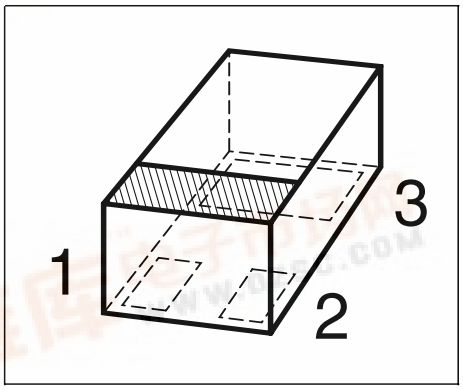
NPN Silicon RF Transistor

Preliminary data

- For low voltage / low current applications
- Ideal for VCO modules and low noise amplifiers
- Low noise figure: 1.1 dB at 1.8 GHz
- World's smallest SMD leadless package
- Excellent ESD performance (>1500V HBM)
- High f_T of 22 GHz



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

Type	Marking	Pin Configuration			Package
BFR460L3	AB	1 = B	2 = E	3 = C	TSLP-3-1

Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CEO}	4.5	V
Collector-emitter voltage	V_{CES}	15	
Collector-base voltage	V_{CBO}	15	
Emitter-base voltage	V_{EBO}	1.5	
Collector current	I_C	50	mA
Base current	I_B	5	
Total power dissipation[1)2)] $T_S \leq 108°C$	P_{tot}	200	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[3)]	R_{thJS}	≤ 210	K/W

[1] P_{tot} due to Maximum Ratings

[2] T_S is measured on the collector lead at the soldering point to the pcb

[3] 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.	
Characteristics					
Collector-emitter breakdown voltage I_C = 1 mA, I_B = 0	$V_{(BR)CEO}$	4.5	5	-	V
Collector-base cutoff current V_{CB} = 5 V, I_E = 0	I_{CBO}	-	-	100	nA
Emitter-base cutoff current V_{EB} = 0,5 V, I_C = 0	I_{EBO}	-	-	1	µA
DC current gain I_C = 20 mA, V_{CE} = 3 V	h_{FE}	50	130	200	-

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

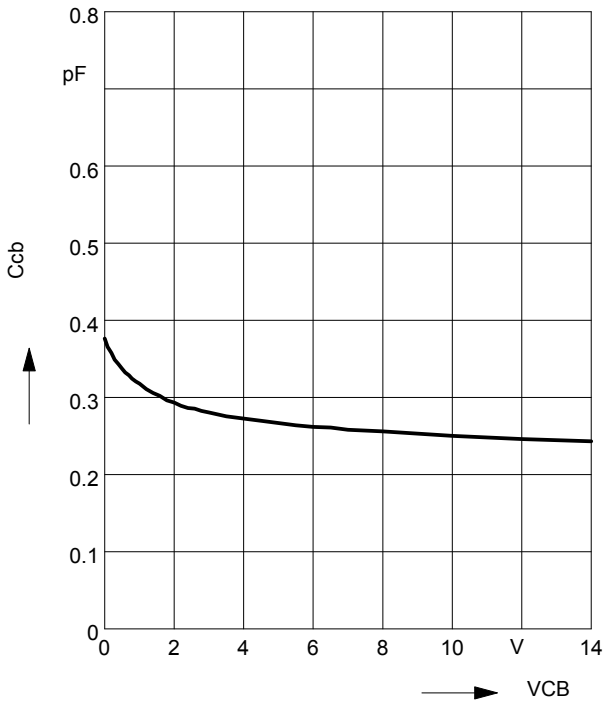
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC Characteristics (verified by random sampling)					
Transition frequency I_C = 30 mA, V_{CE} = 3 V, f = 1 GHz	f_T	16	22	-	GHz
Collector-base capacitance V_{CB} = 3 V, f = 1 MHz, emitter grounded	C_{cb}	-	0.3	0.45	pF
Collector emitter capacitance V_{CE} = 3 V, f = 1 MHz, base grounded	C_{ce}	-	0.14	-	
Emitter-base capacitance V_{EB} = 0.5 V, f = 1 MHz, collector grounded	C_{eb}	-	0.55	-	
Noise figure I_C = 5 mA, V_{CE} = 3 V, Z_S = Z_{Sopt} , f = 1.8 GHz I_C = 5 mA, V_{CE} = 3 V, Z_S = Z_{Sopt} , f = 3 GHz	F	 - -	 1.1 1.35	 - -	dB
Power gain, maximum stable[1)] I_C = 20 mA, V_{CE} = 3 V, Z_S = Z_{Sopt}, Z_L = Z_{Lopt}, f = 1.8 GHz	G_{ms}	-	16.0	-	dB
Power gain, maximum available[1)] I_C = 20 mA, V_{CE} = 3 V, Z_S = Z_{Sopt}, Z_L = Z_{Lopt} , f = 3 GHz	G_{ma}	-	11	-	dB
Transducer gain I_C = 20 mA, V_{CE} = 3 V, Z_S = Z_L = 50Ω, f = 1,8 GHz I_C = 20 mA, V_{CE} = 3 V, Z_S = Z_L = 50Ω , f = 3 GHz	$\lvert S_{21e}\rvert^2$	 - -	 14 10	 - -	dB
Third order intercept point at output[2)] V_{CE} = 3 V, I_C = 20 mA, f = 1.8 GHz	IP_3	-	27	-	dBm
1dB Compression point at output I_C = 20 mA, V_{CE} = 3 V, f = 1.8 GHz	P_{-1dB}	-	11.5	-	

