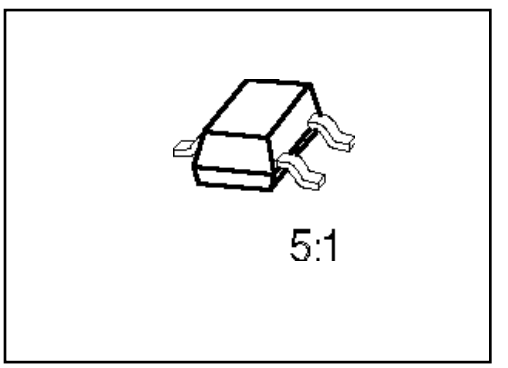
SIEMENS

NPN Silicon AF Transistors

BC 846
... BC 850

- 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: BC 856, BC 857, BC 859, BC 860 (PNP)



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1)]
BC 846 A	1As	Q62702-C1772	B	E	C	SOT-23
BC 846 B	1Bs	Q62702-C1746				
BC 847 A	1Es	Q62702-C1884				
BC 847 B	1Fs	Q62702-C1687				
BC 847 C	1Gs	Q62702-C1715				
BC 848 A	1Js	Q62702-C1741				
BC 848 B	1Ks	Q62702-C1704				
BC 848 C	1Ls	Q62702-C1506				
BC 849 B	2Bs	Q62702-C1727				
BC 849 C	2Cs	Q62702-C1713				
BC 850 B	2Fs	Q62702-C1885				
BC 850 C	2Gs	Q62702-C1712				

1) For detailed information see chapter Package Outlines.

Maximum Ratings

Parameter	Symbol	Values			Unit
		BC 846	BC 847 BC 850	BC 848 BC 849	
Collector-emitter voltage	V_{CE0}	65	45	30	V
Collector-base voltage	V_{CB0}	80	50	30	
Collector-emitter voltage	V_{CES}	80	50	30	
Emitter-base voltage	V_{EB0}	6	6	5	
Collector current	I_C	100			mA
Peak collector current	I_{CM}	200			
Peak base current	I_{BM}	200			
Peak emitter current	I_{EM}	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 cm^2 Cu.

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

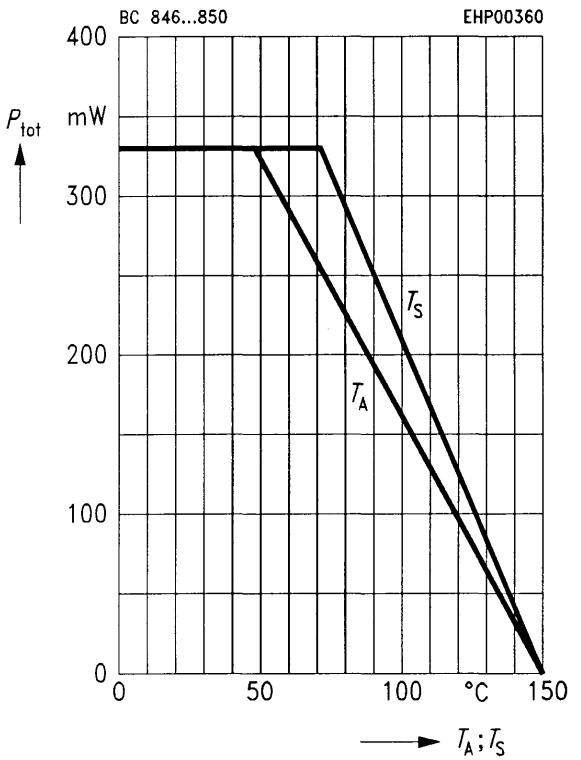
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage	$V_{(BR)CE0}$				V
I_C = 10 mA BC 846		65	–	–	
BC 847, BC 850		45	–	–	
BC 848, BC 849		30	–	–	
Collector-base breakdown voltage	$V_{(BR)CB0}$				
I_C = 10 µA BC 846		80	–	–	
BC 847, BC 850		50	–	–	
BC 848, BC 849		30	–	–	
Collector-emitter breakdown voltage	$V_{(BR)CES}$				
I_C = 10 µA, V_{BE} = 0 BC 846		80	–	–	
BC 847, BC 850		50	–	–	
BC 848, BC 849		30	–	–	
Emitter-base breakdown voltage	$V_{(BR)EB0}$				
I_E = 1 µA BC 846, BC 847		6	–	–	
BC 848, BC 849, BC 850		5	–	–	
Collector cutoff current	I_{CB0}				
V_{CB} = 30 V		–	–	15	nA
V_{CB} = 30 V, T_A = 150 °C		–	–	5	µA
DC current gain	h_{FE}				–
I_C = 10 µA, V_{CE} = 5 V					
BC 846 A, BC 847 A, BC 848 A		–	140	–	
BC 846 B … BC 850 B		–	250	–	
BC 847 C, BC 848 C, BC 849 C, BC 850 C		–	480	–	
I_C = 2 mA, V_{CE} = 5 V					
BC 846 A, BC 847 A, BC 848 A		110	180	220	
BC 846 B … BC 850 B		200	290	450	
BC 847 C, BC 848 C, BC 849 C, BC 850 C		420	520	800	
Collector-emitter saturation voltage[1)]	V_{CEsat}				mV
I_C = 10 mA, I_B = 0.5 mA		–	90	250	
I_C = 100 mA, I_B = 5 mA		–	200	600	
Base-emitter saturation voltage[1)]	V_{BEsat}				
I_C = 10 mA, I_B = 0.5 mA		–	700	–	
I_C = 100 mA, I_B = 5 mA		–	900	–	
Base-emitter voltage	$V_{BE(on)}$				
I_C = 2 mA, V_{CE} = 5 V		580	660	700	
I_C = 10 mA, V_{CE} = 5 V		–	–	770	

