NPN Silicon Transistors

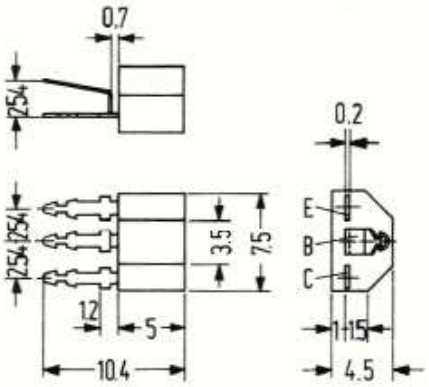
BC 147
BC 148
BC 149

For AF pre and driver stages as well as for universal application

The above transistors are NPN planar epitaxial transistors in plastic package as complementary transistors to BC 157, BC 158 and BC 159 in the case 11 A 3 DIN 41 869 page 3 (SOT-25)
(BC 149 for low-noise pre-stages)

Type	Order Number
BC 147 A	Q60203-X147-A
BC 147 B	Q60203-X147-B
BC 148 A	Q60203-X148-A
BC 148 B	Q60203-X148-B
BC 148 C	Q60203-X148-C
BC 149 B	Q60203-X149-B
BC 149 C	Q60203-X149-C

For mounting instructions and hole diameters see preface of this data manual.



Weight approx. 0.33 g Dimensions in mm

Maximum ratings		BC 147	BC 148	BC 149	
Collector-emitter voltage	V_{CES}	50	30	30	V
Collector-emitter voltage	V_{CEO}	45	20	20	V
Emitter-base voltage	V_{EBO}	6	5	5	V
Collector peak current	I_C	100	100	50	mA
Collector peak current	I_{CM}	200	200	–	mA
Base curent	I_B	50	50	5	mA
Junction temperature	T_j	150	150	150	°C
Storage temperatur	T_S	−55 to +150			°C
Total power dissipation	P_{tot}	300	300	300	mW
Thermal resistance					
Junction to ambient air	R_{thJamb}	≦ 420	≦ 420	≦ 420	K/W

Static characteristics (T_{amb} = 25 °C). The transistors are classified in groups of static forward current transfer ratio h_{FE}, which are indicated by letters A, B, and C. The following values apply at a V_{CE} = V5 and the following collector currents.

h_{FE} groups	A	B	C
Type	**BC 147** **BC 148** –	**BC 147** **BC 148** **BC 149**	– **BC 148** **BC 149**
I_C mA	h_{FE} I_C/I_B	h_{FE} I_C/I_B	h_{FE} I_C/I_B
0.01 2 100[2])	90 170 (120 to 220) 120	150 290 (180 to 460) 200[2])	270 500 (380 to 800) 400[2])

Type	**BC 147; BC 148; BC 149**				
I_C mA	V_{BE} V	I_C mA	I_B mA	V_{CEsat}[1]) V	V_{BEsat}[1]) V
0.1 2 100[2])	0.55 0.62 (0.55 to 0.7) 0.83[2])	10 100[2])	0.5 5	0.07 (< 0.2) 0.2 (< 0.6)[2])	0.73 (< 0.83) 0.87 (< 1.05)[2])

Static characteristics
(T_{amb} = 25 °C)

		BC 147	BC 148	BC 149	
Collector-emitter cutoff current (V_{CES} = 50 V)	I_{CES}	0.2 (< 15)	–	–	nA
Collector-emitter cutoff current (V_{CES} = 30 V)	I_{CES}	–	0.2 (< 15)	0.2 (< 15)	nA
Collector-emitter cutoff current (V_{CES} = 50 V; T_{amb} = 125 °C)	I_{CES}	0.2 (< 4)	–	–	µA
Collector-emitter cutoff current (V_{CES} = 30 V; T_{amb} = 125 °C)	I_{CES}	–	0.2 (< 4)	0.2 (< 4)	µA
Emitter-base breakdown voltage (I_{EBO} = 1 µA)	$V_{(BR)EBO}$	> 6	> 5	> 5	V
Collector-emitter breakdown voltage (I_{CEO} = 2 mA)	$V_{(BR)CEO}$	> 45	> 20	> 20	V

[1]) The transistor is overdriven to such an extent that the static forward current transfer ratio has decreased to h_{FE} = 20

[2]) Measuring values not for BC 149

Dynamic characteristics (T_{amb}=25 °C)		**BC 147**	**BC 148**	**BC 149**	
Current gain-bandwidth product (I_C = 0.5 mA; V_{CE} = 3 V)	f_T	85	85	85	MHz
(I_C = 10 mA; V_{CE} = 5 V; f = 100 MHz)	f_T	250 (>150)	250 (>150)	300 (>150)	MHz
Collector-base capacitance (V_{CBO} = 10 V; f = 1 MHz)	C_{CBO}	<4.5	<4.5	<4.5	pf
Emitter-base capacitance V_{EBO} = 0.5 V; f = 1 MHz)	C_{EBO}	8	8	8	pf
Noise figure (I_C = 0.2 mA; V_{CE} = 5 V; T_g = 2 kΩ; Δf = 30 Hz to 15 kHz)	NF	–	–	<4	db
Noise figure (I_C = 0.2 mA; V_{CE} = 5 V; R_G = 2 kΩ, f = 1 kJz; Δf = 200 Hz)	NF	2 (<10)	2 (<10)	<4	db

