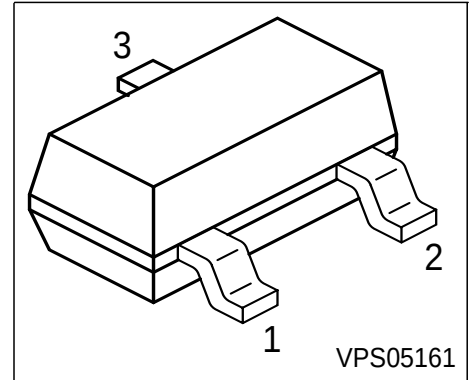


PNP Silicon AF Transistor

- For AF input stages and driver applications
- High current gain
- Low collector-emitter saturation voltage
- Low noise between 30 Hz and 15 kHz
- Complementary types: BCW60, BCX70 (NPN)



Type	Marking	Pin Configuration			Package
BCW 61A	BAs	1 = B	2 = E	3 = C	SOT23
BCW 61B	BBs	1 = B	2 = E	3 = C	SOT23
BCW 61C	BCs	1 = B	2 = E	3 = C	SOT23
BCW 61D	BDs	1 = B	2 = E	3 = C	SOT23
BCW 61FF	BFs	1 = B	2 = E	3 = C	SOT23
BCW 61FN	BNs	1 = B	2 = E	3 = C	SOT23
BCX 71G	BGs	1 = B	2 = E	3 = C	SOT23
BCX 71H	BHs	1 = B	2 = E	3 = C	SOT23
BCX 71J	BJs	1 = B	2 = E	3 = C	SOT23
BCX 71K	BKs	1 = B	2 = E	3 = C	SOT23

Maximum Ratings

Parameter	Symbol	BCW61	BCW61FF	BCX71	Unit
Collector-emitter voltage	V_{CEO}	32	32	45	V
Collector-base voltage	V_{CBO}	32	32	45	
Emitter-base voltage	V_{EBO}	5	5	5	
DC collector current	I_C	100			mA
Peak collector current	I_{CM}	200			mA
Peak base current	I_{BM}	200			
Total power dissipation, $T_S = 71\text{ °C}$	P_{tot}	330			mW
Junction temperature	T_j	150			°C
Storage temperature	T_{sta}	-65 ... 150			

Thermal Resistance

Junction - soldering point ¹⁾	R_{thJS}	≤240	K/W
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Electrical Characteristics at $T_A = 25\text{ °C}$, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	

DC Characteristics

Collector-emitter breakdown voltage $I_C = 10\text{ mA}$, $I_B = 0$	$V_{(BR)CEO}$	BCW61/61FF	32	-	-	V
		BCX71	45	-	-	
Collector-base breakdown voltage $I_C = 10\text{ }\mu\text{A}$, $I_B = 0$	$V_{(BR)CBO}$	BCW61/61FF	32	-	-	
		BCX71	45	-	-	
Emitter-base breakdown voltage $I_E = 1\text{ }\mu\text{A}$, $I_C = 0$	$V_{(BR)EBO}$	BCW61/61FF	5	-	-	
		BCX71	5	-	-	

¹⁾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.	
AC Characteristics					
Collector cutoff current $V_{CB} = 32\text{ V}, I_E = 0$ $V_{CB} = 45\text{ V}, I_E = 0$ BCW61/61FF BCX71	I_{CBO}	- -	- -	20 20	nA
Collector cutoff current $V_{CB} = 32\text{ V}, I_E = 0, T_A = 150\text{ }^{\circ}\text{C}$ $V_{CB} = 45\text{ V}, I_E = 0, T_A = 150\text{ }^{\circ}\text{C}$ BCW61/61FF BCX71	I_{CBO}	- -	- -	20 20	μA
Emitter cutoff current $V_{EB} = 4\text{ V}, I_C = 0$	I_{EBO}	-	-	20	nA
DC current gain 1) $I_C = 10\text{ }\mu\text{A}, V_{CE} = 5\text{ V}$ $h_{FE}\text{-grp. A/G}$ $h_{FE}\text{-grp. B/H}$ $h_{FE}\text{-grp. C/J/FF}$ $h_{FE}\text{-grp. D/K/FN}$	h_{FE}	20 30 40 100	140 200 300 460	- - - -	-
DC current gain 1) $I_C = 2\text{ mA}, V_{CE} = 5\text{ V}$ $h_{FE}\text{-grp. A/G}$ $h_{FE}\text{-grp. B/H}$ $h_{FE}\text{-grp. C/J/FF}$ $h_{FE}\text{-grp. D/K/FN}$	h_{FE}	120 180 250 380	170 250 350 500	220 310 460 630	
DC current gain 1) $I_C = 50\text{ mA}, V_{CE} = 1\text{ V}$ $h_{FE}\text{-grp. A/G}$ $h_{FE}\text{-grp. B/H}$ $h_{FE}\text{-grp. C/J/FF}$ $h_{FE}\text{-grp. D/K/FN}$	h_{FE}	60 80 100 110	- - - -	- - - -	

