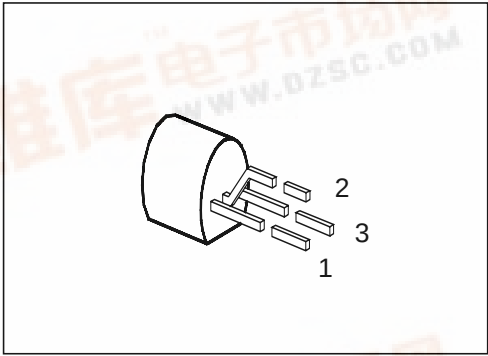


# SIEMENS

## PNP Silicon AF Transistors

BCX 78  
BCX 79

- High current gain
- Low collector-emitter saturation voltage
- Low noise at 1 kHz
- Low noise at low frequencies
- Complementary types: BCX 58, BCX 59 (NPN)



| Type        | Marking | Ordering Code | Pin Configuration |   |   | Package <sup>1)</sup> |
|-------------|---------|---------------|-------------------|---|---|-----------------------|
|             |         |               | 1                 | 2 | 3 |                       |
| BCX 78      | —       | Q62702-C717   | C                 | B | E | TO-92                 |
| BCX 78-VII  |         | Q62702-C626   |                   |   |   |                       |
| BCX 78-VIII |         | Q62702-C627   |                   |   |   |                       |
| BCX 78-IX   |         | Q62702-C628   |                   |   |   |                       |
| BCX 78-X    |         | Q62702-C629   |                   |   |   |                       |
| BCX 79      |         | Q62702-C718   |                   |   |   |                       |
| BCX 79-VII  |         | Q62702-C630   |                   |   |   |                       |
| BCX 79-VIII |         | Q62702-C631   |                   |   |   |                       |
| BCX 79-IX   |         | Q62702-C632   |                   |   |   |                       |
| BCX 79-X    |         | Q62702-C633   |                   |   |   |                       |

## Maximum Ratings

| Parameter                                                   | Symbol    | Values         |        | Unit               |
|-------------------------------------------------------------|-----------|----------------|--------|--------------------|
|                                                             |           | BCX 78         | BCX 79 |                    |
| Collector-emitter voltage                                   | $V_{CE0}$ | 32             | 45     | V                  |
| Collector-base voltage                                      | $V_{CB0}$ | 32             | 45     |                    |
| Emitter-base voltage                                        | $V_{EB0}$ | 5              |        |                    |
| Collector current                                           | $I_C$     | 100            |        | mA                 |
| Peak collector current                                      | $I_{CM}$  | 200            |        |                    |
| Peak base current                                           | $I_{BM}$  | 200            |        |                    |
| Total power dissipation, $T_C = 70\text{ }^{\circ}\text{C}$ | $P_{tot}$ | 500            |        | mW                 |
| Junction temperature                                        | $T_j$     | 150            |        | $^{\circ}\text{C}$ |
| Storage temperature range                                   | $T_{stg}$ | − 65 ... + 150 |        |                    |

## Thermal Resistance

|                               |              |       |     |
|-------------------------------|--------------|-------|-----|
| Junction - ambient            | $R_{th\ JA}$ | ≤ 250 | K/W |
| Junction - case <sup>1)</sup> | $R_{th\ JC}$ | ≤ 160 |     |

<sup>1)</sup> Mounted on Al heat sink 15 mm × 25 mm × 0.5 mm.

## Electrical Characteristics

at  $T_A = 25\text{ °C}$ , unless otherwise specified.

| Parameter | Symbol | Values |      |      | Unit |
|-----------|--------|--------|------|------|------|
|           |        | min.   | typ. | max. |      |

