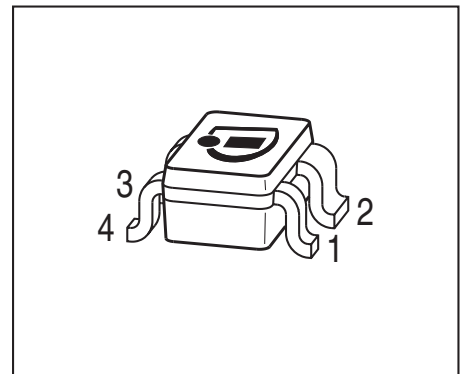


Low Noise Silicon Bipolar RF Transistor

- Low current device suitable e.g. for handhelds
- For high frequency oscillators e.g. DRO for LNB
- For ISM band applications like Automatic Meter Reading, Sensors etc.
- Transit frequency $f_T = 25$ GHz
- Pb-free (RoHS compliant) and halogen-free package with visible leads
- Qualification report according to AEC-Q101 available



ESD (Electrostatic discharge) sensitive device, observe handling precaution!

Type	Marking	Pin Configuration						Package
BFP410	AKs	1=B	2=E	3=C	4=E	-	-	SOT343

Maximum Ratings at $T_A = 25$ °C, unless otherwise specified

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CEO}	4.5	V
$T_A = 25$ °C		4.1	
$T_A = -55$ °C			
Collector-emitter voltage	V_{CES}	13	
Collector-base voltage	V_{CBO}	13	mA
Emitter-base voltage	V_{EBO}	1.5	
Collector current	I_C	40	
Base current	I_B	6	mW
Total power dissipation ¹⁾	P_{tot}	150	
$T_S \leq 100$ °C			°C
Junction temperature	T_J	150	
Storage temperature	T_{Stg}	-55 ... 150	

¹⁾ T_S is measured on the emitter lead at the soldering point to the pcb

Thermal Resistance

Parameter	Symbol	Value	Unit
Junction - soldering point ¹⁾	R_{thJS}	335	K/W

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	

DC Characteristics

Collector-emitter breakdown voltage $I_C = 1\text{ mA}$, $I_B = 0$	$V_{(BR)CEO}$	4.5	5	-	V
Collector-emitter cutoff current $V_{CE} = 2\text{ V}$, $V_{BE} = 0$ $V_{CE} = 5\text{ V}$, $V_{BE} = 0$, $T_A = 85\text{ °C}$ (verified by random sampling)	I_{CES}	-	1	30	nA
		-	2	50	
Collector-base cutoff current $V_{CB} = 2\text{ V}$, $I_E = 0$	I_{CBO}	-	1	30	μA
Emitter-base cutoff current $V_{EB} = 0.5\text{ V}$, $I_C = 0$	I_{EBO}	-	0.001	0.6	
DC current gain $I_C = 13\text{ mA}$, $V_{CE} = 2\text{ V}$, pulse measured	h_{FE}	60	95	130	-

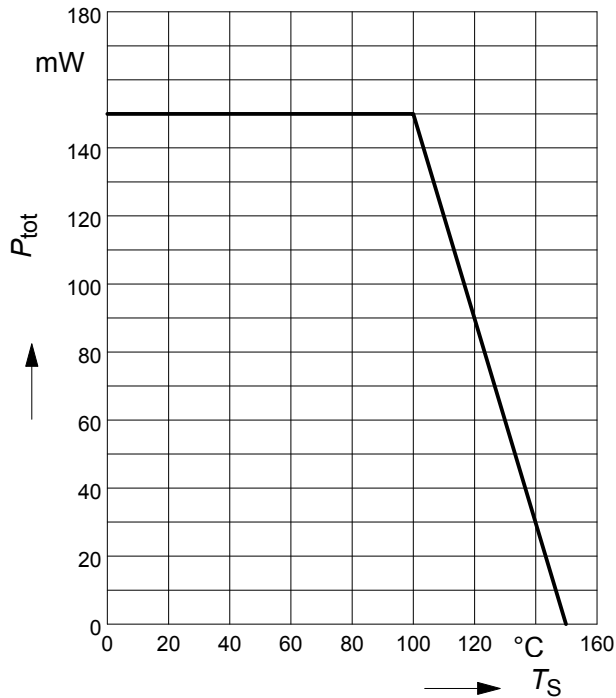
¹⁾For the definition of R_{thJS} please refer to Application Note AN077 (Thermal Resistance Calculation)