1) Pulse test: $t \leq 300\mu\text{s}$, $D = 2\%$

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

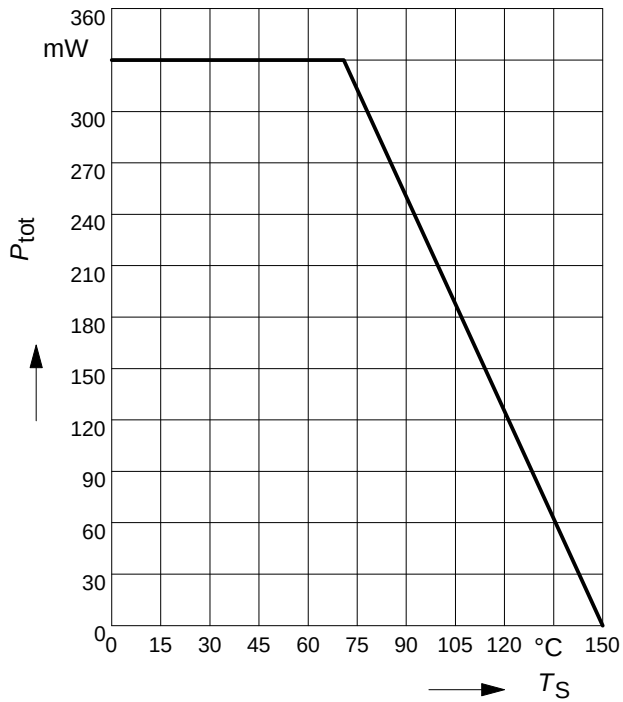
Parameter	Symbol	Values			Unit	
		min.	typ.	max.		
Characteristics						
Collector-emitter saturation voltage1) <i>I</i> _C = 10 mA, <i>I</i> _B = 0.25 mA <i>I</i> _C = 50 mA, <i>I</i> _B = 1.25 mA	<i>V</i> _{CEsat}	- -	0.12 0.2	0.25 0.55	V	
Base-emitter saturation voltage 1) <i>I</i> _C = 10 mA, <i>I</i> _B = 0.25 mA <i>I</i> _C = 50 mA, <i>I</i> _B = 1.25 mA	<i>V</i> _{BEsat}	- -	0.7 0.83	0.85 1.05		
Base-emitter voltage 1) <i>I</i> _C = 10 μA, <i>V</i> _{CE} = 5 V <i>I</i> _C = 2 mA, <i>V</i> _{CE} = 5 V <i>I</i> _C = 50 mA, <i>V</i> _{CE} = 1 V	<i>V</i> _{BE(ON)}	- 0.55 -	0.52 0.65 0.78	- 0.75 -		
AC Characteristics						
Transition frequency <i>I</i> _C = 20 mA, <i>V</i> _{CE} = 5 V, <i>f</i> = 100 MHz	<i>f</i> _T	-	250	-	MHz	
Collector-base capacitance <i>V</i> _{CB} = 10 V, <i>f</i> = 1 MHz	<i>C</i> _{cb}	-	3	-	pF	
Emitter-base capacitance <i>V</i> _{EB} = 0.5 V, <i>f</i> = 1 MHz	<i>C</i> _{eb}	-	8	-		
Short-circuit input impedance <i>I</i> _C = 2 mA, <i>V</i> _{CE} = 5 V, <i>f</i> = 1 kHz	<i>h</i> _{FE-grp.} A/G B/H C/J/FF D/K/FN	<i>h</i> _{11e}	- - - -	2.7 3.6 4.5 7.5	- - - -	kΩ
Open-circuit reverse voltage transf.ratio <i>I</i> _C = 2 mA, <i>V</i> _{CE} = 5 V, <i>f</i> = 1 kHz	<i>h</i> _{FE-grp.} A/G B/H C/J/FF D/K/FN	<i>h</i> _{12e}	- - - -	1.5 2 2 3	- - - -	10 ⁻⁴

