# SIEMENS

PNP Silicon AF Transistors   **BC 856W ... BC 860W**

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 847W, BC 848W,
                                       BC 849W, BC 850W (NPN)
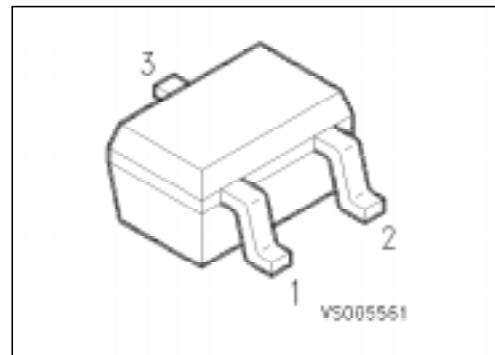
Type	Marking	Ordering Code (tape and reel)	Pin Configuration 1	2	3	Package[1]
BC 856 AW	3As	Q62702-C2335	B	E	C	SOT-323
BC 856 BW	3Bs	Q62702-C2292				
BC 857 AW	3Es	Q62702-C2293				
BC 857 BW	3Fs	Q62702-C2294				
BC 857 CW	3Gs	Q62702-C2295				
BC 858 AW	3Js	Q62702-C2296				
BC 858 BW	3Ks	Q62702-C2297				
BC 858 CW	3Ls	Q62702-C2298				
BC 859 AW	4As	Q62702-C2299				
BC 859 BW	4Bs	Q62702-C2300				
BC 859 CW	4Cs	Q62702-C2301				
BC 860 BW	4Fs	Q62702-C2302				
BC 860 CW	4Gs	Q62702-C2303				

[1]For detailed information see chapter Package Outlines.

Maximum Ratings

Description	Symbol	BC 856W BC 860W	BC 857W BC 858W BC 859W		Unit
Collector-emitter voltage	V_{CEO}	65	45	30	V
Collector-base voltage	V_{CBO}	80	50	30	V
Collector-emitter voltage	V_{CES}	80	50	30	V
Emitter-base voltage	V_{EBO}	5	5	5	V
Collector current	I_C	100			mA
Collector peak current	I_{CM}	200			mA
Total power dissipation, $T_S = 115\ ^\circ C$	P_{tot}	250			mW
Junction temperature	T_j	150			$^\circ C$
Storage temperature range	T_{stg}	−65 to 150			$^\circ C$

Thermal Resistance

Junction - ambient[1]	$R_{th\ JA}$	≤ 240	K/W
Junction - soldering point	$R_{th\ JS}$	≤ 105	K/W

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

[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

Parameter	Symbol	min.	typ.	max.	Unit
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}	–	10	–	
Short-circuit input impedance I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{11e}				kΩ
BC 856 AW … BC 859 AW		–	2.7	–	
BC 856 BW … BC 860 BW		–	4.5	–	
BC 857 CW … BC 860 CW		–	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 AW … BC 859 AW		–	1.5	–	
BC 856 BW … BC 860 BW		–	2.0	–	
BC 857 CW … BC 860 CW		–	3.0	–	
Short-circuit forward current transfer ratio I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{21e}				–
BC 856 AW … BC 859 AW		–	200	–	
BC 856 BW … BC 860 BW		–	330	–	
BC 857 CW … BC 860 CW		–	600	–	
Open-circuit output admittance I_C = 2 mA, V_{CE} = 5 V, f = 1 kHz	h_{22e}				μS
BC 856 AW … BC 859 AW		–	18	–	
BC 856 BW … BC 860 BW		–	30	–	
BC 857 CW … BC 860 CW		–	60	–	
Noise figure I_C = 0.2 mA, V_{CE} = 5 V, R_S = 2 kΩ	F				dB
f = 30 Hz … 15 kHz BC 859W		–	1.2	4	
BC 860W		–	1.0	3	
f = 1 kHz, Δf = 200 Hz BC 859W		–	1.0	4	
BC 860W		–	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				μV
BC 860W		–	–	0.110	

