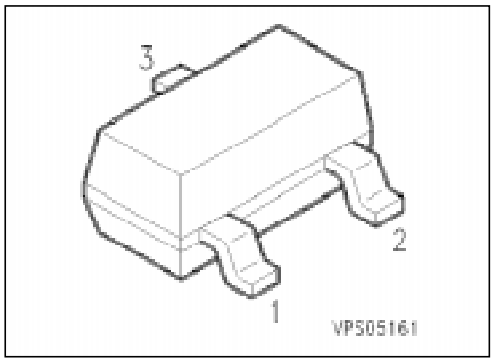
SIEMENS

## PNP Silicon AF Transistors

## BC 856 ... BC 860

### Features

- 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<br>BC 860 | BC 858<br>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.

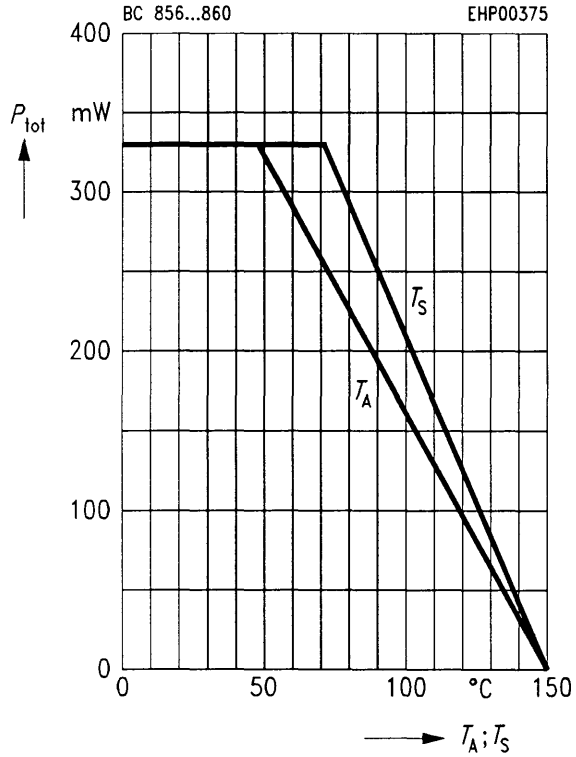
| Parameter | Symbol | Values | | | Unit |
|---|---|---|---|---|---|
| | | min. | typ. | max. | |
| **DC characteristics** | | | | | |
| Collector-emitter breakdown voltage | $V_{(BR)CE0}$ | | | | V |
| $I_C$ = 10 mA BC 856 | | 65 | – | – | |
| BC 857, BC 860 | | 45 | – | – | |
| BC 858, BC 859 | | 30 | – | – | |
| 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 %.

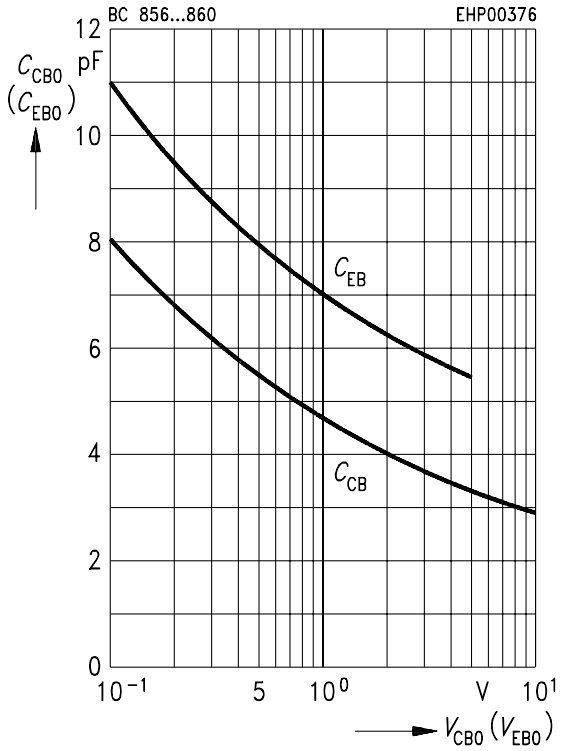
**Electrical Characteristics**
at $T_A$ = 25 °C, unless otherwise specified.

