

8961726 TEXAS INSTR (OPT0)

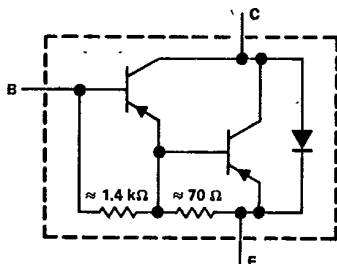
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TIP105, TIP106, TIP107
P-N-P DARLINGTON CONNECTED
SILICON POWER TRANSISTORS
 REVISED OCTOBER 1984

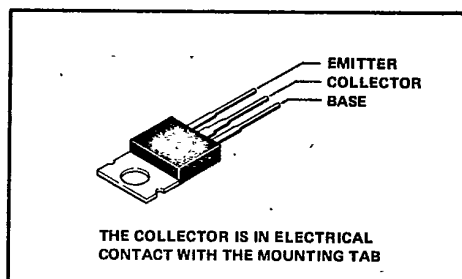
- Designed for Complementary Use with TIP100, TIP101, TIP102 T-33-31
- 80 W at 25°C Case Temperature
- 8 A Continuous Collector Current
- Min h_{FE} of 200 at 4 V, 8 A
- Max I_{CEO} of 50 μ A
- Max $V_{CE(sat)}$ of 2.5 V at $I_C = 8$ A
- Designed to Replace:
 - 2N6042 Series
 - MJE6042 Series

SE9402 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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TIP Devices

TEXAS
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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_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	°C/W
$R_{\theta JA}$			62.5	°C/W
$R_{\theta CHS}$ (see Note 6)			0.7	°C/W
θ_{JA}			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	$I_C = -8 \text{ A}$, $I_{B1} = -80 \text{ mA}$, $I_{B2} = 80 \text{ mA}$, $V_{BE(off)} = 5 \text{ V}$, $R_L = 5 \Omega$, See Figure 1		0.035		μs
t_r			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

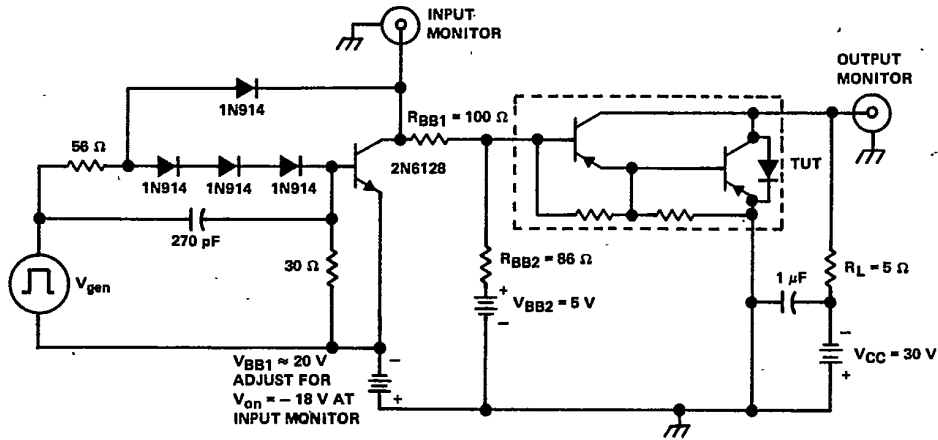
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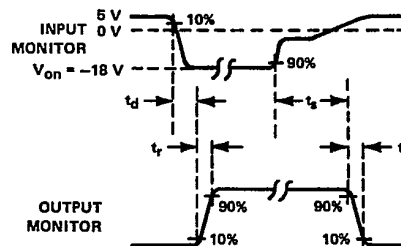
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PARAMETER MEASUREMENT INFORMATION

