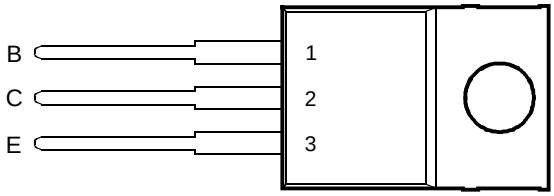
BD539, BD539A, BD539B, BD539C, BD539D
NPN SILICON POWER TRANSISTORS

 JUNE 1973 - REVISED MARCH 1997

- **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

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 = 1 A				0.25	V
		I_B = 375 mA	I_C = 3 A	(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

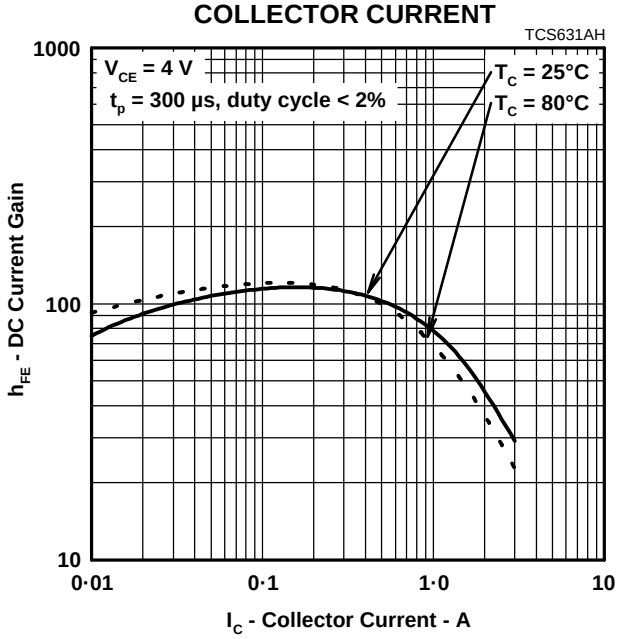


Figure 1.

COLLECTOR-EMITTER SATURATION VOLTAGE vs BASE CURRENT

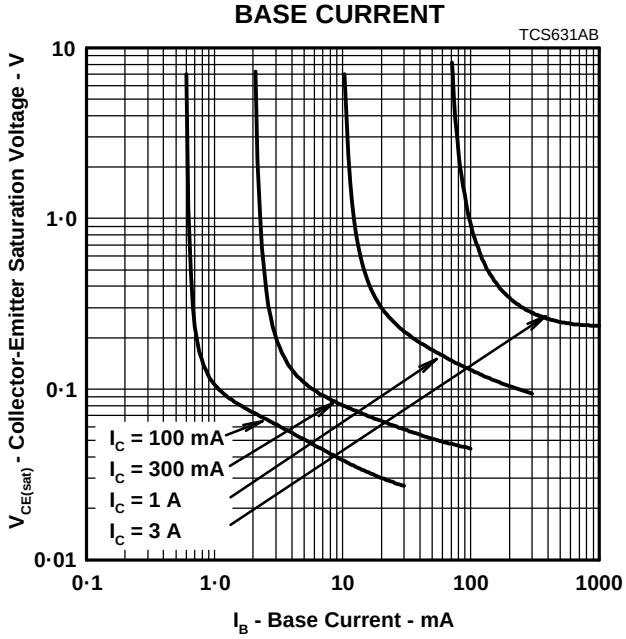


Figure 2.

