

# BGR420

NPN Silicon RF Transistor With Bias Circuitry

Small Signal Discretes



Never stop thinking

**Edition 2008-06-06**

**Published by Infineon Technologies AG,  
85579 Neubiberg, Germany**

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**BGR420, NPN Silicon RF Transistor With Bias Circuitry**

**Revision History: 2008-06-06, Rev. 1.0**

Prevision History: no previous version

<b>Page</b>	<b>Subjects (major changes since last revision)</b>

**Trademarks**

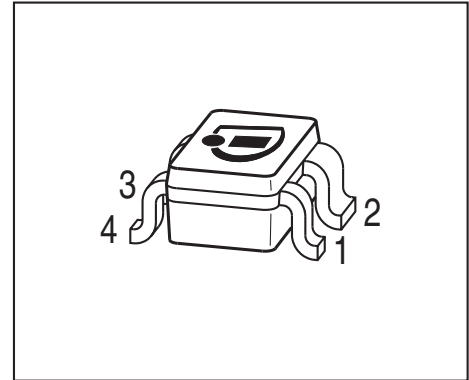
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# 1 NPN Silicon RF Transistor With Bias Circuitry\*

## Features

- Noise figure  $NF = 1.5$  dB at 0.4 GHz
- Gain  $S_{21} = 26$  dB at 0.4 GHz
- On chip bias circuitry, 13 mA bias current at  $V_{CC} = 3.6$  V;  
 $V_{BB} = 2.8$  V
- SIEGET® 25 GHz  $f_T$ -Line
- Pb-free (RoHS compliant) package

\* Short term description



## Applications

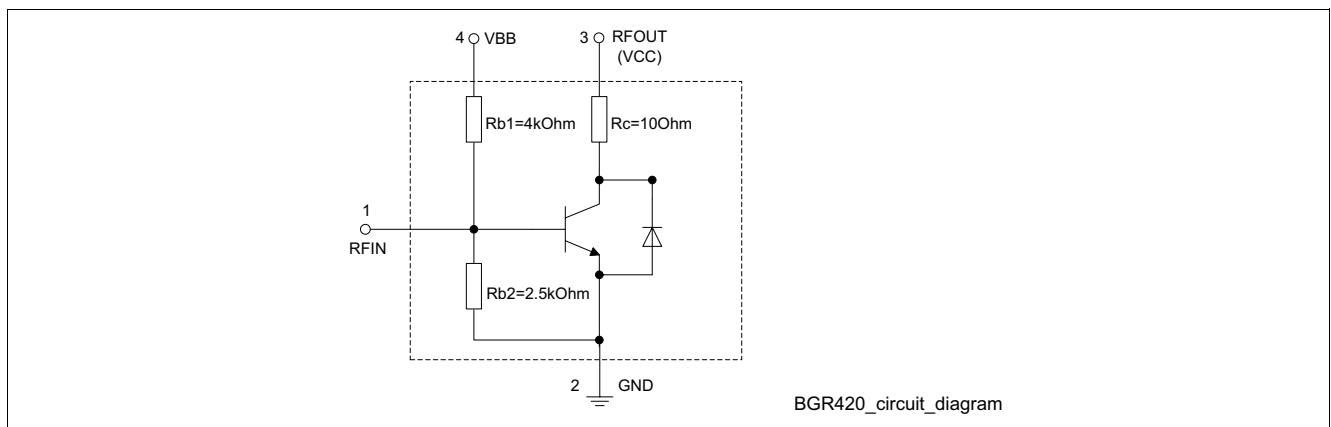
- LNAs

# 2 Description

The BGR420 is a monolithic silicon amplifier with a NPN silicon RF transistor and integrated resistors for biasing.

Type	Package	Marking
BGR420	SOT343	AWs

Note: **ESD (Electrostatic discharge) sensitive device, observe handling precaution!**



**Figure 1 Circuit diagram**

Note: Due to design there is an additional diode between emitter and collector, which does not affect normal operation for common emitter configuration.

**Table 1 Pinning table**

Pin	Function
1	RFIN
2	GND
3	RFOUT (VCC)
4	VBB

## 2.1 Maximum Ratings

*Note: All Voltages refer to GND-node*

**Table 2 Maximum ratings**

Parameter	Symbol	Value	Unit
Current at pin VCC	$I_{CC}$	25	mA
Voltage at pin VCC	$V_{CC}$	13	V
Current at pin VBB	$I_{BB}$	2.2	mA
Voltage at pin VBB	$V_{BB}$	8	V
Current at pin RFIN	$I_{IN}$	3	mA
Voltage at pin RFIN	$V_{IN}$	5	V
Total power dissipation <sup>1)</sup> $T_S = 115\text{ °C}$	$P_{tot}$	120	mW
Operation junction temperature range	$T_{jo}$	-65... 150	°C
Storage junction temperature range	$T_{jstg}$	-65... 150	°C

1)  $T_S$  is measured on the emitter (GND) lead at the soldering point to the pcb

*Note: Stresses above the max. values listed here may cause permanent damage to the device. Exposure to absolute maximum rating conditions even only for a short moment may affect device reliability. Maximum ratings are absolute ratings; exceeding only one of these values may cause irreversible damage to the integrated circuit. Absolute maximum ratings typically differ heavily from recommended operation conditions*

## 2.2 Thermal Resistance

**Table 3 Thermal Resistance**

Parameter	Symbol	Value	Unit
Junction - soldering point <sup>1)</sup>	$R_{thJS}$	≤ 290	K/W

1) For calculation of  $R_{thJA}$  please refer to Application Note Thermal Resistance.