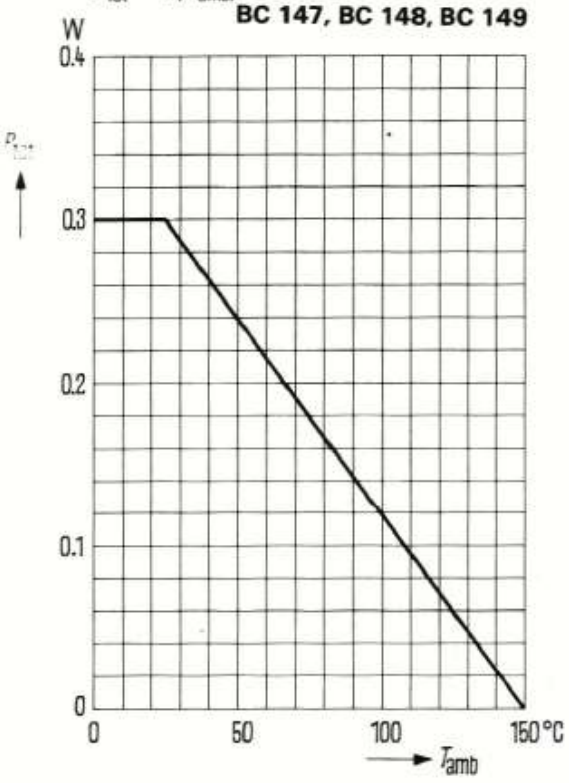
Dynamic characteristics (T_{amb} = 25 °C)
I_C = 2 mA; V_{CE} = 5 V; f = 1 kHz

h_{FE} groups	A	B	C	
Type	**BC 147** **BC 148** –	**BC 147** **BC 148** **BC 149**	– **BC 148** **BC 149**	
h_{11e}	2.7 (1.6 to 4.5)	4.5 (3.2 to 8.5)	8.7 (6 to 16)	kΩ
h_{12e}	1.5	2	3	10^{-4}
h_{21e}	220 (125 to 260)	330 (240 to 500)	600 (450 to 900)	–
h_{22e}	18 (<30)	30 (<60)	60 (<110)	μmhos

