

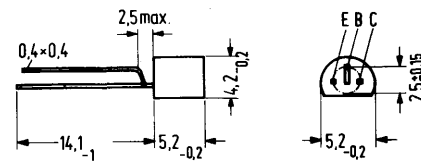
## NPN Silicon Transistors

**BC 237**  
**BC 238**  
**BC 239**

BC 237, BC 238, and BC 239 are epitaxial NPN silicon planar transistors in TO 92 plastic packages (10 A 3 DIN 41868). They are intended for use in AF input and driver stages and as complementary transistors to BC 307, BC 308, and BC 309.

BC 239 is provided for low-noise input stages.

Type	Ordering code
BC 237 <sup>1)</sup>	Q62702-C697
BC 237 A	Q62702-C276
BC 237 B	Q62702-C277
BC 238 <sup>1)</sup>	Q62702-C698
BC 238 A	Q62702-C278
BC 238 B	Q62702-C279
BC 238 C	Q62702-C280
BC 239 <sup>1)</sup>	Q62702-C699
BC 239 B	Q62702-C281
BC 239 C	Q62702-C282



Mounting instruction: Fixing hole dia 0.6

Approx. weight 0.25 g

Dimensions in mm

Maximum ratings		BC 237	BC 238	BC 239	
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	$T_j$	150	150	150	°C
Storage temperature range	$T_{stg}$		-55 to +150		°C
Total power dissipation	$P_{tot}$	300	300	300	mW
<b>Thermal resistance</b>					
Junction to ambient air	$R_{thJA}$	≤420	≤420	≤420	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.

**BC 237**  
**BC 238**  
**BC 239**

**Static characteristics** ( $T_{amb} = 25^{\circ}\text{C}$ )

The transistors are grouped in accordance with the DC current gain  $h_{FE}$  and marked by A, B, and C. At  $V_{CE} = 5\text{ V}$  and the collector currents indicated below the following static characteristics apply:

$h_{FE}$ group	A	B	C
Type	BC 237 BC 238 –	BC 237 BC 238 BC 239	– BC 238 BC 239
$I_C$ mA	$h_{FE}$ $I_C/I_B$	$h_{FE}$ $I_C/I_B$	$h_{FE}$ $I_C/I_B$
0.01	90	150	270
2	170 (120 to 220)	290 (180 to 460)	500 (380 to 800)
100 <sup>2)</sup>	120	200 <sup>2)</sup>	400 <sup>2)</sup>

**Static characteristics** ( $T_{amb} = 25^{\circ}\text{C}$ )

Type	BC 237, BC 238, BC 239					
$V_{CE}$ V	$I_C$ mA	$V_{BE}$ V	$I_C$ mA	$I_B$ mA	$V_{CEsat}^{1)}$ V	$V_{BEsat}^{1)}$ V
5	0.1	0.5	10	0.5	0.07 (<0.2)	0.73 (<0.83)
5	2	0.62(0.55 to 0.7)				
5	100	0.83	100 <sup>2)</sup>	5	0.2 (<0.6) <sup>2)</sup>	0.87 (<1.05) <sup>2)</sup>

	BC 237	BC 238	BC 239
Collector cutoff current ( $V_{CES} = 50\text{ V}$ )	$I_{CES}$ 0.2 (<15)	–	– nA
Collector cutoff current ( $V_{CES} = 30\text{ V}$ )	$I_{CES}$ –	0.2 (<15)	0.2 (<15) nA
Collector cutoff current ( $V_{CES} = 50\text{ V}$ ; $T_{amb} = 125^{\circ}\text{C}$ )	$I_{CES}$ 0.05 (<4)	–	– $\mu\text{A}$
Collector cutoff current ( $V_{CES} = 30\text{ V}$ ; $T_{amb} = 125^{\circ}\text{C}$ )	$I_{CES}$ –	0.05 (<4)	0.05 (<4) $\mu\text{A}$
Emitter-base breakdown voltage ( $I_{EBO} = 1\ \mu\text{A}$ )	$V_{(BR)EBO}$ >6	>5	>5 V
Collector-emitter breakdown voltage ( $I_{CEO} = 2\text{ mA}$ )	$V_{(BR)CEO}$ >45	>20	>20 V