## DC characteristics

|                                                                                                                                                                      |               |                          |                          |                          |                                |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------------------------|--------------------------|--------------------------|--------------------------------|
| Collector-emitter breakdown voltage<br>$I_C = 2\text{ mA}$                                                                                                           | $V_{(BR)CE0}$ | 32<br>45                 | —<br>—                   | —<br>—                   | V                              |
| Collector-base breakdown voltage<br>$I_C = 10\text{ }\mu\text{A}$                                                                                                    | $V_{(BR)CB0}$ | 32<br>45                 | —<br>—                   | —<br>—                   |                                |
| Emitter-base breakdown voltage<br>$I_E = 1\text{ }\mu\text{A}$                                                                                                       | $V_{(BR)EB0}$ | 5                        | —                        | —                        |                                |
| Collector cutoff current<br>$V_{CB} = 32\text{ V}$ BCX 78<br>$V_{CB} = 45\text{ V}$ BCX 79                                                                           | $I_{CB0}$     | —<br>—                   | —<br>—                   | 20<br>20                 | nA<br>nA                       |
| $V_{CB} = 32\text{ V}, T_A = 150\text{ °C}$ BCX 78<br>$V_{CB} = 45\text{ V}, T_A = 150\text{ °C}$ BCX 79                                                             |               | —<br>—                   | —<br>—                   | 10<br>10                 | $\mu\text{A}$<br>$\mu\text{A}$ |
| Collector cutoff current<br>$V_{CB} = 32\text{ V}, V_{BE} = 0.2\text{ V}, T_A = 100\text{ °C}$<br>$V_{CB} = 45\text{ V}, V_{BE} = 0.2\text{ V}, T_A = 100\text{ °C}$ | $I_{CE0}$     | —<br>—                   | —<br>—                   | 20<br>20                 | $\mu\text{A}$                  |
| Emitter cutoff current<br>$V_{EB} = 4\text{ V}$                                                                                                                      | $I_{EB0}$     | —                        | —                        | 20                       | nA                             |
| DC current gain<br>$I_C = 10\text{ }\mu\text{A}, V_{CE} = 5\text{ V}$                                                                                                | $h_{FE}$      | 20<br>30<br>40<br>100    | 140<br>200<br>270<br>340 | —<br>—<br>—<br>—         | —                              |
| $I_C = 2\text{ mA}, V_{CE} = 5\text{ V}$                                                                                                                             |               | 120<br>180<br>250<br>380 | 170<br>250<br>350<br>500 | 220<br>310<br>460<br>630 |                                |
| $I_C = 100\text{ mA}, V_{CE} = 1\text{ V}^{1)}$                                                                                                                      |               | 40<br>45<br>60<br>60     | —<br>—<br>—<br>—         | —<br>—<br>—<br>—         |                                |

<sup>1)</sup> Pulse test:  $t \leq 300\text{ }\mu\text{s}$ ,  $D \leq 2\text{ %}$ .

## Electrical Characteristics

at  $T_A = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified.

| Parameter | Symbol | Values |      |      | Unit |
|-----------|--------|--------|------|------|------|
|           |        | min.   | typ. | max. |      |

### DC characteristics

|                                                                                                                                                                                             |              |                |                      |                |   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|----------------|----------------------|----------------|---|
| Collector-emitter saturation voltage <sup>1)</sup><br>$I_C = 100\text{ mA}$ , $I_B = 2.5\text{ mA}$                                                                                         | $V_{CEsat}$  | —              | —                    | 0.6            | V |
| Base-emitter saturation voltage <sup>1)</sup><br>$I_C = 100\text{ mA}$ , $I_B = 2.5\text{ mA}$                                                                                              | $V_{BEsat}$  | —              | —                    | 1.0            |   |
| Base-emitter voltage<br>$I_C = 10\text{ }\mu\text{A}$ , $V_{CE} = 5\text{ V}$<br>$I_C = 2\text{ mA}$ , $V_{CE} = 5\text{ V}$<br>$I_C = 100\text{ mA}$ , $V_{CE} = 1\text{ V}$ <sup>1)</sup> | $V_{BE(on)}$ | —<br>0.55<br>— | 0.52<br>0.65<br>0.93 | —<br>0.75<br>— |   |

<sup>1)</sup> Pulse test:  $t \leq 300\text{ }\mu\text{s}$ ,  $D \leq 2\text{ }\%$ .

## Electrical Characteristics

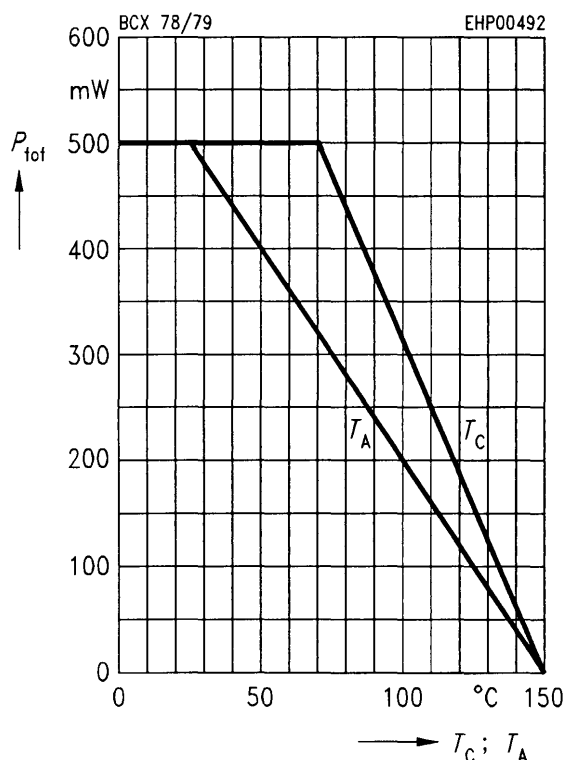
at  $T_A = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified.

