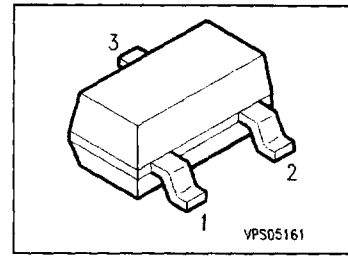
NPN Silicon AF Transistors

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				

[1] For detailed information see chapter Package Outlines.

Maximum Ratings

Parameter	Symbol	Values			Unit
		BCW 60	BCW 60 FF	BCX 70	
Collector-emitter voltage	V_{CEO}	32	32	45	V
Collector-base voltage	V_{CBO}	32	32	45	
Emitter-base voltage	V_{EBO}	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	

1) Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

Electrical Characteristics
at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage	$V_{(BR)CEO}$				V
I_C = 10 mA BCW 60, BCW 60 FF		32	–	–	
BCX 70		45	–	–	
Collector-base breakdown voltage	$V_{(BR)CBO}$				
I_C = 10 µA BCW 60, BCW 60 FF		32	–	–	
BCX 70		45	–	–	
Emitter-base breakdown voltage	$V_{(BR)EBO}$	5	–	–	
I_E = 1 µA					
Collector cutoff current	I_{CBO}				
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_{EBO}	–	–	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	–	–	

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

Electrical Characteristics
at T_A = 25 °C, unless otherwise specified.

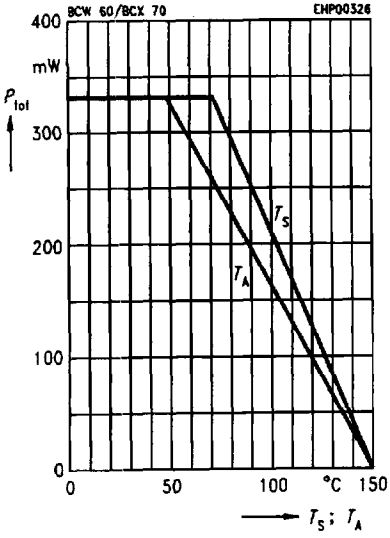
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter saturation voltage[1]	V_{CEsat}				V
I_C = 10 mA, I_B = 0.25 mA		–	0.12	0.25	
I_C = 50 mA, I_B = 1.25 mA		–	0.20	0.55	
Base-emitter saturation voltage[1]	V_{BEsat}				
I_C = 10 mA, I_B = 0.25 mA		–	0.70	0.85	
I_C = 50 mA, I_B = 1.25 mA		–	0.83	1.05	
Base-emitter voltage	$V_{BE\,(on)}$				
I_C = 10 µA, V_{CE} = 5 V		–	0.52	–	
I_C = 2 mA, V_{CE} = 5 V		0.55	0.65	0.75	
I_C = 50 mA, V_{CE} = 1 V [1]		–	0.78	–	
AC characteristics					
Transition frequency	f_t	–	250	–	MHz
I_C = 20 mA, V_{CE} = 5 V, f = 100 MHz					
Output capacitance	C_{obo}	–	3	–	pF
V_{CB} = 10 V, f = 1 MHz					
Input capacitance	C_{ibo}	–	8	–	
V_{EB} = 0.5 V, f = 1 MHz					
Short-circuit input impedance	h_{11e}				kΩ
I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz					
BCW 60 A, BCX 70 G		–	2.7	–	
BCW 60 B, BCX 70 H		–	3.6	–	
BCW 60 FF, BCW 60 C, BCX 70 J		–	4.5	–	
BCW 60 FN, BCW 60 D, BCX 70 K		–	7.5	–	
Open-circuit reverse voltage transfer ratio	h_{12e}				10^{-4}
I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz					
BCW 60 A, BCX 70 G		–	1.5	–	
BCW 60 B, BCX 70 H		–	2.0	–	
BCW 60 FF, BCW 60 C, BCX 70 J		–	2.0	–	
BCW 60 FN, BCW 60 D, BCX 70 K			3.0		