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 $\leq$ 15 ns, t_f $\leq$ 15 ns, Z_{out} = 60 Ω , t_w = 20 μ s, duty cycle $\leq$ 2%.
C. Waveforms are monitored on an oscilloscope with the following characteristics: t_r $\leq$ 15 ns, R_{in} $\geq$ 10 M Ω , C_{in} $\leq$ 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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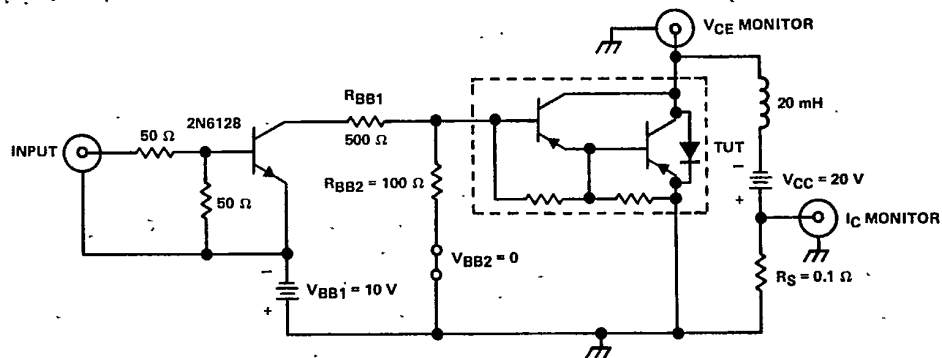
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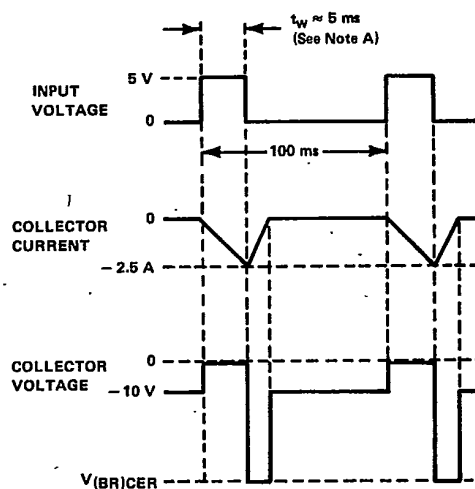
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PARAMETER MEASUREMENT INFORMATION



