

## NPN Silicon Darlington Transistors

T-33-29

BD 643

BD 645

**BD 647**

BD 649

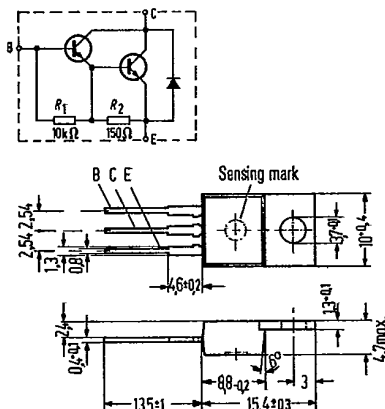
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### Epibase power darlington transistors (62.5W)

BD 643, BD 645, BD 647, and BD 649 are monolithic NPN silicon epibase power darlington transistors with diode and resistors in a TO 220 AB plastic package (TOP-66). The collectors of the two transistors are electrically connected to the metallic mounting area. These darlington transistors for AF applications are outstanding for particularly high current gain. Together with BD 644, BD 646, BD 648, and BD 650, they are particularly suitable for use as complementary AF push-pull output stages.

| Type              | Ordering code |
|-------------------|---------------|
| BD 643            | Q62702-D229   |
| BD 643/BD 644     | Q62702-D235   |
| BD 645            | Q62702-D231   |
| BD 645/BD 646     | Q62702-D236   |
| BD 647            | Q62702-D233   |
| BD 647/BD 648     | Q62702-D237   |
| BD 649            | Q62702-D374   |
| BD 649/BD 650     | Q62702-D376   |
| Insulating nipple | Q62901-B55    |
| Mica washer       | Q62901-B52    |
| Spring washer     |               |
| A 3 DIN 137       | Q62902-B63    |



**Change in dimensional drawings in preparation.**

**Approx. weight 18 g. Dimensions in mm**

| Maximum ratings                                                                             |           | BD 643      | BD 645 | BD 647 | BD 649 |    |
|---------------------------------------------------------------------------------------------|-----------|-------------|--------|--------|--------|----|
| Collector-emitter voltage                                                                   | $V_{CEO}$ | 45          | 60     | 80     | 100    | V  |
| Collector-base voltage                                                                      | $V_{CBO}$ | 45          | 60     | 80     | 100    | V  |
| Base-emitter voltage                                                                        | $V_{EBO}$ | 5           | 5      | 5      | 5      | V  |
| Collector current                                                                           | $I_C$     | 8           | 8      | 8      | 8      | A  |
| Collector-peak current (t < 10 ms)                                                          | $I_{CM}$  | 12          | 12     | 12     | 12     | A  |
| Base current                                                                                | $I_B$     | 150         | 150    | 150    | 150    | mA |
| Storage temperature range                                                                   | $T_{stg}$ | -55 to +150 |        |        |        | °C |
| Junction temperature                                                                        | $T_j$     | 150         | 150    | 150    | 150    | °C |
| Total power dissipation<br>( $T_{case} \leq 25^\circ\text{C}$ , $V_{CE} \leq 10\text{ V}$ ) | $P_{tot}$ | 62,5        | 62,5   | 62,5   | 62,5   | W  |

### Thermal resistance

|                                |            |      |      |      |      |     |
|--------------------------------|------------|------|------|------|------|-----|
| Junction to ambient air        | $R_{thJA}$ | ≤ 80 | ≤ 80 | ≤ 80 | ≤ 80 | K/W |
| Junction to case <sup>1)</sup> | $R_{thJC}$ | ≤ 2  | ≤ 2  | ≤ 2  | ≤ 2  | K/W |

1) For insulated mounting: If the mica washer Q62901-B 52 (50 to 90  $\mu\text{m}$ ) and the insulating nipple Q62901-B 55 are used this value increases by 4 K/W and with grease by 2 K/W.

