

8961726 TEXAS INSTR (OPTO)

62C 36918 D

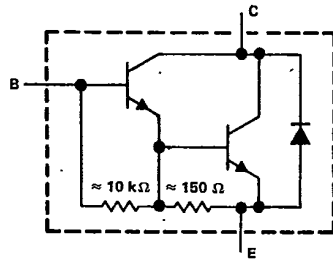
TIP140, TIP141, TIP142

N-P-N DARLINGTON-CONNECTED SILICON POWER TRANSISTORS

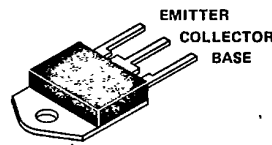
REVISED OCTOBER 1984

- Designed For Complementary Use With TIP145, TIP146, TIP147
- 125 W at 25°C Case Temperature
- 10 A Rated Collector Current
- Min h_{FE} of 1000 at 4 V, 5 A
- 100 mJ Reverse Energy Rating

device schematic



TO-218AA PACKAGE



THE COLLECTOR IS IN ELECTRICAL CONTACT WITH THE MOUNTING TAB

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

	TIP140	TIP141	TIP142
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		10 A	
Peak collector current (see Note 1)		15 A	
Continuous base current		0.5 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)		125 W	
Continuous device dissipation at (or below) 25°C free-air temperature (see Note 3)		3.5 W	
Unclamped inductive load energy (see Note 4)		100 mJ	
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 ≤ 10 %.
2. Derate linearly to 150°C case temperature at the rate of 1 W/°C or refer to Dissipation Derating Curve, Figure 9.
3. Derate linearly to 150°C free-air temperature at the rate of 28 mW/°C or refer to Dissipation Derating Curve, Figure 10.
4. This rating is based on the capability of the transistors to operate safely in the circuit of Figure 2. $L = 20$ mH, $R_{BB2} = 100 \Omega$, $V_{BB2} = 0$ V, $R_S = 0.1 \Omega$, $V_{CC} = 20$ V, Energy $\approx I_C^2 L/2$.

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SILICON POWER TRANSISTORS

electrical characteristics at 25°C case temperature

PARAMETER	TEST CONDITIONS	TIP140			TIP141			TIP142			UNIT
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
$V_{(BR)CEO}$	$I_C = 30 \text{ mA}$, See Note 5 $I_B = 0$	60			80			100			V
I_{CEO}	$V_{CE} = 30 \text{ V}$, $I_B = 0$		2								mA
	$V_{CE} = 40 \text{ V}$, $I_B = 0$					2					
	$V_{CE} = 50 \text{ V}$, $I_B = 0$								2		
I_{CBO}	$V_{CB} = 60 \text{ V}$, $I_E = 0$		1								mA
	$V_{CB} = 80 \text{ V}$, $I_E = 0$					1					
	$V_{CB} = 100 \text{ V}$, $I_E = 0$								1		
I_{EBO}	$V_{EB} = 5 \text{ V}$, $I_C = 0$		2			2			2		mA
h_{FE}	$V_{CE} = 4 \text{ V}$, See Notes 5 and 6 $I_C = 5 \text{ A}$	1000			1000			1000			
	$V_{CE} = 4 \text{ V}$, See Notes 5 and 6 $I_C = 10 \text{ A}$	500			500			500			
	$V_{CE} = 4 \text{ V}$, See Notes 5 and 6 $I_C = 10 \text{ A}$		3			3			3		
V_{BE}	$V_{CE} = 4 \text{ V}$, See Notes 5 and 6 $I_C = 10 \text{ A}$			3			3			3	V
$V_{CE(sat)}$	$I_B = 10 \text{ mA}$, See Notes 5 and 6 $I_C = 5 \text{ A}$		2			2			2		V
	$I_B = 40 \text{ mA}$, See Notes 5 and 6 $I_C = 10 \text{ A}$		3			3			3		
	$I_B = 40 \text{ mA}$, See Notes 5 and 6 $I_C = 10 \text{ A}$			3			3			3	
V_F	$I_F = 10 \text{ A}$, See Notes 5 and 6		3.5			3.5			3.5		V

NOTES: 5. These parameters must be measured using pulse techniques, $t_W = 300 \mu\text{s}$, duty cycle $\leq 2\%$.

