

# BFP720

Low Noise Silicon Germanium Bipolar RF Transistor

## Data Sheet

Revision 1.1, 2012-10-19

**Edition 2012-10-19**

**Published by  
Infineon Technologies AG  
81726 Munich, Germany**

**© 2013 Infineon Technologies AG  
All Rights Reserved.**

### **Legal Disclaimer**

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics. With respect to any examples or hints given herein, any typical values stated herein and/or any information regarding the application of the device, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation, warranties of non-infringement of intellectual property rights of any third party.

### **Information**

For further information on technology, delivery terms and conditions and prices, please contact the nearest Infineon Technologies Office ([www.infineon.com](http://www.infineon.com)).

### **Warnings**

Due to technical requirements, components may contain dangerous substances. For information on the types in question, please contact the nearest Infineon Technologies Office.

Infineon Technologies components may be used in life-support devices or systems only with the express written approval of Infineon Technologies, if a failure of such components can reasonably be expected to cause the failure of that life-support device or system or to affect the safety or effectiveness of that device or system. Life support devices or systems are intended to be implanted in the human body or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.

**BFP720, Low Noise Silicon Germanium Bipolar RF Transistor**
**Revision History: 2012-10-19, Revision 1.1**

| Page | Subjects (changes since previous revision)   |
|------|--|
|      | This data sheet replaces the revision from 2009-01-20.<br>The product itself has not been changed and the device characteristics remain unchanged.<br>Only the product description and information available in the data sheet have been expanded and updated. |
|      |  |
|      |  |
|      |  |

**Trademarks of Infineon Technologies AG**

AURIX™, C166™, CanPAK™, CIPOS™, CIPURSE™, EconoPACK™, CoolMOS™, CoolSET™, CORECONTROL™, CROSSAVE™, DAVE™, DI-POL™, EasyPIM™, EconoBRIDGE™, EconoDUAL™, EconoPIM™, EconoPACK™, EiceDRIVER™, eupec™, FCOS™, HITFET™, HybridPACK™, I<sup>2</sup>RF™, ISOFACE™, IsoPACK™, MIPAQ™, ModSTACK™, my-d™, NovalithIC™, OptiMOS™, ORIGA™, POWERCODE™, PRIMARION™, PrimePACK™, PrimeSTACK™, PRO-SIL™, PROFET™, RASIC™, ReverSave™, SatRIC™, SIEGET™, SINDRION™, SIPMOS™, SmartLEWIS™, SOLID FLASH™, TEMPFET™, thinQ!™, TRENCHSTOP™, TriCore™.

**Other Trademarks**

Advance Design System™ (ADS) of Agilent Technologies, AMBA™, ARM™, MULTI-ICE™, KEIL™, PRIMECELL™, REALVIEW™, THUMB™, μVision™ of ARM Limited, UK. AUTOSAR™ is licensed by AUTOSAR development partnership. Bluetooth™ of Bluetooth SIG Inc. CAT-iq™ of DECT Forum. COLOSSUS™, FirstGPS™ of Trimble Navigation Ltd. EMV™ of EMVCo, LLC (Visa Holdings Inc.). EPCOS™ of Epcos AG. FLEXGO™ of Microsoft Corporation. FlexRay™ is licensed by FlexRay Consortium. HYPERTERMINAL™ of Hilgraeve Incorporated. IEC™ of Commission Electrotechnique Internationale. IrDA™ of Infrared Data Association Corporation. ISO™ of INTERNATIONAL ORGANIZATION FOR STANDARDIZATION. MATLAB™ of MathWorks, Inc. MAXIM™ of Maxim Integrated Products, Inc. MICROTEC™, NUCLEUS™ of Mentor Graphics Corporation. MIPI™ of MIPI Alliance, Inc. MIPS™ of MIPS Technologies, Inc., USA. muRata™ of MURATA MANUFACTURING CO., MICROWAVE OFFICE™ (MWO) of Applied Wave Research Inc., OmniVision™ of OmniVision Technologies, Inc. Openwave™ Openwave Systems Inc. RED HAT™ Red Hat, Inc. RFMD™ RF Micro Devices, Inc. SIRIUS™ of Sirius Satellite Radio Inc. SOLARIS™ of Sun Microsystems, Inc. SPANSION™ of Spansion LLC Ltd. Symbian™ of Symbian Software Limited. TAIYO YUDEN™ of Taiyo Yuden Co. TEAKLITE™ of CEVA, Inc. TEKTRONIX™ of Tektronix Inc. TOKO™ of TOKO KABUSHIKI KAISHA TA. UNIX™ of X/Open Company Limited. VERILOG™, PALLADIUM™ of Cadence Design Systems, Inc. VLYNQ™ of Texas Instruments Incorporated. VXWORKS™, WIND RIVER™ of WIND RIVER SYSTEMS, INC. ZETEX™ of Diodes Zetex Limited.

Last Trademarks Update 2011-11-11

## Table of Contents

|          |  |    |
|----------|--|----|
|          | <b>Table of Contents</b> .....               | 4  |
|          | <b>List of Figures</b> .....                 | 5  |
|          | <b>List of Tables</b> .....                  | 6  |
| <b>1</b> | <b>Product Brief</b> .....                   | 7  |
| <b>2</b> | <b>Features</b> .....                        | 8  |
| <b>3</b> | <b>Maximum Ratings</b> .....                 | 9  |
| <b>4</b> | <b>Thermal Characteristics</b> .....         | 10 |
| <b>5</b> | <b>Electrical Characteristics</b> .....      | 12 |
| 5.1      | DC Characteristics .....                     | 12 |
| 5.2      | General AC Characteristics .....             | 12 |
| 5.3      | Frequency Dependent AC Characteristics ..... | 13 |
| 5.4      | Characteristic Curves .....                  | 18 |
| <b>6</b> | <b>Simulation Data</b> .....                 | 23 |
| <b>7</b> | <b>Package Information SOT343</b> .....      | 24 |

## List of Figures

|             |  |    |
|-------------|--|----|
| Figure 4-1  | Total Power Dissipation $P_{\text{tot}} = f(T_s)$ .....  | 10 |
| Figure 4-2  | Permissible Pulse Load $P_{\text{tot\_max}} / P_{\text{tot\_DC}} = f(t_p)$ .....   | 11 |
| Figure 4-3  | Permissible Pulse Load $R_{\text{thJS}} = f(t_p)$ .....  | 11 |
| Figure 5-1  | BFP720 Testing Circuit. ....   | 13 |
| Figure 5-2  | Transition Frequency $f_T = f(I_C, V_{CE}), f = 1 \text{ GHz}, V_{CE} = \text{Parameter in V}$ .....                           | 18 |
| Figure 5-3  | Power Gain $G_{\text{ma}}, G_{\text{ms}},  S_{21} ^2 = f(f), V_{CE} = 3 \text{ V}, I_C = 13 \text{ mA}$ .....                  | 18 |
| Figure 5-4  | Input Matching $S_{11} = f(f), V_{CE} = 3 \text{ V}, I_C = 5 \text{ mA} / 13 \text{ mA}$ .....                                 | 19 |
| Figure 5-5  | Output Matching $S_{22} = f(f), V_{CE} = 3 \text{ V}, I_C = 5 \text{ mA} / 13 \text{ mA}$ .....                                | 19 |
| Figure 5-6  | Source Impedance $Z_{\text{opt}}$ for $NF_{\text{min}} = f(f), V_{CE} = 3 \text{ V}, I_C = 5 \text{ mA} / 13 \text{ mA}$ ..... | 20 |
| Figure 5-7  | Noise Figure $NF_{\text{min}} = f(I_C), V_{CE} = 3 \text{ V}, Z_S = Z_{\text{opt}}$ .....                                      | 20 |
| Figure 5-8  | Noise Figure $NF_{\text{min}} = f(f), V_{CE} = 3 \text{ V}, Z_S = Z_{\text{opt}}$ .....  | 21 |
| Figure 5-9  | Power Gain $G_{\text{ma}}, G_{\text{ms}} = f(I_C), V_{CE} = 3 \text{ V}, f = \text{Parameter in GHz}$ .....                    | 21 |
| Figure 5-10 | Power Gain $G_{\text{ma}}, G_{\text{ms}} = f(V_{CE}), I_C = 13 \text{ mA}, f = \text{Parameter in GHz}$ .....                  | 22 |
| Figure 7-1  | Package Outline .....  | 24 |
| Figure 7-2  | Package Footprint .....  | 24 |
| Figure 7-3  | Marking Description (Marking BFP720: R9s) .....  | 24 |
| Figure 7-4  | Tape Dimensions .....  | 24 |

## List of Tables

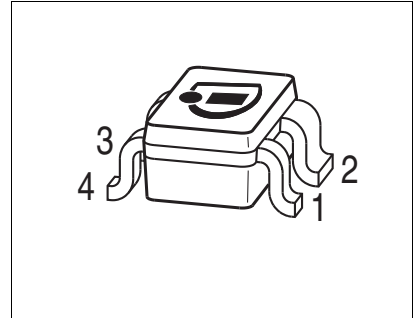
|            |  |    |
|------------|--|----|
| Table 3-1  | Maximum Ratings at $T_A = 25\text{ °C}$ (unless otherwise specified) . . . . . | 9  |
| Table 4-1  | Thermal Resistance . . . . .   | 10 |
| Table 5-1  | DC Characteristics at $T_A = 25\text{ °C}$ . . . . .                           | 12 |
| Table 5-2  | AC Characteristics at $T_A = 25\text{ °C}$ . . . . .                           | 12 |
| Table 5-3  | AC Characteristics, $V_{CE} = 3\text{ V}$ , $f = 150\text{ MHz}$ . . . . .     | 13 |
| Table 5-4  | AC Characteristics, $V_{CE} = 3\text{ V}$ , $f = 450\text{ MHz}$ . . . . .     | 14 |
| Table 5-5  | AC Characteristics, $V_{CE} = 3\text{ V}$ , $f = 900\text{ MHz}$ . . . . .     | 14 |
| Table 5-6  | AC Characteristics, $V_{CE} = 3\text{ V}$ , $f = 1.5\text{ GHz}$ . . . . .     | 15 |
| Table 5-7  | AC Characteristics, $V_{CE} = 3\text{ V}$ , $f = 1.9\text{ GHz}$ . . . . .     | 15 |
| Table 5-8  | AC Characteristics, $V_{CE} = 3\text{ V}$ , $f = 2.4\text{ GHz}$ . . . . .     | 16 |
| Table 5-9  | AC Characteristics, $V_{CE} = 3\text{ V}$ , $f = 3.5\text{ GHz}$ . . . . .     | 16 |
| Table 5-10 | AC Characteristics, $V_{CE} = 3\text{ V}$ , $f = 5.5\text{ GHz}$ . . . . .     | 17 |
| Table 5-11 | AC Characteristics, $V_{CE} = 3\text{ V}$ , $f = 10\text{ GHz}$ . . . . .      | 17 |

## 1 Product Brief

The BFP720 is a very low noise wideband NPN bipolar RF transistor. The device is based on Infineon's reliable high volume silicon germanium carbon (SiGe:C) heterojunction bipolar technology. The collector design supports voltages up to  $V_{CE0} = 4\text{ V}$  and currents up to  $I_C = 25\text{ mA}$ . The device is especially suited for mobile applications in which low power consumption is a key requirement. The typical transition frequency is approximately 45 GHz, hence the device offers high power gain at frequencies up to 12 GHz in amplifier applications. The device is housed in an easy to use plastic package with visible leads.

