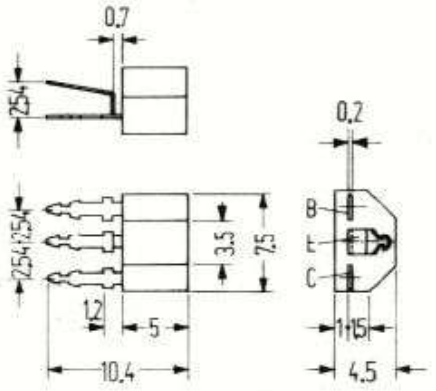
### High-frequency transistors

The BF 194 and BF 195 are silicon NPN planar epitaxial RF transistors in a plastic package 11 A 3 DIN 41869. (SOT-25).
BF 194: This transistor is designed for use in AM/FM-IF amplifiers as well as for input stages in the short, medium and long-wave ranges.
BF 195: This transistor is designed for use in pre-stages as well as in mixer and oscillator stages up into the VHF range.

| Type | Order number |
|---|---|
| BF 194 | Q62702-F147 |
| BF 195 | Q62702-F148 |

Mounting instructions see Preface.




Weight approx. 0.3 g Dimensions in mm

| Maximum ratings | | BF 194 | BF 195 | |
|---|---|---|---|---|
| Collector-base voltage | $V_{CBO}$ | 30 | 30 | V |
| Collector-emitter voltage | $V_{CEO}$ | 20 | 20 | V |
| Emitter-base voltage | $V_{EBO}$ | 5 | 5 | V |
| Collector current | $I_C$ | 30 | 30 | mA |
| Junction temperature | $T_j$ | 125 | 125 | °C |
| Storage temperature | $T_s$ | −65 to +125 | −65 to +125 | °C |
| Total power dissipation | $P_{tot}$ | 220 | 220 | mW |
| Thermal resistance | | | | |
| Junction to ambient air | $R_{thJamb}$ | ≦ 450 | ≦ 450 | K/W |

| **Static characteristics** ($T_{amb}$ = 25°C) | | **BF 194** | **BF 195** | |
|---|---|---|---|---|
| Base-emitter voltage[1]<br>($V_{CE}$ = 10 V; $I_C$ = 1 mA) | $V_{BE}$ | 0.68<br>(0.64 to 0.71) | 0.69<br>(0.65 to 0.73) | V<br>V |
| Base current<br>($V_{CE}$ = 10 V; $I_C$ = 1 mA) | $I_B$ | 8.7<br>(4.5 to 15) | 15<br>(8 to 28) | µA |
| Static forward current transfer ratio<br>($V_{CE}$ = 10 V; $I_C$ = 1 mA) | $h_{FE}$ | 115 | 67 | – |

| **Dynamic characteristics** ($T_{amb}$ = 25°C) | | | | |
|---|---|---|---|---|
| Current gain-bandwidth product<br>($V_{CE}$ = 10 V; $I_C$ = 1 mA) | $f_T$ | 260 | 200 | MHz |
| Noise figure ($V_{CE}$ = 10 V; $I_C$ = 1 mA) | | | | |
| at $f$ = 200 kHz, $g_g$ = 2 mmhos[2]) | $NF$ | 1.5 | – | db |
| at $f$ = 1 MHz, $g_g$ = 1.5 mmhos[2]) | $NF$ | 1.2 | – | db |
| at $f$ = 1 MHz, $g_g$ = 20 mmhos[2]) | $NF$ | – | 3.5 | db |
| at $f$ = 100 MHz, $g_g$ = 10 mmhos[2]) | $NF$ | 4 | 4 | db |
| Mixing noise figure<br>($V_{CE}$ = 10 V; $I_C$ = 1 mA) | | | | |
| at $f$ = 200 kHz, $g_g$ = 0.6 mmhos[2]) | $NF_C$ | 3 | – | db |
| at $f$ = 1 MHz, $g_g$ = 1.2 mmhos[2]) | $NF_C$ | 2 | – | db |
| at $f$ = 200 kHz, $g_g$ = 1.2 mmhos[2]) | $NF_C$ | – | 4 | db |
| at $f$ = 1 MHz, $g_g$ = 1.5 mmhos[2]) | $NF_C$ | – | 2.5 | db |
| Feedback capacitance<br>($V_{CE}$ = 10 V; $I_C$ = 1 mA;<br>$f$ = 450 kHz) | $-C_{12e}$ | 0.95 | 0.95 | pf |

[1]) $\Delta V_{BE}/\Delta T \approx -1.7$ mV/K

[2]) $g_g$ = internal admittance of generator $\left(\frac{1}{R_G}\right)$

**Dynamic characteristics** ($T_{amb}$ = 25 °C) **BF 194:**

Four-pole characteristics
Test condition: ($V_{CB}$ = 10 V; $-I_E$ = 1 mA)

