Infineon technologies

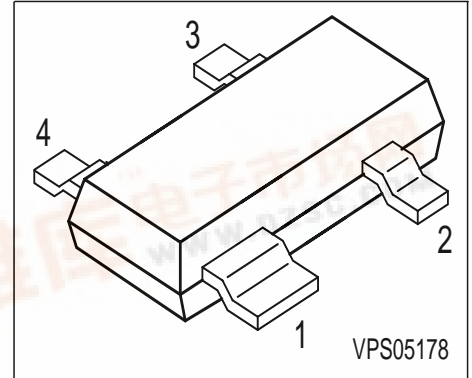# BFP193

NPN Silicon RF Transistor

- For low noise, high-gain amplifiers up to 2 GHz

- For linear broadband amplifiers

- f_T = 8 GHz

  F = 1.3 dB at 900 MHz

VPS05178

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

Type	Marking	Pin Configuration				Package
BFP193	RCs	1 = C	2 = E	3 = B	4 = E	SOT143

Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CEO}	12	V
Collector-emitter voltage	V_{CES}	20	
Collector-base voltage	V_{CBO}	20	
Emitter-base voltage	V_{EBO}	2	
Collector current	I_C	80	mA
Base current	I_B	10	
Total power dissipation $T_S \leq 72\ °C$ [1]	P_{tot}	580	mW
Junction temperature	T_j	150	°C
Ambient temperature	T_A	-65 ... 150	
Storage temperature	T_{stg}	-65 ... 150	

Thermal Resistance

	Symbol	Value	Unit
Junction - soldering point [2]	R_{thJS}	≤ 135	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 $T_A = 25°C$, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage $I_C = 1$ mA, $I_B = 0$	$V_{(BR)CEO}$	12	-	-	V
Collector-emitter cutoff current $V_{CE} = 20$ V, $V_{BE} = 0$	I_{CES}	-	-	100	µA
Collector-base cutoff current $V_{CB} = 10$ V, $I_E = 0$	I_{CBO}	-	-	100	nA
Emitter-base cutoff current $V_{EB} = 1$ V, $I_C = 0$	I_{EBO}	-	-	1	µA
DC current gain $I_C = 30$ mA, $V_{CE} = 8$ V	h_{FE}	50	100	200	-

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC characteristics (verified by random sampling)					
Transition frequency I_C = 50 mA, V_{CE} = 8 V, f = 500 MHz	f_T	6	8	-	GHz
Collector-base capacitance V_{CB} = 10 V, f = 1 MHz	C_{cb}	-	0.6	0.9	pF
Collector-emitter capacitance V_{CE} = 10 V, f = 1 MHz	C_{ce}	-	0.25	-	
Emitter-base capacitance V_{EB} = 0.5 V, f = 1 MHz	C_{eb}	-	1.8	-	
Noise figure I_C = 10 mA, V_{CE} = 8 V, Z_S = Z_{Sopt} , f = 900 MHz f = 1.8 GHz	F	 - -	 1.3 2.1	 - -	dB
Power gain, maximum available [1)] I_C = 30 mA, V_{CE} = 8 V, Z_S = Z_{Sopt}, Z_L = Z_{Lopt} , f = 900 MHz f = 1.8 GHz	G_{ma}	 - -	 17.5 11.5	 - -	
Transducer gain I_C = 30 mA, V_{CE} = 8 V, Z_S = Z_L = 50Ω , f = 900 MHz f = 1.8 GHz	$\lvert S_{21e}\rvert^2$	 - -	 14.5 8.5	 - -	

