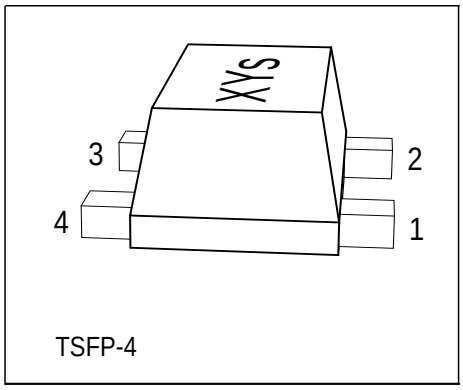
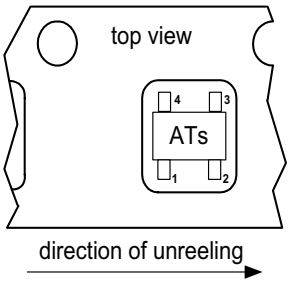
NPN Silicon RF Transistor

Preliminary data

- For highest gain low noise amplifier at 1.8 GHz
  Outstanding G_{ma} = 20 dB
  Noise Figure F = 0.9 dB
- Gold metallization for high reliability
- **SIEGET ® 45 - Line**





ESD: **E**lectro**s**tatic **d**ischarge sensitive device, observe handling precaution!

Type	Marking	Pin Configuration				Package
BFP540F	ATs	1 = B	2 = E	3 = C	4 = E	TSFP-4

Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CEO}	4.5	V
Collector-base voltage	V_{CBO}	14	
Emitter-base voltage	V_{EBO}	1	
Collector current	I_C	80	mA
Base current	I_B	8	
Total power dissipation $T_S \leq$ 82°C [1)]	P_{tot}	250	mW
Junction temperature	T_j	150	°C
Ambient temperature	T_A	-65 ... 150	
Storage temperature	T_{stg}	-65 ... 150	

Thermal Resistance

Junction - soldering point[2)]	R_{thJS}	≤ 270	K/W

[1] T_S is measured on the emitter lead at the soldering point to the pcb

[2] For calculation of R_{thJA} please refer to Application Note Thermal Resistance

Electrical Characteristics at T_A = 25°C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage I_C = 1 mA, I_B = 0	$V_{(BR)CEO}$	4.5	5	6.5	V
Collector-base cutoff current V_{CB} = 5 V, I_E = 0	I_{CBO}	-	-	200	nA
Emitter-base cutoff current V_{EB} = 1 V, I_C = 0	I_{EBO}	-	-	70	µA
DC current gain I_C = 20 mA, V_{CE} = 3.5 V	h_{FE}	50	110	200	-
AC Characteristics (verified by random sampling)					
Transition frequency I_C = 50 mA, V_{CE} = 4 V, f = 1 GHz	f_T	-	30	-	GHz
Collector-base capacitance V_{CB} = 2 V, f = 1 MHz	C_{cb}	-	0.14	-	pF
Collector-emitter capacitance V_{CE} = 2 V, f = 1 MHz	C_{ce}	-	0.3	-	
Emitter-base capacitance V_{EB} = 0.5 V, f = 1 MHz	C_{eb}	-	0.6	-	
Noise figure I_C = 5 mA, V_{CE} = 2 V, Z_S = Z_{Sopt} , f = 1.8 GHz	F	-	0.9	1.4	dB
Power gain, maximum available [1)] I_C = 20 mA, V_{CE} = 2 V, Z_S = Z_{Sopt}, Z_L = Z_{Lopt} , f = 1.8 GHz	G_{ma}	-	20	-	
Insertion power gain I_C = 20 mA, V_{CE} = 2 V, f = 1.8 GHz, Z_S = Z_L = 50Ω	$\lvert S_{21}\rvert^2$	16	18	-	
Third order intercept point at output[2)] V_{CE} = 2 V, f = 1.8 GHz, Z_S=Z_L=50Ω, I_C = 20 mA	IP_3	-	24.5	-	dBm
1dB compression point at output[3)] V_{CE} = 2 V, f = 1.8 GHz, Z_S=Z_L=50Ω, I_C = 20 mA	P_{-1dB}	-	11	-	