## 2 Features

- High performance general purpose wideband LNA transistor
- Operation voltage: 1.0 V to 4.0 V
- Transistor geometry optimized for low-current applications
- 26 dB maximum stable gain at 1.9 GHz and only 13 mA
- 15 dB maximum available gain at 10 GHz and only 13 mA
- 0.7 dB minimum noise figure at 5.5 GHz and 0.95 dB at 10 GHz
- High linearity  $OP_{1dB} = 8.5$  dBm and  $OIP_3 = 23$  dBm at 5.5 GHz and low current consumption of 13 mA
- Easy to use Pb-free (RoHS compliant) and halogen-free standard package with visible leads
- Qualification report according to AEC-Q101 available



### Applications

FM Radio, Mobile TV, RKE, AMR, Cellular, ZigBee, GPS, WiMAX, SDARs, Bluetooth, WiFi, Cordless phone, UMTS, WLAN, UWB, LNB

**Attention: ESD (Electrostatic discharge) sensitive device, observe handling precautions**

| Product Name | Package | Pin Configuration |       |       |       | Marking |
|--------------|---------|-------------------|-------|-------|-------|---------|
| BFP720       | SOT343  | 1 = B             | 2 = E | 3 = C | 4 = E | R9s     |



### 3 Maximum Ratings

**Table 3-1 Maximum Ratings at  $T_A = 25\text{ °C}$  (unless otherwise specified)**

| Parameter                             | Symbol    | Values |        |            | Unit | Note / Test Condition                                      |
|---------------------------------------|-----------|--------|--------|------------|------|--|
|                                       |           | Min.   | Typ.   | Max.       |      |  |
| Collector emitter voltage             | $V_{CEO}$ | –<br>– | –<br>– | 4.0<br>3.5 | V    | Open base<br>$T_A = 25\text{ °C}$<br>$T_A = -55\text{ °C}$ |
| Collector emitter voltage             | $V_{CES}$ | –      | –      | 13         | V    | E-B short circuited  |
| Collector base voltage                | $V_{CBO}$ | –      | –      | 13         | V    | Open emitter   |
| Emitter base voltage                  | $V_{EBO}$ | –      | –      | 1.2        | V    | Open collector   |
| Collector current                     | $I_C$     | –      | –      | 25         | mA   |  |
| Base current                          | $I_B$     | –      | –      | 2          | mA   |  |
| Total power dissipation <sup>1)</sup> | $P_{tot}$ | –      | –      | 100        | mW   | $T_S \leq 108\text{ °C}$                                   |
| Junction temperature                  | $T_J$     | –      | –      | 150        | °C   |  |
| Storage temperature                   | $T_{Stg}$ | -55    | –      | 150        | °C   |  |

1) $T_S$  is the soldering point temperature.  $T_S$  is measured on the emitter lead at the soldering point to the pcb

**Attention: Stresses above the max. values listed here may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect device reliability. Maximum ratings are absolute ratings; exceeding only one of these values may cause irreversible damage to the integrated circuit.**

## 4 Thermal Characteristics

Table 4-1 Thermal Resistance

| Parameter                                | Symbol     | Values |      |      | Unit | Note / Test Condition |
|--|------------|--------|------|------|------|-----------------------|
|  |            | Min.   | Typ. | Max. |      |                       |
| Junction - soldering point <sup>1)</sup> | $R_{thJS}$ | –      | 420  | –    | K/W  | –                     |

1)For the definition of  $R_{thJS}$  please refer to Application Note AN077 (Thermal Resistance Calculation)