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BD 643  
BD 645  
BD 647  
BD 649

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

|                                                                                            |               | BD 643 | BD 645 | BD 647 | BD 649 |    |
|--------------------------------------------------------------------------------------------|---------------|--------|--------|--------|--------|----|
| Collector cutoff current<br>( $V_{CB} = V_{CBmax}$ )                                       | $I_{CBO}$     | <0.2   | <0.2   | <0.2   | <0.2   | mA |
| ( $V_{CB} = V_{CBmax}$ ; $T_{amb} = 100^{\circ}\text{C}$ )                                 | $I_{CBO}$     | <2     | <2     | <2     | <2     | mA |
| Collector cutoff current<br>( $V_{CE} = 0.5 V_{CEmax}$ )                                   | $I_{CEO}$     | <0.5   | <0.5   | <0.5   | <0.5   | mA |
| Emitter cutoff current<br>( $V_{EB} = 5 \text{ V}$ )                                       | $I_{EBO}$     | <5     | <5     | <5     | <5     | mA |
| Collector-emitter breakdown<br>voltage ( $I_C = 100 \text{ mA}$ ) <sup>1)</sup>            | $V_{(BR)CEO}$ | >45    | >60    | <80    | >100   | V  |
| Collector-base breakdown<br>voltage ( $I_E = 5 \text{ mA}$ )                               | $V_{(BR)CBO}$ | >45    | >60    | >80    | >100   | V  |
| Emitter-base breakdown<br>voltage ( $I_E = 2 \text{ mA}$ )                                 | $V_{(BR)EBO}$ | >5     | >5     | >5     | >5     | V  |
| DC current gain<br>( $I_C = 0.5 \text{ A}$ , $V_{CE} = 3 \text{ V}$ )                      | $h_{FE}$      | 1500   | 1500   | 1500   | 1500   | -  |
| ( $I_C = 3 \text{ A}$ , $V_{CE} = 3 \text{ V}$ )                                           | $h_{FE}$      | >750   | >750   | >750   | >750   | -  |
| ( $I_C = 6 \text{ A}$ , $V_{CE} = 3 \text{ V}$ )                                           | $h_{FE}$      | 750    | 750    | 750    | 750    | -  |
| Base-emitter forward voltage<br>( $I_C = 3 \text{ A}$ , $V_{CE} = 3 \text{ V}$ )           | $V_{BE}$      | <2.5   | <2.5   | <2.5   | <2.5   | V  |
| Collector-emitter saturation<br>voltage<br>( $I_C = 3 \text{ A}$ , $I_B = 12 \text{ mA}$ ) | $V_{CEsat}$   | <2     | <2     | <2     | <2     | V  |
| Forward voltage of the protective<br>diode at $I_F = 3 \text{ A}$                          | $V_F$         | 1.8    | 1.8    | 1.8    | 1.8    | V  |

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

|                                                                                                         |           |        |        |        |        |     |
|---------------------------------------------------------------------------------------------------------|-----------|--------|--------|--------|--------|-----|
| Transition frequency<br>( $I_C = 3 \text{ A}$ , $V_{CE} = 3 \text{ V}$ , $f = 1 \text{ MHz}$ )          | $f_T$     | 7 (>1) | 7 (>1) | 7 (>1) | 7 (>1) | MHz |
| Cutoff frequency in common<br>emitter configuration<br>( $I_C = 3 \text{ A}$ ; $V_{CE} = 3 \text{ V}$ ) | $f_{hfe}$ | 60     | 60     | 60     | 60     | kHz |

1)  $t = 200 \mu\text{s}$ , duty cycle 1%.

