

# 8-Ampere N-P-N Darlington Power Transistors

45-60-80 Volts, 70 Watts  
Gain of 750 at 3A

**Features:**

- Operates from IC without predriver
- Low leakage at high temperature

**Applications:**

- Power switching
- Hammer drivers
- Series and shunt regulators
- Audio amplifiers

The BD643, BD645, BD647, and BD649 are monolithic silicon n-p-n Darlington transistors designed for low and medium-frequency power applications. The high gain of these devices makes it possible for them to be driven directly from integrated circuits.

These devices are supplied in the JEDEC TO 220AB (VERSAWATT) plastic package.

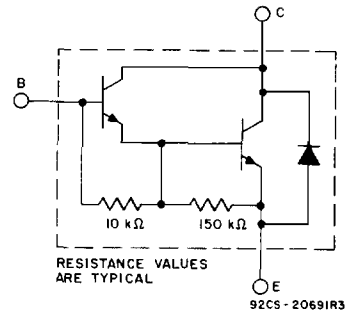
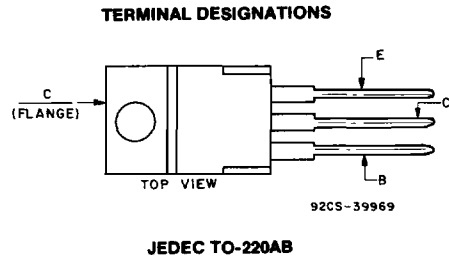


Fig. 1—Schematic diagram for all types.

**MAXIMUM RATINGS, Absolute-Maximum Values:**

	BD643	BD645	BD647	BD649	
$V_{CBO}$ .....	45	60	80	100	V
$V_{CEO(sus)}$ .....	45	60	80	100	V
$V_{EBO}$ .....	5				V
$I_C$ .....	8				A
$I_{CM}$ .....	12				A
$I_B$ .....	0.15				A
$P_T$ .....	62.5				W
$T_C \leq 25^\circ C$ .....	Derate linearly 0.5				W/°C
$T_C > 25^\circ C$ .....	-55 to 150				°C
$T_{stg}, T_J$ .....	235				°C
$T_L$ .....	At distances $\geq 1/8$ in. (3.17 mm) from case for 10 s max.				°C

# BD643, BD645, BD647, BD649

ELECTRICAL CHARACTERISTICS, At Case Temperature ( $T_C$ ) = 25°C  
Unless Otherwise Specified

CHARACTERISTIC	TEST CONDITIONS				LIMITS				UNITS
	VOLTAGE V dc			CUR- RENT A dc	BD643		BD645		
	V <sub>CB</sub>	V <sub>CE</sub>	V <sub>BE</sub>		Min.	Max.	Min.	Max.	
I <sub>CEO</sub>		20 30			— —	0.5 —	— —	— 0.5	mA
I <sub>CBO</sub>	45 60				— —	0.2 —	— —	— 0.2	
T <sub>C</sub> = 100°C	45 60				— —	2 —	— —	— 2	
I <sub>EBO</sub>			—5	0	—	2	—	2	V
V <sub>(BR)CEO</sub>				0.1 <sup>a</sup>	45	—	60	—	
V <sub>(BR)CBO</sub>				0.005	45	—	60	—	
V <sub>(BR)EBO</sub> I <sub>E</sub> = 2 mA					5	—	5	—	
h <sub>FE</sub>		3		0.5 <sup>a</sup>	1500 <sup>b</sup>	—	1500 <sup>b</sup>	—	
		3		3 <sup>a</sup>	750	—	750	—	
		3		6 <sup>a</sup>	750 <sup>b</sup>	—	750 <sup>b</sup>	—	
V <sub>BE</sub>		3		3 <sup>a</sup>	—	2.5	—	2.5	V
V <sub>CE(sat)</sub> I <sub>B</sub> = 12 mA				3 <sup>a</sup>	—	2	—	2	
f <sub>T</sub> f = 1 MHz		3 3		3 3	1 10 <sup>b</sup>	—	1 10 <sup>b</sup>	—	MHz
R <sub>θJC</sub>					—	2	—	2	°C/W

<sup>a</sup> Pulsed; pulse duration = 200 μs, duty factor = 1%.

