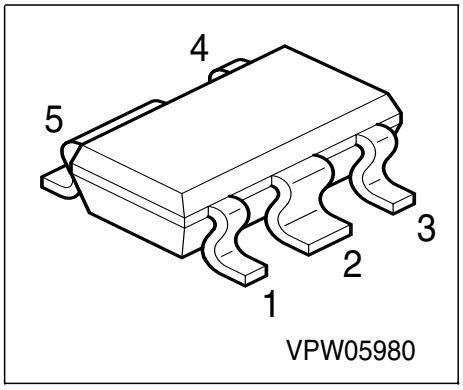
NPN Silicon Germanium RF Transistor

Preliminary data

- For medium power amplifiers
- Maxim. available Gain G_{ma} = 17 dB at 1.8 GHz
- Gold metallization for high reliability
- 70 GHz f_T- Silicon Germanium technology



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

Type	Marking	Pin Configuration						Package
BFP690	R9s	1=B	2=E	3=C	4=C	5=E	-	SCT595

Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CEO}	4	V
Collector-emitter voltage	V_{CES}	13	
Collector-base voltage	V_{CBO}	13	
Emitter-base voltage	V_{EBO}	1.2	
Collector current	I_C	350	mA
Base current	I_B	20	
Total power dissipation[1)] $T_S \leq 80°C$	P_{tot}	1000	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}	≤ 60	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 A	$V_{(BR)CEO}$	4	4.5	-	V
Collector-base cutoff current V_{CB} = 5 V, I_E = 0 A	I_{CBO}	-	-	100	nA
Emitter-base cutoff current V_{EB} = 0.5 V, I_C = 0 A	I_{EBO}	-	-	10	µA
DC current gain I_C = 200 mA, V_{CE} = 3 V	h_{FE}	100	180	250	-

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 = 200 mA, V_{CE} = 3 V, f = 0.5 GHz	f_T	-	37	-	GHz
Collector-base capacitance V_{CB} = 3 V, f = 1 MHz	C_{cb}	-	0.6	-	pF
Collector emitter capacitance V_{CE} = 3 V, f = 1 MHz	C_{ce}	-	1.25	-	
Emitter-base capacitance V_{EB} = 0.5 V, f = 1 MHz	C_{eb}	-	3	-	
Noise figure I_C = 35 mA, V_{CE} = 3 V, f = 1.8 GHz, $Z_S = Z_{Sopt}$ I_C = 35 mA, V_{CE} = 3 V, f = 3 GHz, $Z_S = Z_{Sopt}$	F	 - -	 1 1.2	 - -	dB
Power gain, maximum available[1)] I_C = 200 mA, V_{CE} = 3 V, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$, f = 1.8 GHz I_C = 200 mA, V_{CE} = 3 V, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$, f = 3 GHz	G_{ma}	 - -	 17.5 13	 - -	
Transducer gain I_C = 200 mA, V_{CE} = 3 V, $Z_S = Z_L$ = 50 Ω, f = 1.8 GHz I_C = 200 mA, V_{CE} = 3 V, $Z_S = Z_L$ = 50 Ω, f = 3 GHz	$\lvert S_{21e}\rvert^2$	 - -	 11 6.5	 - -	dB
Third order intercept point at output[2)] V_{CE} = 3 V, I_C = 200 mA, f = 1.8 GHz, $Z_S = Z_L$ = 50 Ω	IP_3	-	29	-	dBm
1dB Compression point at output I_C = 200 mA, V_{CE} = 3 V, $Z_S = Z_L$ = 50 Ω, f = 1.8 GHz	P_{-1dB}	-	19.5	-	

[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 0.1 MHz to 6 GHz

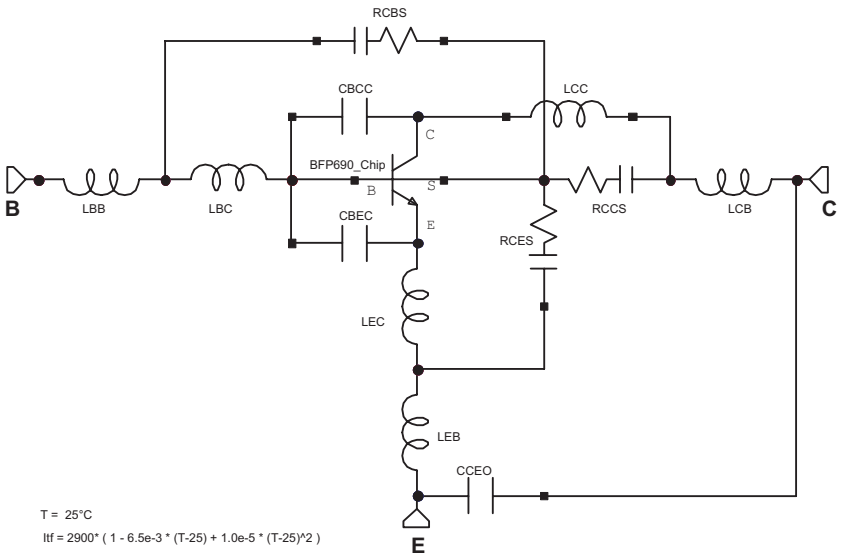
SPICE Parameter (Gummel-Poon Model, Berkley-SPICE 2G.6 Syntax):

