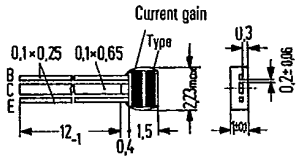
NPN Silicon Transistors

SIEMENS AKTIENGESELLSCHAF

C 121
BC 122
BC 123

BC 121, BC 122, and BC 123 are miniature epitaxial NPN silicon planar transistors in U 32 plastic encapsulation. The types are marked by a color line on the case: BC 121 yellow, BC 122 white, BC 123 red. The transistors are particularly intended for use in low noise AF amplifier stages and as complementary transistors to BC 201, BC 202, and BC 203.

Type	Ordering code
BC 121[1]	Q60203-X121
BC 121 white	Q60203-X121-X9
BC 121 yellow	Q60203-X121-X4
BC 121 green	Q60203-X121-S6
BC 121 blue	Q60203-X121-X6
BC 122[1]	Q60203-X122
BC 122 white	Q60203-X122-X9
BC 122 yellow	Q60203-X122-X4
BC 122 green	Q60203-X122-X10
BC 122 blue	Q60203-X122-X6
BC 123[1]	Q60203-X123
BC 123 white	Q60203-X123-X9
BC 123 yellow	Q60203-X123-X4
BC 123 green	Q60203-X123-X5



Approx. weight 20 mg

Dimensions in mm

Maximum ratings		BC 121	BC 122	BC 123	
Collector-emitter voltage	V_{CEO}	5	20	30	V
Collector-base voltage	V_{CBO}	5	30	45	V
Emitter-base voltage	V_{EBO}	5	5	5	V
Collector current	I_C	75	75	75	mA
Emitter current	I_E	85	85	85	mA
Base current	I_B	10	10	10	mA
Junction temperature	T_j	150	150	150	°C
Storage temperature range	T_{stg}	−55 to +125	−55 to +125	−55 to +125	°C
Total power dissipation Lead length L = 2 mm; see diagram[2] $R_{th} = f(L)$	P_{tot}	250	250	250	mW
Thermal resistance					
see diagram[2] $R_{th} = f(L)$	R_{thJA}	≦1000	≦1000	≦1000	K/W

1) If the order does not include any exact indication of the current amplification group desired, a transistor of a current amplification group just available from stock will be delivered.

2) (page 146)

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

The transistors are grouped according to the small signal current gain h_{fe} and marked by a color line. At a voltage of V_{CE} = 2 V and the collector currents listed below, the following static characteristics apply:

h_{fe} groups	white	yellow	green	blue	
Type	**BC 121 BC 122 BC 123**	**BC 121 BC 122 BC 123**	**BC 121 BC 122 BC 123**	**BC 121 BC 122 –**	**BC 121 BC 122 BC 123**
I_C mA	h_{FE} I_C/I_B	h_{FE} I_C/I_B	h_{FE} I_C/I_B	h_{FE} I_C/I_B	V_{BE} mV
0.01	63	110	180	330	530
0.25	100	175	290	520	560 (500-630)
10	125	220	320	620	610

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

Saturation voltages

	V_{CEsat}	V_{BEsat}	
(I_C = 10 mA; I_B = 0.5 mA)	0.07 (<0.2)	0.73 (<0.83)	V
(I_C = 50 mA; I_B = 2.5 mA)	0.13 (<0.4)	0.82 (>0.95)	V

		BC 121	BC 122	BC 123	
Collector cutoff current (V_{CBO} = 25 V)	I_{CBO}	–	–	<10	nA
Collector cutoff current (V_{CBO} = 15 V)	I_{CBO}	–	<10	–	nA
Collector cutoff current (V_{CBO} = 2 V)	I_{CBO}	<10	–	–	nA
Collector-emitter breakdown voltage (I_{CEO} = 100 µA)	$V_{(BR)CEO}$	>5	>20	>30	V
Collector-base breakdown voltage (I_{CBO} = 100 µA)	$V_{(BR)CBO}$	>5	>30	>45	V
Emitter-base breakdown voltage (I_{EBO} = 100 µA)	$V_{(BR)EBO}$	>5	>5	>5	V

