

**NPN Silicon RF Transistor\***

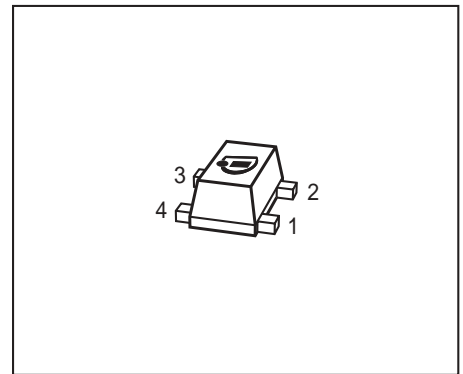
- For highest gain low noise amplifier at 1.8 GHz and 2 mA / 2 V

**Outstanding  $G_{ms} = 23$  dB**

**Noise Figure  $F = 0.95$  dB**

- For oscillators up to 15 GHz
- Transition frequency  $f_T = 45$  GHz
- Gold metallisation for high reliability
- **SIEGET® 45 - Line**
- Pb-free (RoHS compliant) package<sup>1)</sup>
- Qualified according AEC Q101

\* Short term description



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

Type	Marking	Pin Configuration						Package
BFP520F	APs	1=B	2=E	3=C	4=E	-	-	TSFP-4

**Maximum Ratings**

Parameter	Symbol	Value	Unit
Collector-emitter voltage	$V_{CEO}$		V
$T_A > 0$ °C		2.5	
$T_A \leq 0$ °C		2.4	
Collector-emitter voltage	$V_{CES}$	10	
Collector-base voltage	$V_{CBO}$	10	
Emitter-base voltage	$V_{EBO}$	1	
Collector current	$I_C$	40	mA
Base current	$I_B$	4	
Total power dissipation <sup>2)</sup>	$P_{tot}$	100	mW
$T_S \leq 107$ °C			
Junction temperature	$T_j$	150	°C
Ambient temperature	$T_A$	-65 ... 150	
Storage temperature	$T_{stg}$	-65 ... 150	

<sup>1)</sup>Pb-containing package may be available upon special request

<sup>2)</sup> $T_S$  is measured on the collector lead at the soldering point to pcb

**Thermal Resistance**

Parameter	Symbol	Value	Unit
Junction - soldering point <sup>1)</sup>	$R_{thJS}$	$\leq 430$	K/W

**Electrical Characteristics** at  $T_A = 25^\circ\text{C}$ , unless otherwise specified

Parameter	Symbol	Values			Unit
		min.	typ.	max.	

**DC Characteristics**

Collector-emitter breakdown voltage $I_C = 1 \text{ mA}, I_B = 0$	$V_{(BR)CEO}$	2.5	3	3.5	V
Collector-emitter cutoff current $V_{CE} = 10 \text{ V}, V_{BE} = 0$	$I_{CES}$	-	-	10	$\mu\text{A}$
Collector-base cutoff current $V_{CB} = 5 \text{ V}, I_E = 0$	$I_{CBO}$	-	-	200	mA
Emitter-base cutoff current $V_{EB} = 1 \text{ V}, I_C = 0$	$I_{EBO}$	-	-	35	$\mu\text{A}$
DC current gain $I_C = 20 \text{ mA}, V_{CE} = 2 \text{ V}$ , pulse measured	$h_{FE}$	70	110	170	-

<sup>1)</sup>For calculation of  $R_{thJA}$  please refer to Application Note Thermal Resistance