Transitor Chip Data:

IS =	1.41	fA	BF =	450	-	NF =	1.025	-
VAF =	1000	-	IKF =	0.9	A	ISE =	145	fA
NE =	2		BR =	40	-	NR =	1	-
VAR =	2	V	IKR =	45	mA	ISC =	1.2	pA
NC =	1.8	-	RB =	0.4442	Ω	IRB =	10.61	mA
RBM =	0.3836	Ω	RE =	0.14	-	RC =	0.4312	Ω
CJE =	1.592	fF	VJE =	0.8	V	MJE =	0.3	-
TF =	1.9	ps	XTF =	5	-	VTF =	0.6	V
ITF =	2.9	A	PTF =	0	deg	CJC =	477.5	fF
VJC =	0.6	V	MJC =	0.5	-	XCJC =	1	-
TR =	0.2	ns	CJS =	688.1	fF	VJS =	0.6	V
MJS =	0.27	-	NK =	-1.42	-	EG =	1.078	eV
XTI =	3	-	FC =	0.8		TNOM	298	K
AF =	2	-	KF =	1.046E-11				
TITF1	-0.0065	-	TITF2	1.0E-5				

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

Package Equivalent Circuit:

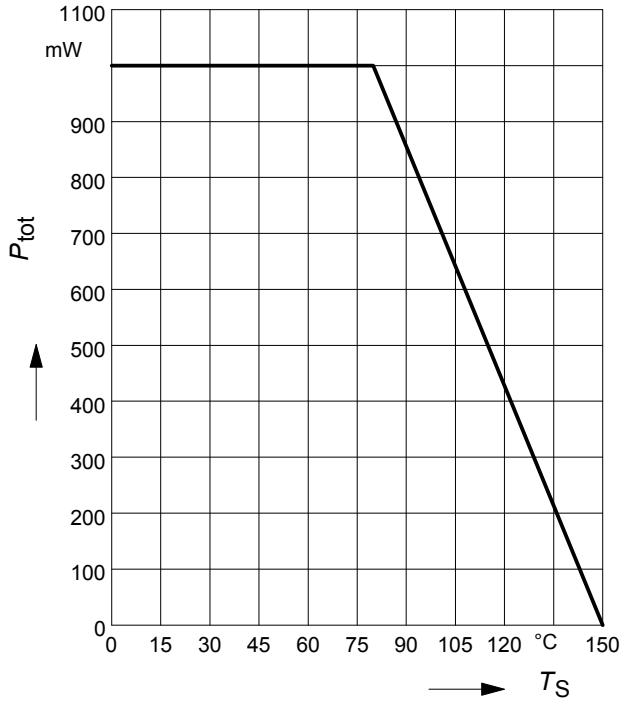


LBC =	15	pH
LCC =	4	pH
LEC =	4	pH
LBB =	900	pH
LCB =	700	pH
LEB =	130	pH
CBEC =	864.4	fF
CBCC =	399.9	fF
CES =	450	fF
CBS =	535	fF
CCS =	135	fF
CCEO =	130	fF
RBS =	190	Ω
RCS =	340	Ω
RES =	340	Ω