Maximum power dissipation

$P_{tot} = f(T_{amb})$

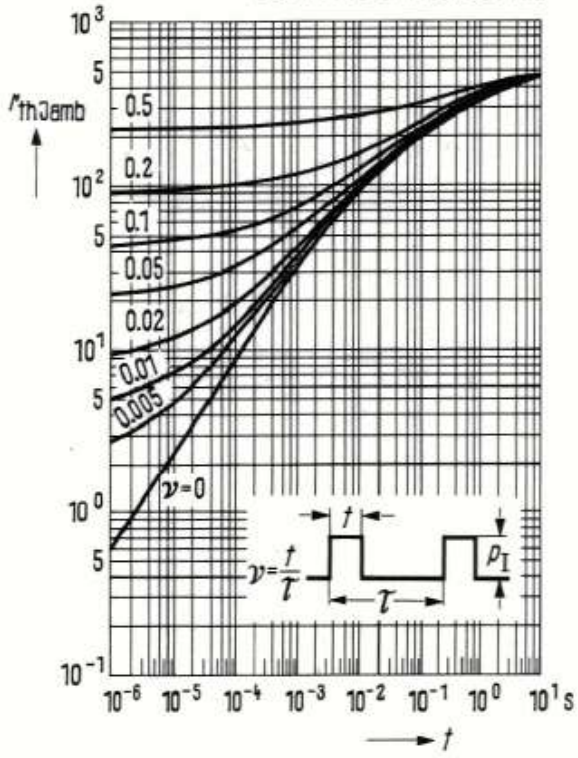
BC 147, BC 148, BC 149



Permissible pulse load

$\frac{K}{W}$ $r_{thJamb} = f(t)$; ν = parameter

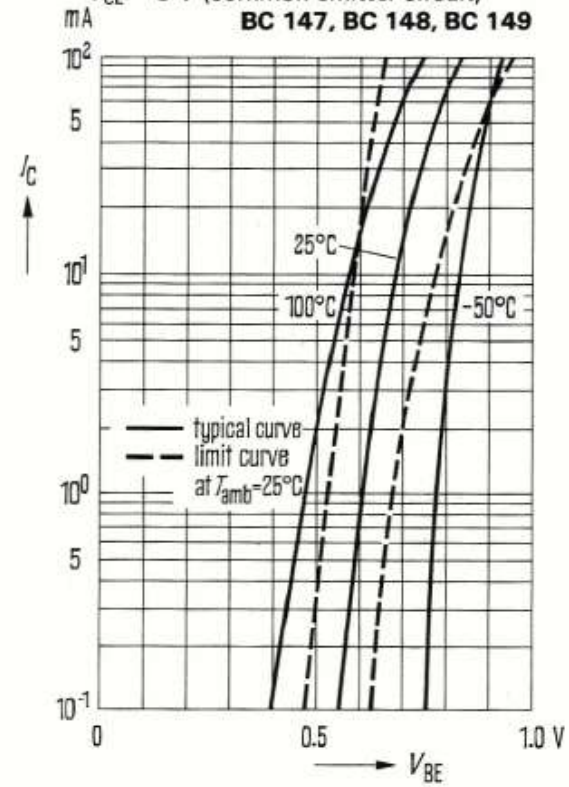
BC 147, BC 148, BC 149



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

V_{CE} = 5 V (common emitter circuit)

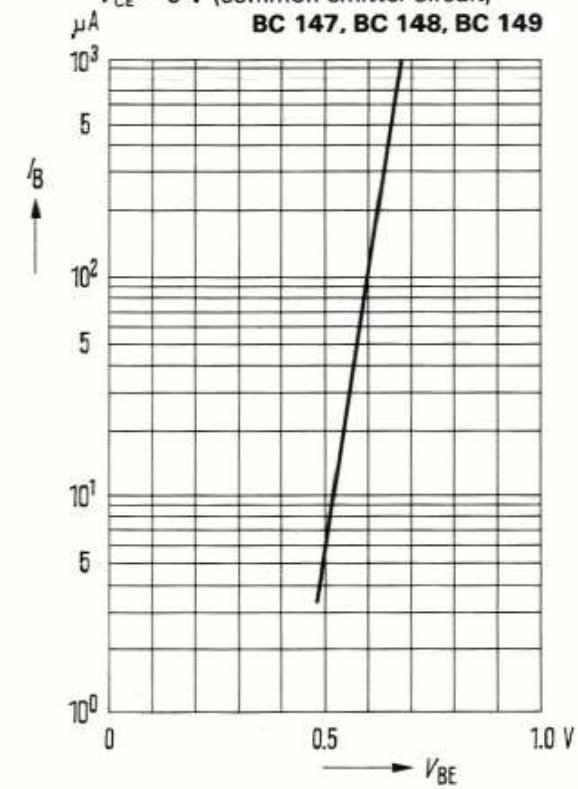
BC 147, BC 148, BC 149



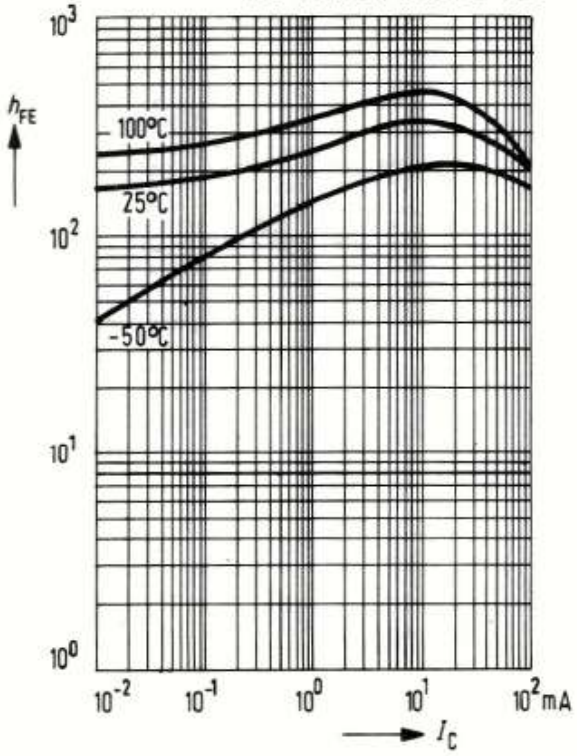
Input characteristic $I_B = f(V_{BE})$

V_{CE} = 5 V (common emitter circuit)