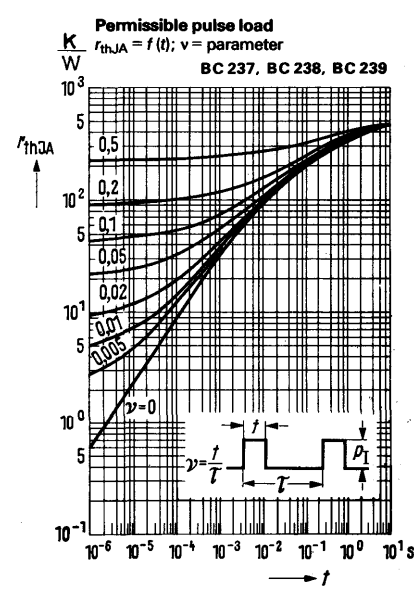
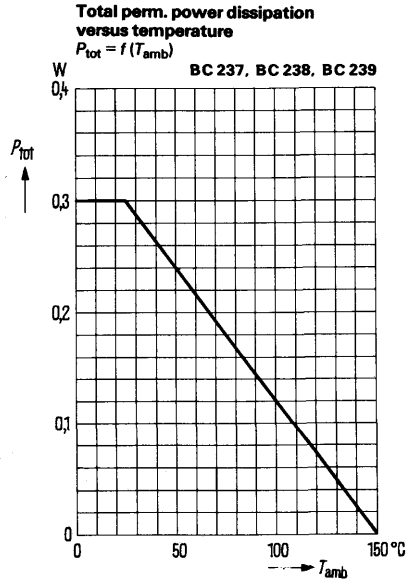
1) The transistor is overloaded to such an extent that the DC current gain decreases to  $h_{FE} = 20$ .  
2) These values do not apply to BC 239.

**BC 237  
BC 238  
BC 239**

Dynamic characteristics ( $T_{amb} = 25^\circ\text{C}$ )		BC 237	BC 238	BC 239	
Transition frequency ( $I_C = 0.5\text{ mA}$ ; $V_{CE} = 3\text{ V}$ )	$f_T$	85	85	85	MHz
Transition frequency ( $I_C = 10\text{ mA}$ ; $V_{CE} = 5\text{ V}$ ; $f = 100\text{ MHz}$ )	$f_T$	250 (>150)	250 (<150)	300 (<150)	MHz
Collector-base capacitance ( $V_{CBO} = 10\text{ V}$ ; $f = 1\text{ MHz}$ )	$C_{CBO}$	<4.5	<4.5	<4.5	pF
Emitter-base capacitance ( $V_{EBO} = 0.5\text{ V}$ ; $f = 1\text{ MHz}$ )	$C_{EBO}$	8	8	8	pF
Noise figure ( $I_C = 0.2\text{ mA}$ ; $V_{CE} = 5\text{ V}$ ; $R_g = 2\text{ k}\Omega$ ; $\Delta f = 30\text{ Hz to }15\text{ kHz}$ )	NF	—	—	<4	dB
Noise figure ( $I_C = 0.2\text{ mA}$ ; $V_{CE} = 5\text{ V}$ ; $R_g = 2\text{ k}\Omega$ ; $f = 1\text{ kHz}$ ; $\Delta f = 200\text{ Hz}$ )	NF	2 (<10)	2 (<10)	<4	dB

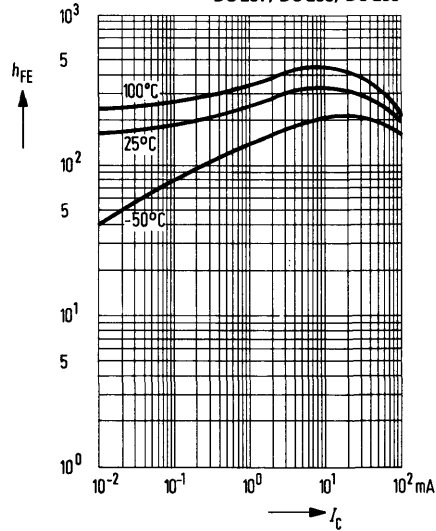
Operating point:  $I_C = 2\text{ mA}$ ;  $V_{CE} = 5\text{ V}$ ;  $f = 1\text{ kHz}$ :