| Parameter | Symbol | Values |      |      | Unit |
|-----------|--------|--------|------|------|------|
|           |        | min.   | typ. | max. |      |

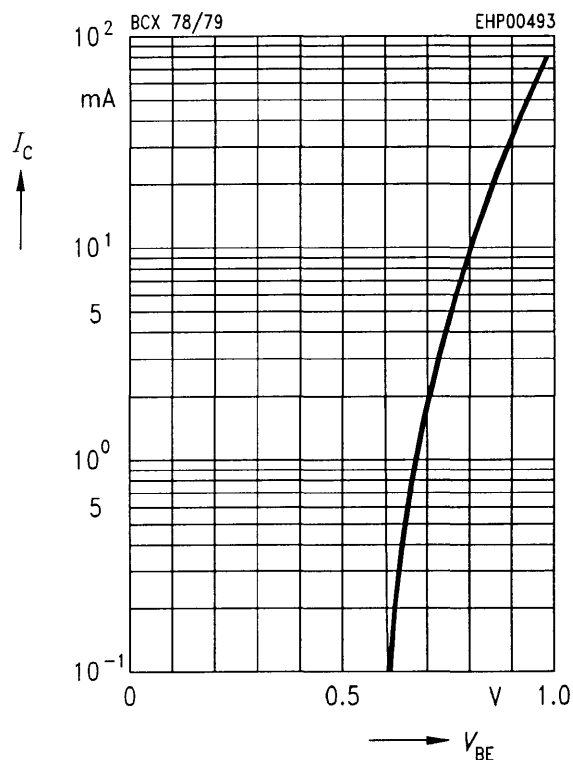
## AC characteristics

|                                                                                                                                                                                                                      |           |                  |                          |                  |               |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|------------------|--------------------------|------------------|---------------|
| Transition frequency<br>$I_C = 20\text{ mA}$ , $V_{CE} = 5\text{ V}$ , $f = 100\text{ MHz}$                                                                                                                          | $f_t$     | —                | 250                      | —                | MHz           |
| Output capacitance<br>$V_{CB} = 10\text{ V}$ , $f = 1\text{ MHz}$                                                                                                                                                    | $C_{obo}$ | —                | 3                        | —                | pF            |
| Input capacitance<br>$V_{EB} = 0.5\text{ V}$ , $f = 1\text{ MHz}$                                                                                                                                                    | $C_{ibo}$ | —                | 10                       | —                |               |
| Short-circuit input impedance<br>$I_C = 2\text{ mA}$ , $V_{CE} = 5\text{ V}$ , $f = 1\text{ kHz}$<br>BCX 78 VII, BCX 79 VII<br>BCX 78 VIII, BCX 79 VIII<br>BCX 78 IX, BCX 79 IX<br>BCX 78 X, BCX 79 X                | $h_{11e}$ | —<br>—<br>—<br>— | 2.7<br>3.6<br>4.5<br>7.5 | —<br>—<br>—<br>— | k $\Omega$    |
| Open-circuit reverse voltage transfer ratio<br>$I_C = 2\text{ mA}$ , $V_{CE} = 5\text{ V}$ , $f = 1\text{ kHz}$<br>BCX 78 VII, BCX 79 VII<br>BCX 78 VIII, BCX 79 VIII<br>BCX 78 IX, BCX 79 IX<br>BCX 78 X, BCX 79 X  | $h_{12e}$ | —<br>—<br>—<br>— | 1.5<br>2<br>2<br>3       | —<br>—<br>—<br>— | $10^{-4}$     |
| Short-circuit forward current transfer ratio<br>$I_C = 2\text{ mA}$ , $V_{CE} = 5\text{ V}$ , $f = 1\text{ kHz}$<br>BCX 78 VII, BCX 79 VII<br>BCX 78 VIII, BCX 79 VIII<br>BCX 78 IX, BCX 79 IX<br>BCX 78 X, BCX 79 X | $h_{21e}$ | —<br>—<br>—<br>— | 200<br>260<br>330<br>520 | —<br>—<br>—<br>— | —             |
| Open-circuit output admittance<br>$I_C = 2\text{ mA}$ , $V_{CE} = 5\text{ V}$ , $f = 1\text{ kHz}$<br>BCX 78 VII, BCX 79 VII<br>BCX 78 VIII, BCX 79 VIII<br>BCX 78 IX, BCX 79 IX<br>BCX 78 X, BCX 79 X               | $h_{22e}$ | —<br>—<br>—<br>— | 18<br>24<br>30<br>50     | —<br>—<br>—<br>— | $\mu\text{S}$ |
| Noise figure<br>$I_C = 0.2\text{ mA}$ , $V_{CE} = 5\text{ V}$ , $R_S = 2\text{ k}\Omega$<br>$f = 1\text{ kHz}$ , $\Delta f = 200\text{ Hz}$                                                                          | $F$       | —                | 2                        | —                | dB            |

