NPN Silicon Transistors SIEMENS AKTIENGESELLSCHAF
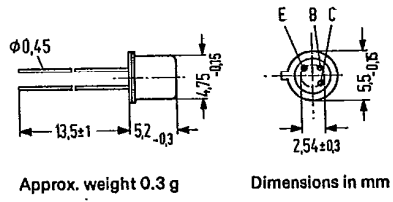BC 107
BC 108
BC 109

BC 107, BC 108, and BC 109 are epitaxial NPN silicon planar transistors in TO 18 metal case (18 A 3 DIN 41 876). The collector is electrically connected to the case.

The transistors are particularly suitable for use in AF input and driver stages.

Type	Ordering code
BC 107[1]	Q62702-C680
BC 107 A	Q60203-X107-A
BC 107 B	Q60203-X107-B
BC 108[1]	Q60203-X108
BC 108 A	Q60203-X108-A
BC 108 B	Q60203-X108-B
BC 108 C	Q60203-X108-C
BC 109[1]	Q60203-X109
BC 109 B	Q60203-X109-B
BC 109 C	Q60203-X109-C

Approx. weight 0.3 g   Dimensions in mm

Maximum ratings		BC 107	BC 108	BC 109	
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 current	I_C	100	100	50	mA
Collector peak current	I_{CM}	200	200	–	mA
Base current	I_B	50	50	5	mA
Junction temperature	T_j	175	175	175	°C
Storage temperature range	T_{stg}		−55 to +175		°C
Total power dissipation	P_{tot}	300	300	300	mW

Thermal resistance

Junction to ambient air	R_{thJA}	≦500	≦500	≦500	K/W
Junction to case	R_{thJC}	≦200	≦200	≦200	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.

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1565   G-06

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BC 107
BC 108
BC 109

Static characteristics (T_{amb} = 25 °C). The transistors are grouped according to the DC current gain h_{FE} and marked by A, B, C. At V_{CE} = 5 V and the collector currents indicated below the following static characteristics apply:

h_{FE} group	A	B	C
Type	BC 107 BC 108 –	BC 107 BC 108 BC 109	– BC 108 BC 109
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]

	BC 107 BC 108 BC 109				
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 107	BC 108	BC 109	
Collector cutoff current (V_{CES} = 50 V)	I_{CES}	0.2 (<15)	–	–	nA
Collector cutoff current (V_{CES} = 30 V)	I_{CES}	–	0.2 (<15)	0.2 (<15)	nA
Collector cutoff current (V_{CES} = 50 V; T_{amb} = 125 °C)	I_{CES}	0.2 (<4)	–	–	μA
Collector 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 break- down voltage (I_{CEO} = 2 mA)	$V_{(BR)CEO}$	>45	>20	>20	V

