## NPN Silicon RF Transistor

Preliminary data

• Low voltage/ low current operation

• Transition frequency of 14 GHz

• High insertion gain

• Ideal for low current amplifiers and oscillators
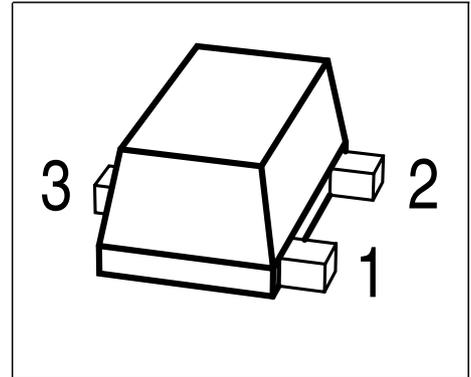
ESD: **E**lectro**s**tatic **d**ischarge sensitive device, observe handling precaution!

Type	Marking	Pin Configuration			Package
BFR340F	FAs	1 = B	2 = E	3 = C	TSFP-3

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	10	mA
Base current	I_B	2	
Total power dissipation[1) $T_S \leq 118°C$	P_{tot}	60	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}	≤ 530	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

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

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

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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 = 6 mA, V_{CE} = 3 V, f = 1 GHz	f_T	11	14	-	GHz
Collector-base capacitance V_{CB} = 5 V, f = 1 MHz, emitter grounded	C_{cb}	-	0.21	0.4	pF
Collector emitter capacitance V_{CE} = 5 V, f = 1 MHz, base grounded	C_{ce}	-	0.17	-	
Emitter-base capacitance V_{EB} = 0.5 V, f = 1 MHz, collector grounded	C_{eb}	-	0.11	-	
Noise figure I_C = 1 mA, V_{CE} = 3 V, Z_S = Z_{Sopt} , f = 1.8 GHz	F_{min}	-	1.15	-	dB
Power gain, maximum stable[1] I_C = 5 mA, V_{CE} = 3 V, Z_S = Z_{Sopt} , Z_L = Z_{Lopt}, f = 1.8 GHz	G_{ms}	-	16	-	-
Power gain, maximum available[1] I_C = 5 mA, V_{CE} = 3 V, Z_S = Z_{Sopt} , Z_L = Z_{Lopt} , f = 3 GHz	G_{ma}	-	12	-	dB
Transducer gain I_C = 5 mA, V_{CE} = 3 V, Z_S = Z_L = 50Ω , f = 1.8 GHz I_C = 5 mA, V_{CE} = 3 V, Z_S = Z_L = 50Ω , f = 3 GHz	$|S_{21e}|^2$	- -	13 9.5	- -	dB
Third order intercept point at output[2] V_{CE} = 3 V, I_C = 5 mA, f = 1.8 GHz, Z_S = Z_L = 50Ω	IP_3	-	13	-	dBm
1dB Compression point at output I_C = 5 mA, V_{CE} = 3 V, Z_S = Z_L = 50Ω , f = 1.8 GHz	P_{-1dB}	-	0	-	

[1] G_{ma} = $|S_{21e}$ / $S_{12e}|$ (k-(k²-1)$^{1/2}$), G_{ms} = $|S_{21e}$ / $S_{12e}|$

[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

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

Transitor Chip Data:

