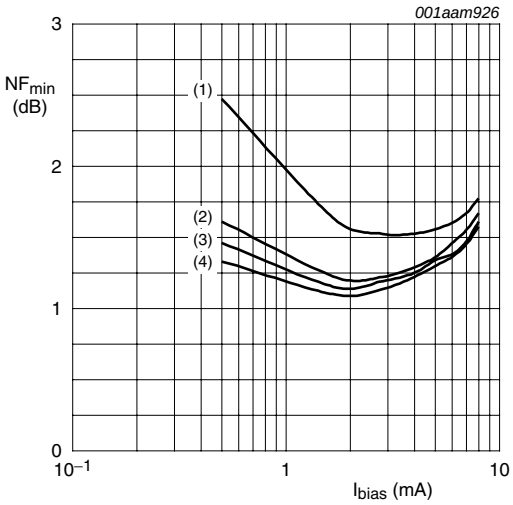
f = 1800 MHz.

Fig 6. Gain as a function of bias current; typical values



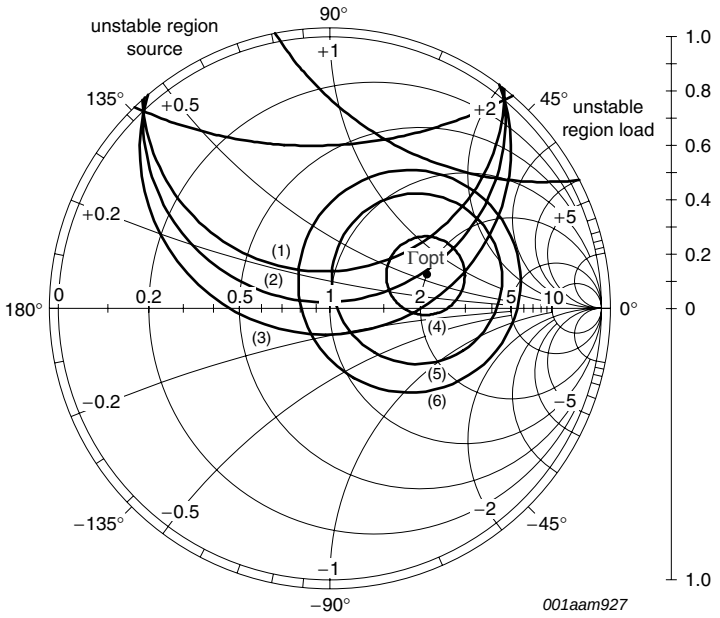
V_{bias} = 25 V; I_{bias} = 4 mA.

Fig 7. 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 8. Minimum noise figure as a function of frequency; typical values



f = 900 MHz; V_{bias} = 2.5 V; I_{bias} = 4 mA; Z_O = 50 Ω.