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

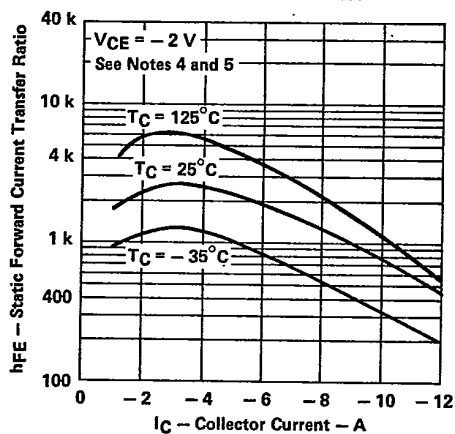


FIGURE 3

STATIC FORWARD CURRENT TRANSFER RATIO
vs
COLLECTOR CURRENT

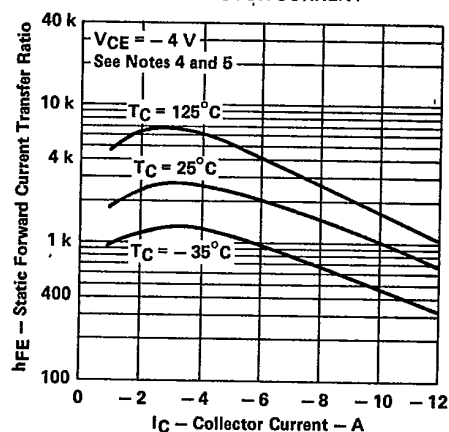


FIGURE 4

COLLECTOR-EMITTER SATURATION VOLTAGE
vs
COLLECTOR CURRENT

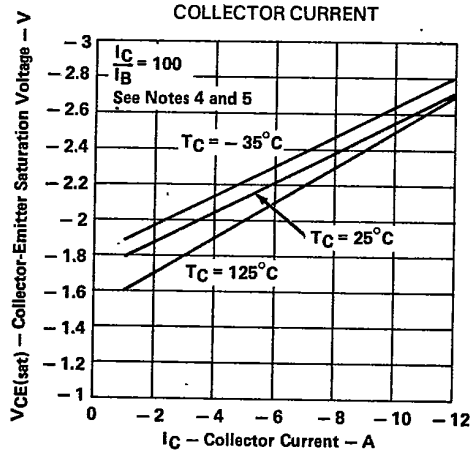


FIGURE 5

BASE-EMITTER VOLTAGE
vs
COLLECTOR CURRENT

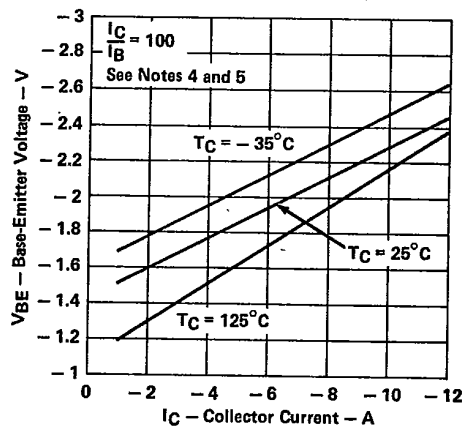


FIGURE 6

- 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

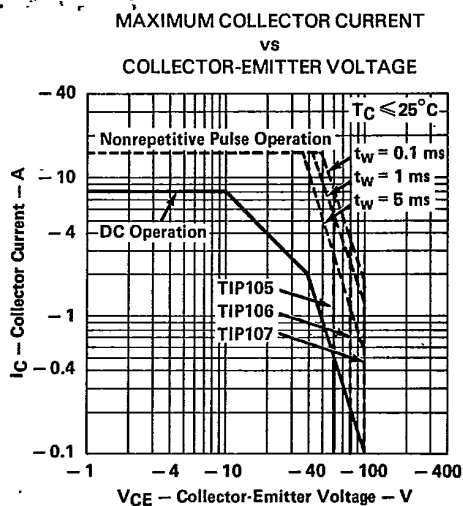


FIGURE 7

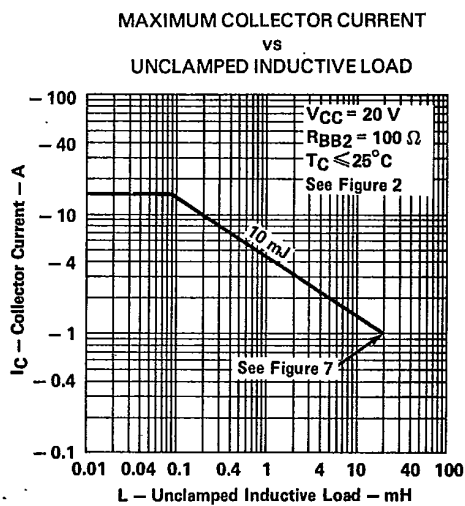


FIGURE 8

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

THERMAL INFORMATION

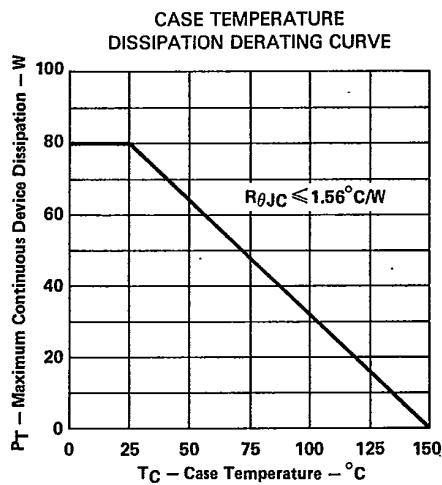


FIGURE 9

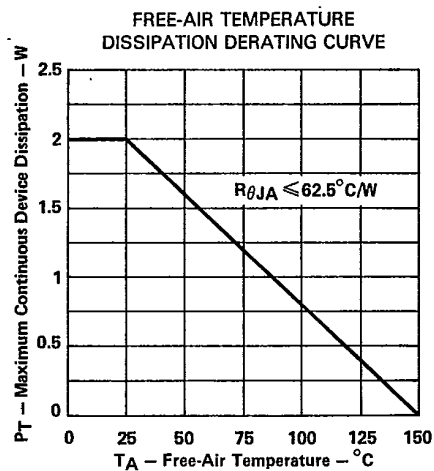


FIGURE 10

TIP Devices