$h_{FE}$ group	A	B	C	
Type	BC 237 BC 238 —	BC 237 BC 238 BC 239	— BC 238 BC 239	
$h_{11e}$	2.7 (1.6 to 4.5)	4.5 (3.2 to 8.5)	8.7 (6 to 15)	k $\Omega$
$h_{12e}$	1.5	2	3	$10^{-4}$
$h_{21e}$	220	330	600	—
$h_{22e}$	18 (<30)	30 (<60)	60 (<110)	$\mu\text{S}$

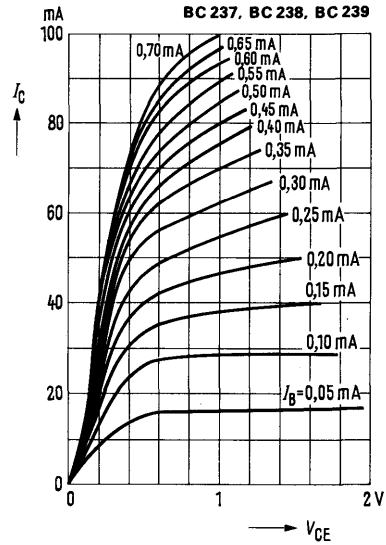


**BC 237  
BC 238  
BC 239**

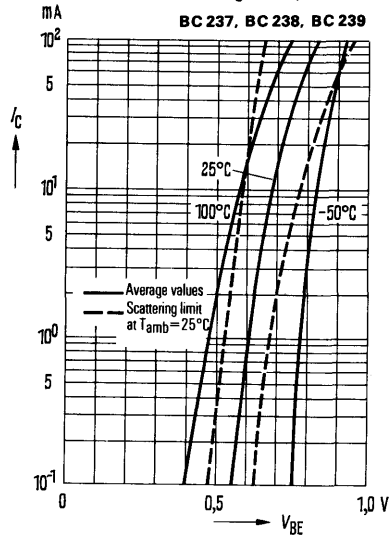
**DC current gain  $h_{FE} = f(I_C)$**   
 $V_{CE} = 5 \text{ V}; T_{amb} = \text{parameter}$   
 (common emitter configuration)  
**BC 237, BC 238, BC 239**



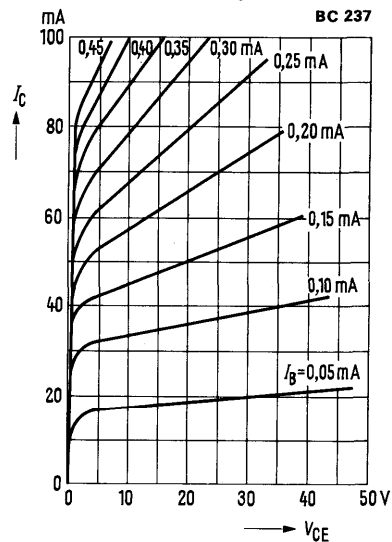
**Output characteristics  $I_C = f(V_{CE})$**   
 $I_B = \text{parameter}$   
 (common emitter configuration)  
**BC 237, BC 238, BC 239**



