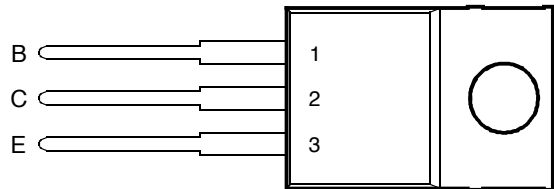


# BD239, BD239A, BD239B, BD239C NPN SILICON POWER TRANSISTORS



- Designed for Complementary Use with the BD240 Series
- 30 W at 25°C Case Temperature
- 2 A Continuous Collector Current
- 4 A Peak Collector Current
- Customer-Specified Selections Available

TO-220 PACKAGE  
(TOP VIEW)



Pin 2 is in electrical contact with the mounting base.

MDTRACA



This series is not recommended for new designs.

### absolute maximum ratings at 25°C case temperature (unless otherwise noted)

RATING		SYMBOL	VALUE	UNIT
Collector-emitter voltage ( $R_{BE} = 100 \Omega$ )	BD239	$V_{CER}$	55	V
	BD239A		70	
	BD239B		90	
	BD239C		115	
Collector-emitter voltage ( $I_C = 30 \text{ mA}$ )	BD239	$V_{CEO}$	45	V
	BD239A		60	
	BD239B		80	
	BD239C		100	
Emitter-base voltage		$V_{EBO}$	5	V
Continuous collector current		$I_C$	2	A
Peak collector current (see Note 1)		$I_{CM}$	4	A
Continuous base current		$I_B$	0.6	A
Continuous device dissipation at (or below) 25°C case temperature (see Note 2)		$P_{tot}$	30	W
Continuous device dissipation at (or below) 25°C free air temperature (see Note 3)		$P_{tot}$	2	W
Unclamped inductive load energy (see Note 4)		$\frac{1}{2}LI_C^2$	32	mJ
Operating junction temperature range		$T_j$	-65 to +150	°C
Storage temperature range		$T_{stg}$	-65 to +150	°C
Lead temperature 3.2 mm from case for 10 seconds		$T_L$	250	°C

- NOTES: 1. This value applies for  $t_p \leq 0.3 \text{ ms}$ , duty cycle  $\leq 10\%$ .  
 2. Derate linearly to 150°C case temperature at the rate of 0.24 W/°C.  
 3. Derate linearly to 150°C free air temperature at the rate of 16 mW/°C.  
 4. This rating is based on the capability of the transistor to operate safely in a circuit of:  $L = 20 \text{ mH}$ ,  $I_{B(on)} = 0.4 \text{ A}$ ,  $R_{BE} = 100 \Omega$ ,  $V_{BE(off)} = 0$ ,  $R_S = 0.1 \Omega$ ,  $V_{CC} = 20 \text{ V}$ .

## PRODUCT INFORMATION

JUNE 1973 - REVISED SEPTEMBER 2002  
 Specifications are subject to change without notice.

**electrical characteristics at 25°C case temperature**

PARAMETER	TEST CONDITIONS			MIN	TYP	MAX	UNIT
$V_{(BR)CEO}$ Collector-emitter breakdown voltage	$I_C = 30 \text{ mA}$ (see Note 5)	$I_B = 0$	BD239	45			V
			BD239A	60			
			BD239B	80			
			BD239C	100			
$I_{CES}$ Collector-emitter cut-off current	$V_{CE} = 55 \text{ V}$ $V_{CE} = 70 \text{ V}$ $V_{CE} = 90 \text{ V}$ $V_{CE} = 115 \text{ V}$	$V_{BE} = 0$ $V_{BE} = 0$ $V_{BE} = 0$ $V_{BE} = 0$	BD239			0.2	mA
			BD239A			0.2	
			BD239B			0.2	
			BD239C			0.2	
$I_{CEO}$ Collector cut-off current	$V_{CE} = 30 \text{ V}$ $V_{CE} = 60 \text{ V}$	$I_B = 0$ $I_B = 0$	BD239/239A			0.3	mA
			BD239B/239C			0.3	
$I_{EBO}$ Emitter cut-off current	$V_{EB} = 5 \text{ V}$	$I_C = 0$				1	$\mu\text{A}$
$h_{FE}$ Forward current transfer ratio	$V_{CE} = 4 \text{ V}$ $V_{CE} = 4 \text{ V}$	$I_C = 0.2 \text{ A}$ $I_C = 1 \text{ A}$	(see Notes 5 and 6)	40			
				15			
$V_{CE(sat)}$ Collector-emitter saturation voltage	$I_B = 0.2 \text{ A}$	$I_C = 1 \text{ A}$	(see Notes 5 and 6)			0.7	V
$V_{BE}$ Base-emitter voltage	$V_{CE} = 4 \text{ V}$	$I_C = 1 \text{ A}$	(see Notes 5 and 6)			1.3	V
$h_{fe}$ Small signal forward current transfer ratio	$V_{CE} = 10 \text{ V}$	$I_C = 0.2 \text{ A}$	$f = 1 \text{ kHz}$	20			
$ h_{fe} $ Small signal forward current transfer ratio	$V_{CE} = 10 \text{ V}$	$I_C = 0.2 \text{ A}$	$f = 1 \text{ MHz}$	3			

