

COMPLEMENTARY SILICON PLASTIC POWER TRANSISTORS

... designed for use in general purpose power amplifier and switching applications.

FEATURES:

- * Collector-Emitter Sustaining Voltage -

$V_{CE(sus)}$ = 40V(Min)- TIP31, TIP32
 60V(Min)- TIP31A, TIP32A
 80V(Min)- TIP31B, TIP32B
 100V(Min)-TIP31C, TIP32C

- * Collector-Emitter Saturation Voltage- $V_{CE(sat)} = 1.2V(Max) @ I_C = 3.0 A$

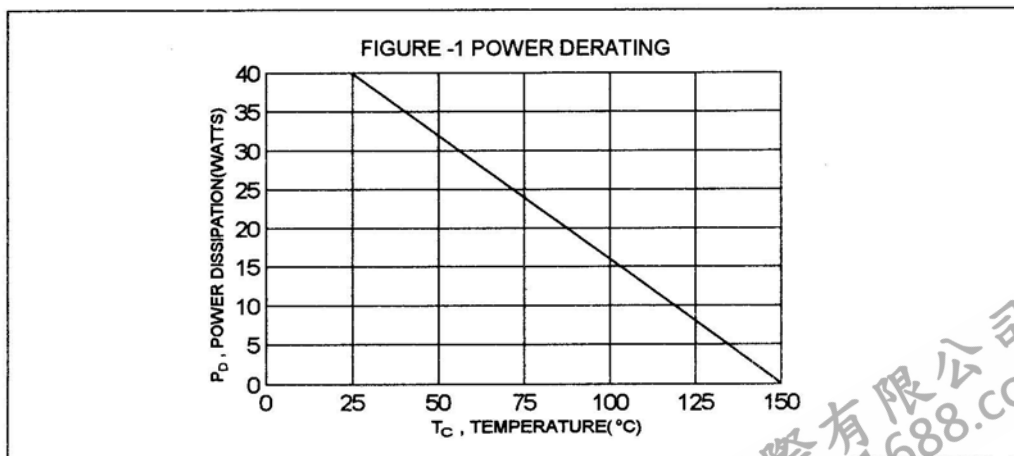
- * Current Gain-Bandwidth Product $f_T = 3.0 MHz (Min) @ I_C = 500 mA$

MAXIMUM RATINGS

| Characteristic | Symbol | TIP31 TIP32 | TIP31A TIP32A | TIP31B TIP32B | TIP31C TIP32C | Unit |
|--|----------------|----------------|------------------|------------------|------------------|--------------------|
| Collector-Emitter Voltage | V_{CEO} | 40 | 60 | 80 | 100 | V |
| Collector-Base Voltage | V_{CBO} | 40 | 60 | 80 | 100 | V |
| Emitter-Base Voltage | V_{EBO} | 5.0 | | | | V |
| Collector Current - Continuous - Peak | I_C | 3.0 5.0 | | | | A |
| Base Current | I_B | 1.0 | | | | A |
| Total Power Dissipation@ $T_C = 25^\circ C$ Derate above $25^\circ C$ | P_D | 40 0.32 | | | | W W/ $^\circ C$ |
| Operating and Storage Junction Temperature Range | T_J, T_{STG} | -65 to +150 | | | | $^\circ C$ |

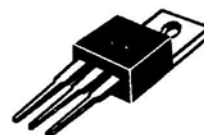
THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|-------------------------------------|-----------------|-------|--------------|
| Thermal Resistance Junction to Case | $R_{\theta jc}$ | 3.125 | $^\circ C/W$ |

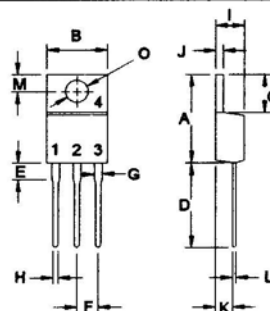


| NPN | PNP |
|--------|--------|
| TIP31 | TIP32 |
| TIP31A | TIP32A |
| TIP31B | TIP32B |
| TIP31C | TIP32C |

3 AMPERE
 COMPLEMENTARY SILICON
 POWER TRANSISTORS
 40 -100 VOLTS
 40 WATTS



TO-220



PIN 1.BASE
 2.COLLECTOR
 3.EMITTER
 4.COLLECTOR(CASE)

| DIM | MILLIMETERS | |
|-----|-------------|-------|
| | MIN | MAX |
| A | 14.68 | 16.00 |
| B | 9.78 | 10.42 |
| C | 5.02 | 6.60 |
| D | 13.00 | 14.62 |
| E | 3.10 | 4.19 |
| F | 2.41 | 2.67 |
| G | 1.10 | 1.67 |
| H | 0.69 | 1.01 |
| I | 3.21 | 4.98 |
| J | 1.14 | 1.40 |
| K | 2.20 | 3.30 |
| L | 0.28 | 0.61 |
| M | 2.48 | 3.00 |
| O | 3.50 | 4.00 |