$^1G_{ma} = \lvert S_{21} / S_{12}\rvert\, (k-(k^2-1)^{1/2})$

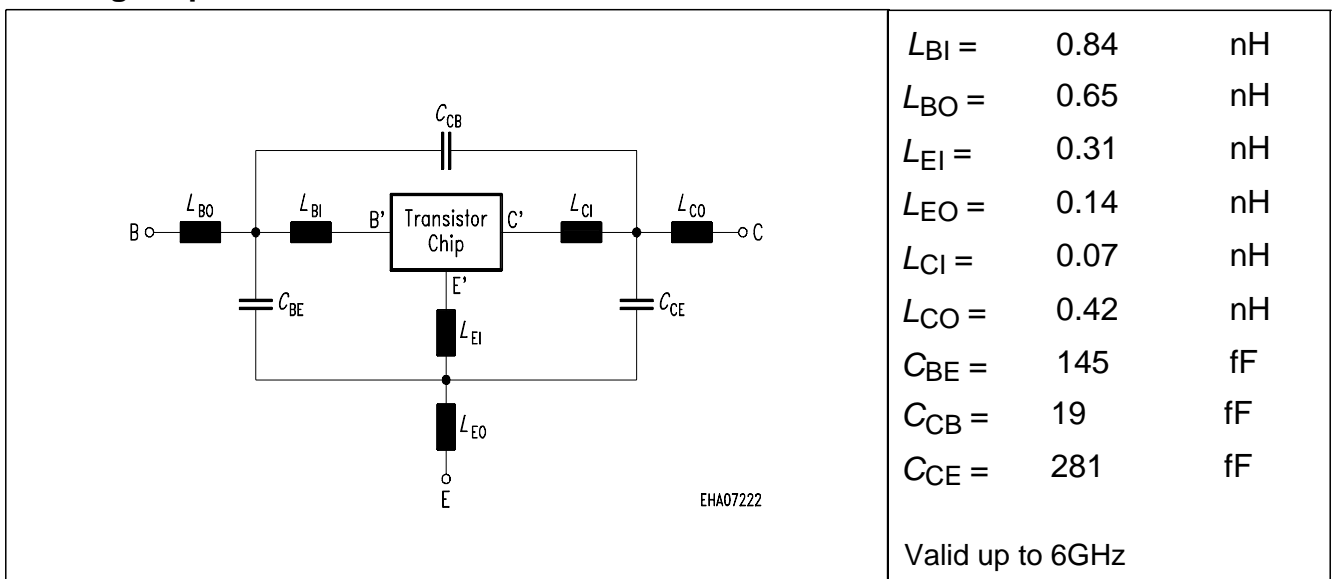**SPICE Parameters (Gummel-Poon Model, Berkley-SPICE 2G.6 Syntax) :**

Transistor Chip Data

IS =	0.2738	fA	BF =	125	-	NF =	0.95341	-
VAF =	24	V	IKF =	0.26949	A	ISE =	10.627	fA
NE =	1.935	-	BR =	14.267	-	NR =	1.4289	-
VAR =	3.8742	V	IKR =	0.037925	A	ISC =	0.037409	fA
NC =	0.94371	-	RB =	1.8368	Ω	IRB =	0.91763	mA
RBM =	1	Ω	RE =	0.76534		RC =	0.11938	Ω
CJE =	1.1824	fF	VJE =	0.70276	V	MJE =	0.48654	-
TF =	18.828	ps	XTF =	0.69477	-	VTF =	0.8	V
ITF =	0.96893	mA	PTF =	0	deg	CJC =	935.03	fF
VJC =	1.1828	V	MJC =	0.30002	-	XCJC =	0.053563	-
TR =	1.0037	ns	CJS =	0	fF	VJS =	0.75	V
MJS =	0	-	XTB =	0	-	EG =	1.11	eV
XTI =	3	-	FC =	0.72063	-	TNOM	300	K

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

Package Equivalent Circuit:

|		
L_{BI} =	0.84	nH
L_{BO} =	0.65	nH
L_{EI} =	0.31	nH
L_{EO} =	0.14	nH
L_{CI} =	0.07	nH
L_{CO} =	0.42	nH
C_{BE} =	145	fF
C_{CB} =	19	fF
C_{CE} =	281	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