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

EHP00944

P_{tot} / mW vs $T_A; T_S$ / °C
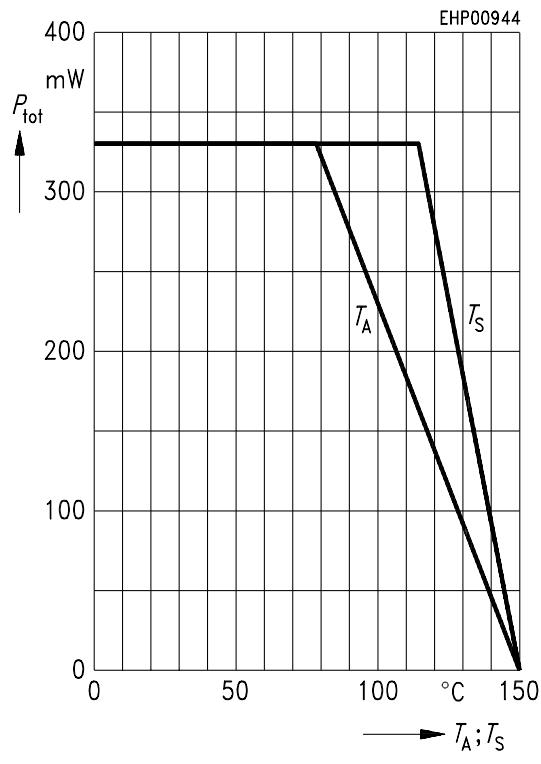
Collector-base capacitance $C_{CB0} = f(V_{CB0})$
Emitter-base capacitance $C_{EB0} = f(V_{EB0})$

BC 856...860   EHP00376

C_{CB0} (C_{EB0}) / pF vs V_{CB0} (V_{EB0}) / V

C_{EB}

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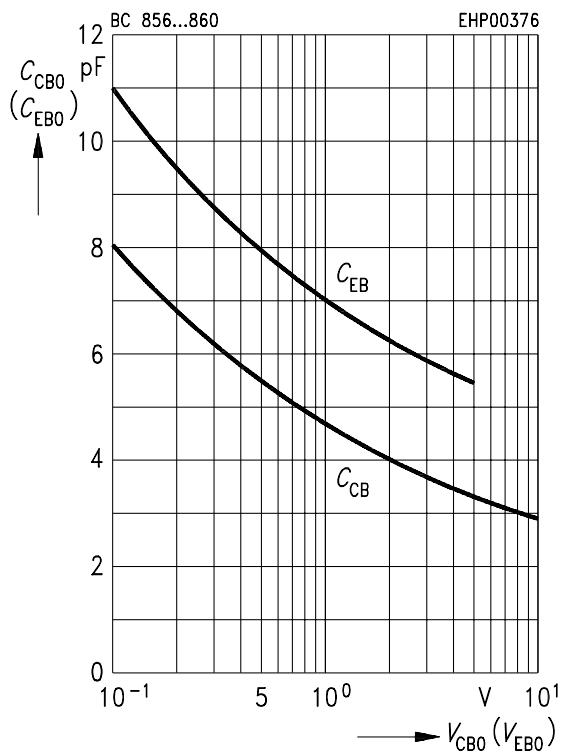
Permissible pulse load $P_{tot\,max}/P_{tot\,DC} = f(t_p)$

BC 856...860   EHP00377

$$D = \frac{t_p}{T}$$

$D=$
0
0.005
0.01
0.02
0.05
0.1
0.2
0.5

$\frac{P_{tot\,max}}{P_{tot\,DC}}$ vs t_p / s
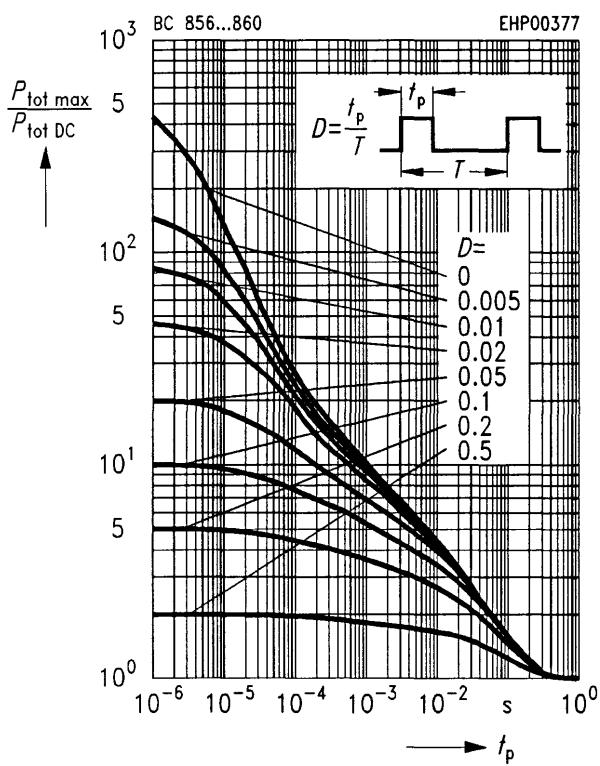
Transition frequency $f_T = f(I_C)$
$V_{CE} = 5\ V$