(1) G = 22 dB

(2) G = 21 dB

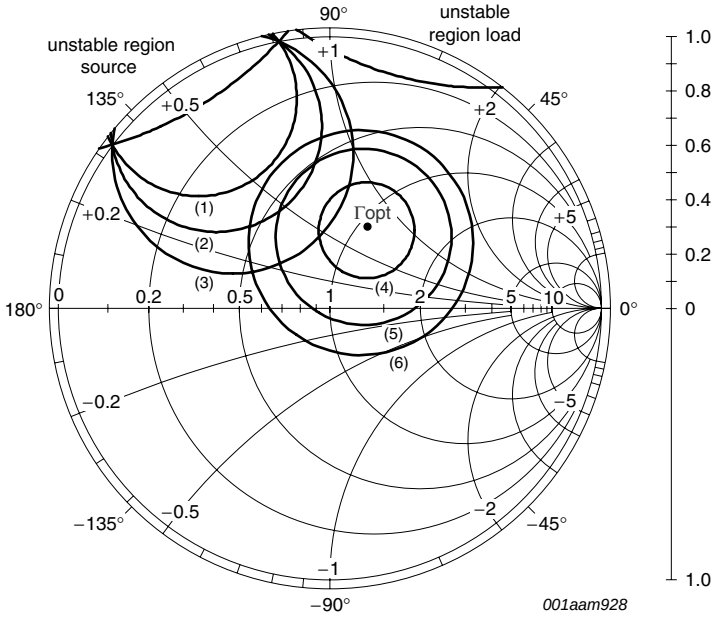
(3) G = 20 dB

(4) NF = 1.3 dB

(5) NF = 1.5 dB

(6) NF = 1.7 dB

Fig 9. Noise, stability and gain circles; typical values



f = 1800 MHz; V_{bias} = 2.5 V; I_{bias} = 4 mA; Z_O =50 Ω.