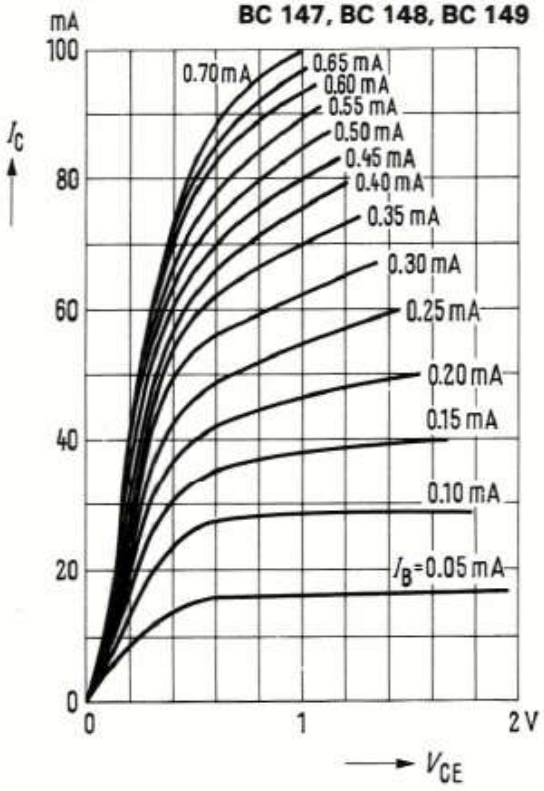
BC 147, BC 148, BC 149



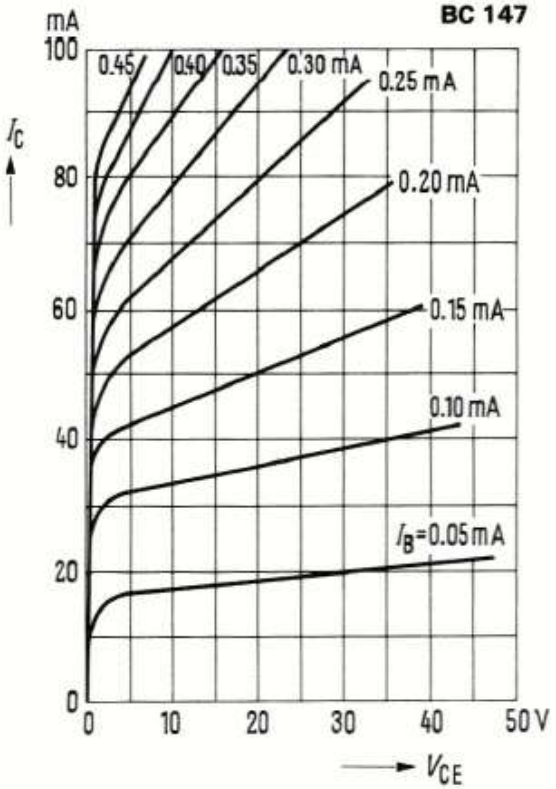
Current gain $h_{FE} = f(I_C)$
V_{CE} = 5 V; T_{amb} = parameter
(common emitter circuit)
BC 147, BC 148, BC 149



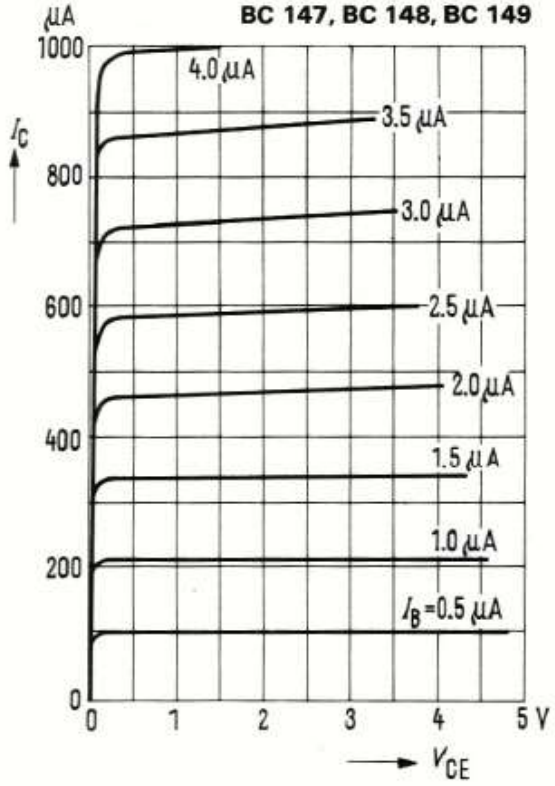
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)
BC 147, BC 148, BC 149



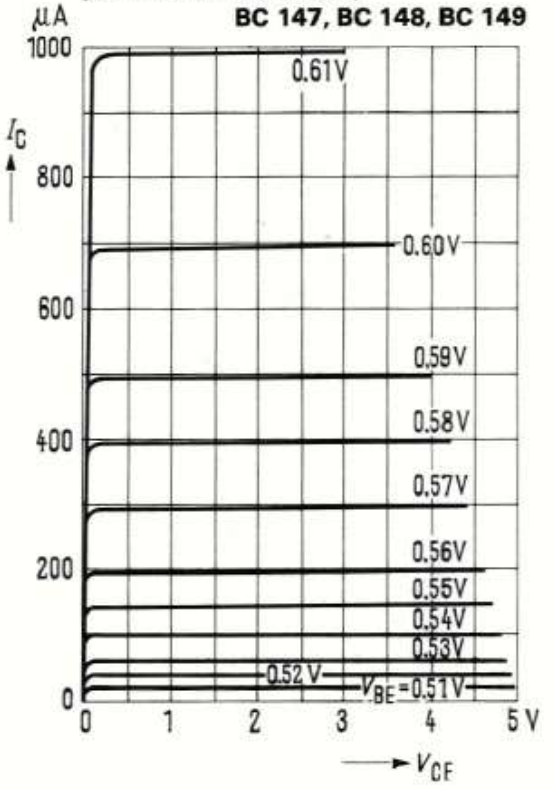
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)
BC 147