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

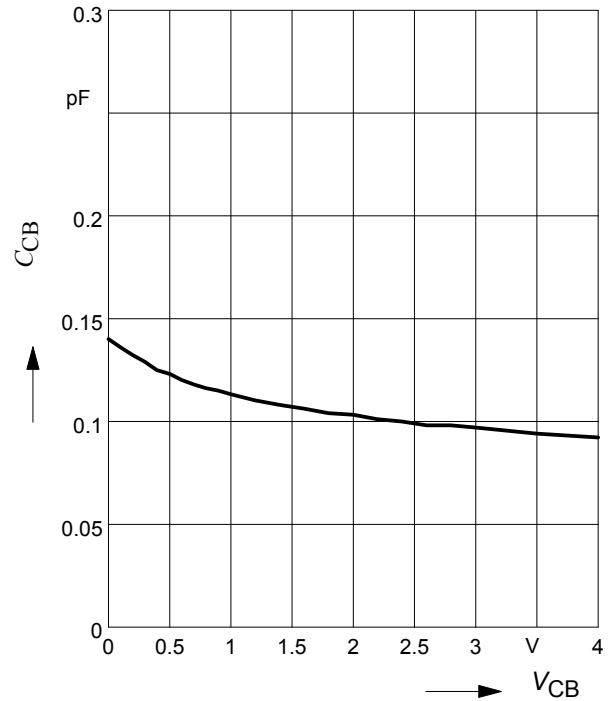
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC Characteristics (verified by random sampling)					
Transition frequency $I_C = 20\text{ mA}$, $V_{CE} = 2\text{ V}$, $f = 2\text{ GHz}$	f_T	18	25	-	GHz
Collector-base capacitance $V_{CB} = 2\text{ V}$, $f = 1\text{ MHz}$, $V_{BE} = 0$, emitter grounded	C_{cb}	-	0.09	0.17	pF
Collector emitter capacitance $V_{CE} = 2\text{ V}$, $f = 1\text{ MHz}$, $V_{BE} = 0$, base grounded	C_{ce}	-	0.35	-	
Emitter-base capacitance $V_{EB} = 0.5\text{ V}$, $f = 1\text{ MHz}$, $V_{CB} = 0$, collector grounded	C_{eb}	-	0.45	-	
Minimum noise figure $I_C = 2\text{ mA}$, $V_{CE} = 2\text{ V}$, $f = 2\text{ GHz}$, $Z_S = Z_{Sopt}$	NF_{min}	-	1.2	-	dB
Power gain, maximum stable ¹⁾ $I_C = 20\text{ mA}$, $V_{CE} = 2\text{ V}$, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$, $f = 2\text{ GHz}$	G_{ms}	-	21.5	-	dB
Insertion power gain $V_{CE} = 2\text{ V}$, $I_C = 20\text{ mA}$, $f = 2\text{ GHz}$, $Z_S = Z_L = 50\text{ }\Omega$	$ S_{21} ^2$	-	18.5	-	
Third order intercept point at output ²⁾ $V_{CE} = 2\text{ V}$, $I_C = 20\text{ mA}$, $f = 2\text{ GHz}$, $Z_S = Z_L = 50\text{ }\Omega$	$IP3$	-	23.5	-	dBm
1dB compression point at output $I_C = 20\text{ mA}$, $V_{CE} = 2\text{ V}$, $Z_S = Z_L = 50\text{ }\Omega$, $f = 2\text{ GHz}$	P_{-1dB}	-	10.5	-	

¹⁾ $G_{ms} = |S_{21}| / |S_{12}|$
²⁾ $IP3$ value depends on termination of all intermodulation frequency components.
Termination used for this measurement is $50\text{ }\Omega$ from 0.1 MHz to 6 GHz

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



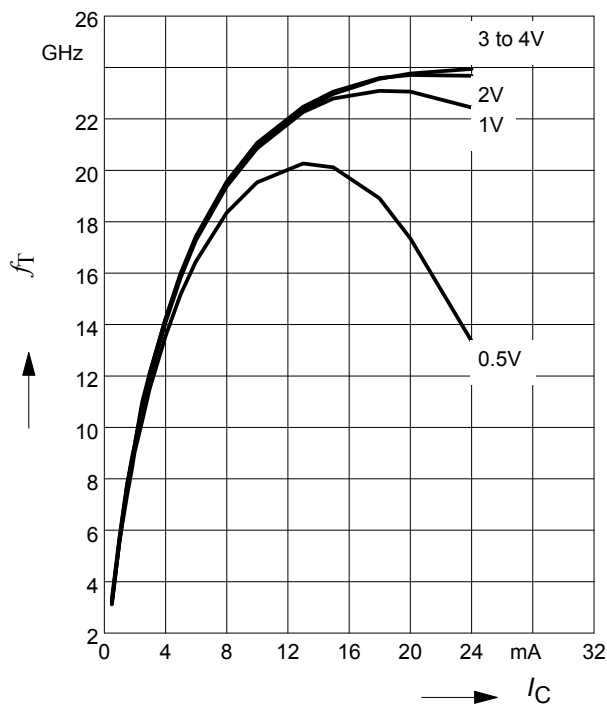
Collector-base capacitance $C_{\text{cb}} = f(V_{\text{CB}})$
 $f = 1 \text{ MHz}$



Transition frequency $f_T = f(I_C)$

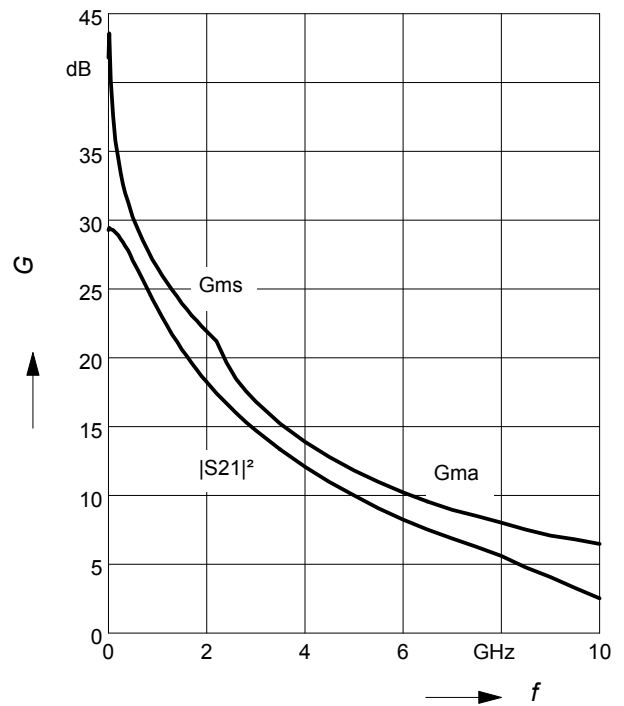
$f = 2 \text{ GHz}$

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



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

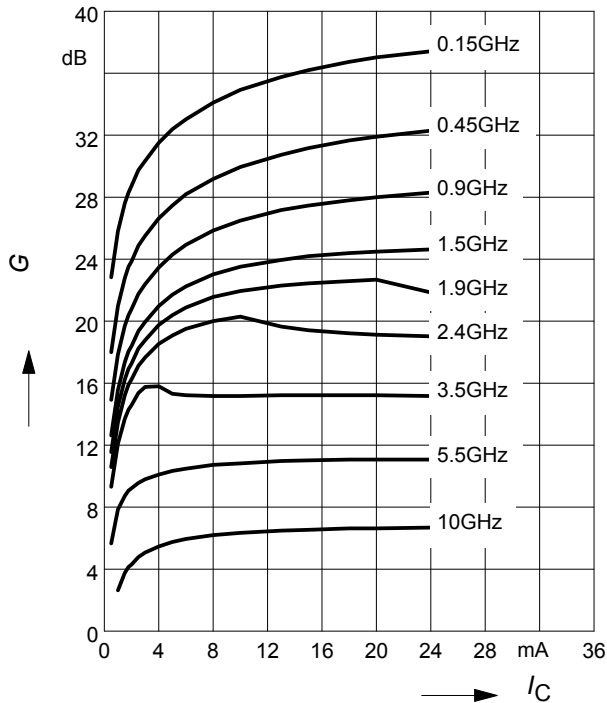
$V_{\text{CE}} = 2 \text{ V}, I_C = 13 \text{ mA}$



