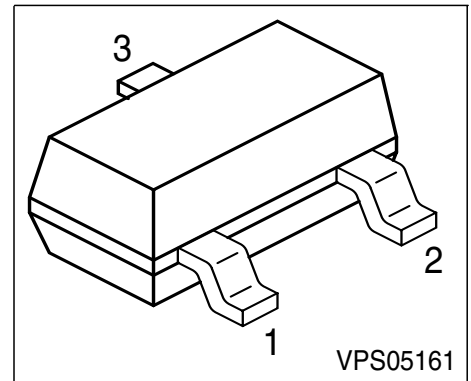


**NPN Silicon AF Transistors**

- 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: BCW 61, BCX71 (PNP)



Type	Marking	Pin Configuration			Package
BCW 60A	AAs	1 = B	2 = E	3 = C	SOT-23
BCW 60B	ABs	1 = B	2 = E	3 = C	SOT-23
BCW 60C	ACs	1 = B	2 = E	3 = C	SOT-23
BCW 60D	ADs	1 = B	2 = E	3 = C	SOT-23
BCW 60FF	AFs	1 = B	2 = E	3 = C	SOT-23
BCW 60FN	ANs	1 = B	2 = E	3 = C	SOT-23
BCX 70G	AGs	1 = B	2 = E	3 = C	SOT-23
BCX 70H	AHs	1 = B	2 = E	3 = C	SOT-23
BCX 70J	AJs	1 = B	2 = E	3 = C	SOT-23
BCX 70K	AKs	1 = B	2 = E	3 = C	SOT-23

**Maximum Ratings**

Parameter	Symbol	BCW 60	BCW60FF	BCX 70	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			
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 ambient <sup>1)</sup>	$R_{thJA}$	≤310	K/W
Junction - soldering point	$R_{thJS}$	≤240	

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC Characteristics					
Collector-emitter breakdown voltage $I_C = 10\text{ mA}$ , $I_B = 0$ <b>BCW 60/60FF</b> <b>BCX 70</b>	$V_{(BR)CEO}$	32 45	- -	- -	V
Collector-base breakdown voltage $I_C = 10\text{ }\mu\text{A}$ , $I_B = 0$ <b>BCW 60/60FF</b> <b>BCX 70</b>	$V_{(BR)CBO}$	32 45	- -	- -	
Emitter-base breakdown voltage $I_E = 1\text{ }\mu\text{A}$ , $I_C = 0$	$V_{(BR)EBO}$	5	-	-	

1) Package mounted on pcb 40mm x 40mm x 1.5mm / 6cm<sup>2</sup> Cu

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC Characteristics					
Collector cutoff current $V_{CB} = 32\text{ V}$ , $I_E = 0$ <b>BCW 60 / 60FF</b> $V_{CB} = 45\text{ V}$ , $I_E = 0$ <b>BCX 70</b>	$I_{CBO}$	-	-	20	nA
Collector cutoff current $V_{CB} = 32\text{ V}$ , $I_E = 0$ , $T_A = 150\text{ °C}$ <b>BCW 60 / 60FF</b> $V_{CB} = 45\text{ V}$ , $I_E = 0$ , $T_A = 150\text{ °C}$ <b>BCX 70</b>	$I_{CBO}$	-	-	20	μA
Emitter cutoff current $V_{EB} = 4\text{ V}$ , $I_C = 0$	$I_{EBO}$	-	-	20	nA
DC current gain 1) $I_C = 10\text{ μA}$ , $V_{CE} = 5\text{ V}$ $h_{FE}\text{-grp. A/ G}$ $h_{FE}\text{-grp. B/ H}$ $h_{FE}\text{-grp. C/ J/ FF}$ $h_{FE}\text{-grp. D/ K/ FN}$	$h_{FE}$	20 20 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) $I_C = 50\text{ mA}$ , $V_{CE} = 1\text{ V}$ $h_{FE}\text{-grp. A/ G}$ $h_{FE}\text{-grp. B/ H}$ $h_{FE}\text{-grp. C/ J/ FF}$ $h_{FE}\text{-grp. D/ K/ FN}$	$h_{FE}$	50 70 90 100	- - - -	- - - -	