IS =	6.12	fA	BF =	98.48	-	NF =	0.4213	-
VAF =	42.228	V	IKF =	103	mA	ISE =	11.768	nA
NE =	2.4753	-	BR =	19.61	-	NR =	0.3253	-
VAR =	16.777	V	IKR =	0.834	A	ISC =	3.632	nA
NC =	0.8956	-	RB =	59.99	Ω	IRB =	0.01	mA
RBM =	0.2403	Ω	RE =	3.677	-	RC =	5.2493	Ω
CJE =	182	fF	VJE =	0.626	V	MJE =	0.4172	-
TF =	10.3	ps	XTF =	0	-	VTF =	0.262	V
ITF =	0.0017	mA	PTF =	0	deg	CJC =	222.63	fF
VJC =	0.5487	V	MJC =	0.319	-	XCJC =	0.3904	-
TR =	2.71	ns	CJS =	0	fF	VJS =	0.75	V
MJS =	0	-	NK =	0.5	-	EG =	1.11	eV
XTI =	0	-	FC =	0.735		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:
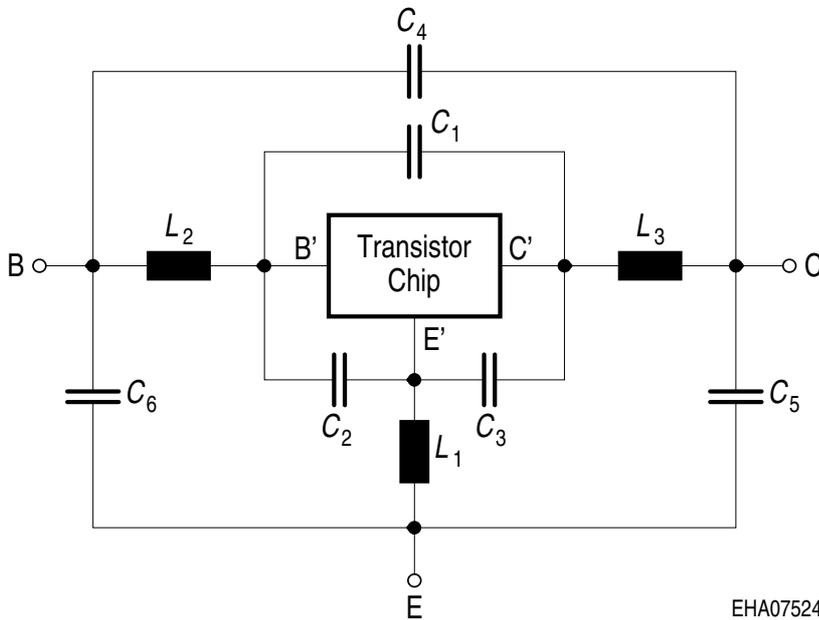
EHA07524

|		
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

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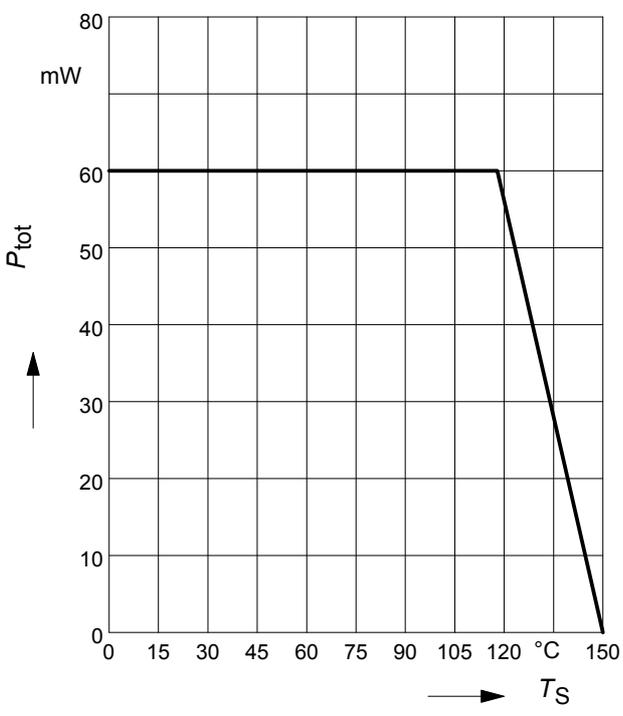
Permissible Pulse Load $R_{thJS} = f(t_p)$

0.5
0.2
0.1
0.05
0.02
0.01
0.005
D=0
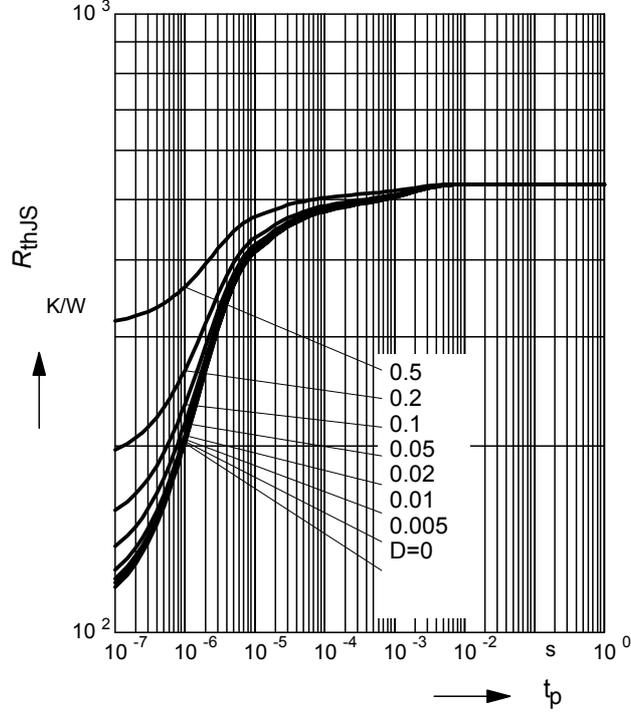
Permissible Pulse Load