| Parameter | Symbol | Values | | | Unit |
|---|---|---|---|---|---|
| | | min. | typ. | max. | |
| **AC characteristics** | | | | | |
| Transition frequency<br>$I_C$ = 20 mA, $V_{CE}$ = 5 V, $f$ = 100 MHz | $f_T$ | – | 250 | – | MHz |
| Output capacitance<br>$V_{CB}$ = 10 V, $f$ = 1 MHz | $C_{obo}$ | – | 3 | – | pF |
| Input capacitance<br>$V_{CB}$ = 0.5 V, $f$ = 1 MHz | $C_{ibo}$ | – | 8 | – | |
| Short-circuit input impedance<br>$I_C$ = 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<br>$I_C$ = 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<br>$I_C$ = 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<br>$I_C$ = 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<br>$I_C$ = 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, $\Delta f$ = 200 Hz BC 859 | | – | 1.0 | 4 | |
| BC 860 | | – | 1.0 | 4 | |
| Equivalent noise voltage<br>$I_C$ = 0.2 mA, $V_{CE}$ = 5 V, $R_S$ = 2 kΩ<br>$f$= 10 Hz … 50 Hz<br>BC 860 | $V_n$ | – | – | 0.110 | µV |

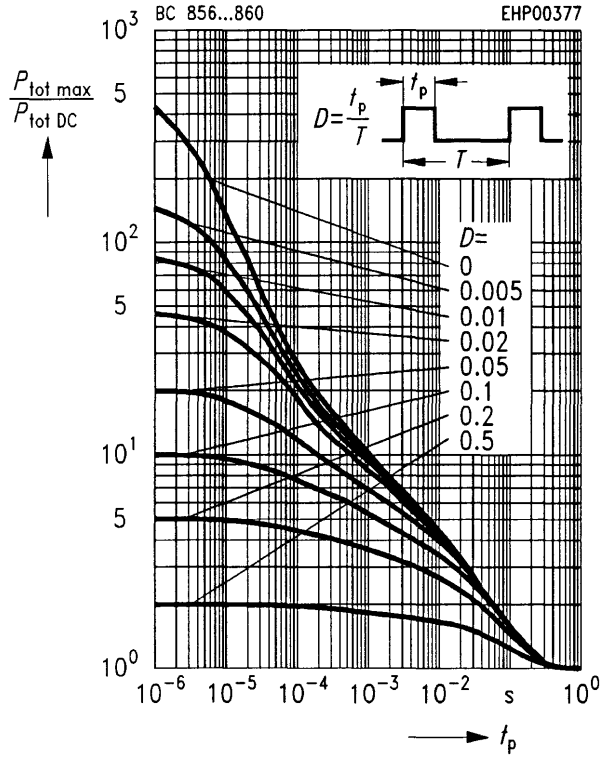
**Total power dissipation** $P_{tot} = f(T_A^*; T_S)$
* Package mounted on epoxy



