



BD643/645/647/649/651

SILICON DARLINGTON POWER TRANSISTORS

NPN epitaxial-base transistors in a monolithic Darlington circuit and housed in a TO-220 envelope. They are intended for output stages in audio equipment, general amplifiers, and analogue switching application.

PNP complements are BD644, BD646, BD648, BD650 and BD652

ABSOLUTE MAXIMUM RATINGS

| Symbol | Ratings | Value | Unit | |
|-----------|---------------------------|-------|------|---|
| V_{CBO} | Collector-Base Voltage | BD643 | 60 | V |
| | | BD645 | 80 | |
| | | BD647 | 100 | |
| | | BD649 | 120 | |
| | | BD651 | 140 | |
| V_{CEO} | Collector-Emitter Voltage | BD643 | 45 | V |
| | | BD645 | 60 | |
| | | BD647 | 80 | |
| | | BD649 | 100 | |
| | | BD651 | 120 | |
| V_{EBO} | Emitter-Base Voltage | BD643 | 5 | V |
| | | BD645 | | |
| | | BD647 | | |
| | | BD649 | | |
| | | BD651 | | |
| I_C | Collector Current | BD643 | 8 | A |
| | | BD645 | | |
| | | BD647 | | |
| | | BD649 | | |
| | | BD651 | | |
| I_{CM} | Collector Peak Current | BD643 | 12 | A |
| | | BD645 | | |
| | | BD647 | | |
| | | BD649 | | |
| | | BD651 | | |

BD643/645/647/649/651

| Symbol | Ratings | | Value | Unit |
|--------|----------------------------------|-----------------------|-------------|-------|
| I_B | Base Current | BD643 | 150 | mA |
| | | BD645 | | |
| | | BD647 | | |
| | | BD649 | | |
| | | BD651 | | |
| P_T | Power Dissipation | @ $T_{mb} < 25^\circ$ | 62.5 | Watts |
| | | BD643 | | |
| | | BD645 | | |
| | | BD647 | | |
| | | BD649 | | |
| T_J | Junction <i>Temperature</i> | BD643 | 150 | °C |
| | | BD645 | | |
| | | BD647 | | |
| | | BD649 | | |
| | | BD651 | | |
| T_s | Storage <i>Temperature range</i> | BD643 | -65 to +150 | |
| | | BD645 | | |
| | | BD647 | | |
| | | BD649 | | |
| | | BD651 | | |

Limiting values in accordance with the Absolute Maximum System (IEC 134)

THERMAL CHARACTERISTICS

| Symbol | Ratings | | Value | Unit |
|--------------|--------------------------------------|-------|-------|------|
| R_{thJ-MB} | From junction to mounting base | BD643 | 2 | K/W |
| | | BD645 | | |
| | | BD647 | | |
| | | BD649 | | |
| | | BD651 | | |
| R_{thJ-A} | From junction to ambient in free air | BD643 | 70 | K/W |
| | | BD645 | | |
| | | BD647 | | |
| | | BD649 | | |
| | | BD651 | | |

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ELECTRICAL CHARACTERISTICS

TC=25°C unless otherwise noted

| Symbol | Ratings | Test Condition(s) | Min | Typ | Mx | Unit | |
|---------------|--|---|-------|-----|----|------|----|
| I_{CBO} | Collector Cutoff Current | $I_E=0, V_{CB} = V_{CEO}MAX$ | BD643 | - | - | 0.1 | mA |
| | | | BD645 | | | | |
| | | | BD647 | | | | |
| | | | BD649 | | | | |
| | | | BD651 | | | | |
| | | $I_E=0, V_{CB} = 1/2 V_{CBO}MAX, T_J=150^\circ C$ | BD643 | - | - | 1 | mA |
| | | | BD645 | | | | |
| | | | BD647 | | | | |
| | | | BD649 | | | | |
| | | | BD651 | | | | |
| I_{CEO} | Collector Cutoff Current | $I_E=0, V_{CE} = 1/2 V_{CEO}MAX$ | BD643 | - | - | 0.2 | mA |
| | | | BD645 | | | | |
| | | | BD647 | | | | |
| | | | BD649 | | | | |
| | | | BD651 | | | | |
| I_{EBO} | Emitter Cutoff Current | $V_{EB}=5 V, I_C=0$ | BD643 | - | - | 5.0 | mA |
| | | | BD645 | | | | |
| | | | BD647 | | | | |
| | | | BD649 | | | | |
| | | | BD651 | | | | |
| $V_{CE(SAT)}$ | Collector-Emitter saturation Voltage (*) | $I_C=4 A, I_B=16 mA$ | BD643 | - | - | 2 | V |
| | | | BD645 | | | | |
| | | | BD647 | | | | |
| | | | BD649 | | | | |
| | | | BD651 | | | | |
| | | $I_C=3 A, I_B=12 mA$ | BD643 | - | - | 2 | |
| | | | BD645 | | | | |
| | | | BD647 | | | | |
| | | | BD649 | | | | |
| | | | BD651 | | | | |
| | | $I_C=5 A, I_B=50 mA$ | BD643 | - | - | 2.5 | |
| | | | BD645 | | | | |
| | | | BD647 | | | | |
| | | | BD649 | | | | |
| | | | BD651 | | | | |
| $V_{BE(SAT)}$ | Base-Emitter Saturation Voltage (*) | $I_C=12 A, I_B=50 mA$ | BD643 | - | - | 3 | V |
| | | | BD645 | | | | |
| | | | BD647 | | | | |
| | | | BD649 | | | | |
| | | | BD651 | | | | |