$P_{totmax}/P_{totDC} = f(t_p)$
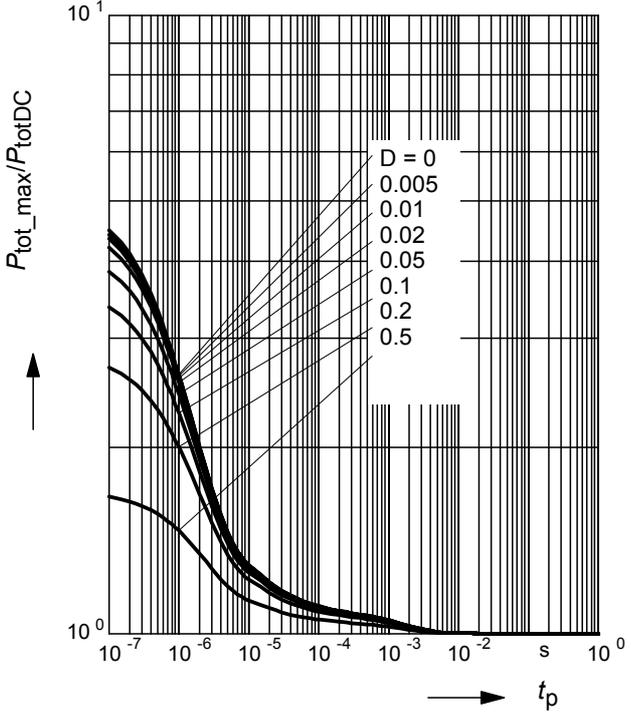
Collector-base capacitance $C_{cb} = f(V_{CB})$

f = 1MHz

D = 0
0.005
0.01
0.02
0.05
0.1
0.2
0.5

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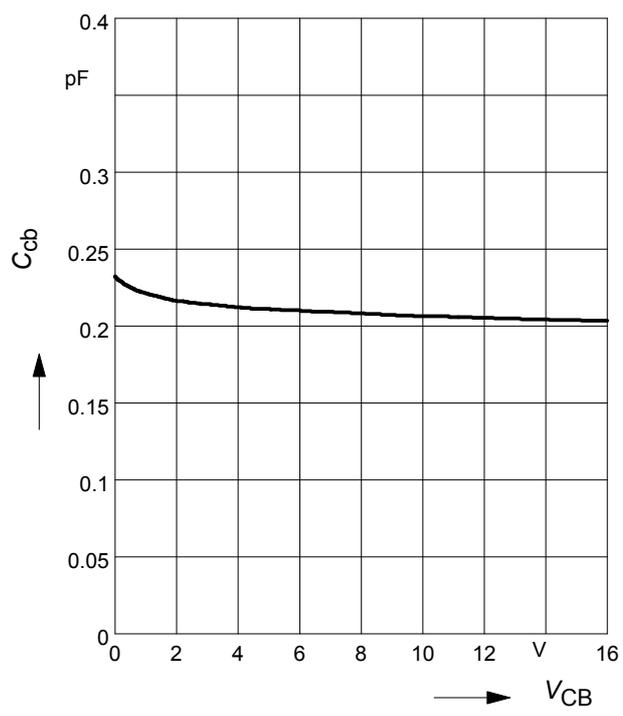
Third order Intercept Point $IP_3 = f(I_C)$

(Output, $Z_S = Z_L = 50\Omega$)