6. These parameters are measured with voltage-sensing contacts separate from the current-carrying contacts and located within 3.2mm (0.125 inch) from the device body.

resistive-load switching characteristics at 25°C case temperature

PARAMETER	TEST CONDITIONS †			MIN	TYP	MAX	UNIT
t_{on}	$I_C = 10 \text{ A}$, $I_{B1} = 40 \text{ mA}$, $I_{B2} = -40 \text{ mA}$, $V_{BE(off)} = -4.2 \text{ V}$, $R_L = 3 \Omega$, See Figure 1				0.9		μs
t_{off}					11		

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

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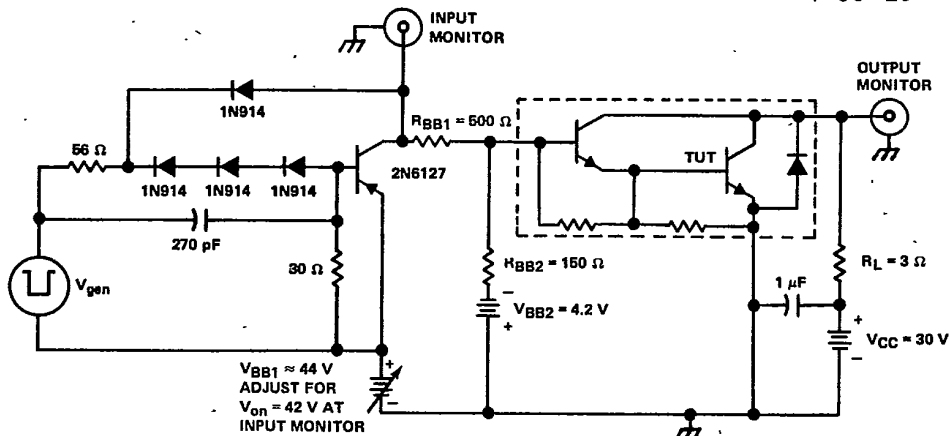
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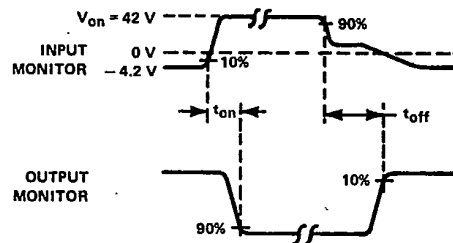
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PARAMETER MEASUREMENT INFORMATION

