

T-33-29

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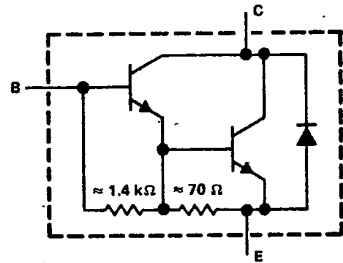
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**BDX53, BDX53A, BDX53B, BDX53C
N-P-N SILICON POWER DARLINGTONS**

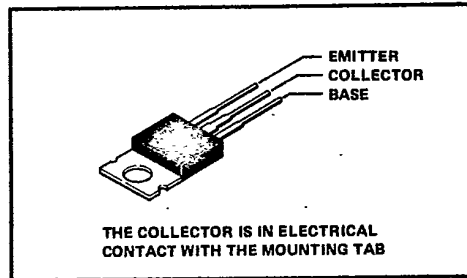
REVISED OCTOBER 1984

- 60 W at 25°C Case Temperature
- 8 A Continuous Collector Current
- Min h_{FE} of 750 at 3 V, 3 A

device schematic



TO-220AB PACKAGE



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

	BDX53	BDX53A	BDX53B	BDX53C
Collector-base voltage	45 V	60 V	80 V	100 V
Collector-emitter voltage ($I_B = 0$)	45 V	60 V	80 V	100 V
Emitter-base voltage	5 V			
Continuous collector current	8 A			
Continuous base current	200 mA			
Continuous device dissipation at (or below) 25°C case temperature (see Note 1)	60 W			
Continuous device dissipation at (or below) 25°C free-air temperature (see Note 2)	2 W			
Operating free-air temperature range	- 65°C to 150°C			
Operating collector junction and storage temperature range	- 65°C to 150°C			

NOTES: 1. Derate linearly to 150°C case temperature at the rate of 0.48 W/°C.
2. Derate linearly to 150°C free-air temperature at the rate of 16 mW/°C.

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BD, BDW, BDX, BU, BUX, BUY Devices

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**BDX53, BDX53A, BDX53B, BDX53C
N-P-N SILICON POWER DARLINGTONS**

electrical characteristics at 25°C case temperature

PARAMETER	TEST CONDITIONS	BDX53			BDX53A			BDX53B			BDX53C			UNIT
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
$V_{(BR)CEO}$	$I_C = 100\text{ mA}$, $I_B = 0$, See Note 3	45			60			80			100			V
I_{CEO}	$V_{CE} = 30\text{ V}$, $I_B = 0$		500			500				500				μA
	$V_{CE} = 40\text{ V}$, $I_B = 0$													
	$V_{CE} = 50\text{ V}$, $I_B = 0$												500	
I_{CBO}	$V_{CB} = 45\text{ V}$, $V_{BE} = 0$		200											μA
	$V_{CB} = 60\text{ V}$, $V_{BE} = 0$					200								
	$V_{CB} = 80\text{ V}$, $V_{BE} = 0$								200					
	$V_{CB} = 100\text{ V}$, $V_{BE} = 0$										200			
I_{EBO}	$V_{EB} = 5\text{ V}$, $I_C = 0$		2			2			2			2		mA
h_{FE}	$V_{CE} = 3\text{ V}$, $I_C = 3\text{ A}$, See Notes 3 and 4	750			750			750			750			
$V_{BE(sat)}$	$I_C = 3\text{ A}$, $I_B = 12\text{ mA}$, See Notes 3 and 4		2.5			2.5			2.5			2.5		V
$V_{CE(sat)}$	$I_C = 3\text{ A}$, $I_B = 12\text{ mA}$, See Notes 3 and 4		2			2			2			2		V
V_F	$I_F = 3\text{ A}$		2.5			2.5			2.5			2.5		V

- NOTES: 3. These parameters must be measured using pulse techniques, $t_W = 300\ \mu\text{s}$, duty cycle $\leq 2\%$.
 4. These parameters are measured with voltage-sensing contacts separate from the current-carrying contacts and located within 3.2 mm (0.125 inch) from the device body.

thermal characteristics

PARAMETER	MIN	TYP	MAX	UNIT
$R_{\theta JC}$			2.08	
$R_{\theta JA}$			62.5	$^{\circ}\text{C/W}$

resistive-load switching characteristics at 25°C case temperature

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{on}	$I_C = 3\text{ A}$, $I_{B1} = 12\text{ mA}$, $I_{B2} = -12\text{ mA}$,		1		
t_{off}	$V_{BE(off)} = -4.5\text{ V}$, $R_L = 10\ \Omega$, See Figure 1		5		μs