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

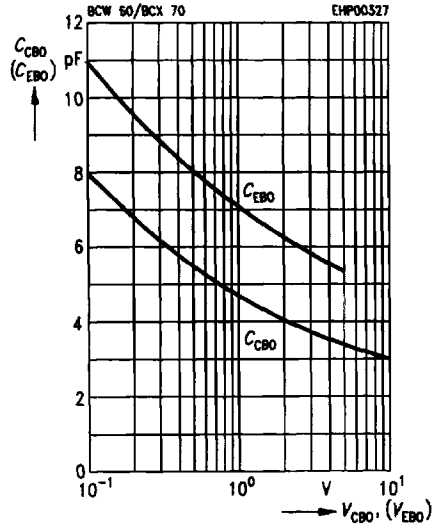
Electrical Characteristics
at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC characteristics					
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	–	–	0.135	µV
BCW 60 FF, BCW 60 FN					

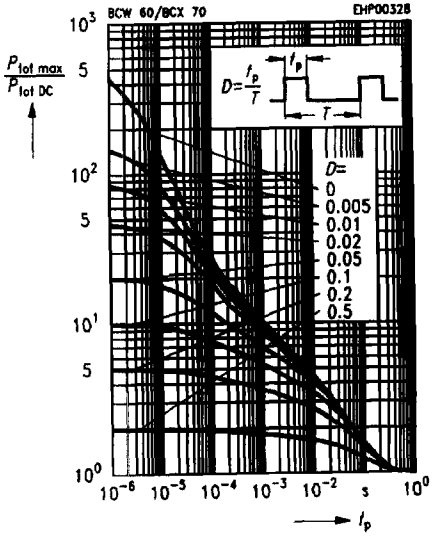
Total power dissipation $P_{tot} = f(T_A^*; T_S)$
* Package mounted on epoxy



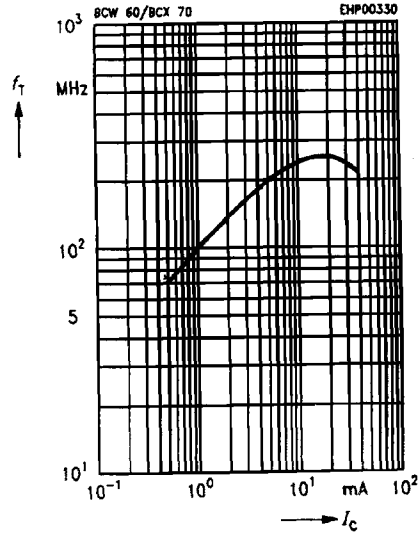
Collector-base capacitance $C_{CBO} = f(V_{CBO})$
Emitter-base capacitance $C_{EBO} = f(V_{EBO})$



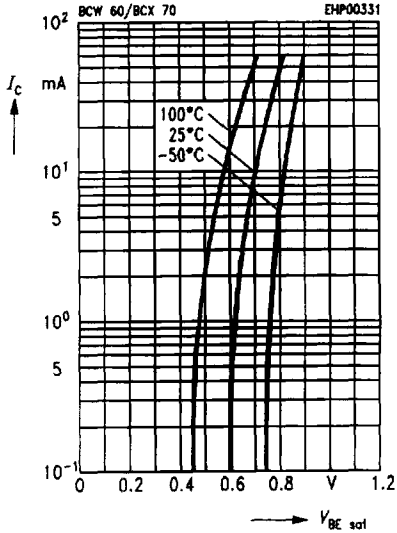
Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f(t_p)$



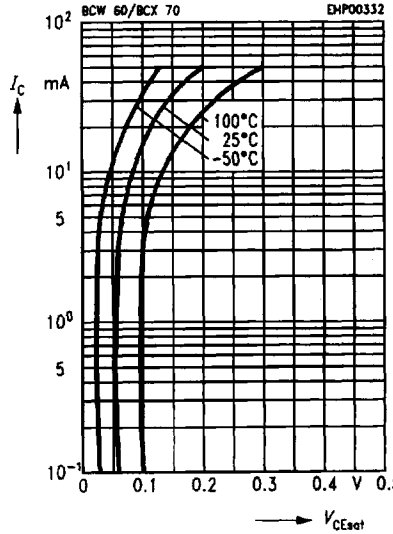
Transition frequency $f_T = f(I_C)$
$V_{CE} = 5$ V