$f$ = 450 kHz

| | | | |
|---|---|---|---|
| $g_{11e}$ 0.3 mmhos | $\lvert y_{12e} \rvert$ = 2.7 µmhos | $\lvert y_{21e} \rvert$ = 35 mmhos | $g_{22e}$ = 4 µmhos |
| $b_{11e}$ = 0.07 mmhos | $-\varphi_{12e}$ = 90° | $-\varphi_{21e}$ = 0° | $b_{22e}$ = 4 µmhos |
| $C_{11e}$ = 25 pf | | | $C_{22e}$ = 1.4 pf |

$f$ = 10.7 MHz:

| | | | |
|---|---|---|---|
| $g_{11e}$ = 0.45 mmhos | $\lvert y_{12e} \rvert$ = 65 µmhos | $\lvert y_{21e} \rvert$ = 35 mmhos | $g_{22e}$ = 5.5 µmhos |
| $b_{11e}$ = 1.7 mmhos | $-\varphi_{12e}$ = 90° | $-\varphi_{21e}$ = 5° | $b_{22e}$ = 0.1 mmhos |
| $C_{11e}$ = 25 pf | | | $C_{22e}$ = 1.6 pf |

$f$ = 35 MHz:

| | | | |
|---|---|---|---|
| $g_{11e}$ = 0.85 mmhos | $\lvert y_{12e} \rvert$ = 185 µmhos | $\lvert y_{21e} \rvert$ = 35 mmhos | $g_{22e}$ = 6 µmhos |
| $b_{11e}$ = 4.2 mmhos | $-\varphi_{12e}$ = 100° | $-\varphi_{21e}$ = 15° | $b_{22e}$ = 0.35 mmhos |
| $C_{11e}$ = 19 pf | | | $C_{22e}$ = 1.6 pf |

**Dynamic characteristics** ($T_{amb}$ = 25 °C) **BF 195:**

Four-pole characteristics
Test condition ($V_{CB}$ = 10 V; $-I_E$ = 1 mA)

$f$ = 450 kHz:

| | | | |
|---|---|---|---|
| $g_{11e}$ = 0.4 mmhos | $\lvert y_{12e} \rvert$ = 2.7 µmhos | $\lvert y_{21e} \rvert$ = 35 mmhos | $g_{22e}$ = 4 µmhos |
| $b_{11e}$ = 0.07 mmhos | $-\varphi_{12e}$ = 90° | $-\varphi_{21e}$ = 0° | $b_{22e}$ = 4 µmhos |
| $C_{11e}$ = 25 pf | | | $C_{22e}$ = 1.4 pf |

$f$ = 10.7 MHz:

| | | | |
|---|---|---|---|
| $g_{11e}$ = 0.55 mmhos | $\lvert y_{12e} \rvert$ = 65 µmhos | $\lvert y_{21e} \rvert$ = 35 mmhos | $g_{22e}$ = 4.5 µmhos |
| $b_{11e}$ = 1.95 mmhos | $-\varphi_{12e}$ = 90° | $-\varphi_{21e}$ = 5° | $b_{22e}$ = 0.1 mmhos |
| $C_{11e}$ = 29 pf | | | $C_{22e}$ = 1.6 pf |

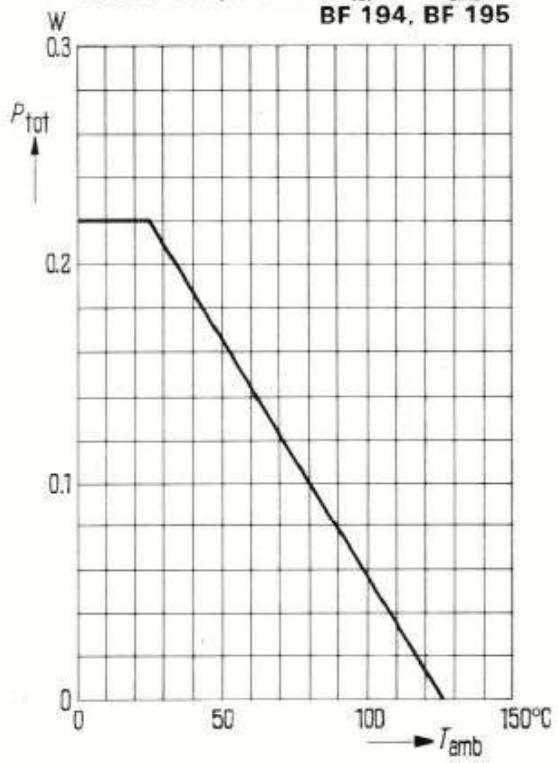
$f$ = 35 MHz:

| | | | |
|---|---|---|---|
| $g_{11e}$ = 1.1 mmhos | $\lvert y_{12e} \rvert$ = 185 µmhos | $\lvert y_{21e} \rvert$ = 35 mmhos | $g_{22e}$ = 5 µmhos |
| $b_{11e}$ = 4.85 mmhos | $-\varphi_{12e}$ = 100° | $-\varphi_{21e}$ = 15° | $b_{22e}$ = 0.35 mmhos |
| $C_{11e}$ = 22 pf | | | $C_{22e}$ = 1.6 pf |