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

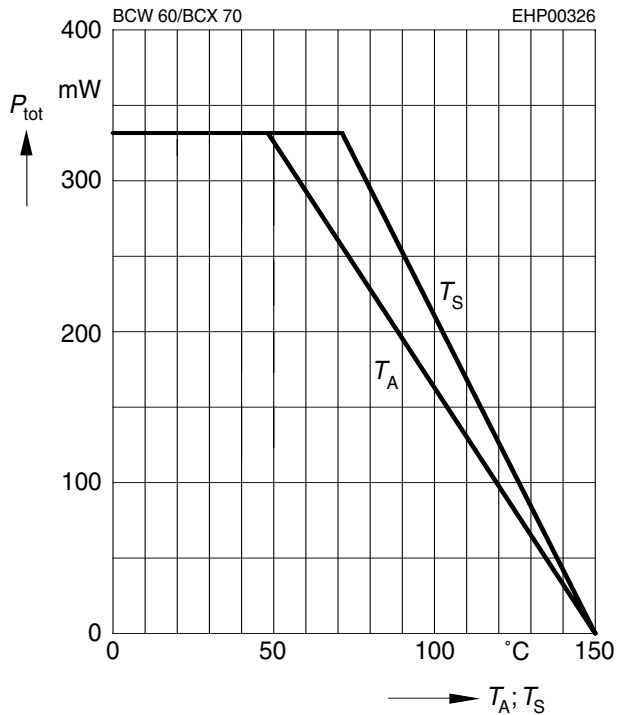
1) Pulse test:  $t \leq 300\mu\text{s}$ ,  $D = 2\%$

**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   $h_{FE}\text{-grp.}$ $I_C = 2\text{ mA}$ , $V_{CE} = 5\text{ V}$ , $f = 1\text{ kHz}$	$h_{21e}$					-
A / G		-	200	-		
B / H		-	260	-		
C / J / FF		-	330	-		
D / K / FN		-	520	-		
Open-circuit output admittance $I_C = 2\text{ mA}$ , $V_{CE} = 5\text{ V}$ , $f = 1\text{ kHz}$	$h_{FE}\text{-grp.}$ $h_{22e}$					$\mu\text{S}$
A / G		-	18	-		
B / H		-	24	-		
C / J / FF		-	30	-		
D / K / FN		-	50	-		
Noise figure $I_C = 100\text{ }\mu\text{A}$ , $V_{CE} = 5\text{ V}$ , $R_S = 1\text{ k}\Omega$ , $f = 1\text{ kHz}$ , $\Delta f = 200\text{ Hz}$	$h_{FE}\text{-grp.}$ $F$					dB
A - K		-	2	-		
FF - FN		-	1	2		
Equivalent noise voltage $I_C = 200\text{ }\mu\text{A}$ , $V_{CE} = 5\text{ V}$ , $R_S = 2\text{ k}\Omega$ , $f = 10 \dots 50\text{ Hz}$	$h_{FE}\text{-grp.}$ $V_n$	-	-	135		$\mu\text{V}$
FF / FN						