**Electrical Characteristics** at  $T_A = 25^\circ\text{C}$ , unless otherwise specified

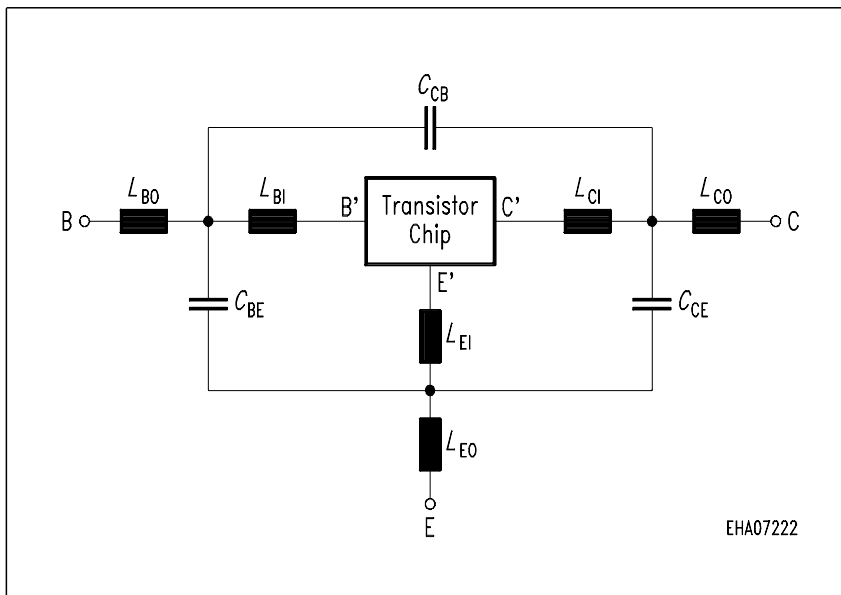
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>AC Characteristics</b> (verified by random sampling)					
Transition frequency $I_C = 30\text{ mA}$ , $V_{CE} = 2\text{ V}$ , $f = 2\text{ GHz}$	$f_T$	32	45	-	GHz
Collector-base capacitance $V_{CB} = 2\text{ V}$ , $f = 1\text{ MHz}$ , $V_{BE} = 0$ , emitter grounded	$C_{cb}$	-	0.07	0.14	pF
Collector emitter capacitance $V_{CE} = 2\text{ V}$ , $f = 1\text{ MHz}$ , $V_{BE} = 0$ , base grounded	$C_{ce}$	-	0.25	-	
Emitter-base capacitance $V_{EB} = 0.5\text{ V}$ , $f = 1\text{ MHz}$ , $V_{CB} = 0$ , collector grounded	$C_{eb}$	-	0.31	-	
Noise figure $I_C = 2\text{ mA}$ , $V_{CE} = 2\text{ V}$ , $Z_S = Z_{Sopt}$ , $f = 1.8\text{ GHz}$	$F$	-	0.95	-	dB
Power gain, maximum stable <sup>1)</sup> $I_C = 20\text{ mA}$ , $V_{CE} = 2\text{ V}$ , $Z_S = Z_{Sopt}$ , $Z_L = Z_{Lopt}$ , $f = 1.8\text{ GHz}$	$G_{ms}$	-	22.5	-	dB
Insertion power gain $V_{CE} = 2\text{ V}$ , $I_C = 20\text{ mA}$ , $f = 1.8\text{ GHz}$ , $Z_S = Z_L = 50\ \Omega$	$ S_{21} ^2$	-	20.5	-	
Third order intercept point at output $V_{CE} = 2\text{ V}$ , $I_C = 20\text{ mA}$ , $f = 1.8\text{ GHz}$ , $Z_S = Z_{Sopt}$ , $Z_L = Z_{Lopt}$	$IP_3$	-	23.5	-	dBm
1dB Compression point $I_C = 20\text{ mA}$ , $V_{CE} = 2\text{ V}$ , $Z_S = Z_{Sopt}$ , $Z_L = Z_{Lopt}$ , $f = 1.8\text{ GHz}$	$P_{-1dB}$	-	10.5	-	

<sup>1)</sup>  $G_{ms} = |S_{21} / S_{12}|$

**SPICE Parameter (Gummel-Poon Model, Berkley-SPICE 2G.6 Syntax):**
**Transistor Chip Data:**

IS =	15	aA	BF =	235	-	NF =	1	-
VAF =	25	V	IKF =	0.4	A	ISE =	25	fA
NE =	2	-	BR =	1.5	-	NR =	1	-
VAR =	2	V	IKR =	0.01	A	ISC =	20	fA
NC =	2	-	RB =	11	$\Omega$	IRB =	-	A
RBM =	7.5	$\Omega$	RE =	0.6	-	RC =	7.6	$\Omega$
CJE =	235	fF	VJE =	0.958	V	MJE =	0.335	-
TF =	1.7	ps	XTF =	10	-	VTF =	5	V
ITF =	0.7	A	PTF =	50	deg	CJC =	93	fF
VJC =	0.661	V	MJC =	0.236	-	XCJC =	1	-
TR =	50	ns	CJS =	0	fF	VJS =	0.75	V
MJS =	0.333	-	XTB =	-0.25	-	EG =	1.11	eV
XTI =	0.35	-	FC =	0.5	-	TNOM	298	K