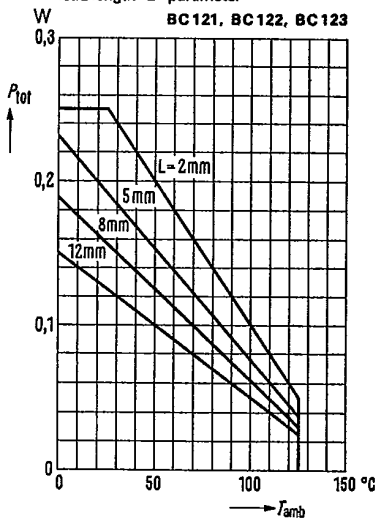
Dynamic characteristics (T_{amb} = 25 °C)		BC 121	BC 122	BC 123	
Transition frequency (I_C = 250 µA; V_{CE} = 0.5 V)	f_T	50	50	50	MHz
Transition frequency (I_C = 10 mA; V_{CE} = 0.5 V)	f_T	250	250	250	MHz
Collector-base capacitance (V_{CBO} = 2 V; f = 1 MHz)	C_{CBO}	4.4 (<11)	–	–	pF
Collector-base capacitance (V_{CBO} = 10 V; f = 1 MHz)	C_{CBO}	–	3.5 (<7)	3.5 (<7)	pF
Noise figure (I_C = 200 µA; V_{CE} = 0.5 V; f = 1 kHz; Δf = 200 Hz; R_g = 2 kΩ)	NF	2.5 (<5)	2.5 (<5)	2.5 (<5)	dB

Current gain groups

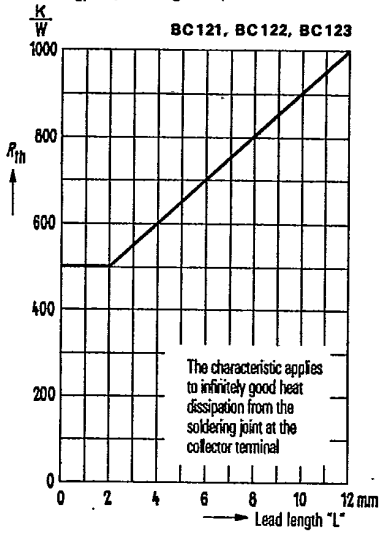
The transistors BC 121, BC 122, BC 123 are grouped according to the small signal current gain h_{fe} and are marked by a color line.
Operating point: V_{CE} = 0.5 V; I_C = 250 µA; f = 1 kHz

Color line	white	yellow	green	blue
Type	**BC 121** **BC 122** **BC 123**	**BC 121** **BC 122** **BC 123**	**BC 121** **BC 122** **BC 123**	**BC 121** **BC 122** –
Small signal current gain h_{fe}	75 to 150	125 to 260	240 to 500	450 to 900

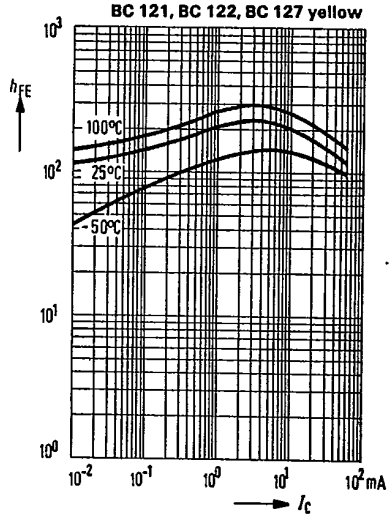
Total perm. power dissipation versus temperature $P_{tot} = f(T_{amb})$; lead length "L"-parameter



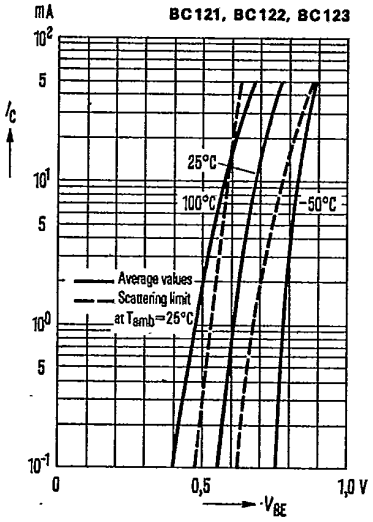
Thermal resistance $R_{th} = f$ (lead length "L")