1) Pulse test: $t \leq 300\mu\text{s}$, $D = 2\%$

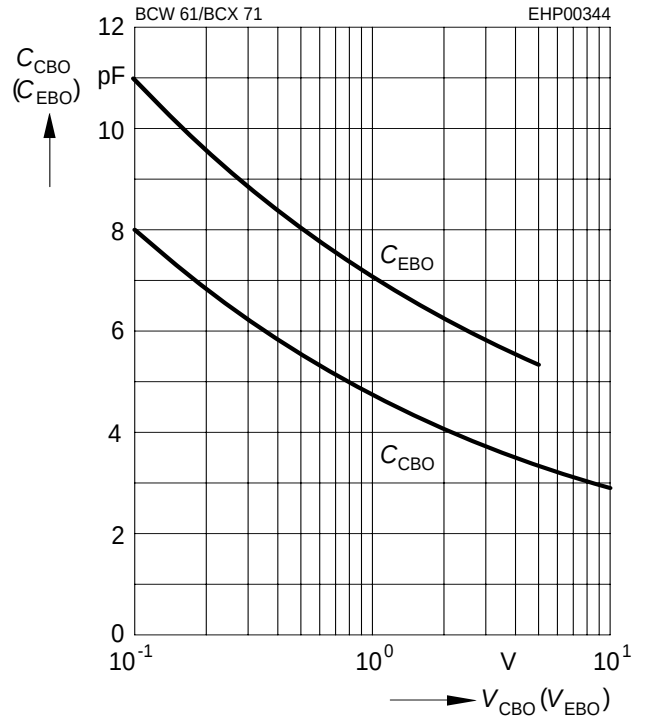
Electrical Characteristics at $T_A = 25^\circ\text{C}$, unless otherwise specified.

Parameter	Symbol	Values			Unit	
		min.	typ.	max.		
AC Characteristics						
Short-circuit forward current transf.ratio $I_C = 2\text{ mA}$, $V_{CE} = 5\text{ V}$, $f = 1\text{ kHz}$	$h_{FE\text{-grp.}}$ A/G B/H C/J/FF D/K/FN	h_{21e}	- - - -	200 260 330 520	- - - -	-
Open-circuit output admittance $I_C = 2\text{ mA}$, $V_{CE} = 5\text{ V}$, $f = 1\text{ kHz}$	$h_{FE\text{-grp.}}$ A/G B/H C/J/FF D/K/FN	h_{22e}	- - - -	18 24 30 50	- - - -	μS
Noise figure $I_C = 200\text{ }\mu\text{A}$, $V_{CE} = 5\text{ V}$, $R_S = 1\text{ k}\Omega$, $f = 1\text{ kHz}$, $\Delta f = 200\text{ Hz}$	$h_{FE\text{-grp.}}$ A/K FF/FN	F	- -	2 1	- 2	dB
Equivalent noise voltage $I_C = 200\text{ }\mu\text{A}$, $V_{CE} = 5\text{ V}$, $R_S = 2\text{ k}\Omega$, $f = 10 \dots 50\text{ Hz}$	$h_{FE\text{-grp.}}$ FF/FN	V_n	-	-	0.11	μV

