

# BD643, BD645, BD647, BD649

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

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

The RCA-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.

### Features:

- Operates from IC without predriver
- Low leakage at high temperature
- High reverse second-breakdown capability

### Applications:

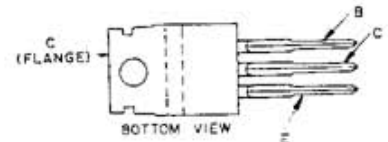
- Power switching
- Hammer drivers
- Series and shunt regulators
- Audio amplifiers

### MAXIMUM RATINGS, Absolute-Maximum Values:

	BD643	BD645	BD647	BD649	
V <sub>CB0</sub> .....	45	60	80	100	V
V <sub>CEO(sus)</sub> .....	45	60	80	100	V
V <sub>EBO</sub> .....	5				V
I <sub>C</sub> .....	8				A
I <sub>CM</sub> .....	12				A
I <sub>B</sub> .....	0.15				A
P <sub>T</sub> .....	62.5				W
T <sub>C</sub> < 25°C.....	Derate linearly 0.5				W/°C
T <sub>C</sub> > 25°C.....	Derate linearly 0.5				W/°C
T <sub>stg</sub> , T <sub>J</sub> .....	-55 to 150				°C
T <sub>L</sub> .....	235				°C

At distances > 1/8 in. (3.17 mm) from case for 10 s max.

### TERMINAL DESIGNATIONS



### JEDEC TO-220AB

(See dimensional outline "S")

### ELECTRICAL CHARACTERISTICS, At Case Temperature (T<sub>C</sub>) = 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	—	—	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> I = 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.

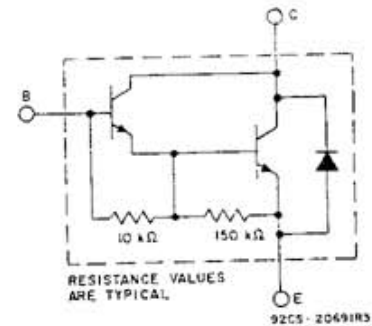


Fig. 1—Schematic diagram for all types.

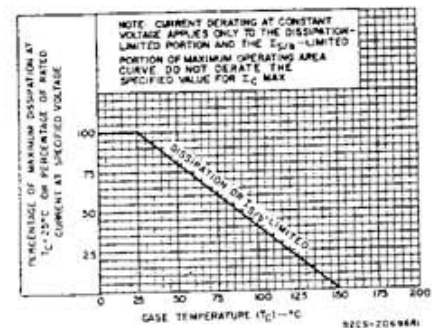


Fig. 2—Derating curve for all types.

# BD643, BD645, BD647, BD649

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

CHARACTERISTIC	TEST CONDITIONS				LIMITS				UNITS
	VOLTAGE V dc			CUR- RENT A dc $I_C$	BD647		BD649		
	$V_{CB}$	$V_{CE}$	$V_{BE}$		Min.	Max.	Min.	Max.	
$I_{CEO}$		40 50			—	0.5	—	—	mA
$I_{CBO}$	80 100				—	0.2	—	—	
$T_C = 100^\circ\text{C}$	80 100				—	2	—	2	
$I_{EBO}$			-5	0	—	2	—	2	V
$V_{(BR)CEO}$				0.1 <sup>a</sup>	80	—	100	—	
$V_{(BR)CBO}$				0.005	80	—	100	—	
$V_{(BR)EBO}$ $I_E = 2\text{ mA}$					5	—	5	—	
$h_{FE}$		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>	—	
$V_{BE}$		3		3 <sup>a</sup>	—	2.5	—	2.5	V
$V_{CE(sat)}$ $I_B = 12\text{ mA}$				3 <sup>a</sup>	—	2	—	2	
$f_T$ $f = 1\text{ MHz}$		3		3	1	—	1	—	MHz
		3		3	10 <sup>b</sup>	—	10 <sup>b</sup>	—	
$\theta_{\theta JC}$					—	2	—	2	$^\circ\text{C/W}$

<sup>a</sup> Pulsed; pulse duration = 200  $\mu\text{s}$ , duty factor = 1%.

<sup>b</sup> Typical value.

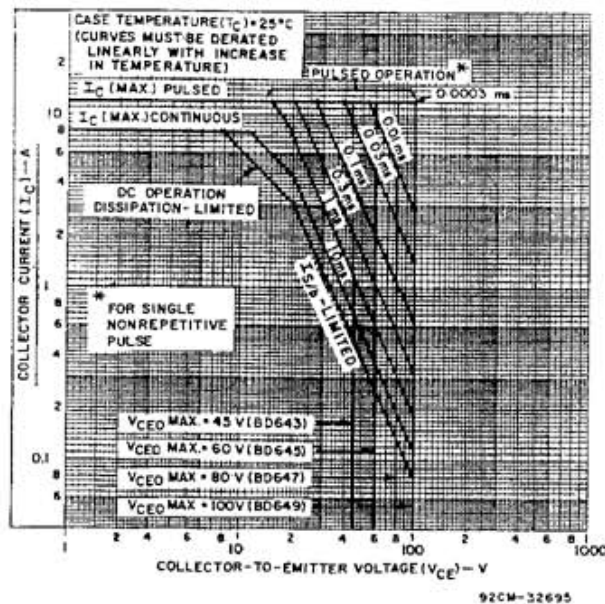


Fig. 3—Maximum operating area for all types.