

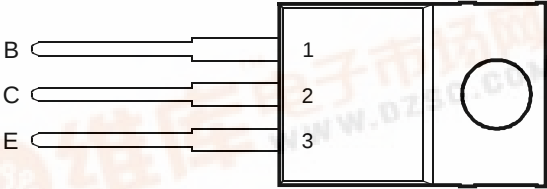
BD539, BD539A, BD539B, BD539C, BD539D
NPN SILICON POWER TRANSISTORS

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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.



PRODUCT INFORMATION

Information is current as of publication date. Products conform to specifications in accordance with the terms of Power Innovations standard warranty. Production processing does not necessarily include testing of all parameters.

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

NOTES: 4. These parameters must be measured using pulse techniques, $t_p = 300 \mu\text{s}$, duty cycle $\leq 2\%$.

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	$I_C = 1 \text{ A}$	$I_{B(on)} = 0.1 \text{ A}$	$I_{B(off)} = -0.1 \text{ A}$		0.5		μs
t_{off} Turn-off time	$V_{BE(off)} = -4.3 \text{ V}$	$R_L = 30 \Omega$	$t_p = 20 \mu\text{s}$, dc $\leq 2\%$		2		μs

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

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TYPICAL CHARACTERISTICS

**TYPICAL DC CURRENT GAIN
VS
COLLECTOR CURRENT**

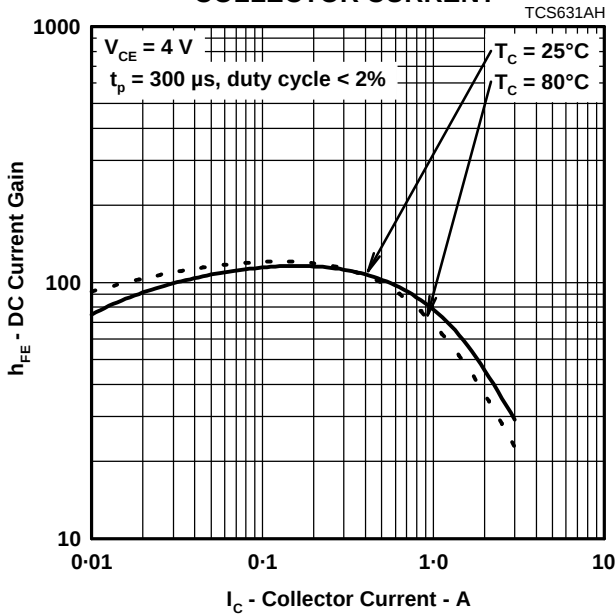


Figure 1.

**COLLECTOR-EMITTER SATURATION VOLTAGE
VS
BASE CURRENT**

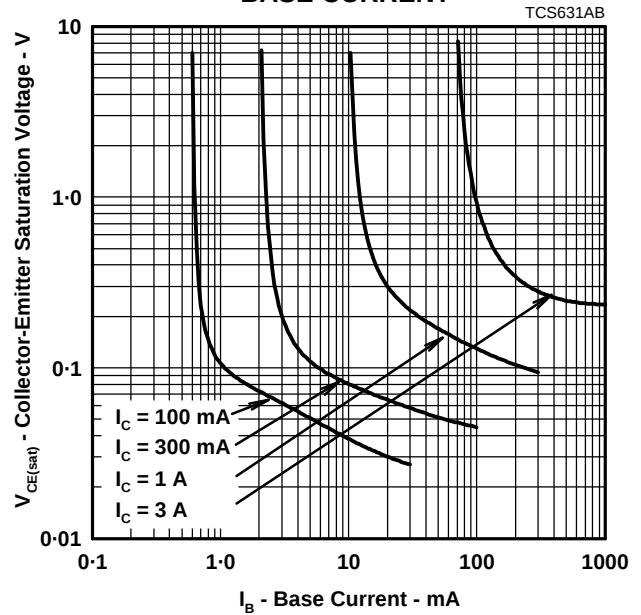


Figure 2.