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

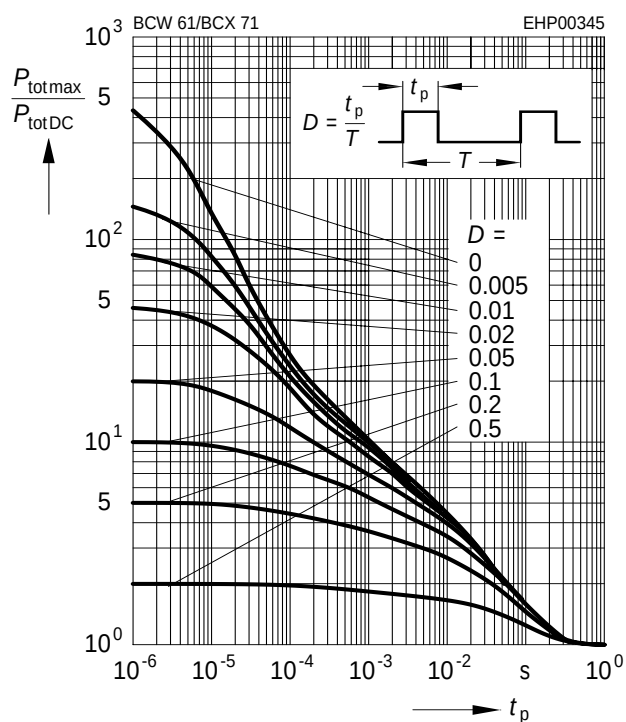


Collector-base capacitance $C_{\text{CB}} = f(V_{\text{CBO}})$
Emitter-base capacitance $C_{\text{EB}} = f(V_{\text{EBO}})$



