



8961726 TEXAS INSTR (OPTO)

62C 36901 D

TIP125, TIP126, TIP127  
P-N-P DARLINGTON-CONNECTED  
SILICON POWER TRANSISTORS

T-33-31

## electrical characteristics at 25°C case temperature

| PARAMETER     | TEST CONDITIONS                                                          | TIP125 |      |     | TIP126 |      |     | TIP127 |      |     | UNIT |
|---------------|--------------------------------------------------------------------------|--------|------|-----|--------|------|-----|--------|------|-----|------|
|               |                                                                          | MIN    | TYP  | MAX | MIN    | TYP  | MAX | MIN    | TYP  | MAX |      |
| $V_{(BR)CEO}$ | $I_C = -30 \text{ mA}$ ,<br>See Note 5<br>$I_B = 0$                      | -60    |      |     | -80    |      |     | -100   |      |     | V    |
| $I_{CEO}$     | $V_{CE} = -30 \text{ V}$ ,<br>$I_B = 0$                                  |        | -0.5 |     |        |      |     |        |      |     | mA   |
|               | $V_{CE} = -40 \text{ V}$ ,<br>$I_B = 0$                                  |        |      |     |        | -0.5 |     |        |      |     |      |
|               | $V_{CE} = -60 \text{ V}$ ,<br>$I_B = 0$                                  |        |      |     |        |      |     |        | -0.5 |     |      |
| $I_{CBO}$     | $V_{CB} = -60 \text{ V}$ ,<br>$I_E = 0$                                  |        | -0.2 |     |        |      |     |        |      |     | mA   |
|               | $V_{CB} = -80 \text{ V}$ ,<br>$I_E = 0$                                  |        |      |     |        | -0.2 |     |        |      |     |      |
|               | $V_{CB} = -100 \text{ V}$ ,<br>$I_E = 0$                                 |        |      |     |        |      |     |        | -0.2 |     |      |
| $I_{EBO}$     | $V_{EB} = -5 \text{ V}$ ,<br>$I_C = 0$                                   |        | -2   |     |        | -2   |     |        | -2   |     | mA   |
| $h_{FE}$      | $V_{CE} = -3 \text{ V}$ ,<br>See Notes 5 and 6<br>$I_C = -0.5 \text{ A}$ | 1000   |      |     | 1000   |      |     | 1000   |      |     |      |
|               | $V_{CE} = -3 \text{ V}$ ,<br>See Notes 5 and 6<br>$I_C = -3 \text{ A}$   | 1000   |      |     | 1000   |      |     | 1000   |      |     |      |
| $V_{CE(sat)}$ | $I_B = -12 \text{ mA}$ ,<br>See Notes 5 and 6<br>$I_C = -3 \text{ A}$    |        | -2   |     |        | -2   |     |        | -2   |     | V    |
|               | $I_B = -20 \text{ mA}$ ,<br>See Notes 5 and 6<br>$I_C = -5 \text{ A}$    |        | -4   |     |        | -4   |     |        | -4   |     |      |
| $V_{BE}$      | $V_{CE} = -3 \text{ V}$ ,<br>See Notes 5 and 6<br>$I_C = -3 \text{ A}$   |        | -2.5 |     |        | -2.5 |     |        | -2.5 |     | V    |
| $V_F$         | $I_F = 5 \text{ A}$ ,<br>See Notes 5 and 6<br>$I_B = 0$                  |        | 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 located within 3.2 mm (0.125 inch) from the device body.