<sup>b</sup> Typical value.

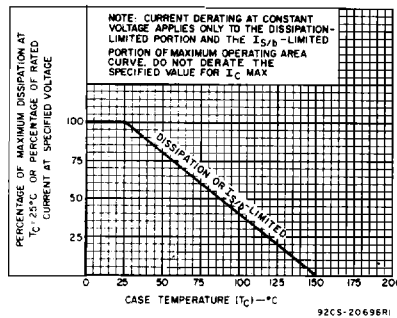


Fig. 2—Derating curve for all types.

# BD643, BD645, BD647, BD649

## ELECTRICAL CHARACTERISTICS, At Case Temperature ( $T_C$ ) = 25°C Unless Otherwise Specified

CHARACTERISTIC	TEST CONDITIONS				LIMITS				UNITS
	VOLTAGE V dc			CURRENT A dc	BD647		BD649		
	V <sub>CB</sub>	V <sub>CE</sub>	V <sub>BE</sub>		Min.	Max.	Min.	Max.	
I <sub>CEO</sub>		40 50			— —	0.5 —	— —	— 0.5	mA
I <sub>CBO</sub>	80 100				— —	0.2 —	— —	— 0.2	
$T_C = 100^\circ\text{C}$	80 100				— —	2 —	— —	— 2	
I <sub>EBO</sub>			—5	0	—	2	—	2	V
V <sub>(BR)CEO</sub>				0.1 <sup>a</sup>	80	—	100	—	
V <sub>(BR)CBO</sub>				0.005	80	—	100	—	
V <sub>(BR)EBO</sub> I <sub>E</sub> = 2 mA					5	—	5	—	
h <sub>FE</sub>		3		0.5 <sup>a</sup>	1500 <sup>b</sup>	—	1500 <sup>b</sup>	—	
		3		3 <sup>a</sup>	750	—	750	—	
		3		6 <sup>a</sup>	750 <sup>b</sup>	—	750 <sup>b</sup>	—	
V <sub>BE</sub>		3		3 <sup>a</sup>	—	2.5	—	2.5	V
V <sub>CE(sat)</sub> I <sub>B</sub> = 12 mA				3 <sup>a</sup>	—	2	—	2	
f <sub>T</sub> f = 1 MHz		3 3		3 3	1 10 <sup>b</sup>	—	1 10 <sup>b</sup>	—	MHz
R <sub>θJC</sub>					—	2	—	2	°C/W

<sup>a</sup> Pulsed; pulse duration = 200 μs, duty factor = 1%.

<sup>b</sup> Typical value.

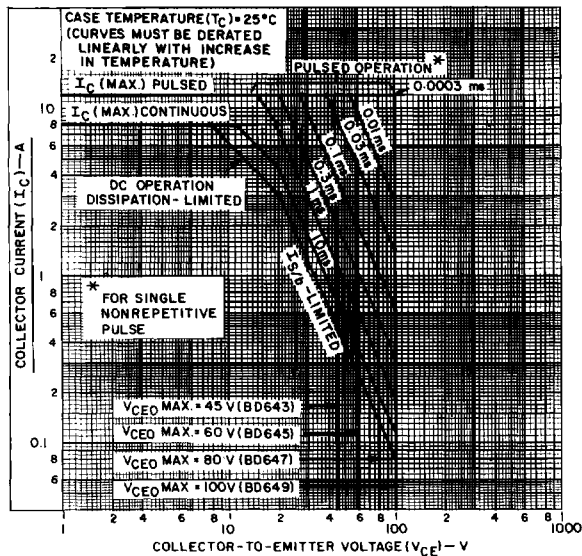


Fig. 3—Maximum operating area for all types.