**BASE-EMITTER VOLTAGE
VS
COLLECTOR CURRENT**

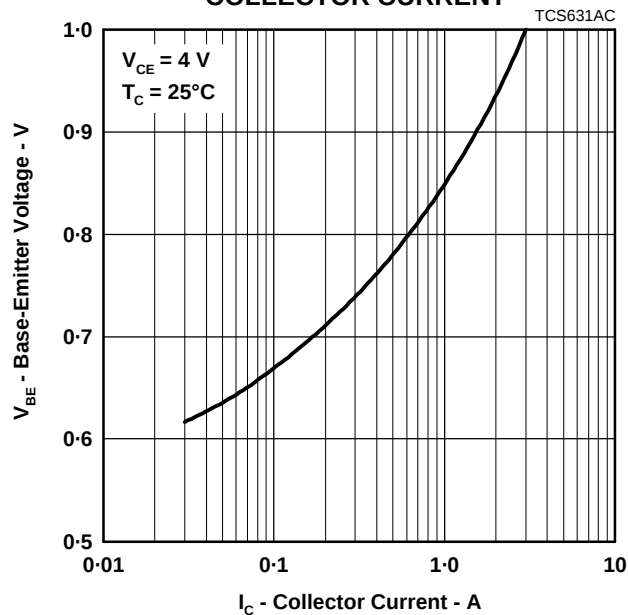


Figure 3.

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MAXIMUM SAFE OPERATING REGIONS

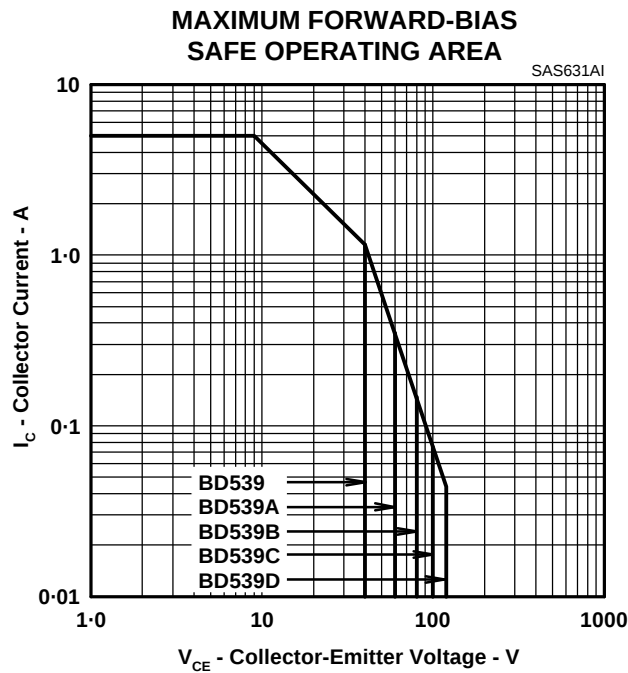


Figure 4.

THERMAL INFORMATION

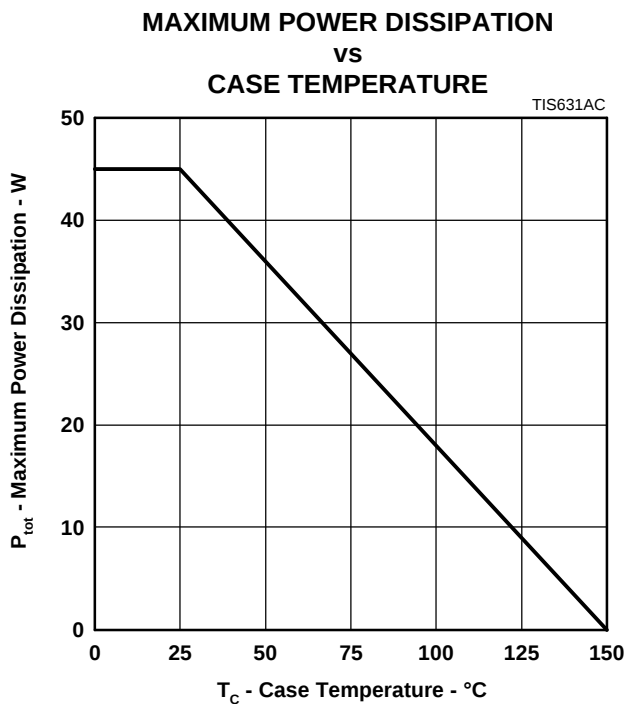


Figure 5.