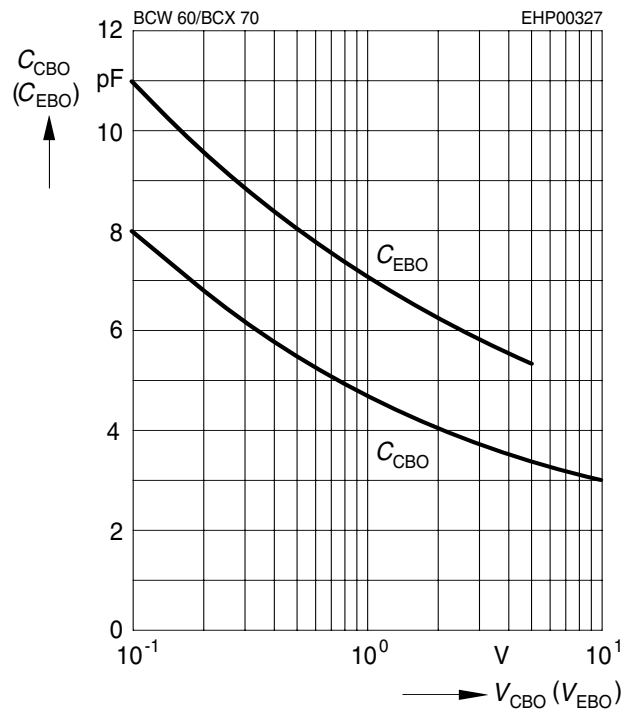
**Total power dissipation**  $P_{\text{tot}} = f(T_A^*; T_S)$

\* Package mounted on epoxy



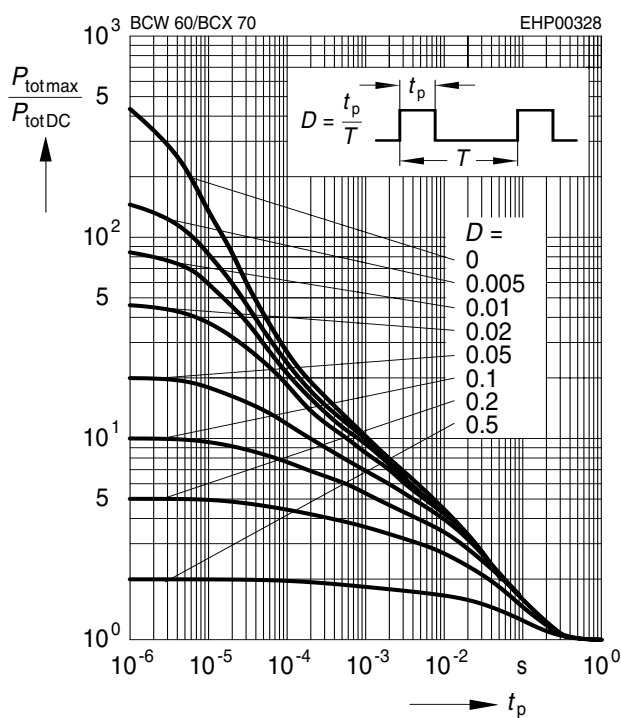
**Collector-base capacitance**  $C_{CB} = f(V_{CBO})$