## thermal characteristics

| PARAMETER       | MIN | TYP | MAX  | UNIT |
|-----------------|-----|-----|------|------|
| $R_{\theta JC}$ |     |     | 1.92 | °C/W |
| $R_{\theta JA}$ |     |     | 62.5 |      |

## resistive-load switching characteristics at 25°C case temperature

| PARAMETER | TEST CONDITIONS†                                                                  | MIN | TYP | MAX | UNIT          |
|-----------|-----------------------------------------------------------------------------------|-----|-----|-----|---------------|
| $t_{on}$  | $I_C = -3 \text{ A}$ ,<br>$I_{B1} = -12 \text{ mA}$ ,<br>$I_{B2} = 12 \text{ mA}$ |     | 1.5 |     | $\mu\text{s}$ |
| $t_{off}$ | $V_{BE(off)} = 5 \text{ V}$ ,<br>$R_L = 10 \Omega$ ,<br>See Figure 1              |     | 8.5 |     |               |

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

TIP Devices

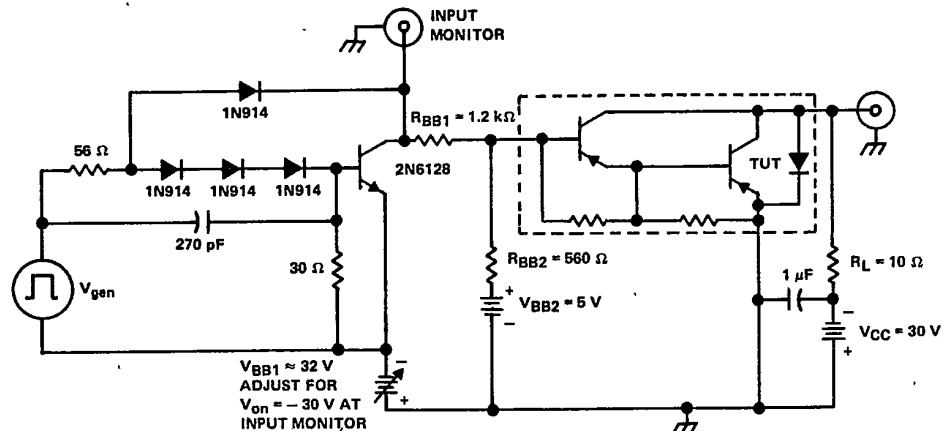
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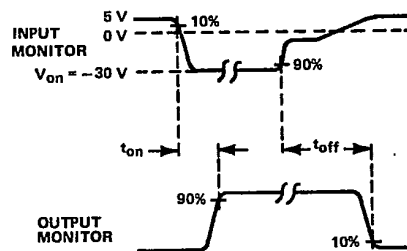
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## PARAMETER MEASUREMENT INFORMATION

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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:  $t_r \leq 15$  ns,  $t_f \leq 15$  ns,  $Z_{out} = 50$   $\Omega$ ,  $t_w = 20$   $\mu$ 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 $\Omega$ ,  $C_{in} \leq 11.5$  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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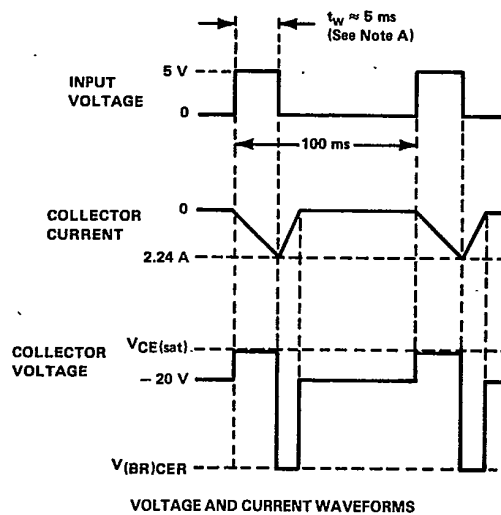
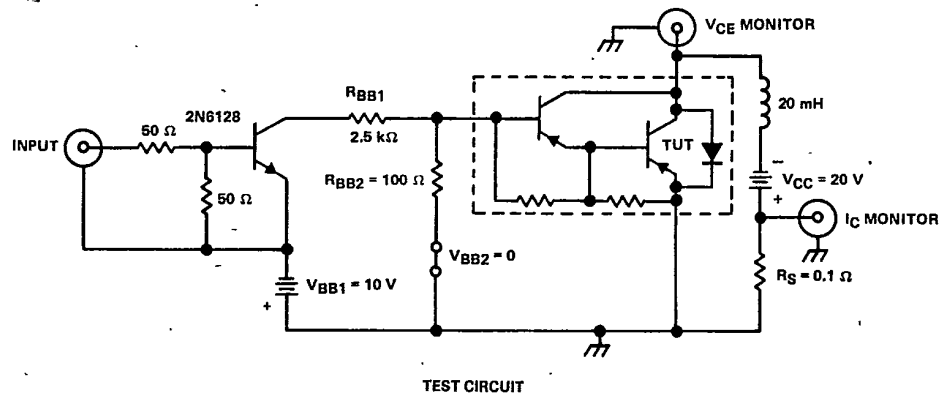
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## PARAMETER MEASUREMENT INFORMATION