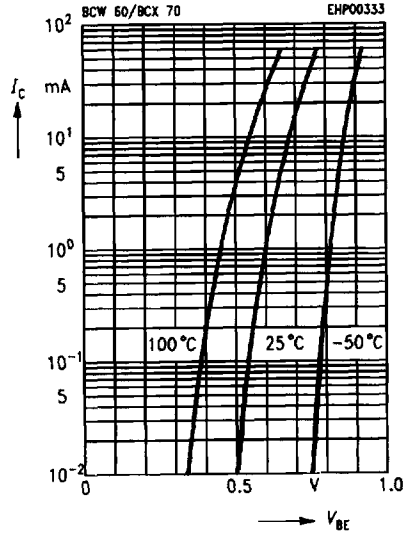
Base-emitter saturation voltage
$I_C = f(V_{BEsat})$
$h_{FE} = 40$



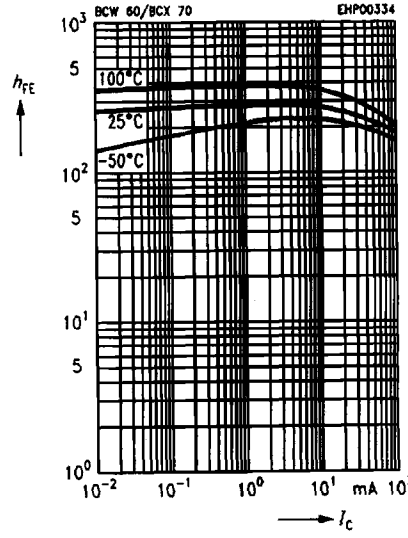
Collector-emitter saturation voltage
$I_C = f(V_{CEsat})$
$h_{FE} = 40$



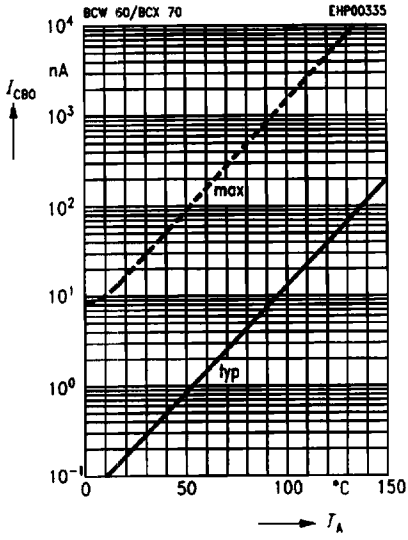
Collector current $I_C = f(V_{BE})$
$V_{CE} = 5$ V



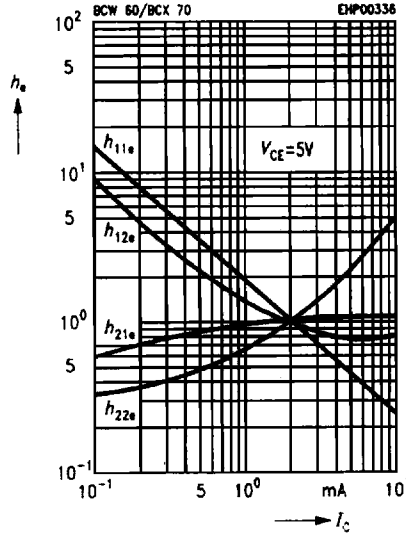
DC current gain $h_{FE} = f(I_C)$
$V_{CE} = 5$ V



