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NPN Silicon AF Transistors

BCW 60
BCX 70

- 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, BCX 71 (PNP)

Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1]
BCW 60 A	AAs	Q62702-C1517	B	E	C	SOT-23
BCW 60 B	ABs	Q62702-C1497				
BCW 60 C	ACs	Q62702-C1476				
BCW 60 D	ADs	Q62702-C1477				
BCW 60 FF	AFs	Q62702-C1529				
BCW 60 FN	ANs	Q62702-C1567				
BCX 70 G	AGs	Q62702-C1539				
BCX 70 H	AHs	Q62702-C1481				
BCX 70 J	AJs	Q62702-C1552				
BCX 70 K	AKs	Q62702-C1571				

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[1] For detailed information see chapter Package Outlines.

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Maximum Ratings

Parameter	Symbol	Values			Unit
		BCW 60	**BCW 60 FF**	**BCX 70**	
Collector-emitter voltage	V_{CE0}	32	32	45	V
Collector-base voltage	V_{CB0}	32	32	45	
Emitter-base voltage	V_{EB0}	5			
Collector current	I_C	100			mA
Peak collector current	I_{CM}	200			
Peak base current	I_{BM}	200			
Total power dissipation, $T_S = 71$ ˚C	P_{tot}	330			mW
Junction temperature	T_j	150			˚C
Storage temperature range	T_{stg}	− 65 … + 150			

Thermal Resistance

Junction - ambient[1]	$R_{th\ JA}$	≤ 310	K/W
Junction - soldering point	$R_{th\ JS}$	≤ 240	

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[1] Package mounted on epoxy pcb 40 mm $\times$ 40 mm $\times$ 1.5 mm/6 cm^2 Cu.

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Electrical Characteristics

at T_A = 25 ˚C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	

DC characteristics

Parameter	Symbol	min.	typ.	max.	Unit
Collector-emitter breakdown voltage	$V_{(BR)CE0}$				V
I_C = 10 mA BCW 60, BCW 60 FF		32	–	–	
BCX 70		45	–	–	
Collector-base breakdown voltage	$V_{(BR)CB0}$				
I_C = 10 μA BCW 60, BCW 60 FF		32	–	–	
BCX 70		45	–	–	
Emitter-base breakdown voltage	$V_{(BR)EB0}$	5	–	–	
I_E = 1 μA					
Collector cutoff current	I_{CB0}				
V_{CB} = 32 V BCW 60, BCW 60 FF		–	–	20	nA
V_{CB} = 45 V BCX 70		–	–	20	nA
V_{CB} = 32 V, T_A = 150 ˚C BCW 60, BCW 60 FF		–	–	20	μA
V_{CB} = 45 V, T_A = 150 ˚C BCX 70		–	–	20	μA
Emitter cutoff current	I_{EB0}	–	–	20	nA
V_{EB} = 4 V					
DC current gain [1]	h_{FE}				–
I_C = 10 μA, V_{CE} = 5 V					
BCW 60 A, BCX 70 G		20	140	–	
BCW 60 B, BCX 70 H		20	200	–	
BCW 60 FF, BCW 60 C, BCX 70 J		40	300	–	
BCW 60 FN, BCW 60 D, BCX 70 K		100	460	–	
I_C = 2 mA, V_{CE} = 5 V					
BCW 60 A, BCX 70 G		120	170	220	
BCW 60 B, BCX 70 H		180	250	310	
BCW 60 FF, BCW 60 C, BCX 70 J		250	350	460	
BCW 60 FN, BCW 60 D, BCX 70 K		380	500	630	
I_C = 50 mA, V_{CE} = 1 V					
BCW 60 A, BCX 70 G		50	–	–	
BCW 60 B, BCX 70 H		70	–	–	
BCW 60 FF, BCW 60 C, BCX 70 J		90	–	–	
BCW 60 FN, BCW 60 D, BCX 70 K		100	–	–	

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[1] Pulse test: $t \leq 300$ μs, $D \leq 2$ %.