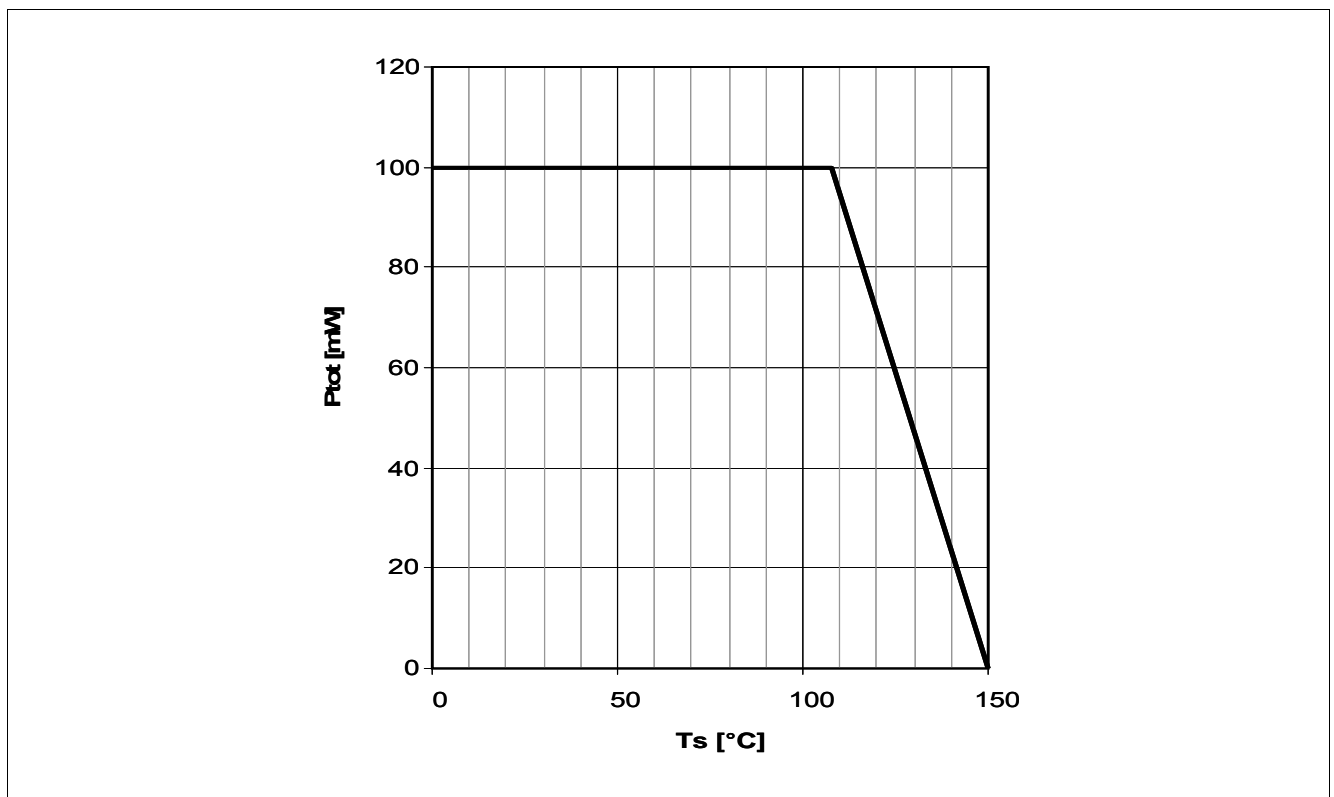


Figure 4-1 Total Power Dissipation  $P_{tot} = f(T_s)$

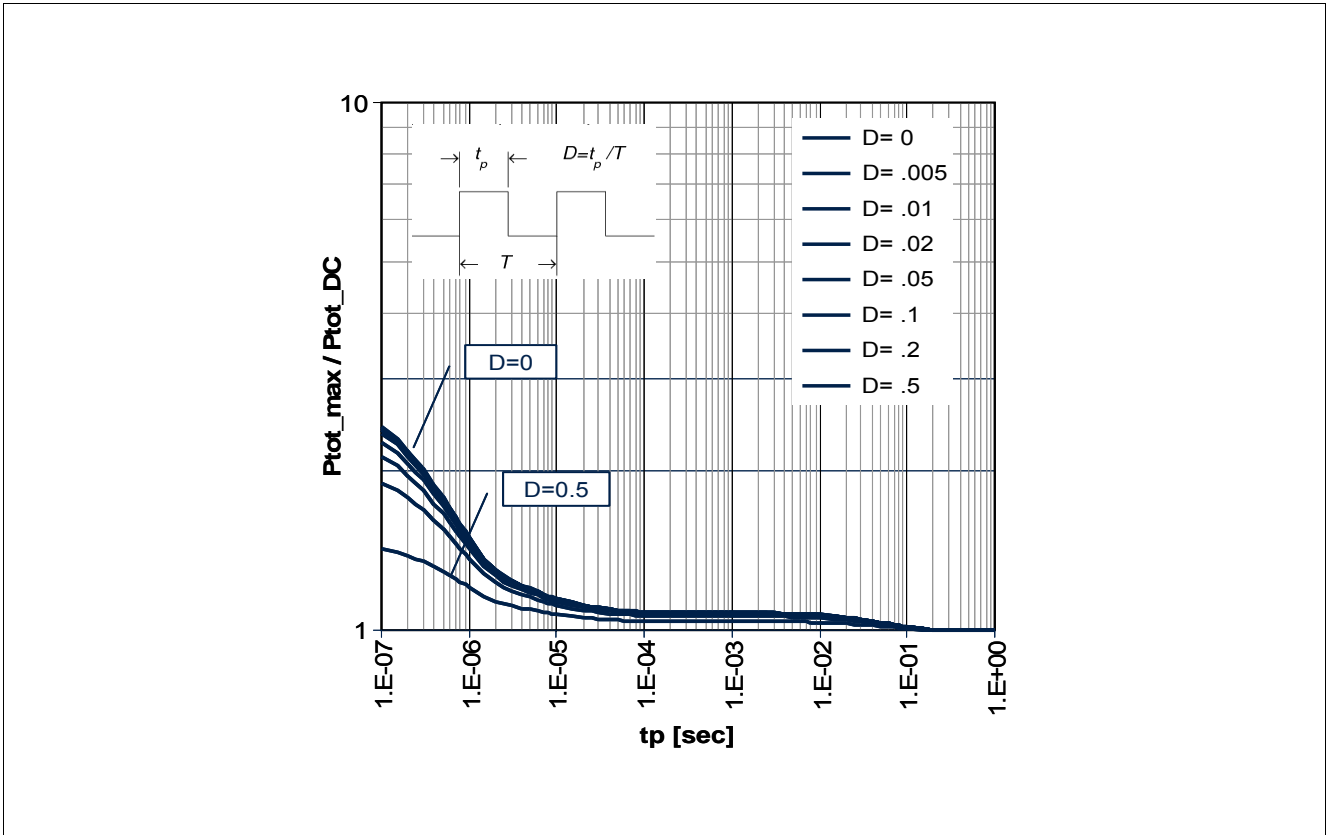


Figure 4-2 Permissible Pulse Load  $P_{tot\_max} / P_{tot\_DC} = f(t_p)$

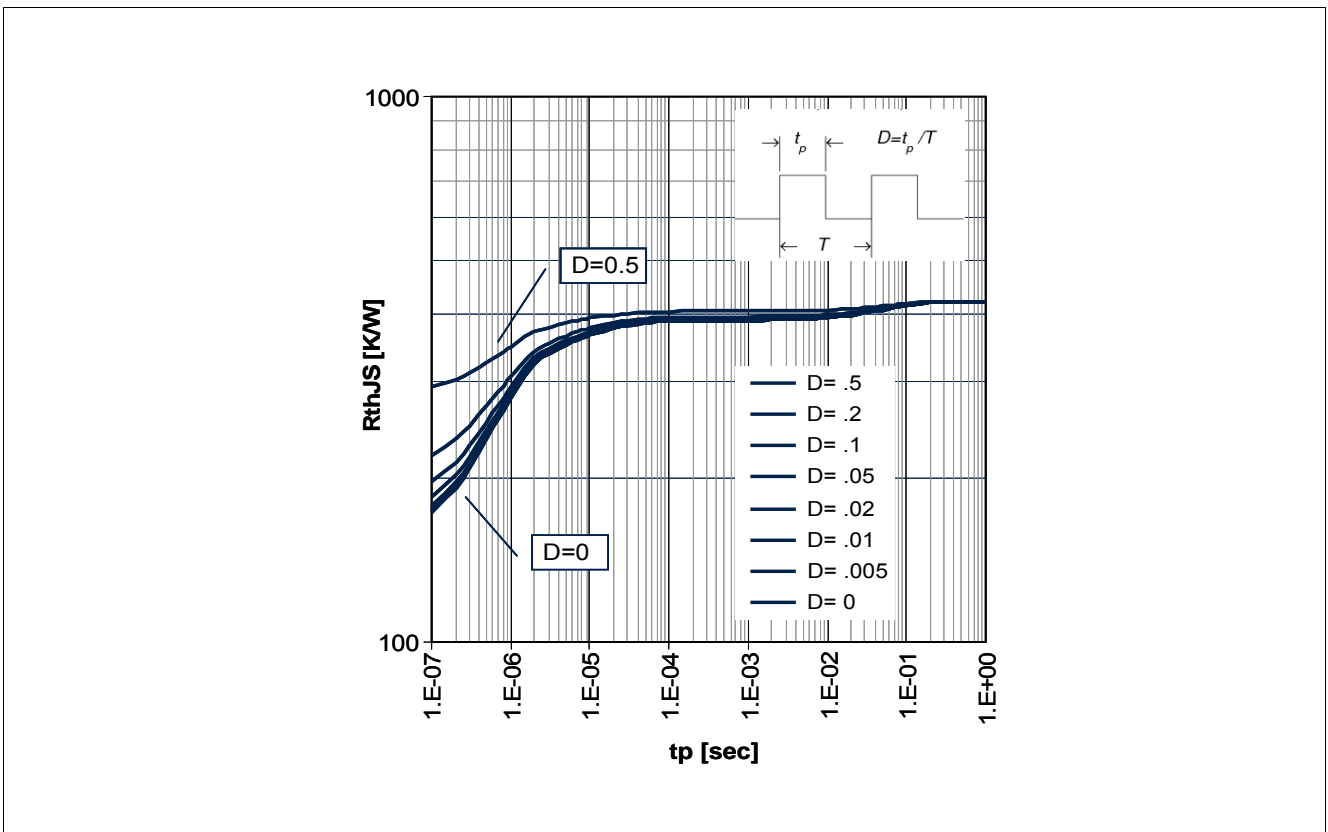


Figure 4-3 Permissible Pulse Load  $R_{thJS} = f(t_p)$

## 5 Electrical Characteristics

### 5.1 DC Characteristics

Table 5-1 DC Characteristics at  $T_A = 25\text{ °C}$

| Parameter                           | Symbol        | Values |      |      | Unit          | Note / Test Condition                                       |
|-------------------------------------|---------------|--------|------|------|---------------|---|
|                                     |               | Min.   | Typ. | Max. |               |   |
| Collector emitter breakdown voltage | $V_{(BR)CEO}$ | 4      | 4.7  | –    | V             | $I_C = 1\text{ mA}, I_B = 0\text{ mA}$                      |
| Collector emitter cutoff current    | $I_{CES}$     | –      | –    | 30   | $\mu\text{A}$ | $V_{CE} = 13\text{ V}, V_{BE} = 0\text{ V}$                 |
| Collector base cutoff current       | $I_{CBO}$     | –      | –    | 100  | nA            | $V_{CB} = 5\text{ V}, I_E = 0\text{ mA}$                    |
| Emitter base cutoff current         | $I_{EBO}$     | –      | –    | 2    | $\mu\text{A}$ | $V_{EB} = 0.5\text{ V}, I_C = 0\text{ mA}$                  |
| DC current gain                     | $h_{FE}$      | 160    | 250  | 400  |               | $I_C = 13\text{ mA}, V_{CE} = 3\text{ V}$<br>pulse measured |

### 5.2 General AC Characteristics

Table 5-2 AC Characteristics at  $T_A = 25\text{ °C}$

| Parameter                     | Symbol   | Values |      |      | Unit | Note / Test Condition  |
|-------------------------------|----------|--------|------|------|------|--|
|                               |          | Min.   | Typ. | Max. |      |  |
| Transition frequency          | $f_T$    | –      | 45   | –    | GHz  | $I_C = 13\text{ mA}, V_{CE} = 3\text{ V}$<br>$f = 1\text{ GHz}$                          |
| Collector base capacitance    | $C_{CB}$ | –      | 0.06 | –    | pF   | $V_{CB} = 3\text{ V}, V_{BE} = 0\text{ V}$<br>$f = 1\text{ MHz}$<br>emitter grounded     |
| Collector emitter capacitance | $C_{CE}$ | –      | 0.35 | –    | pF   | $V_{CE} = 3\text{ V}, V_{BE} = 0\text{ V}$<br>$f = 1\text{ MHz}$<br>base grounded        |
| Emitter base capacitance      | $C_{EB}$ | –      | 0.35 | –    | pF   | $V_{EB} = 0.5\text{ V}, V_{CB} = 0\text{ V}$<br>$f = 1\text{ MHz}$<br>collector grounded |

### 5.3 Frequency Dependent AC Characteristics

Measurement setup is a test fixture with Bias T's in a 50 Ω system,  $T_A = 25\text{ °C}$

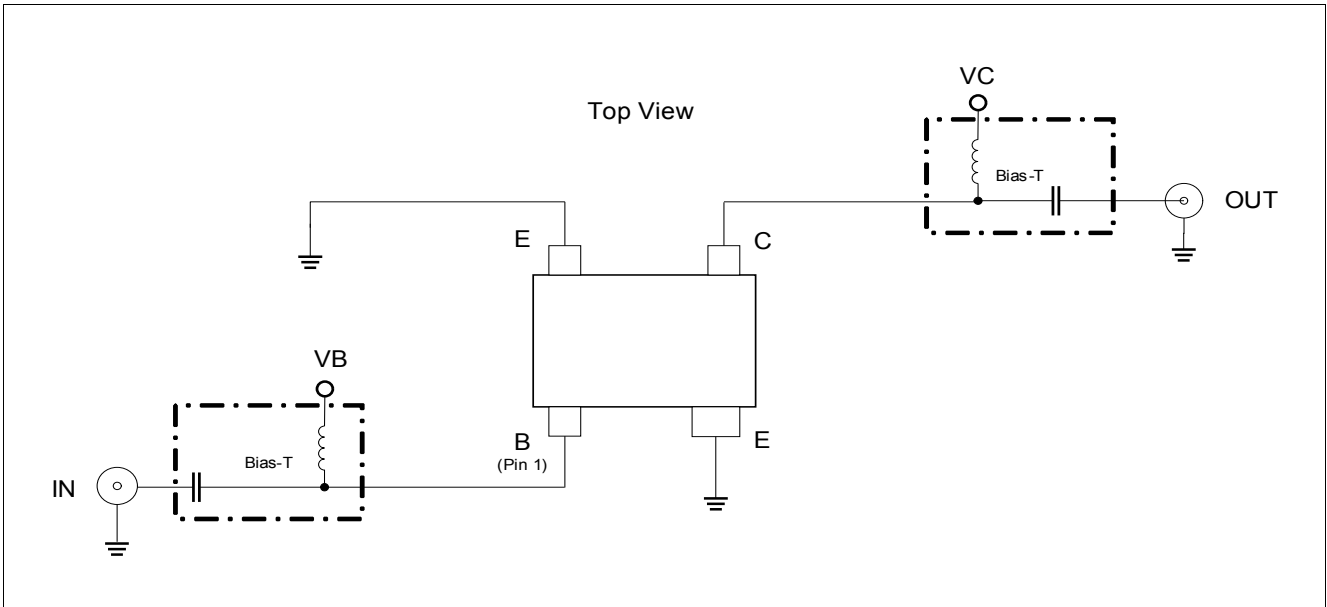


Figure 5-1 BFP720 Testing Circuit

Table 5-3 AC Characteristics,  $V_{CE} = 3\text{ V}$ ,  $f = 150\text{ MHz}$

| Parameter                      | Symbol     | Values |      |      | Unit | Note / Test Condition          |
|--------------------------------|------------|--------|------|------|------|--------------------------------|
|                                |            | Min.   | Typ. | Max. |      |                                |
| <b>Maximum Power Gain</b>      |            |        |      |      | dB   |                                |
| Low noise operation point      | $G_{ms}$   | –      | 34   | –    |      | $I_C = 5\text{ mA}$            |
| High linearity operation point | $G_{ms}$   | –      | 37.5 | –    |      | $I_C = 13\text{ mA}$           |
| <b>Transducer Gain</b>         |            |        |      |      | dB   | $Z_S = Z_L = 50\text{ }\Omega$ |
| Low noise operation point      | $S_{21}$   | –      | 23   | –    |      | $I_C = 5\text{ mA}$            |
| High linearity operation point | $S_{21}$   | –      | 29.5 | –    |      | $I_C = 13\text{ mA}$           |
| <b>Minimum Noise Figure</b>    |            |        |      |      | dB   | $Z_S = Z_{opt}$                |
| Minimum noise figure           | $NF_{min}$ | –      | 0.4  | –    |      | $I_C = 5\text{ mA}$            |
| Associated gain                | $G_{ass}$  | –      | 28.5 | –    |      | $I_C = 5\text{ mA}$            |
| <b>Linearity</b>               |            |        |      |      | dBm  | $Z_S = Z_L = 50\text{ }\Omega$ |
| 1 dB gain compression point    | $OP_{1dB}$ | –      | 6    | –    |      | $I_C = 13\text{ mA}$           |
| 3rd order intercept point      | $OIP_3$    | –      | 22   | –    |      | $I_C = 13\text{ mA}$           |