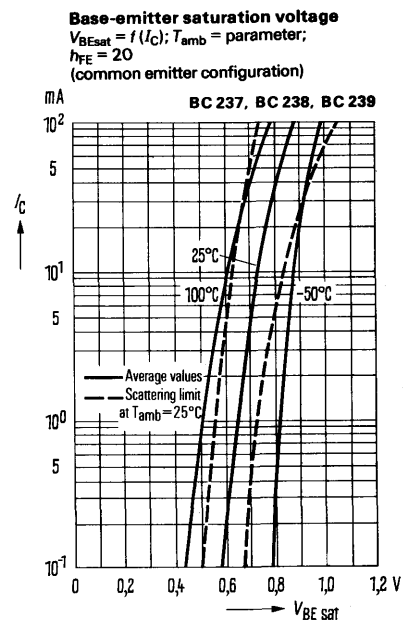
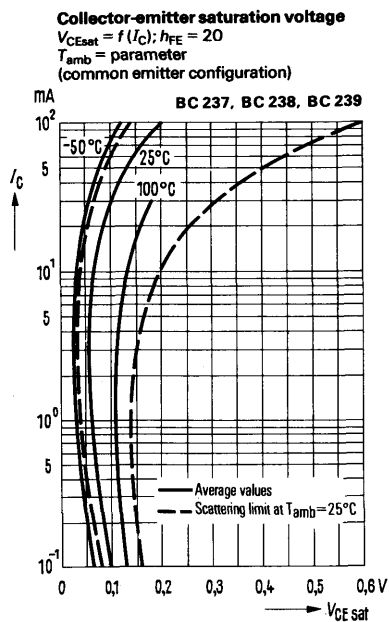
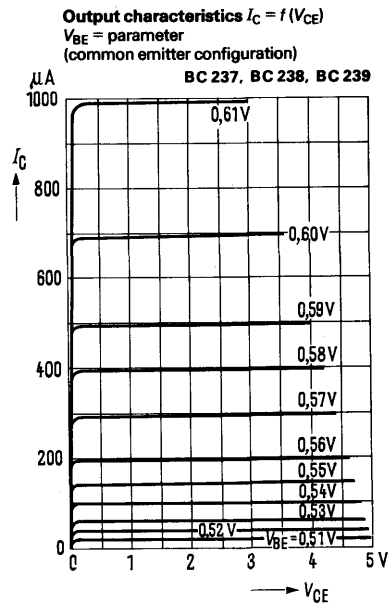
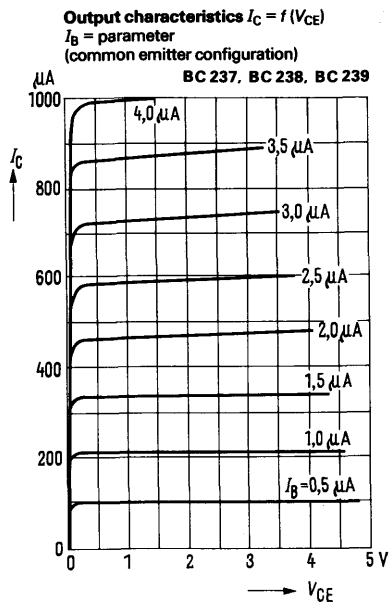
**Collector current  $I_C = f(V_{BE})$**   
 $V_{CE} = 5 \text{ V}$   
 (common emitter configuration)  
**BC 237, BC 238, BC 239**



**Output characteristics  $I_C = f(V_{CE})$**   
 $I_B = \text{parameter}$   
 (common emitter configuration)  
**BC 237**

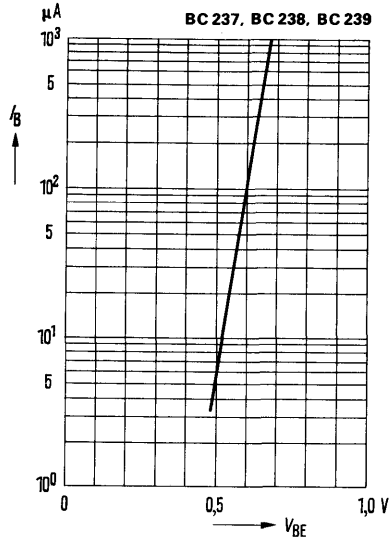


**BC 237  
BC 238  
BC 239**

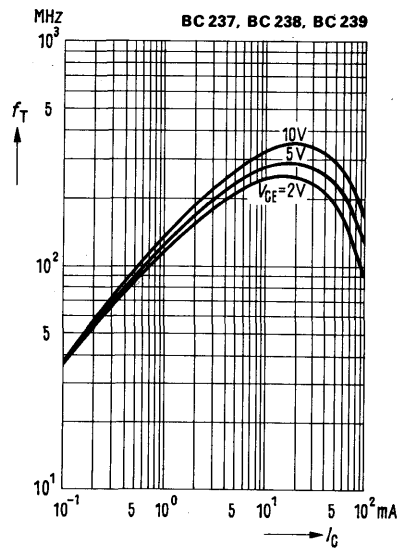


**BC 237  
BC 238  
BC 239**

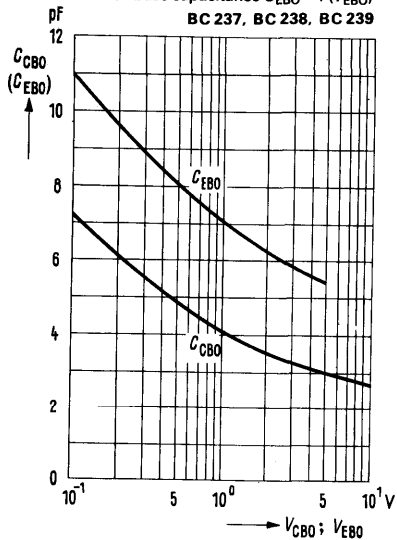
**Input characteristic**  $I_B = f(V_{BE})$   
 $V_{CE} = 5\text{ V}$   
(common emitter configuration)