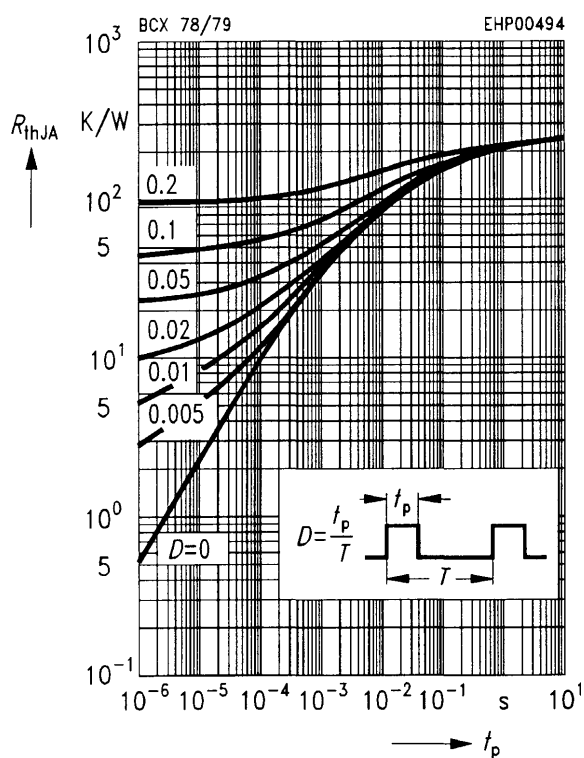
**Total power dissipation**  $P_{\text{tot}} = f(T_A; T_C)$



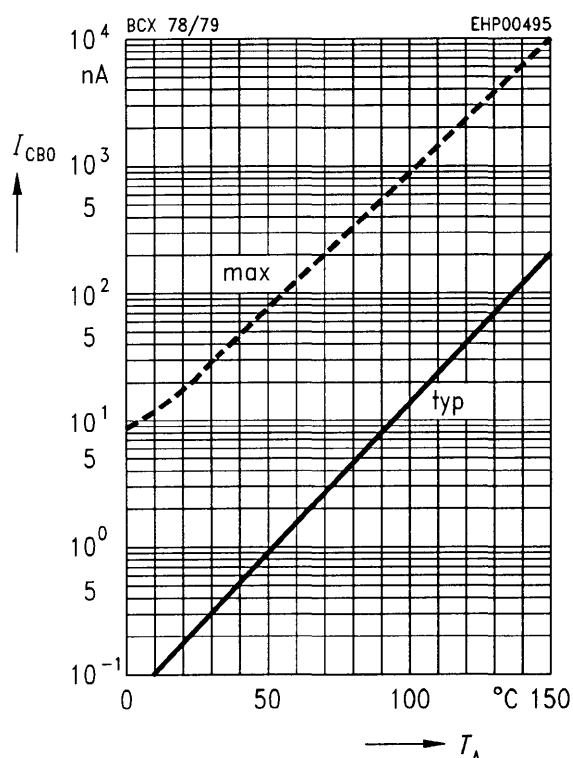
**Collector current**  $I_C = f(V_{\text{BE}})$   
 $V_{\text{CE}} = 5 \text{ V}$