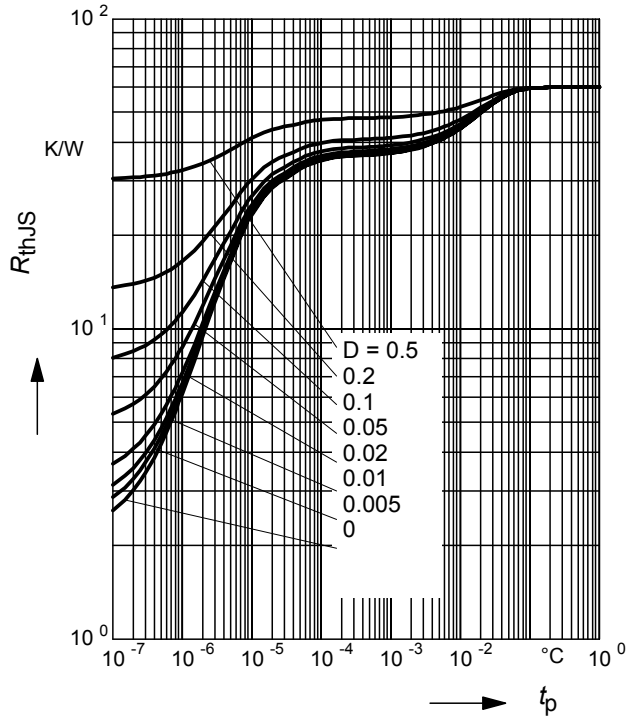
Valid up to 6GHz

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/silicondiscretes

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

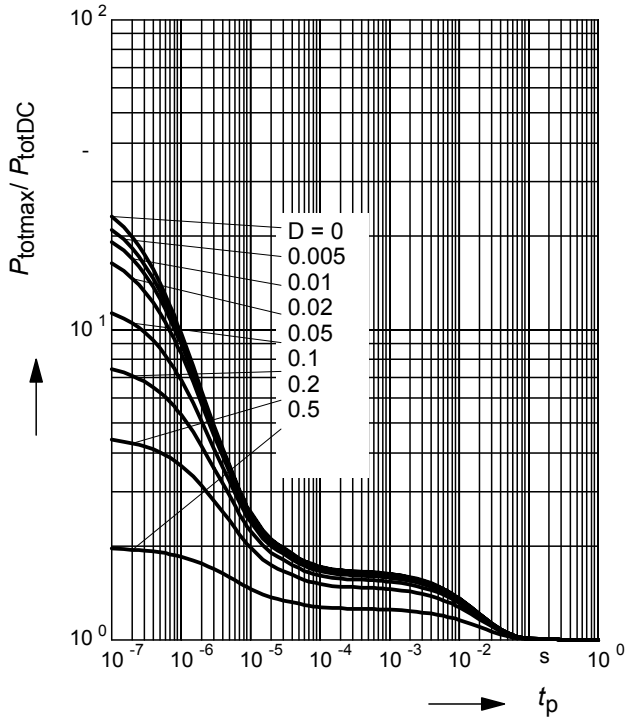


Permissible Pulse Load $R_{thJS} = f(t_p)$



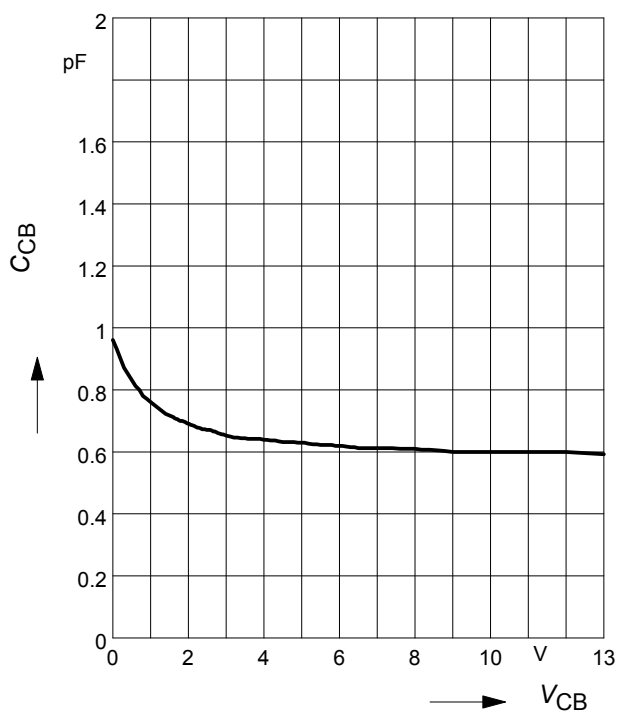
Permissible Pulse Load

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



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

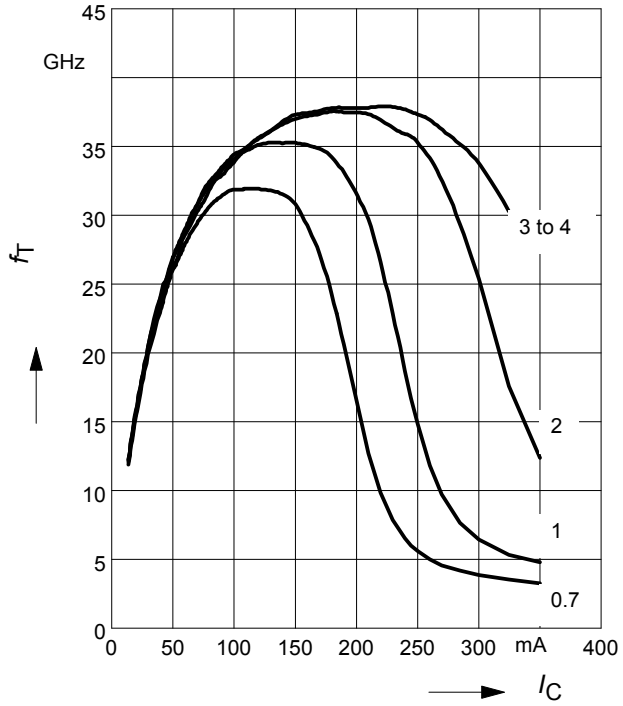