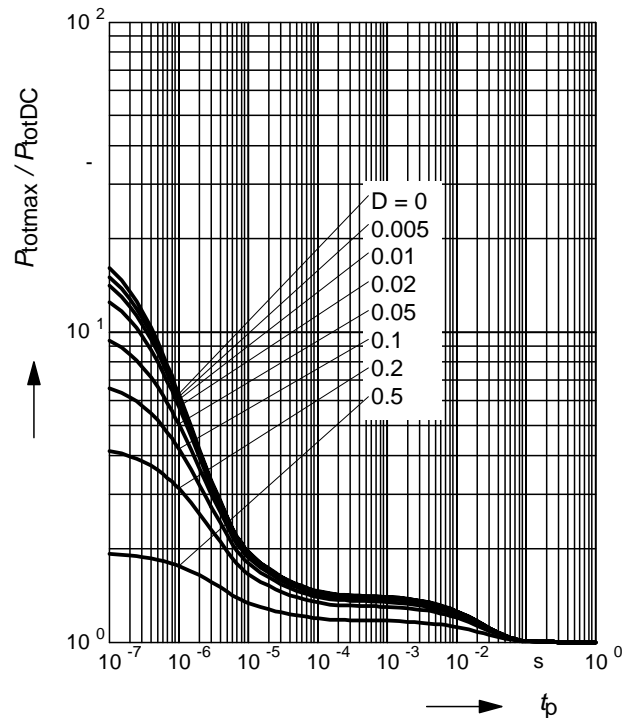## Total power dissipation $P_{tot} = f(T_S)$
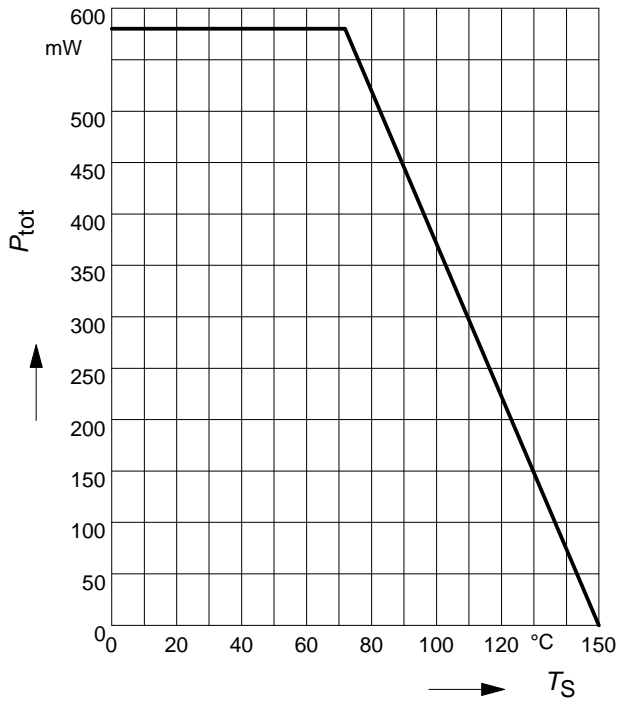
Permissible Pulse Load $R_{thJS} = f(t_p)$
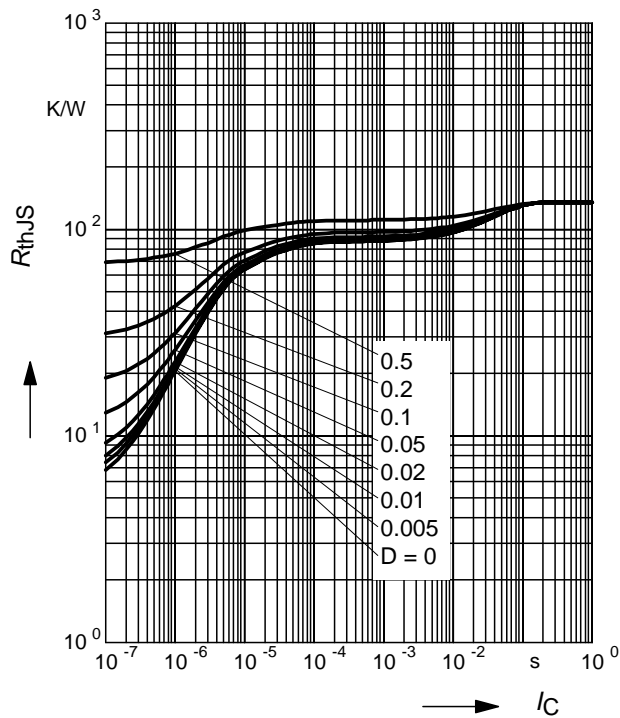
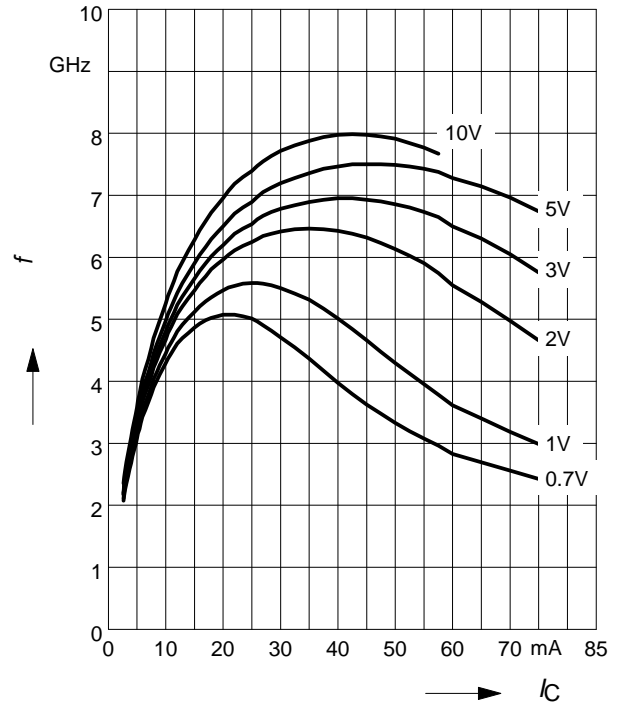## Permissible Pulse Load