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

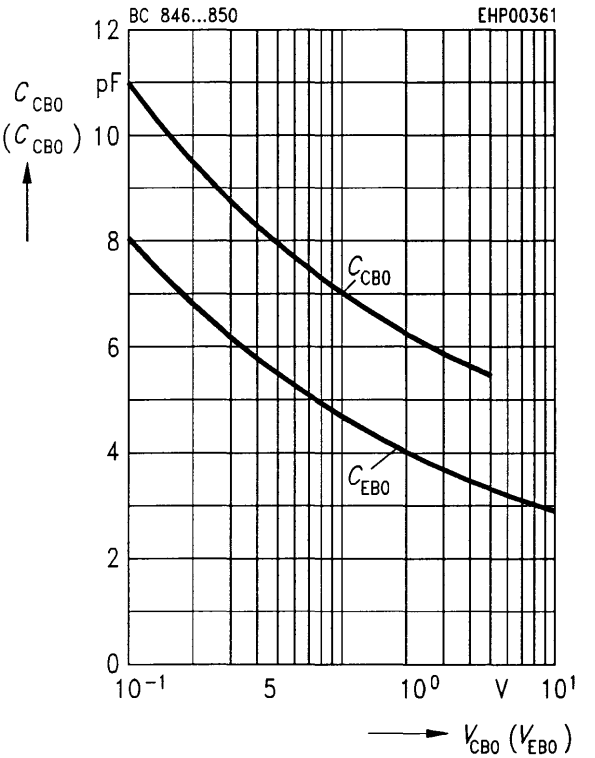
Electrical Characteristics
at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC characteristics					
Transition frequency I_C = 20 mA, V_{CE} = 5 V, f = 100 MHz	f_T	–	250	–	MHz
Output capacitance V_{CB} = 10 V, f = 1 MHz	C_{obo}	–	3	–	pF
Input capacitance V_{CB} = 0.5 V, f = 1 MHz	C_{ibo}	–	8	–	
Short-circuit input impedance I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{11e}				kΩ
BC 846 A … BC 848 A		–	2.7	–	
BC 846 B … BC 850 B		–	4.5	–	
BC 847 C … BC 850 C		–	8.7	–	
Open-circuit reverse voltage transfer ratio I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{12e}				10^{-4}
BC 846 A … BC 848 A		–	1.5	–	
BC 846 B … BC 850 B		–	2.0	–	
BC 847 C … BC 850 C		–	3.0	–	
Short-circuit forward current transfer ratio I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{21e}				–
BC 846 A … BC 848 A		–	200	–	
BC 846 B … BC 850 B		–	330	–	
BC 847 C … BC 850 C		–	600	–	
Open-circuit output admittance I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{22e}				µS
BC 846 A … BC 848 A		–	18	–	
BC 846 B … BC 850 B		–	30	–	
BC 847 C … BC 850 C		–	60	–	
Noise figure I_C = 0.2 mA, V_{CE} = 5 V, R_S = 2 kΩ	F				dB
f = 30 Hz … 15 kHz BC 849		–	1.4	4	
BC 850		–	1.4	3	
f = 1 kHz, Δf = 200 Hz BC 849		–	1.2	4	
BC 850		–	1.0	4	
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
BC 850					

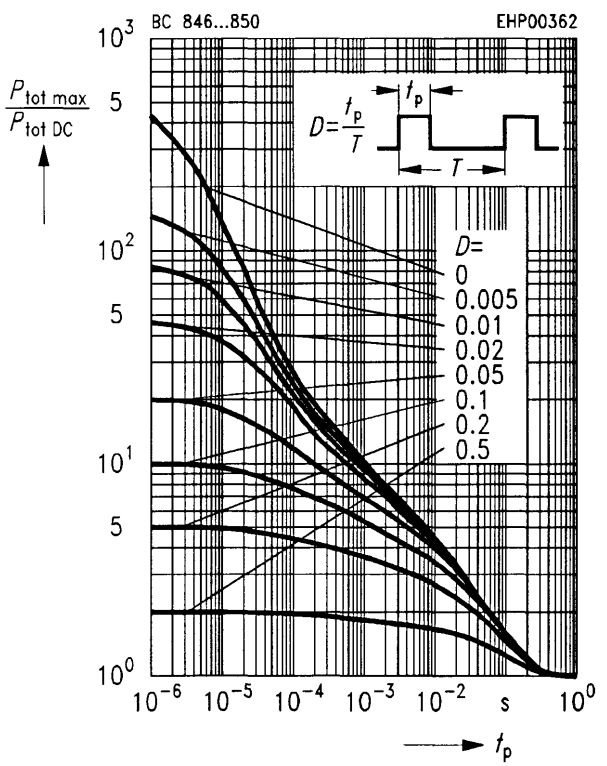
Total power dissipation $P_{tot} = f(T_A^*; T_S)$
* Package mounted on epoxy



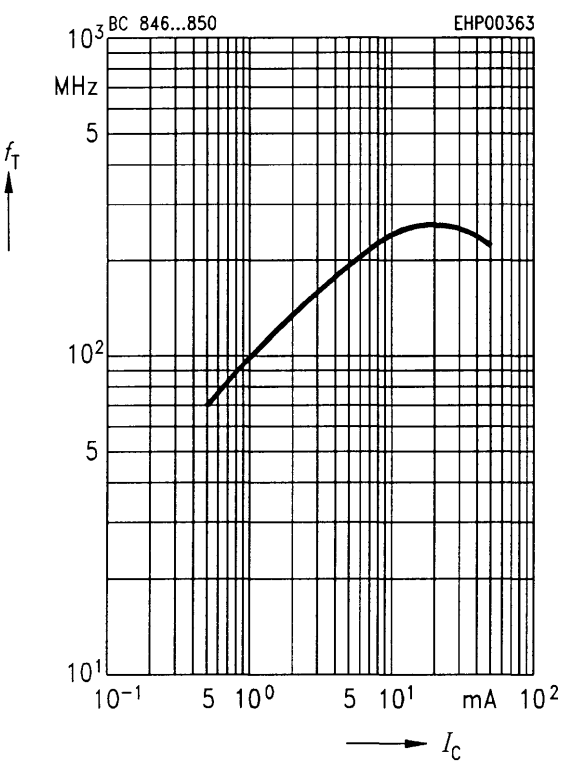
Collector-base capacitance $C_{CB0} = f(V_{CB0})$
Emitter-base capacitance $C_{EB0} = f(V_{EB0})$



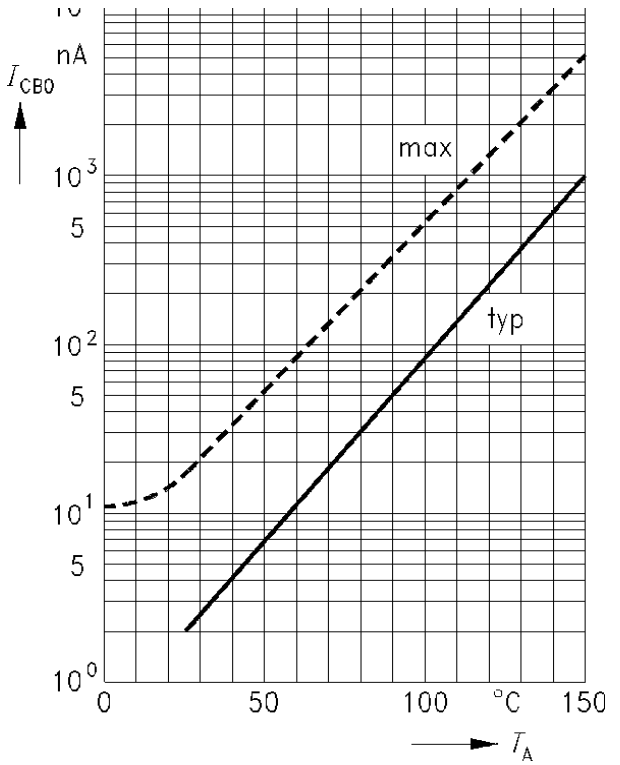
Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f(t_p)$



