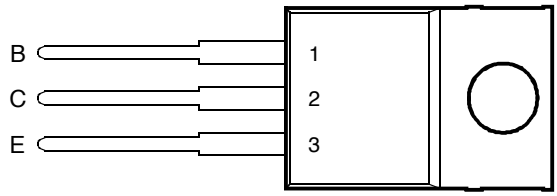
BD539, BD539A, BD539B, BD539C, BD539D
NPN SILICON POWER TRANSISTORS

- **Designed for Complementary Use with the BD540 Series**
- **45 W at 25°C Case Temperature**
- **5 A Continuous Collector Current**
- **Up to 120 V V_{CEO} rating**

TO-220 PACKAGE
(TOP VIEW)



Pin 2 is in electrical contact with the mounting base.

MDTRACA

This series is obsolete and not recommended for new designs.

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

RATING		SYMBOL	VALUE	UNIT
Collector-base voltage	BD539	V_{CBO}	40	V
	BD539A		60	
	BD539B		80	
	BD539C		100	
	BD539D		120	
Collector-emitter voltage (see Note 1)	BD539	V_{CEO}	40	V
	BD539A		60	
	BD539B		80	
	BD539C		100	
	BD539D		120	
Emitter-base voltage		V_{EBO}	5	V
Continuous collector current		I_C	5	A
Continuous device dissipation at (or below) 25°C case temperature (see Note 2)		P_{tot}	45	W
Continuous device dissipation at (or below) 25°C free air temperature (see Note 3)		P_{tot}	2	W
Operating free air temperature range		T_A	-65 to +150	°C
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	260	°C

NOTES: 1. These values apply when the base-emitter diode is open circuited.
2. Derate linearly to 150°C case temperature at the rate of 0.36 W/°C.
3. Derate linearly to 150°C free air temperature at the rate of 16 mW/°C.

electrical characteristics at 25°C case temperature

PARAMETER		TEST CONDITIONS			MIN	TYP	MAX	UNIT
$V_{(BR)CEO}$	Collector-emitter breakdown voltage	I_C = 30 mA (see Note 4)	I_B = 0	BD539	40			V
				BD539A	60			
				BD539B	80			
				BD539C	100			
				BD539D	120			
I_{CES}	Collector-emitter cut-off current	V_{CE} = 40 V	V_{BE} = 0	BD539			0.2	mA
		V_{CE} = 60 V	V_{BE} = 0	BD539A			0.2	
		V_{CE} = 80 V	V_{BE} = 0	BD539B			0.2	
		V_{CE} = 100 V	V_{BE} = 0	BD539C			0.2	
		V_{CE} = 120 V	V_{BE} = 0	BD539D			0.2	
I_{CEO}	Collector cut-off current	V_{CE} = 30 V	I_B = 0	BD539/539A			0.3	mA
		V_{CE} = 60 V	I_B = 0	BD539B/539C			0.3	
		V_{CE} = 90 V	I_B = 0	BD539D			0.3	
I_{EBO}	Emitter cut-off current	V_{EB} = 5 V	I_C = 0				1	mA
h_{FE}	Forward current transfer ratio	V_{CE} = 4 V	I_C = 0.5 A		40			
		V_{CE} = 4 V	I_C = 1 A	(see Notes 4 and 5)	30			
		V_{CE} = 4 V	I_C = 3 A		12			
$V_{CE(sat)}$	Collector-emitter saturation voltage	I_B = 125 mA	I_C = 1A				0.25	V
		I_B = 375 mA	I_C = 3A	(see Notes 4 and 5)			0.8	
		I_B = 1 A	I_C = 5 A				1.5	
$V_{BE(on)}$	Base-emitter voltage	V_{CE} = 4 V	I_C = 3 A	(see Notes 4 and 5)			1.25	V
h_{fe}	Small signal forward current transfer ratio	V_{CE} = 10 V	I_C = 0.5 A	f = 1 kHz	20			
$\|h_{fe}\|$	Small signal forward current transfer ratio	V_{CE} = 10 V	I_C = 0.5 A	f = 1 MHz	3			