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

[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

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

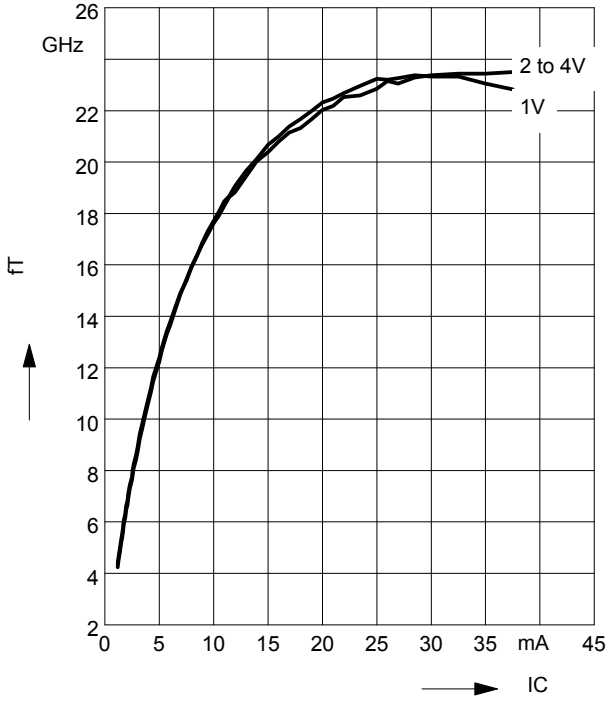
f = 1MHz



Transition frequency $f_T = f(I_C)$

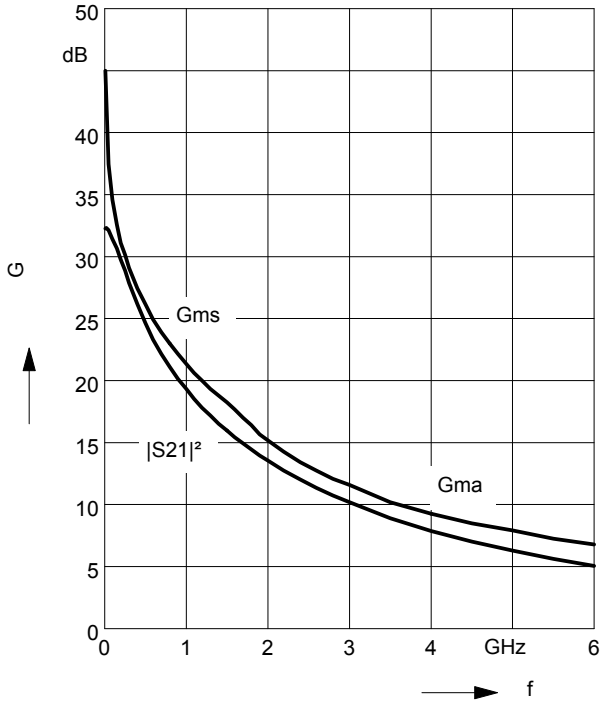
f = 1 GHz

V_{CE} = parameter in V



Power gain G_{ma}, G_{ms}, $|S_{21}|^2 = f(f)$

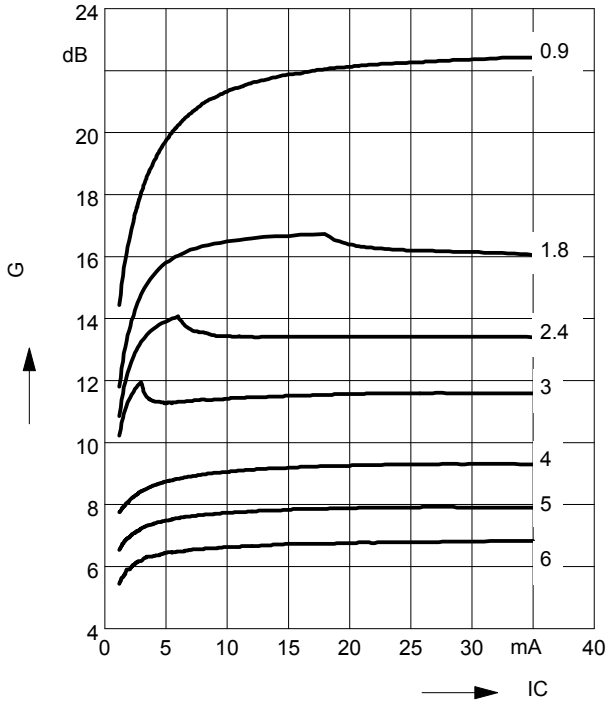
V_{CE} = 3 V, I_C = 20 mA



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

V_{CE} = 3V

f = parameter in GHz



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

I_C = 20 mA

f = parameter in GHz