

8961726 TEXAS INSTR (OPTO)

62C 36876 D

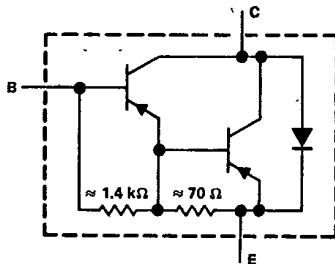
**TIP105, TIP106, TIP107
P-N-P DARLINGTON CONNECTED
SILICON POWER TRANSISTORS**

REVISED OCTOBER 1984

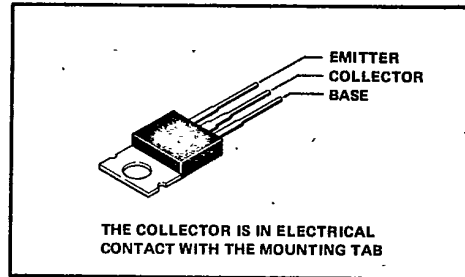
- Designed for Complementary Use with TIP100, TIP101, TIP102 T-33-31
- 80 W at 25°C Case Temperature
- 8 A Continuous Collector Current
- Min h_{FE} of 200 at 4 V, 8 A
- Max I_{CEO} of 50 μ A
- Max $V_{CE(sat)}$ of 2.5 V at $I_C = 8$ A

Designed to Replace:
 2N6042 Series SE9402 Series
 MJE6042 Series RCA8203B Series

device schematic



TO-220AB PACKAGE



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

	TIP105	TIP106	TIP107
Collector-base voltage	-60 V	-80 V	-100 V
Collector-emitter voltage ($I_B = 0$)	-60 V	-80 V	-100 V
Emitter-base voltage		-5 V	
Continuous collector current		-8 A	
Peak collector current (see Note 1)		-15 A	
Continuous base current		-1 A	
Safe operating areas at (or below) 25°C case temperature	See Figures 7 and 8		
Continuous device dissipation at (or below) 25°C case temperature (see Note 2)	80 W		
Continuous device dissipation at (or below) 25°C free-air temperature (see Note 3)	2 W		
Operating collector junction and storage temperature range	-65°C to 150°C		
Lead temperature 3,2 mm (0.125 inch) from case for 10 seconds	260°C		

- NOTES: 1. This value applies for $t_w \leq 0.3$ ms, duty cycle $\leq 10\%$.
 2. Derate linearly to 150°C case temperature at the rate of 0.64 W/C or refer to Dissipation Derating Curve, Figure 9.
 3. Derate linearly to 150°C free-air temperature at the rate of 16 mW/C or refer to Dissipation Derating Curve, Figure 10.

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electrical characteristics at 25°C case temperature

PARAMETER	TEST CONDITIONS	TIP105			TIP106			TIP107			UNIT
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
$V_{(BR)CEO}$	$I_C = -30\text{ mA}$, $I_B = 0$, See Note 5	-60			-80			-100			V
I_{CEO}	$V_{CE} = -30\text{ V}$, $I_B = 0$			-50							μA
	$V_{CE} = -40\text{ V}$, $I_B = 0$						-50				
	$V_{CE} = -50\text{ V}$, $I_B = 0$								-50		
I_{CBO}	$V_{CB} = -60\text{ V}$, $I_E = 0$			-50							μA
	$V_{CB} = -80\text{ V}$, $I_E = 0$						-50				
	$V_{CB} = -100\text{ V}$, $I_E = 0$								-50		
I_{EBO}	$V_{EB} = -5\text{ V}$, $I_C = 0$			-8			-8			-8	mA
h_{FE}	$V_{CE} = -4\text{ V}$, $I_C = -3\text{ A}$, See Notes 4 and 5	1000	20 000		1000	20 000		1000	20 000		
	$V_{CE} = -4\text{ V}$, $I_C = -8\text{ A}$, See Notes 4 and 5	200			200			200			
V_{BE}	$V_{CE} = -4\text{ V}$, $I_C = -8\text{ A}$, See Notes 4 and 5			-2.8			-2.8			-2.8	V
$V_{CE(sat)}$	$I_B = -6\text{ mA}$, $I_C = -3\text{ A}$, See Notes 4 and 5			-2			-2			-2	V
	$I_B = -80\text{ mA}$, $I_C = -8\text{ A}$, See Notes 4 and 5			-2.5			-2.5			-2.5	V
V_F	$I_F = 8\text{ A}$, $I_B = 0$, See Notes 4 and 5			3.5			3.5			3.5	V