V_{CE} = parameter, f = 1.8GHz
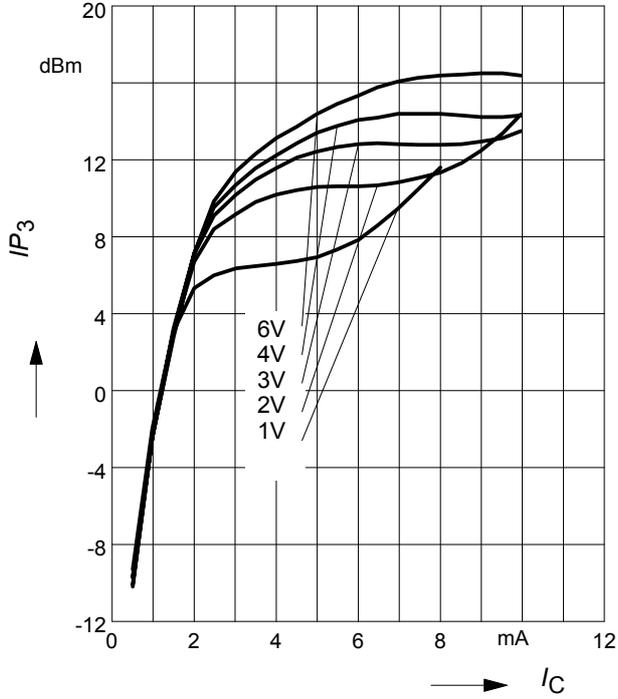
Transition frequency $f_T = f(I_C)$

f = 1GHz

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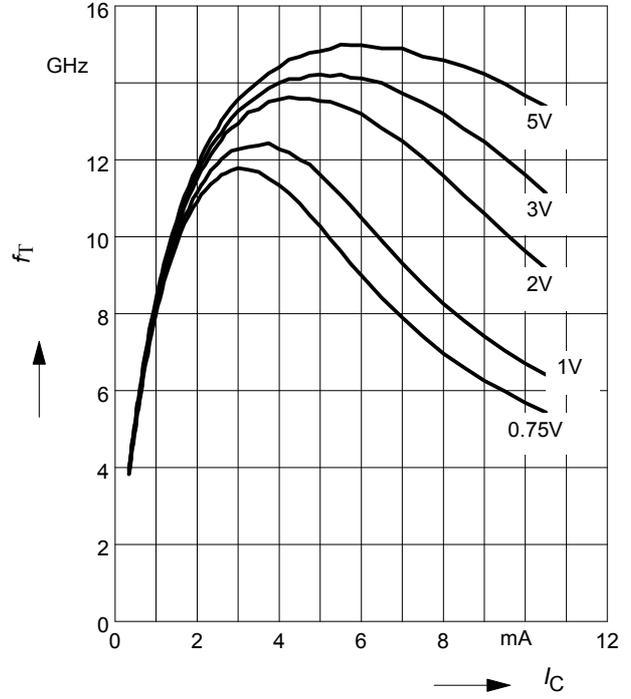
Power gain G_{ma}, $G_{ms} = f(I_C)$

f = 0.9GHz

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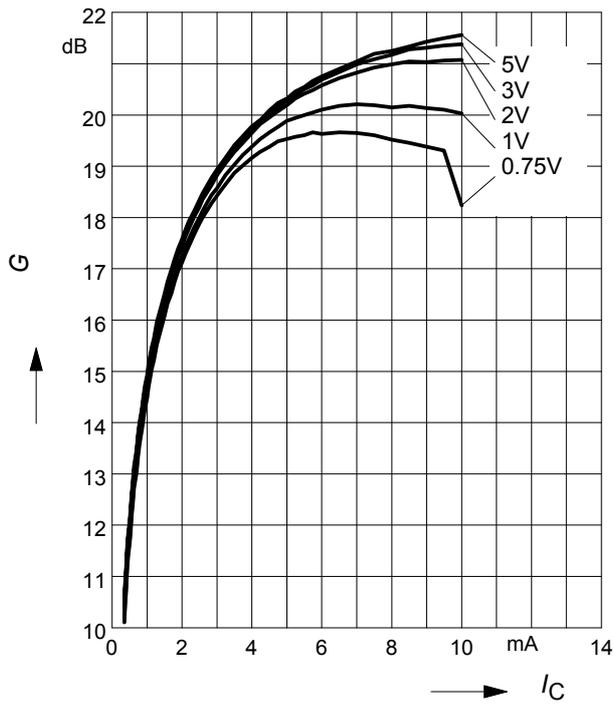
Power gain G_{ma}, $G_{ms} = f(I_C)$