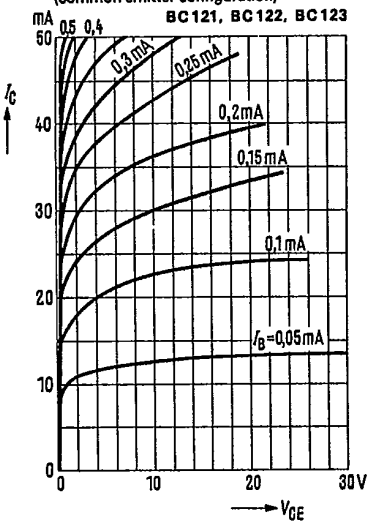
DC current gain $h_{FE} = f(I_C)$
V_{CE} = 2 V, T_{amb} = parameter
(common emitter configuration)
BC 121 yellow, BC 122 yellow, BC 123 yellow



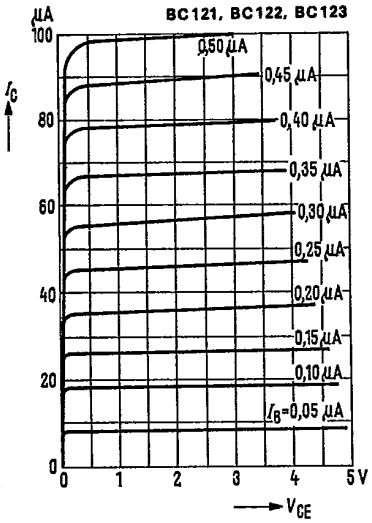
Collector current $I_C = f(V_{BE})$
T_{amb} = parameter; V_{CE} = 2 V
(common emitter configuration)



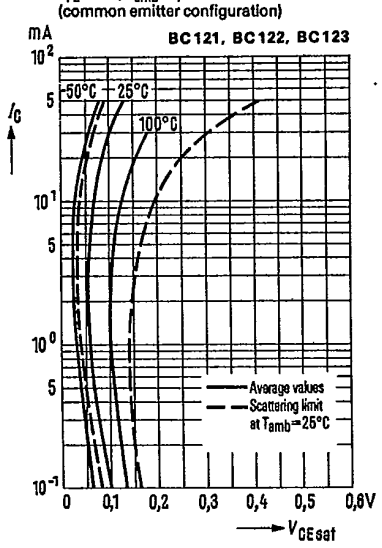
Output characteristics $I_C = f(V_{CE})$;
I_B = parameter, T_{amb} = 25°C
(common emitter configuration)



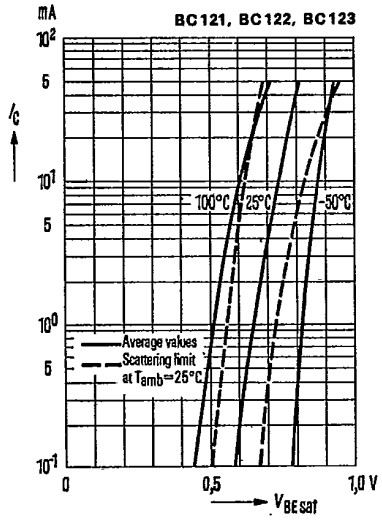
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter configuration)



Collector-emitter saturation voltage
$V_{CEsat} = f(I_C)$
h_{FE} = 20; T_{amb} = parameter
(common emitter configuration)

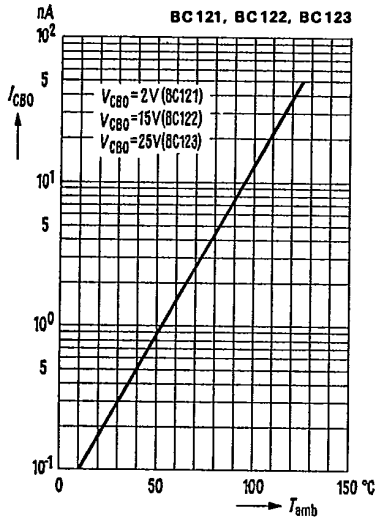


Base-emitter saturation voltage
$V_{BEsat} = f(I_C)$
h_{FE} = 20; T_{amb} = parameter
(common emitter configuration)