Table 5-4 AC Characteristics,  $V_{CE} = 3\text{ V}$ ,  $f = 450\text{ MHz}$ 

| Parameter                             | Symbol     | Values |      |      | Unit | Note / Test Condition    |
|---------------------------------------|------------|--------|------|------|------|--------------------------|
|                                       |            | Min.   | Typ. | Max. |      |                          |
| <b>Maximum Power Gain</b>             |            |        |      |      | dB   |                          |
| Low noise operation point             | $G_{ms}$   | –      | 29   | –    |      | $I_C = 5\text{ mA}$      |
| High linearity operation point        | $G_{ms}$   | –      | 32.5 | –    |      | $I_C = 13\text{ mA}$     |
| <b>Transducer Gain</b>                |            |        |      |      | dB   | $Z_S = Z_L = 50\ \Omega$ |
| Low noise operation point             | $S_{21}$   | –      | 23   | –    |      | $I_C = 5\text{ mA}$      |
| High linearity operation point        | $S_{21}$   | –      | 28.5 | –    |      | $I_C = 13\text{ mA}$     |
| <b>Minimum Noise Figure</b>           |            |        |      |      | dB   | $Z_S = Z_{opt}$          |
| Minimum noise figure                  | $NF_{min}$ | –      | 0.4  | –    |      | $I_C = 5\text{ mA}$      |
| Associated gain                       | $G_{ass}$  | –      | 28   | –    |      | $I_C = 5\text{ mA}$      |
| <b>Linearity</b>                      |            |        |      |      | dBm  | $Z_S = Z_L = 50\ \Omega$ |
| 1 dB gain compression point           | $OP_{1dB}$ | –      | 5.5  | –    |      | $I_C = 13\text{ mA}$     |
| 3 <sup>rd</sup> order intercept point | $OIP_3$    | –      | 21.5 | –    |      | $I_C = 13\text{ mA}$     |

 Table 5-5 AC Characteristics,  $V_{CE} = 3\text{ V}$ ,  $f = 900\text{ MHz}$ 

| Parameter                             | Symbol     | Values |      |      | Unit | Note / Test Condition    |
|---------------------------------------|------------|--------|------|------|------|--------------------------|
|                                       |            | Min.   | Typ. | Max. |      |                          |
| <b>Maximum Power Gain</b>             |            |        |      |      | dB   |                          |
| Low noise operation point             | $G_{ms}$   | –      | 26.5 | –    |      | $I_C = 5\text{ mA}$      |
| High linearity operation point        | $G_{ms}$   | –      | 29.5 | –    |      | $I_C = 13\text{ mA}$     |
| <b>Transducer Gain</b>                |            |        |      |      | dB   | $Z_S = Z_L = 50\ \Omega$ |
| Low noise operation point             | $S_{21}$   | –      | 22.5 | –    |      | $I_C = 5\text{ mA}$      |
| High linearity operation point        | $S_{21}$   | –      | 27.5 | –    |      | $I_C = 13\text{ mA}$     |
| <b>Minimum Noise Figure</b>           |            |        |      |      | dB   | $Z_S = Z_{opt}$          |
| Minimum noise figure                  | $NF_{min}$ | –      | 0.4  | –    |      | $I_C = 5\text{ mA}$      |
| Associated gain                       | $G_{ass}$  | –      | 26   | –    |      | $I_C = 5\text{ mA}$      |
| <b>Linearity</b>                      |            |        |      |      | dBm  | $Z_S = Z_L = 50\ \Omega$ |
| 1 dB gain compression point           | $OP_{1dB}$ | –      | 5.5  | –    |      | $I_C = 13\text{ mA}$     |
| 3 <sup>rd</sup> order intercept point | $OIP_3$    | –      | 21   | –    |      | $I_C = 13\text{ mA}$     |

**Table 5-6 AC Characteristics,  $V_{CE} = 3\text{ V}$ ,  $f = 1.5\text{ GHz}$**

| Parameter                             | Symbol     | Values |      |      | Unit | Note / Test Condition                            |
|---------------------------------------|------------|--------|------|------|------|--|
|                                       |            | Min.   | Typ. | Max. |      |  |
| <b>Maximum Power Gain</b>             |            |        |      |      |      |  |
| Low noise operation point             | $G_{ms}$   | –      | 24   | –    | dB   | $I_C = 5\text{ mA}$                              |
| High linearity operation point        | $G_{ms}$   | –      | 27.5 | –    |      | $I_C = 13\text{ mA}$                             |
| <b>Transducer Gain</b>                |            |        |      |      |      |  |
| Low noise operation point             | $S_{21}$   | –      | 22   | –    | dB   | $Z_S = Z_L = 50\ \Omega$<br>$I_C = 5\text{ mA}$  |
| High linearity operation point        | $S_{21}$   | –      | 25.5 | –    |      | $I_C = 13\text{ mA}$                             |
| <b>Minimum Noise Figure</b>           |            |        |      |      |      |  |
| Minimum noise figure                  | $NF_{min}$ | –      | 0.45 | –    | dB   | $Z_S = Z_{opt}$<br>$I_C = 5\text{ mA}$           |
| Associated gain                       | $G_{ass}$  | –      | 24   | –    |      | $I_C = 5\text{ mA}$                              |
| <b>Linearity</b>                      |            |        |      |      |      |  |
| 1 dB gain compression point           | $OP_{1dB}$ | –      | 6    | –    | dBm  | $Z_S = Z_L = 50\ \Omega$<br>$I_C = 13\text{ mA}$ |
| 3 <sup>rd</sup> order intercept point | $OIP_3$    | –      | 21.5 | –    |      | $I_C = 13\text{ mA}$                             |

**Table 5-7 AC Characteristics,  $V_{CE} = 3\text{ V}$ ,  $f = 1.9\text{ GHz}$**

| Parameter                             | Symbol     | Values |      |      | Unit | Note / Test Condition                            |
|---------------------------------------|------------|--------|------|------|------|--|
|                                       |            | Min.   | Typ. | Max. |      |  |
| <b>Maximum Power Gain</b>             |            |        |      |      |      |  |
| Low noise operation point             | $G_{ms}$   | –      | 23   | –    | dB   | $I_C = 5\text{ mA}$                              |
| High linearity operation point        | $G_{ms}$   | –      | 26   | –    |      | $I_C = 13\text{ mA}$                             |
| <b>Transducer Gain</b>                |            |        |      |      |      |  |
| Low noise operation point             | $S_{21}$   | –      | 21.5 | –    | dB   | $Z_S = Z_L = 50\ \Omega$<br>$I_C = 5\text{ mA}$  |
| High linearity operation point        | $S_{21}$   | –      | 24.5 | –    |      | $I_C = 13\text{ mA}$                             |
| <b>Minimum Noise Figure</b>           |            |        |      |      |      |  |
| Minimum noise figure                  | $NF_{min}$ | –      | 0.45 | –    | dB   | $Z_S = Z_{opt}$<br>$I_C = 5\text{ mA}$           |
| Associated gain                       | $G_{ass}$  | –      | 23   | –    |      | $I_C = 5\text{ mA}$                              |
| <b>Linearity</b>                      |            |        |      |      |      |  |
| 1 dB gain compression point           | $OP_{1dB}$ | –      | 7    | –    | dBm  | $Z_S = Z_L = 50\ \Omega$<br>$I_C = 13\text{ mA}$ |
| 3 <sup>rd</sup> order intercept point | $OIP_3$    | –      | 22   | –    |      | $I_C = 13\text{ mA}$                             |

Table 5-8 AC Characteristics,  $V_{CE} = 3\text{ V}$ ,  $f = 2.4\text{ GHz}$ 

| Parameter                             | Symbol     | Values |      |      | Unit | Note / Test Condition                            |
|---------------------------------------|------------|--------|------|------|------|--|
|                                       |            | Min.   | Typ. | Max. |      |  |
| <b>Maximum Power Gain</b>             |            |        |      |      |      |  |
| Low noise operation point             | $G_{ms}$   | –      | 22   | –    | dB   | $I_C = 5\text{ mA}$                              |
| High linearity operation point        | $G_{ms}$   | –      | 25   | –    |      | $I_C = 13\text{ mA}$                             |
| <b>Transducer Gain</b>                |            |        |      |      |      |  |
| Low noise operation point             | $S_{21}$   | –      | 20.5 | –    | dB   | $Z_S = Z_L = 50\ \Omega$<br>$I_C = 5\text{ mA}$  |
| High linearity operation point        | $S_{21}$   | –      | 23   | –    |      | $I_C = 13\text{ mA}$                             |
| <b>Minimum Noise Figure</b>           |            |        |      |      |      |  |
| Minimum noise figure                  | $NF_{min}$ | –      | 0.5  | –    | dB   | $Z_S = Z_{opt}$<br>$I_C = 5\text{ mA}$           |
| Associated gain                       | $G_{ass}$  | –      | 21.5 | –    |      | $I_C = 5\text{ mA}$                              |
| <b>Linearity</b>                      |            |        |      |      |      |  |
| 1 dB gain compression point           | $OP_{1dB}$ | –      | 6    | –    | dBm  | $Z_S = Z_L = 50\ \Omega$<br>$I_C = 13\text{ mA}$ |
| 3 <sup>rd</sup> order intercept point | $OIP_3$    | –      | 22   | –    |      | $I_C = 13\text{ mA}$                             |

 Table 5-9 AC Characteristics,  $V_{CE} = 3\text{ V}$ ,  $f = 3.5\text{ GHz}$ 

| Parameter                             | Symbol     | Values |      |      | Unit | Note / Test Condition                            |
|---------------------------------------|------------|--------|------|------|------|--|
|                                       |            | Min.   | Typ. | Max. |      |  |
| <b>Maximum Power Gain</b>             |            |        |      |      |      |  |
| Low noise operation point             | $G_{ms}$   | –      | 20.5 | –    | dB   | $I_C = 5\text{ mA}$                              |
| High linearity operation point        | $G_{ms}$   | –      | 23.5 | –    |      | $I_C = 13\text{ mA}$                             |
| <b>Transducer Gain</b>                |            |        |      |      |      |  |
| Low noise operation point             | $S_{21}$   | –      | 18.5 | –    | dB   | $Z_S = Z_L = 50\ \Omega$<br>$I_C = 5\text{ mA}$  |
| High linearity operation point        | $S_{21}$   | –      | 20   | –    |      | $I_C = 13\text{ mA}$                             |
| <b>Minimum Noise Figure</b>           |            |        |      |      |      |  |
| Minimum noise figure                  | $NF_{min}$ | –      | 0.55 | –    | dB   | $Z_S = Z_{opt}$<br>$I_C = 5\text{ mA}$           |
| Associated gain                       | $G_{ass}$  | –      | 19   | –    |      | $I_C = 5\text{ mA}$                              |
| <b>Linearity</b>                      |            |        |      |      |      |  |
| 1 dB gain compression point           | $OP_{1dB}$ | –      | 7.5  | –    | dBm  | $Z_S = Z_L = 50\ \Omega$<br>$I_C = 13\text{ mA}$ |
| 3 <sup>rd</sup> order intercept point | $OIP_3$    | –      | 22.5 | –    |      | $I_C = 13\text{ mA}$                             |