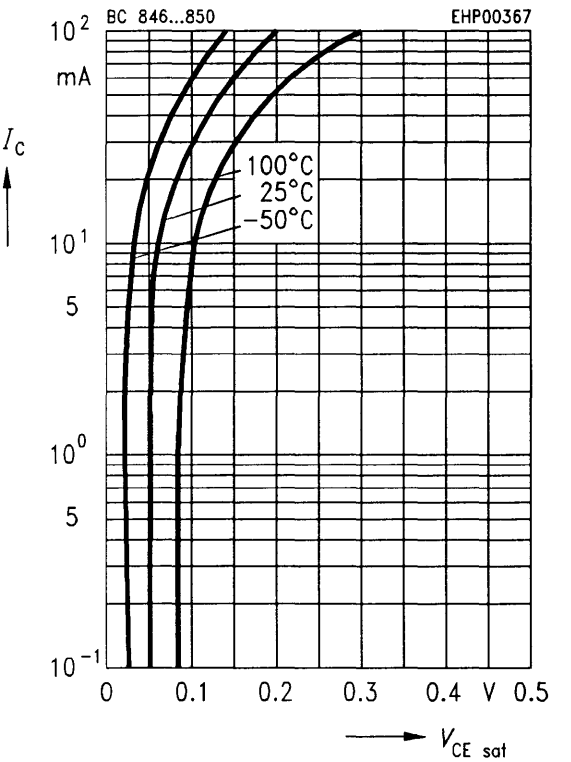
Transition frequency $f_T = f(I_C)$
V_{CE} = 5 V



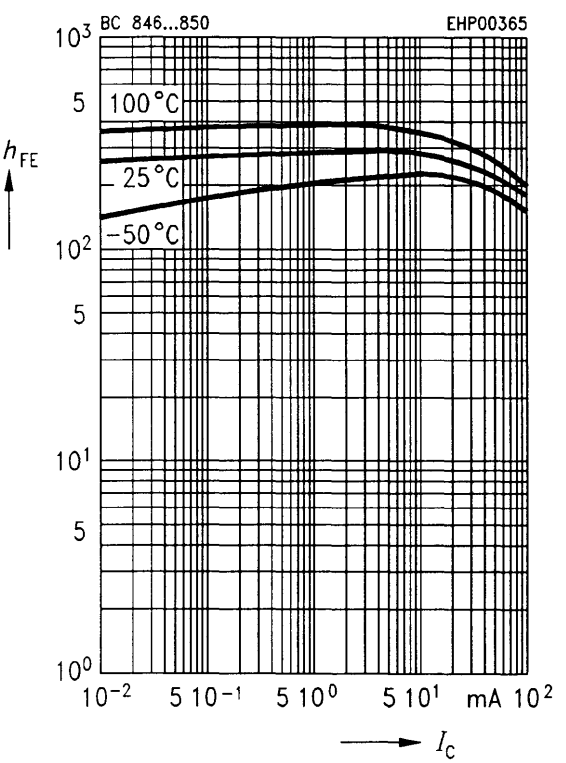
Collector cutoff current $I_{CB0} = f(T_A)$
V_{CB} = 30 V



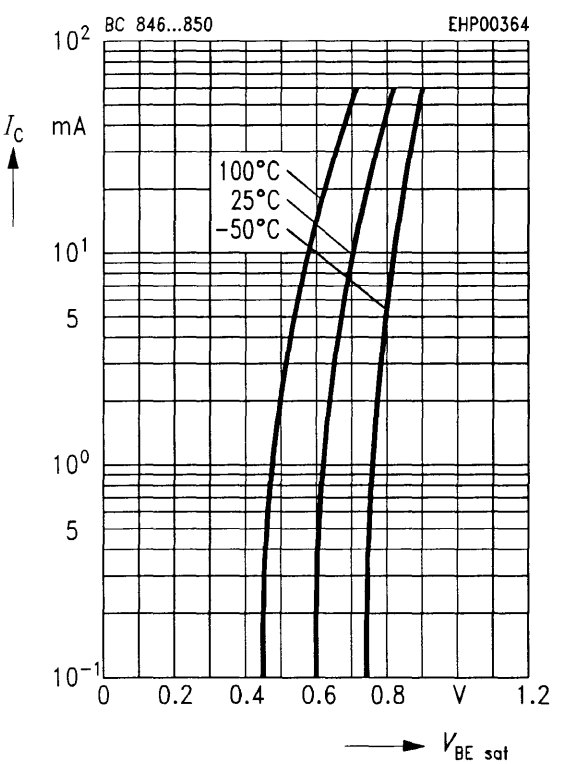
Collector-emitter saturation voltage
$I_C = f(V_{CEsat})$, h_{FE} = 20



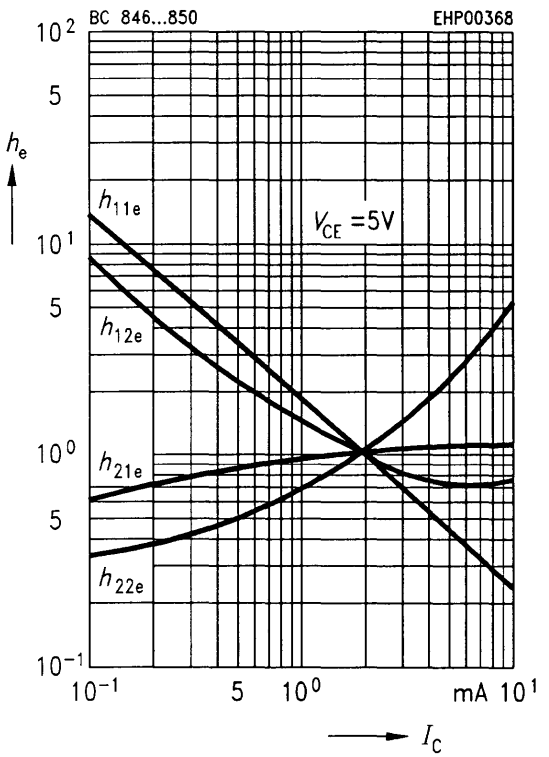
DC current gain $h_{FE} = f(I_C)$
V_{CE} = 5 V



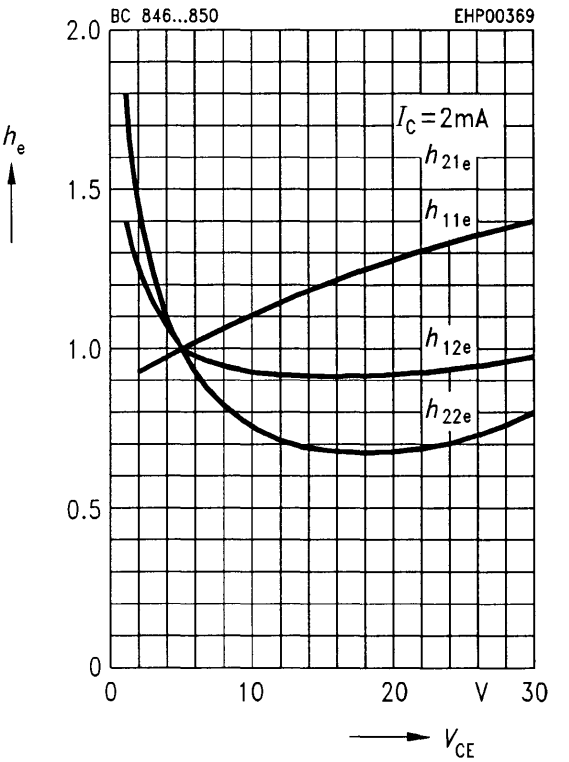
Base-emitter saturation voltage
$I_C = f(V_{BEsat})$, h_{FE} = 20