Electrical Characteristics

at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	

DC characteristics

Parameter	Symbol	min.	typ.	max.	Unit
Collector-emitter saturation voltage[1] I_C = 10 mA, I_B = 0.25 mA I_C = 50 mA, I_B = 1.25 mA	V_{CEsat}	– –	0.12 0.20	0.25 0.55	V
Base-emitter saturation voltage[1] I_C = 10 mA, I_B = 0.25 mA I_C = 50 mA, I_B = 1.25 mA	V_{BEsat}	– –	0.70 0.83	0.85 1.05	
Base-emitter voltage I_C = 10 μA, V_{CE} = 5 V I_C = 2 mA, V_{CE} = 5 V I_C = 50 mA, V_{CE} = 1 V [1]	$V_{BE (on)}$	– 0.55 –	0.52 0.65 0.78	– 0.75 –	

AC characteristics

Parameter	Symbol	min.	typ.	max.	Unit
Transition frequency I_C = 20 mA, V_{CE} = 5 V, f = 100 MHz	f	–	250	–	MHz
Output capacitance V_{CB} = 10 V, f = 1 MHz	C_{obo}	–	3	–	pF
Input capacitance V_{EB} = 0.5 V, f = 1 MHz	C_{ibo}	–	8	–	
Short-circuit input impedance I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz BCW 60 A, BCX 70 G BCW 60 B, BCX 70 H BCW 60 FF, BCW 60 C, BCX 70 J BCW 60 FN, BCW 60 D, BCX 70 K	h_{11e}	– – – –	2.7 3.6 4.5 7.5	– – – –	kΩ
Open-circuit reverse voltage transfer ratio I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz BCW 60 A, BCX 70 G BCW 60 B, BCX 70 H BCW 60 FF, BCW 60 C, BCX 70 J BCW 60 FN, BCW 60 D, BCX 70 K	h_{12e}	– – –	1.5 2.0 2.0 3.0	– – –	10^{-4}

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[1] Pulse test: $t \leq 300$ μs, $D \leq 2$ %.
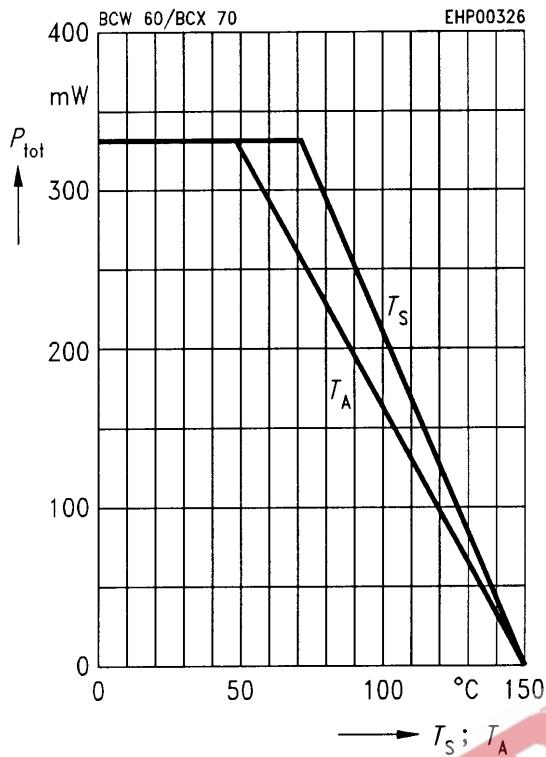
Electrical Characteristics