NOTES: 4. These parameters must be measured using pulse techniques, $t_w = 300\ \mu\text{s}$, duty cycle $\leq 2\%$.
5. 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
$R_{\theta JC}$			1.56	$^{\circ}\text{C/W}$
$R_{\theta JA}$			62.5	$^{\circ}\text{C/W}$
$R_{\theta CHS}$ (see Note 6)			0.7	$^{\circ}\text{C/W}$
θ_{JC}			0.9	J/C

NOTE: 6 This parameter is measured using a 0,08 mm (0.003 inch) mica insulator with Dow-Corning 11 compound on both sides of the insulator, a 0.138-32 (formerly 6-32) mounting screw with bushing, and a mounting torque of 0,9 newton-meter (8 inch-pounds).

resistive-load switching characteristics at 25°C case temperature

PARAMETER	TEST CONDITIONS†	MIN	TYP	MAX	UNIT
t_d			0.035		μs
t_r	$I_C = -8\text{ A}$, $I_{B1} = -80\text{ mA}$, $I_{B2} = 80\text{ mA}$, $V_{BE(off)} = 5\text{ V}$, $R_L = 5\ \Omega$, See Figure 1		0.3		μs
t_s			0.9		μs
t_f			1.3		μs

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

functional tests at 25°C free-air temperature

TEST	TEST CONDITIONS	LEVEL
Power ($V_{CE} \cdot I_C$)	$V_{CE} = -40\text{ V}$, $I_C = -2\text{ A}$, $t_{test} = 0.15\text{ s}$	80 W
Reverse Pulse Energy $\left(\frac{I_C^2 L}{2}\right)$	$I_{CM} = -1\text{ A}$, $L = 20\text{ mH}$, $f = 10\text{ Hz}$, $t_{test} = 0.5\text{ s}$, See Figure 2	10 mJ

TIP Devices

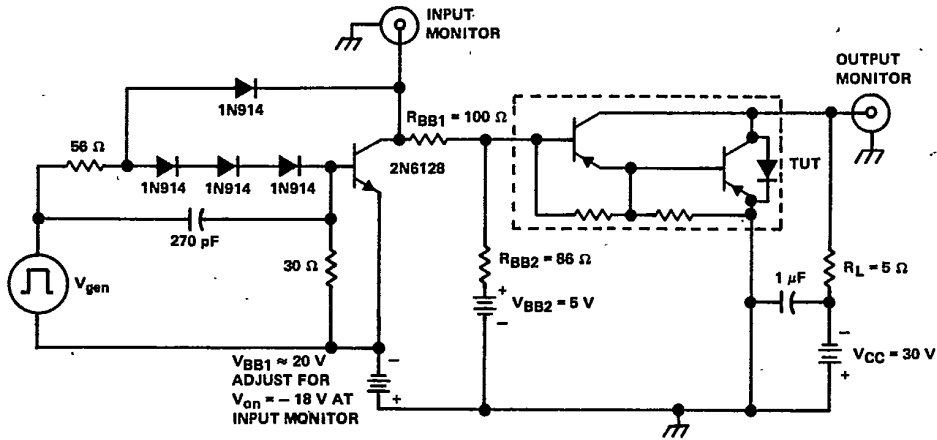
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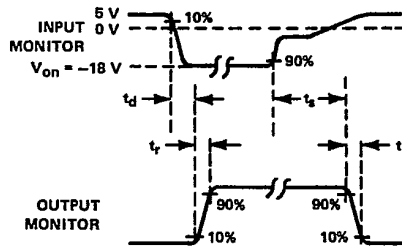
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PARAMETER MEASUREMENT INFORMATION

T-33-31



TEST CIRCUIT



VOLTAGE WAVEFORMS

- NOTES:
- A. V_{gen} is a 30-V pulse into a 50 Ω termination.
 - B. The V_{gen} waveform is supplied by a generator with the following characteristics: t_r < 15 ns, t_f < 15 ns, Z_{out} = 50 Ω, t_w = 20 μs, duty cycle < 2%.
 - C. Waveforms are monitored on an oscilloscope with the following characteristics: t_r < 15 ns, R_{in} > 10 MΩ, C_{in} < 11.5 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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TIP Devices