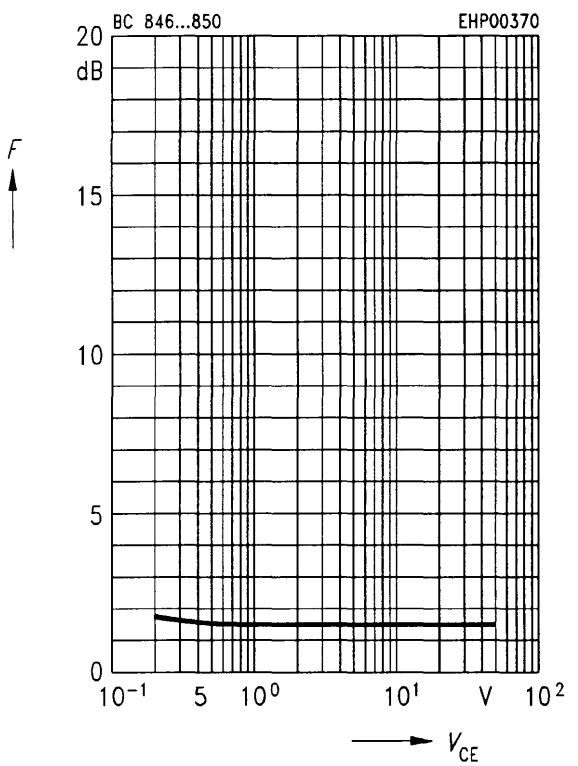
h parameter $h_e = f(I_C)$
V_{CE} = 5 V



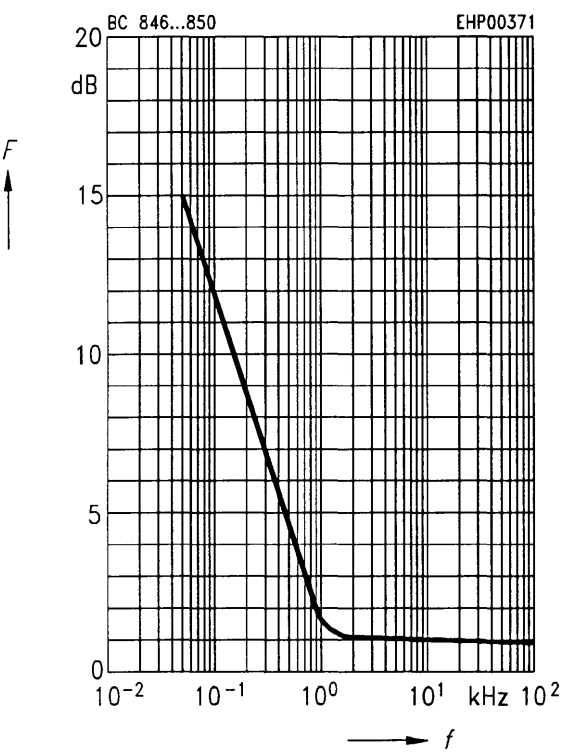
h parameter $h_e = f(V_{CE})$
I_C = 2 mA



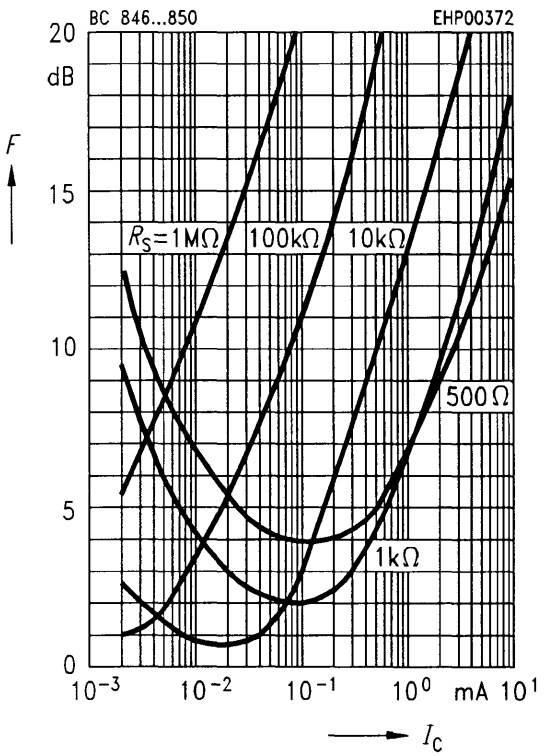
Noise figure $F = f(V_{CE})$
I_C = 0.2 mA, R_S = 2 kΩ, f = 1 kHz



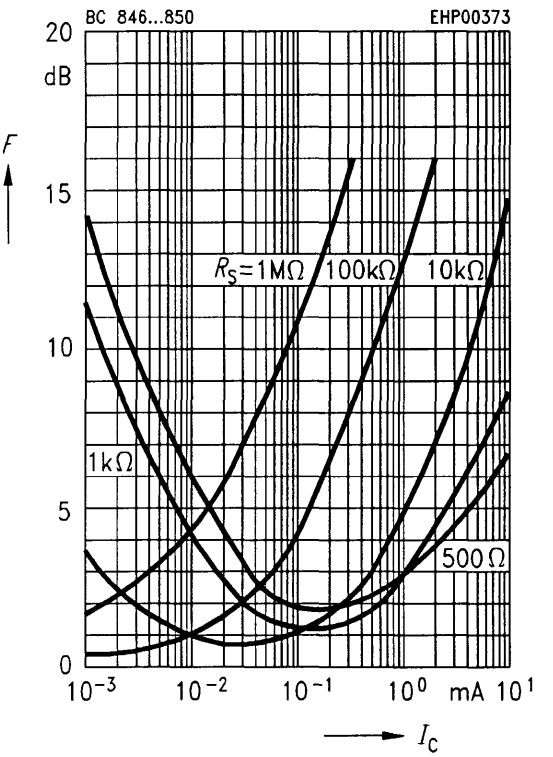
Noise figure $F = f(f)$
I_C = 0.2 mA, V_{CE} = 5 V, R_S = 2 kΩ



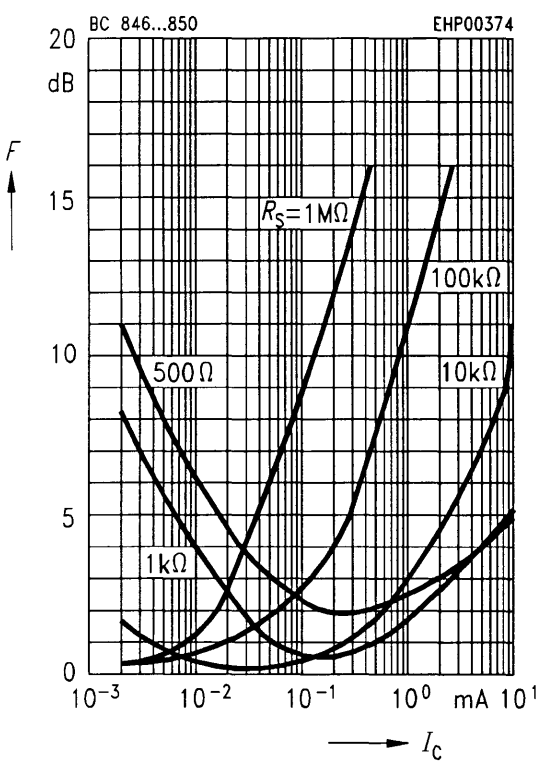
Noise figure $F = f(I_C)$
V_{CE} = 5 V, f = 120 Hz