f = 1.8GHz

V_{CE} = parameter

6
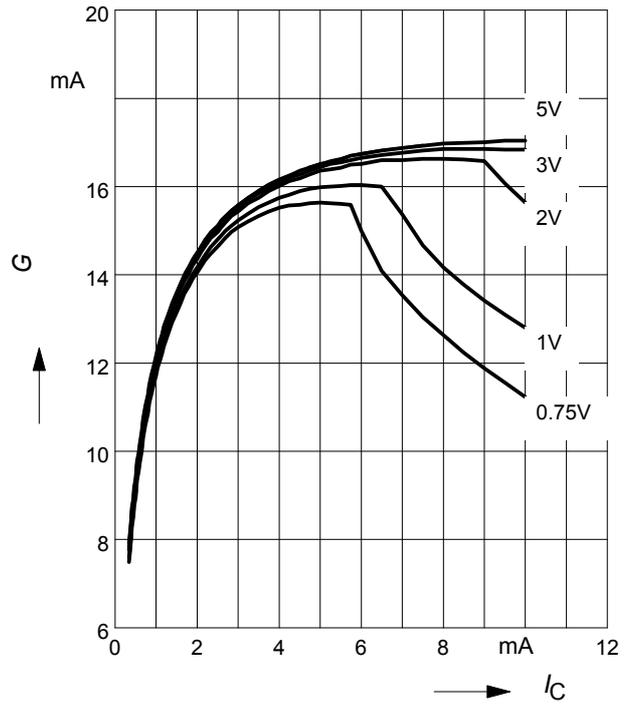
Power Gain G_{ma}, G_{ms} = $f(f)$

V_{CE} = parameter
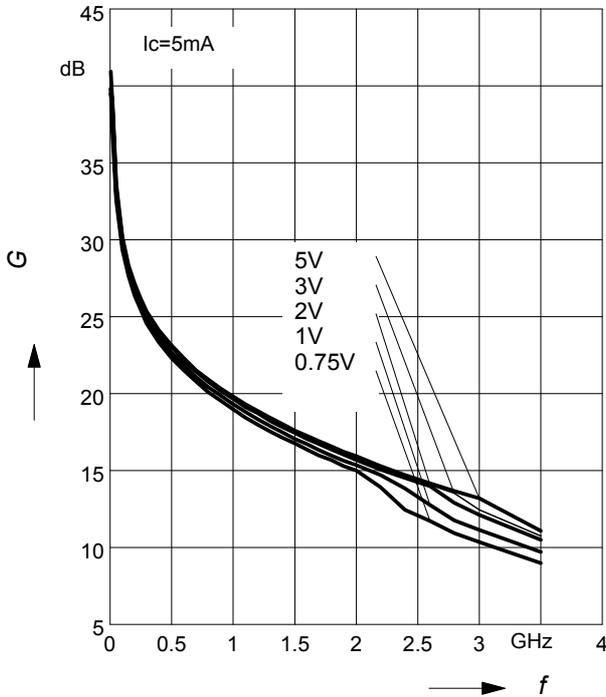

Insertion Power Gain $|S_{21}|^2$ = $f(f)$

V_{CE} = parameter
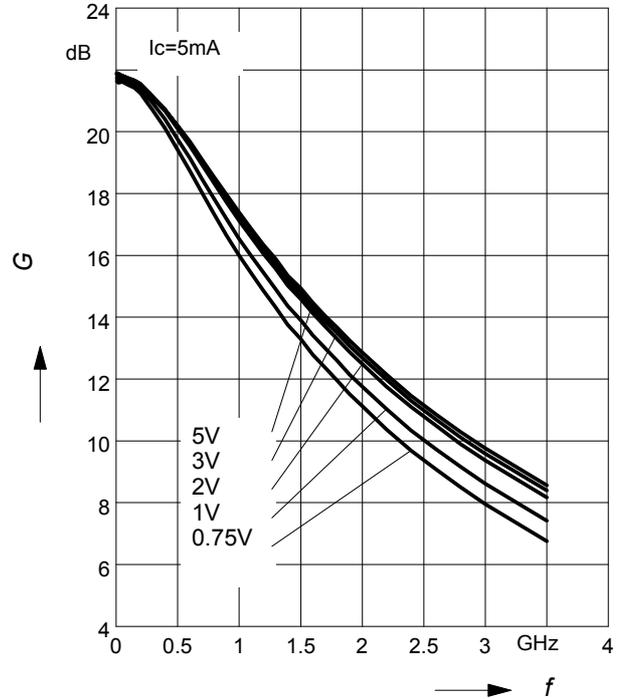
**Power Gain** G_{ma}, G_{ms} = $f(V_{CE})$: ———