at T_A = 25 ˚C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	

AC characteristics
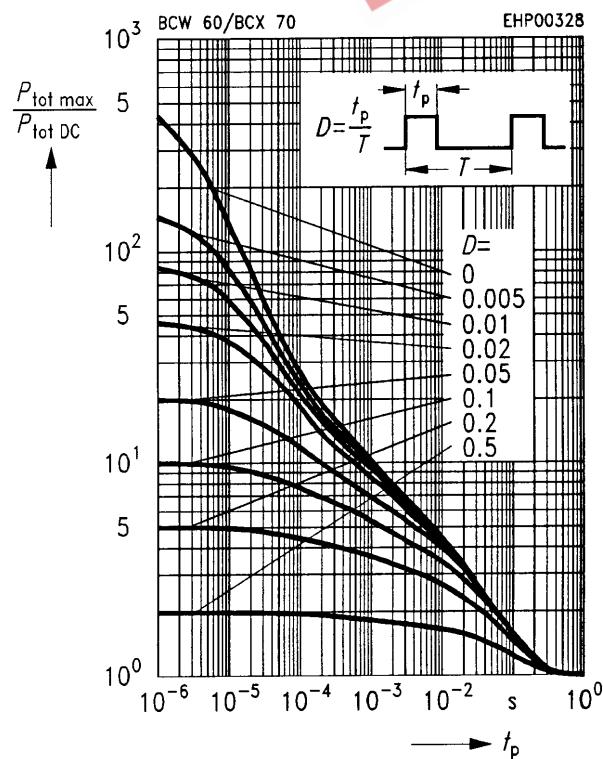
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Short-circuit forward current transfer ratio I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{21e}				−
BCW 60 A, BCX 70 G		−	200	−	
BCW 60 B, BCX 70 H		−	260	−	
BCW 60 FF, BCW 60 C, BCX 70 J		−	330	−	
BCW 60 FN, BCW 60 D, BCX 70 K		−	520	−	
Open-circuit output admittance I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{22e}				µS
BCW 60 A, BCX 70 G		−	18	−	
BCW 60 B, BCX 70 H		−	24	−	
BCW 60 FF, BCW 60 C, BCX 70 J		−	30	−	
BCW 60 FN, BCW 60 D, BCX 70 K		−	50	−	
Noise figure I_C = 0.2 mA, V_{CE} = 5 V, R_S = 2 kΩ f = 1 kHz, Δf = 200 Hz	F				dB
BCW 60 A to BCX 70 K		−	2	−	
BCW 60 FF, BCW 60 FN		−	1	2	
Equivalent noise voltage I_C = 0.2 mA, V_{CE} = 5 V, R_S = 2 kΩ f = 10 Hz … 50 Hz	V_n				µV
BCW 60 FF, BCW 60 FN		−	−	0.135	
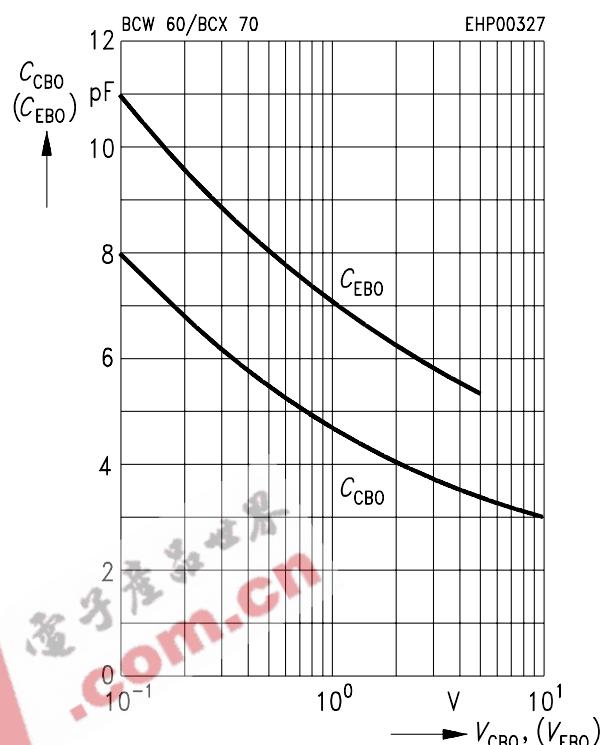
Total power dissipation $P_{tot} = f(T_A^*; T_S)$
*Package mounted on epoxy