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

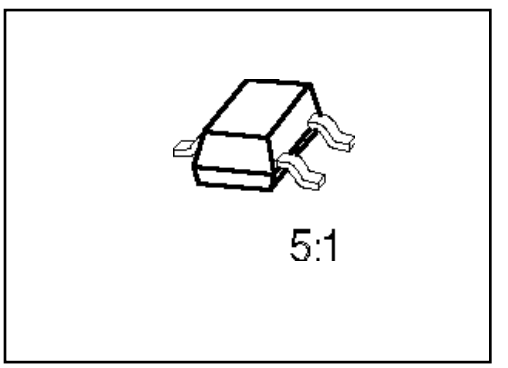


SIEMENS

PNP Silicon AF Transistors

BC 856
... BC 860

- 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: BC 846, BC 847, BC 849, BC 850 (NPN)



Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1)]
BC 856 A	3As	Q62702-C1773	B	E	C	SOT-23
BC 856 B	3Bs	Q62702-C1886				
BC 857 A	3Es	Q62702-C1850				
BC 857 B	3Fs	Q62702-C1688				
BC 857 C	3Gs	Q62702-C1851				
BC 858 A	3Js	Q62702-C1742				
BC 858 B	3Ks	Q62702-C1698				
BC 858 C	3Ls	Q62702-C1507				
BC 859 A	4As	Q62702-C1887				
BC 859 B	4Bs	Q62702-C1774				
BC 859 C	4Cs	Q62702-C1761				
BC 860 B	4Fs	Q62702-C1888				
BC 860 C	4Gs	Q62702-C1889				

1) For detailed information see chapter Package Outlines.

Maximum Ratings

Parameter	Symbol	Values			Unit
		BC 856	BC 857 BC 860	BC 858 BC 859	
Collector-emitter voltage	V_{CE0}	65	45	30	V
Collector-base voltage	V_{CB0}	80	50	30	
Collector-emitter voltage	V_{CES}	80	50	30	
Emitter-base voltage	V_{EB0}	5	5	5	
Collector current	I_C	100			mA
Peak collector current	I_{CM}	200			
Peak base current	I_{BM}	200			
Peak emitter current	I_{EM}	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 cm^2 Cu.

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

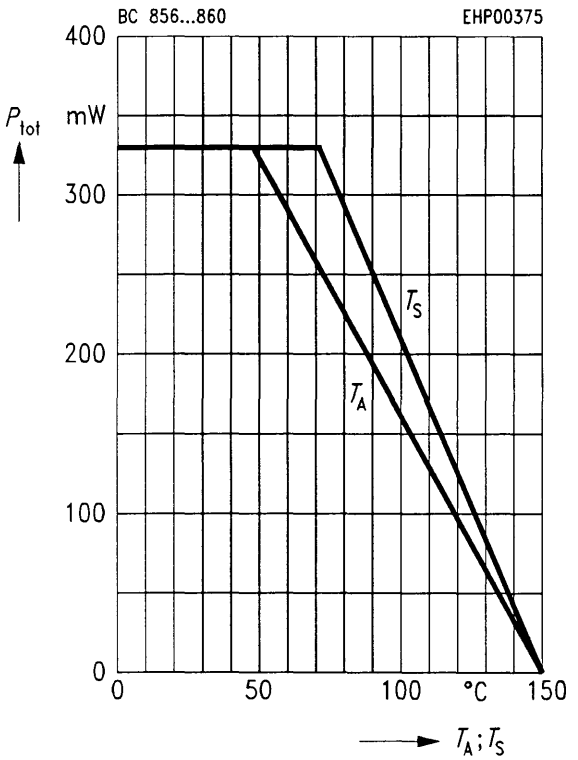
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage	$V_{(BR)CE0}$				V
I_C = 10 mA BC 856		65	–	–	
BC 857, BC 860		45	–	–	
BC 858, BC 859		30	–	–	
Collector-base breakdown voltage	$V_{(BR)CB0}$				
I_C = 10 µA BC 856		80	–	–	
BC 857, BC 860		50	–	–	
BC 858, BC 859		30	–	–	
Collector-emitter breakdown voltage	$V_{(BR)CES}$				
I_C = 10 µA, V_{BE} = 0 BC 856		80	–	–	
BC 857, BC 860		50	–	–	
BC 858, BC 859		30	–	–	
Emitter-base breakdown voltage	$V_{(BR)EB0}$	5	–	–	
I_E = 1 µA					
Collector cutoff current	I_{CB0}				
V_{CB} = 30 V		–	1	15	nA
V_{CB} = 30 V, T_A = 150 ˚C		–	–	4	µA
DC current gain	h_{FE}				–
I_C = 10 µA, V_{CE} = 5 V					
BC 856 A … BC 859 A		–	140	–	
BC 856 B … BC 860 B		–	250	–	
BC 857 C … BC 860 C		–	480	–	
I_C = 2 mA, V_{CE} = 5 V					
BC 856 A … BC 859 A		125	180	250	
BC 856 B … BC 860 B		220	290	475	
BC 857 C … BC 860 C		420	520	800	
Collector-emitter saturation voltage[1)]	V_{CEsat}				mV
I_C = 10 mA, I_B = 0.5 mA		–	75	300	
I_C = 100 mA, I_B = 5 mA		–	250	650	
Base-emitter saturation voltage[1)]	V_{BEsat}				
I_C = 10 mA, I_B = 0.5 mA		–	700	–	
I_C = 100 mA, I_B = 5 mA		–	850	–	
Base-emitter voltage	$V_{BE(on)}$				
I_C = 2 mA, V_{CE} = 5 V		600	650	750	
I_C = 10 mA, V_{CE} = 5 V		–	–	820	