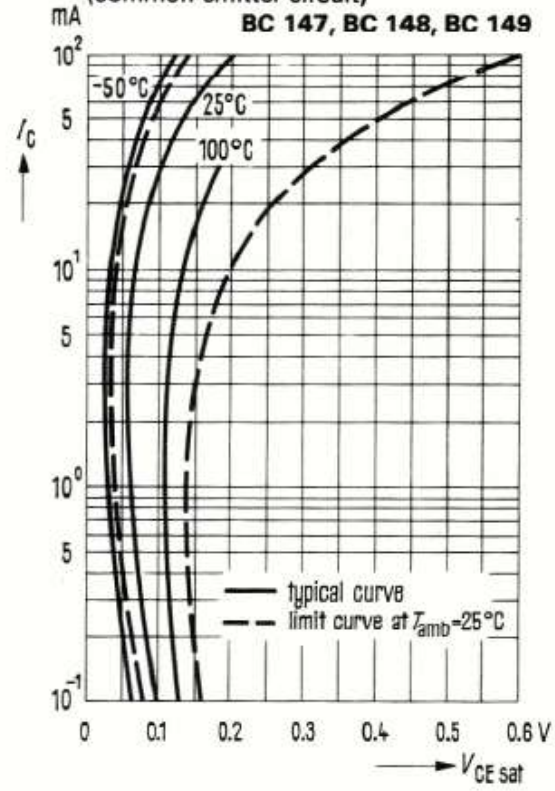
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)
BC 147, BC 148, BC 149



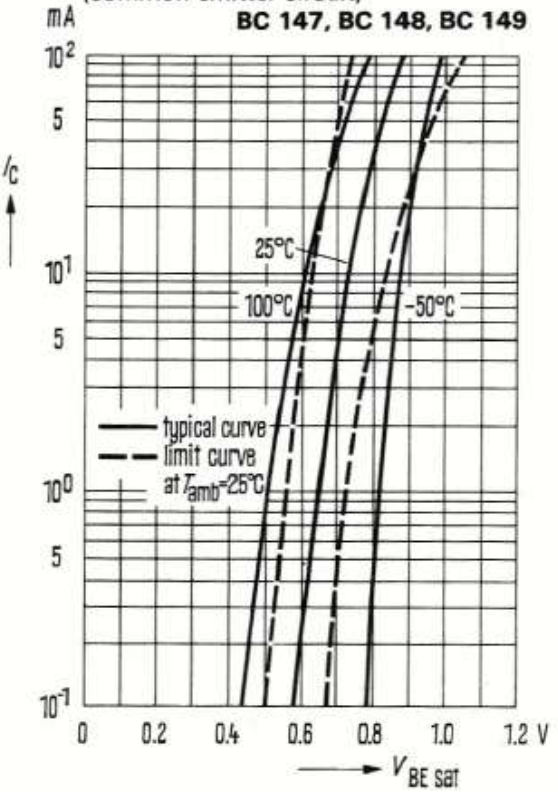
Output characteristics $I_C = f(V_{CE})$
V_{BE} = parameter
(common emitter circuit)
BC 147, BC 148, BC 149



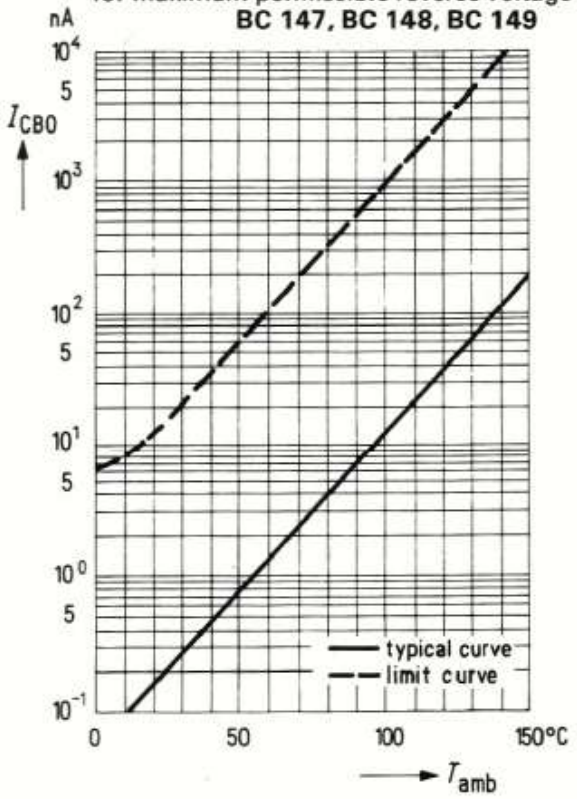
Saturation voltage $V_{CEsat} = f(I_C)$
h_{FE} = 20; T_{amb} = parameter
(common emitter circuit)
BC 147, BC 148, BC 149