NOTES: 4. These parameters must be measured using pulse techniques, t_p = 300 µs, duty cycle ≤ 2%.
5. 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			2.78	°C/W
$R_{\theta JA}$	Junction to free air thermal resistance			62.5	°C/W

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

PARAMETER		TEST CONDITIONS †			MIN	TYP	MAX	UNIT
t_{on}	Turn-on time	I_C = 1 A	$I_{B(on)}$ = 0.1 A	$I_{B(off)}$ = -0.1 A		0.5		µs
t_{off}	Turn-off time	$V_{BE(off)}$ = -4.3 V	R_L = 30 Ω	t_p = 20 µs, dc ≤ 2%		2		µs

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

TYPICAL CHARACTERISTICS

TYPICAL DC CURRENT GAIN vs COLLECTOR CURRENT

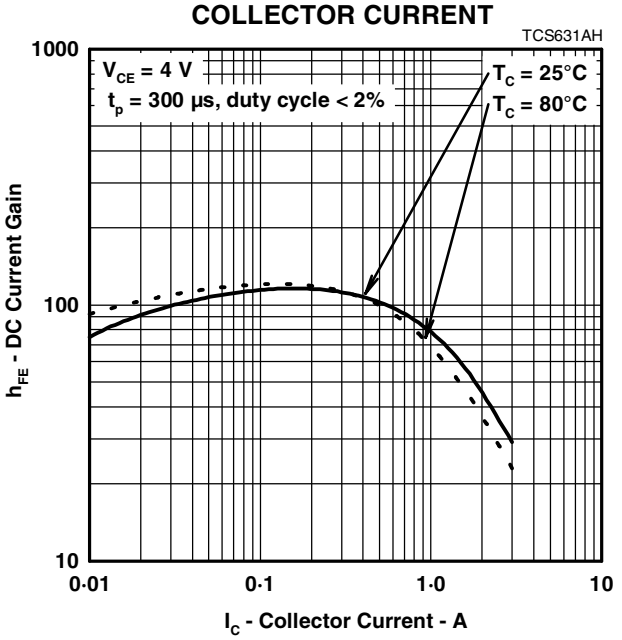


Figure 1.

COLLECTOR-EMITTER SATURATION VOLTAGE vs BASE CURRENT

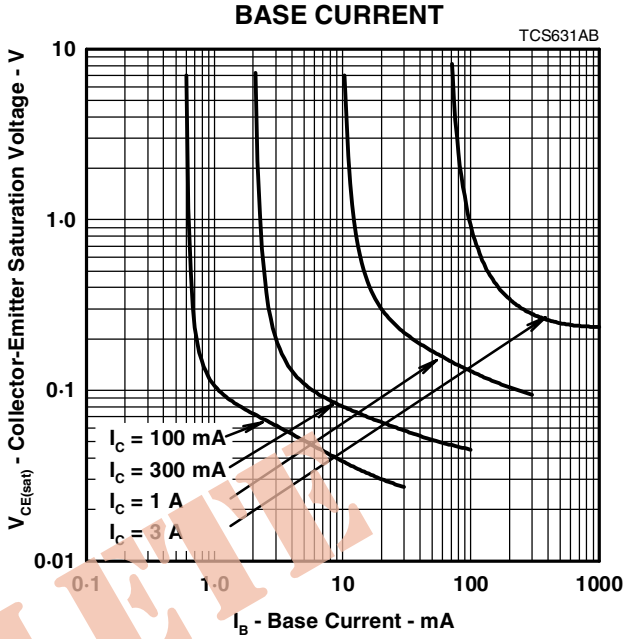


Figure 2.

