

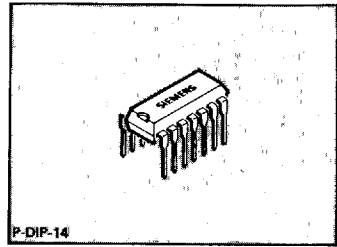
**SIEMENS**

SIEMENS AKTIENGESELLSCHAFT

T-43-25

**Transistor Array with 5 NPN Transistors****TCA 671****TCA 871****TCA 971****TCA 991****Bipolar IC****Features**

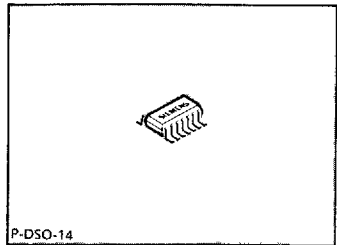
- Versatile use
- Slight  $V_{BE}$  and  $B$  deviations
- High output current
- Good thermal matching
- TCA 971; G/TCA 991; G compatible with 3045/46/86 and 3146



P-DIP-14

**4**

| Type        | Ordering Code | Package        |
|-------------|---------------|----------------|
| ☒ TCA 671   | Q67000-T1     | P-DIP-14       |
| ☒ TCA 671 G | Q67000-A2366  | P-DSO-14 (SMD) |
| ☒ TCA 871   | Q67000-T2     | P-DIP-14       |
| ☒ TCA 871 G | Q67000-A2367  | P-DSO-14 (SMD) |
| ☒ TCA 971   | Q67000-T11    | P-DIP-14       |
| ☒ TCA 971 G | Q67000-A8075  | P-DSO-14 (SMD) |
| ☒ TCA 991   | Q67000-T12    | P-DIP-14       |
| ☒ TCA 991 G | Q67000-A8076  | P-DSO-14 (SMD) |



P-DSO-14

TCA 671, TCA 871, TCA 971, and TCA 991 are monolithic integrated transistor arrays each consisting of five NPN transistors. The arrays are well suited for switching and amplifying applications up to approx. 30 MHz. Due to a uniform design, the transistor characteristics show only slight deviations. The arrays are preferably intended for lamp drivers, amplifiers, pulse generators, and types TCA 971 and TCA 991 especially for discrete differential amplifiers.

**Pin Configurations**

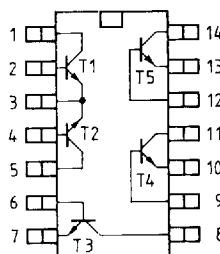
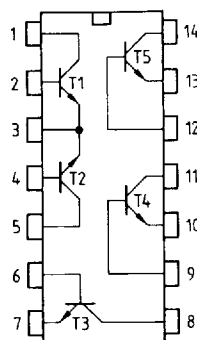
(top view)

**TCA 671, TCA 871**  
**TCA 971, TCA 991**

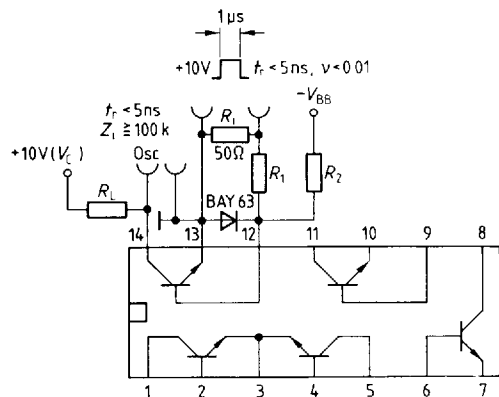
substrate = pin 3  
substrate = pin 13

**TCA 671 G, TCA 871 G,**  
**TCA 971 G, TCA 991 G**

Substrate connection has to be on the most negative potential.