**Emitter-base capacitance**  $C_{EB} = f(V_{EBO})$



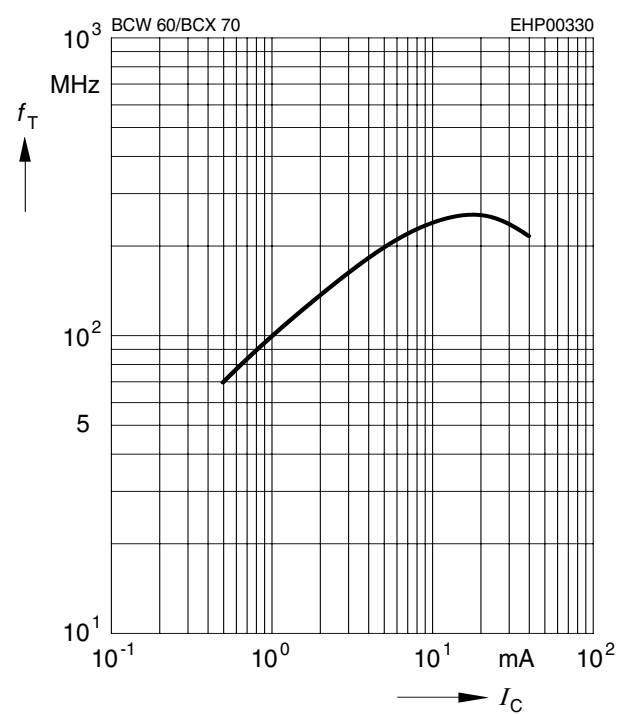
**Permissible pulse load**

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



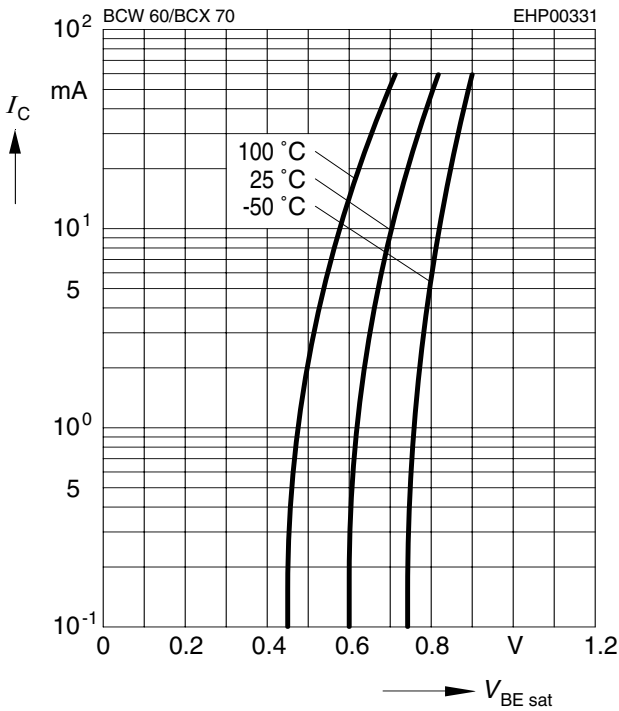
**Transition frequency**  $f_T = f(I_C)$