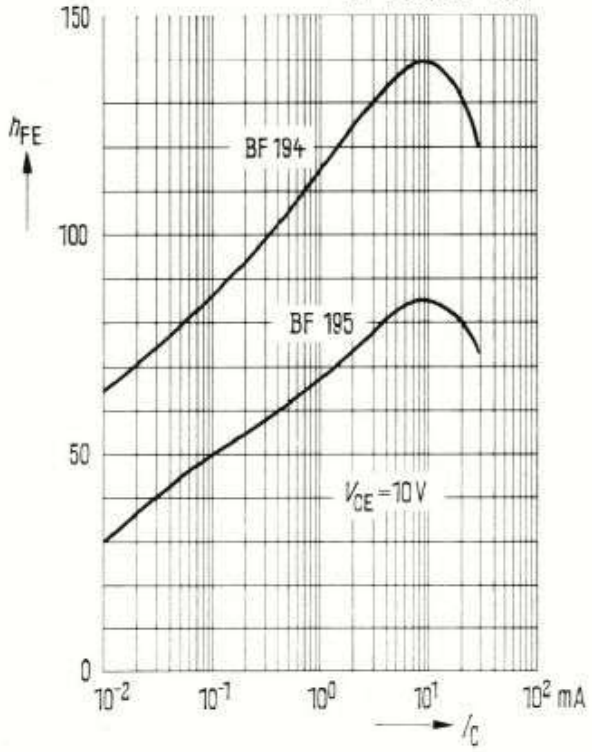
$f$ = 100 MHz:

| | | | |
|---|---|---|---|
| $g_{11e}$ = 6 mmhos | $\lvert y_{12e} \rvert$ = 0.59 mmhos | $\lvert y_{21e} \rvert$ = 31 mmhos | $g_{22e}$ = 12 µmhos |
| $b_{11e}$ = 13.8 mmhos | $-\varphi_{12e}$ = 115° | $-\varphi_{21e}$ = 30° | $b_{22e}$ = 1 mmhos |
| $C_{11e}$ = 22 pf | | | $C_{22e}$ = 1 pf |
| $g_{11b}$ = 33 mmhos | $\lvert y_{12b} \rvert$ = 480 µmhos | $\lvert y_{21b} \rvert$ = 31 mmhos | $g_{22b}$ = 12 µmhos |
| $-b_{11b}$ = 5.6 mmhos | $-\varphi_{12b}$ = 92° | $-\varphi_{21b}$ = 150° | $b_{22b}$ = 1 mmhos |
| $-C_{11b}$ = 9 pf | | | $C_{22b}$ = 1.6 pf |

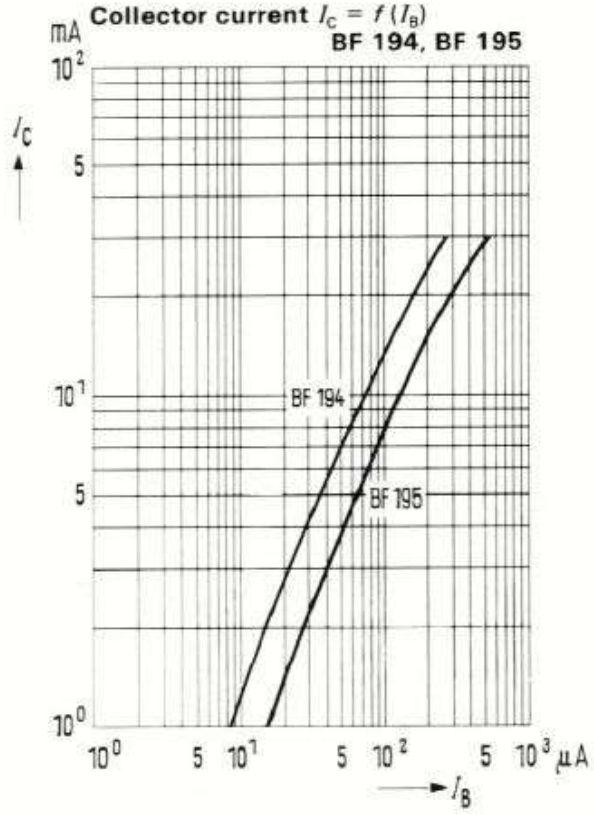
**Permissible total power dissipation versus temperature $P_{tot} = f(T_{amb})$**
**BF 194, BF 195**



