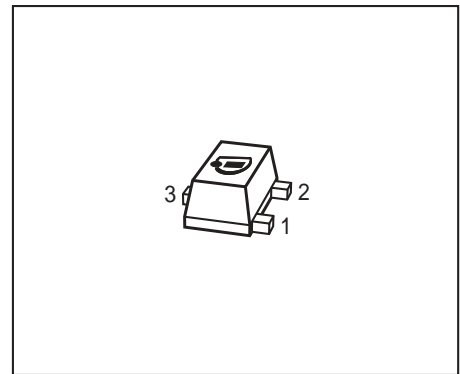


**NPN Silicon RF Transistor\***

- For low noise, high-gain broadband amplifiers at collector currents from 1 mA to 20 mA
- $f_T = 9$  GHz,  $F = 1$  dB at 1 GHz
- \* Short term description



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

Type	Marking	Pin Configuration			Package
BFR949F	RKs	1 = B	2 = E	3 = C	TSFP-3

**Maximum Ratings**

Parameter	Symbol	Value	Unit
Collector-emitter voltage	$V_{CEO}$	10	V
Collector-emitter voltage	$V_{CES}$	20	
Collector-base voltage	$V_{CBO}$	20	
Emitter-base voltage	$V_{EBO}$	1.5	
Collector current	$I_C$	50	mA
Base current	$I_B$	5	
Total power dissipation <sup>1)</sup> $T_S \leq 93^\circ\text{C}$	$P_{tot}$	250	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 <sup>2)</sup>	$R_{thJS}$	$\leq 225$	K/W

<sup>1)</sup>  $T_S$  is measured on the collector lead at the soldering point to the pcb

<sup>2)</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>DC Characteristics</b>					
Collector-emitter breakdown voltage $I_C = 1 \text{ mA}, I_B = 0$	$V_{(BR)CEO}$	10	-	-	V
Collector-emitter cutoff current $V_{CE} = 20 \text{ V}, V_{BE} = 0$	$I_{CES}$	-	-	100	$\mu\text{A}$
Collector-base cutoff current $V_{CB} = 10 \text{ V}, I_E = 0$	$I_{CBO}$	-	-	100	nA
Emitter-base cutoff current $V_{EB} = 1 \text{ V}, I_C = 0$	$I_{EBO}$	-	-	0.1	$\mu\text{A}$
DC current gain- $I_C = 5 \text{ mA}, V_{CE} = 6 \text{ V}$ , pulse measured	$h_{FE}$	100	140	180	-

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

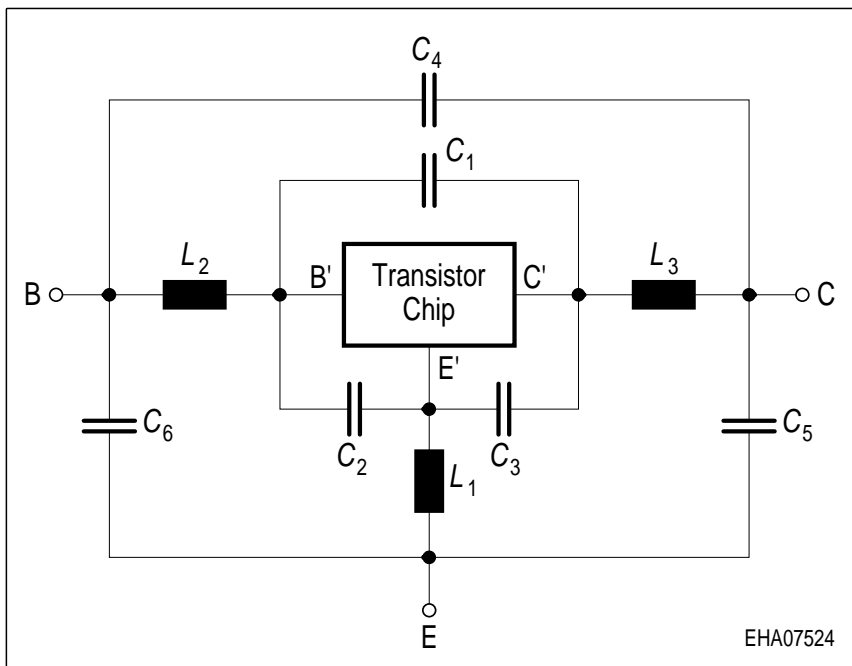
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>AC Characteristics</b> (verified by random sampling)					
Transition frequency $I_C = 15\text{ mA}$ , $V_{CE} = 6\text{ V}$ , $f = 1\text{ GHz}$	$f_T$	7	9	-	GHz
Collector-base capacitance $V_{CB} = 10\text{ V}$ , $f = 1\text{ MHz}$ , $V_{BE} = 0$ , emitter grounded	$C_{cb}$	-	0.3	0.45	pF
Collector emitter capacitance $V_{CE} = 10\text{ V}$ , $f = 1\text{ MHz}$ , $V_{BE} = 0$ , base grounded	$C_{ce}$	-	0.2	-	
Emitter-base capacitance $V_{EB} = 0.5\text{ V}$ , $f = 1\text{ MHz}$ , $V_{CB} = 0$ , collector grounded	$C_{eb}$	-	0.7	-	
Noise figure $I_C = 5\text{ mA}$ , $V_{CE} = 6\text{ V}$ , $Z_S = Z_{Sopt}$ , $f = 1\text{ GHz}$ $I_C = 3\text{ mA}$ , $V_{CE} = 8\text{ V}$ , $Z_S = Z_{Sopt}$ , $f = 1.8\text{ GHz}$	$F$	-	1	2.5	dB
Power gain <sup>1)</sup> $I_C = 10\text{ mA}$ , $V_{CE} = 8\text{ V}$ , $Z_S = Z_{Sopt}$ , $Z_L = Z_{Lopt}$ , $f = 900\text{ MHz}$	$G_{ms}$	-	21	-	-
Power gain, maximum available <sup>1)</sup> $I_C = 10\text{ mA}$ , $V_{CE} = 8\text{ V}$ , $Z_S = Z_{Sopt}$ , $Z_L = Z_{Lopt}$ , $f = 1.8\text{ GHz}$	$G_{ma}$	-	15.5	-	dB
Transducer gain $I_C = 15\text{ mA}$ , $V_{CE} = 6\text{ V}$ , $Z_S = Z_L = 50\Omega$ , $f = 1\text{ GHz}$ $I_C = 10\text{ mA}$ , $V_{CE} = 8\text{ V}$ , $Z_S = Z_L = 50\Omega$ , $f = 1.8\text{ GHz}$	$ S_{21e} ^2$	14	17	-	dB
		-	12	-	