BD643/645/647/649/651

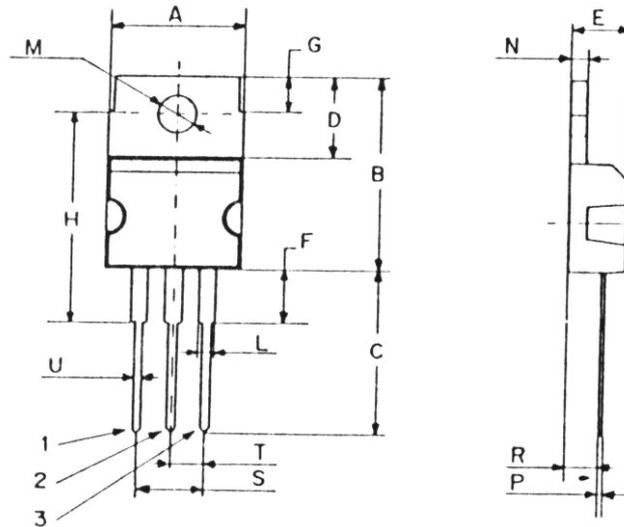
| Symbol | Ratings | | | Value | | | Unit |
|----------|---------------------------|--|-------|-------|------|-----|------|
| | | | | | | | |
| V_{BE} | Base-Emitter Voltage (*) | $I_C=4\text{ A}, V_{CE}=3\text{ V}$ | BD643 | - | - | 2.5 | V |
| | | | BD645 | - | - | - | |
| | | | BD647 | - | - | - | |
| | | | BD649 | - | - | - | |
| | | | BD651 | - | - | - | |
| | | $I_C=3\text{ A}, V_{CE}=3\text{ V}$ | BD643 | - | - | - | |
| | | | BD645 | - | - | 2.5 | |
| | | | BD647 | - | - | 2.5 | |
| | | | BD649 | - | - | 2.5 | |
| | | | BD651 | - | - | 2.5 | |
| h_{FE} | DC Current Gain (*) | $V_{CE}=3.0\text{ V}, I_C=0.5\text{ A}$ | BD643 | - | 1900 | - | - |
| | | | BD645 | - | | - | |
| | | | BD647 | - | | - | |
| | | | BD649 | - | | - | |
| | | | BD651 | - | | - | |
| | | $V_{CE}=3.0\text{ V}, I_C=4\text{ A}$ | BD643 | 750 | - | - | |
| | | | BD645 | - | - | - | |
| | | | BD647 | - | - | - | |
| | | | BD649 | - | - | - | |
| | | | BD651 | - | - | - | |
| | | $V_{CE}=3.0\text{ V}, I_C=3\text{ A}$ | BD643 | 750 | - | - | |
| | | | BD645 | | - | - | |
| | | | BD647 | | - | - | |
| | | | BD649 | | - | - | |
| | | | BD651 | | - | - | |
| | | $V_{CE}=3.0\text{ V}, I_C=8\text{ A}$ | BD643 | 1800 | - | - | |
| | | | BD645 | | - | - | |
| | | | BD647 | | - | - | |
| | | | BD649 | | - | - | |
| | | | BD651 | | - | - | |
| h_{fe} | Small Signal Current Gain | $V_{CE}=3.0\text{ V}, I_C=4\text{ A}, f=1\text{MHz}$ | BD643 | 10 | - | - | |
| | | | BD645 | - | - | - | |
| | | | BD647 | - | - | - | |
| | | | BD649 | - | - | - | |
| | | | BD651 | - | - | - | |
| | | $V_{CE}=3.0\text{ V}, I_C=3\text{ A}, f=1\text{MHz}$ | BD643 | - | - | - | |
| | | | BD645 | 10 | - | - | |
| | | | BD647 | 10 | - | - | |
| | | | BD649 | 10 | - | - | |
| | | | BD651 | 10 | - | - | |

 (*) Pulse Width $\approx 300\ \mu\text{s}$, Duty Cycle $\angle 2.0\%$

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MECHANICAL DATA CASE TO-220

| DIMENSIONS | | |
|------------|-------|--------|
| | mm | inches |
| A | 9,86 | 0,39 |
| B | 15,73 | 0,62 |
| C | 13,37 | 0,52 |
| D | 6,67 | 0,26 |
| E | 4,44 | 0,17 |
| F | 4,21 | 0,16 |
| G | 2,99 | 0,11 |
| H | 17,21 | 0,68 |
| L | 1,29 | 0,05 |
| M | 3,6 | 0,14 |
| N | 1,36 | 0,05 |
| P | 0,46 | 0,02 |
| R | 2,1 | 0,08 |
| S | 5 | 0,19 |
| T | 2,51 | 0,098 |
| U | 0,79 | 0,03 |



| | |
|---------|---------|
| Pin 1 : | Anode 1 |
| Pin 2 : | Anode 2 |
| Pin 3 : | Gate |