

Description:

Designed for general-purpose amplifier and low speed switching applications.

Features:

- Collector-Emitter sustaining voltage- $V_{CEO(sus)} = 60V$ (Min.) - TIP140
- Collector-Emitter saturation voltage- $V_{CE(sat)} = 2.5V$ (Max.) at $I_C = 5A$
- Monolithic construction with built-in-base-emitter shunt resistor

Maximum Ratings

| Characteristic | Symbol | Values | Unit |
|--|-------------------|-------------|--------------------|
| Collector-Emitter Voltage | V_{CEO} | 60 | V |
| Collector-Base Voltage | V_{CBO} | | |
| Emitter-Base Voltage | V_{EBO} | | |
| Collector Current-Continuous -Peak | I_C I_{CM} | 10 15 | A |
| Base Current | I_B | 0.5 | |
| Total Power Dissipation at $T_C = 25^\circ C$ Derate above $25^\circ C$ | P_D | 125 1 | W W/ $^\circ C$ |
| Operation and Storage Junction Temperature Range | T_J, T_{STG} | -65 to +150 | $^\circ C$ |

Thermal Characteristics

| Characteristic | Symbol | Max. | Unit |
|-------------------------------------|-----------------|------|--------------|
| Thermal Resistance Junction to Case | $R_{\theta jc}$ | 1 | $^\circ C/W$ |

Electrical Characteristics ($T_C = 25^\circ\text{C}$ unless otherwise noted)

| Characteristic | Symbol | Min. | Max. | Unit |
|----------------|--------|------|------|------|
|----------------|--------|------|------|------|

Off Characteristics

| | | | | |
|--|----------------|----|---|----|
| Collector-Emitter Sustaining Voltage (1) $I_C = 30\text{mA}, I_B = 0$ | $V_{CEO(sus)}$ | 60 | - | V |
| Collector Cut off Current $V_{CE} = 30\text{V}, I_B = 0$ | I_{CEO} | - | 2 | mA |
| Collector Cut off Current $V_{CB} = 60\text{V}, I_E = 0$ | I_{CBO} | - | 1 | |
| Emitter Cut off Current $V_{EB} = 5\text{V}, I_C = 0$ | I_{EBO} | - | 2 | |

On Characteristics (1)

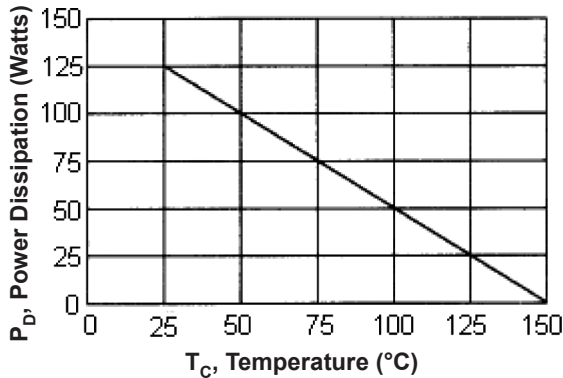
| | | | | |
|---|---------------|--------------|--------|---|
| DC Current Gain $I_C = 5\text{A}, V_{CE} = 4\text{V}$ $I_C = 10\text{A}, V_{CE} = 40\text{V}$ | h_{FE} | 1,000 500 | - | - |
| Collector-Emitter Saturation Voltage $I_C = 5\text{A}, I_B = 10\text{mA}$ $I_C = 10\text{A}, I_B = 40\text{mA}$ | $V_{CE(sat)}$ | - | 2 3 | V |
| Base-Emitter Saturation Voltage $I_C = 10\text{A}, I_B = 40\text{mA}$ | $V_{BE(sat)}$ | - | 3.5 | |
| Base-Emitter On Voltage $I_C = 10\text{A}, V_{CE} = 4\text{V}$ | $V_{BE(on)}$ | - | 3.0 | |

Switching Characteristics

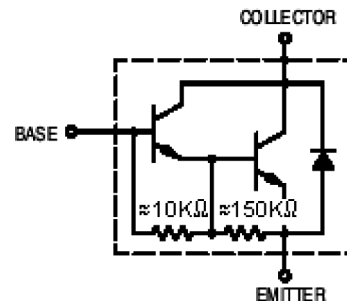
| | | | | | |
|--------------|--|-------|-------------|---|---------------|
| Delay Time | $V_{CC} = 30\text{V}, I_C = 5\text{A}$ $I_{B1} = -I_{B2} = 20\text{mA}$ $t_p = 20\text{ms}, \text{Duty Cycle } \leq 2\%$ | t_d | 0.15 (Typ.) | - | μs |
| Rise Time | | t_r | 0.55 (Typ.) | - | |
| Storage Time | | t_s | 2.5 (Typ.) | - | |
| Fall Time | | t_f | 2.5 (Typ.) | - | |

(1) Pulse Test: Pulse Width = $300\mu\text{s}$, Duty Cycle $\leq 2\%$.