### 3 Electrical Characteristics

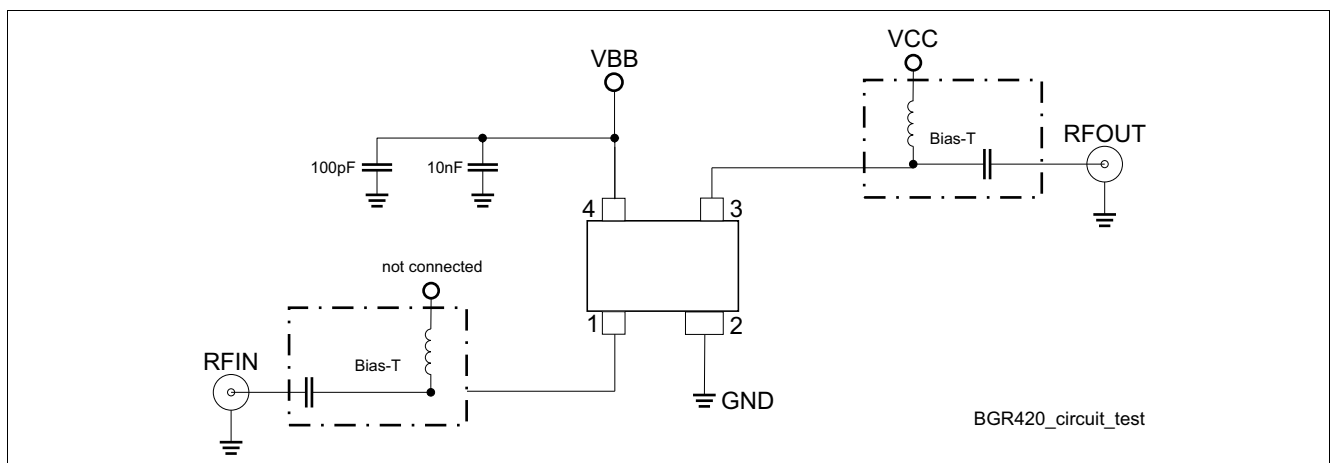
**Table 4 DC characteristics at  $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise specified**

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
VCC-GND cutoff current	$I_{CC}$			10	$\mu\text{A}$	$V_{CC} = 13\text{ V}$ , $I_{BB} = 0$ , $V_{IN} = 0$
Current at pin VCC	$I_{CC}$	7	13	20	$\text{mA}$	$V_{BB} = 2.8\text{ V}$ , $I_{IN} = 0$ , $V_{CC} = 3.6\text{ V}$

**Table 5 AC characteristics (measured in test circuit [Figure 2](#); verified by random sampling)  
 $T_A = 25\text{ }^\circ\text{C}$ ,  $V_{BB} = 2.8\text{ V}$ ,  $V_{CC} = 3.6\text{ V}$ ,  $Z_0 = 50\text{ }\Omega$ , unless otherwise specified**

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Insertion power gain	$S_{21}$		26.0 15.5		$\text{dB}$	$f = 0.4\text{ GHz}$ $f = 1.8\text{ GHz}$
Reverse isolation	$S_{12}$		-32.5 -23.4		$\text{dB}$	$f = 0.4\text{ GHz}$ $f = 1.8\text{ GHz}$
Noise figure, $Z_S = Z_{Sopt}$	$NF$		1.5 1.7		$\text{dB}$	$f = 0.4\text{ GHz}$ $f = 1.8\text{ GHz}$
Third order intercept point at the output <sup>1)</sup>	$OIP_3$		21 23		$\text{dBm}$	$f = 0.4\text{ GHz}$ $f = 1.8\text{ GHz}$
1 dB compression point at the output	$OP_{-1\text{dB}}$		5.5 7.4		$\text{dBm}$	$f = 0.4\text{ GHz}$ $f = 1.8\text{ GHz}$
Return loss input	$S_{11}$		-7.3 -11		$\text{dB}$	$f = 0.4\text{ GHz}$ $f = 1.8\text{ GHz}$
Return loss output	$S_{22}$		-2.5 -9.5		$\text{dB}$	$f = 0.4\text{ GHz}$ $f = 1.8\text{ GHz}$

1)  $OIP_3$  value depends on termination of all intermodulation frequency components. Termination used for this measurement is  $50\text{ }\Omega$  from 0.1 MHz to 6 GHz.