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

Collector-base capacitance $C_{cb} = f(V_{CB})$

f = 1MHz

Plot: C_{cb} (pF) vs V_{CB} (V), y-axis from 0.0 to 1.3, x-axis from 0 to 22.
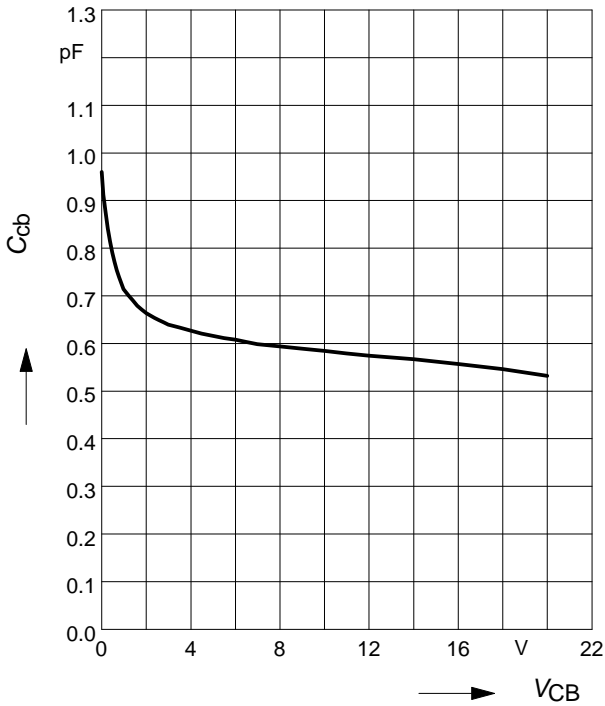
Transition frequency $f_T = f(I_C)$

V_{CE} = Parameter

Plot: f (GHz) vs I_C (mA), curves labeled 10V, 5V, 3V, 2V, 1V, 0.7V.