**Test Circuit for Switching Times**



**Switching Times**

$I_C, I_{B1}, -I_{B2} \approx 10 : 1 : 1 \text{ mA}; R_1 = 5 \text{ k}\Omega; R_2 = 5 \text{ k}\Omega; V_{BB} = 3.5 \text{ V}; R_L = 990 \Omega$   
 $t_{ON} 85 (< 150) \text{ ns} \quad t_{OFF} 480 (< 800) \text{ ns}$   
 $I_C: I_{B1} - I_{B2} \approx 100 : 10 : 10 \text{ mA}, R_1 = 500 \Omega; R_2 = 700 \Omega, V_{BB} = 5 \text{ V}; R_L = 98 \Omega$   
 $t_{ON} 55 (< 150) \text{ ns} \quad t_{OFF} 450 (< 800) \text{ ns}$

## Absolute Maximum Ratings

| Parameter                                                | Symbol      | Limit Values       |                    | Unit |
|----------------------------------------------------------|-------------|--------------------|--------------------|------|
|                                                          |             | TCA 671<br>TCA 971 | TCA 871<br>TCA 991 |      |
| Collector-base breakdown voltage                         | $V_{CB0}$   | 45                 | 35                 | V    |
| Collector-emitter breakdown voltage                      | $V_{CE0}$   | 42                 | 32                 | V    |
| Emitter-base breakdown voltage                           | $V_{EB0}$   | 6                  | 6                  | V    |
| Collector-substrate voltage ( $I_C = 100 \mu\text{A}$ )  | $V_{CS}$    | 70                 | 60                 | V    |
| Collector current                                        | $I_C$       | 200                | 200                | mA   |
| Base current                                             | $I_B$       | 10                 | 10                 | mA   |
| Permissible power dissipation<br>for a single transistor | $P_{tot}$   | 300                | 300                | mW   |
| Junction temperature                                     | $T_j$       | 150                | 150                | °C   |
| Storage temperature range                                | $T_{stg}$   | -40 to 125         | -40 to 125         | °C   |
| Thermal resistance<br>system - air                       | $R_{th SA}$ | 85                 | 85                 | K/W  |
| TCA 671 G; TCA 871 G;<br>TCA 971 G; TCA 991 G            | $R_{th SA}$ | 145                | 145                | K/W  |

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## Operating Range

|                     |       |           |           |    |
|---------------------|-------|-----------|-----------|----|
| Ambient temperature | $T_A$ | -25 to 85 | -25 to 85 | °C |
|---------------------|-------|-----------|-----------|----|

## Characteristics

 $T_A = 25^\circ\text{C}$ 

| Parameter                                                                                                         | Symbol                           | Limit Values<br>TCA 671<br>TCA 971 |      |      | Limit Values<br>TCA 871<br>TCA 991 |      |      | Unit          |
|-------------------------------------------------------------------------------------------------------------------|----------------------------------|------------------------------------|------|------|------------------------------------|------|------|---------------|
|                                                                                                                   |                                  | min.                               | typ. | max. | min.                               | typ. | max. |               |
| Differential base current for<br>transistors T1 = T2<br>at $V_{CE} = 3 \text{ V}$ , $I_C = 1 \text{ mA}$          | $I_{BD}$                         |                                    | 0.5  | 1    |                                    | 1    |      | $\mu\text{A}$ |
| Base-emitter voltage<br>at $V_{CE} = 3 \text{ V}$ , $I_C = 1 \text{ mA}$                                          | $V_{BE}$                         |                                    | 0.65 |      |                                    | 0.65 |      | V             |
| Differential base-emitter voltage<br>for transistors T1 + T2<br>at $V_{CE} = 3 \text{ V}$ , $I_C = 1 \text{ mA}$  | $V_{BED}$                        |                                    | 2    | 5    |                                    | 4    |      | mV            |
| Differential base-emitter voltage<br>for transistors T3 to T5<br>at $V_{CE} = 3 \text{ V}$ , $I_C = 1 \text{ mA}$ | $V_{BED}$                        |                                    | 4    | 10   |                                    | 6    |      | mV            |
| Temperature coefficient<br>of base-emitter voltage<br>at $V_{CE} = 3 \text{ V}$ , $I_C = 1 \text{ mA}$            | $\frac{\Delta V_{BE}}{\Delta T}$ |                                    | -2   |      |                                    | -2   |      | mV/K          |
| Transition frequency                                                                                              | $f_T$                            | 300                                | 550  |      | 300                                | 550  |      | MHz           |

