

NPN Silicon RF Transistor*

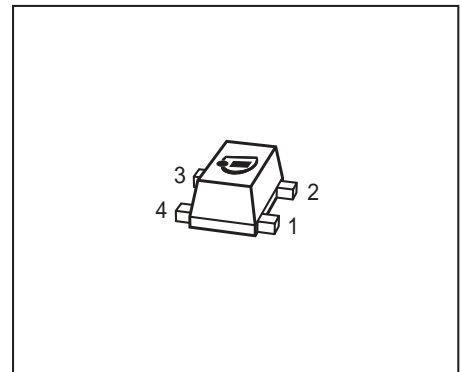
- For highest gain low noise amplifier at 1.8 GHz and 2 mA / 2 V

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) package¹⁾
- 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 ²⁾	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	

¹⁾Pb-containing package may be available upon special request

²⁾ T_S is measured on the collector lead at the soldering point to pcb

Thermal Resistance

Parameter	Symbol	Value	Unit
Junction - soldering point ¹⁾	R_{thJS}	≤ 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	μA
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	μA
DC current gain $I_C = 20 \text{ mA}, V_{CE} = 2 \text{ V}$, pulse measured	h_{FE}	70	110	170	-

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

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

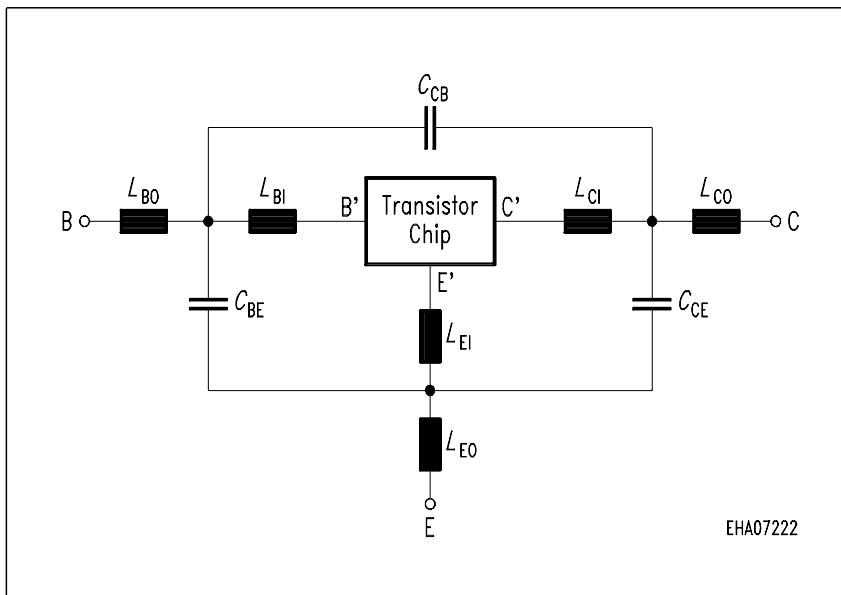
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC Characteristics (verified by random sampling)					
Transition frequency $I_C = 30\text{ mA}$, $V_{CE} = 2\text{ V}$, $f = 2\text{ GHz}$	f_T	32	45	-	GHz
Collector-base capacitance $V_{CB} = 2\text{ V}$, $f = 1\text{ MHz}$, $V_{BE} = 0$, emitter grounded	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 ¹⁾ $I_C = 20\text{ mA}$, $V_{CE} = 2\text{ V}$, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$, $f = 1.8\text{ GHz}$	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	-	

¹⁾ $G_{ms} = |S_{21} / S_{12}|$

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	Ω	IRB =	-	A
RBM =	7.5	Ω	RE =	0.6	-	RC =	7.6	Ω
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	Ω
$R_{LEI} =$	0.13	Ω

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.

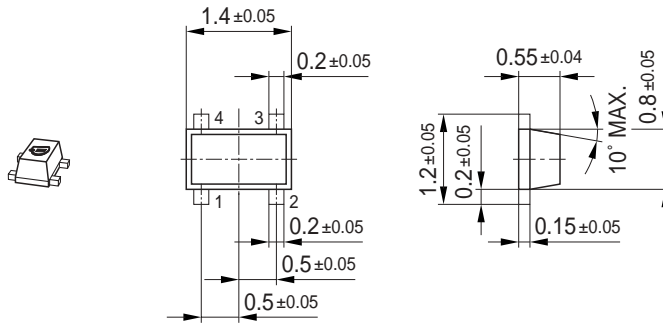
R_{LXI} are series resistors for the inductances L_{XI} and K_{xa-by} are the coupling coefficients between the inductances L_{ax} and L_{yb} . The

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

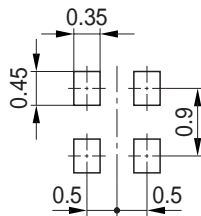
For examples and ready to use parameters please contact your local Infineon Technologies distributor or sales office to obtain an Infineon Technologies CD-ROM or see Internet:

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

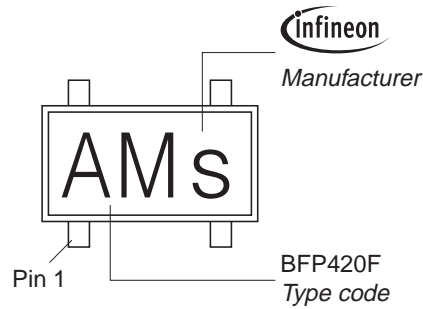
Package Outline



Foot Print

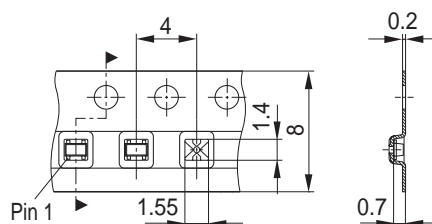


Marking Layout (Example)



Standard Packing

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



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