BC 856...860   EHP00378

f_T / MHz vs I_C / mA
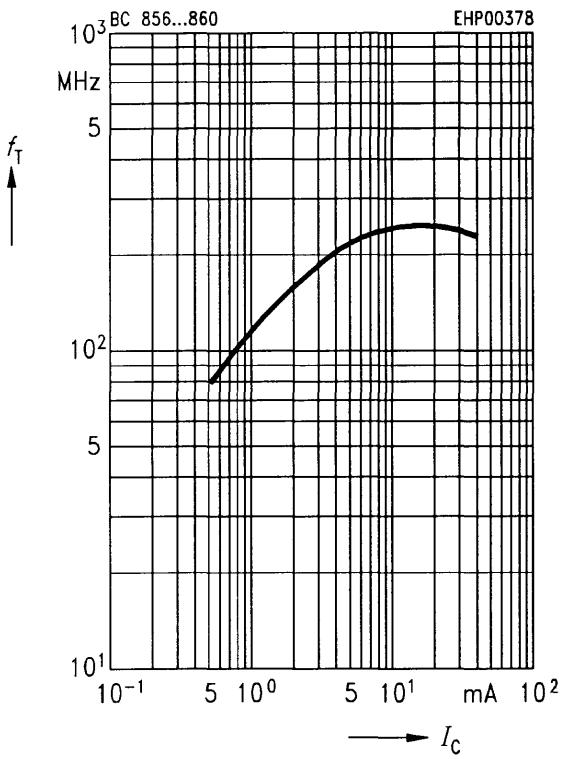
Collector cutoff current $I_{CB0} = f(T_A)$
$V_{CB} = 30$ V