$V_{CE} = 5V$

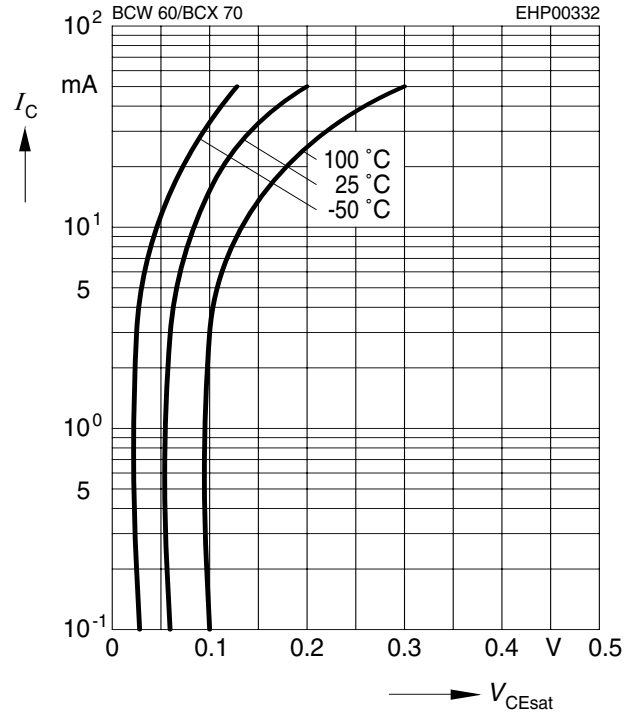


**Base-emitter saturation voltage**

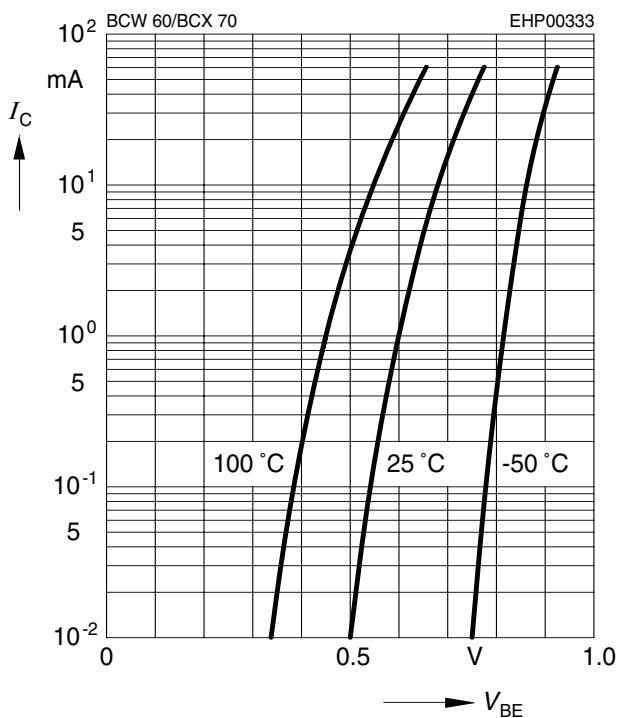
$$I_C = f(V_{BEsat}), h_{FE} = 40$$


**Collector-emitter saturation voltage**

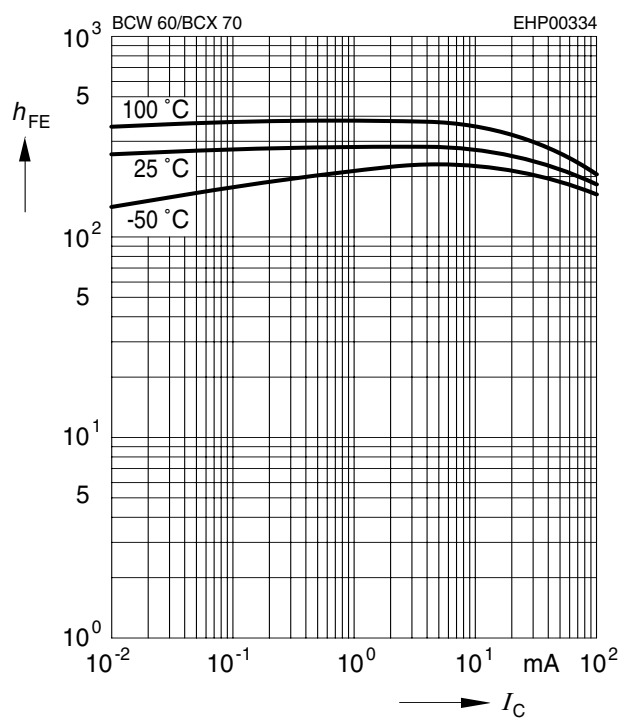
$$I_C = f(V_{CEsat}), h_{FE} = 40$$


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