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

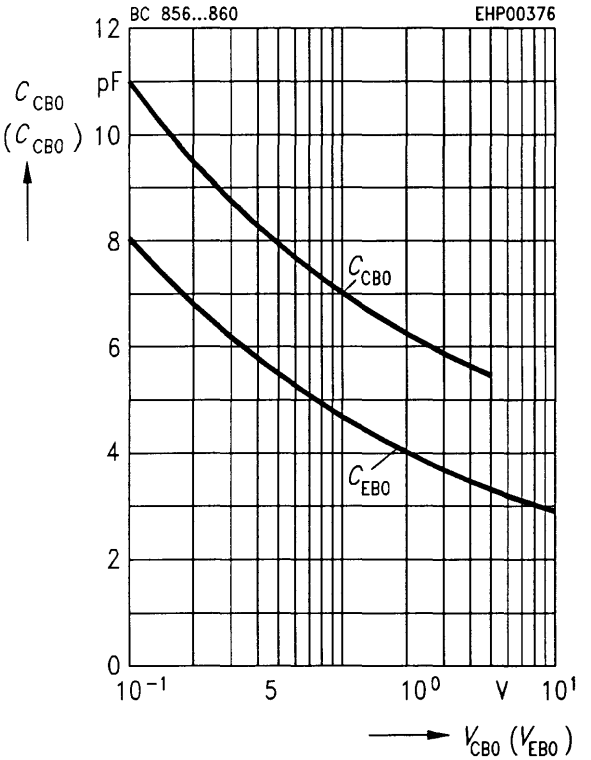
Electrical Characteristics
at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC characteristics					
Transition frequency I_C = 20 mA, V_{CE} = 5 V, f = 100 MHz	f_T	–	250	–	MHz
Output capacitance V_{CB} = 10 V, f = 1 MHz	C_{obo}	–	3	–	pF
Input capacitance V_{CB} = 0.5 V, f = 1 MHz	C_{ibo}	–	8	–	
Short-circuit input impedance I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{11e}				kΩ
BC 856 A … BC 859 A		–	2.7	–	
BC 856 B … BC 860 B		–	4.5	–	
BC 857 C … BC 860 C		–	8.7	–	
Open-circuit reverse voltage transfer ratio I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{12e}				10^{-4}
BC 856 A … BC 859 A		–	1.5	–	
BC 856 B … BC 860 B		–	2.0	–	
BC 857 C … BC 860 C		–	3.0	–	
Short-circuit forward current transfer ratio I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{21e}				–
BC 856 A … BC 859 A		–	200	–	
BC 856 B … BC 860 B		–	330	–	
BC 857 C … BC 860 C		–	600	–	
Open-circuit output admittance I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{22e}				µS
BC 856 A … BC 859 A		–	18	–	
BC 856 B … BC 860 B		–	30	–	
BC 857 C … BC 860 C		–	60	–	
Noise figure I_C = 0.2 mA, V_{CE} = 5 V, R_S = 2 kΩ	F				dB
f = 30 Hz … 15 kHz BC 859		–	1.2	4	
BC 860		–	1.0	3	
f = 1 kHz, Δf = 200 Hz BC 859		–	1.0	4	
BC 860		–	1.0	4	
Equivalent noise voltage I_C = 0.2 mA, V_{CE} = 5 V, R_S = 2 kΩ f = 10 Hz … 50 Hz	V_n	–	–	0.110	µV
BC 860					

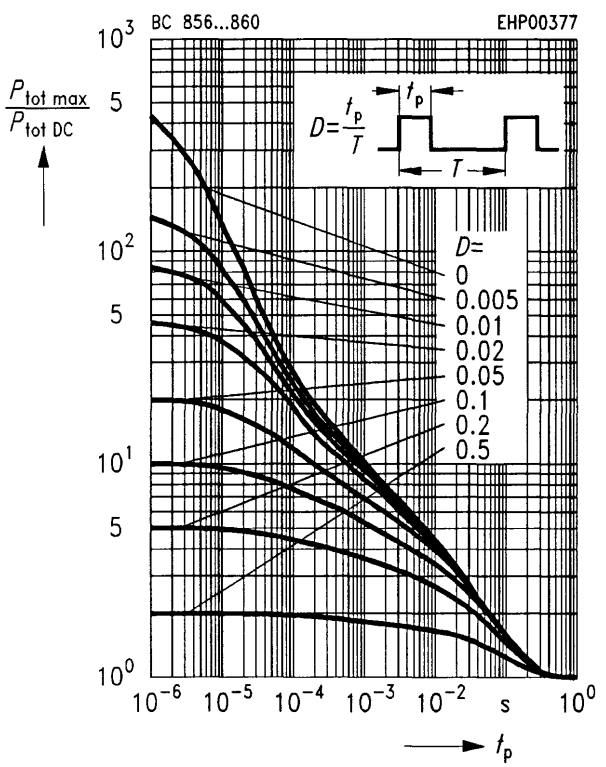
Total power dissipation $P_{tot} = f(T_A^*; T_S)$
* Package mounted on epoxy



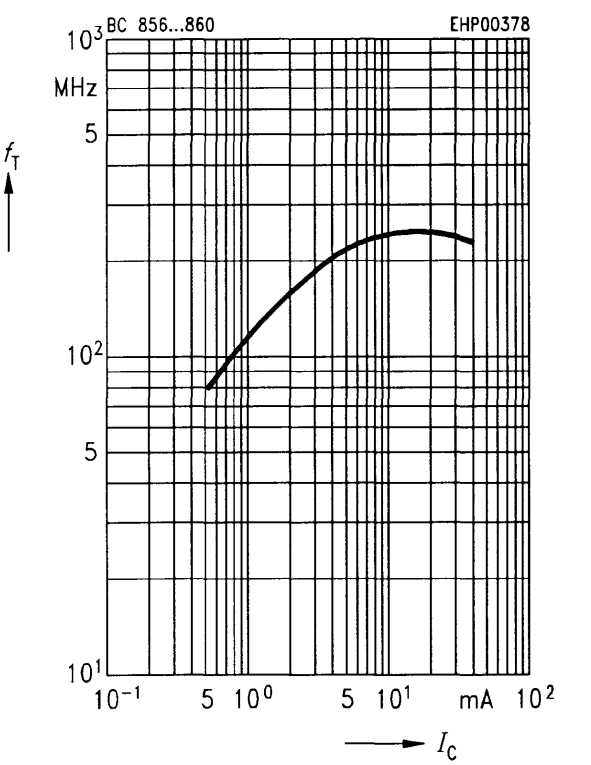
Collector-base capacitance $C_{CB0} = f(V_{CB0})$
Emitter-base capacitance $C_{EB0} = f(V_{EB0})$



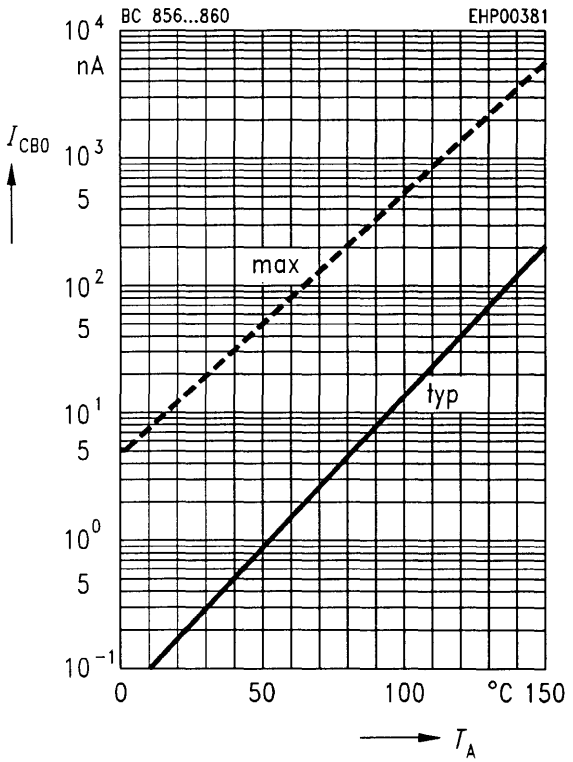
Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f(t_p)$