TIP31, TIP31A, TIP31B, TIP31C NPN / TIP32, TIP32A, TIP32B, TIP32C PNP

ELECTRICAL CHARACTERISTICS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

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

OFF CHARACTERISTICS

| | | | | |
|---|--|---------------|--------------------------|----|
| Collector-Emitter Sustaining Voltage(1) ($I_C = 30\text{ mA}$, $I_B = 0$) | TIP31, TIP32 TIP31A, TIP32A TIP31B, TIP32B TIP31C, TIP32C | $V_{CE(sus)}$ | 40 60 80 100 | V |
| Collector Cutoff Current ($V_{CE} = 30\text{ V}$, $I_B = 0$) ($V_{CE} = 60\text{ V}$, $I_B = 0$) | TIP31, TIP32, TIP31A, TIP32A TIP31B, TIP32B, TIP31C, TIP32C | I_{CEO} | 0.3 0.3 | mA |
| Collector Cutoff Current ($V_{CE} = 40\text{ V}$, $V_{EB} = 0$) ($V_{CE} = 60\text{ V}$, $V_{EB} = 0$) ($V_{CE} = 80\text{ V}$, $V_{EB} = 0$) ($V_{CE} = 100\text{ V}$, $V_{EB} = 0$) | TIP31, TIP32 TIP31A, TIP32A TIP31B, TIP32B TIP31C, TIP32C | I_{CES} | 0.2 0.2 0.2 0.2 | mA |
| Emitter Cutoff Current ($V_{EB} = 5.0\text{ V}$, $I_C = 0$) | | I_{EBO} | 1.0 | mA |

ON CHARACTERISTICS (1)

| | | | | |
|---|---------------|----------|-----|---|
| DC Current Gain ($I_C = 1.0\text{ A}$, $V_{CE} = 4.0\text{ V}$) ($I_C = 3.0\text{ A}$, $V_{CE} = 4.0\text{ V}$) | h_{FE} | 25 10 | 50 | |
| Collector-Emitter Saturation Voltage ($I_C = 3.0\text{ A}$, $I_B = 375\text{ mA}$) | $V_{CE(sat)}$ | | 1.2 | V |
| Base-Emitter On Voltage ($I_C = 3.0\text{ A}$, $V_{CE} = 4.0\text{ V}$) | $V_{BE(on)}$ | | 1.8 | V |

DYNAMIC CHARACTERISTICS

| | | | | |
|--|----------|-----|--|-----|
| Current Gain - Bandwidth Product (2) ($I_C = 500\text{ mA}$, $V_{CE} = 10\text{ V}$, $f_{TEST} = 1\text{ MHz}$) | f_T | 3.0 | | MHz |
| Small Signal Current Gain ($I_C = 500\text{ mA}$, $V_{CE} = 10\text{ V}$, $f = 1\text{ kHz}$) | h_{fe} | 20 | | |

(1) Pulse Test: Pulse width $\leq 300\text{ }\mu\text{s}$, Duty Cycle $\leq 2.0\%$