NOTES: 5. These parameters must be measured using pulse techniques,  $t_p = 300 \mu\text{s}$ , duty cycle  $\leq 2\%$ .

6. These parameters must be measured using voltage-sensing contacts, separate from the current carrying contacts.

**thermal characteristics**

PARAMETER	MIN	TYP	MAX	UNIT
$R_{\theta JC}$ Junction to case thermal resistance			4.17	$^{\circ}\text{C}/\text{W}$
$R_{\theta JA}$ Junction to free air thermal resistance			62.5	$^{\circ}\text{C}/\text{W}$

**resistive-load-switching characteristics at 25°C case temperature**

PARAMETER	TEST CONDITIONS †			MIN	TYP	MAX	UNIT
$t_{on}$ Turn-on time	$I_C = 200 \text{ mA}$ $V_{BE(off)} = -3.4 \text{ V}$	$I_{B(on)} = 20 \text{ mA}$ $R_L = 150 \Omega$	$I_{B(off)} = -20 \text{ mA}$ $t_p = 20 \mu\text{s}$ , dc $\leq 2\%$		0.3		$\mu\text{s}$
$t_{off}$ Turn-off time					0.8		$\mu\text{s}$

† Voltage and current values shown are nominal; exact values vary slightly with transistor parameters.

TYPICAL CHARACTERISTICS

TYPICAL DC CURRENT GAIN  
VS  
COLLECTOR CURRENT

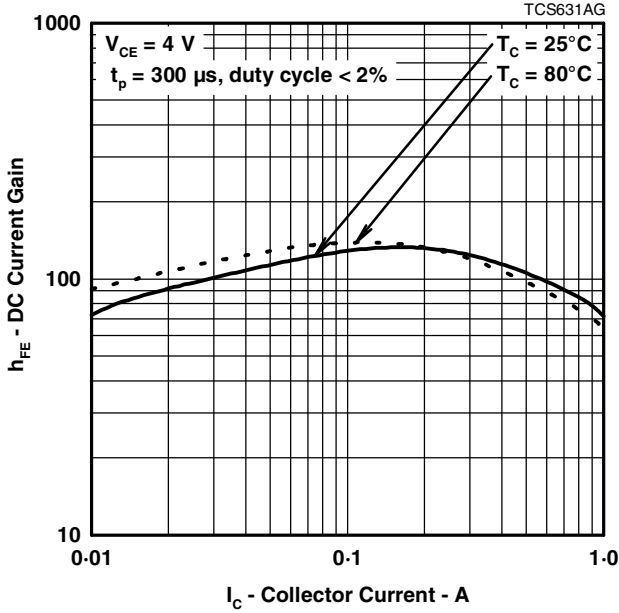


Figure 1.

COLLECTOR-EMITTER SATURATION VOLTAGE  
VS  
BASE CURRENT

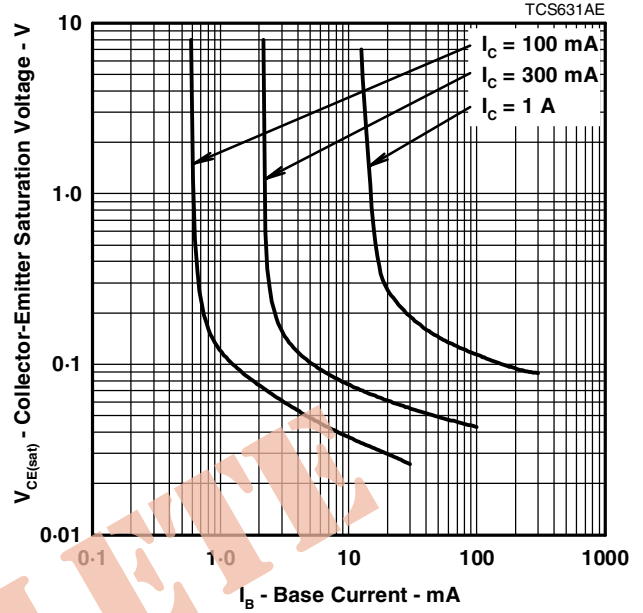


Figure 2.