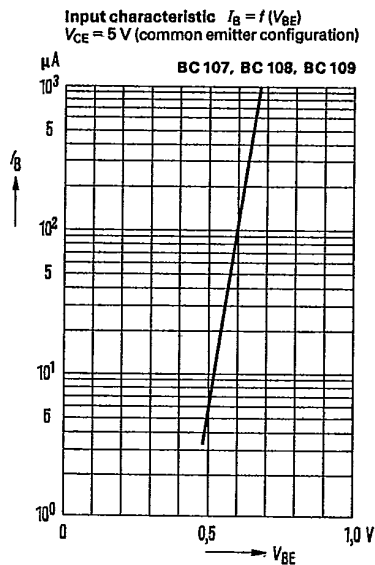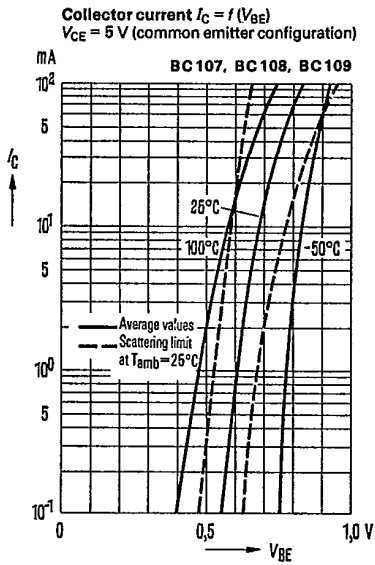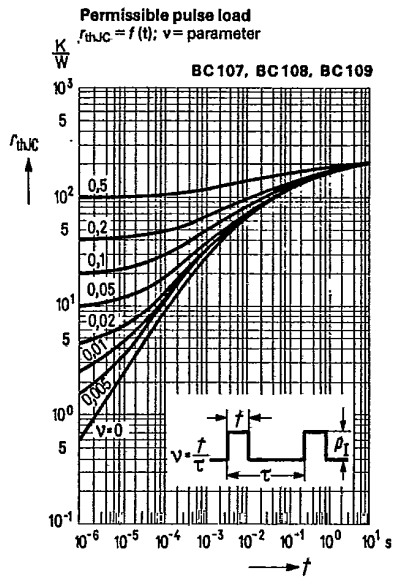1) The transistor is overloaded to such an extent that the DC current gain decreases to h_{FE} = 20
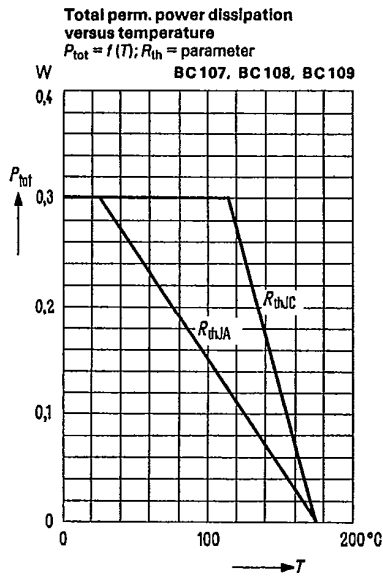2) These values do not apply to BC 109.

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BC 107
BC 108
BC 109

Dynamic characteristics (T_{amb} = 25°C)		BC 107	BC 108	BC 109	
Transition frequency (I_C = 0.5 mA; V_{CE} = 3 V)	f_T	85	85	85	MHz
Transition frequency (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}	3.5 (<6)	3.5 (<6)	3.5 (<6)	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; R_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 kHz; 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} group	A	B	C	
Type	BC 107 BC 108 –	BC 107 BC 108 BC 109	– BC 108 BC 109	
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	330	600	–
h_{22e}	18 (<30)	30 (<60)	60 (<110)	µS

**Total perm. power dissipation
versus temperature**
$P_{tot} = f(T)$; R_{th} = parameter

W   BC 107, BC 108, BC 109

Permissible pulse load
$r_{thJC} = f(t)$; v = parameter

$\frac{K}{W}$ BC 107, BC 108, BC 109

Collector current $I_C = f(V_{BE})$
V_{CE} = 5 V (common emitter configuration)

mA   BC 107, BC 108, BC 109

Input characteristic $I_B = f(V_{BE})$
V_{CE} = 5 V (common emitter configuration)

µA   BC 107, BC 108, BC 109

Output characteristics
$I_C = f(V_{CE})$; I_B = parameter
(common emitter configuration)
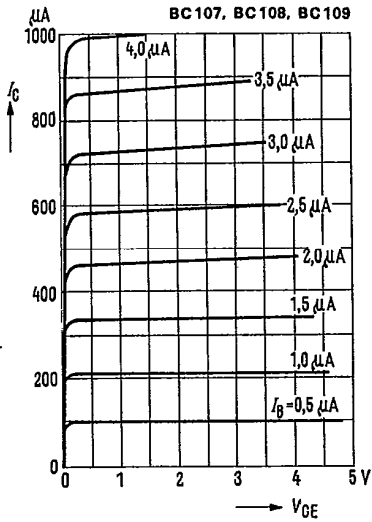
Output characteristics
$I_C = f(V_{CE})$; V_{BE} = parameter
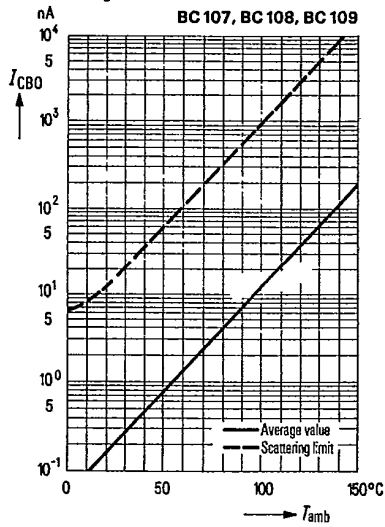(common emitter configuration)
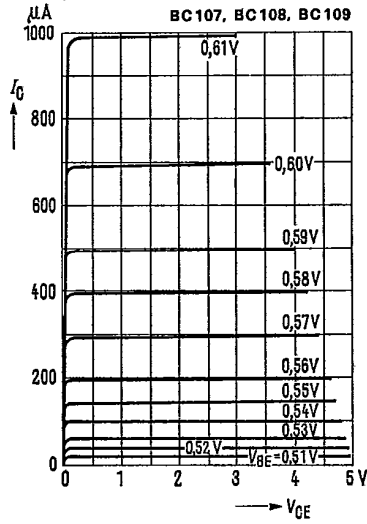
Collector-emitter saturation voltage
$V_{CEsat} = f(I_C)$; $h_{FE} = 20$; T_{amb} = parameter
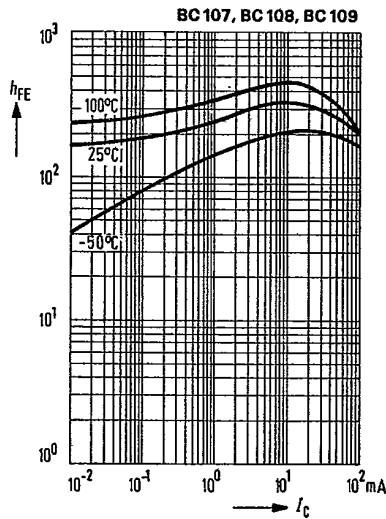(common emitter configuration)
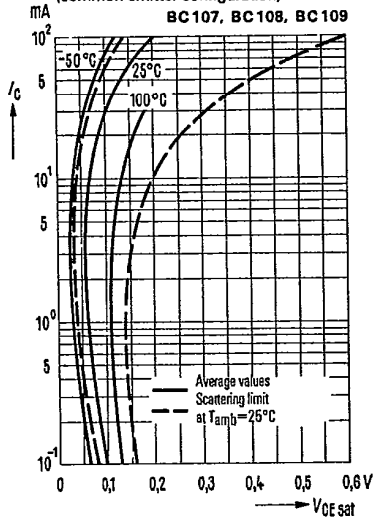
Base-emitter saturation voltage
$V_{BEsat} = f(I_C)$; $h_{FE} = 20$; T_{amb} = parameter
(common emitter configuration)

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BC 107
BC 108
BC 109
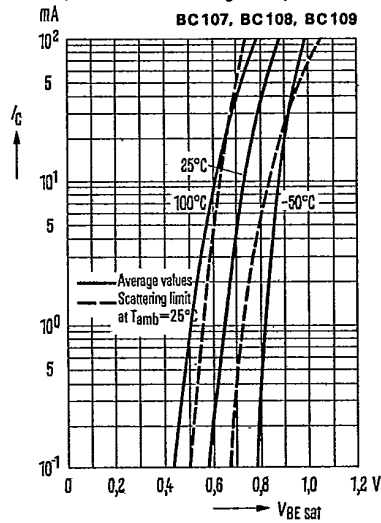
Collector cutoff current versus
temperature $I_{CBO} = f(T_{amb})$
for maximum permissible breakdown
voltage

BC 107, BC 108, BC 109

Average value
Scattering limit

DC current gain $h_{FE} = f(I_C)$;
$V_{CE} = 5$ V; T_{amb} = parameter
(common emitter configuration)

BC 107, BC 108, BC 109

100°C
25°C
-50°C

Transition frequency
$f_T = f(I_C)$; V_{CE} = parameter

BC 107, BC 108, BC 109

10 V
5 V
$V_{CE} = 2$ V
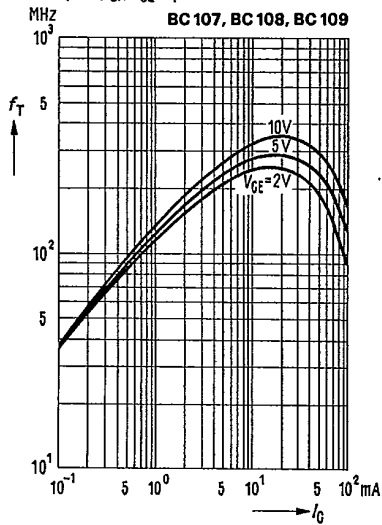
Collector-base capacitance
$C_{CBO} = f(V_{CBO})$
Emitter-base capacitance
$C_{EBO} = f(V_{EBO})$

BC 107, BC 108, BC 109

C_{EBO}
C_{CBO}
BC 107, 108, 109
C_{CBO}
BC 147, 148, 149
BC 167, 168, 169

140   1570   G-11

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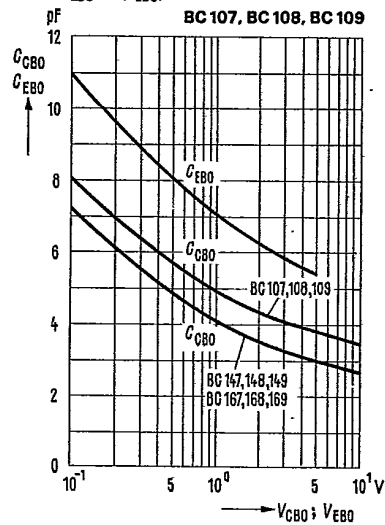
BC 107
BC 108
BC 109

h-parameter versus collector current

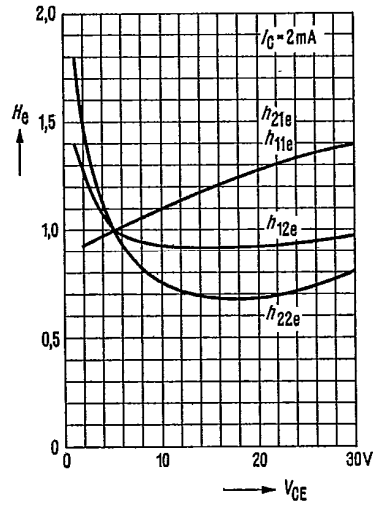$$H_e = \frac{h_e(I_C)}{h_e(I_C = 2\,mA)} = f(I_C);\ V_{CE} = 5\,V$$

BC107, BC108, BC109
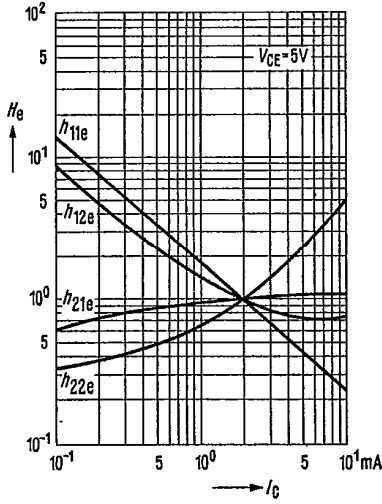
h-parameter versus collector-emitter voltage

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

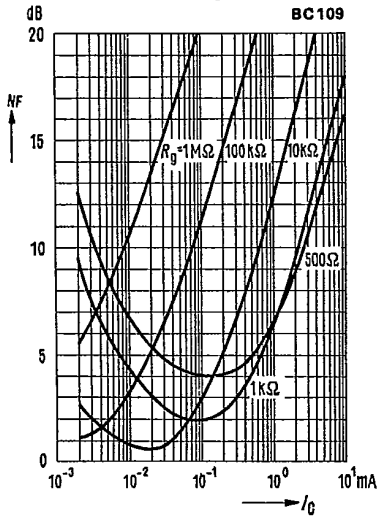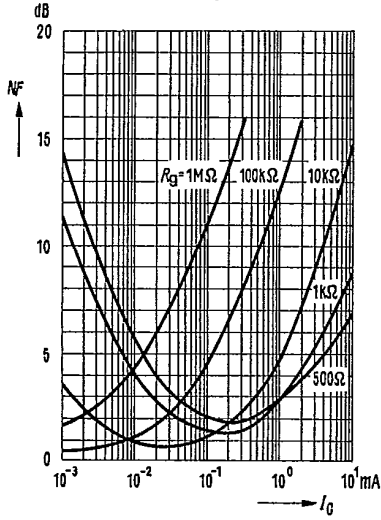BC107, BC108, BC109

Noise figure $NF = f(I_C)$
$V_{CE} = 5\,V;\ f = 120\,Hz;\ R_g$ = parameter

dB   BC109

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

dB
20

NF

15

$R_g = 1\,M\Omega$ $100\,k\Omega$ $10\,K\Omega$

10

$1\,K\Omega$

5

$500\,\Omega$

0
10^{-3} 10^{-2} 10^{-1} 10^{0} 10^{1} mA
I_C

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

dB
20

NF

15

$R_g = 1\,M\Omega$

10

$100\,k\Omega$

$500\,\Omega$ $10\,K\Omega$

5

$1\,K\Omega$

0
10^{-3} 10^{-2} 10^{-1} 10^{0} 10^{1} mA
I_C
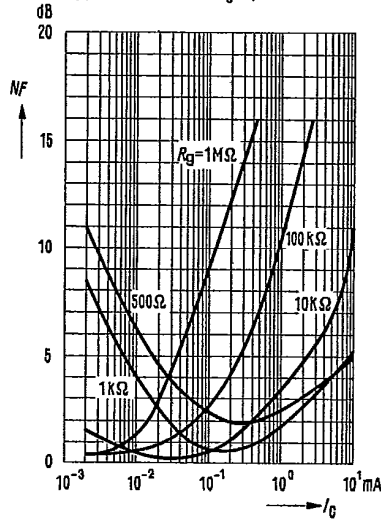
Noise figure $NF = f(V_{CE})$
$I_C = 0.2\,mA; R_g = 2\,k\Omega; f = 1\,kHz$
$\Delta f = 200\,Hz; T_{amb} = 25°C$

dB
20

NF

15

10

5

0
10^{-1} 5 1,0   5 10^{1} 5 10^{2} V
V_{CE}
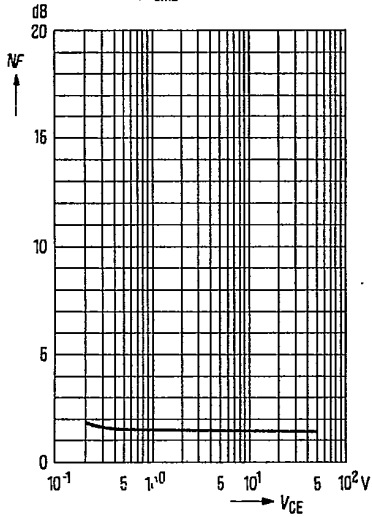
Noise figure $NF = f(f)$
$V_{CE} = 5\,V; I_C = 0.2\,mA$
$R_g = 2\,k\Omega; T_{amb} = 25°C$

dB
20

NF

15

10

5

0
10^{-2} 10^{-1} 10^{0} 10^{1} 10^{2} kHz
f

142

1572   G-13