NOTE A: Input pulse duration is increased until  $I_{CM} = -2.24$  A.

FIGURE 2. INDUCTIVE-LOAD SWITCHING

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## TYPICAL CHARACTERISTICS

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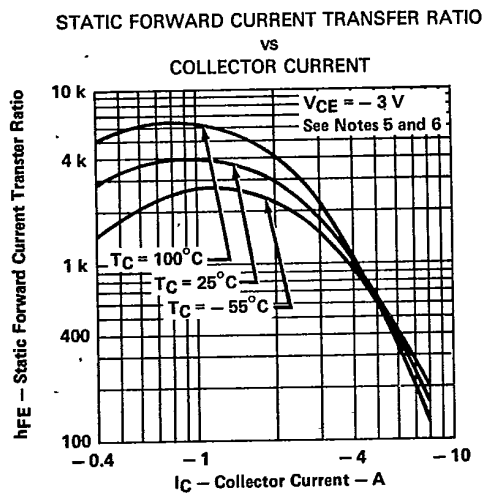


FIGURE 3

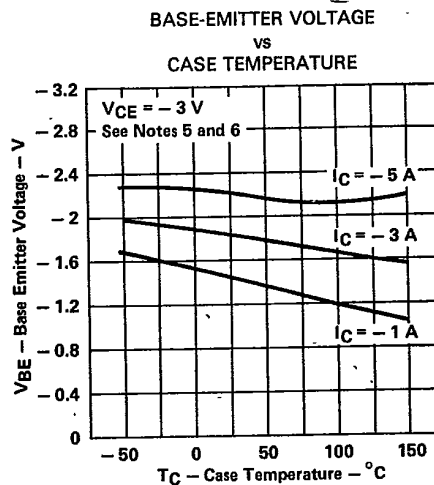


FIGURE 4

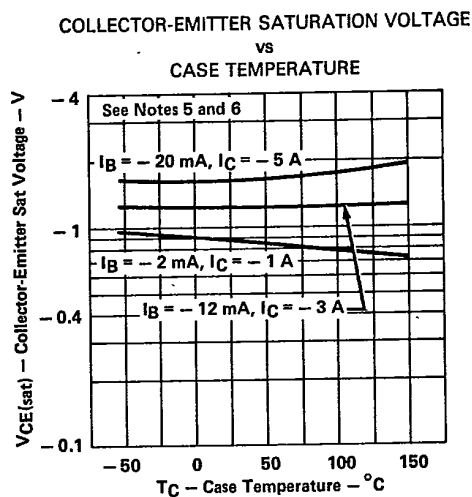


FIGURE 5

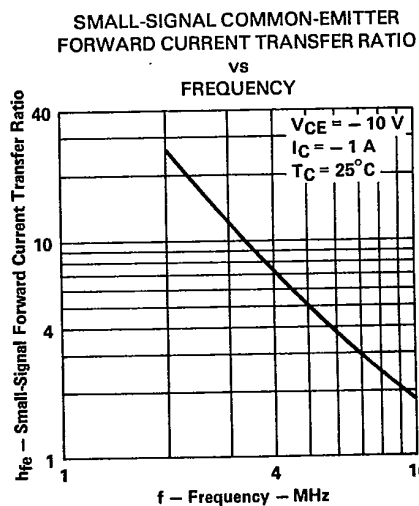


FIGURE 6

- 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 located within 3,2 mm (0.125 inch) from the device body.