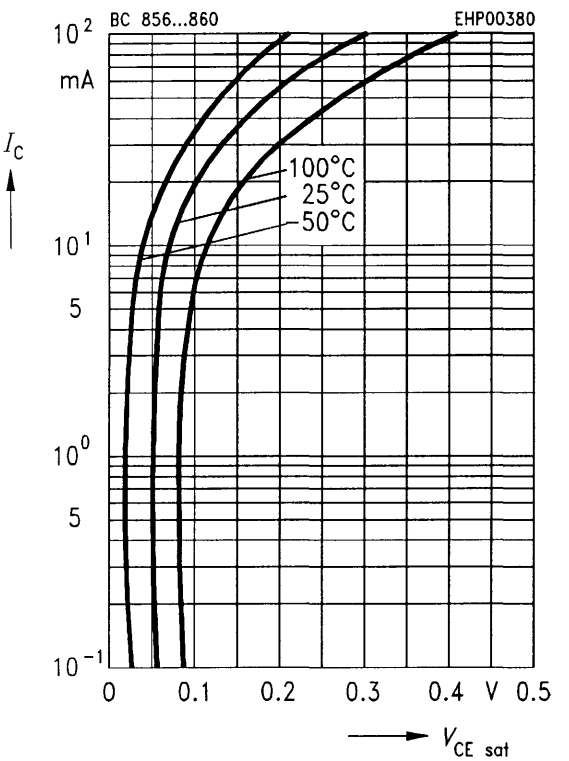
Transition frequency $f_T = f(I_C)$
V_{CE} = 5 V



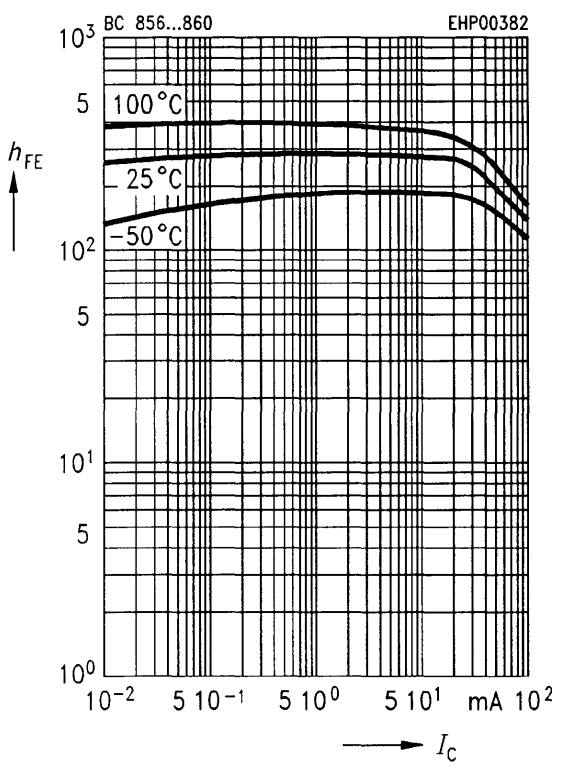
Collector cutoff current $I_{CB0} = f(T_A)$
V_{CB} = 30 V



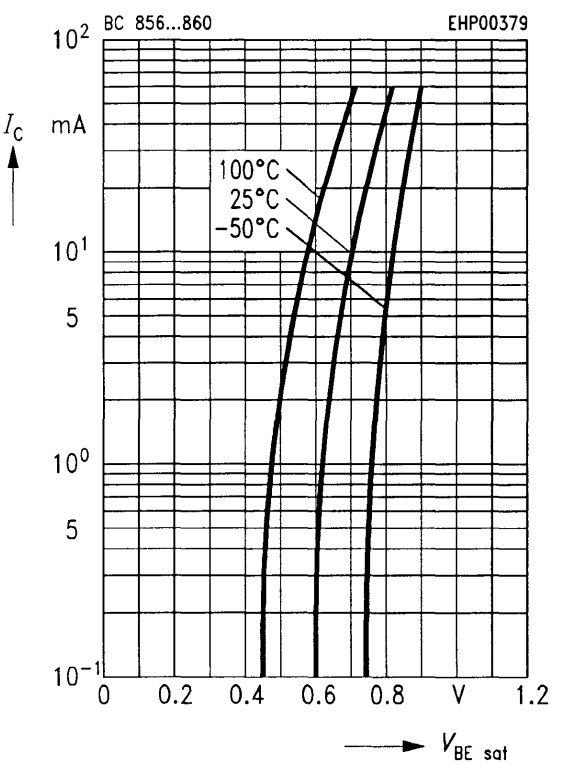
Collector-emitter saturation voltage
$I_C = f(V_{CEsat})$, h_{FE} = 20



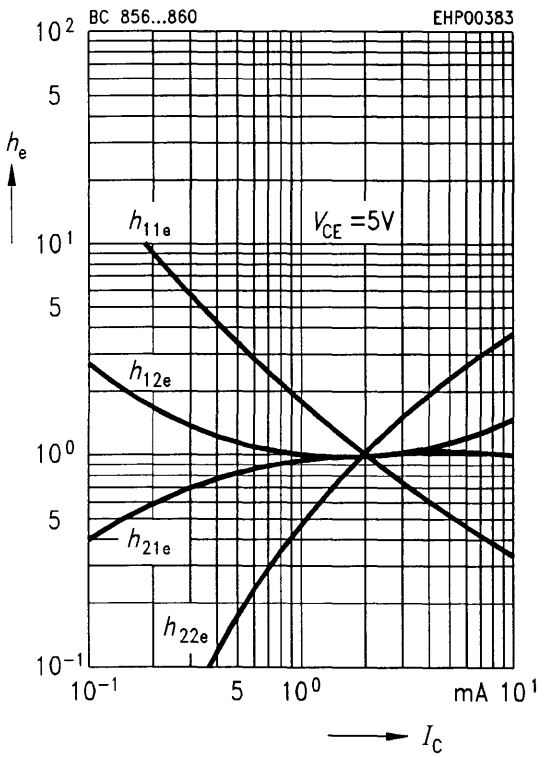
DC current gain $h_{FE} = f(I_C)$
V_{CE} = 5 V