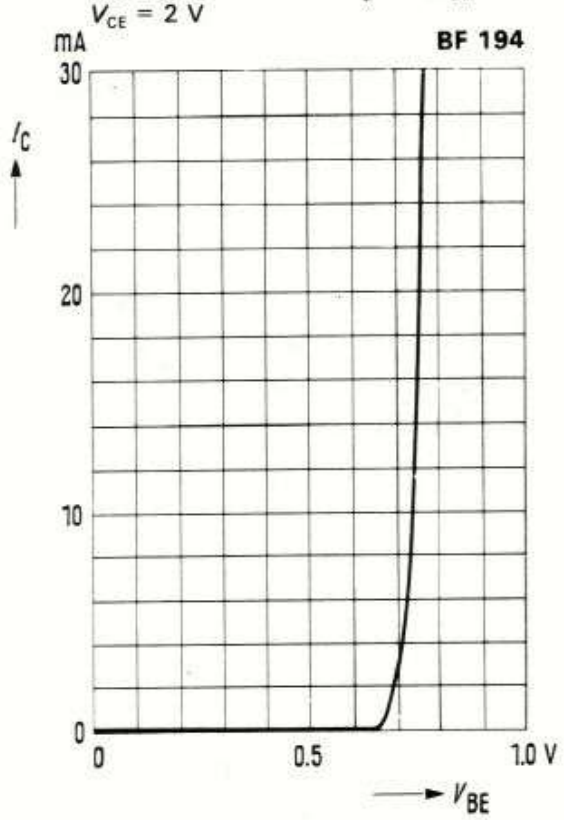

**Static forward current transfer ratio**
$h_{FE} = f(I_C)$; $V_{CE}$ = 10 V; $T_{amb}$ = 25°C
**BF 194, BF 195**



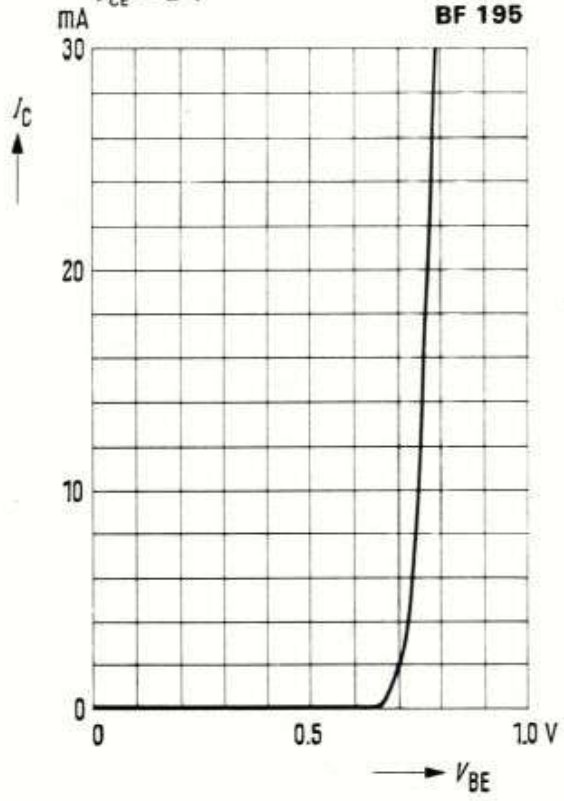

**Collector current $I_C = f(I_B)$**
**BF 194, BF 195**



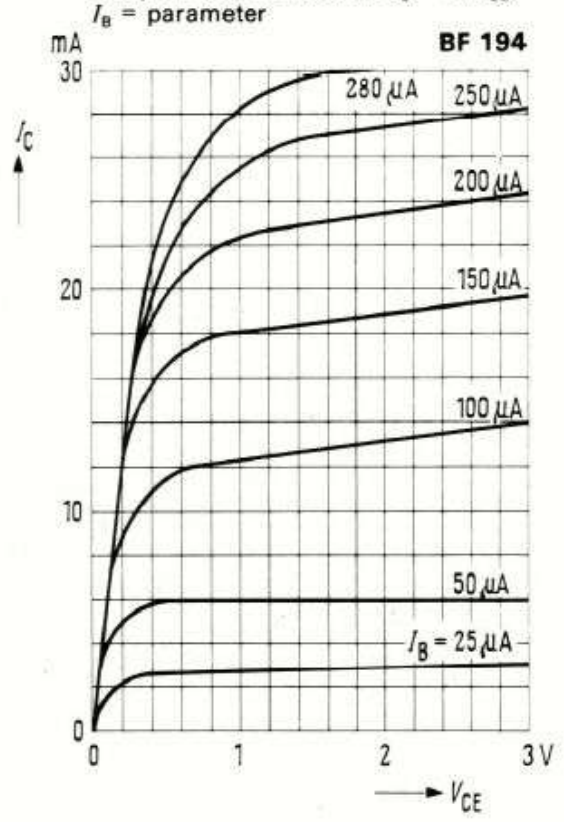
**Input characteristic $I_C = f(V_{BE})$**
$V_{CE}$ = 2 V