BASE-EMITTER VOLTAGE  
VS  
COLLECTOR CURRENT

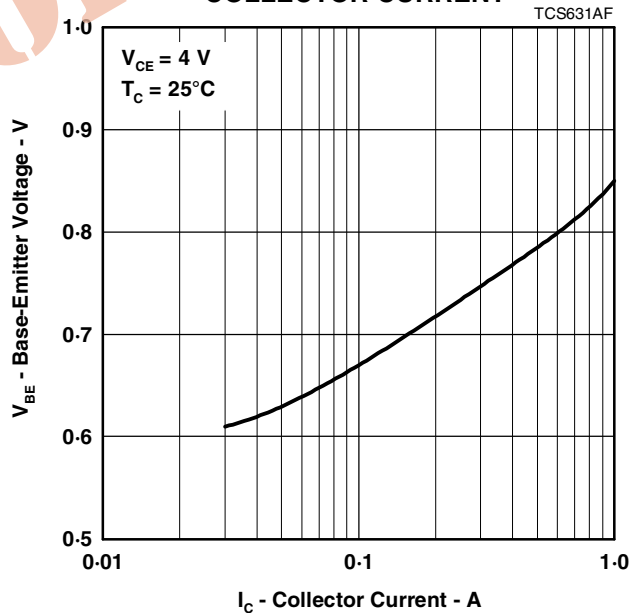


Figure 3.

**PRODUCT INFORMATION**

**MAXIMUM SAFE OPERATING REGIONS**

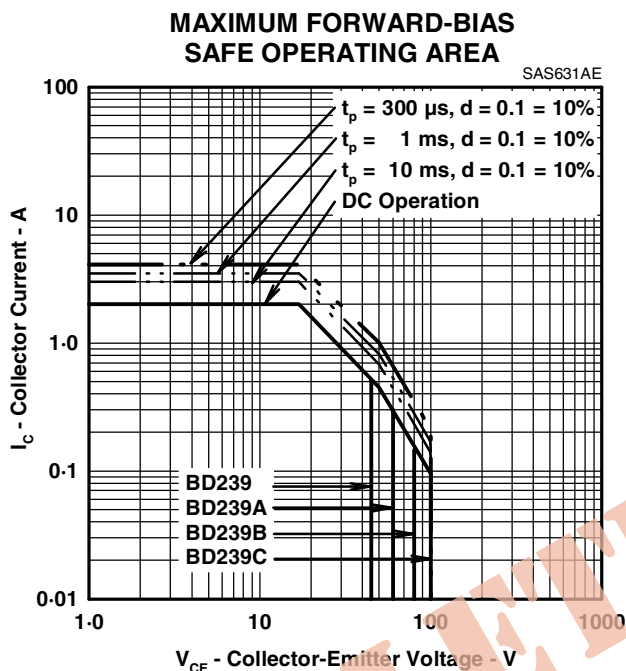


Figure 4.

**THERMAL INFORMATION**

**MAXIMUM POWER DISSIPATION  
vs  
CASE TEMPERATURE**

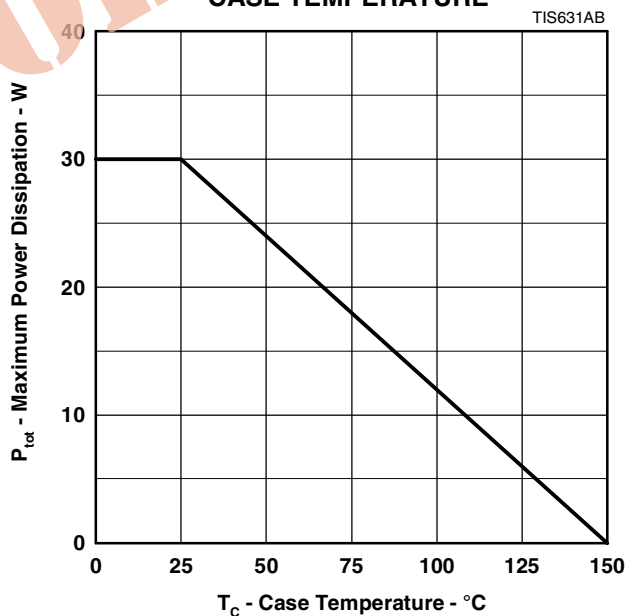


Figure 5.

**PRODUCT INFORMATION**