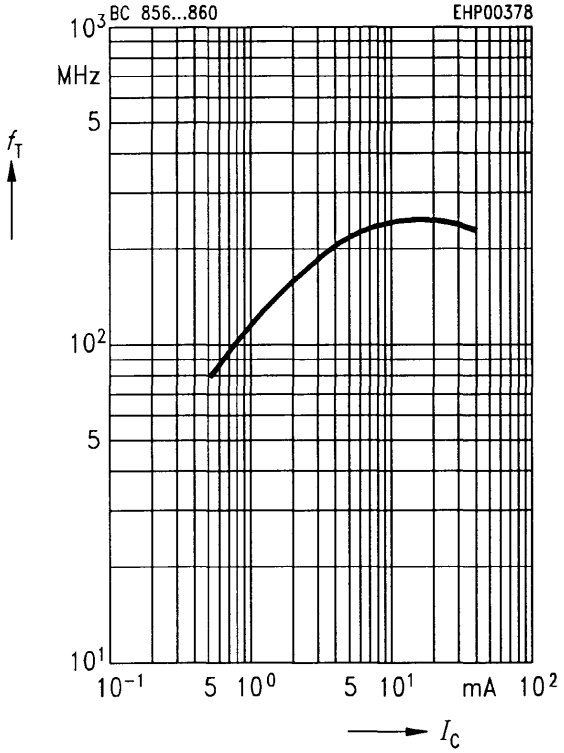

**Collector-base capacitance** $C_{CB0} = f(V_{CB0})$
**Emitter-base capacitance** $C_{EB0} = f(V_{EB0})$



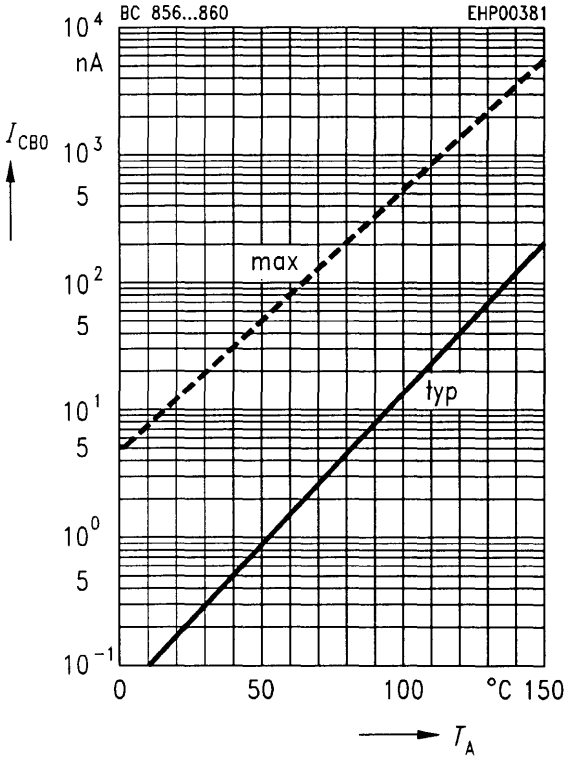

**Permissible pulse