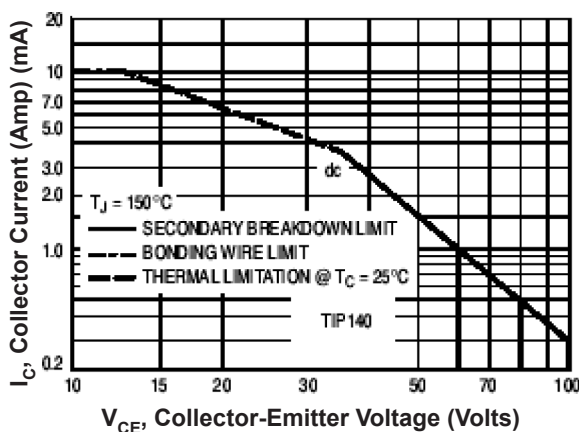
Figure - 1 Power Derating



Internal Schematic Diagram



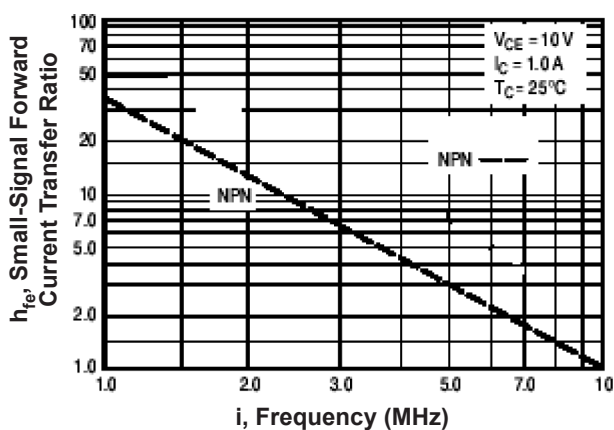
Active Region Safe Operating Area (SOA)



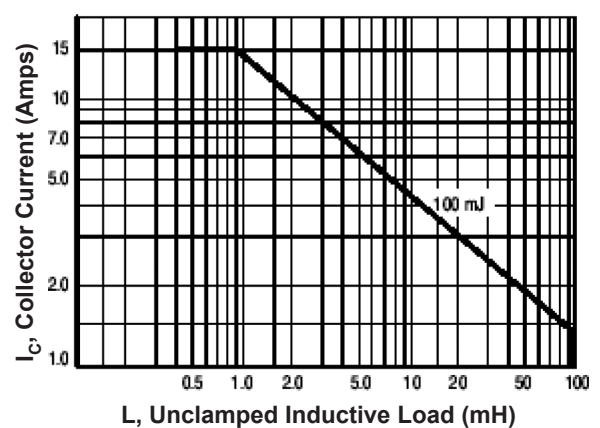
There are two limitation on the power handling ability of a transistor: average junction temperature and second breakdown safe operating area curves indicate I_C - V_{CE} limits of the transistor that must be observed for reliable operation i.e., the transistor must not be subjected to greater dissipation than curves indicate.

The data of SOA curve is based on $T_{J(PK)} = 150^\circ\text{C}$; T_C is variable depending on conditions. At high case temperatures, thermal limitation will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

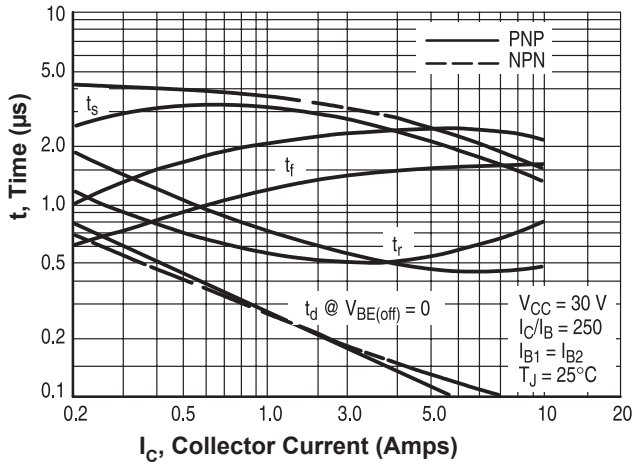
Small-Signal Common-Emitter Forward Current Transfer Ratio