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## MAXIMUM SAFE OPERATING AREA

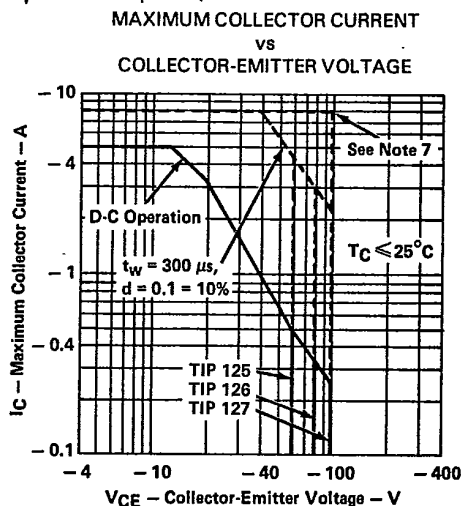


FIGURE 7

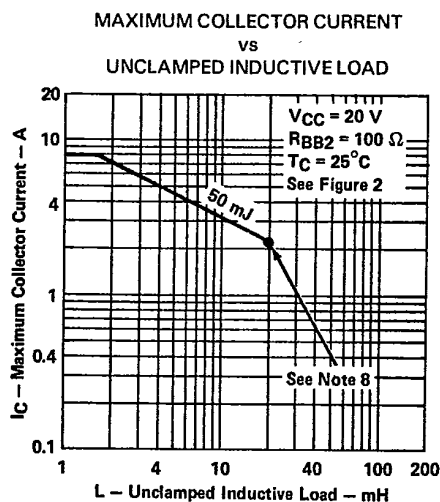


FIGURE 8

- NOTES: 7. This combination of maximum voltage and current may be achieved only when switching from saturation to cutoff with a clamped inductive load.  
8. Above this point the safe operating area has not been defined.

## THERMAL INFORMATION



TIP Devices

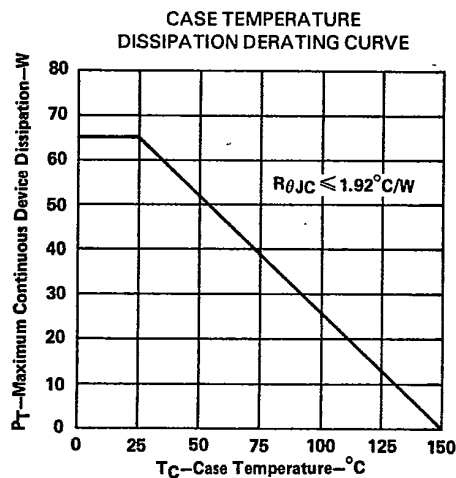


FIGURE 9

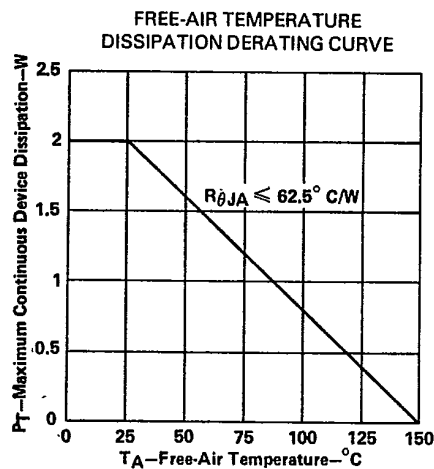


FIGURE 10