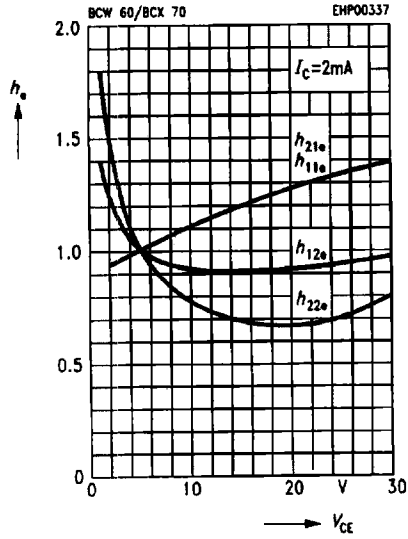
Collector cutoff current $I_{CBO} = f(T_A)$



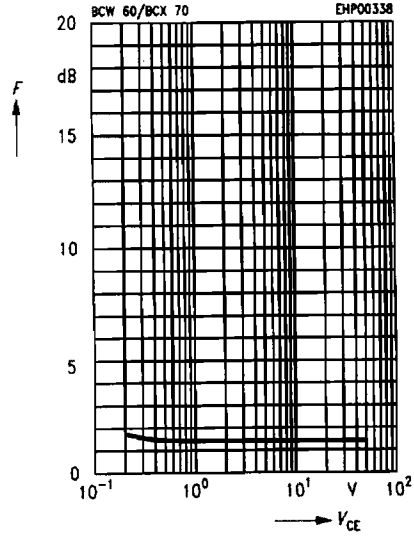
h parameter $h_e = f(I_C)$
$V_{CE} = 5$ V



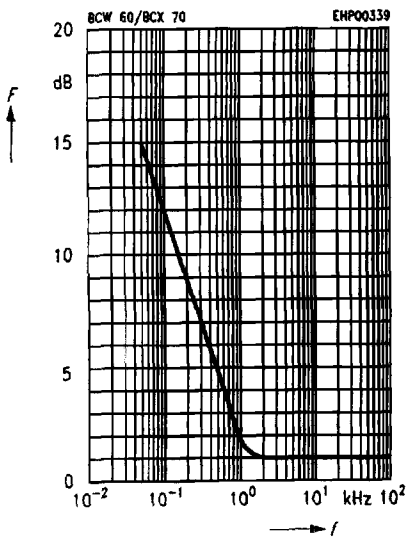
h parameter $h_e = f(V_{CE})$
$I_C = 2$ mA



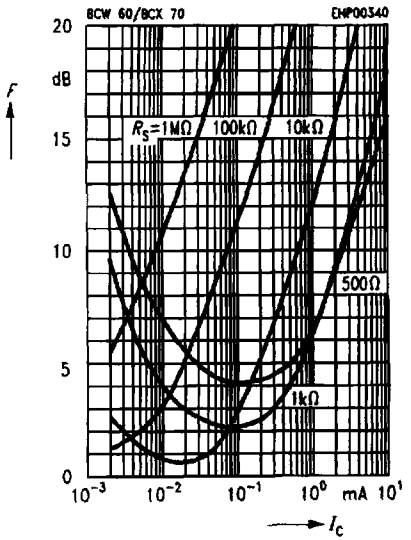
Noise figure $F = f(V_{CE})$
$I_C = 0.2$ mA, $R_S = 2$ kΩ, $f = 1$ kHz



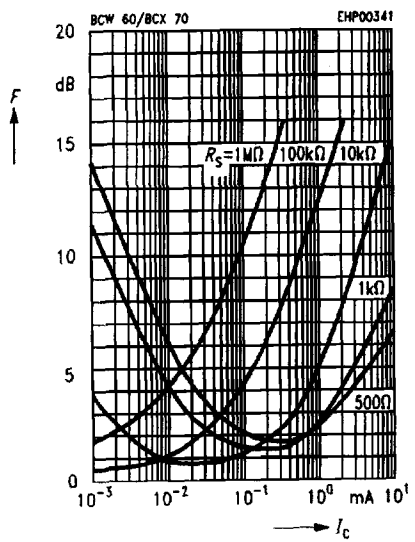
Noise figure $F = f(f)$
I_C = 0.2 mA, R_S = 2 kΩ, V_{CE} = 5 V



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