T-33-29



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: $t_r \leq 15 \text{ ns}$, $t_f \leq 15 \text{ ns}$, $Z_{out} = 50\ \Omega$, $t_w = 20\ \mu\text{s}$, duty cycle = 2 %.
C. Waveforms are monitored on an oscilloscope with the following characteristics: $t_r \leq 15 \text{ ns}$, $R_{in} \geq 10 \text{ M}\Omega$, $C_{in} \leq 11.5 \text{ pF}$.
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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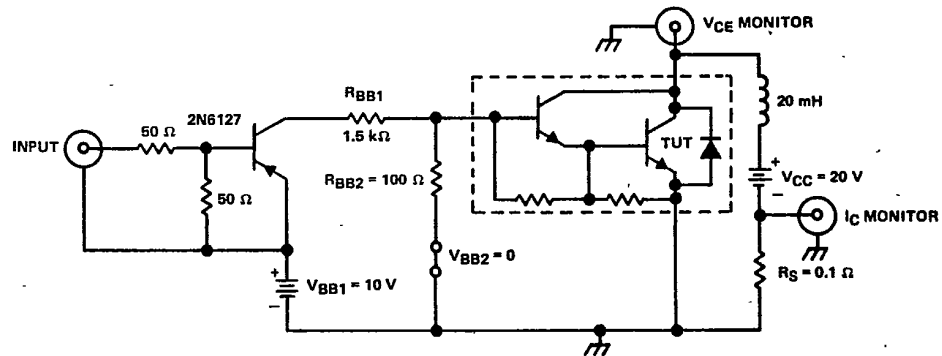
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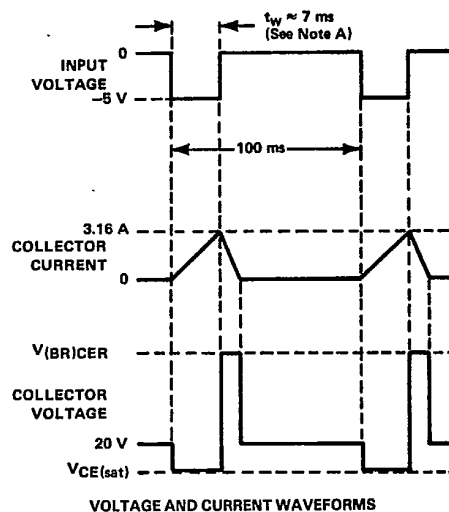
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PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT



VOLTAGE AND CURRENT WAVEFORMS

NOTE A: Input pulse duration is increased until $I_{CM} = 3.16$ A.