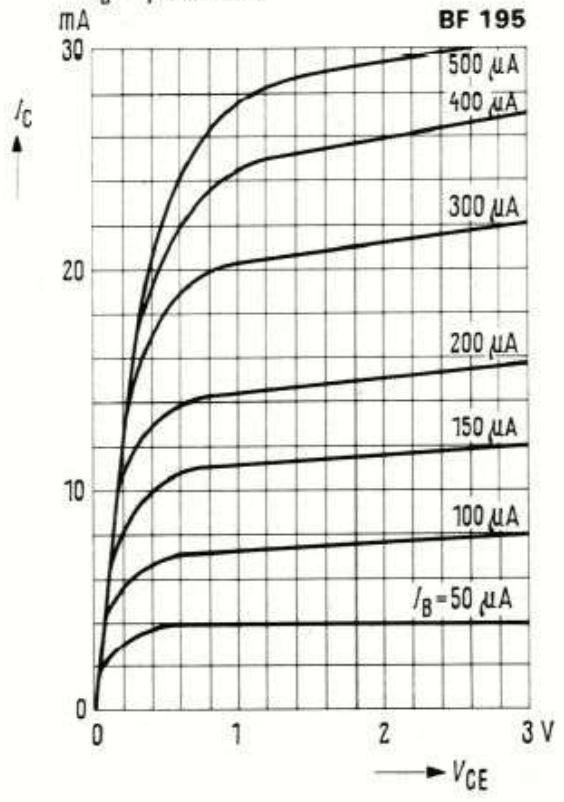

**Input characteristic $I_C = f(V_{BE})$**
$V_{CE}$ = 2 V



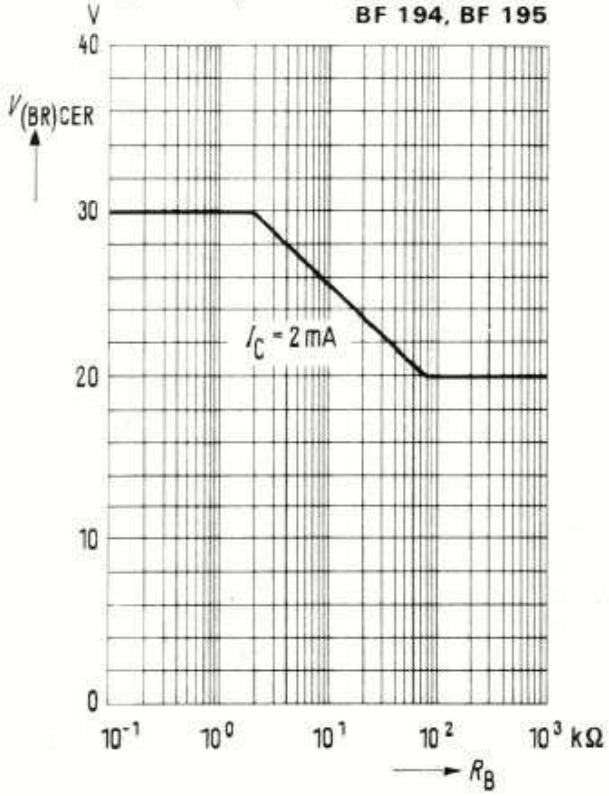

**Output characteristics $I_C = f(V_{CE})$**
$I_B$ = parameter



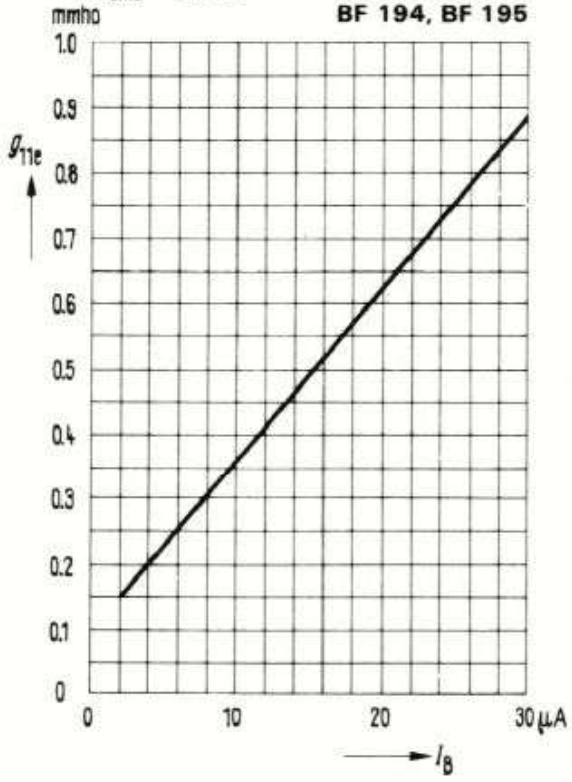

**Output characteristics $I_C = f(V_{CE})$**
$I_B$ = parameter



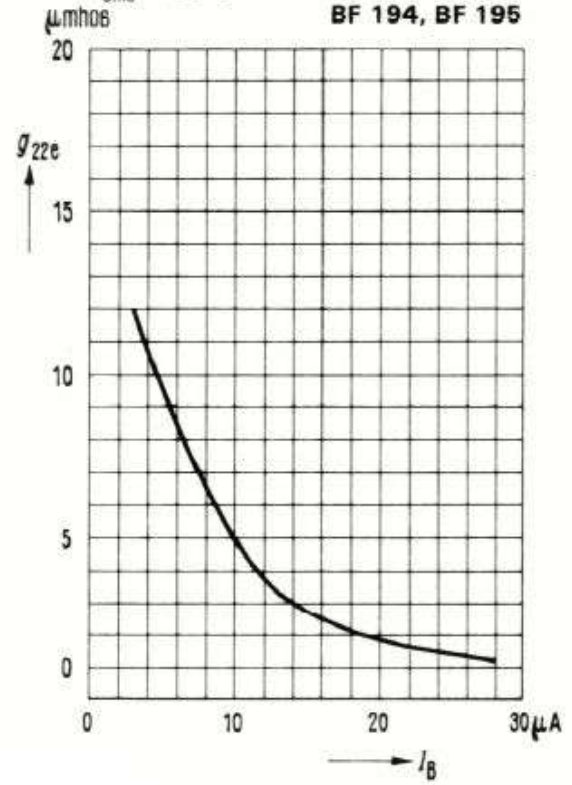