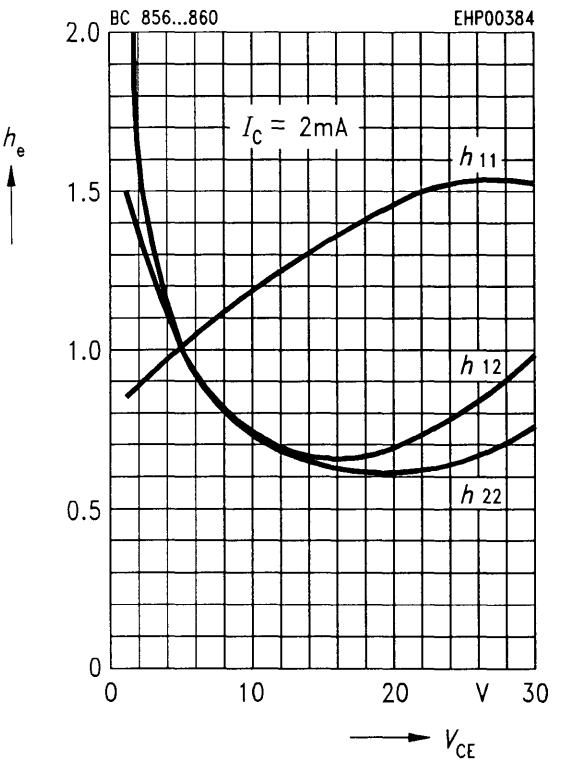
Base-emitter saturation voltage
$I_C = f(V_{BEsat})$, h_{FE} = 20



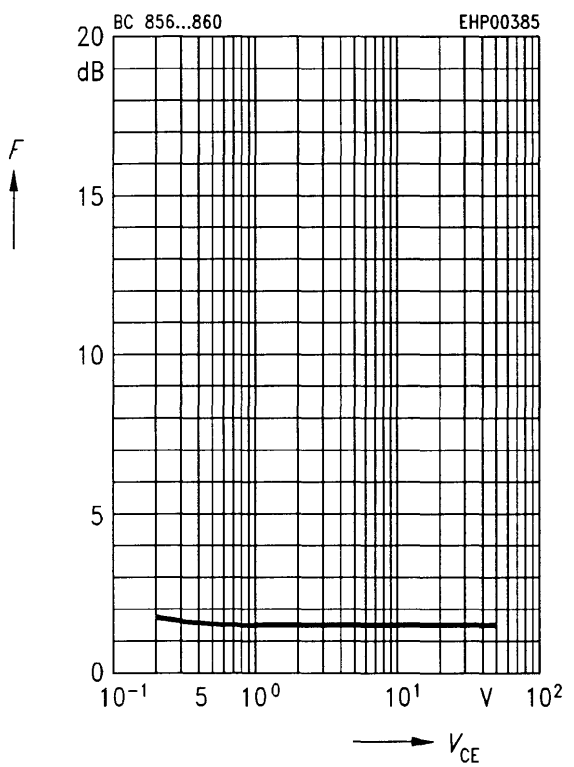
h parameter $h_e = f(I_C)$
V_{CE} = 5 V



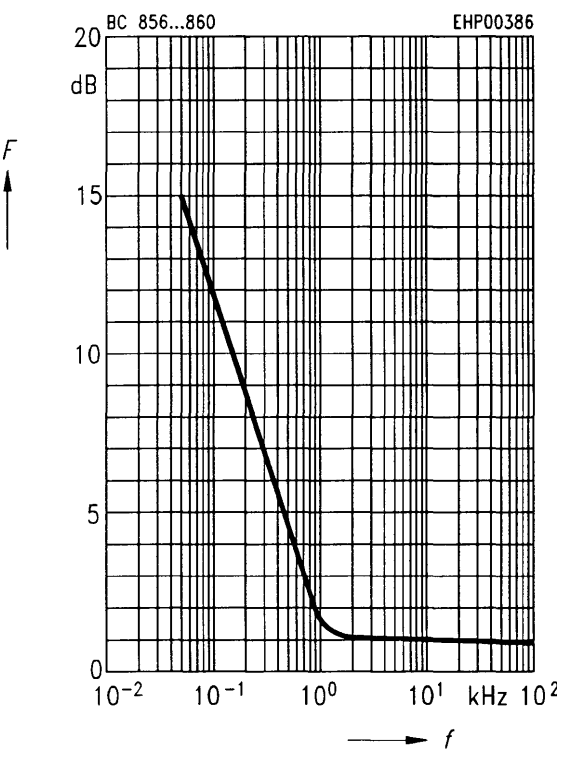
h parameter $h_e = f(V_{CE})$
I_C = 2 mA



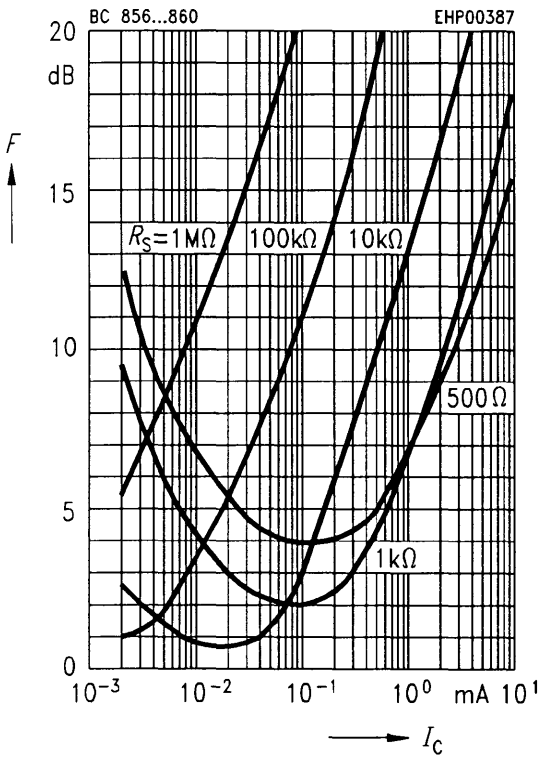
Noise figure $F = f(V_{CE})$
I_C = 0.2 mA, R_S = 2 kΩ, f = 1 kHz



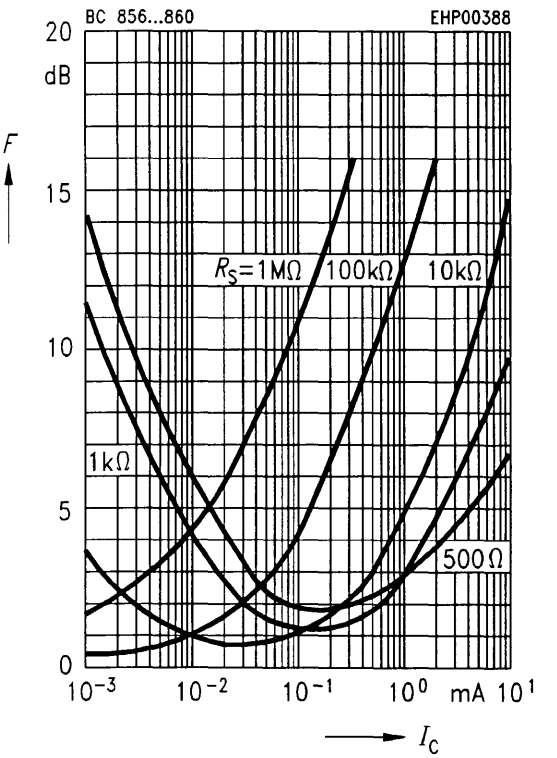
Noise figure $F = f(f)$
I_C = 0.2 mA, R_S = 2 kΩ, V_{CE} = 5 V



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