Power Gain G_{ma}, $G_{ms} = f(I_C)$

f = 0.9GHz

V_{CE} = Parameter

Plot: G (dB) vs I_C (mA), y-axis from 6 to 20, curves labeled 10V, 5V, 3V, 2V, 1V, 0.7V.
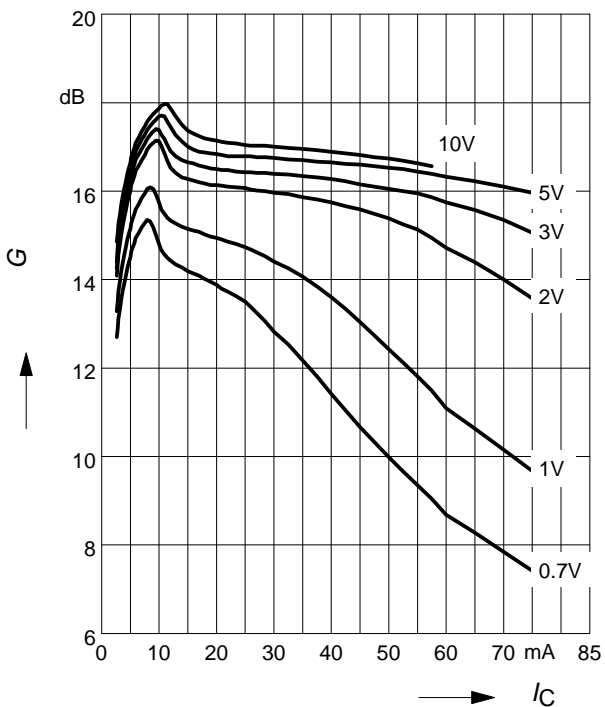
Power Gain G_{ma}, $G_{ms} = f(I_C)$