f = 1MHz



Transition frequency $f_T = f(I_C)$

f = 0.5GHz

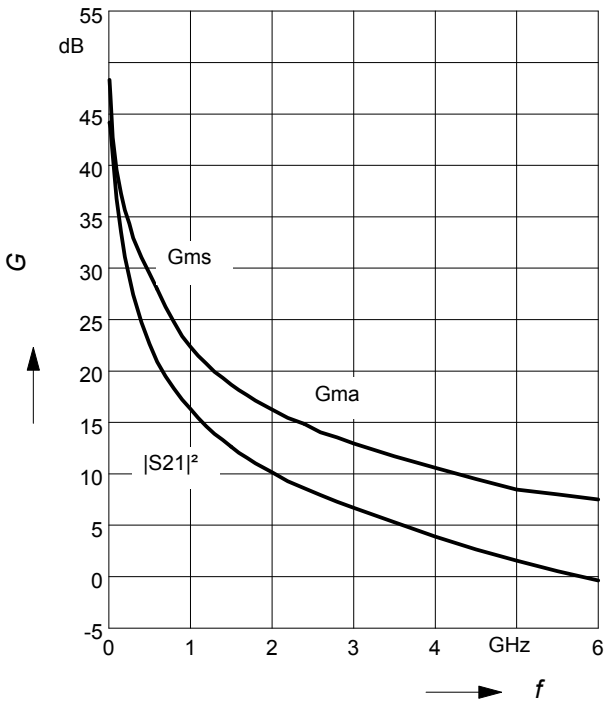
V_{CE} = parameter in V



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

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

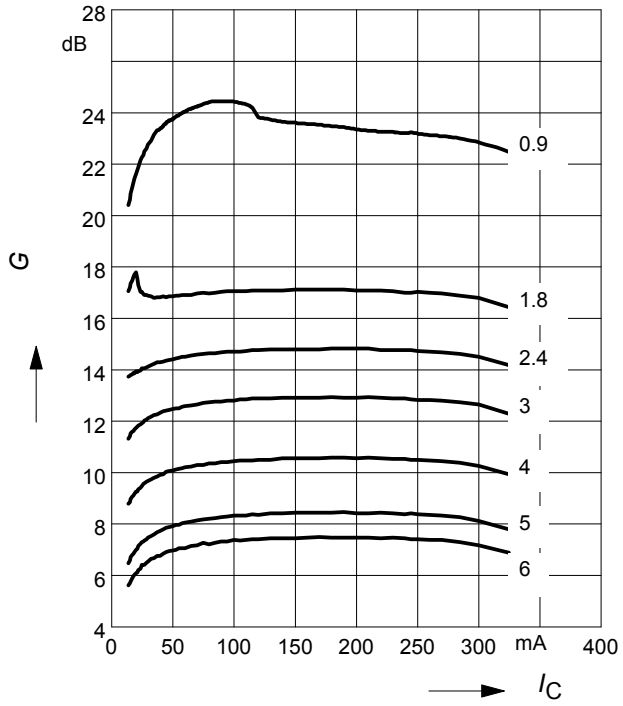
V_{CE} = 3V, I_C = 200mA



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

V_{CE} = 3V

f = parameter



Power gain G_{ma}, G_{ms} = f (V_{CE})

I_C = 200mA

f = parameter in GHz