[1] $G_{ma} = |S_{21} / S_{12}| (k-(k^2-1)^{1/2}$

[2] IP3 value depends on termination of all intermodulation frequency components. Termination used for this measurement is 50Ω from 0.1MHz to 6GHz

[3] DC current at no input power

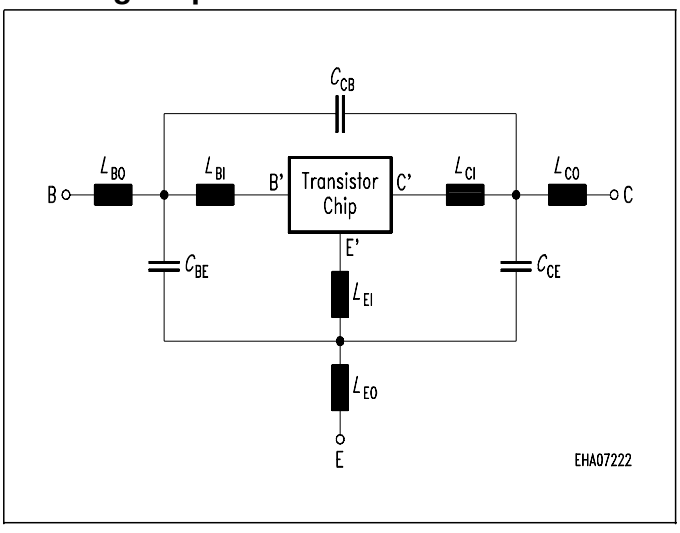
SPICE Parameters (Gummel-Poon Model, Berkley-SPICE 2G.6 Syntax) :

Transistor Chip Data

IS =	82.84	aA	BF =	107.5	-	NF =	1	-
VAF =	28.383	V	IKF =	0.48731	A	ISE =	11.15	pA
NE =	3.19	-	BR =	5.5	-	NR =	1	-
VAR =	19.705	V	IKR =	0.02	A	ISC =	19.237	aA
NC =	1.172	-	RB =	5.4	Ω	IRB =	0.72983	mA
RBM =	1.3	Ω	RE =	0.31111		RC =	4	Ω
CJE =	1.8063	fF	VJE =	0.8051	V	MJE =	0.46576	-
TF =	6.76	ps	XTF =	0.4219	-	VTF =	0.23794	V
ITF =	1	mA	PTF =	0	deg	CJC =	234	fF
VJC =	0.81969	V	MJC =	0.30232	-	XCJC =	0.3	-
TR =	2.324	ns	CJS =	0	fF	VJS =	0.75	V
MJS =	0	-	XTB =	0	-	EG =	1.11	eV
XTI =	3	-	FC =	0.73234	-	TNOM	300	K

All parameters are ready to use, no scaling is necessary

Package Equivalent Circuit:



L_{BO} =	0.22	nH	L_{BI} =	0.42	nH
L_{EO} =	0.28	nH	R_{LBI} =	0.15	Ω
L_{CO} =	0.22	nH	L_{EI} =	0.26	nH
K_{BO-EO} =	0.10	-	R_{LEI} =	0.11	Ω
K_{BO-CO} =	0.01	-	L_{CI} =	0.35	nH
K_{EO-CO} =	0.11	-	R_{LI} =	0.13	Ω
C_{BE} =	34	fF	K_{BI-EI} =	-0.05	-
C_{BC} =	2	fF	K_{BI-CI} =	-0.08	-
C_{CE} =	33	fF	K_{BI-EI} =	0.20	-

Valid up to 6GHz

The TSFP-4 package has two emitter leads. To avoid high complexity of 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-yb} are the coupling coefficients between the inductances L_{xa} and L_{yb}. The referencepins for the coupled 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 a Infineon Technologies CD-ROM or see Internet: http://www.infineon.com/silicondiscretes