f = 1.8GHz

V_{CE} = Parameter

Plot: G (dB) vs I_C (mA), y-axis from 0 to 13, curves labeled 10V, 5V, 3V, 2V, 1V, 0.7V.
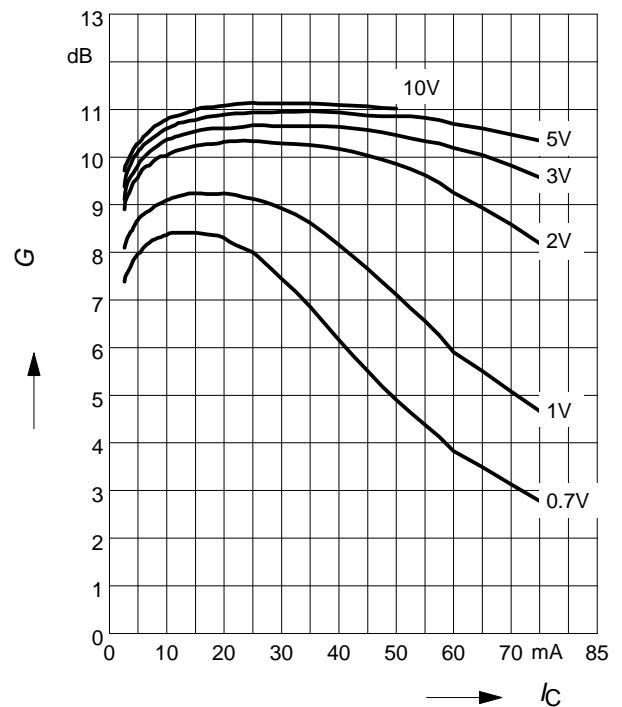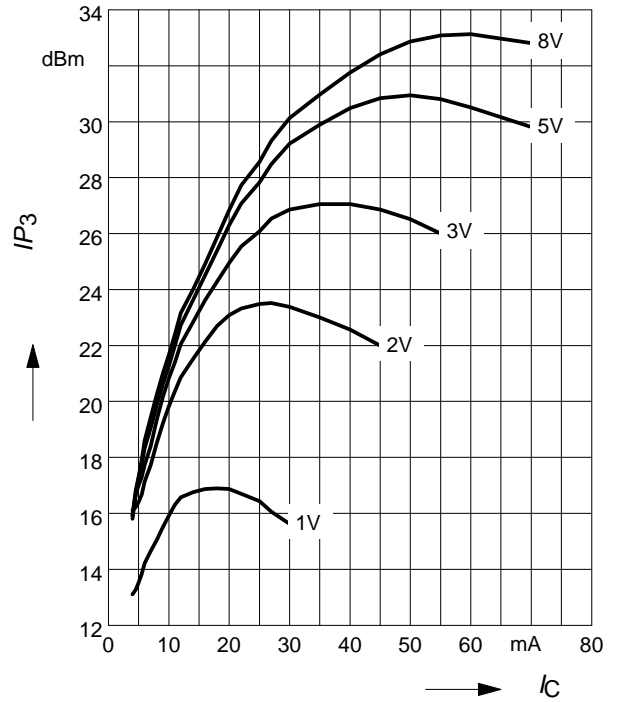
Power Gain G_{ma}, $G_{ms} = f(V_{CE})$:_____
$$|S_{21}|^2 = f(V_{CE}):\text{---------}$$
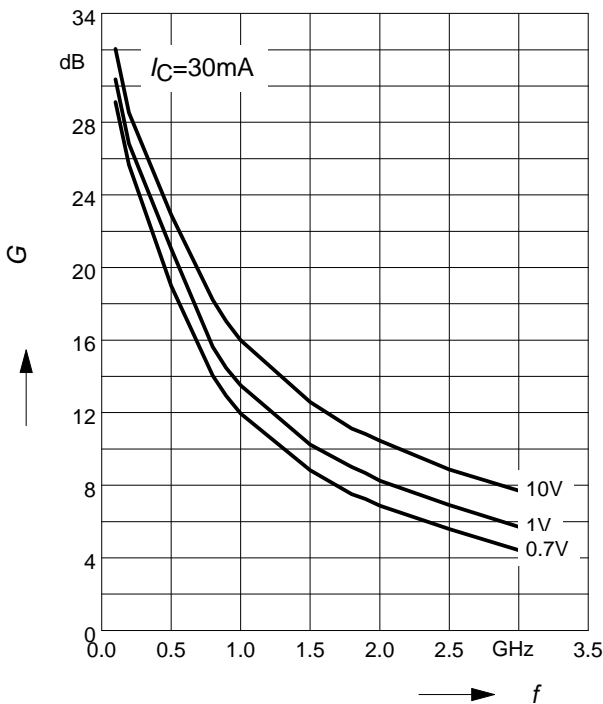
f = Parameter
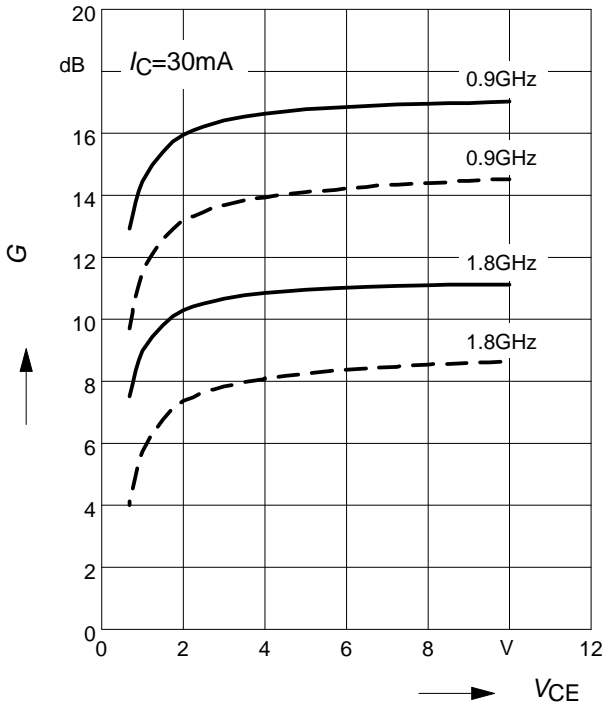
Intermodulation Intercept Point $IP_3 = f(I_C)$

(3rd order, Output, $Z_S = Z_L = 50\Omega$)

V_{CE} = Parameter, f = 900MHz

Power Gain G_{ma}, $G_{ms} = f(f)$

V_{CE} = Parameter

Power Gain $|S_{21}|^2 = f(f)$

V_{CE} = Parameter