BASE-EMITTER VOLTAGE vs COLLECTOR CURRENT

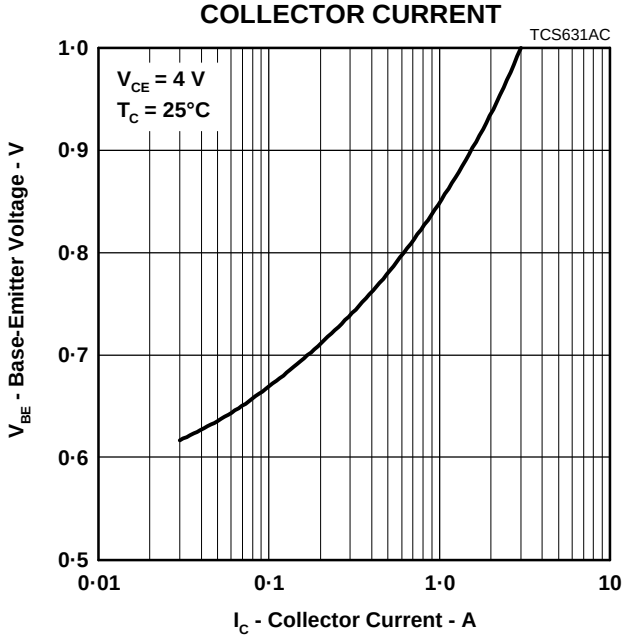


Figure 3.

MAXIMUM SAFE OPERATING REGIONS

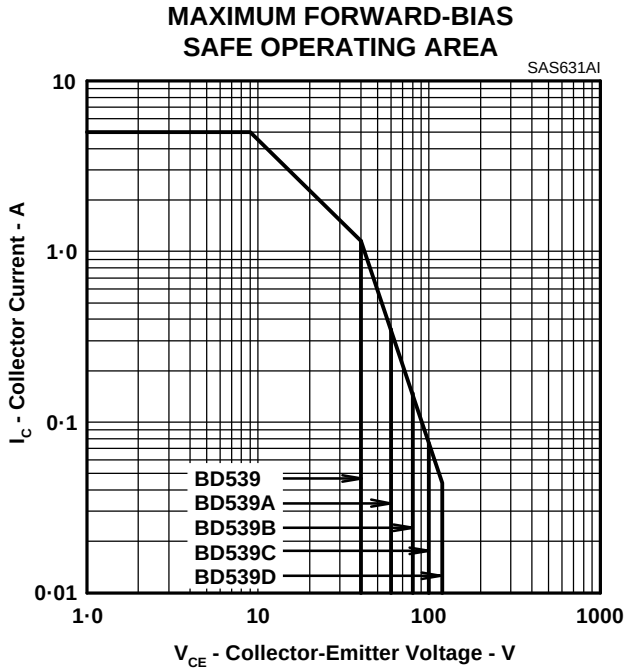


Figure 4.