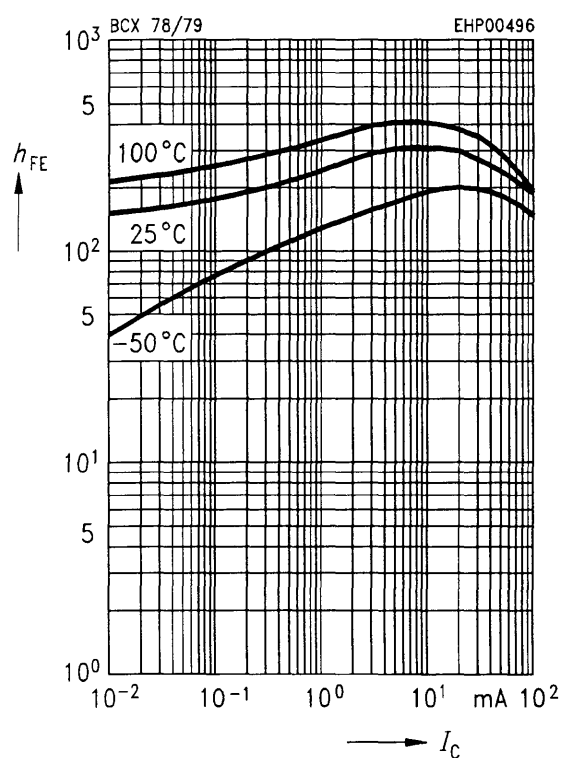
**Permissible pulse load**  $R_{\text{thJA}} = f(t_p)$



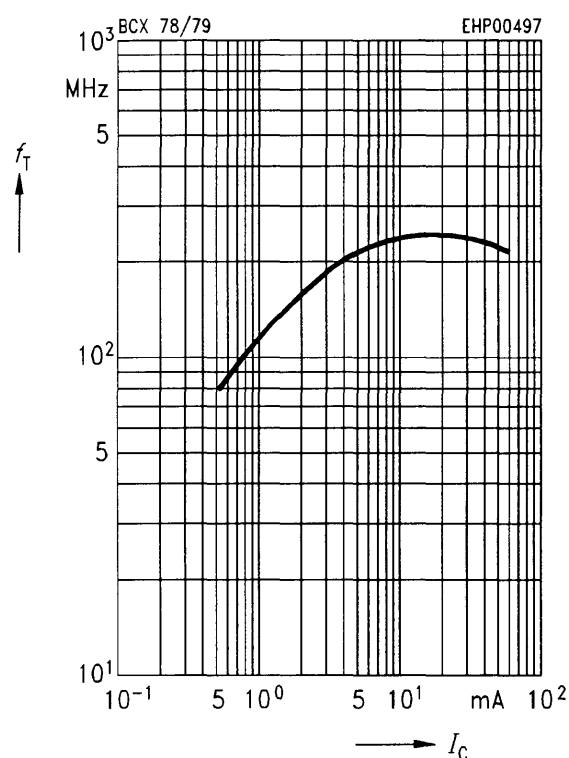
**Collector cutoff current**  $I_{\text{CBO}} = f(T_A)$   
for max. permissible reverse voltage



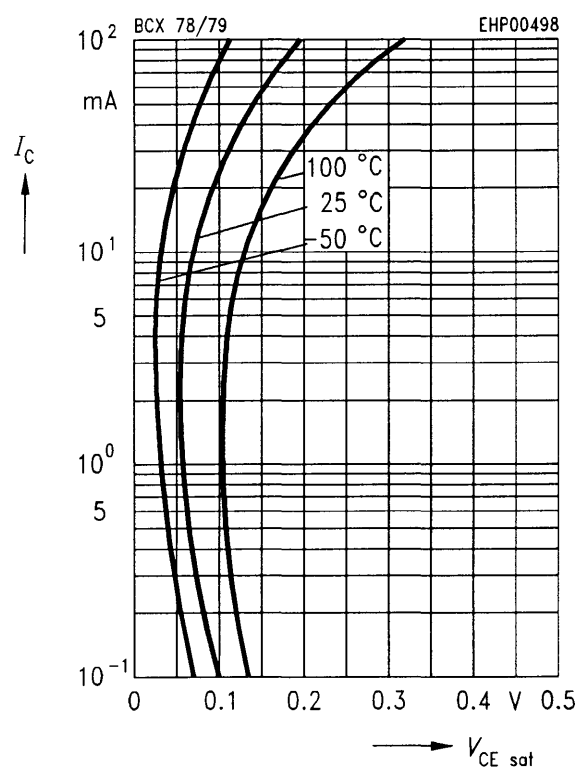
**DC current gain  $h_{FE} = f(I_C)$**   
 $V_{CE} = 5\text{ V}$  (common emitter configuration)



**Transition frequency  $f_T = f(I_C)$**   
 $V_{CE} = 5\text{ V}$



**Collector-emitter saturation voltage**  
 $I_C = f(V_{CEsat})$   
 $h_{FE} = 20$



**Base-emitter saturation voltage**  
 $I_C = f(V_{BEsat})$   
 $h_{FE} = 20$

