

# Epitaxial-Base Silicon N-P-N VERSAWATT Transistors

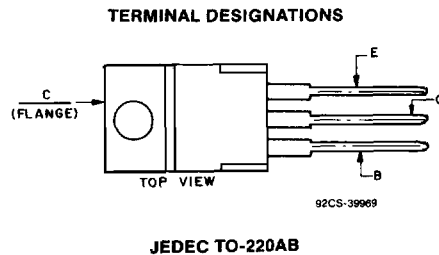
For Power-Amplifier and  
High-Speed-Switching Applications

**Features:**

- 30 W at 25°C case temperature
- 4-A rated collector current
- Min.  $f_T$  of 3 MHz at 10 V, 200 mA
- Complements of p-n-p types BD240, BD240A, BD240B, and BD240C

Types BD239, BD239A, BD239B, and BD239C are epitaxial-base silicon n-p-n transistors; they differ only in their voltage ratings. These devices are intended for a wide variety of switching and amplifier applications such as series and shunt regulators, and driver and output stages of high-fidelity amplifiers. The BD239-series power transistors are complements of the devices in the BD240 series. (The BD240-series devices are described in File No. 670.)

All types utilize the JEDEC TO-220AB (VERSAWATT) plastic package.



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

	BD239	BD239A	BD239B	BD239C		
<b>COLLECTOR-TO-EMITTER VOLTAGE:</b>						
With external base-to-emitter resistance ( $R_{BE}$ ) = 100 $\Omega$ . . . . .	$V_{CER}$	55	70	90	115	V
With base open . . . . .	$V_{CEO}$	45	60	80	100	V
<b>EMITTER-TO-BASE VOLTAGE . . . . .</b>	$V_{EBO}$	5	5	5	5	V
<b>CONTINUOUS COLLECTOR CURRENT . . . . .</b>	$I_C$	4	4	4	4	A
<b>CONTINUOUS BASE CURRENT . . . . .</b>	$I_B$	1	1	1	1	A
<b>TRANSISTOR DISSIPATION: <math>P_T</math></b>						
At case temperatures up to 25°C . . . . .		30	30	30	30	W
At ambient temperatures up to 25°C . . . . .		2	2	2	2	W
At case temperatures above 25°C . . . . .		← See Fig. 2 →				
<b>TEMPERATURE RANGE:</b>						
Storage & Operating (Junction) . . . . .		← -65 to 150 →				°C
<b>LEAD TEMPERATURE (During Soldering):</b>						
At distance 1/8 in. (3.17 mm) from case for 10 s max. . . . .		← 235 →				°C

# BD239, BD239A, BD239B, BD239C

ELECTRICAL CHARACTERISTICS at Case Temperature ( $T_C$ ) = 25°C

CHARACTERISTIC	SYMBOL	TEST CONDITIONS				LIMITS								UNITS
		VOLTAGE V dc		CURRENT A dc		BD239		BD239A		BD239B		BD239C		
		V <sub>CE</sub>	V <sub>BE</sub>	I <sub>C</sub>	I <sub>B</sub>	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	
Collector Cutoff Current: With base open	I <sub>CEO</sub>	30			0	—	0.3	—	0.3	—	—	—	—	mA
		60			0	—	—	—	—	—	0.3	—	0.3	
With base-to-emitter junction short-circuited	I <sub>CES</sub>	45	0			—	0.2	—	—	—	—	—	—	mA
		60	0			—	—	—	0.2	—	—	—	—	
		80	0			—	—	—	—	—	0.2	—	—	
		100	0			—	—	—	—	—	—	—	0.2	
Emitter Cutoff Current	I <sub>EBO</sub>		-5	0		—	1	—	1	—	1	—	1	mA
Collector-to-Emitter Breakdown Voltage: With base open	V <sub>BR(CEO)</sub>			0.03 <sup>a</sup>	0	45	—	60	—	80	—	100	—	V
DC Forward-Current Transfer Ratio	h <sub>FE</sub>	4		0.2 <sup>a</sup>		40	—	40	—	40	—	40	—	
		4		1 <sup>a</sup>		15	—	15	—	15	—	15	—	
Base-to-Emitter Voltage	V <sub>BE</sub>	4		1 <sup>a</sup>		—	1.3	—	1.3	—	1.3	—	1.3	V
Collector-to-Emitter Saturation Voltage	V <sub>CE(sat)</sub>			1 <sup>a</sup>	0.2	—	0.7	—	0.7	—	0.7	—	0.7	V
Common-Emitter Small-Signal Short- Circuit Forward- Current Transfer Ratio (f = 1 kHz)	h <sub>fe</sub>	10		0.2		20	—	20	—	20	—	20	—	
Magnitude of Common Emitter Small-Signal Short-Circuit Forward- Current Transfer Ratio (f = 1 MHz)	h <sub>fe</sub>	10		0.2		3	—	3	—	3	—	3	—	
Thermal Resistance: Junction-to-Case	R <sub>θJC</sub>					—	4.17	—	4.17	—	4.17	—	4.17	°C/W
Junction-to-Ambient	R <sub>θJA</sub>					—	62.5	—	62.5	—	62.5	—	62.5	

<sup>a</sup>Pulsed: Pulse duration = 300 μs, duty factor = 2%.

**2**  
POWER TRANSISTORS

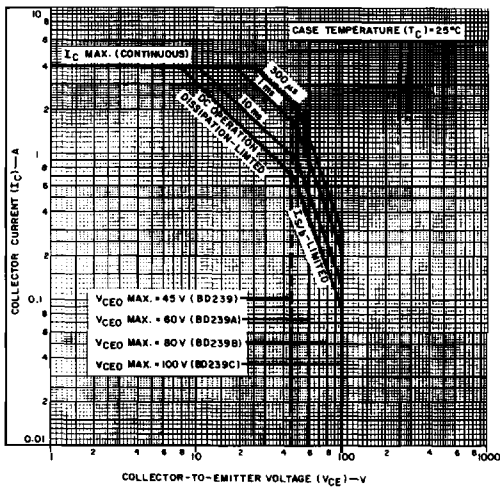


Fig. 1— Maximum safe operating areas for all types.

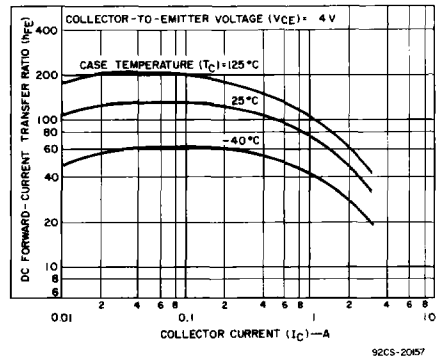


Fig. 2— Typical dc beta characteristics for all types.