THERMAL INFORMATION

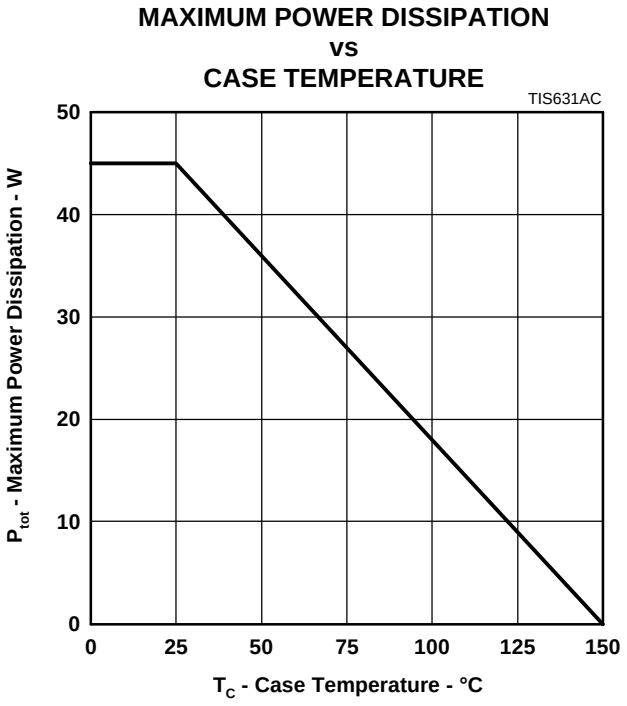


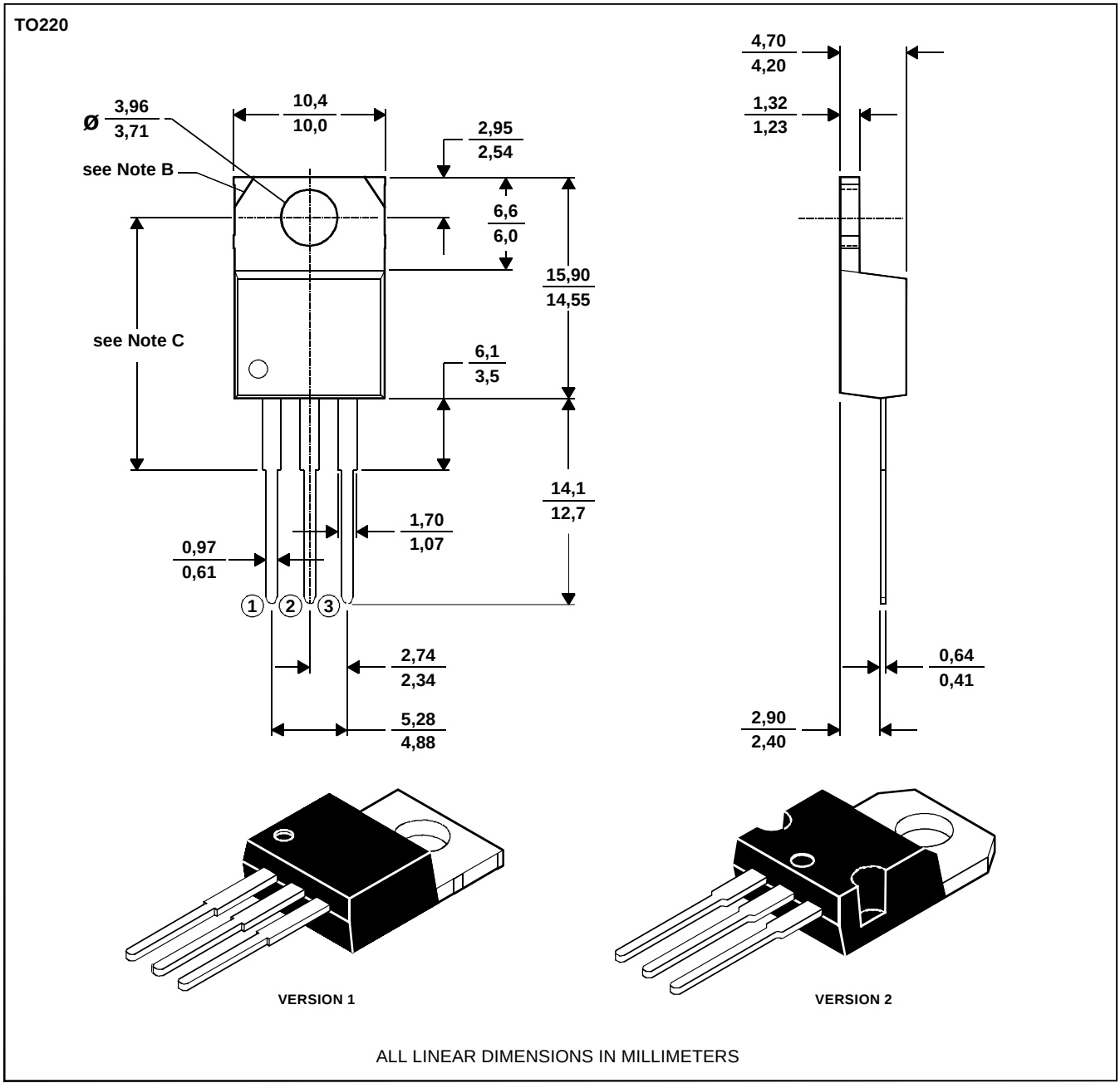
Figure 5.

PRODUCT INFORMATION

MECHANICAL DATA

TO-220
3-pin plastic flange-mount package

This single-in-line package consists of a circuit mounted on a lead frame and encapsulated within a plastic compound. The compound will withstand soldering temperature with no deformation, and circuit performance characteristics will remain stable when operated in high humidity conditions. Leads require no additional cleaning or processing when used in soldered assembly.



NOTES: A. The centre pin is in electrical contact with the mounting tab. MDXXBE
B. Mounting tab corner profile according to package version.
C. Typical fixing hole centre stand off height according to package version.
Version 1, 18.0 mm. Version 2, 17.6 mm.

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