load** $P_{tot\,max}/P_{tot\,DC} = f(t_p)$



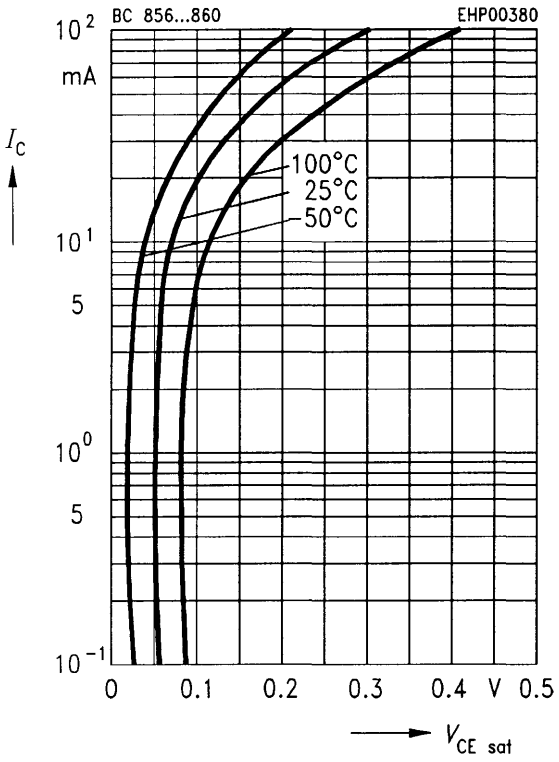

**Transition frequency** $f_T = f(I_C)$
$V_{CE}$ = 5 V



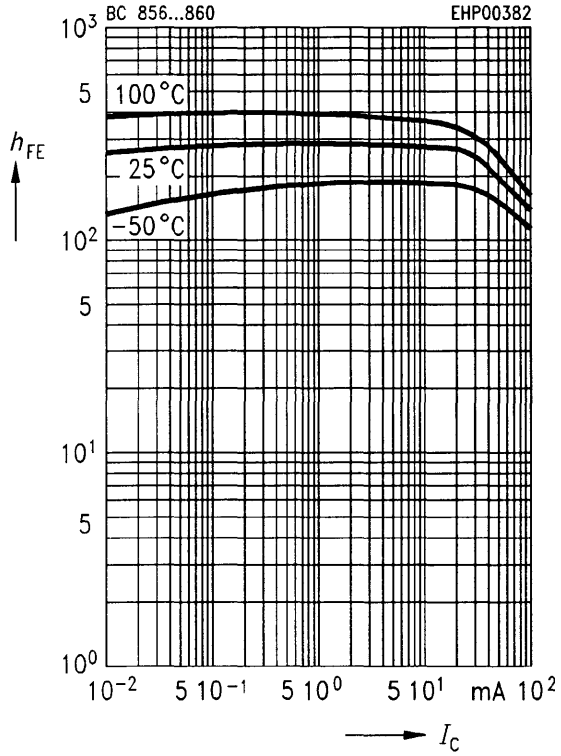
**Collector cutoff current** $I_{CB0} = f(T_A)$
$V_{CB}$ = 30 V