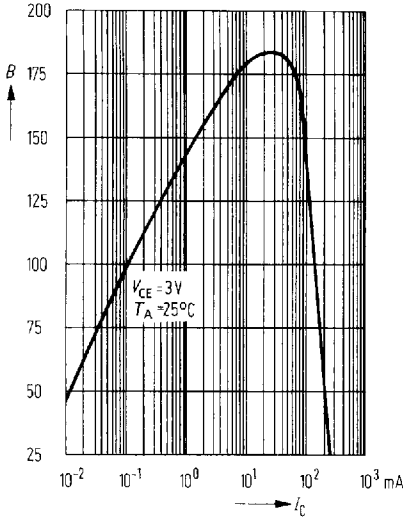
T-43-25

**Characteristics** $T_A = 25^\circ\text{C}$ 

| Parameter                                                                               | Symbol              | Limit Values<br>TCA 671<br>TCA 971 |      |      | Limit Values<br>TCA 871<br>TCA 991 |      |      | Unit          |
|-----------------------------------------------------------------------------------------|---------------------|------------------------------------|------|------|------------------------------------|------|------|---------------|
|                                                                                         |                     | min.                               | typ. | max. | min.                               | typ. | max. |               |
| Collector-base breakdown voltage<br>at $I_C = 100\ \mu\text{A}$ , $I_E = 0$             | $V_{CB0}$           | 45                                 |      |      | 35                                 |      |      | V             |
| Collector-emitter breakdown voltage<br>at $I_C = 100\ \mu\text{A}$ , $I_B = 0$          | $V_{CE0}$           | 42                                 |      |      | 32                                 |      |      | V             |
| Collector-substrate breakdown voltage<br>at $I_C = 100\ \mu\text{A}$ , $I_{CS} = 0$     | $V_{CS}$            | 70                                 |      |      | 60                                 |      |      | V             |
| Emitter-base breakdown voltage<br>at $I_E = 100\ \mu\text{A}$ , $I_C = 0$               | $V_{EB0}$           | 6                                  |      |      | 6                                  |      |      | V             |
| Collector-emitter saturation voltage<br>at $I_C = 50\ \text{mA}$ ; $I_B = 5\ \text{mA}$ | $V_{CE\text{ Sat}}$ |                                    | 200  | 350  |                                    | 200  | 350  | mV            |
| Collector-base cutoff current<br>at $V_{CB} = 25\ \text{V}$ , $I_E = 0$                 | $I_{CB0}$           |                                    | 0.02 | 1    |                                    | 0.02 | 10   | $\mu\text{A}$ |
| Collector-emitter cutoff current<br>at $V_{CE} = 25\ \text{V}$ , $I_B = 0$              | $I_{CE0}$           |                                    |      | 1    |                                    |      | 10   | $\mu\text{A}$ |
| Static current gain                                                                     | $B$                 |                                    |      |      |                                    |      |      |               |
| at $V_{CE} = 3\ \text{V}$ , $I_C = 100\ \mu\text{A}$                                    |                     | 40                                 | 80   |      | 40                                 | 80   |      |               |
| at $V_{CE} = 3\ \text{V}$ , $I_C = 1\ \text{mA}$                                        |                     | 100                                | 140  |      | 100                                | 140  |      |               |
| at $V_{CE} = 3\ \text{V}$ , $I_C = 10\ \text{mA}$                                       |                     | 100                                | 160  |      | 100                                | 160  |      |               |
| at $V_{CE} = 3\ \text{V}$ , $I_C = 100\ \text{mA}$                                      |                     | 40                                 | 100  |      | 40                                 | 100  |      |               |

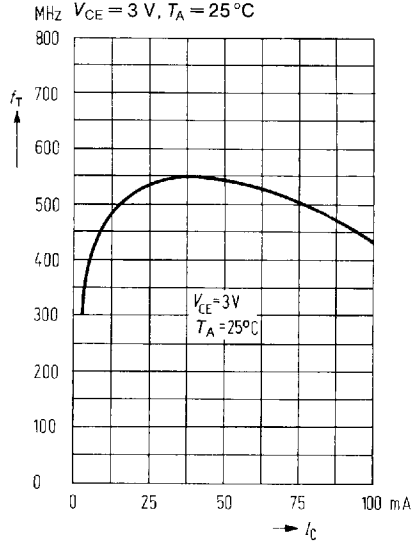
**Current gain versus collector current**