$$V_{CE} = 5V$$

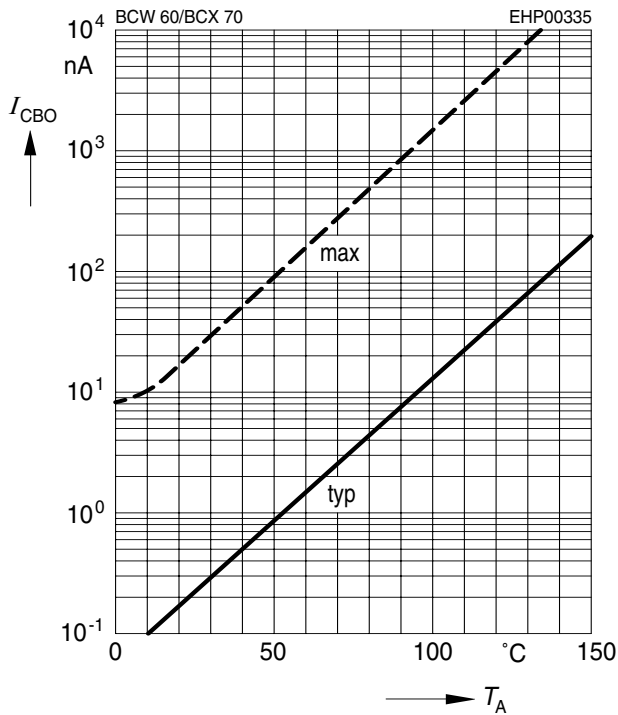

**DC current gain  $h_{FE} = f(I_C)$** 

$$V_{CE} = 5V$$



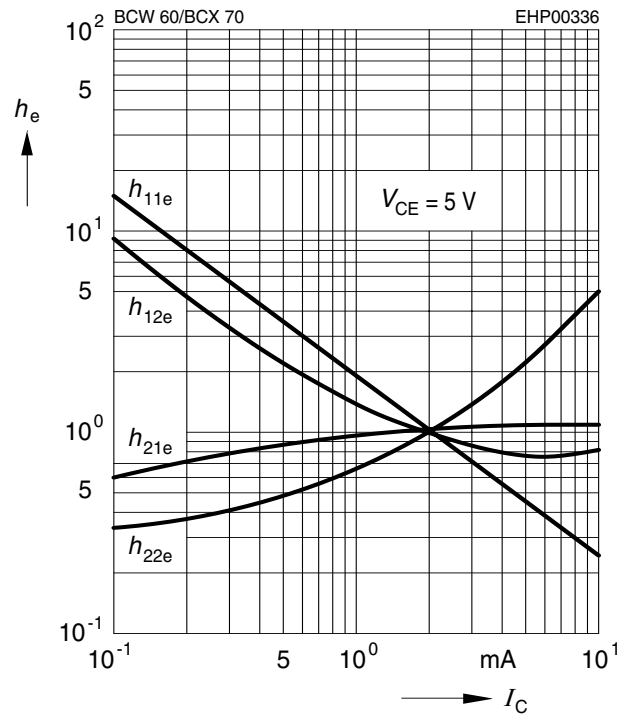
**Collector cutoff current  $I_{CBO} = f(T_A)$**

$$V_{CB} = V_{CEmax}$$



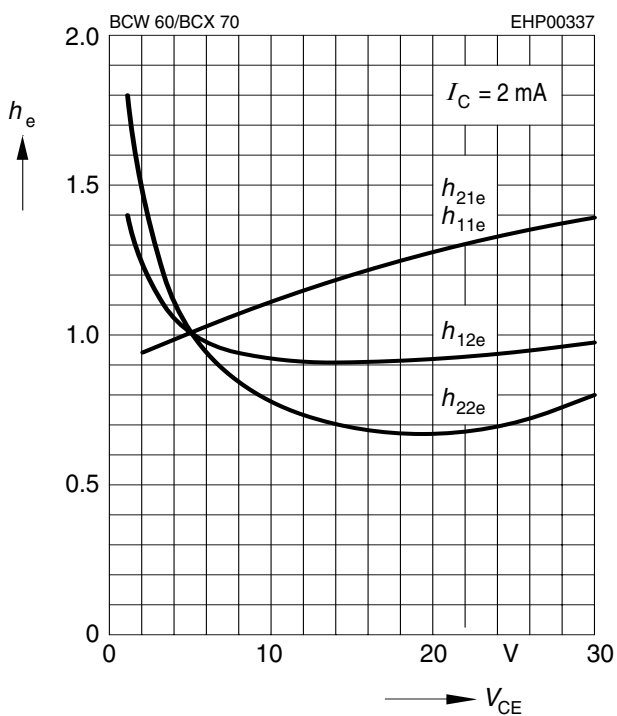
**h parameter  $h_e = f(I_C)$  normalized**

