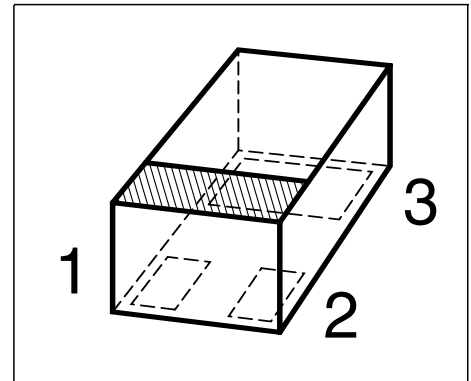


NPN Silicon RF Transistor

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
typical value > 1500V (HBM)
- High f_T of 22 GHz


ESD: Electrostatic discharge 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⁾ $T_S \leq 108^\circ\text{C}$	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 $T_A = 25^\circ\text{C}$, unless otherwise specified

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

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

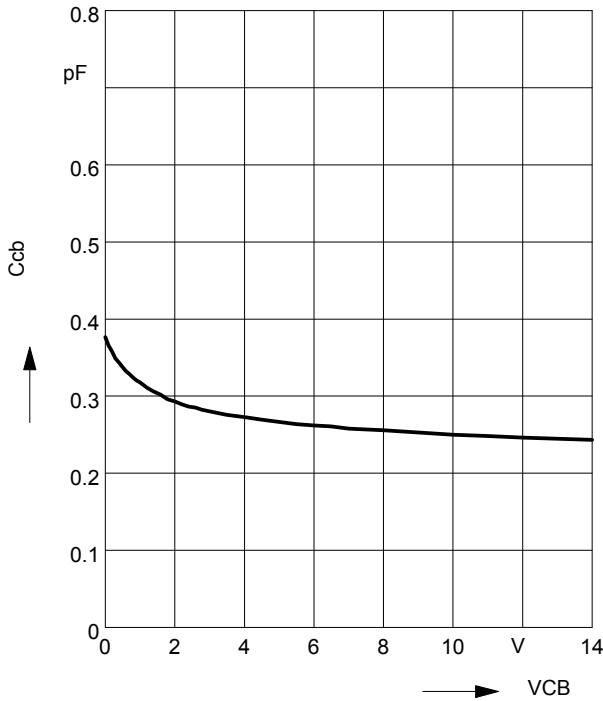
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC Characteristics (verified by random sampling)					
Transition frequency $I_C = 30\text{ mA}$, $V_{CE} = 3\text{ V}$, $f = 1\text{ GHz}$	f_T	16	22	-	GHz
Collector-base capacitance $V_{CB} = 3\text{ V}$, $f = 1\text{ MHz}$, emitter grounded	C_{cb}	-	0.3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