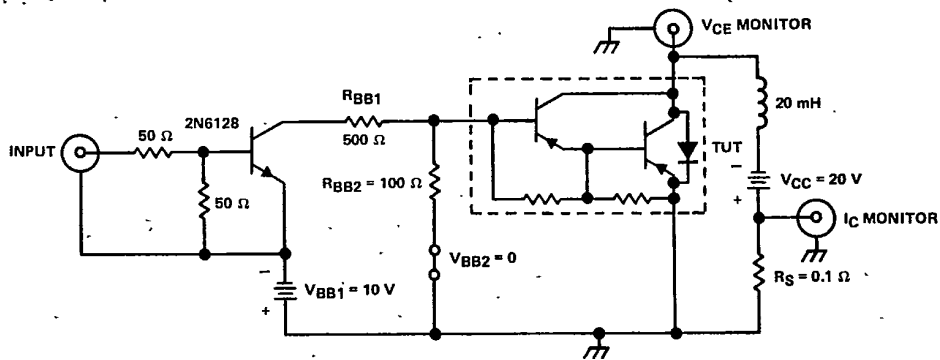
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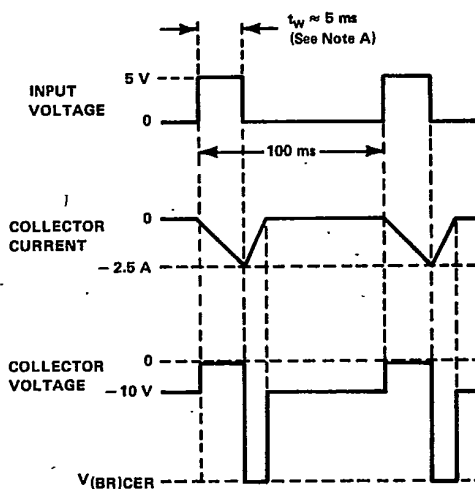
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PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT



VOLTAGE AND CURRENT WAVEFORMS

NOTE A: Input pulse duration is increased until $I_{CM} = -1$ A.