Collector-emitter saturation voltage
$I_C = f(V_{CEsat})$, $h_{FE} = 20$
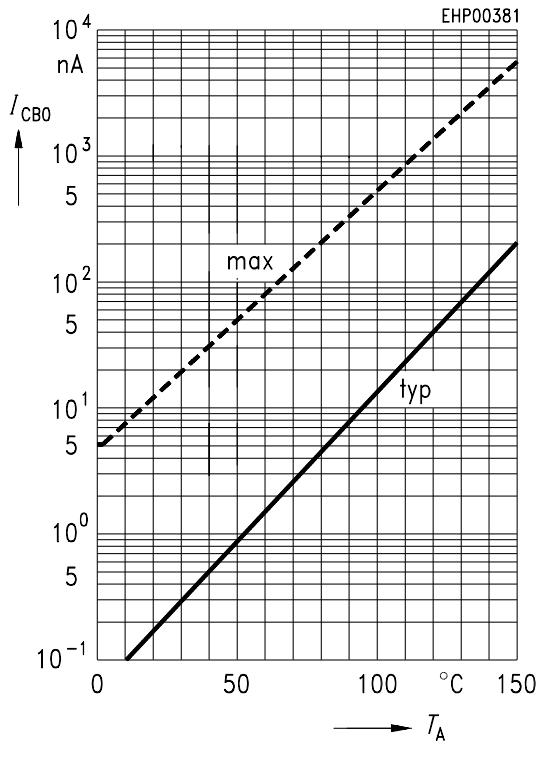
DC current gain $h_{FE} = f(I_C)$
$V_{CE} = 5$ V
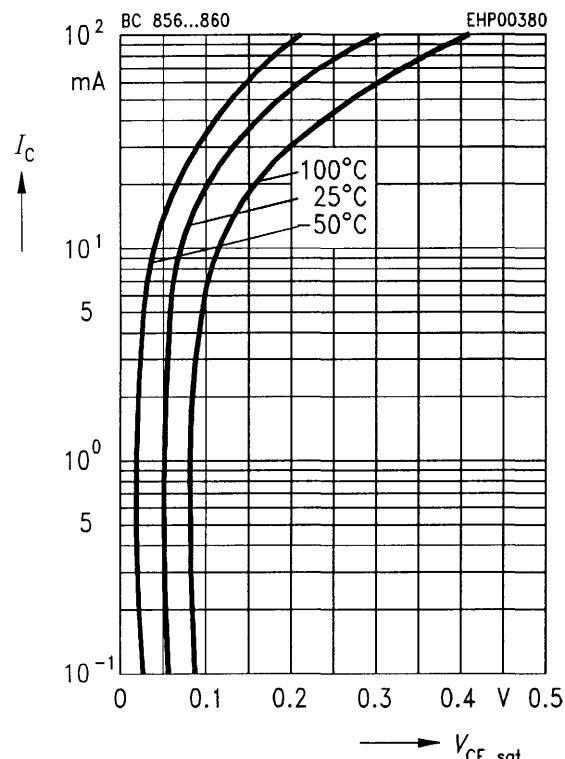
Base-emitter saturation voltage
$I_C = f(V_{BEsat})$, $h_{FE} = 20$
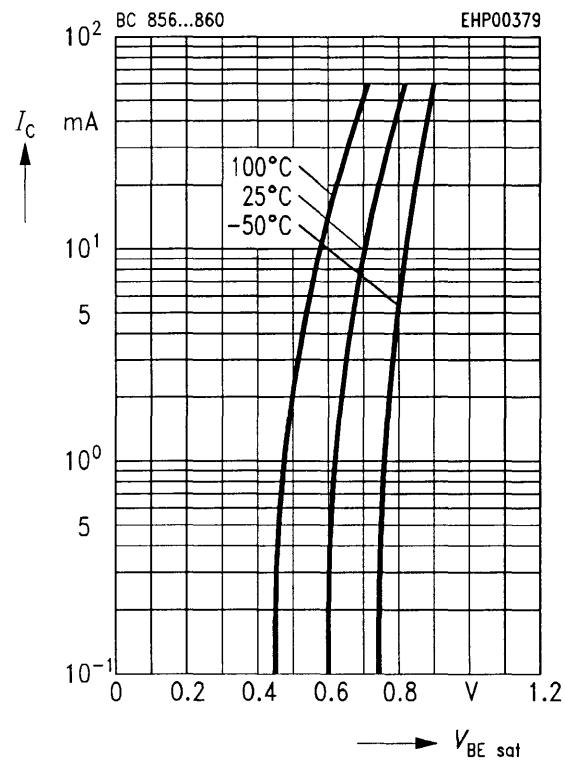
**h parameter** $h_e = f(I_C)$ **normalized**
V_{CE} = 5 V