(1) G = 19 dB

(2) G = 18 dB

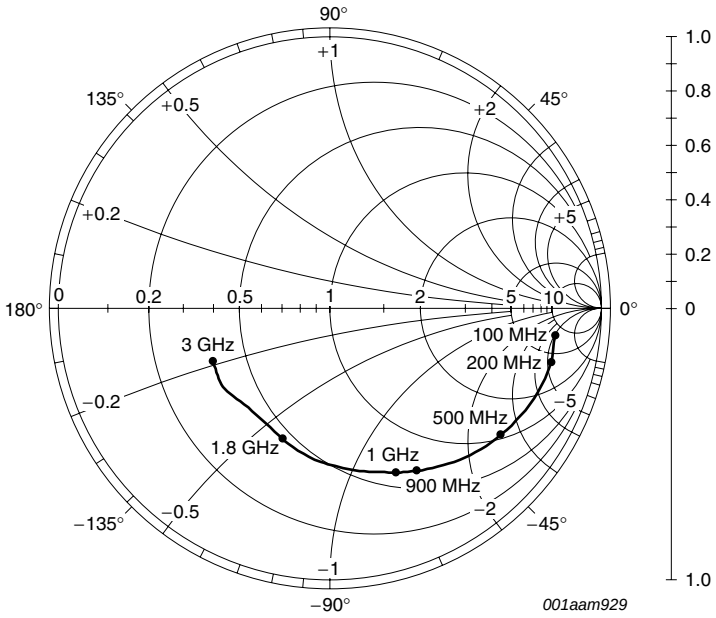
(3) G = 17 dB

(4) NF = 1.3 dB

(5) NF = 1.5 dB

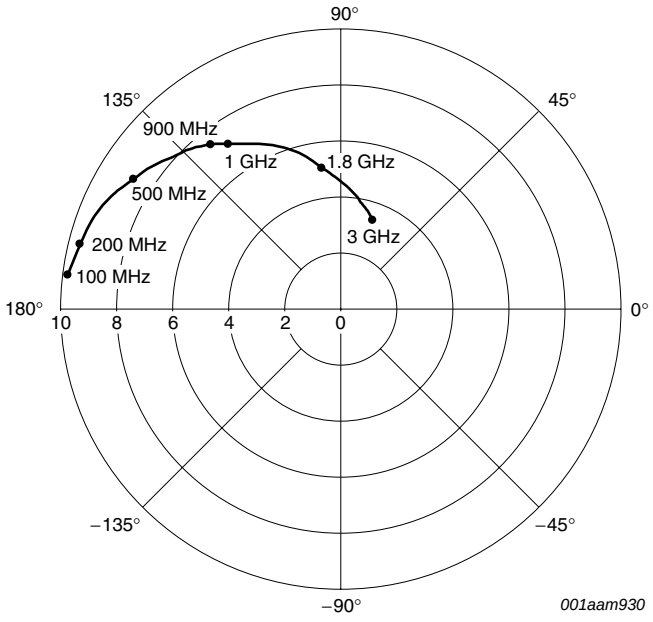
(6) NF = 1.7 dB

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



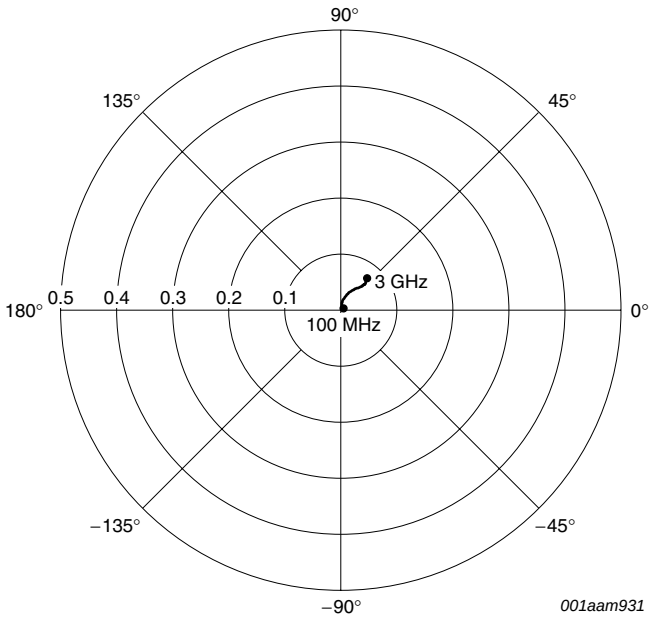
V_{bias} = 2.5 V; I_{bias} = 4 mA; Z_O = 50 Ω.

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



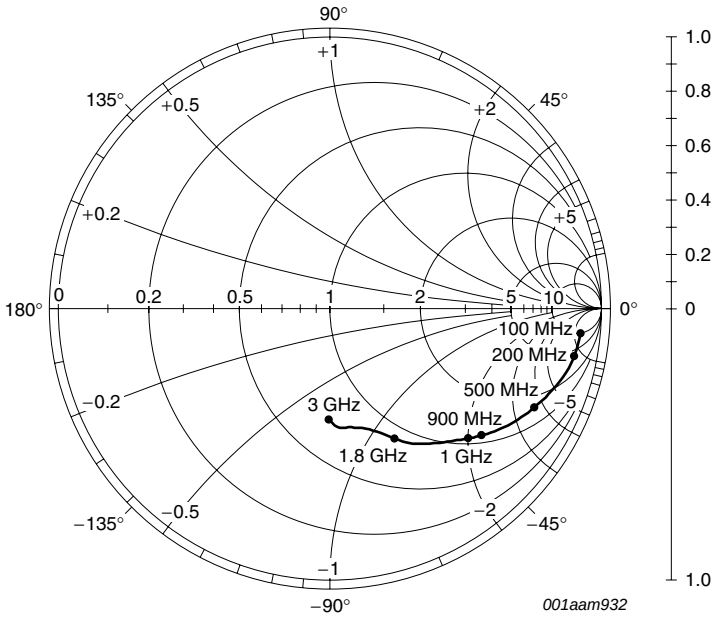
V_{bias} = 2.5 V; I_{bias} = 4 mA; Z_O = 50 Ω.

Fig 12. Common emitter forward transmission coefficient (S_{21}); typical values



V_{bias} = 2.5 V; I_{bias} = 4 mA; Z_O = 50 Ω.

Fig 13. Common emitter reverse transmission coefficient (S_{12}); typical values



V_{bias} = 2.5 V; I_{bias} = 4 mA; Z_O = 50 Ω.