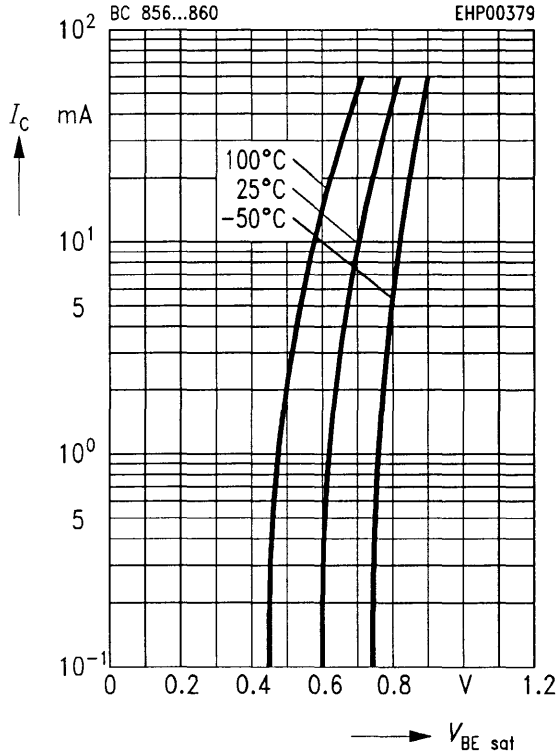

**Collector-emitter saturation voltage**
$I_C = f(V_{CEsat})$, $h_{FE}$ = 20



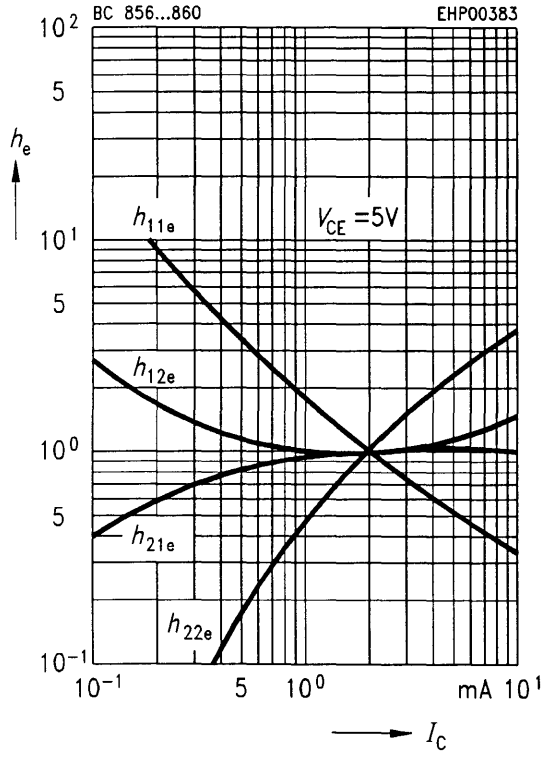

**DC current gain** $h_{FE} = f(I_C)$
$V_{CE}$ = 5 V



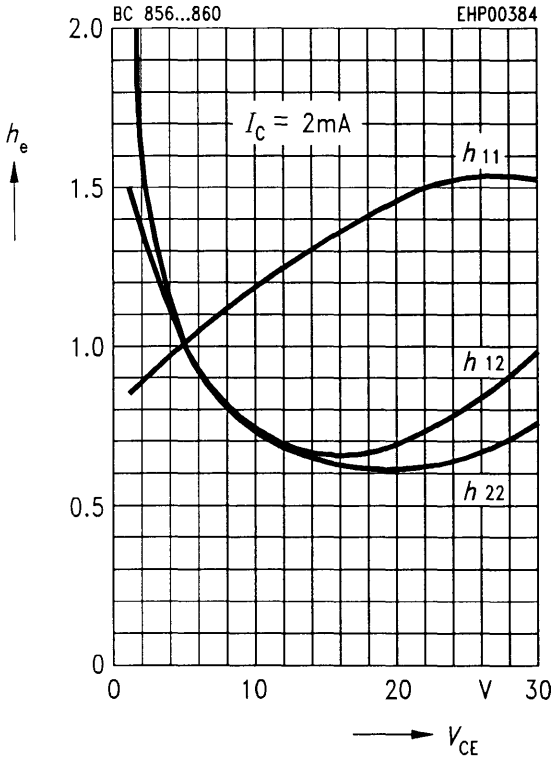

**Base-emitter saturation voltage**
$I_C = f(V_{BEsat})$, $h_{FE}$ = 20



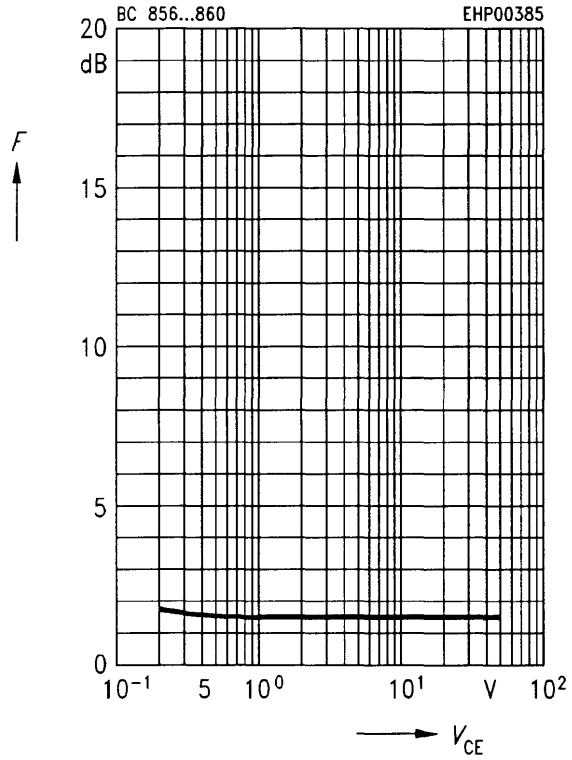
**h parameter** $h_e = f(I_C)$ **normalized**
$V_{CE}$ = 5 V