(2) $f_T = |h_{fe}| \cdot f_{TEST}$

FIGURE 2 - SWITCHING TIME EQUIVALENT CIRCUIT

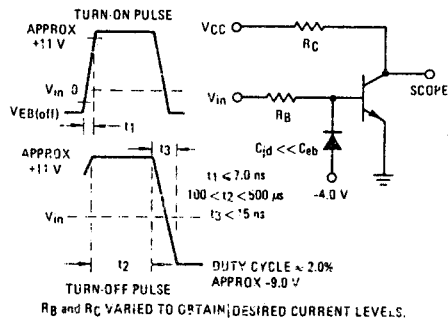


FIG-3 TURN-ON TIME

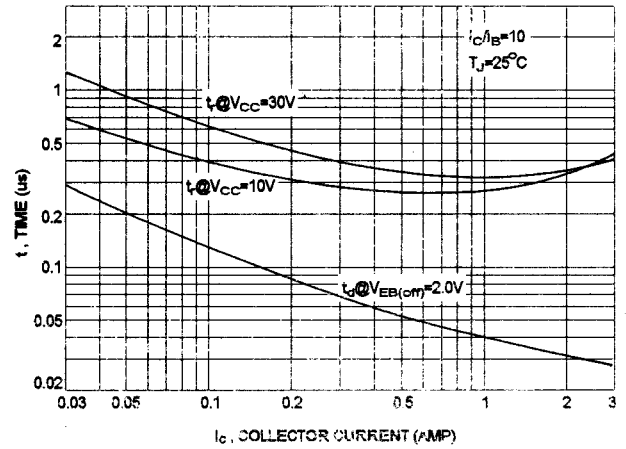


FIG-4 DC CURRENT GAIN

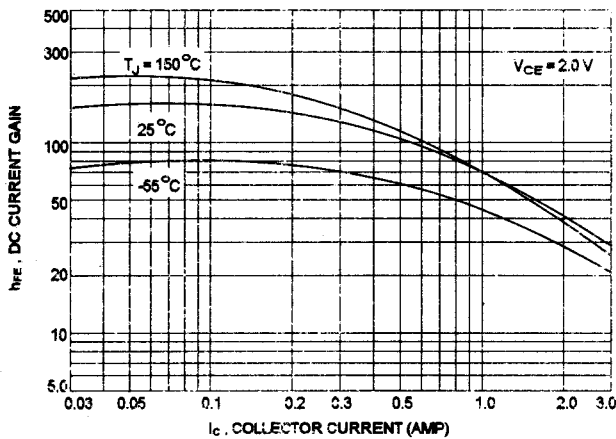


FIG-5 TURN-OFF TIME

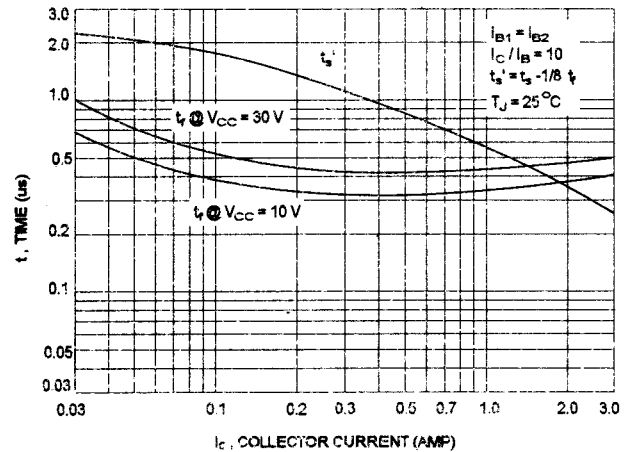
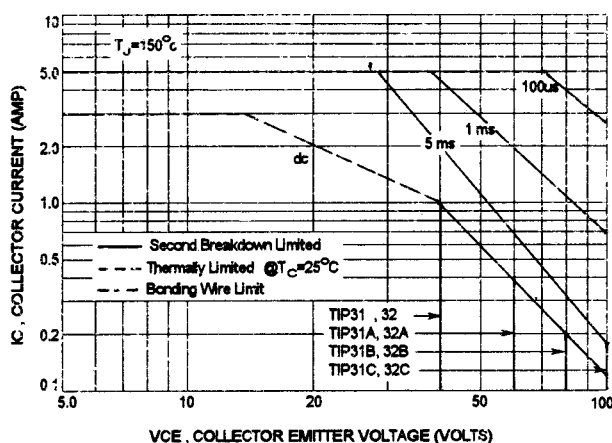


FIG-6 ACTIVE REGION SAFE OPERATING AREA



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 FIG-6 curve is base on $T_{J(PK)} = 150^\circ\text{C}$; T_C is variable depending on power level. second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(PK)} \leq 150^\circ\text{C}$. At high case temperatures, thermal limitation will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