Fig 14. Common emitter output reflection coefficient (S_{22}); typical values

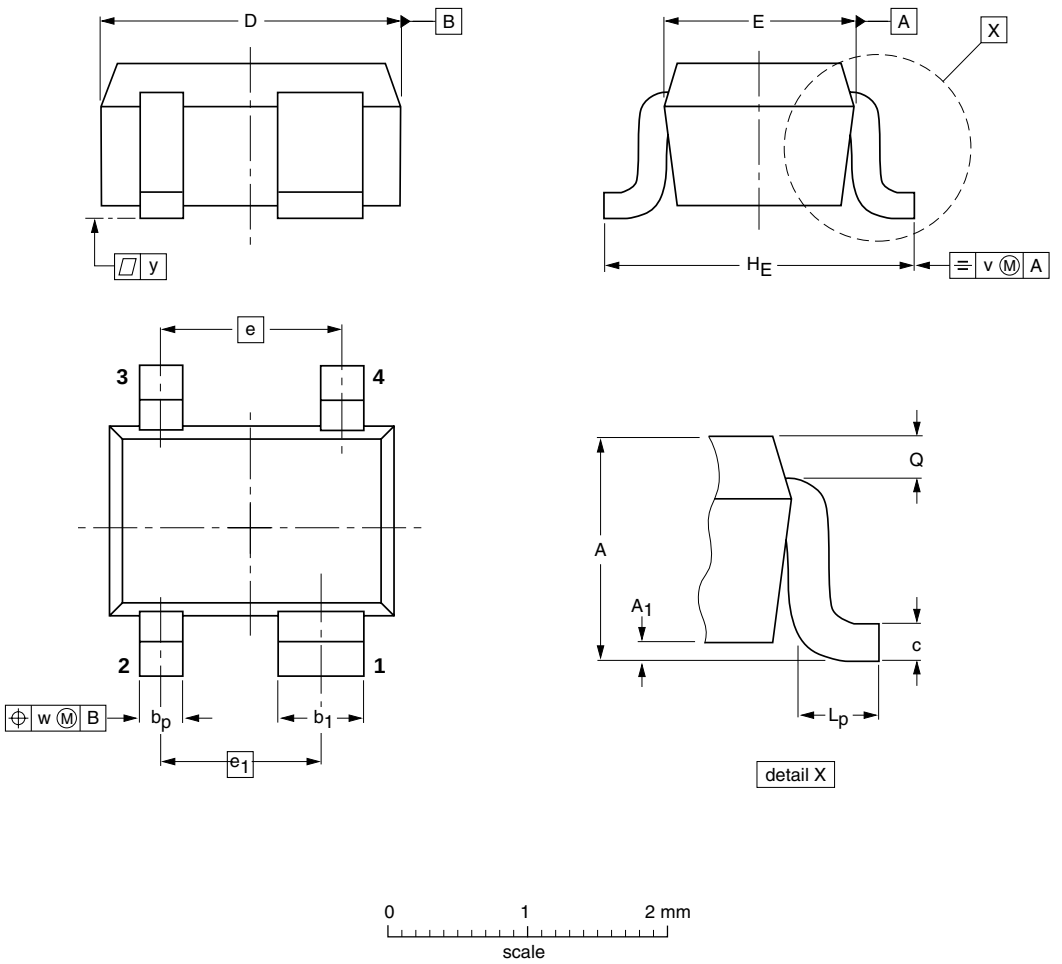
8. Test information

8.1 Quality information

All qualification tests are performed according AEC-Q100 except for read point testing, this is done only at room temperature.

9. 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~~ 06-03-16

Fig 15. Package outline SOT343R

10. Abbreviations

Table 8. Abbreviations

Acronym	Description
IF	Intermediate Frequency
LNB	Low-Noise Block converter
NPN	Negative Positive Negative
RF	Radio Frequency

11. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BGA2002 v.4	20110209	Product data sheet	-	BGA2002 v.3
Modifications:	• Section 8 on page 10: has been added.			
BGA2002 v.3	20101102	Product data sheet	-	BGA2002 v.2
Modifications:	• Status changed from objective to product. • The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors. • Legal texts have been adapted to the new company name where appropriate.			
BGA2002 v.2	19980901	Objective data sheet	-	-

12. Legal information

12.1 Data sheet status

Document status[1][2]	Product status[3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nxp.com.

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13. Contact information

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14. Contents

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