BASE-EMITTER VOLTAGE vs COLLECTOR CURRENT

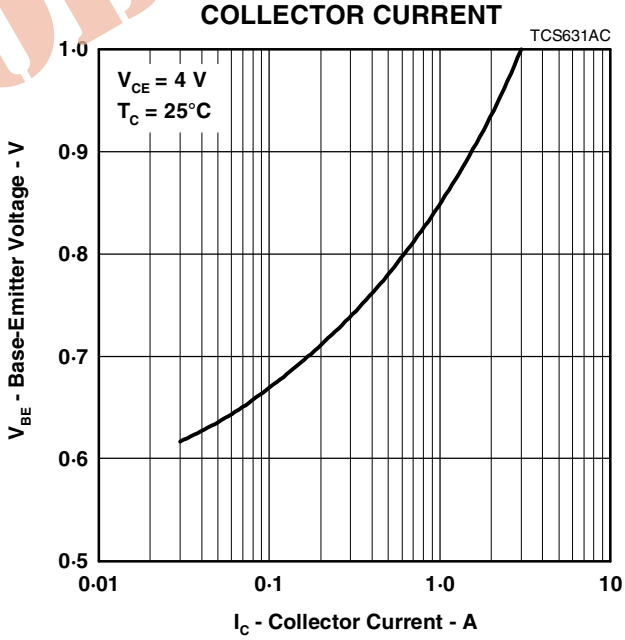


Figure 3.

MAXIMUM SAFE OPERATING REGIONS

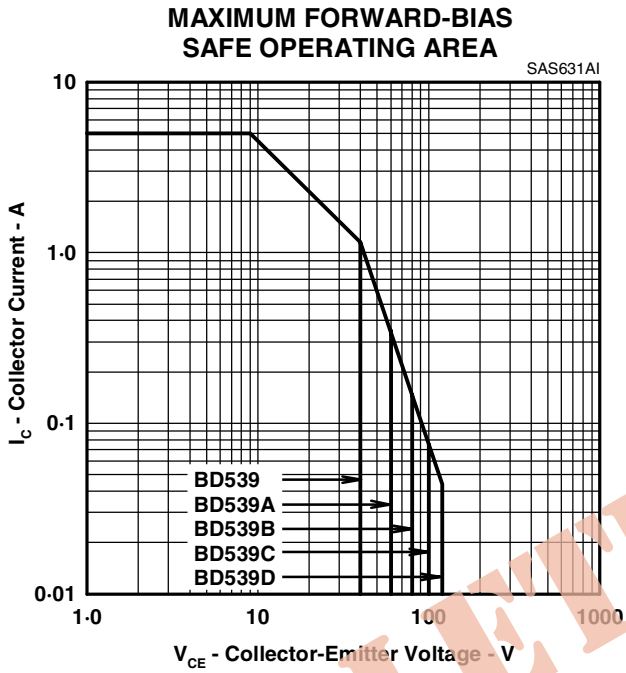


Figure 4.

THERMAL INFORMATION

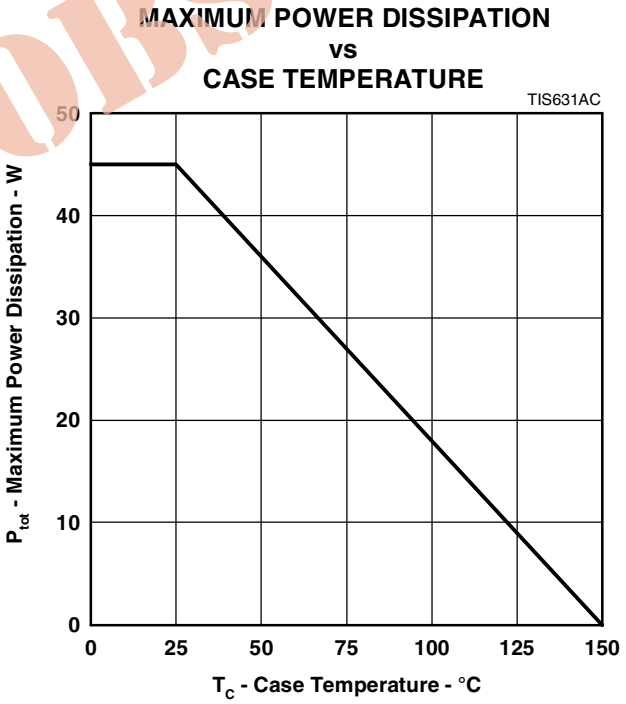


Figure 5.