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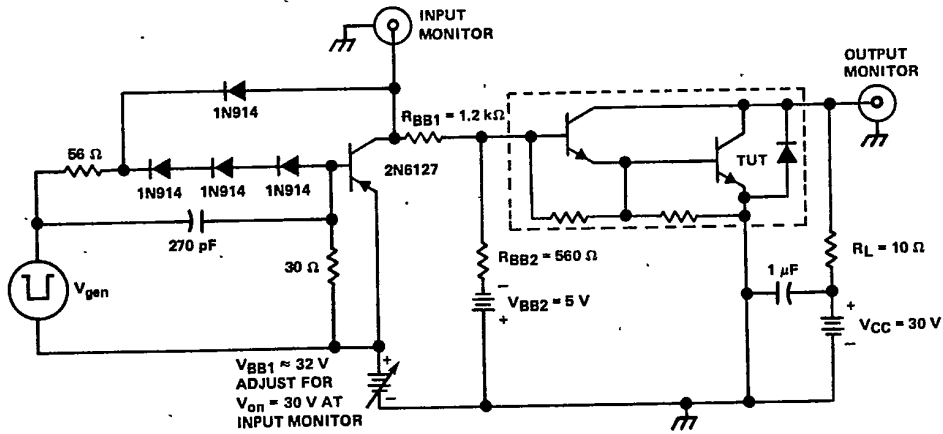
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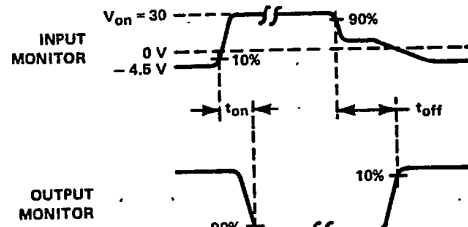
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PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT



VOLTAGE WAVEFORMS

- NOTES:
- A. V_{gen} is a -30-V pulse into a $50\ \Omega$ termination.
 - B. The V_{gen} waveform is supplied by a generator with the following characteristics: $t_r < 15\text{ ns}$, $t_f < 15\text{ ns}$, $Z_{out} = 50\ \Omega$, $t_w = 20\ \mu\text{s}$, duty cycle $\leq 2\%$.
 - C. Waveforms are monitored on an oscilloscope with the following characteristics: $t_r < 15\text{ ns}$, $R_{in} \geq 10\text{ M}\Omega$, $C_{in} < 11.5\text{ pF}$.
 - D. Resistors must be noninductive types.
 - E. The d-c power supplies may require additional bypassing in order to minimize ringing.