**Lower limit value of collector-emitter breakdown voltage $V_{(BR)\,CER} = f(R_B)$**
$R_E \leqq 1\,k\Omega$ $I_C = 2$ mA; $T_{amb} \leqq 125$ °C
**BF 194, BF 195**



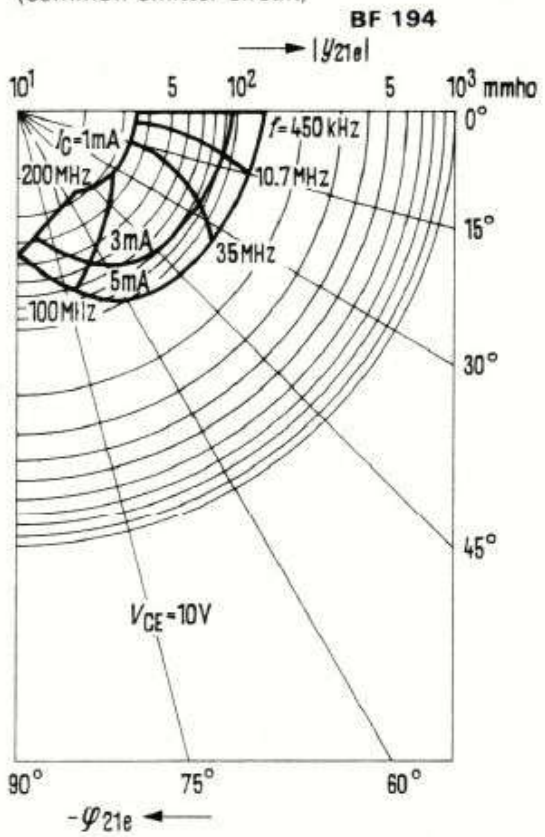

**Input admittance in the current range $g_{11e} = f(I_B)$**
$V_{CE} = 10$ V; $I_C = 1$ mA; $f = 450$ kHz; $T_{amb} = 25$°C
**BF 194, BF 195**