<sup>1)</sup>  $G_{ma} = |S_{21} / S_{12}| (k - (k^2 - 1)^{1/2})$ ,  $G_{ms} = |S_{21} / S_{12}|$

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

IS =	4.36	fA	BF =	120	-	NF =	1.085	-
VAF =	30	V	IKF =	0.152	mA	ISE =	1.86	pF
NE =	1.998	-	BR =	33.322	-	NR =	1.095	-
VAR =	41.889	V	IKR =	0.063	A	ISC =	3.68	pA
NC =	1.569	-	RB =	20.766	$\Omega$	IRB =	72.2	mA
RBM =	0.823	$\Omega$	RE =	0.101	-	RC =	0.849	$\Omega$
CJE =	291	fF	VJE =	0.568	V	MJE =	0.456	-
TF =	8.77	ps	XTF =	0.00894	-	VTF =	0.198	V
ITF =	1.336	mA	PTF =	0	deg	CJC =	459	fF
VJC =	1.048	V	MJC =	0.334	-	XCJC =	0.217	-
TR =	1.39	ns	CJS =	0	fF	VJS =	0.75	V
MJS =	0	-	NK =	0.5	-	EG =	1.11	eV
.	-	-	FC =	0.924	-	TNOM	300	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:**


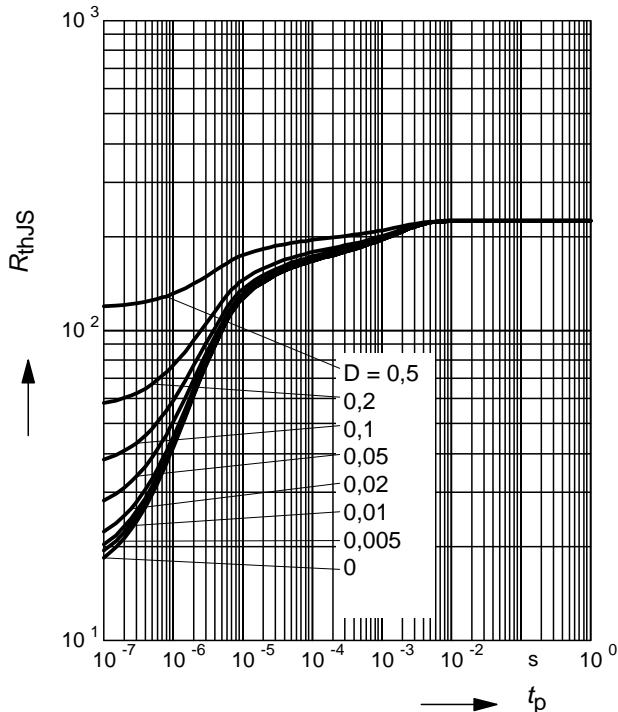
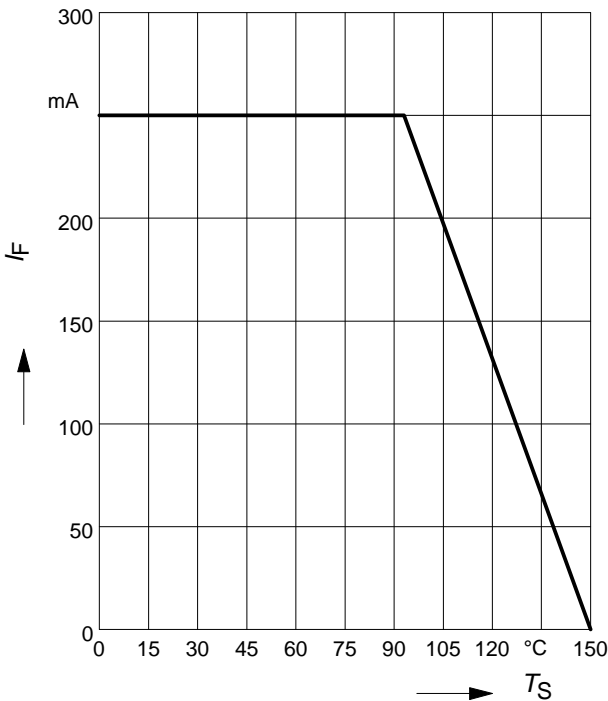
$L_1 =$	0.556	nH
$L_2 =$	0.657	nH
$L_3 =$	0.381	nH
$C_1 =$	43	fF
$C_2 =$	123	fF
$C_3 =$	66	fF
$C_4 =$	10	fF
$C_5 =$	36	fF
$C_6 =$	47	fF