**h parameter** $h_e = f(V_{CE})$ **normalized**
I_C = 2 mA
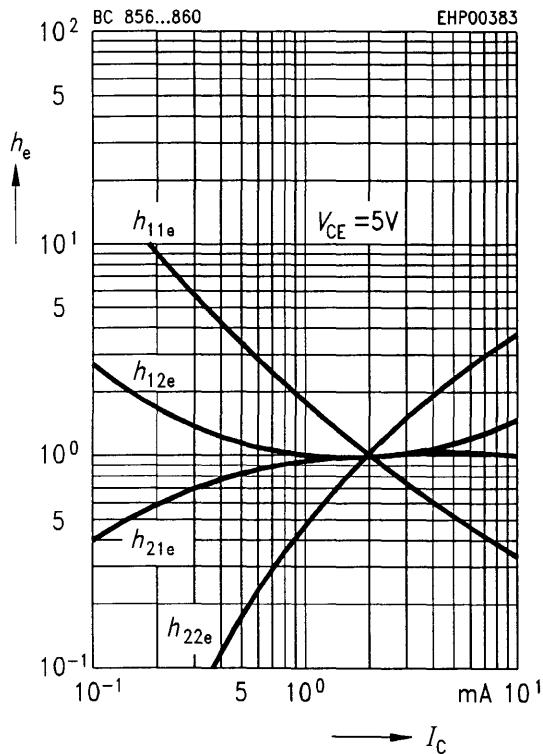
Noise figure $F = f(V_{CE})$
I_C = 0.2 mA, R_S = 2 kΩ, f = 1 kHz
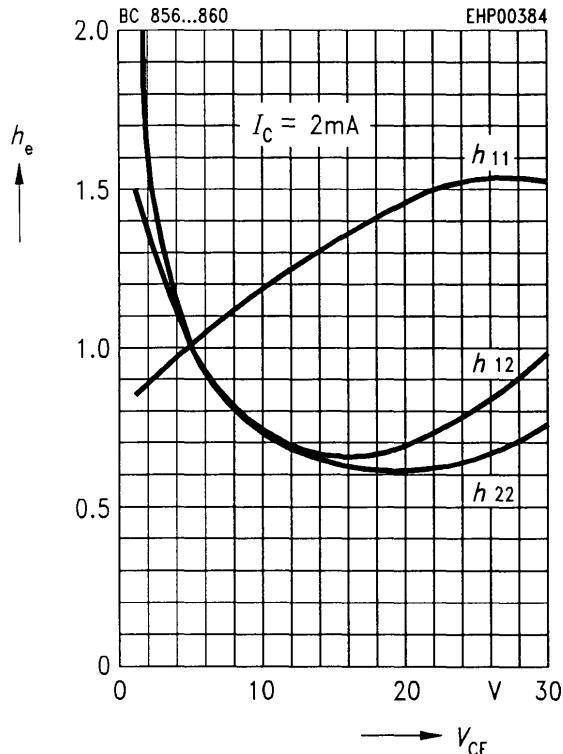
Noise figure $F = f(f)$
I_C = 0.2 mA, V_{CE} = 5 V, R_S = 2 kΩ
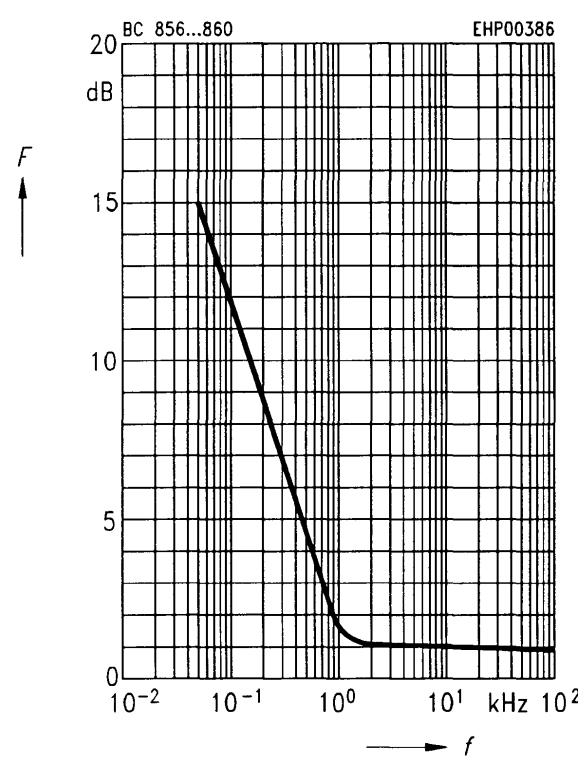
Noise figure $F = f(I_C)$
$V_{CE} = 5$ V, $f = 120$ Hz
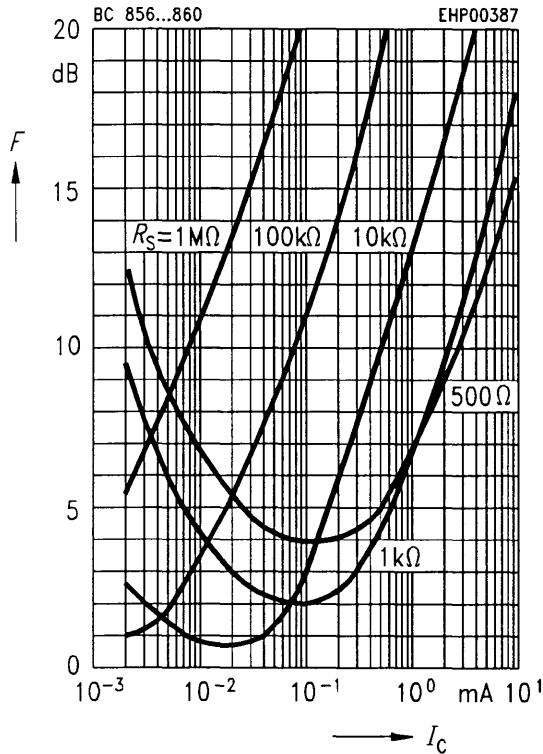
Noise figure $F = f(I_C)$
$V_{CE} = 5$ V, $f = 1$ kHz

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