## NPN Silicon Double Transistor
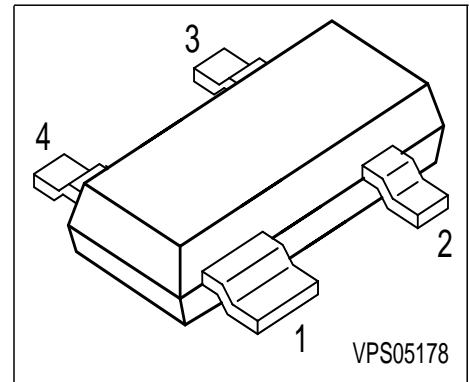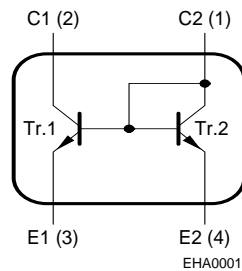
- To be used as a current mirror
- Good thermal coupling and $V_{BE}$ matching
- High current gain
- Low collector-emitter saturation voltage



C1 (2)   C2 (1)

Tr.1   Tr.2

E1 (3)   E2 (4)

EHA00012

VPS05178

| Type | Marking | Pin Configuration | | | | Package |
|------|---------|------|------|------|------|---------|
| BCV61A | 1Js | 1 = C2 | 2 = C1 | 3 = E1 | 4 = E2 | SOT143 |
| BCV61B | 1Ks | 1 = C2 | 2 = C1 | 3 = E1 | 4 = E2 | SOT143 |
| BCV61C | 1Ls | 1 = C2 | 2 = C1 | 3 = E1 | 4 = E2 | SOT143 |

### Maximum Ratings

| Parameter | Symbol | Value | Unit |
|-----------|--------|-------|------|
| Collector-emitter voltage (transistor T1) | $V_{CEO}$ | 30 | V |
| Collector-base voltage (open emitter) (transistor T1) | $V_{CBO}$ | 30 | |
| Emitter-base voltage | $V_{EBS}$ | 6 | |
| DC collector current | $I_C$ | 100 | mA |
| Peak collector current | $I_{CM}$ | 200 | |
| Base peak current (transistor T1) | $I_{BM}$ | 200 | |
| Total power dissipation, $T_S$ = 99 °C | $P_{tot}$ | 300 | mW |
| Junction temperature | $T_j$ | 150 | °C |
| Storage temperature | $T_{stg}$ | -65 ... 150 | |

### Thermal Resistance

| | | | |
|---|---|---|---|
| Junction - soldering point[1] | $R_{thJS}$ | ≤170 | K/W |

[1]For calculation of $R_{thJA}$ please refer to Application Note Thermal Resistance

Jul-10-2001

**Electrical Characteristics** at $T_A = 25°C$, unless otherwise specified

| Parameter | Symbol | Values | | | Unit |
|---|---|---|---|---|---|
| | | min. | typ. | max. | |
| **DC Characteristics of T1** | | | | | |
| Collector-emitter breakdown voltage $I_C = 10$ mA, $I_B = 0$ | $V_{(BR)CEO}$ | 30 | - | - | V |
| Collector-base breakdown voltage $I_C = 10$ µA, $I_B = 0$ | $V_{(BR)CBO}$ | 30 | - | - | |
| Emitter-base breakdown voltage $I_E = 10$ µA, $I_C = 0$ | $V_{(BR)EBO}$ | 6 | - | - | |
| Collector cutoff current $V_{CB} = 30$ V, $I_E = 0$ | $I_{CBO}$ | - | - | 15 | nA |
| Collector cutoff current $V_{CB} = 30$ V, $I_E = 0$ , $T_A = 150$ °C | $I_{CBO}$ | - | - | 5 | µA |
| DC current gain  1) $I_C = 0.1$ mA, $V_{CE} = 5$ V | $h_{FE}$ | 100 | - | - | - |
| DC current gain  1) $I_C = 2$ mA, $V_{CE} = 5$ V     BCV61A BCV61B BCV61C | $h_{FE}$ | 110 200 420 | 180 290 520 | 220 450 800 | |
| Collector-emitter saturation voltage1) $I_C = 10$ mA, $I_B = 0.5$ mA $I_C = 100$ mA, $I_B = 5$ mA | $V_{CEsat}$ | - - | 90 200 | 250 600 | mV |
| Base-emitter saturation voltage  1) $I_C = 10$ mA, $I_B = 0.5$ mA $I_C = 100$ mA, $I_B = 5$ mA | $V_{BEsat}$ | - - | 700 900 | - - | |
| Base-emitter voltage  1) $I_C = 2$ mA, $V_{CE} = 5$ V $I_C = 10$ mA, $V_{CE} = 5$ V | $V_{BE(ON)}$ | 580 - | 660 - | 700 770 | |