All parameters are ready to use, no scaling is necessary. Extracted on behalf of Infineon Technologies AG by: Institut für Mobil- und Satellitentechnik (IMST)

**Package Equivalent Circuit:**


$L_{BO} =$	0.22	nH
$L_{EO} =$	0.28	nH
$L_{CO} =$	0.22	nH
$L_{BI} =$	0.42	nH
$L_{EI} =$	0.26	nH
$L_{CI} =$	0.35	nH
$K_{BO-EO} =$	0.1	-
$K_{BO-CO} =$	0.01	-
$K_{EO-CO} =$	0.11	-
$K_{CI-EF} =$	-0.05	-
$K_{BI-CI} =$	-0.08	-
$K_{BI-EI} =$	0.2	-
$C_{BE} =$	34	fF
$C_{BC} =$	2	fF
$C_{CE} =$	33	fF
$R_{LBI} =$	0.11	$\Omega$
$R_{LEI} =$	0.13	$\Omega$

Valid up to 6GHz

The TSFP-4 package has two emitter leads. To avoid high complexity for the package equivalent circuit, both leads are combined in one electrical connection.

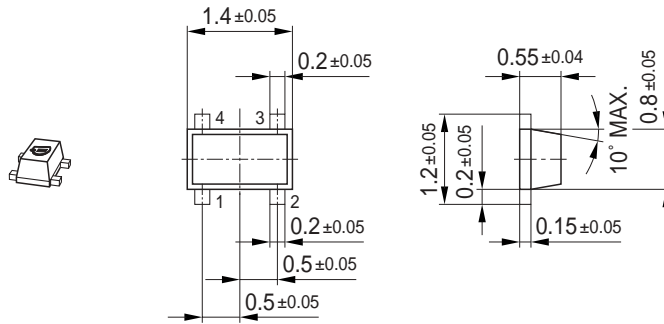
$R_{LXI}$  are series resistors for the inductances  $L_{Xi}$  and  $K_{xa-by}$  are the coupling coefficients between the inductances  $L_{ax}$  and  $L_{yb}$ . The

reference pin for the couple ports are B, E, C, B', E', C

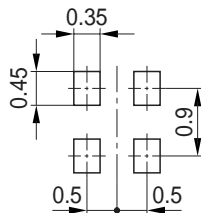
For examples and ready to use parameters please contact your local Infineon Technologies distributor or sales office to obtain an Infineon Technologies CD-ROM or see Internet:

<http://www.infineon.com/silicondiscretes>

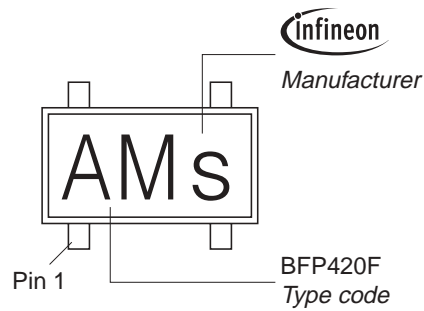
Package Outline



Foot Print

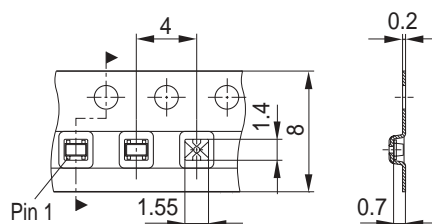


Marking Layout (Example)



Standard Packing

Reel  $\varnothing$ 180 mm = 3.000 Pieces/Reel  
 Reel  $\varnothing$ 330 mm = 10.000 Pieces/Reel



Edition 2006-02-01

Published by

Infineon Technologies AG

81726 München, Germany

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