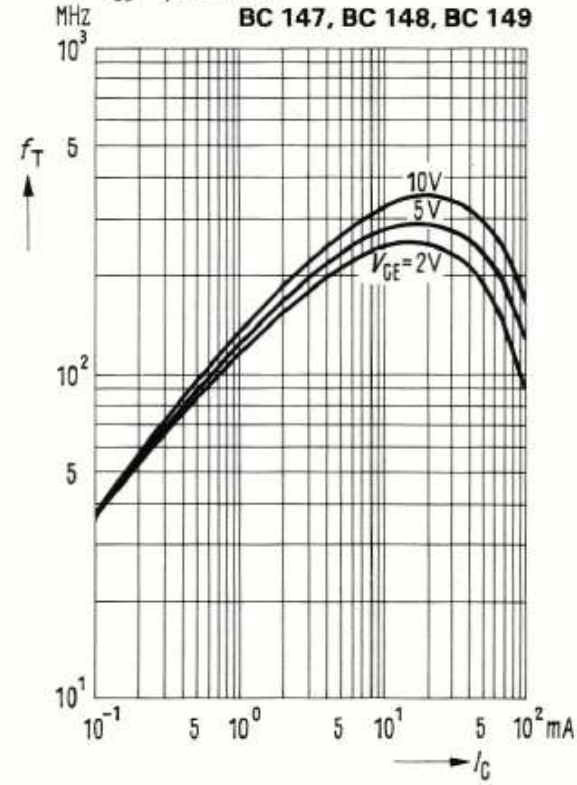
Saturation voltage $V_{BEsat} = f(I_C)$
h_{FE} = 20; T_{amb} = parameter
(common emitter circuit)
BC 147, BC 148, BC 149



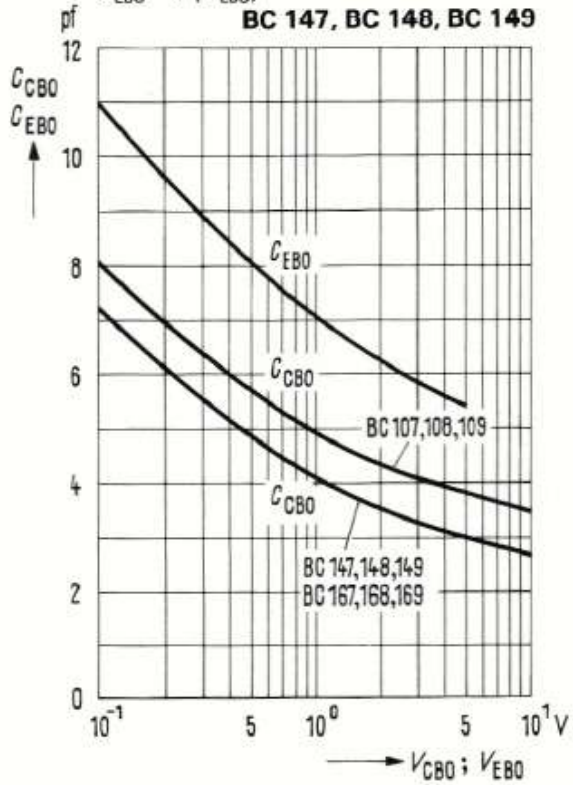
Collector-base cutoff current versus temperature $I_{CBO} = f(T_{amb})$
for maximum permissible reverse voltage
BC 147, BC 148, BC 149



Current gain bandwidth product $f_T = f(I_C)$
V_{CE} = parameter
BC 147, BC 148, BC 149