**Table 5-10 AC Characteristics,  $V_{CE} = 3\text{ V}$ ,  $f = 5.5\text{ GHz}$** 

| Parameter                             | Symbol     | Values |      |      | Unit | Note / Test Condition    |
|---------------------------------------|------------|--------|------|------|------|--------------------------|
|                                       |            | Min.   | Typ. | Max. |      |                          |
| <b>Maximum Power Gain</b>             | $G_{ms}$   |        |      |      | dB   | $I_C = 5\text{ mA}$      |
| Low noise operation point             | $G_{ma}$   | –      | 19   | –    |      |                          |
| High linearity operation point        |            | –      | 19.5 | –    |      | $I_C = 13\text{ mA}$     |
| <b>Transducer Gain</b>                |            |        |      |      | dB   | $Z_S = Z_L = 50\ \Omega$ |
| Low noise operation point             | $S_{21}$   | –      | 15   | –    |      |                          |
| High linearity operation point        | $S_{21}$   | –      | 16   | –    |      | $I_C = 13\text{ mA}$     |
| <b>Minimum Noise Figure</b>           |            |        |      |      | dB   | $Z_S = Z_{opt}$          |
| Minimum noise figure                  | $NF_{min}$ | –      | 0.7  | –    |      |                          |
| Associated gain                       | $G_{ass}$  | –      | 15   | –    |      | $I_C = 5\text{ mA}$      |
| <b>Linearity</b>                      |            |        |      |      | dBm  | $Z_S = Z_L = 50\ \Omega$ |
| 1 dB gain compression point           | $OP_{1dB}$ | –      | 8.5  | –    |      |                          |
| 3 <sup>rd</sup> order intercept point | $OIP_3$    | –      | 23   | –    |      | $I_C = 13\text{ mA}$     |

**Table 5-11 AC Characteristics,  $V_{CE} = 3\text{ V}$ ,  $f = 10\text{ GHz}$** 

| Parameter                             | Symbol     | Values |      |      | Unit | Note / Test Condition    |
|---------------------------------------|------------|--------|------|------|------|--------------------------|
|                                       |            | Min.   | Typ. | Max. |      |                          |
| <b>Maximum Power Gain</b>             |            |        |      |      | dB   | $I_C = 5\text{ mA}$      |
| Low noise operation point             | $G_{ma}$   | –      | 13.5 | –    |      |                          |
| High linearity operation point        | $G_{ma}$   | –      | 15   | –    |      | $I_C = 13\text{ mA}$     |
| <b>Transducer Gain</b>                |            |        |      |      | dB   | $Z_S = Z_L = 50\ \Omega$ |
| Low noise operation point             | $S_{21}$   | –      | 9    | –    |      |                          |
| High linearity operation point        | $S_{21}$   | –      | 10   | –    |      | $I_C = 13\text{ mA}$     |
| <b>Minimum Noise Figure</b>           |            |        |      |      | dB   | $Z_S = Z_{opt}$          |
| Minimum noise figure                  | $NF_{min}$ | –      | 0.95 | –    |      |                          |
| Associated gain                       | $G_{ass}$  | –      | 10.5 | –    |      | $I_C = 5\text{ mA}$      |
| <b>Linearity</b>                      |            |        |      |      | dBm  | $Z_S = Z_L = 50\ \Omega$ |
| 1 dB gain compression point           | $OP_{1dB}$ | –      | 8    | –    |      |                          |
| 3 <sup>rd</sup> order intercept point | $OIP_3$    | –      | 19.5 | –    |      | $I_C = 13\text{ mA}$     |

**Notes**

- $G_{ms} = |S_{21} / S_{12}|$  for  $k < 1$ ;  $G_{ma} = |S_{21} / S_{12}|(k - (k^2 - 1)^{1/2})$  for  $k > 1$
- In order to get the  $NF_{min}$  values stated in this chapter the test fixture losses have been subtracted from all measured results

### 5.4 Characteristic Curves

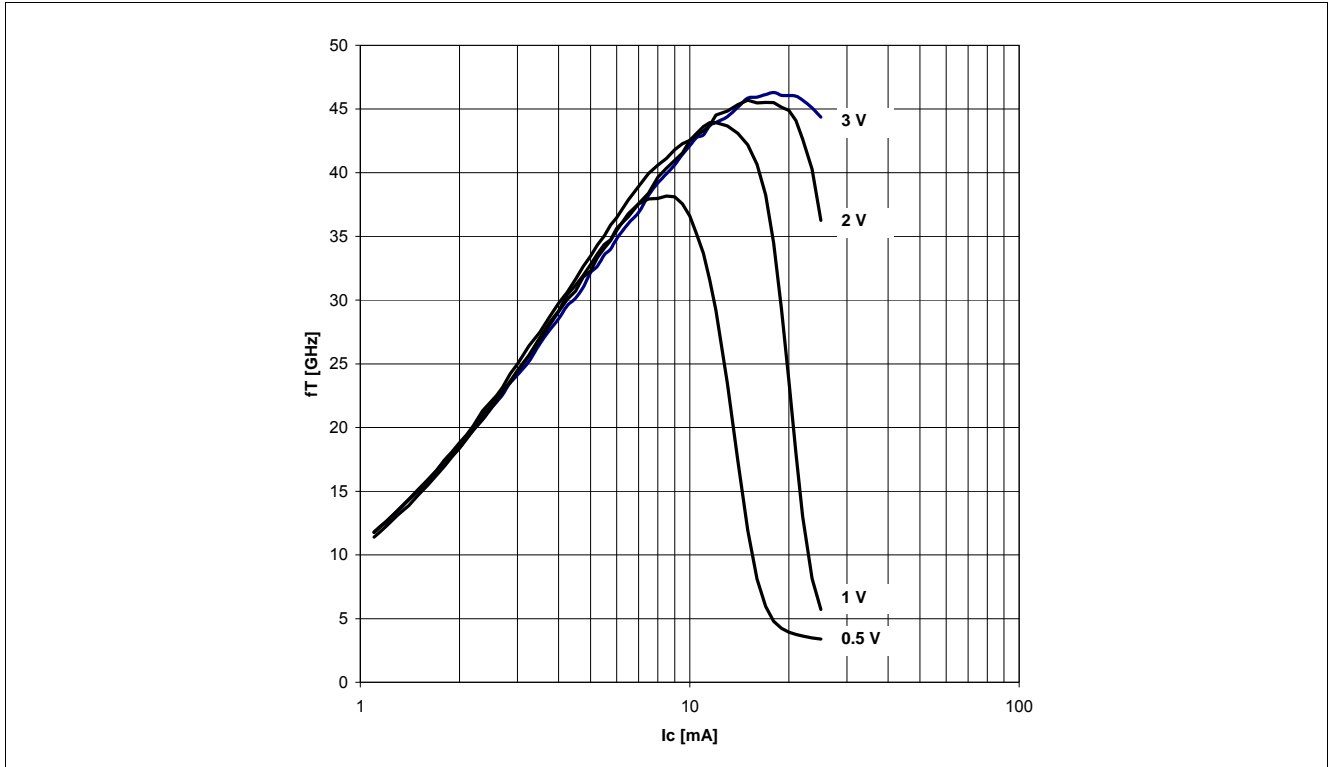


Figure 5-2 Transition Frequency  $f_T = f(I_C, V_{CE}), f = 1 \text{ GHz}, V_{CE} = \text{Parameter in V}$

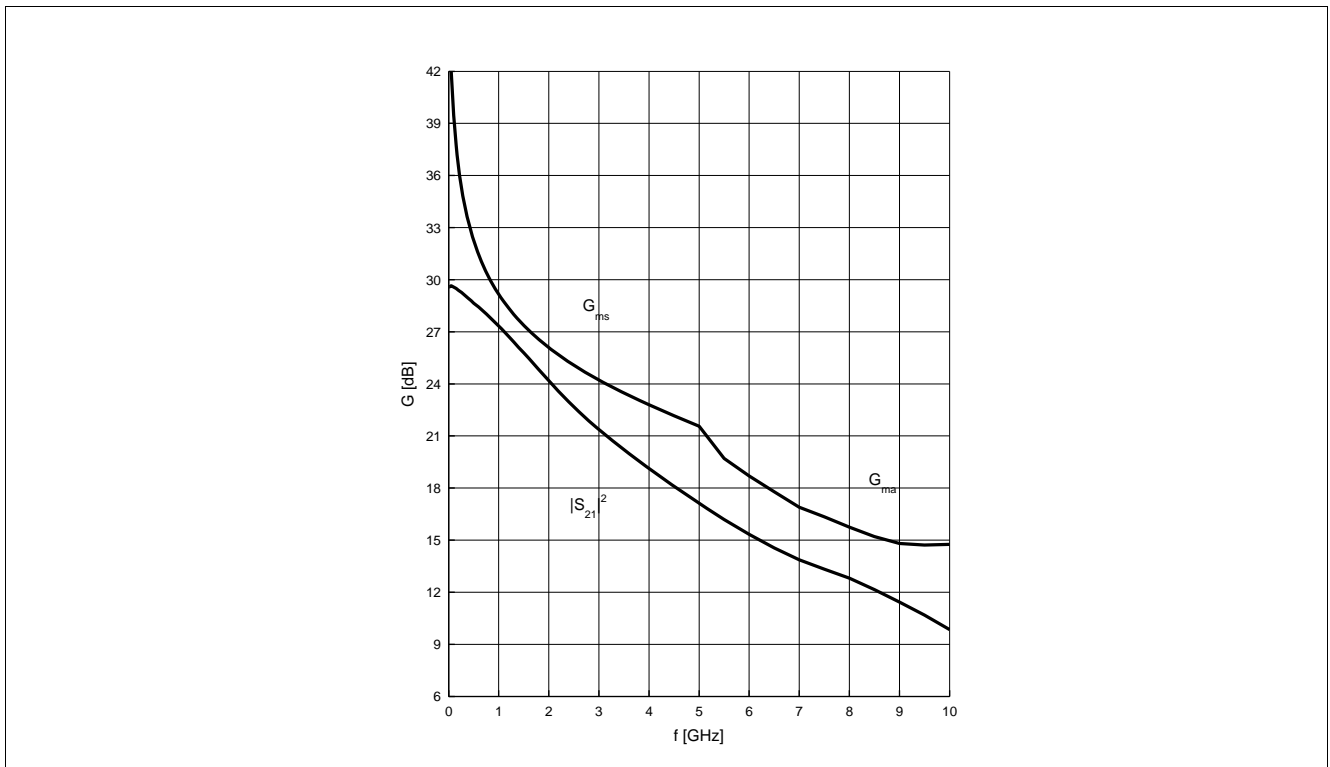


Figure 5-3 Power Gain  $G_{ma}, G_{ms}, |S_{21}|^2 = f(f), V_{CE} = 3 \text{ V}, I_C = 13 \text{ mA}$

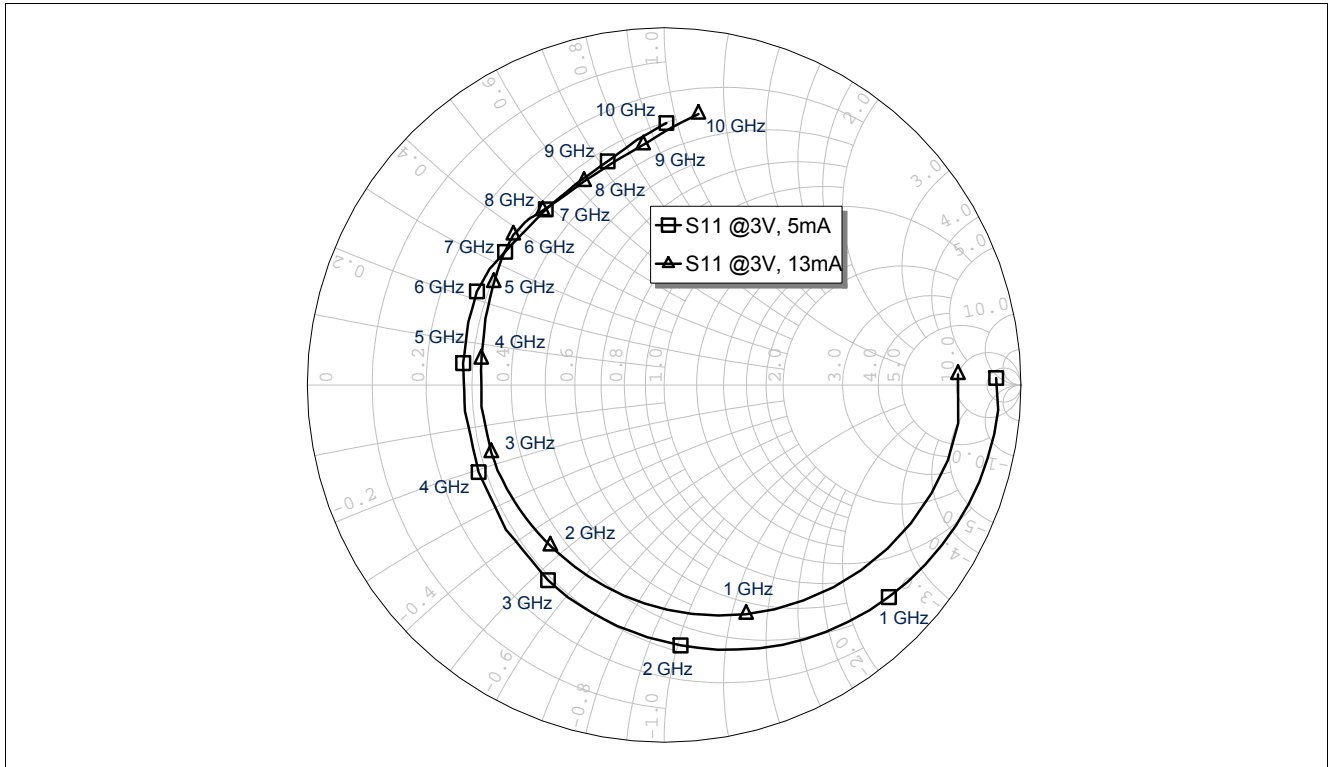


Figure 5-4 Input Matching  $S_{11} = f(f)$ ,  $V_{CE} = 3\text{ V}$ ,  $I_C = 5\text{ mA} / 13\text{ mA}$

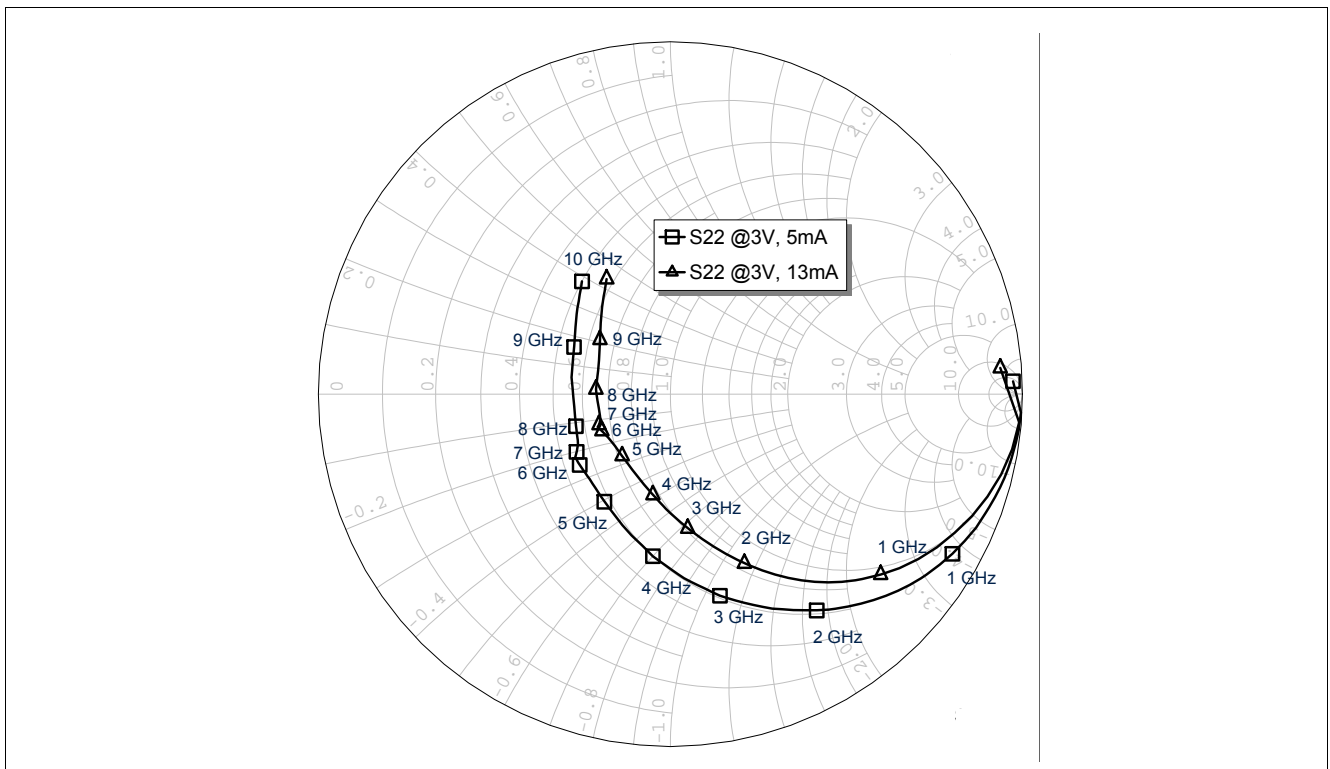


Figure 5-5 Output Matching  $S_{22} = f(f)$ ,  $V_{CE} = 3\text{ V}$ ,  $I_C = 5\text{ mA} / 13\text{ mA}$

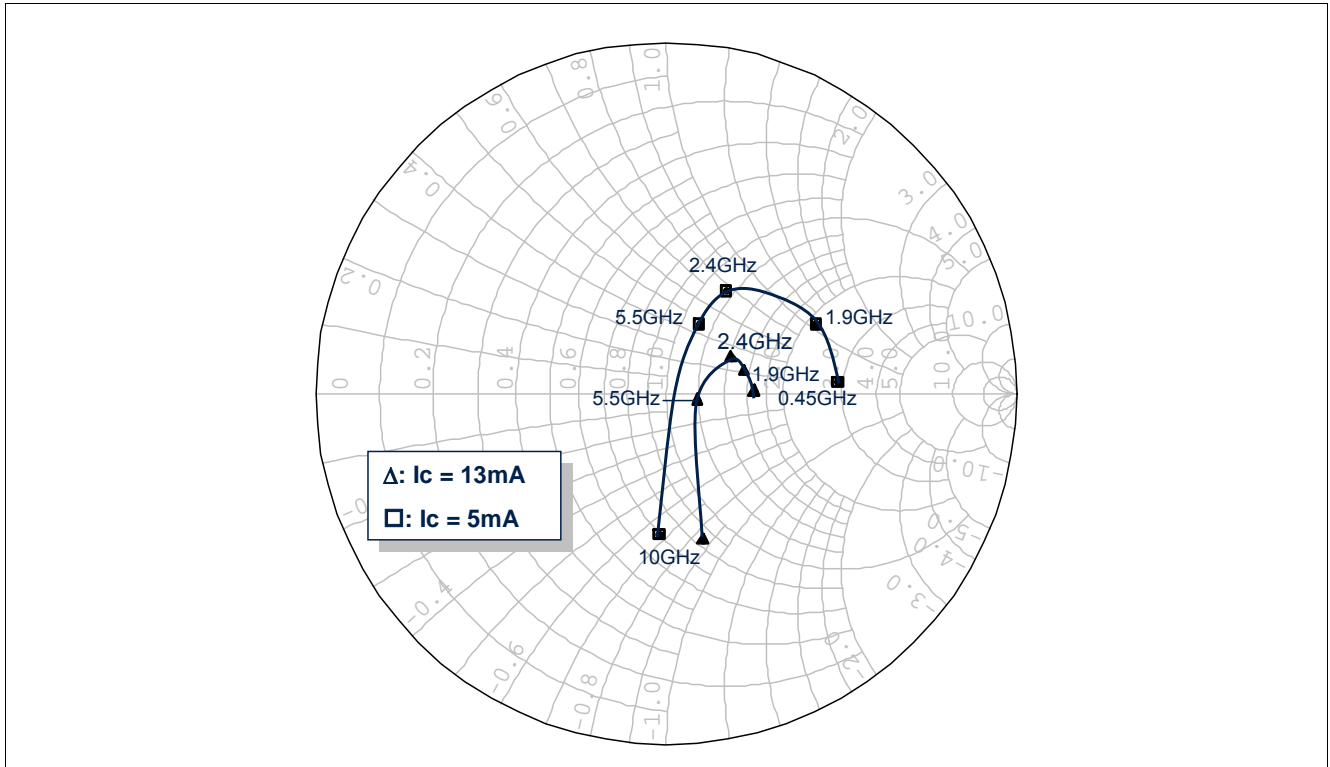


Figure 5-6 Source Impedance  $Z_{opt}$  for  $NF_{min} = f(f)$ ,  $V_{CE} = 3 V$ ,  $I_C = 5 mA / 13 mA$

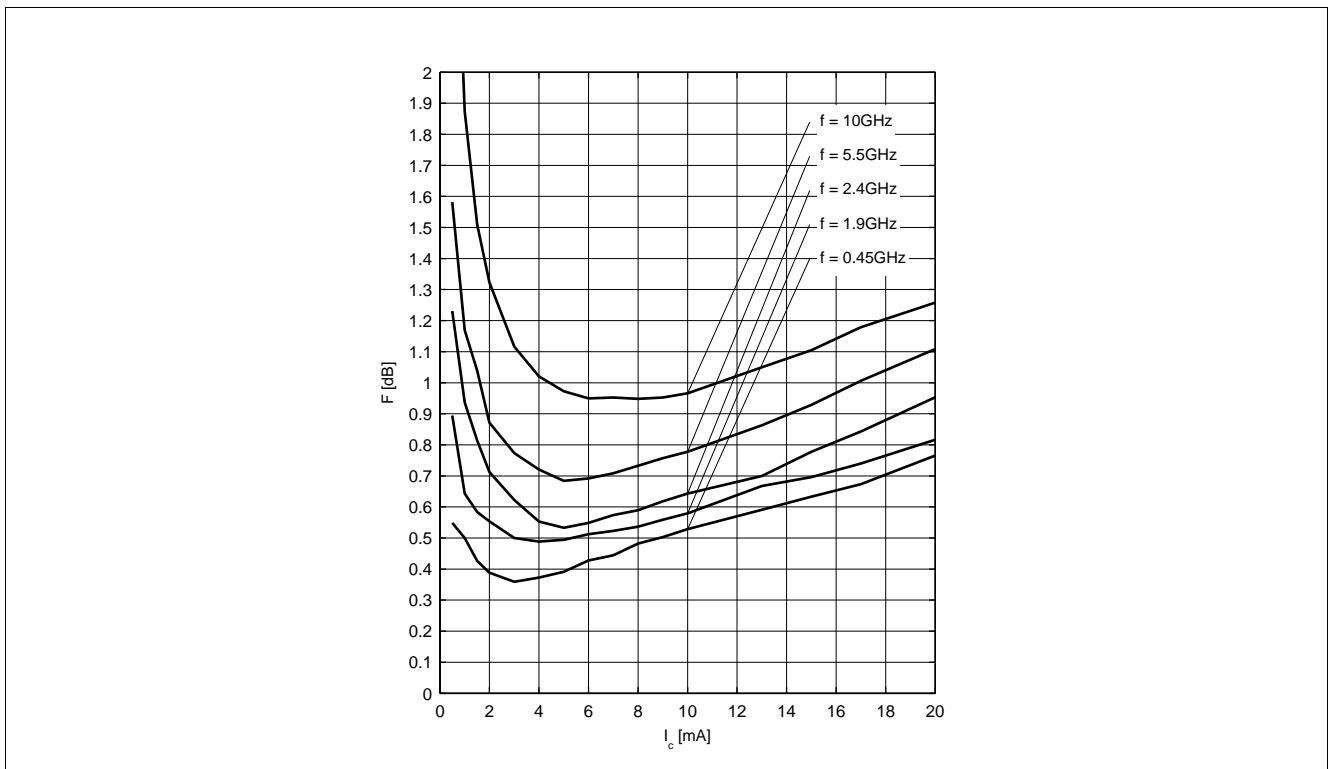


Figure 5-7 Noise Figure  $NF_{min} = f(I_C)$ ,  $V_{CE} = 3 V$ ,  $Z_S = Z_{opt}$

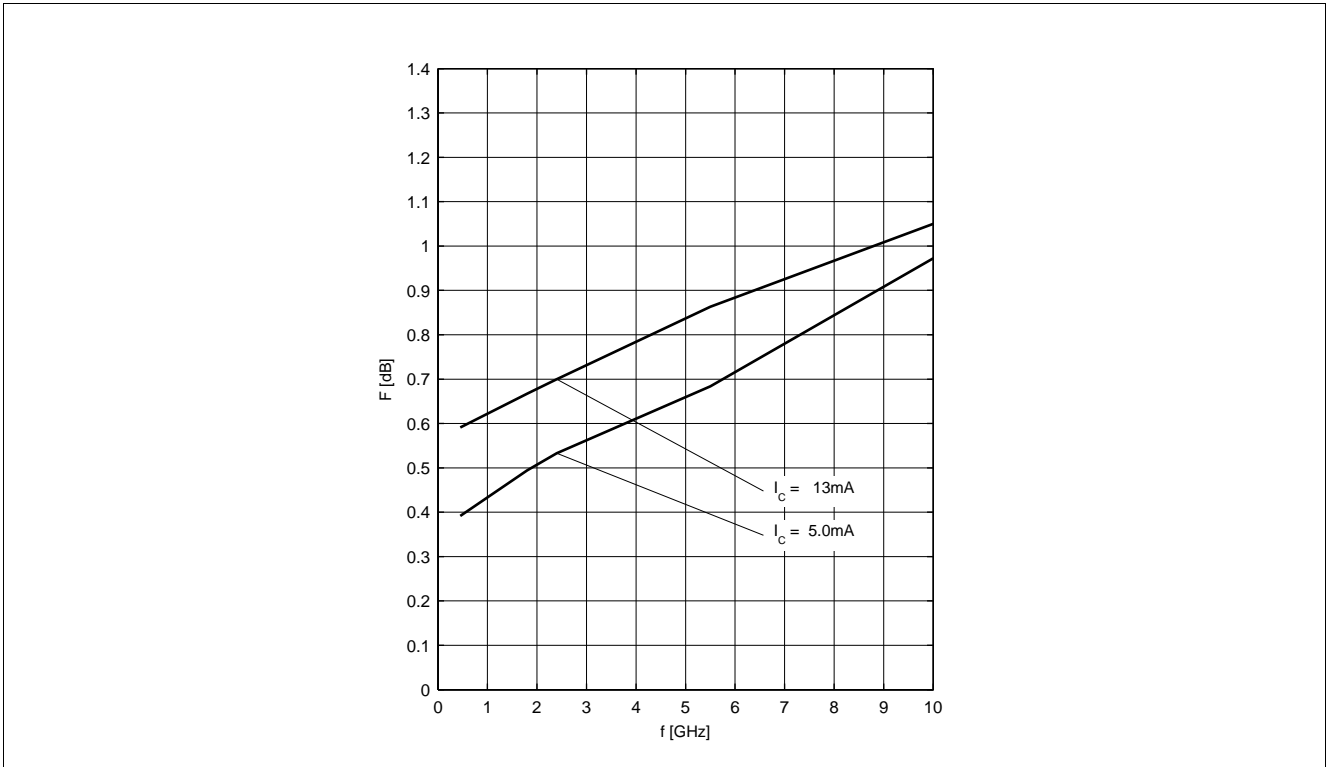


Figure 5-8 Noise Figure  $NF_{min} = f(f)$ ,  $V_{CE} = 3\text{ V}$ ,  $Z_S = Z_{opt}$

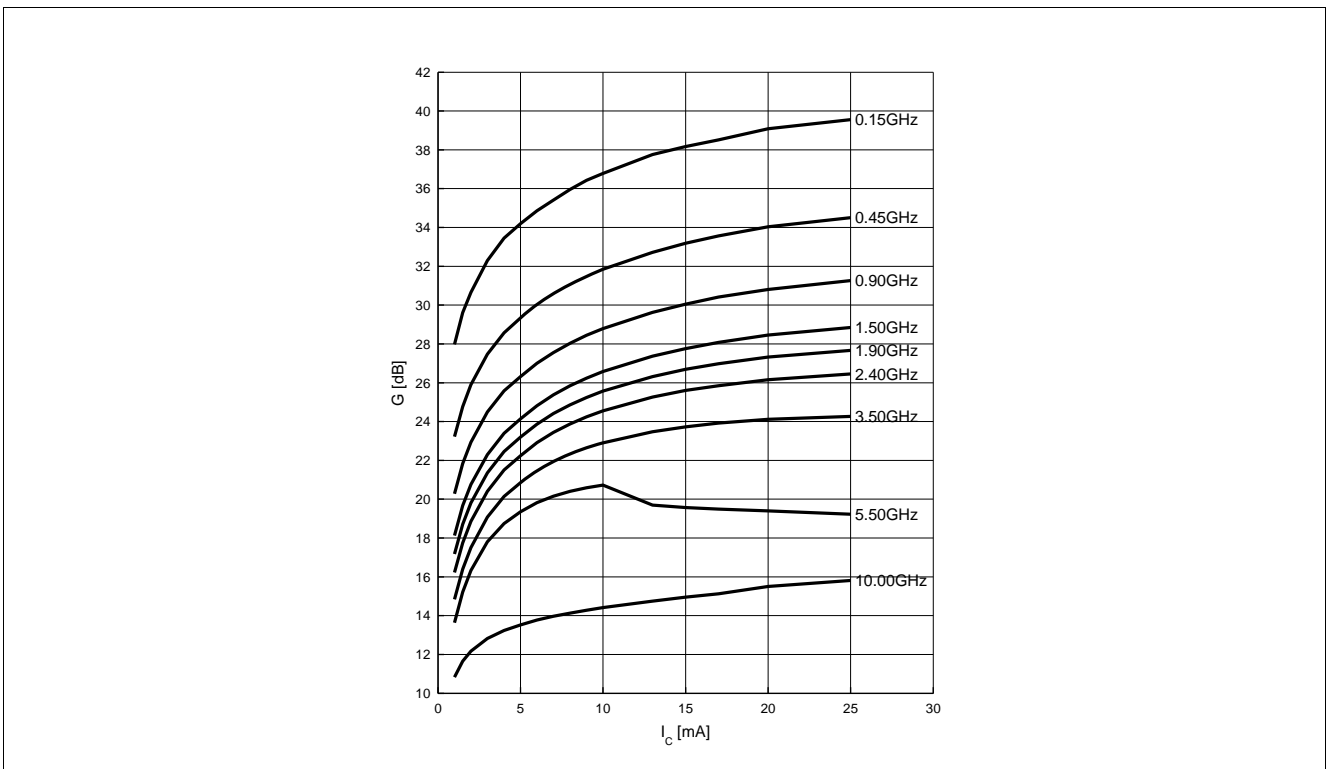


Figure 5-9 Power Gain  $G_{ma}, G_{ms} = f(I_C)$ ,  $V_{CE} = 3\text{ V}$ ,  $f = \text{Parameter in GHz}$

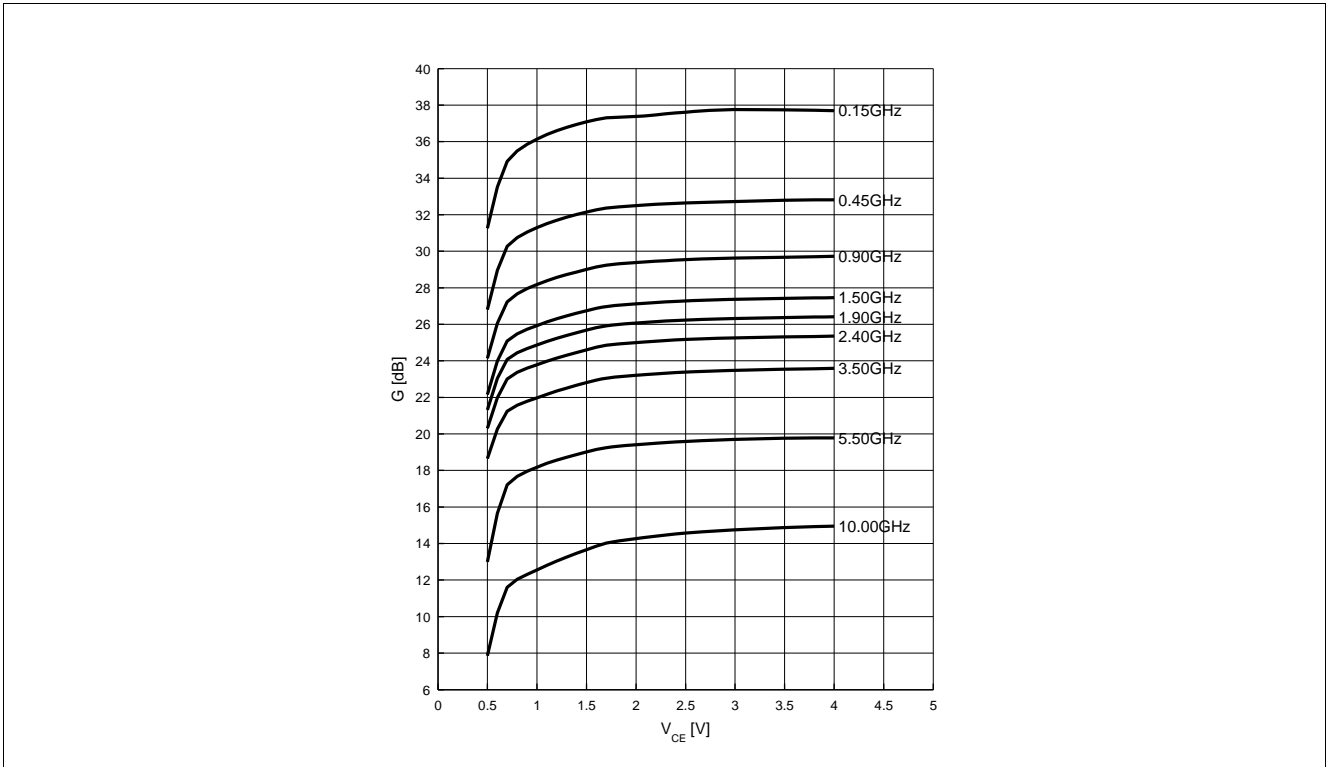


Figure 5-10 Power Gain  $G_{ms} = f(V_{CE})$ ,  $I_C = 13 \text{ mA}$ ,  $f = \text{Parameter in GHz}$

Note: The curves shown in this chapter have been generated using typical devices but shall not be considered as a guarantee that all devices have identical characteristic curves

## 6 Simulation Data

For the SPICE Gummel Poon (GP) model as well as for the S-parameters (including noise parameters) please refer to our internet website: [www.infineon.com/rf.models](http://www.infineon.com/rf.models). Please consult our website and download the latest versions before actually starting your design.

You find the BFP720 SPICE GP model in the internet in MWO- and ADS-format, which you can import into these circuit simulation tools very quickly and conveniently. The model already contains the package parasitic and is ready to use for DC- and high frequency simulations. The terminals of the model circuit correspond to the pin configuration of the device.

The model parameters have been extracted and verified up to 12 GHz using typical devices. The BFP720 SPICE GP model reflects the typical DC- and RF-performance within the limitations which are given by the SPICE GP model itself.

## 7 Package Information SOT343

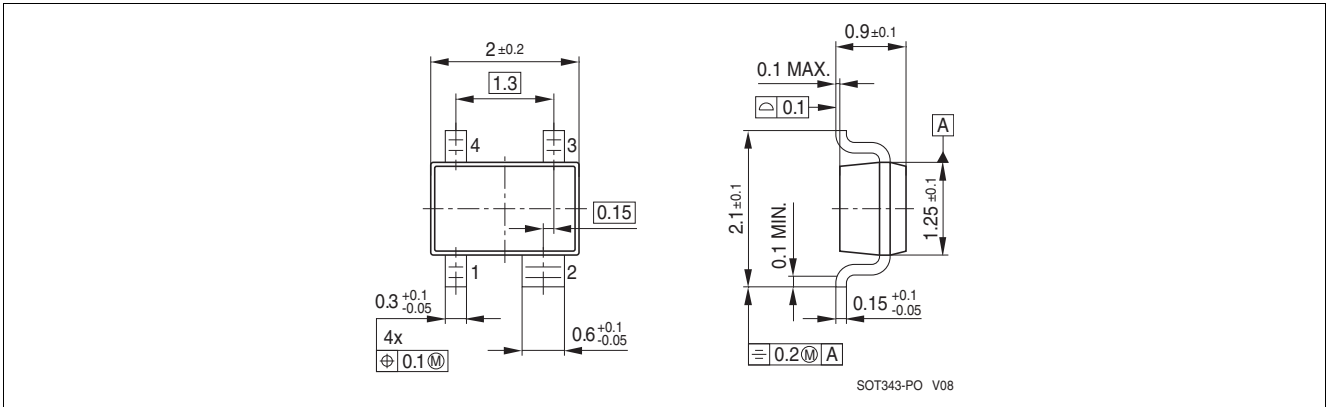


Figure 7-1 Package Outline

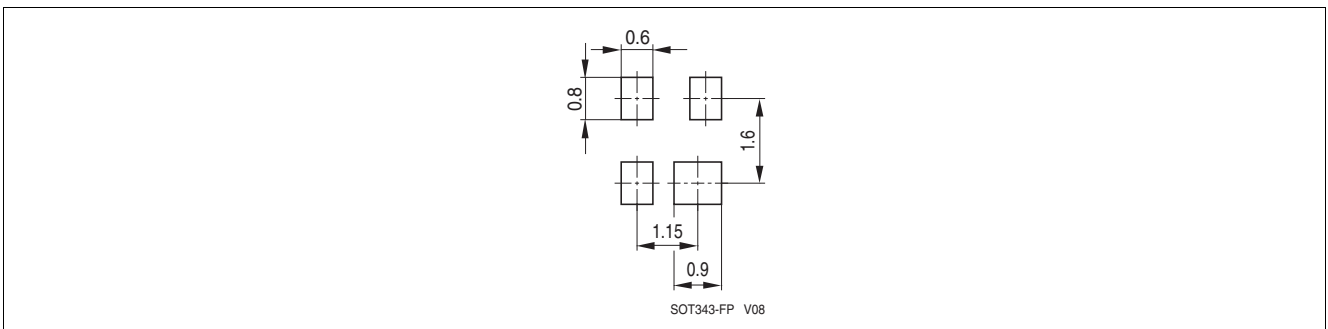


Figure 7-2 Package Footprint

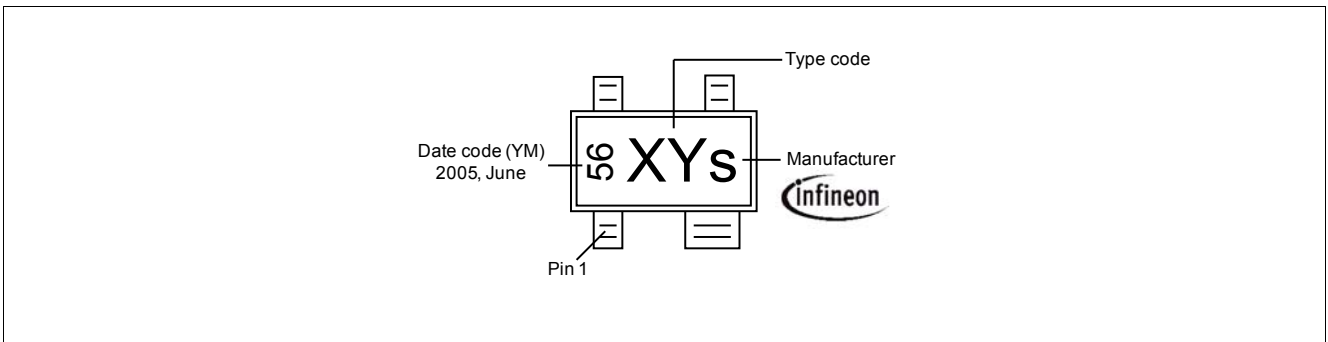


Figure 7-3 Marking Description (Marking BFP720: R9s)

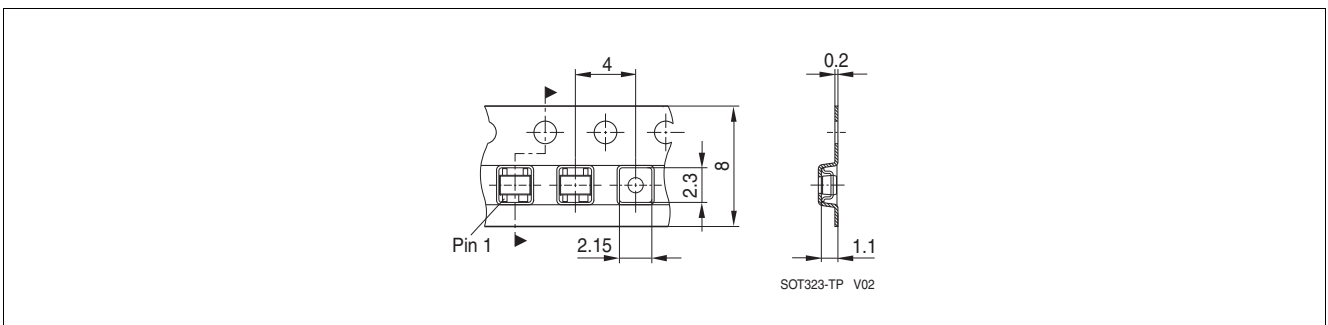


Figure 7-4 Tape Dimensions



[www.infineon.com](http://www.infineon.com)

Published by Infineon Technologies AG

## Данный компонент на территории Российской Федерации

### Вы можете приобрести в компании MosChip.

Для оперативного оформления запроса Вам необходимо перейти по данной ссылке:

<http://moschip.ru/get-element>

Вы можете разместить у нас заказ для любого Вашего проекта, будь то серийное производство или разработка единичного прибора.

В нашем ассортименте представлены ведущие мировые производители активных и пассивных электронных компонентов.

Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

### Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: [info@moschip.ru](mailto:info@moschip.ru)

Skype отдела продаж:

moschip.ru

moschip.ru\_4

moschip.ru\_6

moschip.ru\_9