FIG-7 COLLECTOR SATURATION REGION

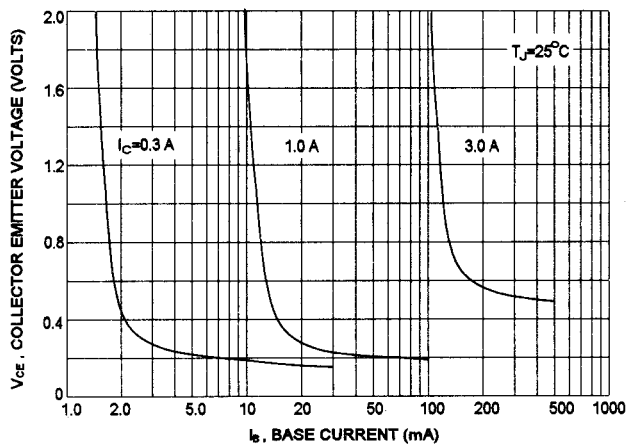


FIG-8 CAPACITANCES

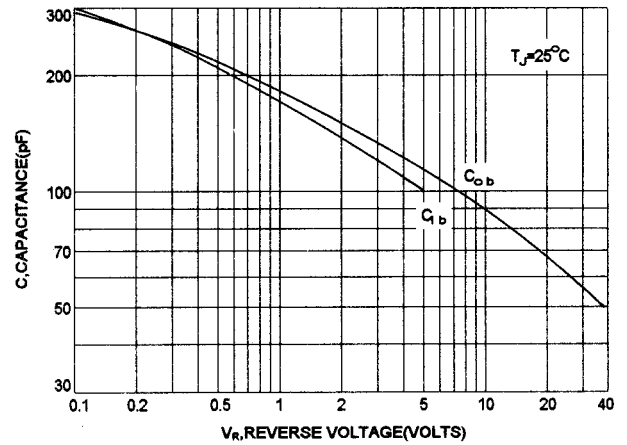


FIG-9 "ON" VOLTAGE

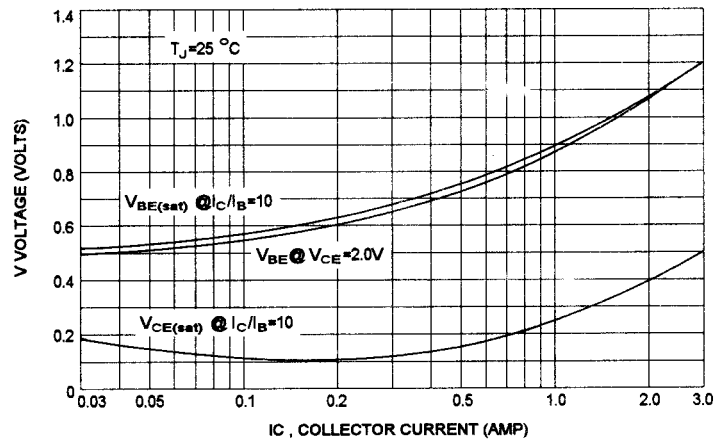
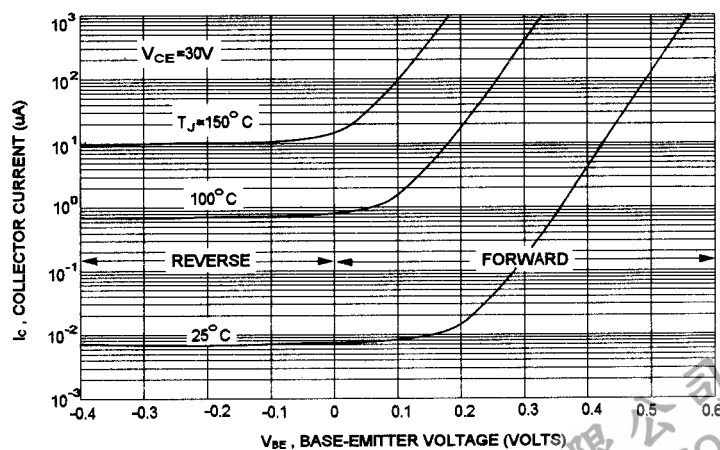


FIG-10 COLLECTOR CUT-OFF REGION



Notice

MOSPEC reserves the rights to make changes of the content herein the document anytime without notification. MOSPEC or anyone on its behalf, assumes no responsibility or liability for any errors or inaccuracies. Please refer to MOSPEC website for the last document.

MOSPEC disclaims any and all liability arising out of the application or use of any product including damages incidentally and consequentially incurred.

Application shown on the herein document are examples of standard use and operation. Customers are responsible for comprehending suitable use in particular applications. MOSPEC makes no representation or warranty that such application will be suitable for the specified use without further testing or modification.

The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by MOSPEC for any infringements of patents or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of MOSPEC or others.

These MOSPEC products are intended for usage in general electronic equipment. