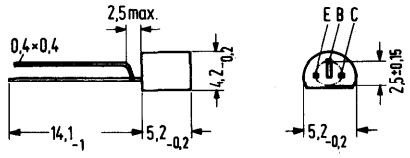
BC 413 and BC 414 are epitaxial NPN silicon planar transistors in TO 92 plastic packages (10 A 3 DIN 41868). They are intended for use in low-noise AF input stages and as complementary transistors to BC 415 and BC 416.

Type	Ordering code
BC 413[1]	Q62702-C375
BC 413 B	Q62702-C375-V1
BC 413 C	Q62702-C375-V2
BC 414[1]	Q62702-C376
BC 414 B	Q62702-C376-V1
BC 414 C	Q62702-C376-V2



Mounting instruction: Fixing hole dia 0.6
Approx. weight 0.25 g Dimensions in mm

Maximum ratings		BC 413	BC 414	
Collector-emitter voltage	V_{CEO}	30	45	V
Collector-base voltage	V_{CBO}	45	50	V
Emitter-base voltage	V_{EBO}	5	5	V
Collector current	I_C	100	100	mA
Base current	I_B	20	20	mA
Junction temperature	T_j	150	150	°C
Storage temperature range	T_{stg}	−65 to +150		°C
Total power dissipation (T_{amb} = 25 °C)	P_{tot}	300	300	mW
Thermal resistance				
Junction to ambient air	R_{thJA}	420	420	K/W

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

The transistors are grouped according to the DC current gain h_{FE} and marked by B and C. At V_{CE} = 5 V and the collector currents tabulated below the following static characteristics apply.

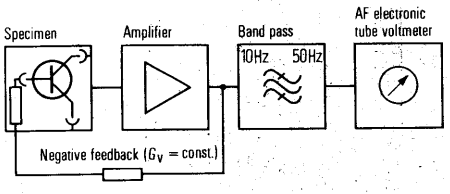
h_{FE} group	B	C
Type	**BC 413, BC 414**	**BC 413, BC 414**
I_C (mA)	h_{FE} I_C/I_B	h_{FE} I_C/I_B
0.01	150 (> 100)	270 (> 100)
2	290 (180 to 460)	500 (380 to 800)

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.

Type	BC 413, BC 414				
V_{CE} (V)	I_C (mA)	I_B (mA)	V_{BE} (V)	V_{CEsat} (V)	V_{BEsat} (V)
5	0.01	–	0.52	–	–
5	0.1	–	0.55	–	–
–	10	0.5	–	0.075 (<0.25)	–
–	100	5	–	0.25 (<0.6)	0.9
5	2	–	0.62 (0.55 to 0.75)	–	–
1	10	–	–	0.3 (<0.6)[1]	–

Static characteristics (T_{amb} = 25 °C)		BC 413	BC 414	
Collector cutoff current (V_{CB} = 30 V)	I_{CBO}	<15	<15	nA
Collector cutoff current (V_{CB} = 30 V; T_{amb} = 150 °C)	I_{CBO}	<5	<5	µA
Emitter cutoff current (V_{EB} = 4 V)	I_{EBO}	<15	<15	nA
Collector-emitter breakdown voltage (I_C = 10 mA)	$V_{(BR)CEO}$	>30	>45	V
Collector-base breakdown voltage (I_C = 10 µA)	$V_{(BR)CBO}$	>45	>50	V
Emitter-base breakdown voltage (I_C = 10 µA)	$V_{(BR)EBO}$	>5	>5	V
Dynamic characteristics (T_{amb} = 25 °C)				
Transition frequency (I_C = 10 mA; V_{CE} = 5 V; f = 100 MHz)	f_T	250	250	MHz
Collector-base capacitance (V_{CB} = 10 V; I_E = 0; f = 1 MHz)	C_{CBO}	2.5	2.5	pF
Noise figure (I_C = 0.2 mA; V_{CE} = 5 V; f = 30 Hz to 15 kHz)	NF	<2.5	<2.5	dB
Equivalent, base referred noise voltage[2] (I_C = 0.2 mA; V_{CE} = 5 V; R_g = 2 kΩ; f = 10 to 50 Hz)	E_n	<0.135	<0.135	µV

Test circuit for noise voltage measurement



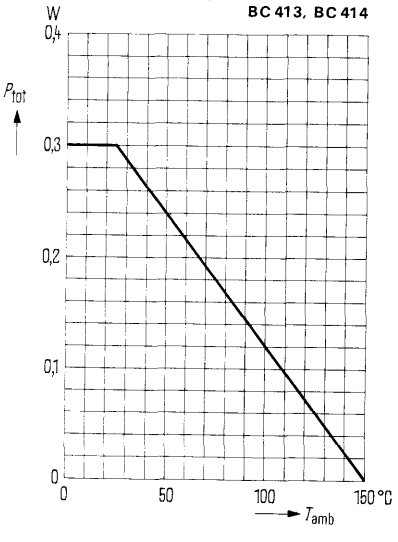
1) For the characteristic which passes through the point I_C = 11 mA; V_{CE} = 1 V at constant base current.
2) Test circuit for noise voltage measurement.

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

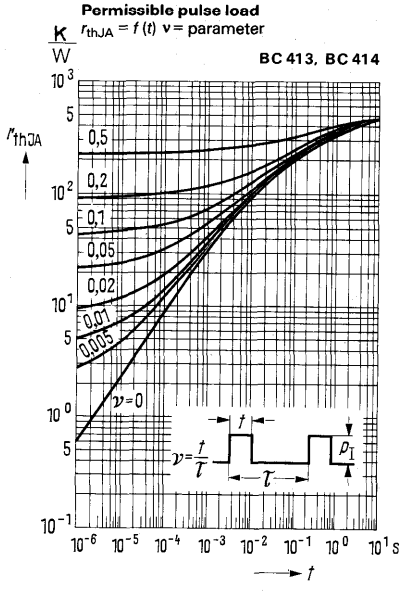
I_C = 2 mA; V_{CE} = 5 V; f = 1 kHz

Type	**BC 413, BC 414**	**BC 413, BC 414**	
h_{FE} group	**B**	**C**	
h_{11e}	4.5 (3.2 to 8.5)	8.7 (6 to 15)	kΩ
h_{12e}	2	3	10^{-4}
h_{21e}	330	600	–
h_{22e}	30 (<60)	60 (<110)	μS

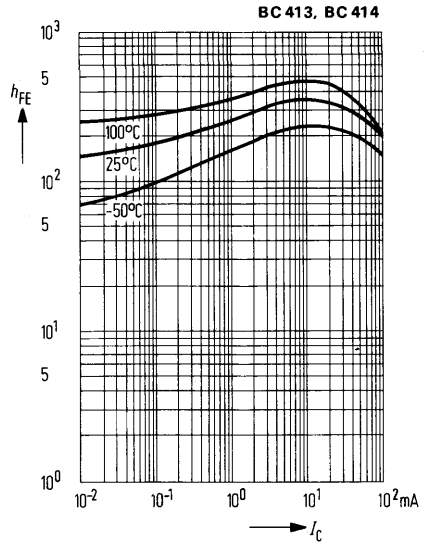
Total perm. power dissipation versus temperature
$P_{tot} = f(T_{amb})$



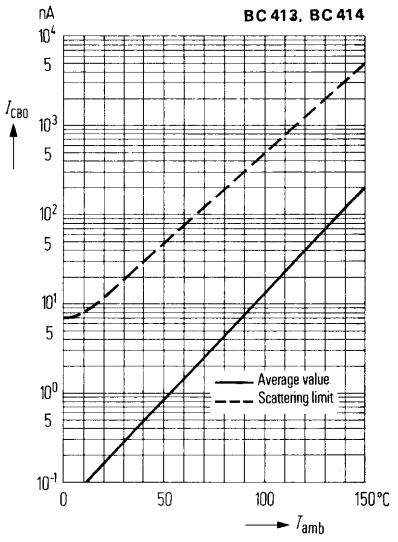
Permissible pulse load
$r_{thJA} = f(t)$ ν = parameter



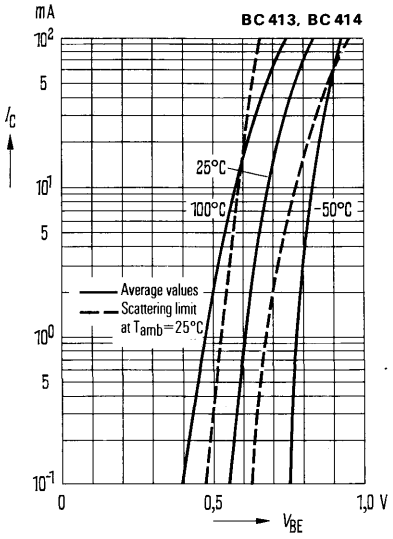
DC current gain $h_{FE} = f(I_C)$;
V_{CE} = 5 V; T_{amb} = parameter
(common emitter configuration)



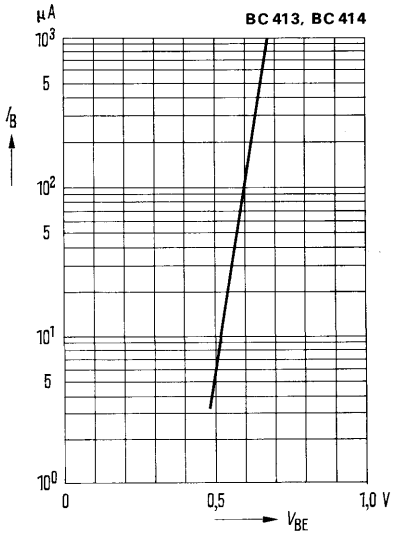
Collector cutoff current versus temperature $I_{CBO} = f(T_{amb})$
V_{CB} = 30 V



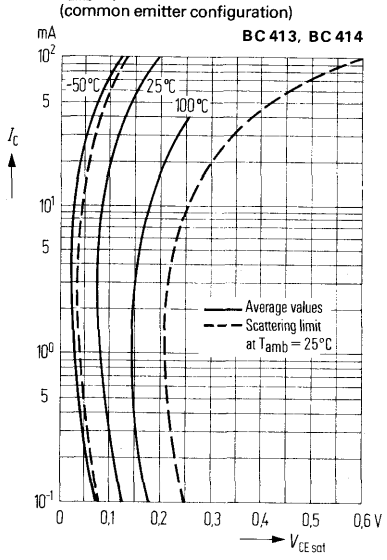
Collector current $I_C = f(V_{BE})$
V_{CE} = 5 V
(common emitter configuration)



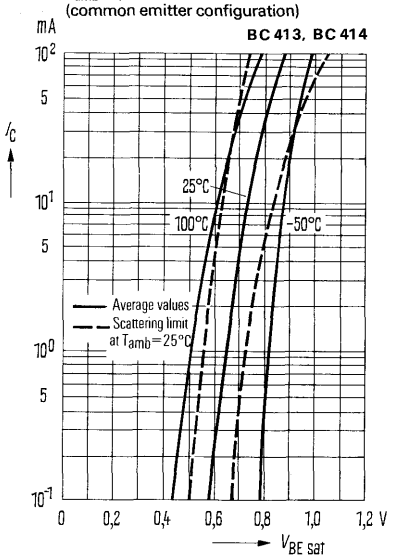
Input characteristic $I_B = f(V_{BE})$
V_{CE} = 5 V;
(common emitter configuration)



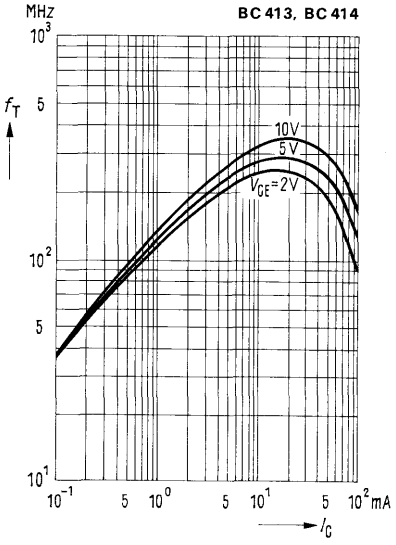
Collector-emitter saturation voltage
$V_{CEsat} = f(I_C)$; $h_{FE} = 20$;
T_{amb} = parameter
(common emitter configuration)



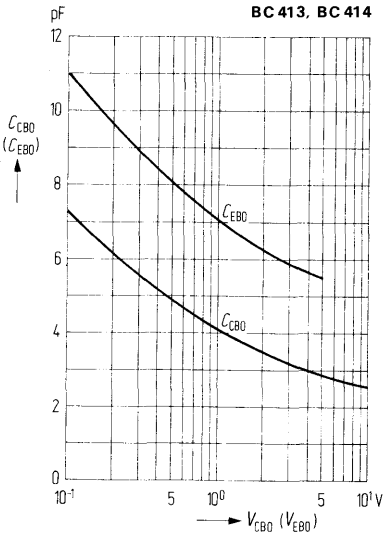
Base-emitter saturation voltage
$V_{BEsat} = f(I_C)$; $h_{FE} = 20$;
T_{amb} = parameter
(common emitter configuration)



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



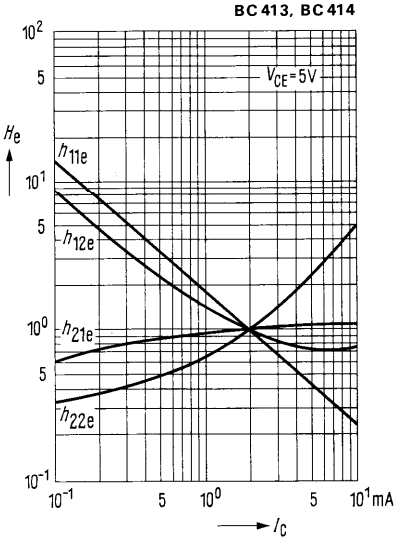
Collector-base capacitance
$C_{CBO} = f(V_{CBO})$
Emitter-base capacitance
$C_{EBO} = f(V_{EBO})$



h-parameter versus collector current

$H_e = \frac{h_e(I_C)}{h_e(I_C = 2\,mA)} = f(I_C)$

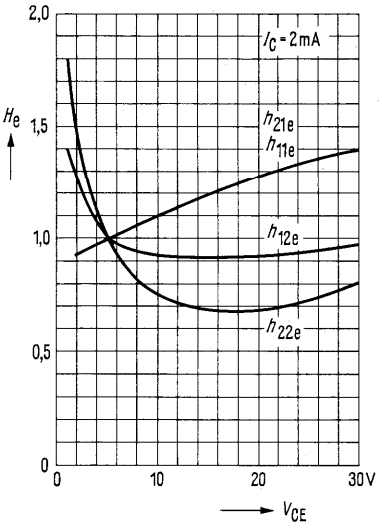
$V_{CE} = 5\,V$



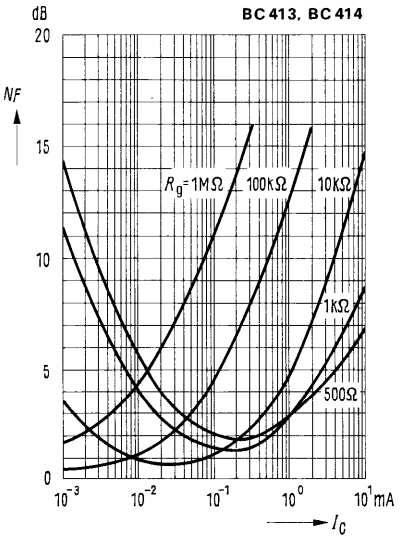
h-parameter versus collector-emitter voltage

$I_C = 2\,mA$

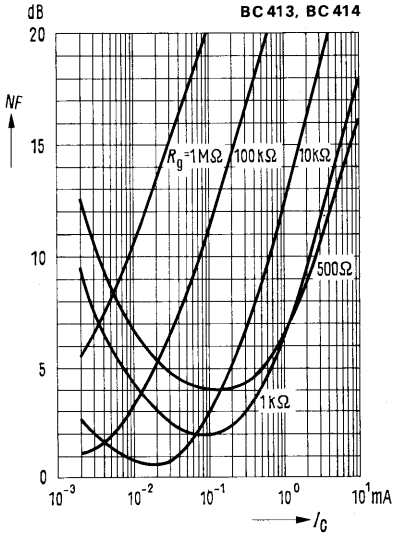
$H_e = \frac{h(V_{CE})}{h_e(V_{CE} = 5\,V)} = f(_{CE})$



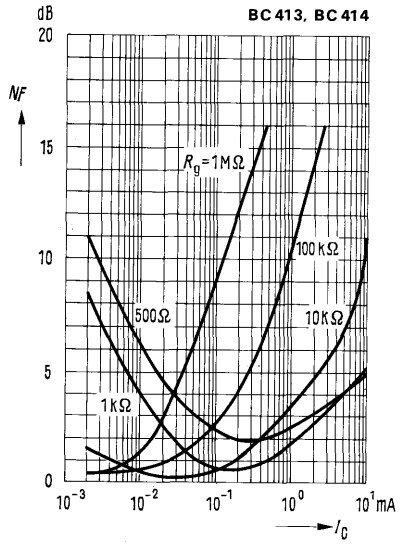
Noise figure $NF = f(I_C)$
V_{CE} = 5 V; f = 1 kHz;
R_g = parameter



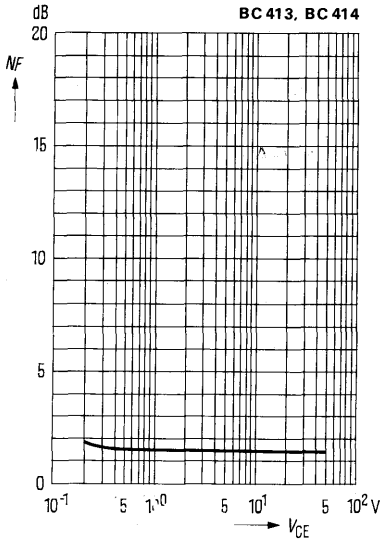
Noise figure $NF = f(I_C)$
V_{CE} = 5 V; f = 120 Hz
R_g = parameter



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



Noise figure $NF = f(V_{CE})$
$I_C = 0.2$ mA; $R_g = 2$ kΩ; $f = 10$ kHz
$\Delta f = 200$ Hz; $T_{amb} = 25$ °C



Noise figure $NF = f(f)$
$R_g = 2$ kΩ; $V_{CE} = 5$ V; $I_C = 0.2$ mA
$T_{amb} = 25$ °C