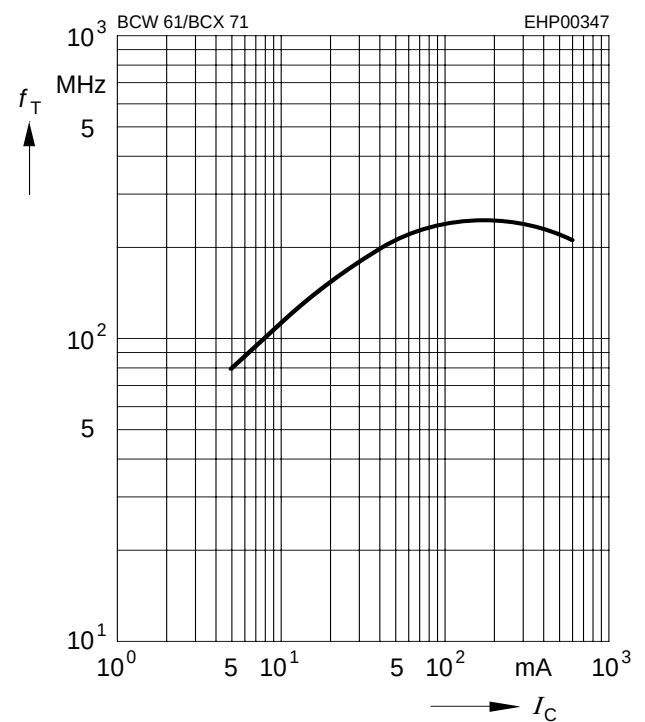
Permissible pulse load

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



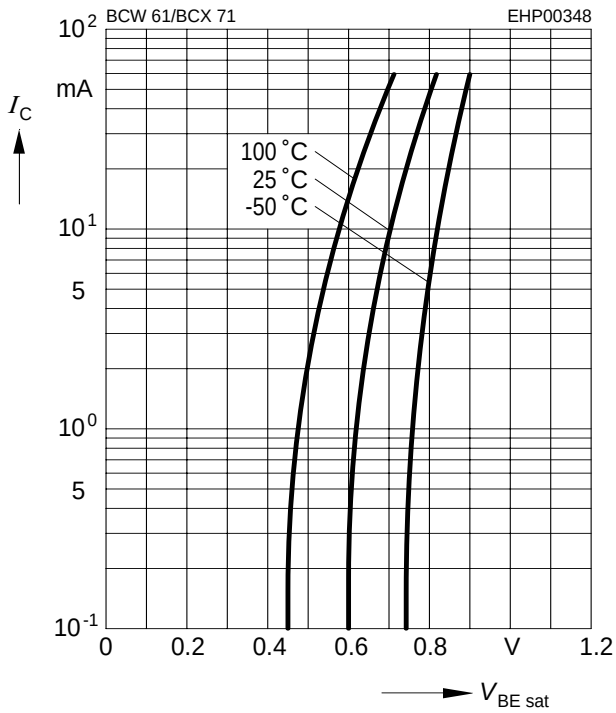
Transition frequency $f_T = f(I_C)$

$$V_{\text{CE}} = 5V$$



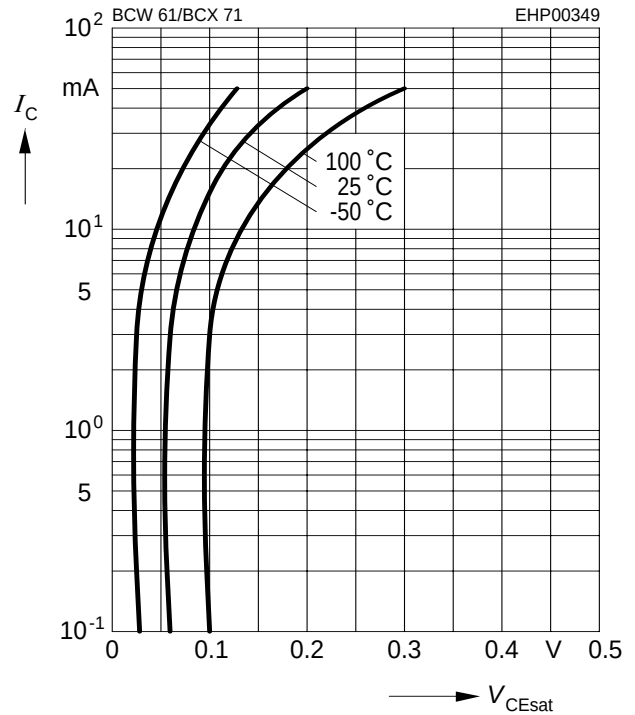
Base-emitter saturation voltage

$$I_C = f(V_{BEsat}), h_{FE} = 40$$



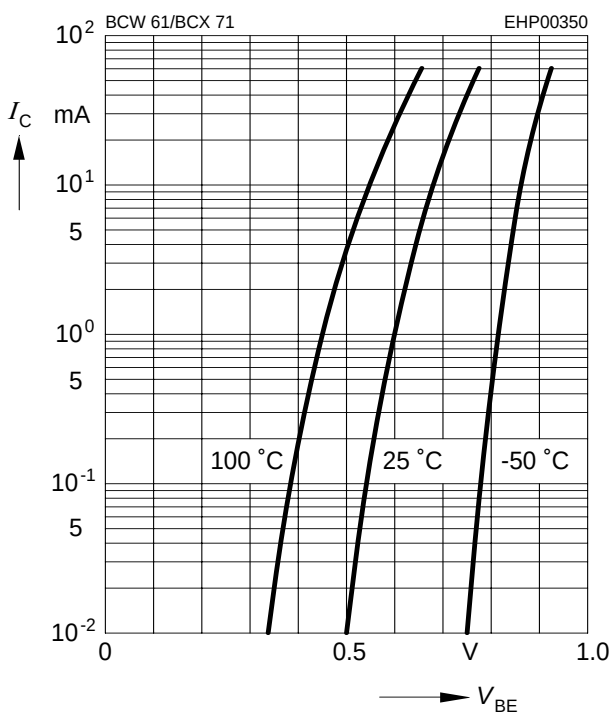