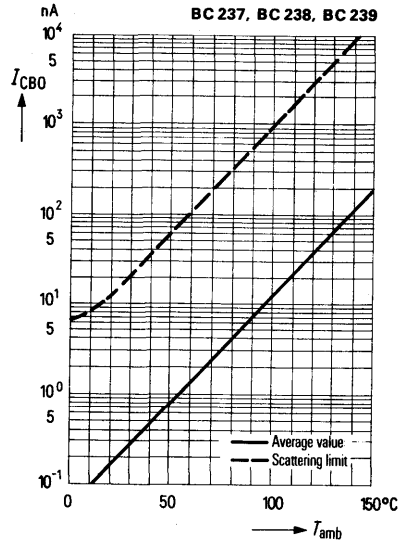
**Transition frequency**  $f_T = f(I_C)$   
 $V_{CE} = \text{parameter}$



**Collector-base capacitance**  
 $C_{CB0} = f(V_{CB0})$   
**Emitter-base capacitance**  $C_{EB0} = f(V_{EB0})$   
BC 237, BC 238, BC 239



**Collector cutoff current versus temperature**  
 $I_{CB0} = f(T_{amb})$  for max. permissible reverse voltage

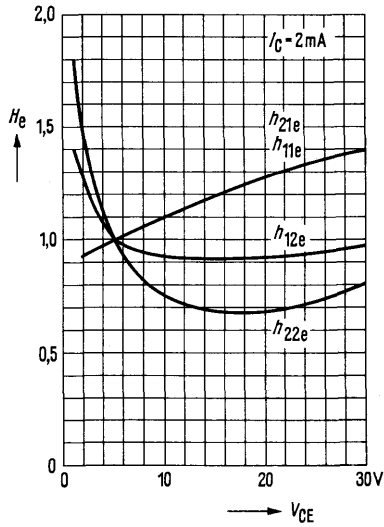


**BC 237  
BC 238  
BC 239**

***h*-parameter versus collector-emitter voltage**

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

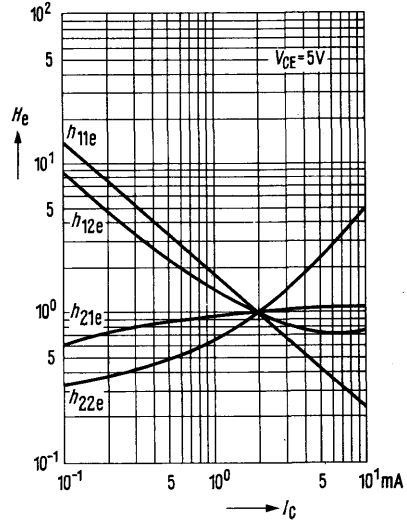
BC 237



***h*-parameter versus collector current**

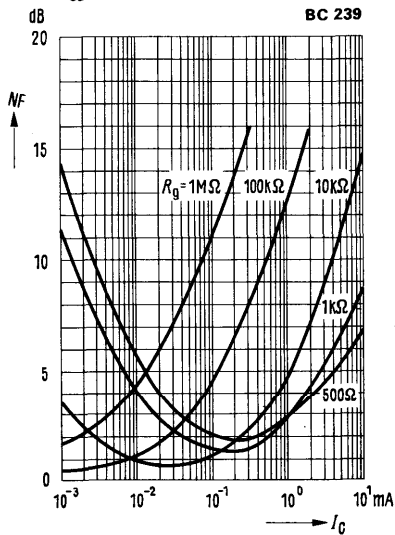
$$H_e = \frac{h_e(I_C)}{h_e(I_C=2\text{mA})} = f(I_C)$$

BC 237, BC 238, BC 239



**Noise figure  $NF = f(I_C)$**   
 $V_{CE} = 5\text{V}; f = 1\text{kHz}$

BC 239



**Noise figure  $NF = f(I_C)$**   
 $V_{CE} = 5\text{V}; f = 120\text{Hz}$

BC 239