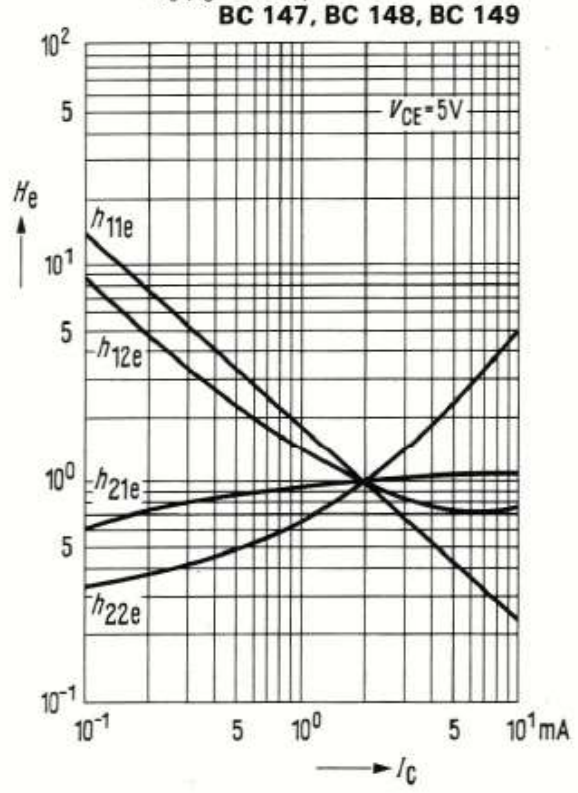
Collector-base capacitance
$C_{CBO} = f(V_{CBO})$
Emitter-base capacitance
$C_{EBO} = f(V_{EBO})$
BC 147, BC 148, BC 149



h-parameter versus collector current

$H_e = \frac{h_e\,(I_C)}{h_e\,(I_C = 2\text{mA})} = f\,(I_C);\ V_{CE} = 5\ \text{V}$

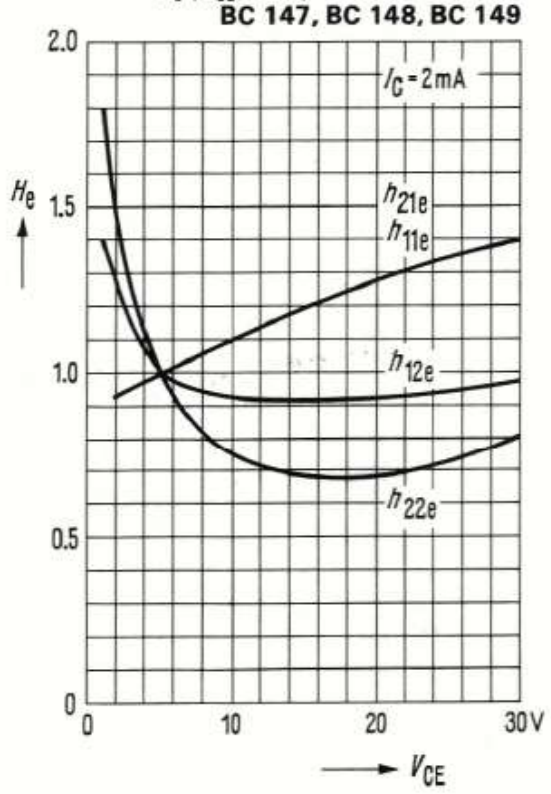
BC 147, BC 148, BC 149



h-parameter versus collector-emitter voltage

$H_e = \frac{h_e\,(V_{CE})}{h_e\,(V_{CE} = 5\text{V})} = f\,(V_{CE});\ I_C = 2\ \text{mA}$