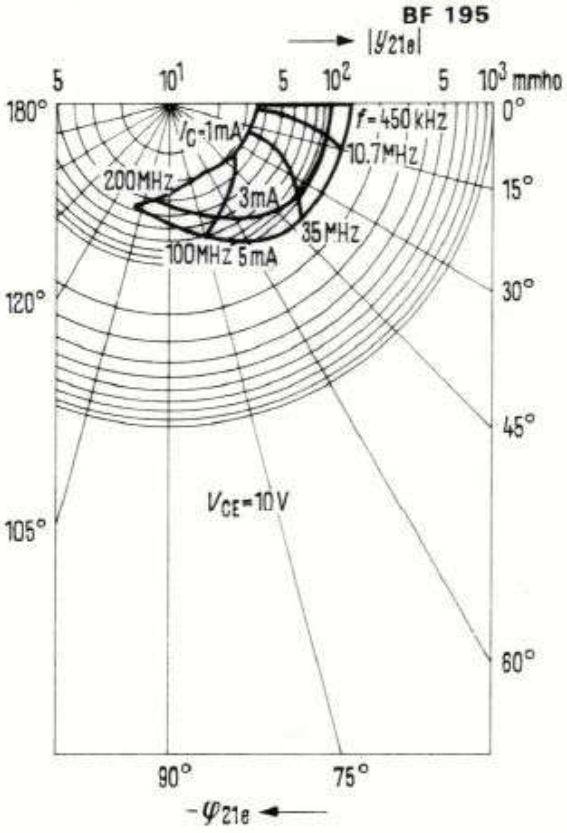

**Output admittance in the DC gain range $g_{22e} = f(I_B)$**
$V_{CE} = 10$ V; $I_C = 1$ mA; $f = 450$ kHz; $T_{amb} = 25$°C
**BF 194, BF 195**



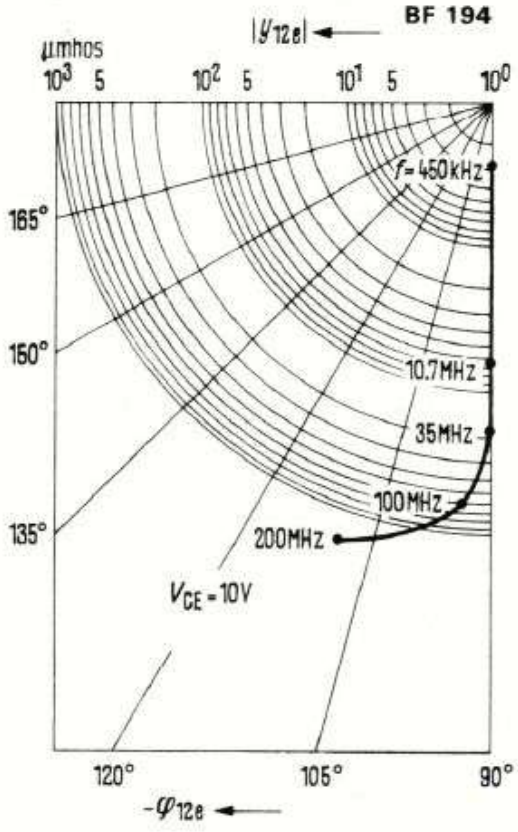
**Forward transconductance $Y_{21e}$**
(common emitter circuit)



