

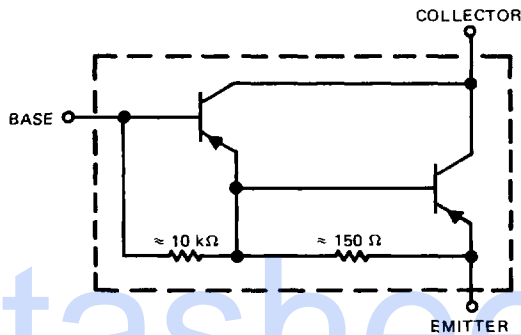
TYPES TIP125, TIP126, TIP127 P-N-P DARLINGTON-CONNECTED SILICON POWER TRANSISTORS

DESIGNED FOR COMPLEMENTARY USE WITH TIP120, TIP121, TIP122

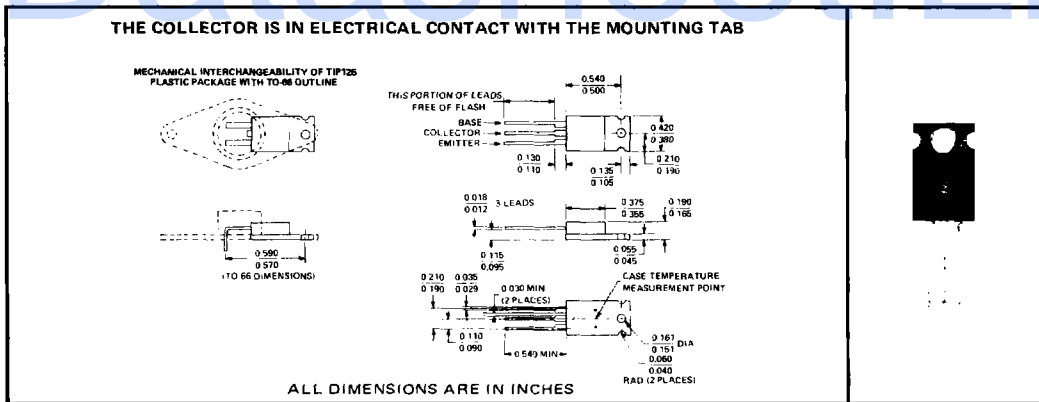
- 65 W at 25°C Case Temperature
- Min h_{FE} of 1000 at 3 V, 3 A
- 5 A Rated Collector Current
- 50 mJ Reverse Energy Rating

TYPES TIP125, TIP126, TIP127
BULLETIN NO. DLS-7111611, DECEMBER 1971

device schematic



mechanical data



5

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

| | TIP125 | TIP126 | TIP127 |
|--|-------------------------|--------|--------|
| Collector-Base Voltage | -60 V | -80 V | -100 V |
| Collector-Emitter Voltage (See Note 1) | -60 V | -80 V | -100 V |
| Emitter-Base Voltage | -5 V | -5 V | -5 V |
| Continuous Collector Current | ← 5 A → | | |
| Peak Collector Current (See Note 2) | ← 8 A → | | |
| Continuous Base Current | ← 0.1 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 3) | ← 65 W → | | |
| Continuous Device Dissipation at (or below) 25°C Free-Air Temperature (See Note 4) | ← 2 W → | | |
| Unclamped Inductive Load Energy (See Note 5) | ← 50 mJ → | | |
| Operating Collector Junction Temperature Range | ← -65°C to 150°C → | | |
| Storage Temperature Range | ← -65°C to 150°C → | | |
| Lead Temperature 1/8 Inch from Case for 10 Seconds | ← 260°C → | | |

- NOTES:
1. These values apply when the base-emitter diode is open-circuited.
 2. This value applies for $t_{W} \leq 0.3$ ms, duty cycle $\leq 10\%$.
 3. Derate linearly to 150°C case temperature at the rate of $0.52 \text{ W}/^\circ\text{C}$ or refer to Dissipation Derating Curve, Figure 9.
 4. Derate linearly to 150°C free-air temperature at the rate of $16 \text{ mW}/^\circ\text{C}$ or refer to Dissipation Derating Curve, Figure 10.
 5. This rating is based on the capability of the transistors to operate safely in the circuit of Figure 2. $L = 100 \text{ mH}$, $R_{BB2} = 100 \Omega$, $V_{BB2} = 0 \text{ V}$, $R_S = 0.1 \Omega$, $V_{CC} = 20 \text{ V}$. Energy $\approx I_C^2 L/2$.