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

²IP3 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 $C_{cb} = f(V_{CB})$

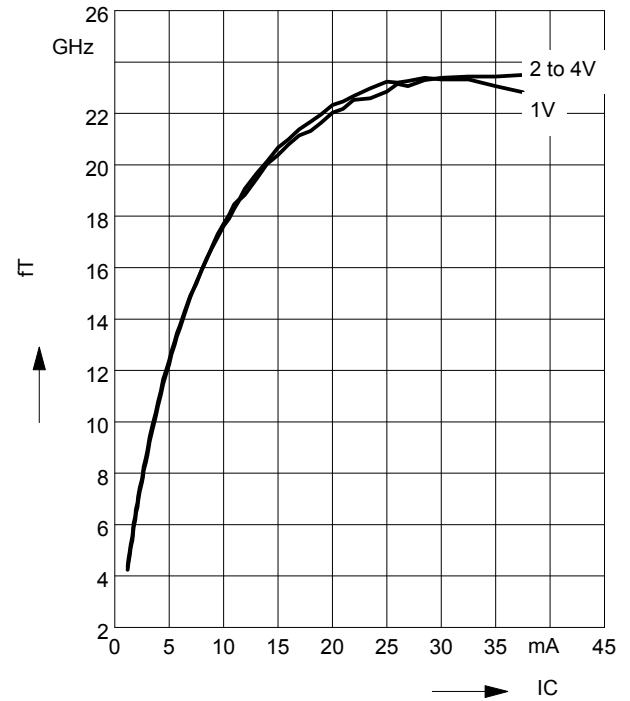
$f = 1\text{MHz}$



Transition frequency $f_T = f(I_C)$

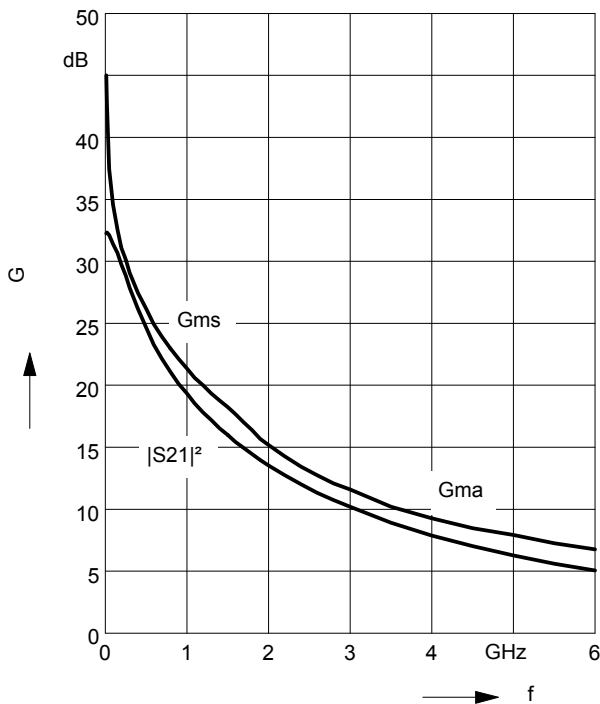
$f = 1\text{GHz}$

$V_{CE} = \text{parameter in V}$



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

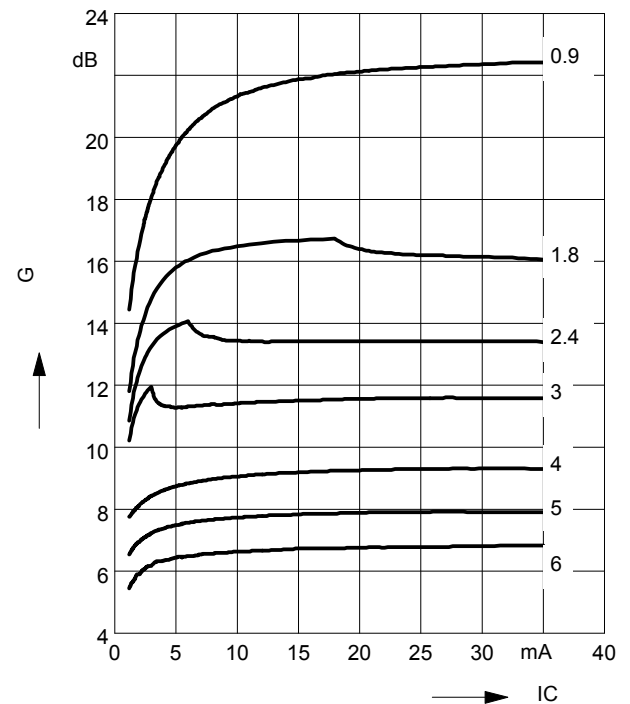
$V_{CE} = 3\text{V}, I_C = 20\text{mA}$



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

$V_{CE} = 3\text{V}$

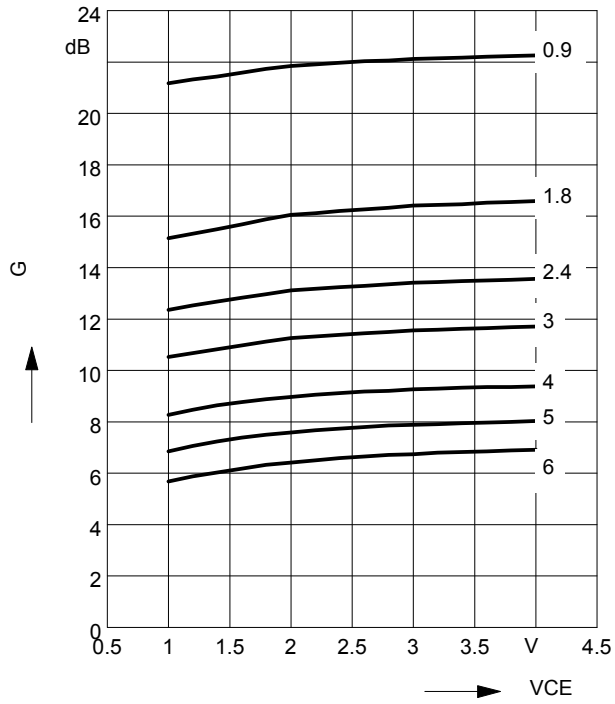
$f = \text{parameter in GHz}$



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

$I_C = 20 \text{ mA}$

$f = \text{parameter in GHz}$



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