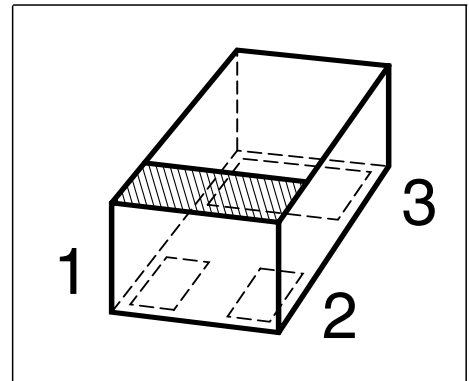


NPN Silicon RF Transistor

Preliminary data

- Low voltage/ Low current operation
- For low noise amplifiers
- For Oscillators up to 3.5 GHz and Pout > 10 dBm
- Low noise figure: 1.0 dB at 1.8 GHz


ESD: Electrostatic discharge sensitive device, observe handling precaution!

Type	Marking	Pin Configuration			Package
BFR360L3	FB	1 = B	2 = E	3 = C	TSLP-3-1

Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CEO}	6	V
Collector-emitter voltage	V_{CES}	15	
Collector-base voltage	V_{CBO}	15	
Emitter-base voltage	V_{EBO}	2	
Collector current	I_C	35	mA
Base current	I_B	4	
Total power dissipation ¹⁾ $T_S \leq 106^\circ\text{C}$	P_{tot}	210	mW
Junction temperature	T_j	150	°C
Ambient temperature	T_A	-65 ... 150	
Storage temperature	T_{stg}	-65 ... 150	

Thermal Resistance

Parameter	Symbol	Value	Unit
Junction - soldering point ²⁾	R_{thJS}	tbd	K/W

¹⁾ T_S is measured on the collector lead at the soldering point to the pcb

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

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Characteristics					
Collector-emitter breakdown voltage $I_C = 1 \text{ mA}, I_B = 0$	$V_{(BR)CEO}$	6	9	-	V
Collector-emitter cutoff current $V_{CE} = 15 \text{ V}, V_{BE} = 0$	I_{CES}	-	-	10	μA
Collector-base cutoff current $V_{CB} = 5 \text{ V}, I_E = 0$	I_{CBO}	-	-	100	nA
Emitter-base cutoff current $V_{EB} = 1 \text{ V}, I_C = 0$	I_{EBO}	-	-	1	μA
DC current gain- $I_C = 15 \text{ mA}, V_{CE} = 3 \text{ V}$	h_{FE}	60	130	200	-

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 $I_C = 15\text{ mA}$, $V_{CE} = 3\text{ V}$, $f = 1\text{ GHz}$	f_T	11	14	-	GHz
Collector-base capacitance $V_{CB} = 5\text{ V}$, $f = 1\text{ MHz}$, emitter grounded	C_{cb}	-	0.26	0.5	pF
Collector emitter capacitance $V_{CE} = 5\text{ V}$, $f = 1\text{ MHz}$, base grounded	C_{ce}	-	0.15	-	
Emitter-base capacitance $V_{EB} = 0.5\text{ V}$, $f = 1\text{ MHz}$, collector grounded	C_{eb}	-	0.43	-	
Noise figure $I_C = 3\text{ mA}$, $V_{CE} = 3\text{ V}$, $Z_S = Z_{Sopt}$, $f = 1.8\text{ GHz}$	F_{min}	-	1	-	dB
Power gain, maximum stable ¹⁾ $I_C = 15\text{ mA}$, $V_{CE} = 3\text{ V}$, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$, $f = 1.8\text{ GHz}$	G_{ms}	-	16.5	-	-
Power gain, maximum available ¹⁾ $I_C = 15\text{ mA}$, $V_{CE} = 3\text{ V}$, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$, $f = 3\text{ GHz}$	G_{ma}	-	11.5	-	dB
Transducer gain $I_C = 15\text{ mA}$, $V_{CE} = 3\text{ V}$, $Z_S = Z_L = 50\Omega$, $f = 1.8\text{ GHz}$ $I_C = 30\text{ mA}$, $V_{CE} = 3\text{ V}$, $Z_S = Z_L = 50\Omega$, $f = 3\text{ GHz}$	$ S_{21e} ^2$	-	13.5	-	dB
		-	9	-	
Third order intercept point at output ²⁾ $V_{CE} = 3\text{ V}$, $I_C = 15\text{ mA}$, $f = 1.8\text{ GHz}$, $Z_S = Z_L = 50\Omega$	IP_3	-	24	-	dBm
1dB Compression point at output $I_C = 15\text{ mA}$, $V_{CE} = 3\text{ V}$, $Z_S = Z_L = 50\Omega$, $f = 1.8\text{ GHz}$	P_{-1dB}	-	8.5	-	