1) Pulse test: t ≤ 300µs, D = 2%

**Electrical Characteristics** at $T_A$ = 25°C, unless otherwise specified.

| Parameter | Symbol | Values | | | Unit |
|---|---|---|---|---|---|
| | | min. | typ. | max. | |
| **Characteristics** | | | | | |
| Base-emitter forward voltage | $V_{BES}$ | | | | V |
| $I_E$ = 10 µA | | 0.4 | - | - | |
| $I_E$ = 250 mA | | - | - | 1.8 | |
| Matching of transistor T1 and transistor T2 | $I_{C1}$ / $I_{C2}$ | | | | - |
| at $I_{E2}$ = 0.5mA and $V_{CE1}$ = 5V | | - | - | - | |
| $T_A$ = 25 °C | | 0.7 | - | 1.3 | |
| $T_A$ = 150 °C | | 0.7 | - | 1.3 | |
| Thermal coupling of transistor T1 and transistor T2 [1]    T1: $V_{CE}$ = 5V Maximum current of thermal stability of $I_{C1}$ | $I_{E2}$ | - | 5 | - | mA |
| **AC characteristics for transistor T1** | | | | | |
| Transition frequency $I_C$ = 10 mA, $V_{CE}$ = 5 V, $f$ = 100 MHz | $f_T$ | - | 250 | - | MHz |
| Collector-base capacitance $V_{CB}$ = 10 V, $f$ = 1 MHz | $C_{cb}$ | - | 3 | - | pF |
| Emitter-base capacitance $V_{EB}$ = 0.5 V, $f$ = 1 MHz | $C_{eb}$ | - | 8 | - | |
| Noise figure $I_C$ = 200 µA, $V_{CE}$ = 5 V, $R_S$ = 2 kΩ, $f$ = 1 kHz, $\Delta f$ = 200 Hz | $F$ | - | 2 | - | dB |
| Short-circuit input impedance $I_C$ = 1 mA, $V_{CE}$ = 10 V, $f$ = 1 kHz | $h_{11e}$ | - | 4.5 | - | kΩ |
| Open-circuit reverse voltage transf.ratio $I_C$ = 1 mA, $V_{CE}$ = 10 V, $f$ = 1 kHz | $h_{12e}$ | - | 2 | - | $10^{-4}$ |
| Short-circuit forward current transf.ratio $I_C$ = 1 mA, $V_{CE}$ = 10 V, $f$ = 1 kHz | $h_{21e}$ | 100 | - | 900 | - |
| Open-circuit output admittance $I_C$ = 1 mA, $V_{CE}$ = 10 V, $f$ = 1 kHz | $h_{22e}$ | - | 30 | - | µS |