$$V_{CE} = 5V$$



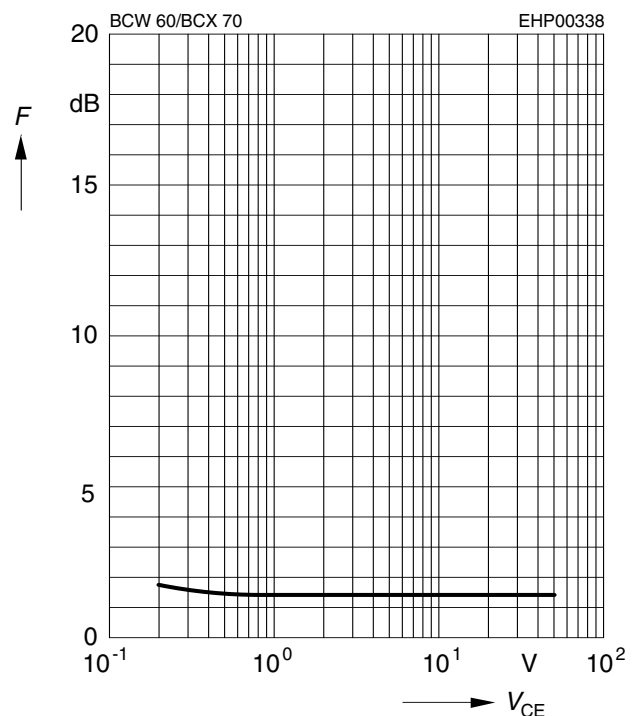
**h parameter  $h_e = f(V_{CE})$  normalized**