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/silicondiscretes>

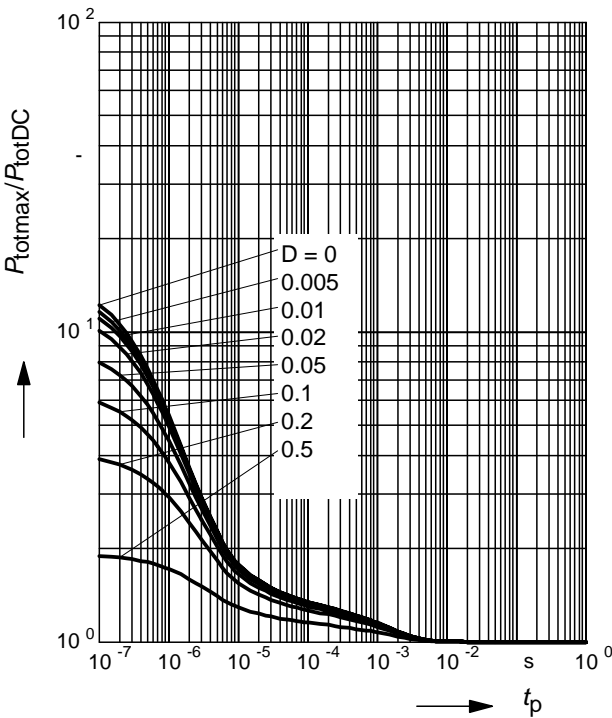
**Total power dissipation  $P_{tot} = f(T_S)$**

**Permissible Pulse Load  $R_{thJS} = f(t_p)$**

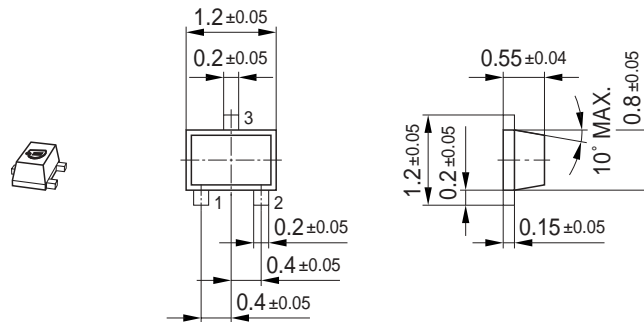


**Permissible Pulse Load**

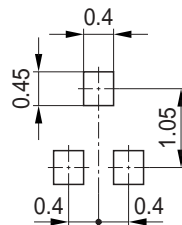
$P_{totmax}/P_{totDC} = f(t_p)$



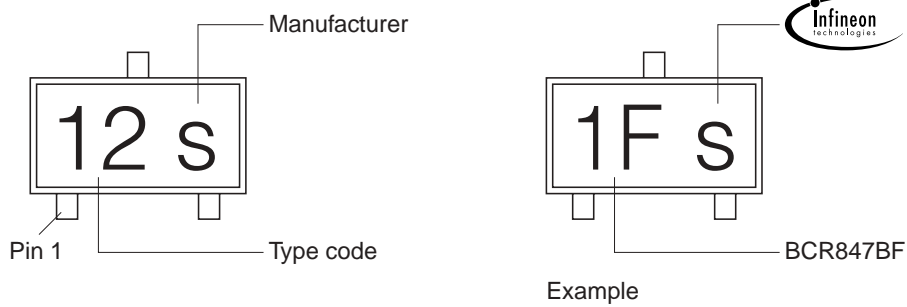
Package Outline



Foot Print

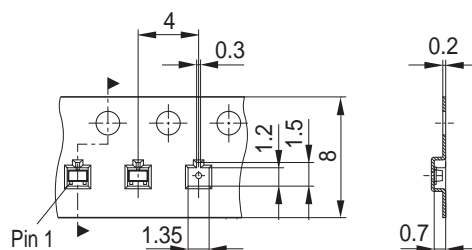


Marking Layout



Standard Packing

Reel ø180 mm = 3.000 Pieces/Reel  
 Reel ø330 mm = 10.000 Pieces/Reel



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St.-Martin-Strasse 53,  
81669 München  
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