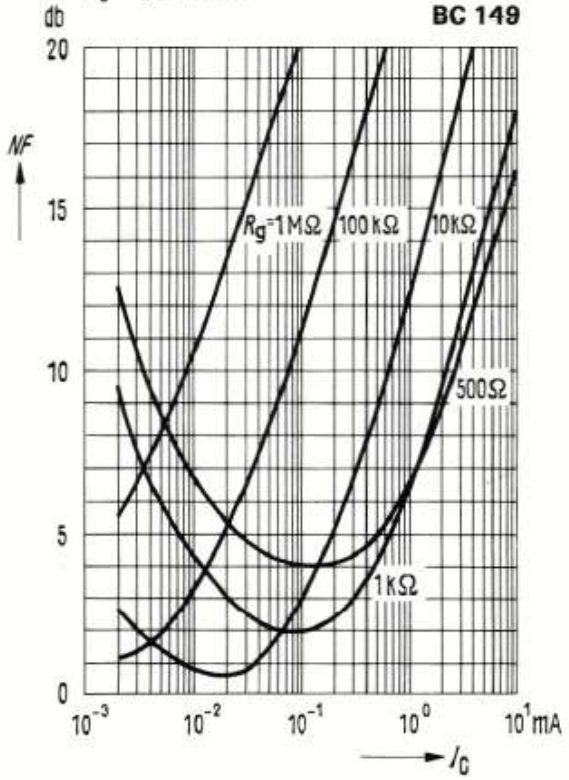
BC 147, BC 148, BC 149



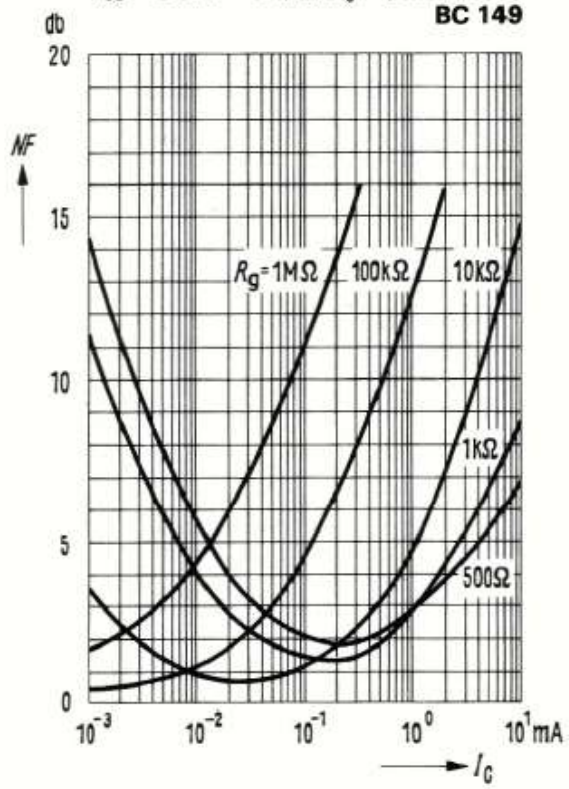
Noise figure $NF = f\,(I_C)$

V_{CE} = 5 V; f = 120 Hz;
R_g = parameter

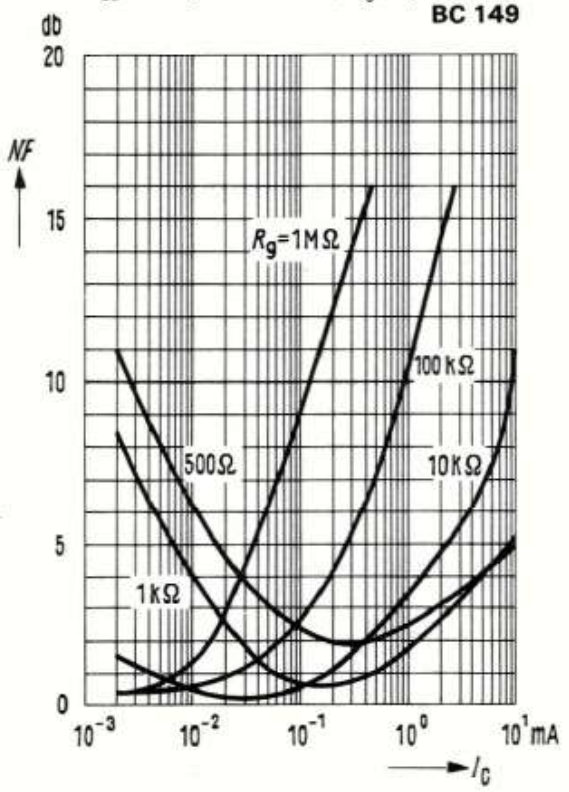
BC 149



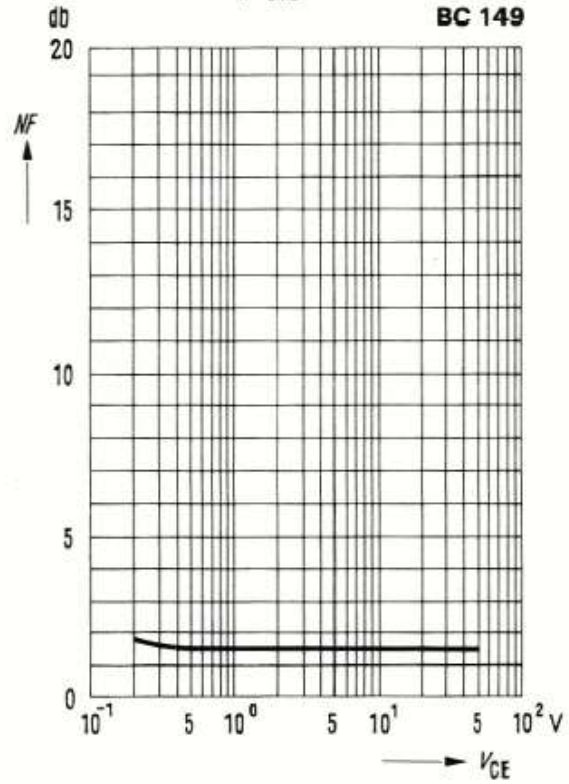
Noise figure $NF = f(I_C)$
V_{CE} = 5 V; f = 1 kHz; R_g = parameter
BC 149



Noise figure $NF = f(I_C)$
V_{CE} = 5 V; f = 10 kHz; R_g = parameter
BC 149



Noise figure $= f(V_{CE})$
I_C = 0,2 mA; R_g = 2 kΩ; NF = 1 kHz
Δf = 200 Hz; T_{amb} = 25 °C
BC 149



Noise figure $NF = f(f)$
V_{CE} = 5 V; I_C = 0,2 mA
R_g = 2 kΩ; T_{amb} = 25 °C
BC 149