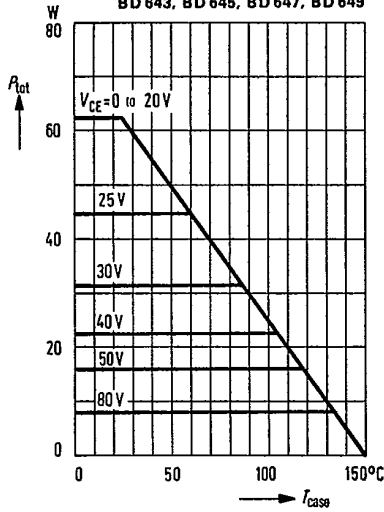
BD 643  
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Total perm. power dissipation  
versus temperature

$P_{tot} = f(T_{case})$ ;  $V_{CE} = \text{parameter}$

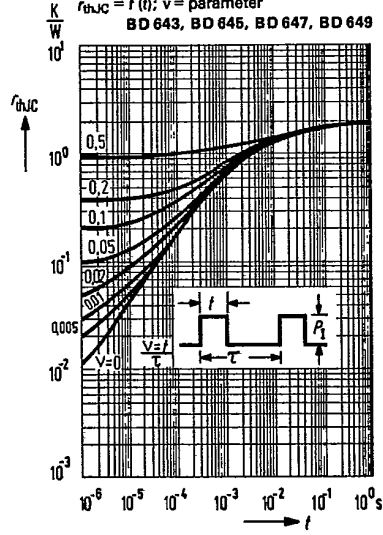
BD 643, BD 645, BD 647, BD 649



Permissible pulse load

$r_{thJC} = f(t)$ ;  $v = \text{parameter}$

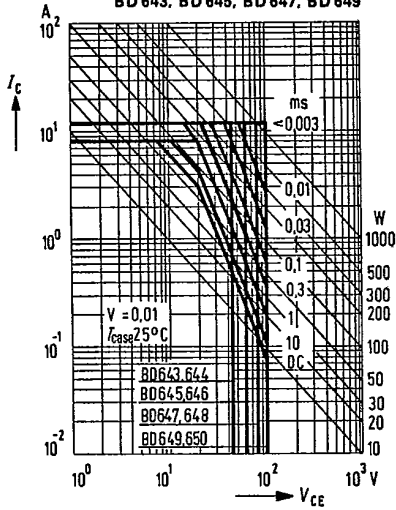
BD 643, BD 645, BD 647, BD 649



Permissible operating range

$I_C = f(V_{CE})$ ;  $T_{case} = 25^\circ\text{C}$ ;  $v = 0.01$

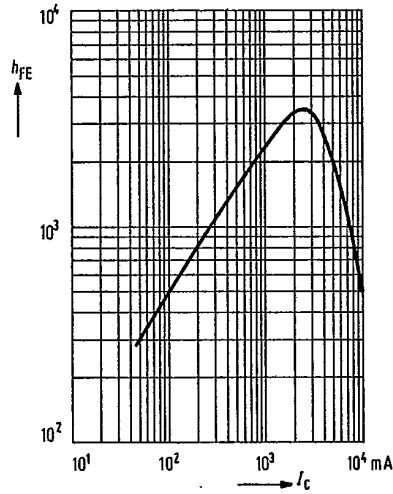
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DC current gain  $h_{FE} = f(I_C)$

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

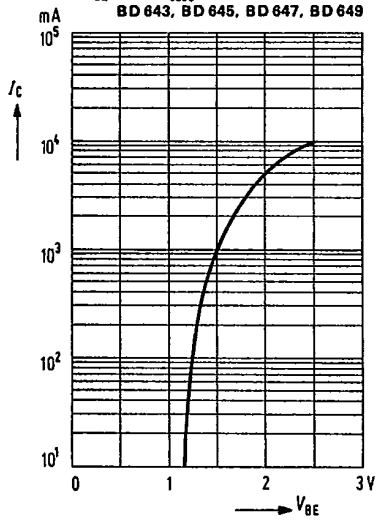
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Collector current  $I_C = f(V_{BE})$   
 $V_{CE} = 3\text{ V}; T_{CBA} = 25^\circ\text{C}$   
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Collector-emitter saturation voltage  
 $V_{CEsat} = f(I_C); h_{FE} = 250; T_{CBA} = 25^\circ\text{C}$   
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