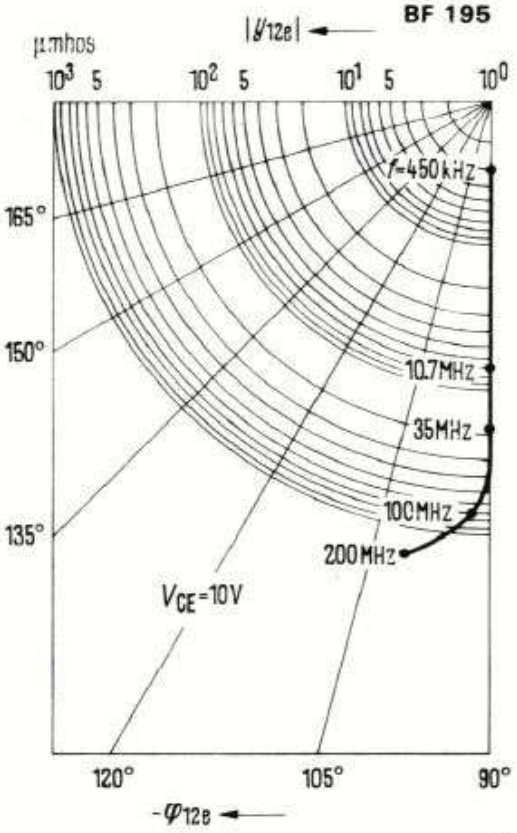

**Forward transconductance $Y_{21e}$**
(common emitter circuit)



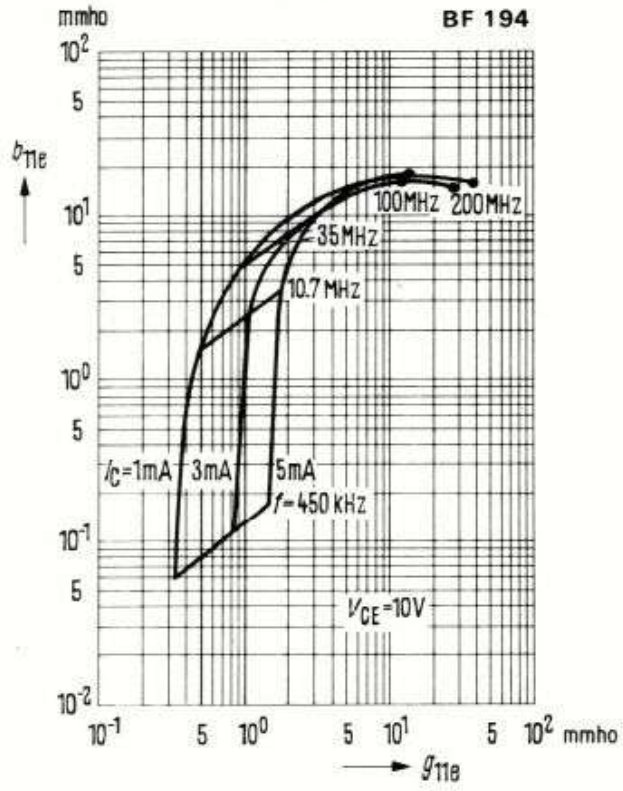

**Reverse transconductance $Y_{12e}$**
(common emitter circuit)



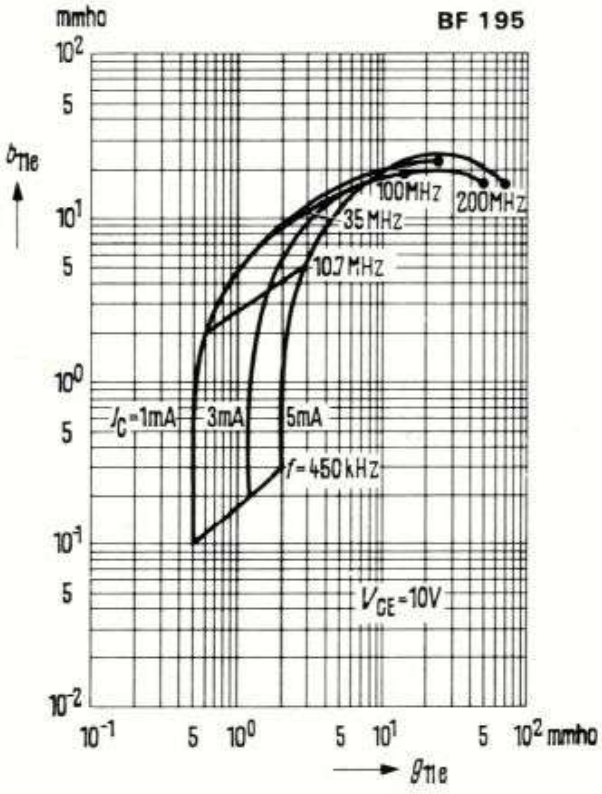

**Reverse transconductance $Y_{12e}$**
(common emitter circuit)



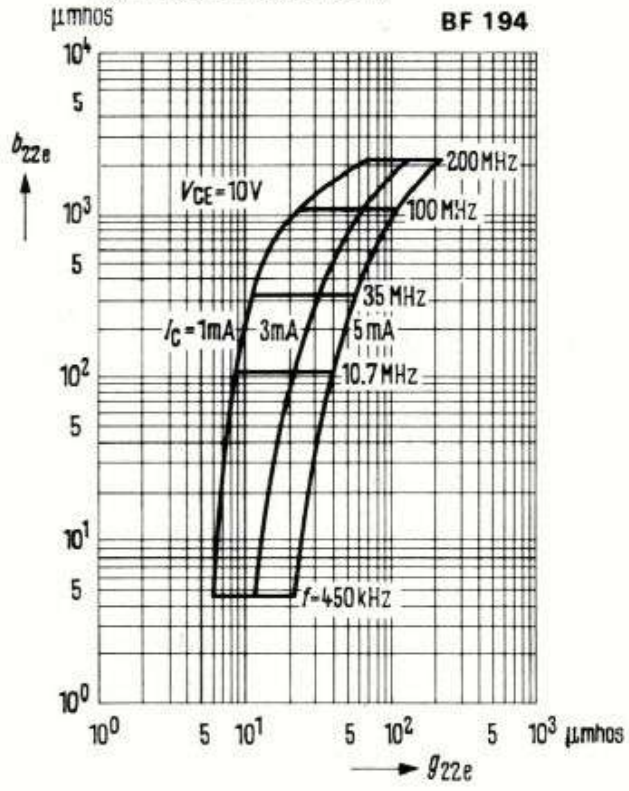
**Input admittance $Y_{11e}$**
(common emitter circuit)




**Input admittance $Y_{11e}$**
(common emitter circuit)




**Output admittance $Y_{22e}$**
(common emitter circuit)




**Output admittance $Y_{22e}$**
(common emitter circuit)