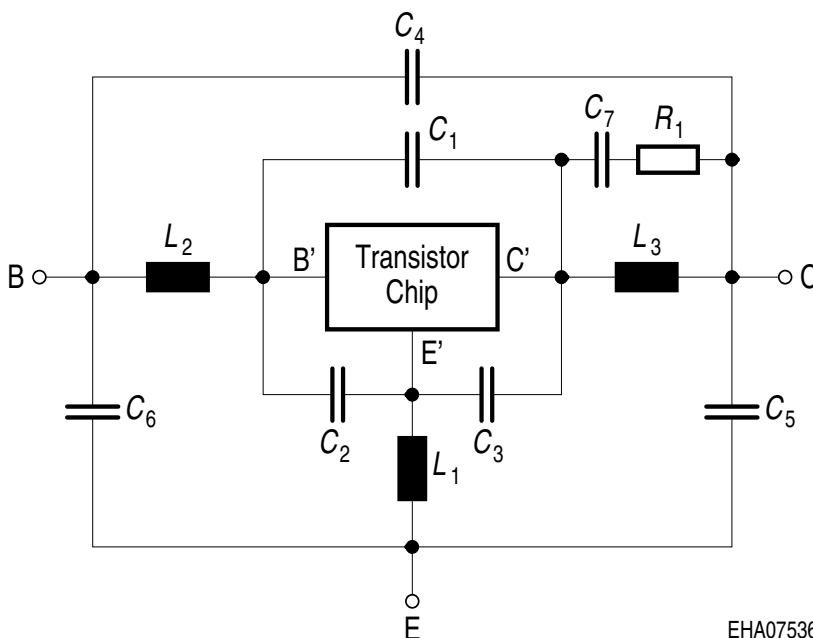
$$^1G_{ma} = |S_{21e}| / |S_{12e}| (k - (k^2 - 1)^{1/2})$$

² IP_3 value depends on termination of all intermodulation frequency components.
Termination used for this measurement is 50Ω from 0.1 MHz to 6 GHz

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

IS =	0.0689	fA	BF =	147	-	NF =	1	-
VAF =	20	V	IKF =	77.28	mA	ISE =	150	fA
NE =	2.4	-	BR =	6	-	NR =	1	-
VAR =	60	V	IKR =	0.3	A	ISC =	20	fA
NC =	1.4	-	RB =	0.1	Ω	IRB =	74	μ A
RBM =	7.31	Ω	RE =	78.2	m Ω	RC =	0.35	Ω
CJE =	400	fF	VJE =	1.3	V	MJE =	0.5	-
TF =	9.219	ps	XTF =	0.115	-	VTF =	0.198	V
ITF =	1.336	mA	PTF =	0	deg	CJC =	473	fF
VJC =	0.864	V	MJC =	0.486	-	XCJC =	0.129	-
TR =	1.92	ns	CJS =	0	fF	VJS =	0.75	V
MJS =	0	-	XTB =	0	-	EG =	1.11	eV
XTI =	0	-	FC =	0.954	-	NK =	0.5	K
AF =	1	-	KF =	1E-14	-			

All parameters are ready to use, no scaling is necessary.

Package Equivalent Circuit:


$L_1 =$	0.575	nH
$L_2 =$	0.575	nH
$L_3 =$	0.275	nH
$C_1 =$	33	fF
$C_2 =$	28	fF
$C_3 =$	131	fF
$C_4 =$	8	fF
$C_5 =$	8	fF
$C_6 =$	24	fF
$C_7 =$	300	fF
$R_1 =$	204	Ω

Valid up to 6GHz

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/silicondiscretres>