1) Witout emitter resistor. Device mounted on alumina 15mm x 16.5mm x 0.7mm

Jul-10-2001

**Test circuit for current matching**



EHN00001
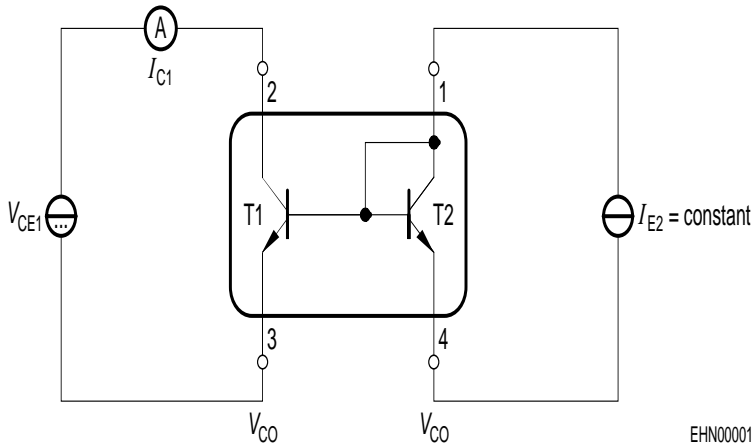
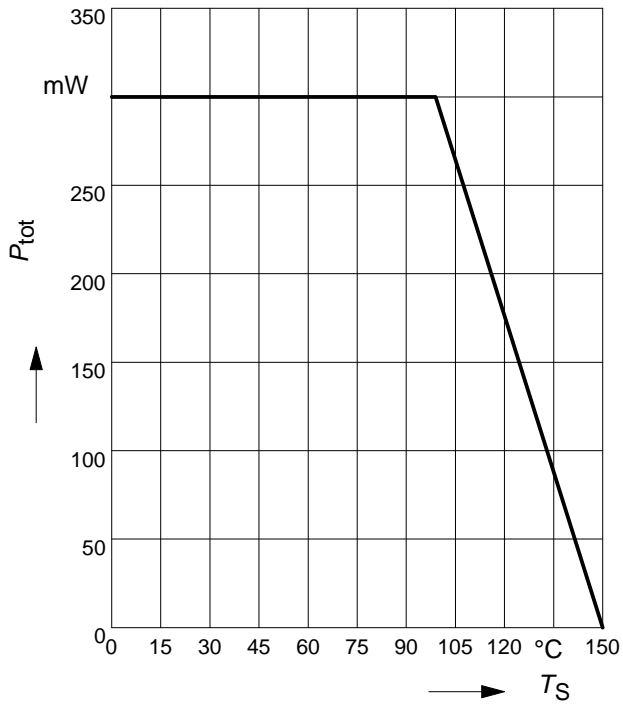Note: Voltage drop at contacts: $V_{CO} < 2/3\ V_T = 16mV$

**Characteristic for determination of $V_{CE1}$ at specified $R_E$ range with $I_{E2}$ as parameter under condition of $I_{C1}/I_{E2} = 1.3$**



EHN00002
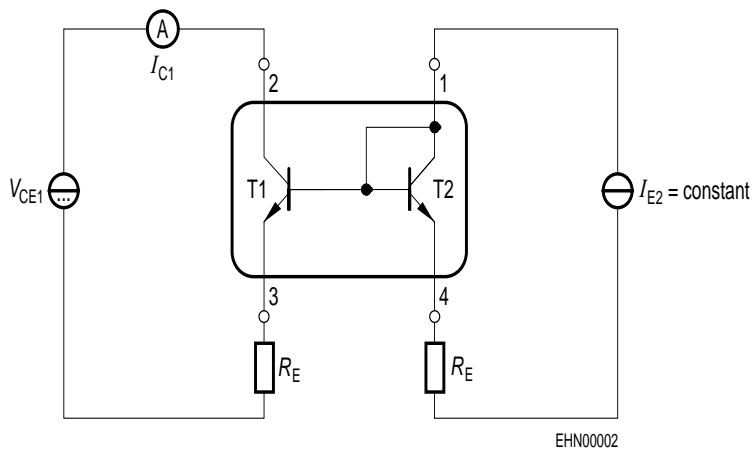
Note: BCV61 with emitter resistors

**Total power dissipation** $P_{tot} = f(T_S)$

**Permissible pulse load**

$P_{totmax} / P_{totDC} = f(t_p)$