FIGURE 2. INDUCTIVE-LOAD SWITCHING



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TYPICAL CHARACTERISTICS

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STATIC FORWARD CURRENT TRANSFER RATIO
vs
COLLECTOR CURRENT

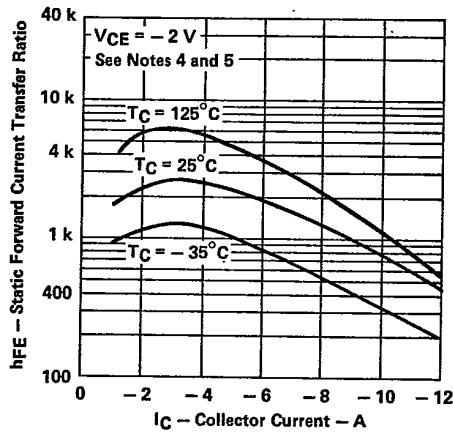


FIGURE 3

STATIC FORWARD CURRENT TRANSFER RATIO
vs
COLLECTOR CURRENT

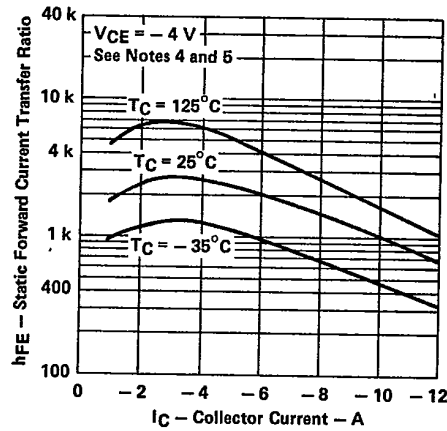


FIGURE 4

COLLECTOR-EMITTER SATURATION VOLTAGE
vs
COLLECTOR CURRENT

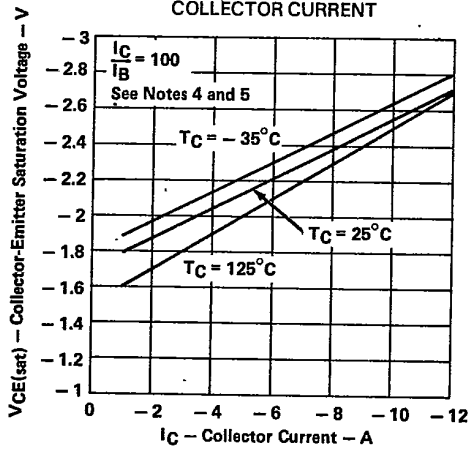


FIGURE 5

BASE-EMITTER VOLTAGE
vs
COLLECTOR CURRENT

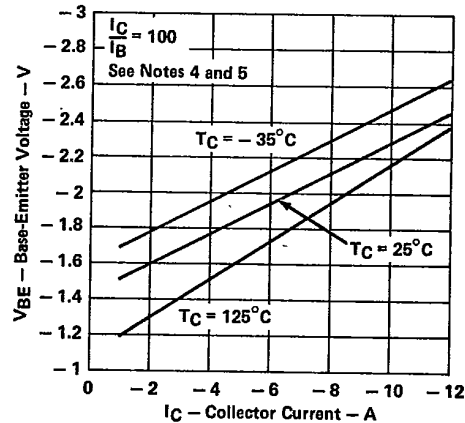


FIGURE 6

- NOTES: 4. These parameters must be measured using pulse techniques, $t_w = 300 \mu s$, duty cycle $\leq 2\%$.
5. 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.

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MAXIMUM SAFE OPERATING AREA

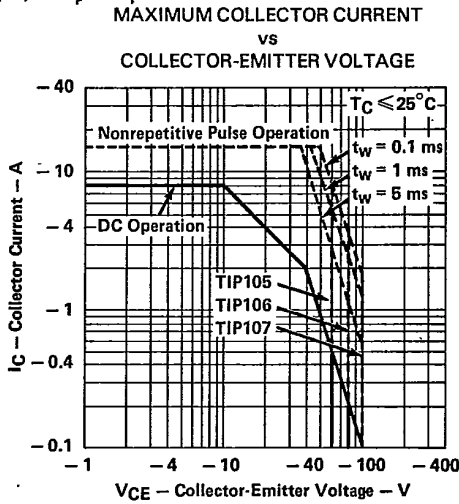


FIGURE 7

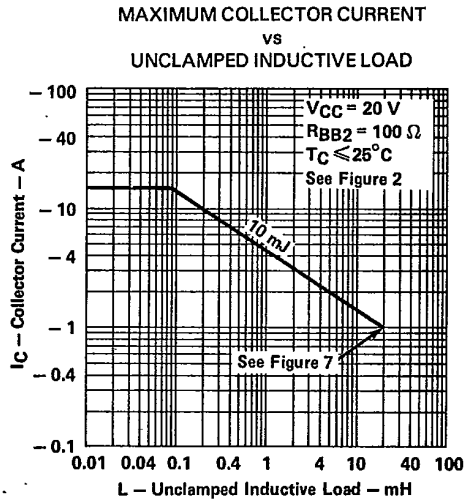


FIGURE 8

NOTE 7: Above this point the safe operating area has not been defined.

THERMAL INFORMATION

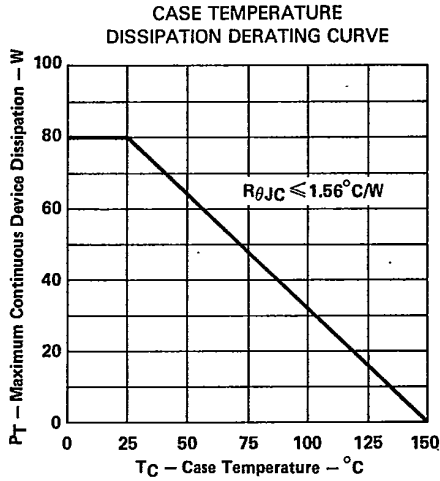


FIGURE 9

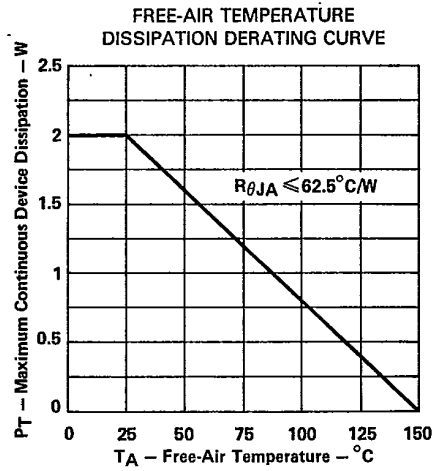


FIGURE 10



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