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

$V_{CE} = 2V$

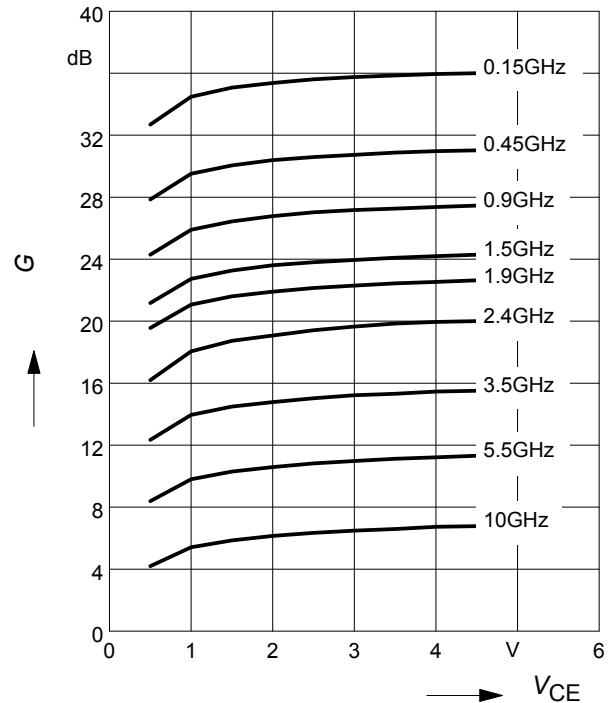
f = parameter in GHz



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

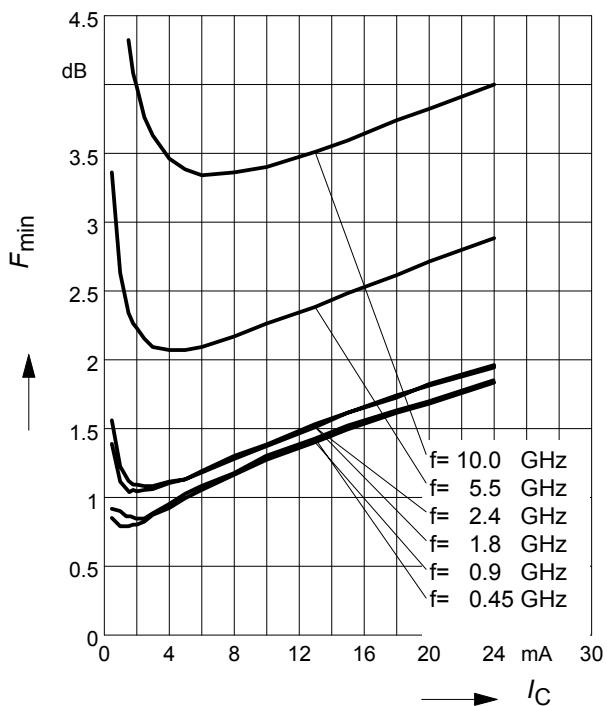
$I_C = 13 mA$

f = parameter in GHz



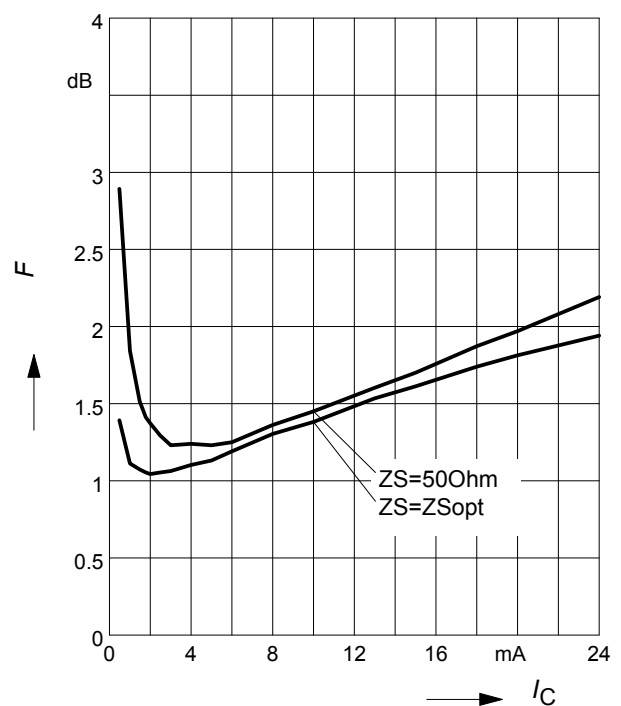
Noise figure $F = f(I_C)$

$V_{CE} = 2 V$, $Z_S = Z_{Sopt}$