Collector-emitter saturation voltage

$$I_C = f(V_{CEsat}), h_{FE} = 40$$



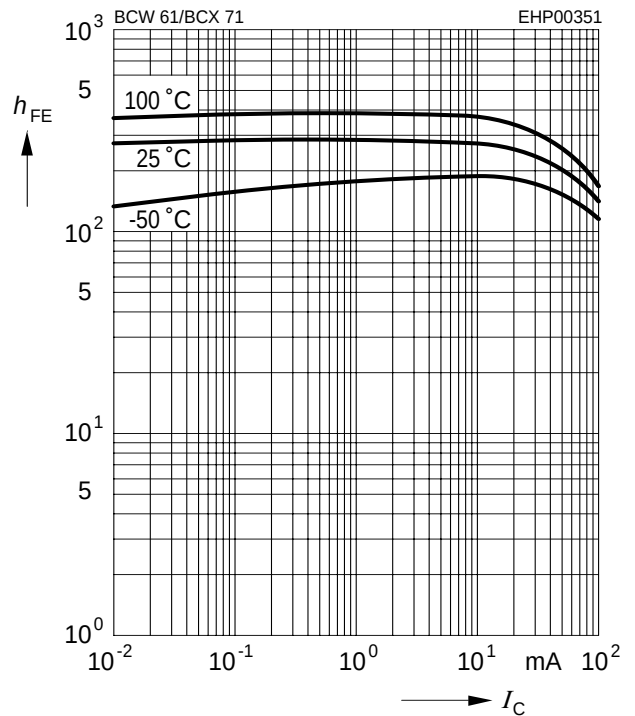
Collector current $I_C = f(V_{BE})$

$$V_{CE} = 5V$$



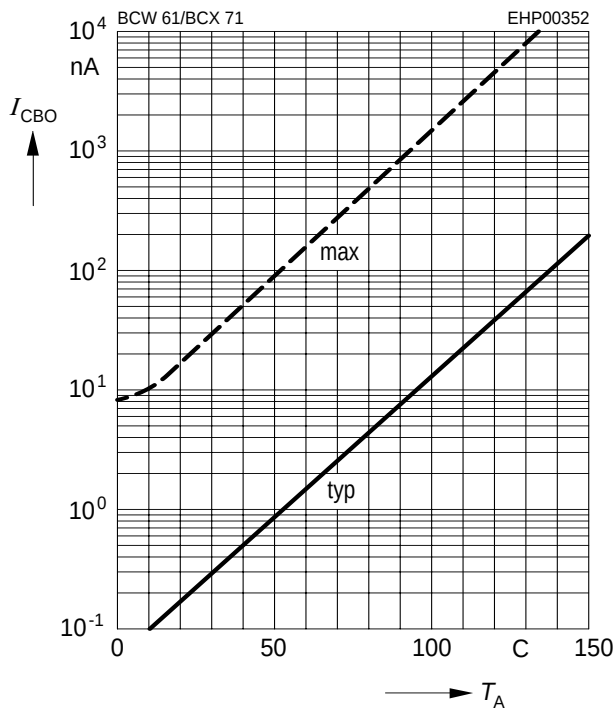
DC current gain $h_{FE} = f(I_C)$

$$V_{CE} = 5V$$



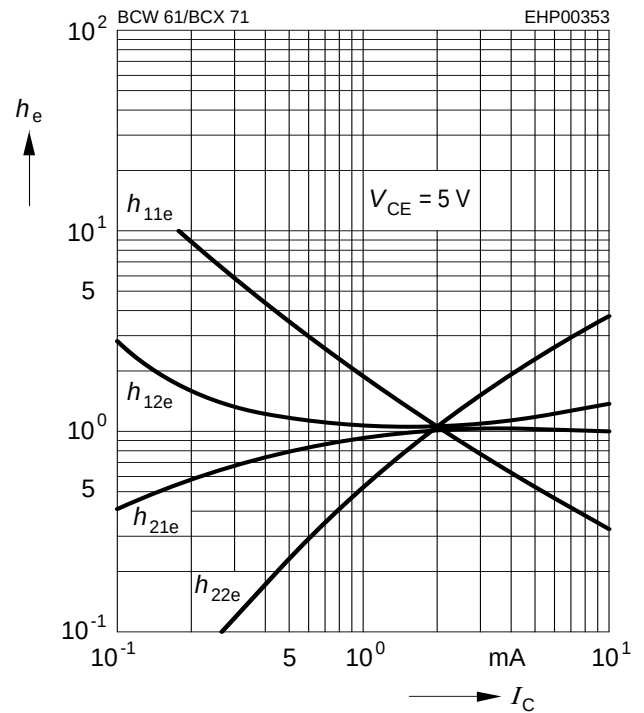
Collector cutoff current $I_{CBO} = f(T_A)$