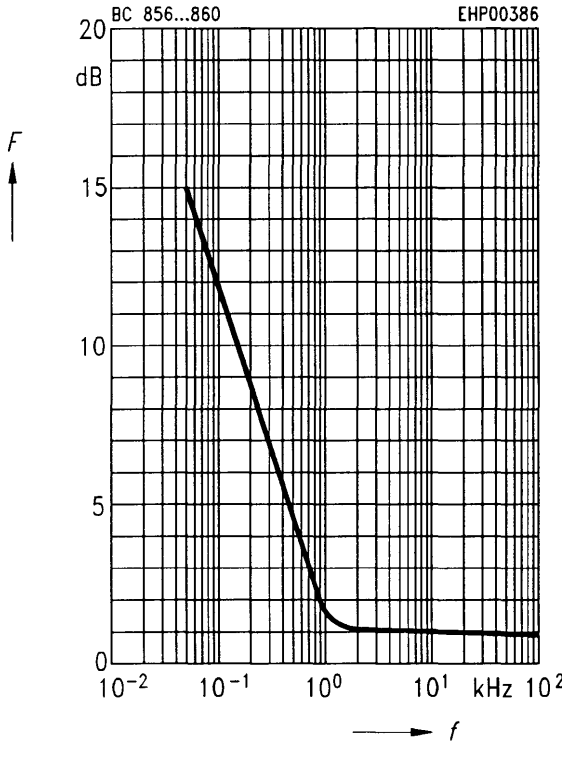

**h parameter** $h_e = f(V_{CE})$ **normalized**
$I_C$ = 2 mA



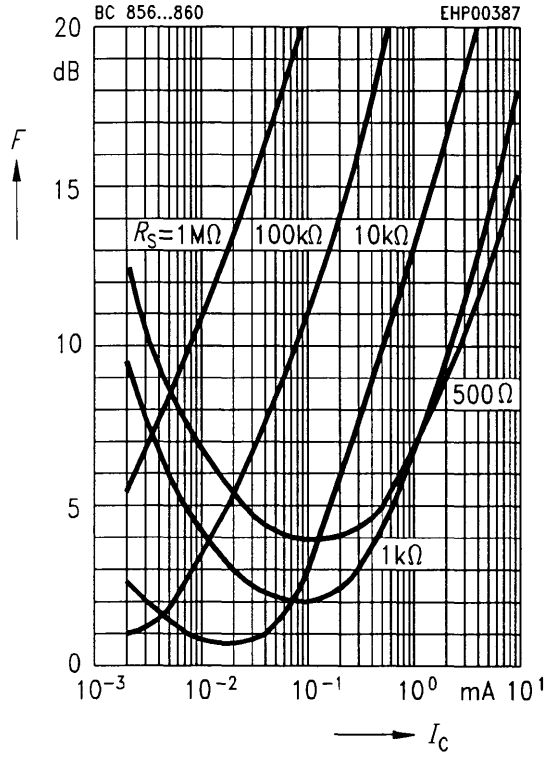

**Noise figure** $F = f(V_{CE})$
$I_C$ = 0.2 mA, $R_S$ = 2 kΩ, $f$ = 1 kHz



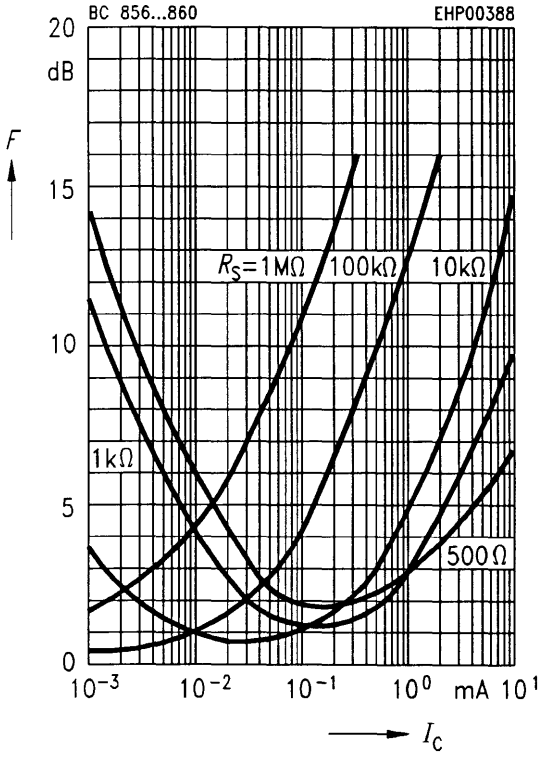

**Noise figure** $F = f(f)$
$I_C$ = 0.2 mA, $R_S$ = 2 kΩ, $V_{CE}$ = 5 V



**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