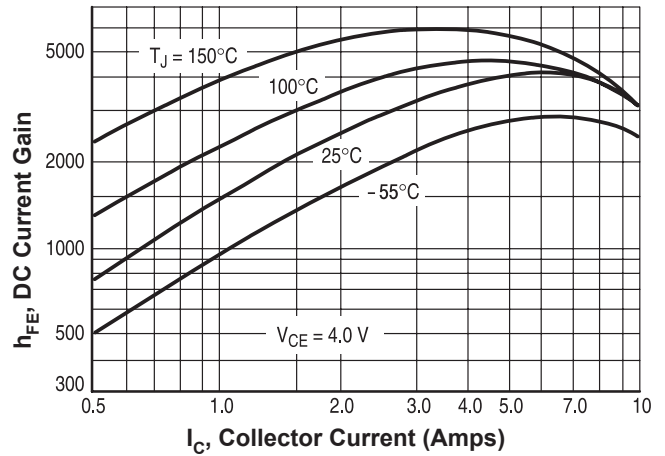
Unclamped Inductive Load



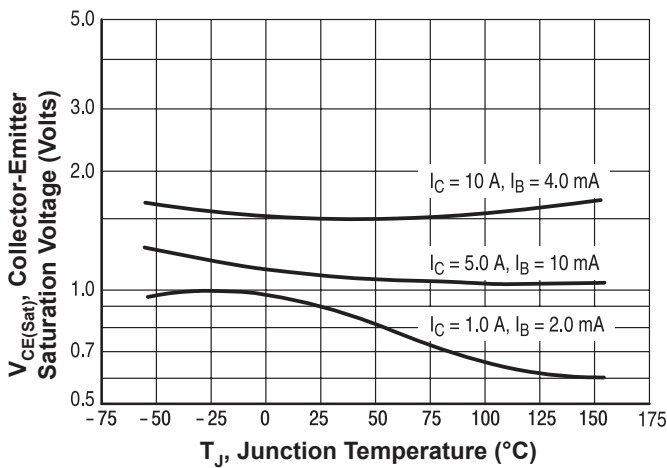
Switching Time



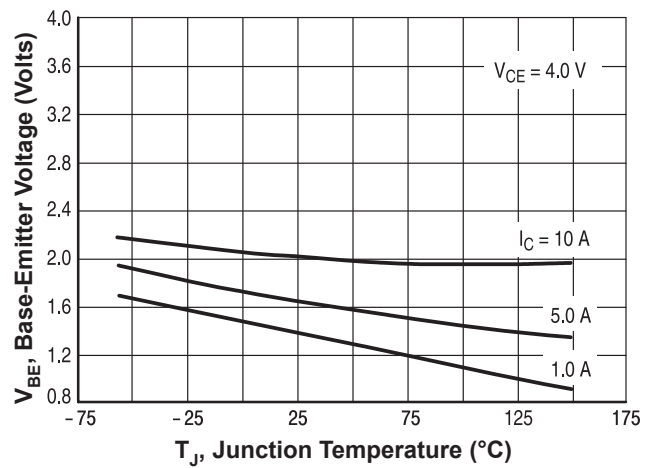
DC Current Gain

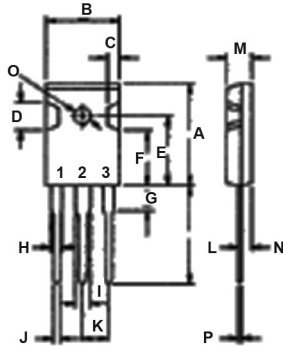


Collector-Emitter Saturation Voltage



Base-Emitter Voltage





Pin Configuration:

1. Base
2. Collector
3. Emitter

| Dimensions | Min. | Max. |
|------------|-------|-------|
| A | 20.63 | 22.38 |
| B | 15.38 | 16.2 |
| C | 1.9 | 2.7 |
| D | 5.1 | 6.1 |
| E | 14.81 | 15.22 |
| F | 11.72 | 12.84 |
| G | 4.2 | 4.5 |
| H | 1.82 | 2.46 |
| I | 2.92 | 3.23 |
| J | 0.89 | 1.53 |
| K | 5.26 | 5.66 |
| L | 18.5 | 21.5 |
| M | 4.68 | 5.36 |
| N | 2.4 | 2.8 |
| O | 3.25 | 3.65 |
| P | 0.55 | 0.7 |

Dimensions : Millimetres

Part Number Table

| Description | Part Number |
|------------------------------------|-------------|
| Darlington Transistor, NPN, TO-247 | TIP140 |

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