$V_{CB} = V_{CEmax}$



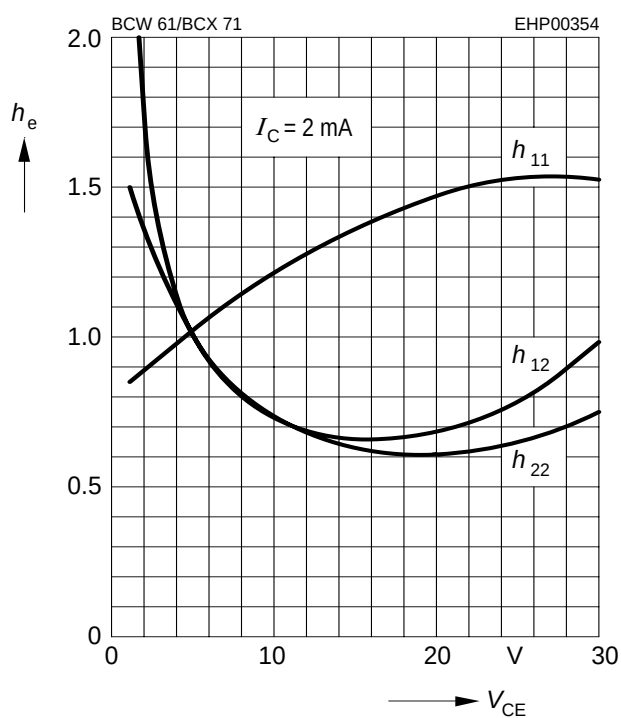
h parameter $h_e = f(I_C)$ normalized

$V_{CE} = 5V$



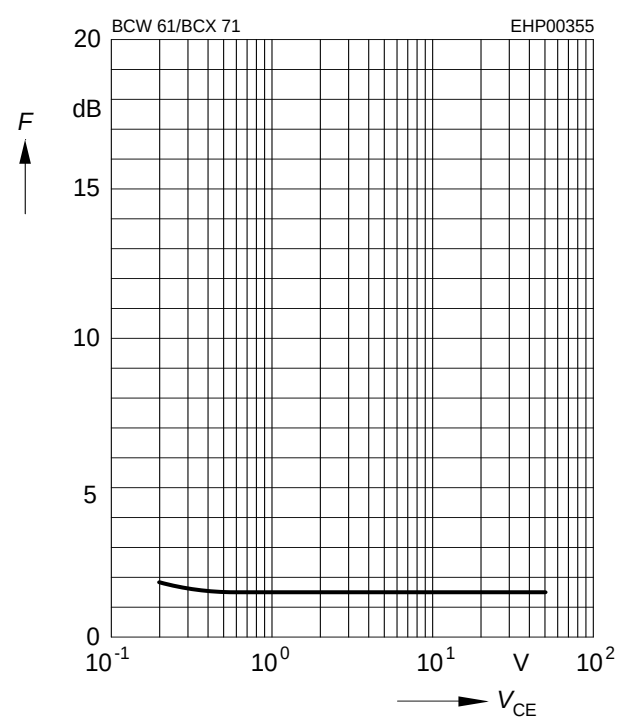
h parameter $h_e = f(V_{CE})$ normalized