FIGURE 2. INDUCTIVE-LOAD SWITCHING

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TYPICAL CHARACTERISTICS

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STATIC FORWARD CURRENT TRANSFER RATIO
VS
COLLECTOR CURRENT

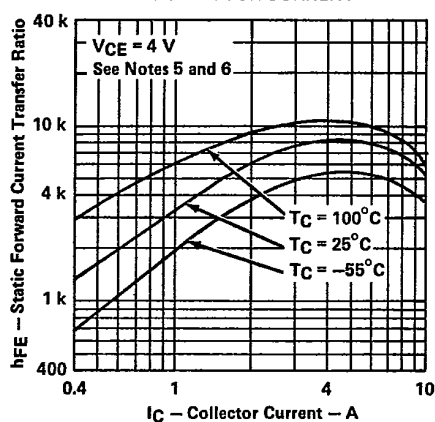


FIGURE 3

BASE-EMITTER VOLTAGE
VS
CASE TEMPERATURE

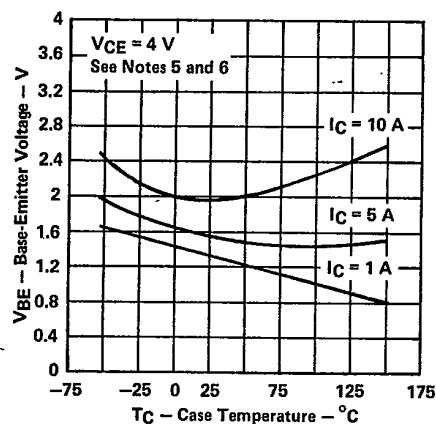


FIGURE 4

COLLECTOR-EMITTER SATURATION VOLTAGE
VS
CASE TEMPERATURE

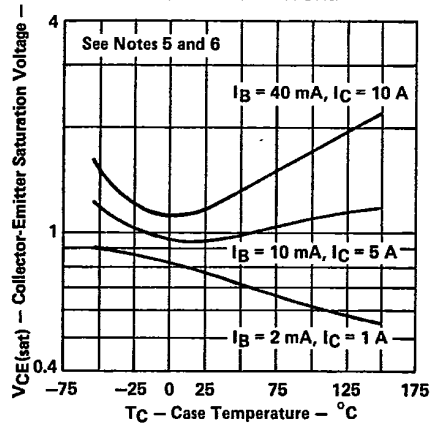


FIGURE 5

SMALL-SIGNAL COMMON-EMITTER
FORWARD CURRENT TRANSFER RATIO
VS
FREQUENCY

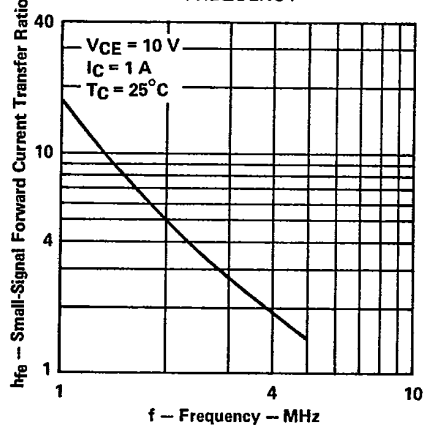


FIGURE 6

- NOTES: 5. These parameters must be measured using pulse techniques, $t_w = 300 \mu s$, duty cycle $\leq 2\%$.
6. 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

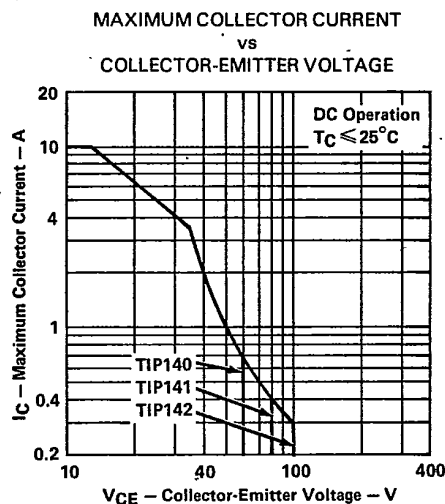


FIGURE 7

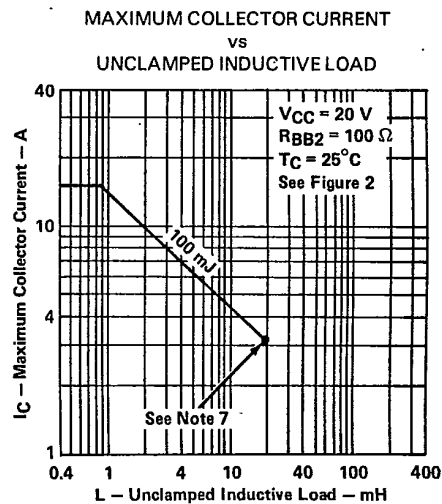


FIGURE 8

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

THERMAL INFORMATION

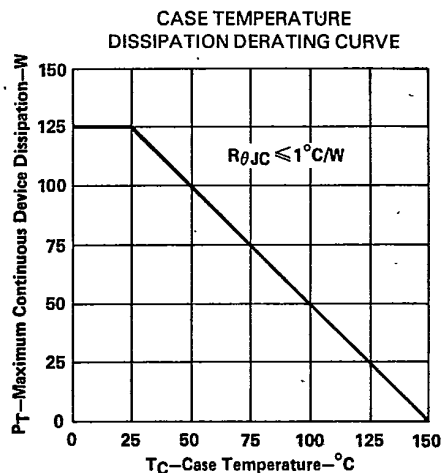


FIGURE 9

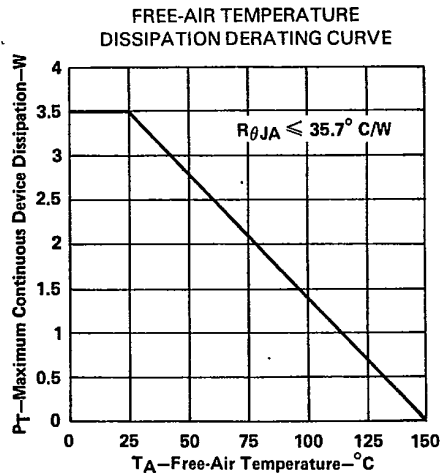


FIGURE 10

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