**Figure 2 BGR420 test circuit**

## 4 Package Information

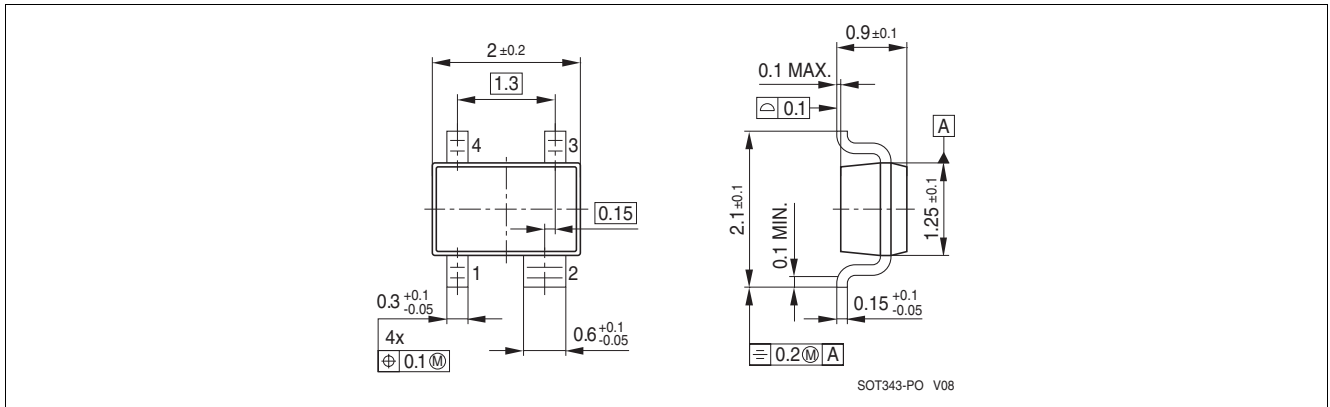


Figure 3 Package Outline SOT343

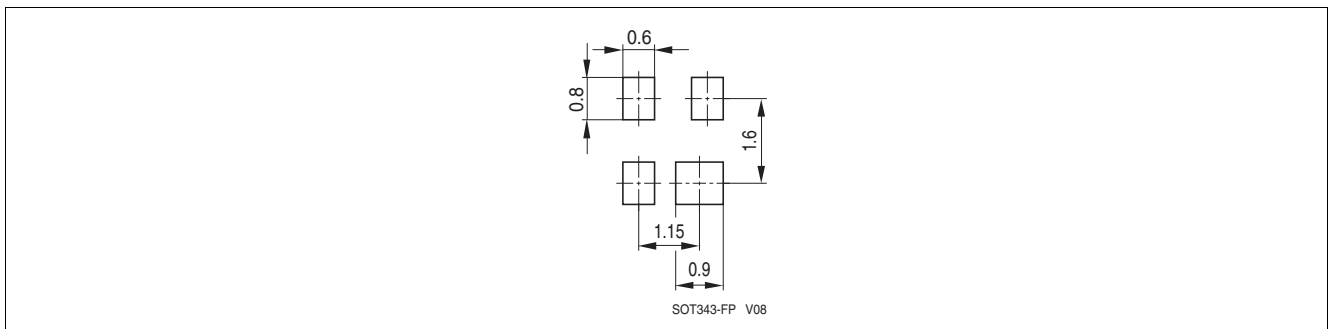


Figure 4 Footprint of SOT343

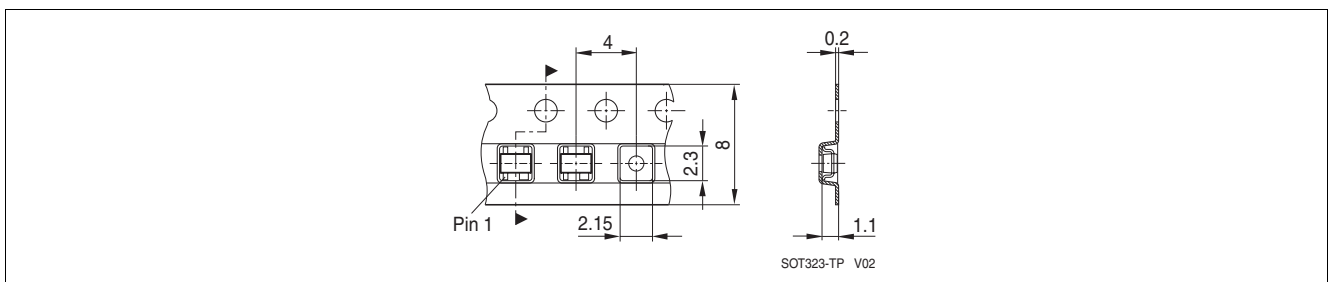


Figure 5 Tape of SOT343