$V_{CE} = 3 \text{ V}, T_A = 25^\circ\text{C}$



**Transition frequency versus collector current**

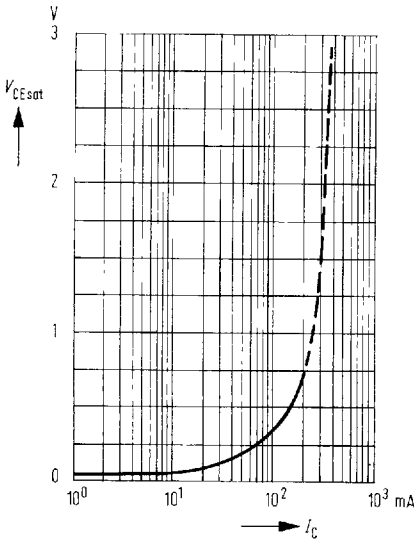
$V_{CE} = 3 \text{ V}, T_A = 25^\circ\text{C}$



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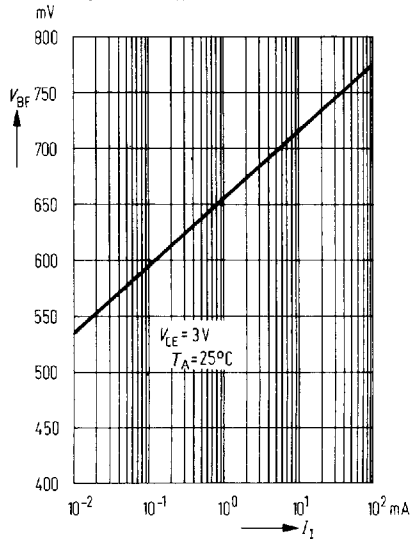
**Collector-emitter saturation voltage versus collector current**

$B = 20$

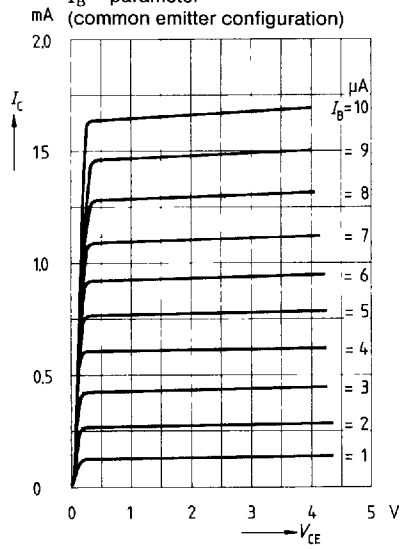


**Base-emitter voltage versus input current**

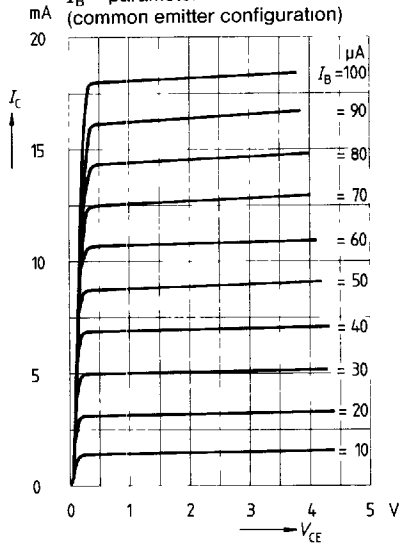
$V_{CE} = 3 \text{ V}; T_A = 25^\circ\text{C}$



**Output characteristics**  
**Collector current versus**  
**collector-emitter voltage**  
 $I_B = \text{parameter}$   
(common emitter configuration)



**Output characteristics**  
**Collector current versus**  
**collector-emitter voltage**  
 $I_B = \text{parameter}$   
(common emitter configuration)



**Output characteristics**  
**Collector current versus**  
**collector-emitter voltage**  
 $I_B = \text{parameter}$   
(common emitter configuration)