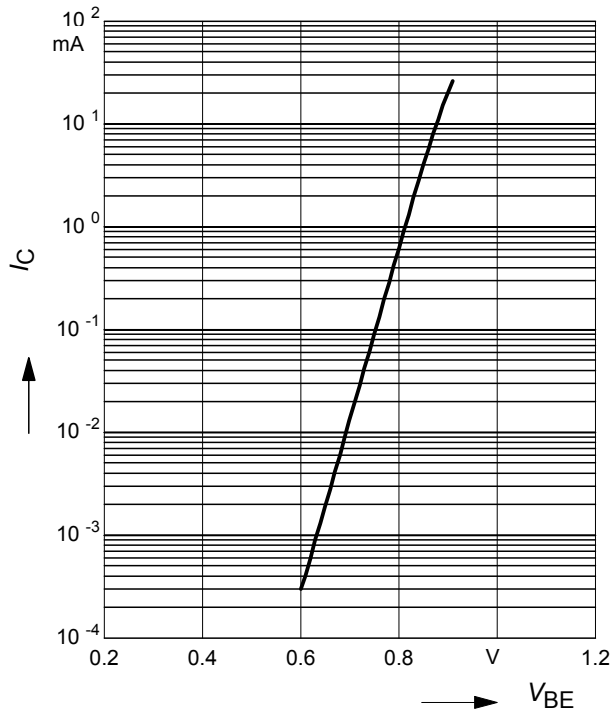
Noise figure $F = f(I_C)$

$V_{CE} = 2 V$, $f = 2 GHz$



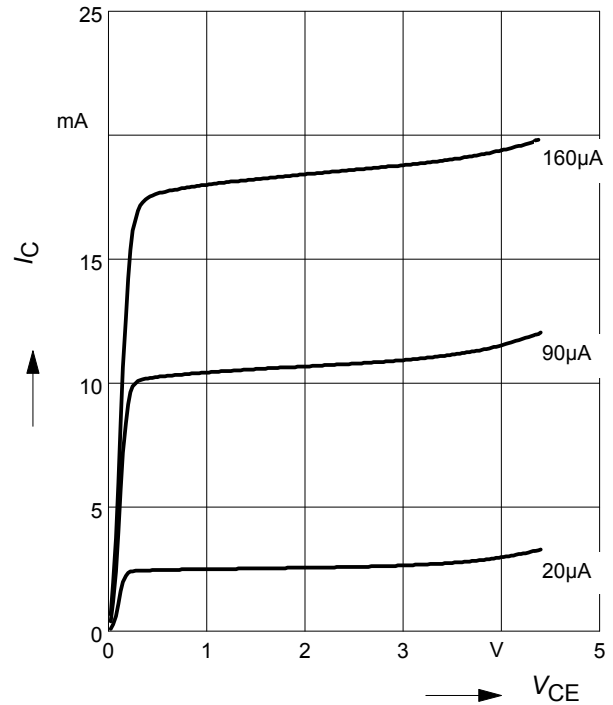
Collector current $I_C = f(V_{BE})$

$V_{CE} = 2 \text{ V}$



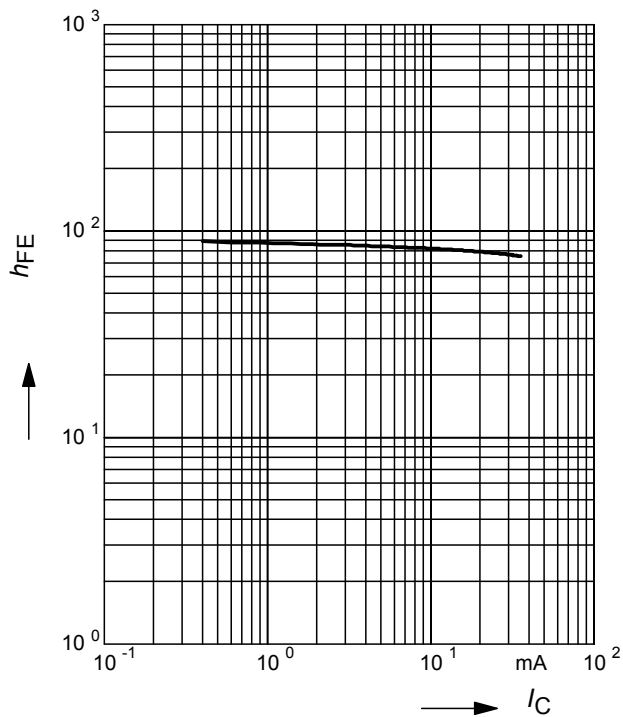
Collector current $I_C = f(V_{CE})$

Parameter I_B

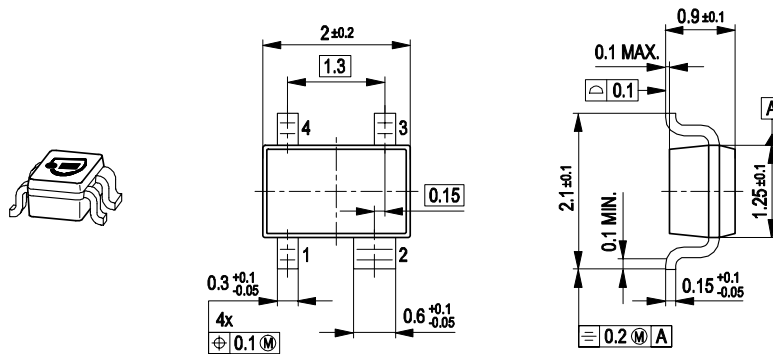


DC current gain $h_{FE} = f(I_C)$

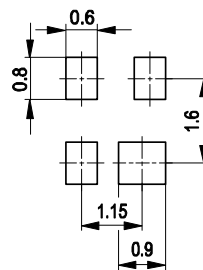
$V_{CE} = 2 \text{ V}$



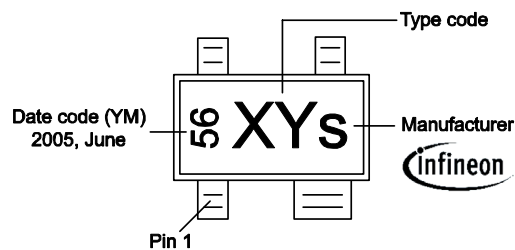
Package Outline



Foot Print

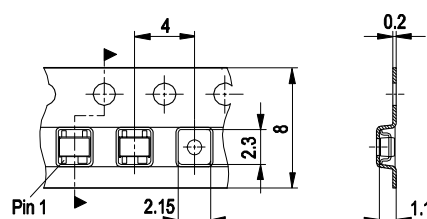


Marking Layout (Example)



Standard Packing

Reel $\varnothing 180 \text{ mm}$ = 3.000 Pieces/Reel
 Reel $\varnothing 330 \text{ mm}$ = 10.000 Pieces/Reel



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