FIGURE 1. RESISTIVE-LOAD SWITCHING

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TYPICAL CHARACTERISTICS

STATIC FORWARD CURRENT TRANSFER RATIO
vs
COLLECTOR CURRENT

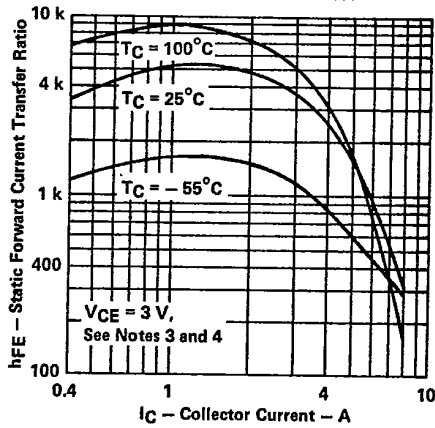


FIGURE 2

BASE-EMITTER VOLTAGE
vs
CASE TEMPERATURE

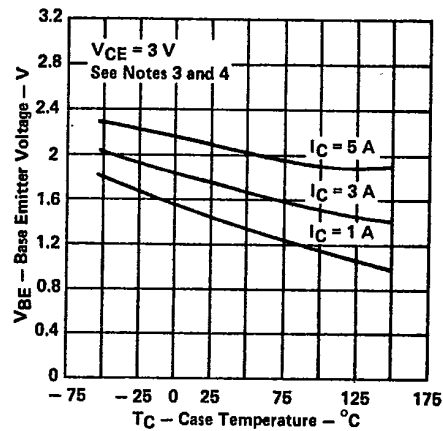


FIGURE 3

COLLECTOR-EMITTER SATURATION VOLTAGE
vs
CASE TEMPERATURE

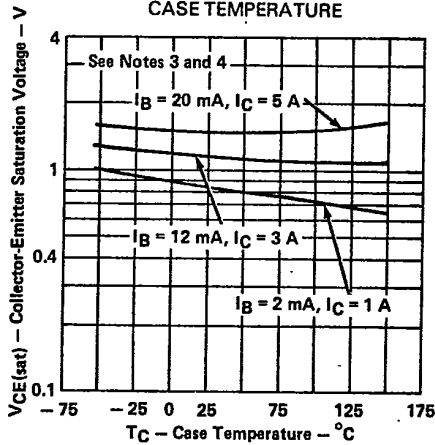


FIGURE 4

SMALL SIGNAL COMMON-EMITTER
FORWARD CURRENT TRANSFER RATIO
vs
FREQUENCY

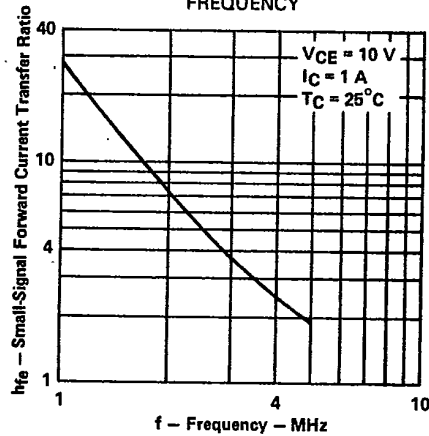


FIGURE 5

- NOTES: 3. These parameters must be measured using pulse techniques, $t_W = 300 \mu s$, duty cycle $\leq 2\%$.
4. These parameters are measured with voltage-sensing contacts separate from the current-carrying contacts and located within 3.2 mm (0.125 inch) from the device body.



BD, BDW, BDX, BU, BUX, BUY Devices

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MAXIMUM SAFE OPERATING AREA
MAXIMUM COLLECTOR CURRENT
vs
COLLECTOR-EMITTER VOLTAGE

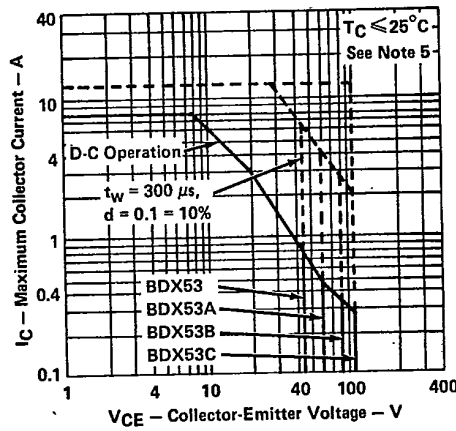


FIGURE 6

NOTE 5: This combination of maximum voltage and current may be achieved only when switching from saturation to cutoff with a clamped inductive load.

THERMAL INFORMATION

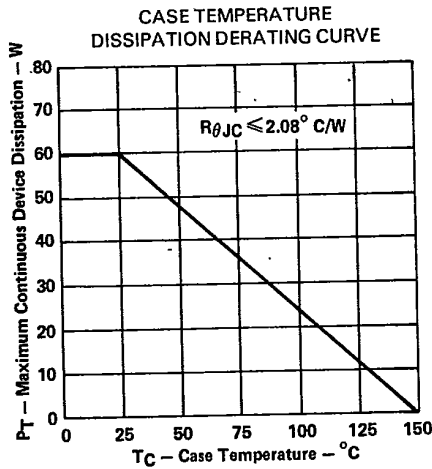


FIGURE 7

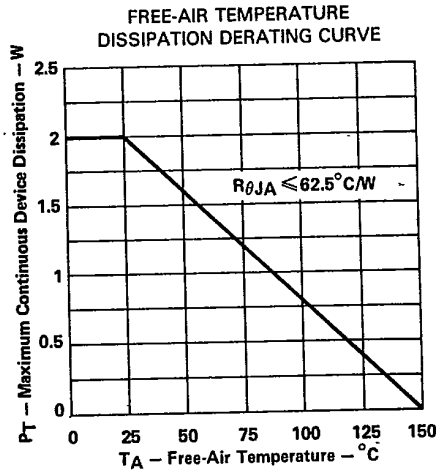


FIGURE 8



BD, BDW, BDX, BU, BUX, BUY Devices