$I_C = 2mA$



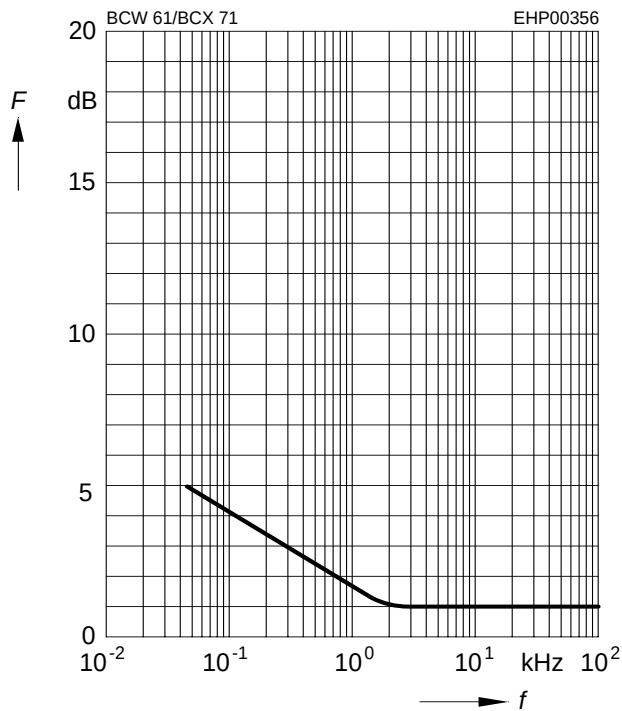
Noise figure $F = f(V_{CE})$

$I_C = 0.2mA$, $R_S = 2k\Omega$, $f = 1kHz$



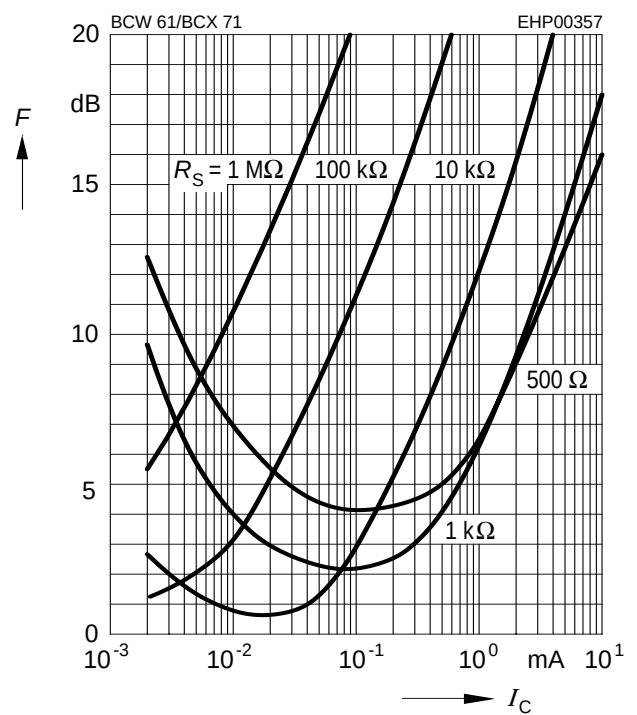
Noise figure $F = f(f)$

$I_C = 0.2\text{mA}$, $V_{CE} = 5\text{V}$, $R_S = 2\text{k}\Omega$



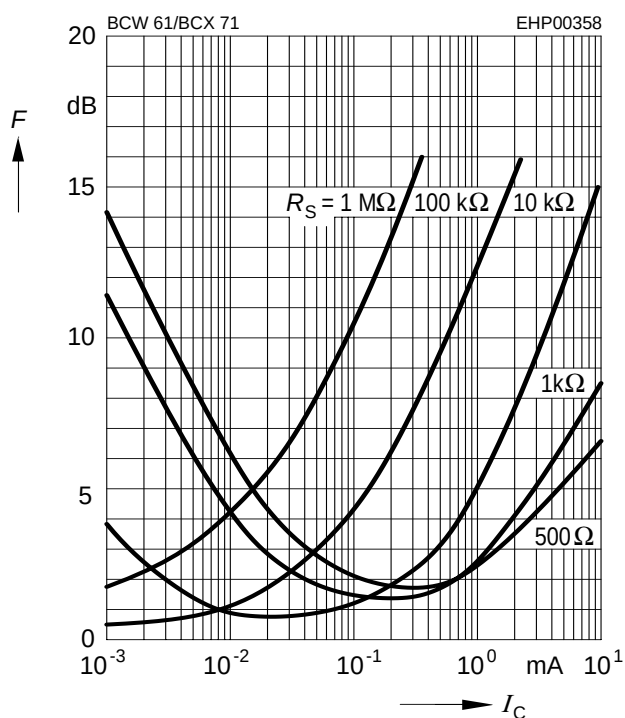
Noise figure $F = f(I_C)$

$V_{CE} = 5\text{V}$, $f = 120\text{Hz}$



Noise figure $F = f(I_C)$

$V_{CE} = 5\text{V}$, $f = 1\text{kHz}$



Noise figure $F = f(I_C)$

$V_{CE} = 5\text{V}$, $f = 10\text{kHz}$