$$I_C = 2mA$$

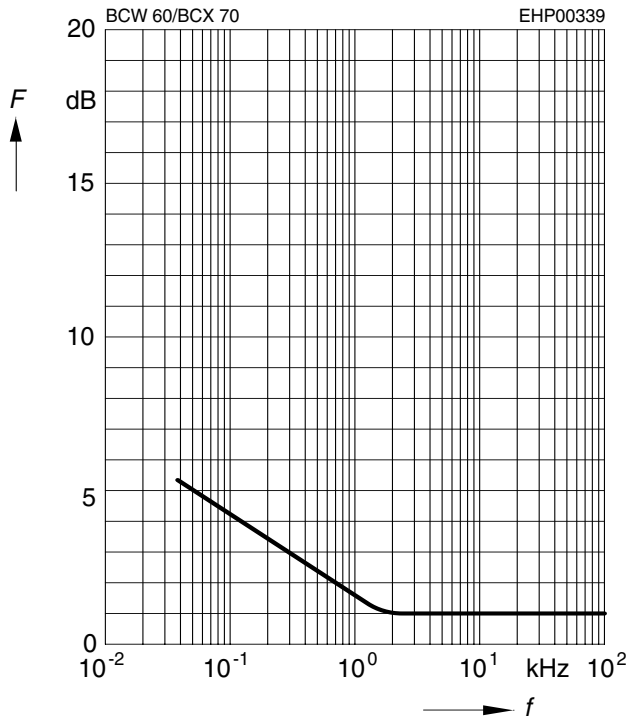
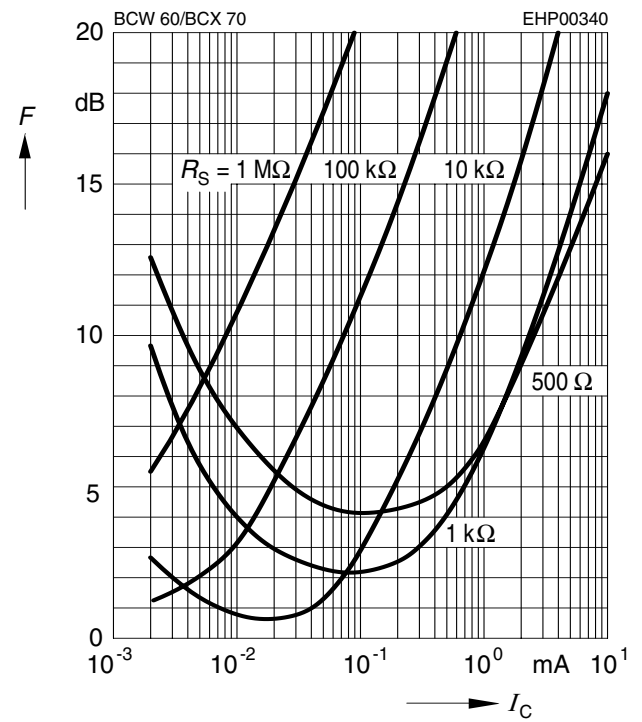
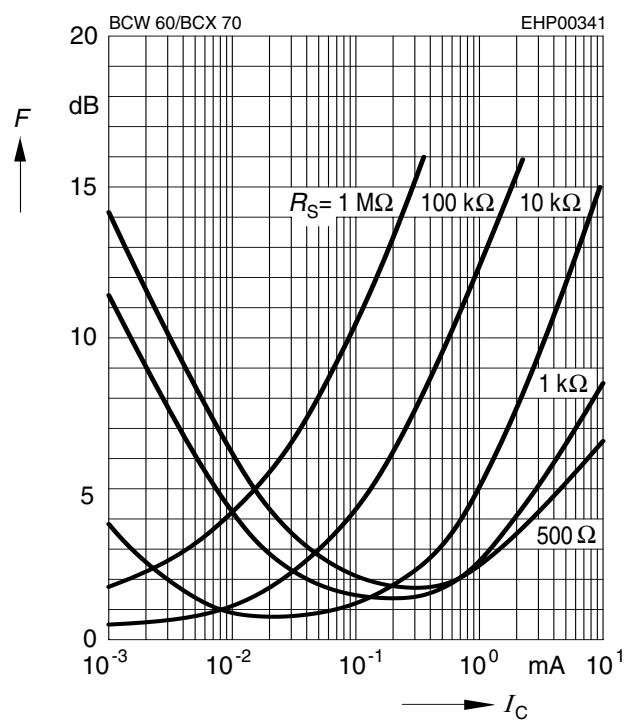
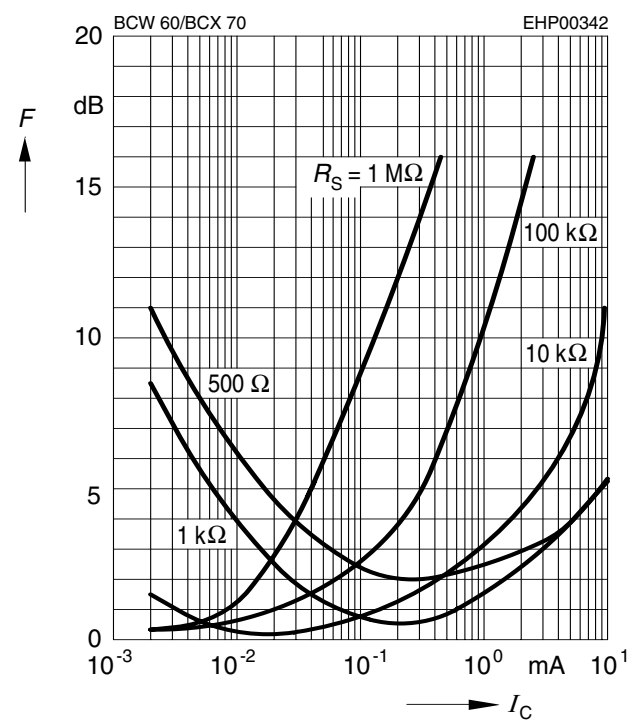


**Noise figure  $F = f(V_{CE})$**

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





**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  $F = f(I_C)$** 
 $V_{CE} = 5\text{V}$ ,  $f = 10\text{kHz}$ 


This datasheet has been download from:

[www.datasheetcatalog.com](http://www.datasheetcatalog.com)

Datasheets for electronics components.