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

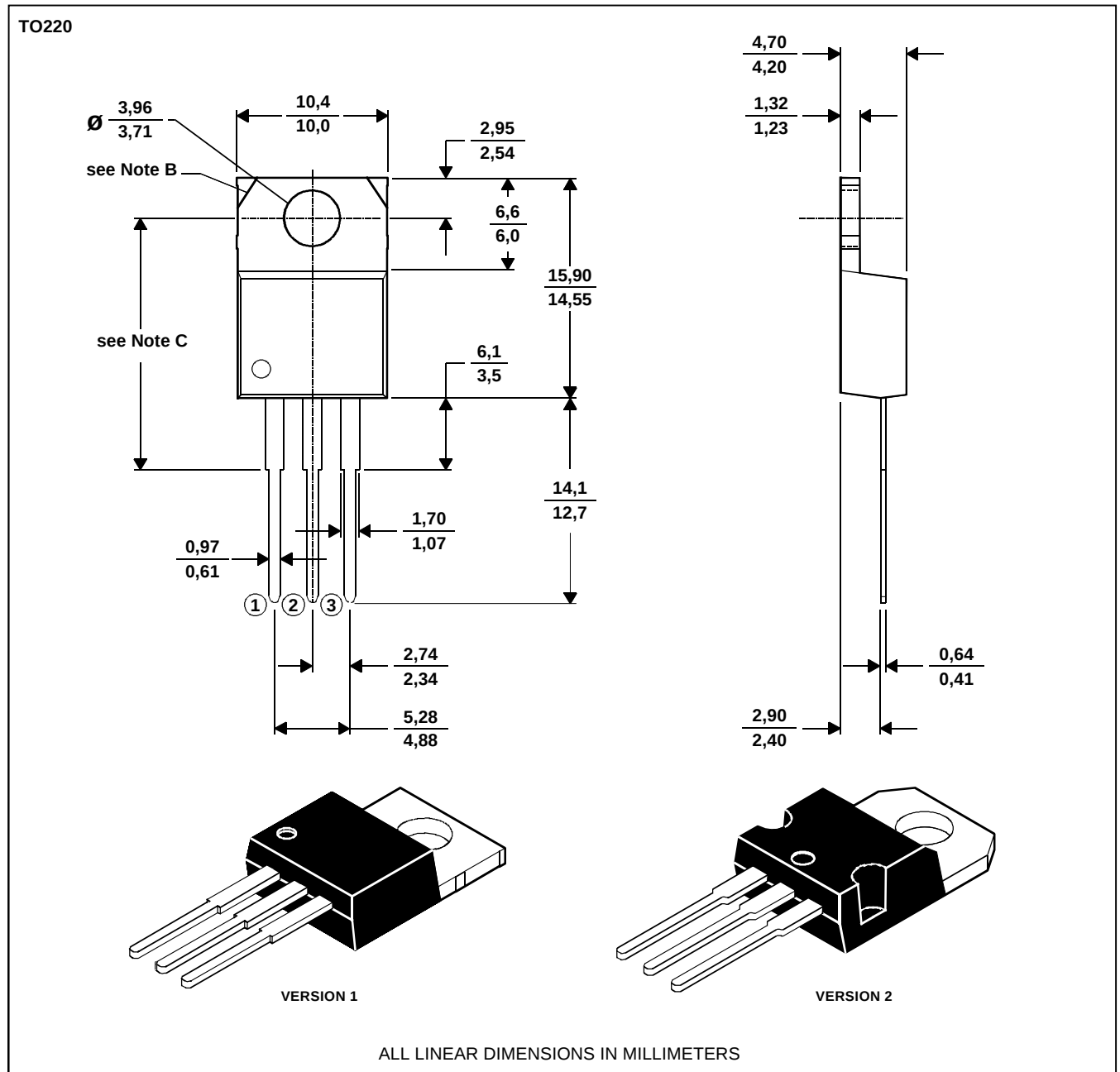
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MECHANICAL DATA

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.
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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