$|S_{21}|^2$ = $f(V_{CE})$: - - - -

f = parameter
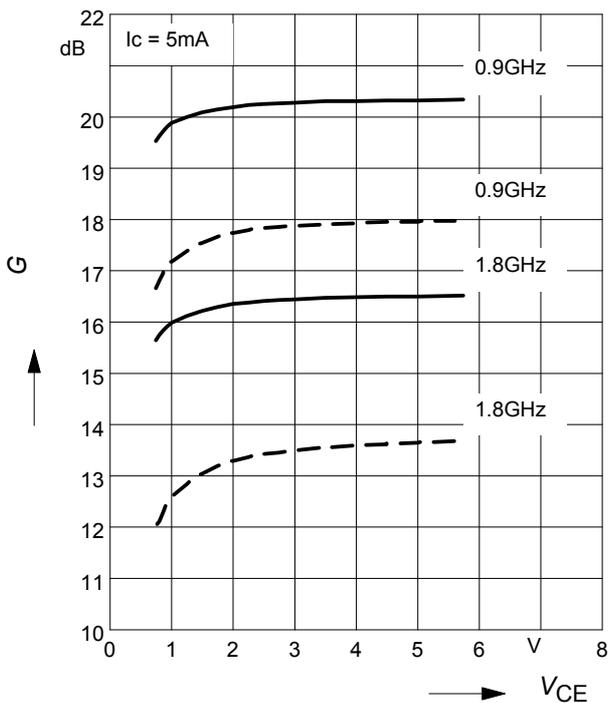

Power gain G_{ma}, G_{ms} = $f(I_C)$

V_{CE} = 3V

f = parameter

7
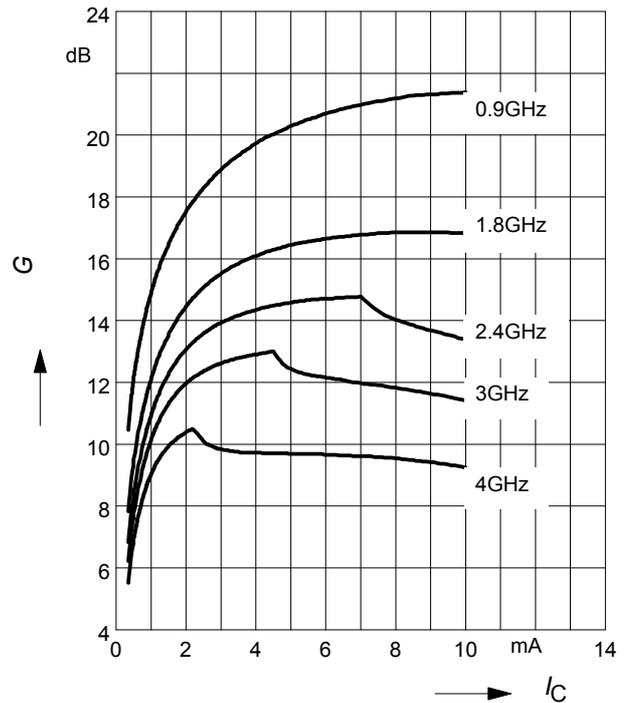
Noise figure $NF = f(I_C)$

V_{CE} = 3V, f = 1,8 GHz
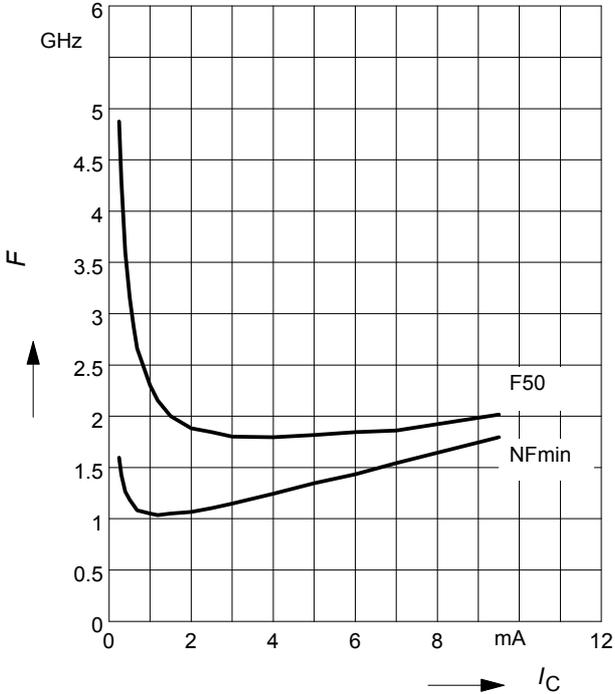
Source impedance for min.

noise figure vs. frequency

V_{CE} = 3 V

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