TYPES TIP125, TIP126, TIP127

P-N-P DARLINGTON-CONNECTED SILICON POWER TRANSISTORS

electrical characteristics at 25°C case temperature

| PARAMETER | TEST CONDITIONS | TIP125 | TIP126 | TIP127 | UNIT |
|--|--|---------|---------|---------|------|
| | | MIN MAX | MIN MAX | MIN MAX | |
| $V_{(BR)CEO}$ Collector-Emitter Breakdown Voltage | $I_C = -30 \text{ mA}$, $I_B = 0$, See Note 6 | -60 | -80 | -100 | V |
| I_{CEO} Collector Cutoff Current | $V_{CE} = -30 \text{ V}$, $I_B = 0$ | -0.5 | | | mA |
| | $V_{CE} = -40 \text{ V}$, $I_B = 0$ | | -0.5 | | |
| | $V_{CE} = -50 \text{ V}$, $I_B = 0$ | | | -0.5 | |
| I_{CBO} Collector Cutoff Current | $V_{CB} = -60 \text{ V}$, $I_E = 0$ | -0.2 | | | mA |
| | $V_{CB} = -80 \text{ V}$, $I_E = 0$ | | -0.2 | | |
| | $V_{CB} = -100 \text{ V}$, $I_E = 0$ | | | -0.2 | |
| I_{EBO} Emitter Cutoff Current | $V_{EB} = -5 \text{ V}$, $I_C = 0$ | -2 | -2 | -2 | mA |
| h_{FE} Static Forward Current Transfer Ratio | $V_{CE} = -3 \text{ V}$, $I_C = -0.5 \text{ A}$ | 1000 | 1000 | 1000 | |
| | $V_{CE} = -3 \text{ V}$, $I_C = -3 \text{ A}$ | 1000 | 1000 | 1000 | |
| V_{BE} Base-Emitter Voltage | $V_{CE} = -3 \text{ V}$, $I_C = -3 \text{ A}$, See Notes 6 and 7 | -2.5 | -2.5 | -2.5 | V |
| $V_{CE(sat)}$ Collector-Emitter Saturation Voltage | $I_B = -12 \text{ mA}$, $I_C = -3 \text{ A}$ | -2 | -2 | -2 | V |
| | $I_B = -20 \text{ mA}$, $I_C = -5 \text{ A}$, See Notes 6 and 7 | -4 | -4 | -4 | |

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

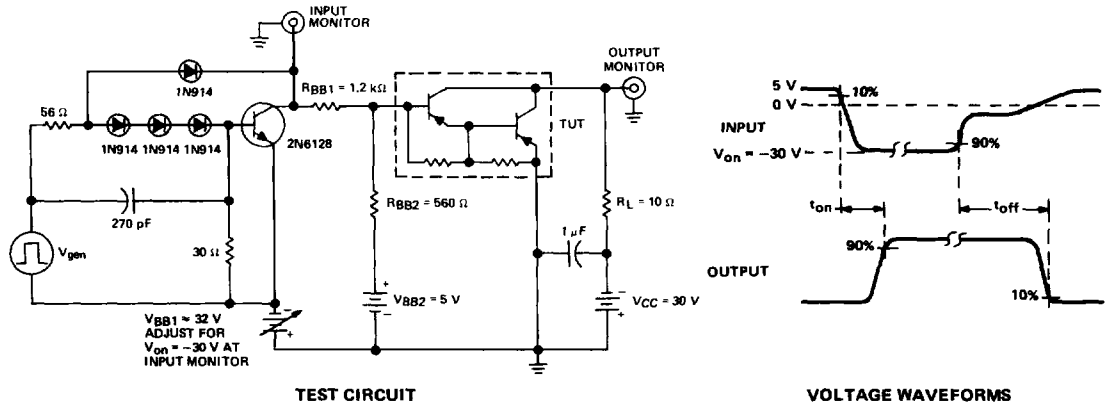
7. These parameters are measured with voltage-sensing contacts separate from the current-carrying contacts and located within 0.125 inch from the device body.

switching characteristics at 25°C case temperature

| PARAMETER | TEST CONDITIONS† | TYP | UNIT |
|-------------------------|---|-----|---------------|
| t_{on} Turn-On Time | $I_C = -3 \text{ A}$, $I_B(2) = -12 \text{ mA}$, $I_B(2) = 12 \text{ mA}$, | 1.5 | μs |
| t_{off} Turn-Off Time | $V_{BE(off)} = 5 \text{ V}$, $R_L = 10 \Omega$, See Figure 1 | 8.5 | |

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

PARAMETER MEASUREMENT INFORMATION

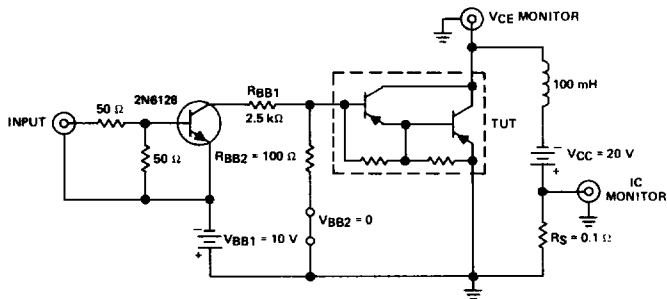


- NOTES: A. V_{gen} is a 30-V pulse (from 0 V) into a 50- Ω termination.
 B. The V_{gen} waveform is supplied by a generator with the following characteristics: $t_r \leq 15 \text{ ns}$, $t_f \leq 15 \text{ ns}$, $Z_{out} = 50 \Omega$, $t_w = 20 \mu\text{s}$, duty cycle $\leq 2\%$.
 C. Waveforms are monitored on an oscilloscope with the following characteristics: $t_r \leq 15 \text{ ns}$, $R_{in} > 10 \text{ M}\Omega$, $C_{in} \leq 11.5 \text{ pF}$.
 D. Resistors must be noninductive types.
 E. The d-c power supplies may require additional bypassing in order to minimize ringing.

FIGURE 1

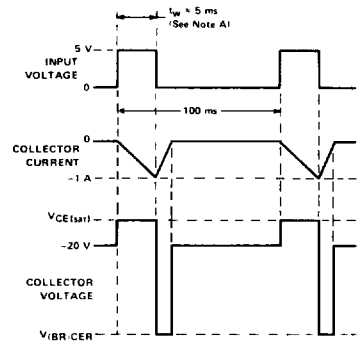
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INDUCTIVE LOAD SWITCHING



TEST CIRCUIT

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



VOLTAGE AND CURRENT WAVEFORMS

FIGURE 2

TYPICAL CHARACTERISTICS

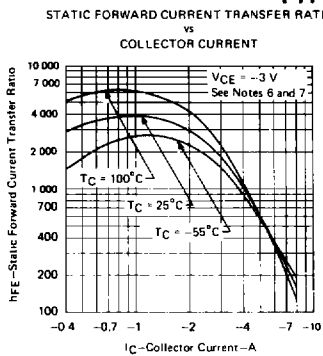


FIGURE 3

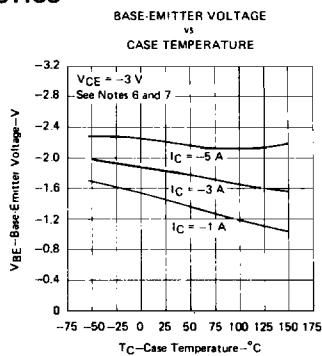


FIGURE 4

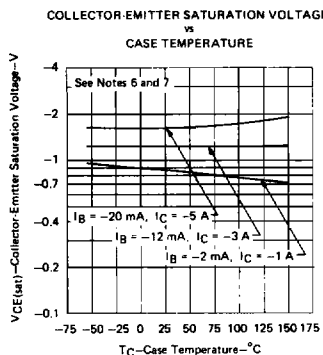


FIGURE 5

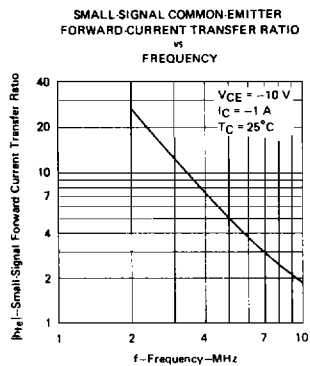


FIGURE 6

- NOTES: 6. These parameters must be measured using pulse techniques. $t_w = 300 \mu s$, duty cycle $< 2\%$.
7. These parameters are measured with voltage-sensing contacts separate from the current-carrying contacts and located within 0.125 inch from the device body.

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MAXIMUM SAFE OPERATING AREAS

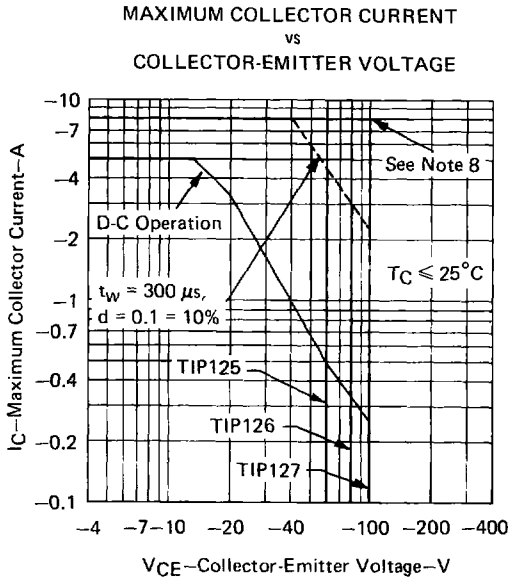


FIGURE 7

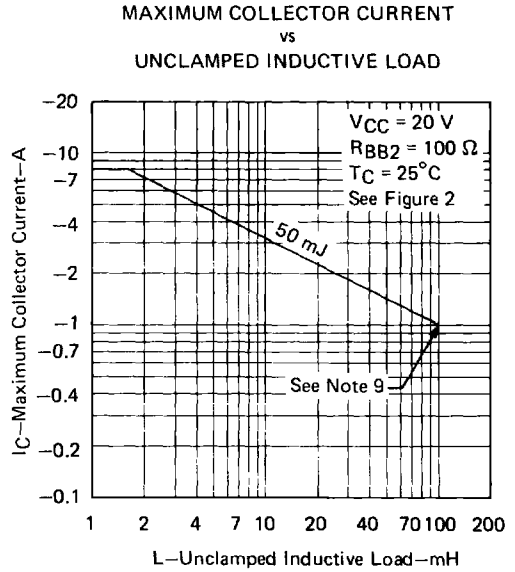


FIGURE 8

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

THERMAL INFORMATION

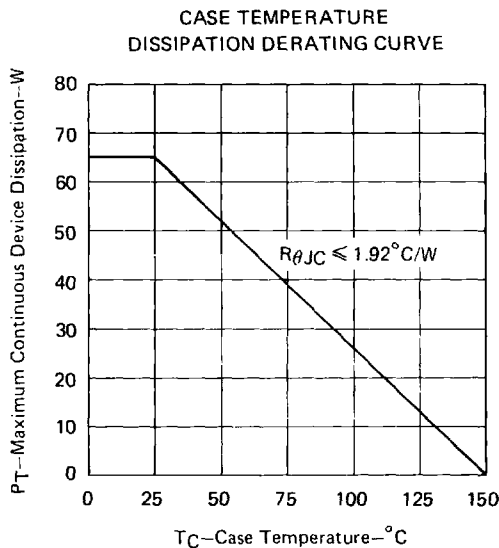


FIGURE 9

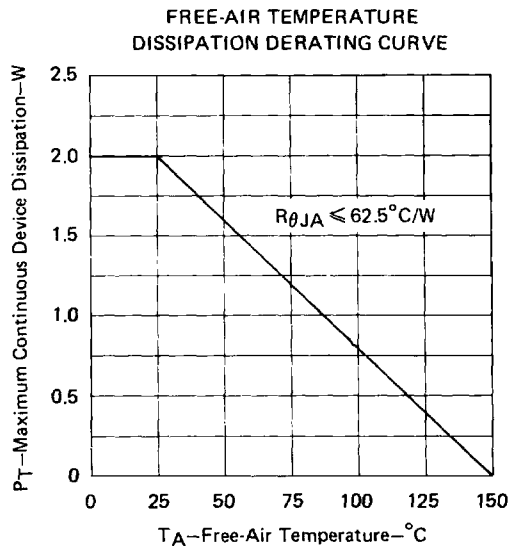


FIGURE 10