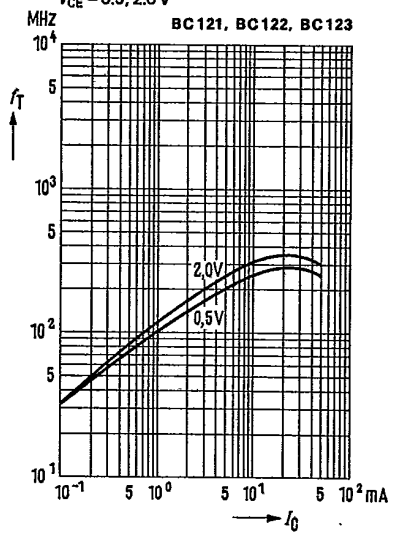


BC 121
BC 122
BC 123

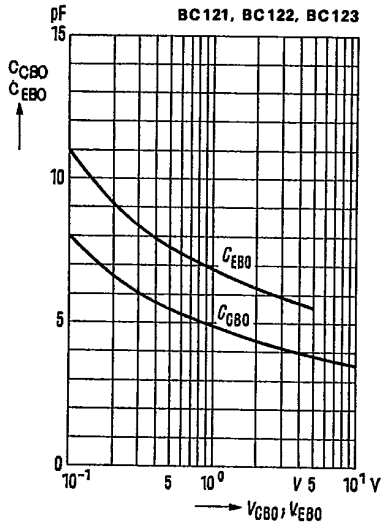
Collector cutoff current versus temperature
$I_{CBO} = f(T_{amb})$



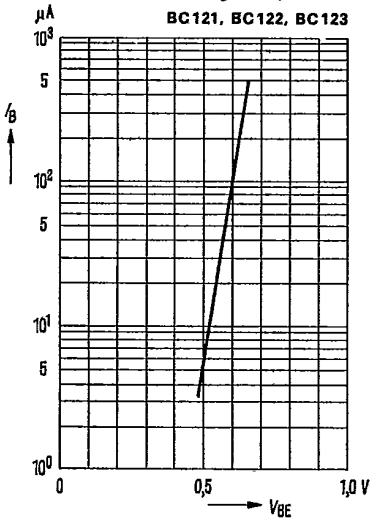
Transition frequency $f_T = f(I_C)$;
V_{CE} = 0.5; 2.0 V



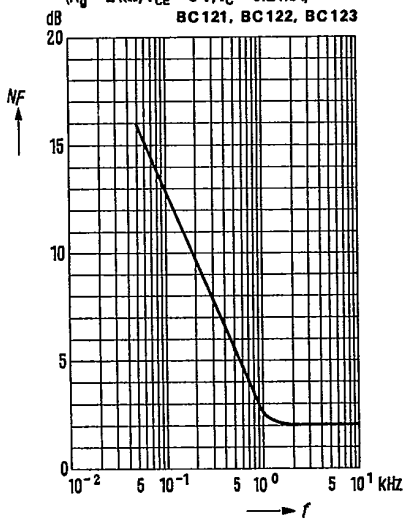
Emitter-base capacitance $C_{EBO} = f(V_{EBO})$
Collector-base capacitance $C_{CBO} = f(V_{CBO})$



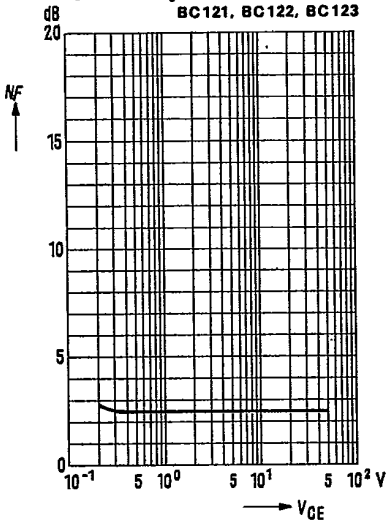
Input characteristic $I_B = f(V_{BE})$
V_{CE} = 2 V
(common emitter configuration)



Noise figure $NF = f(f)$
($R_g = 2\,k\Omega$, $V_{CE} = 5\,V$, $I_C = 0.2\,mA$)
BC121, BC122, BC123



Noise figure $NF = f(V_{CE})$
($I_C = 0.2\,mA$, $R_g = 2\,k\Omega$, $f = 1\,kHz$)
BC121, BC122, BC123



Noise figure $NF = f(I_C)$
($V_{CE} = 5\,V$; $f = 1\,kHz$, $T_{amb} = 25°C$)
BC121, BC122, BC123