Collector-base capacitance $C_{CB0} = f(V_{CB0})$
Emitter-base capacitance $C_{EB0} = f(V_{EB0})$
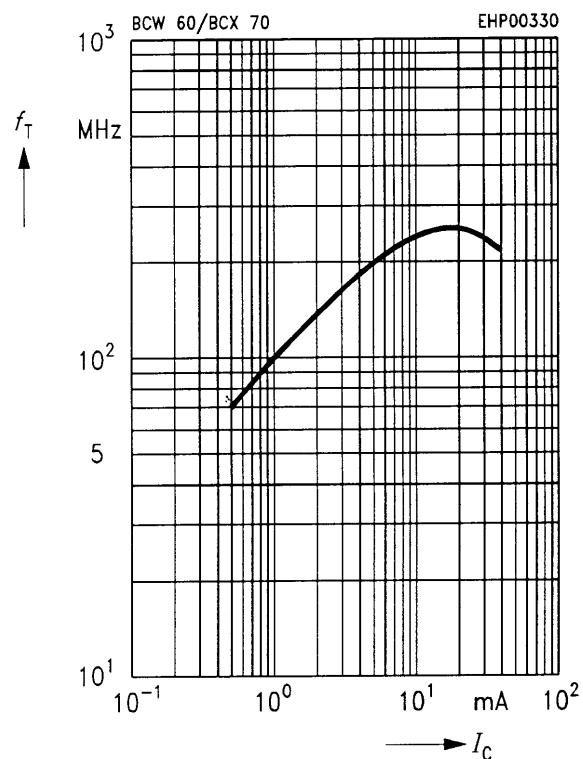
Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f(t_p)$
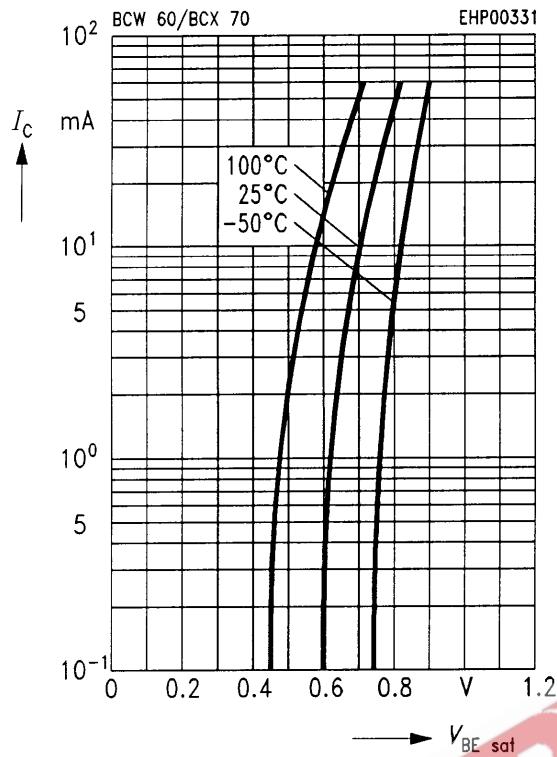
Transition frequency $f_T = f(I_C)$
$V_{CE} = 5$ V
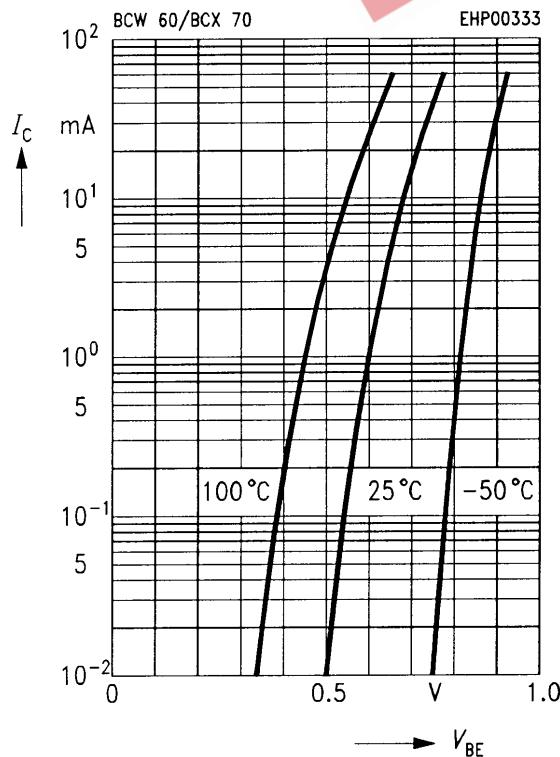
Base-emitter saturation voltage

$I_C = f(V_{BEsat})$

$h_{FE} = 40$

## Collector-emitter saturation voltage
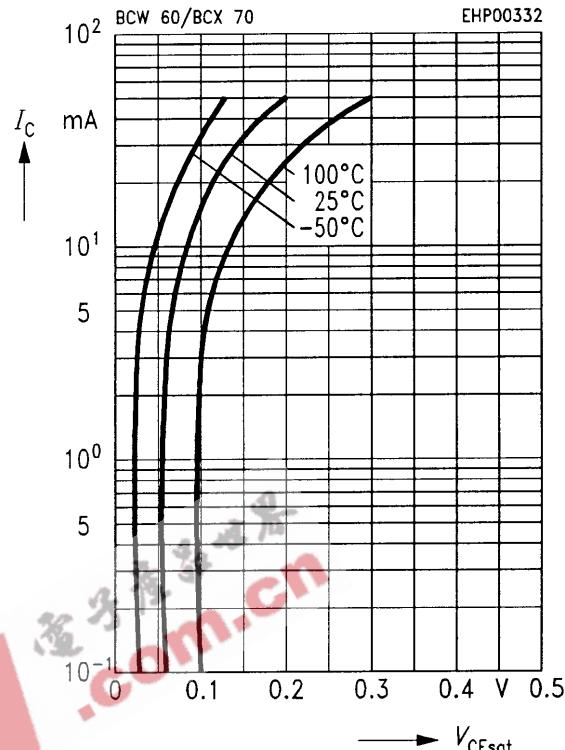
$I_C = f(V_{CEsat})$

$h_{FE} = 40$

Collector current $I_C = f(V_{BE})$
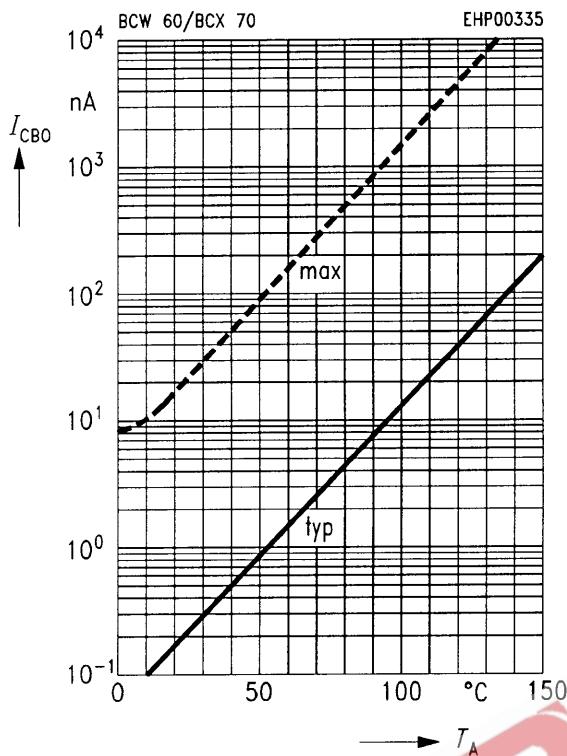
$V_{CE} = 5$ V

DC current gain $h_{FE} = f(I_C)$
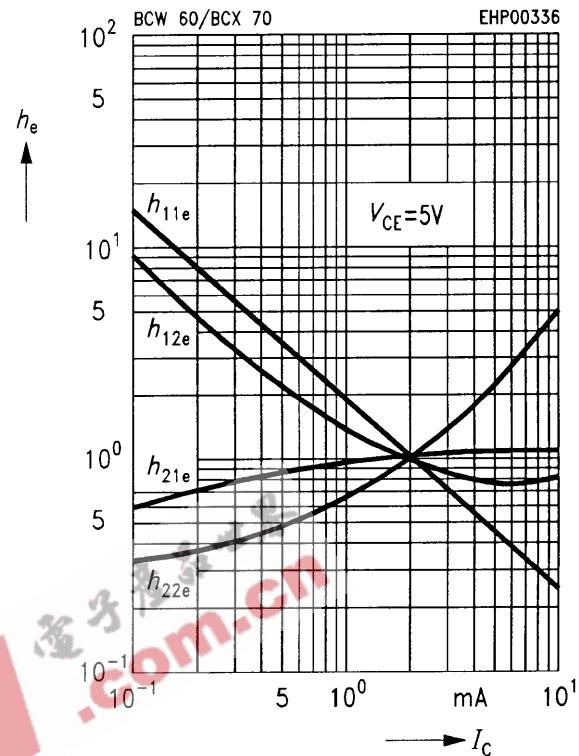
$V_{CE} = 5$ V
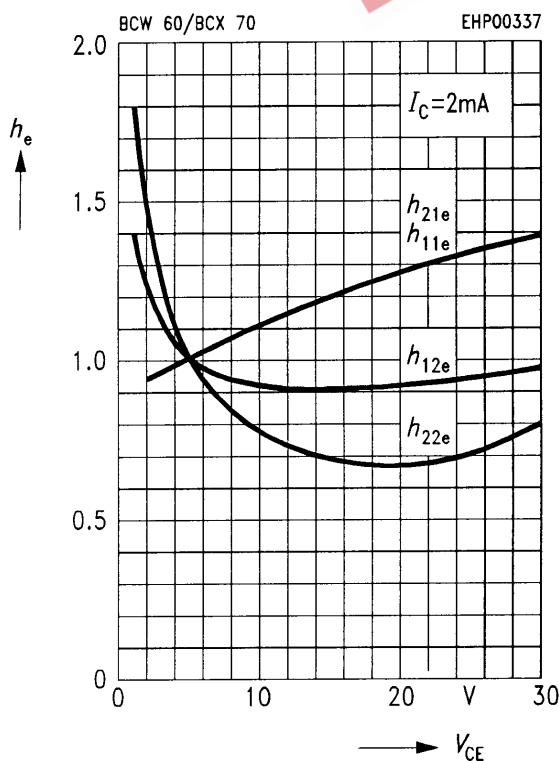
Collector cutoff current $I_{CB0} = f(T_A)$
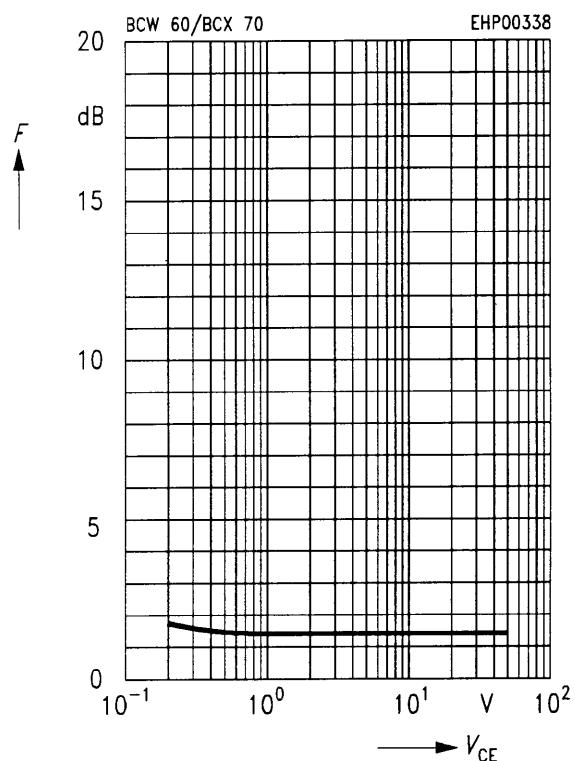
h parameter $h_e = f(I_C)$
$V_{CE} = 5 \text{ V}$


h parameter $h_e = f(V_{CE})$
$I_C = 2 \text{ mA}$
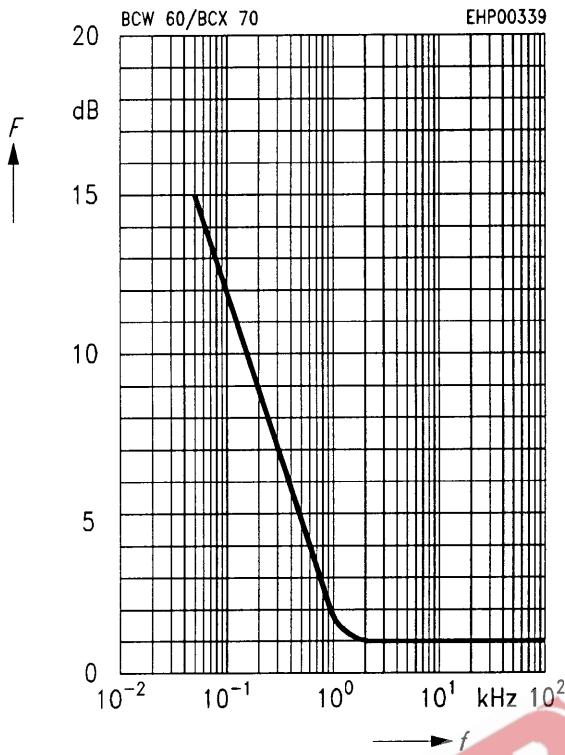
Noise figure $F = f(V_{CE})$
$I_C = 0.2 \text{ mA}$, $R_S = 2 \text{ k}\Omega$, $f = 1 \text{ kHz}$
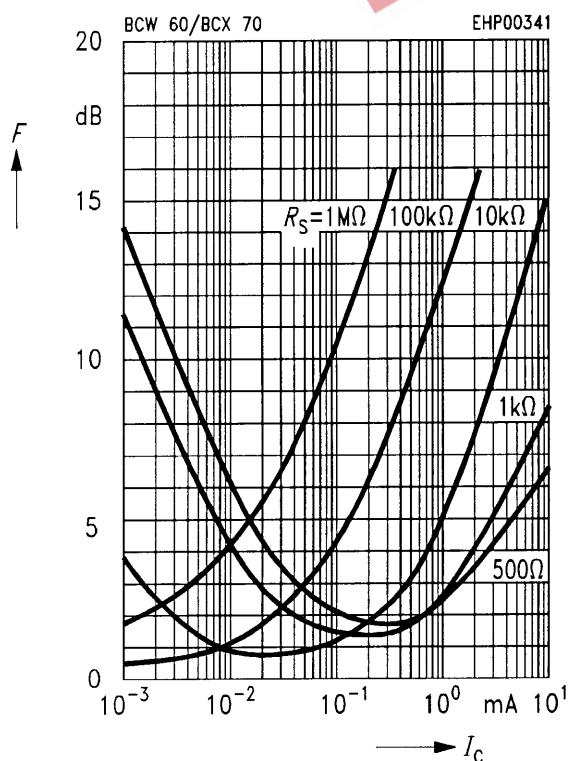
Noise figure $F = f(f)$
$I_C = 0.2$ mA, $R_S = 2$ kΩ, $V_{CE} = 5$ V

Noise figure $F = f(I_C)$
$V_{CE} = 5$ V, $f = 120$ Hz
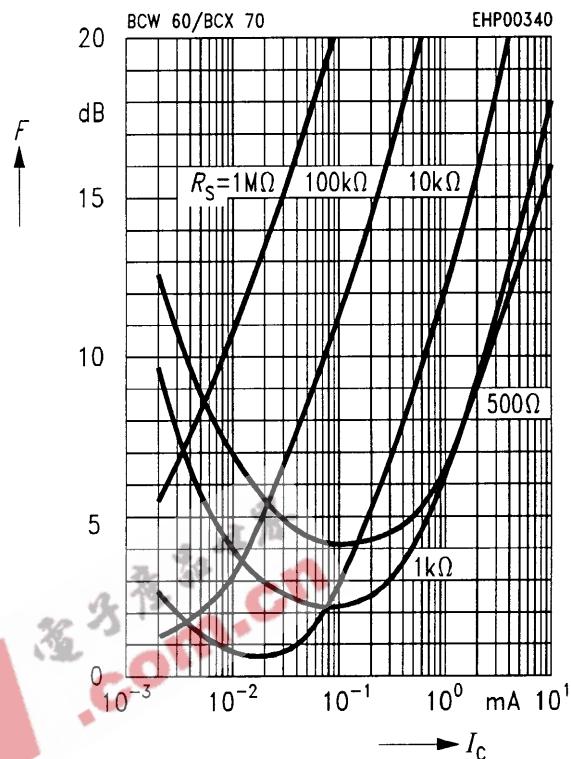
Noise figure $F = f(I_C)$
$V_{CE} = 5$ V, $f = 1$ kHz

Noise figure $F = f(I_C)$
$V_{CE} = 5$ V, $f = 10$ kHz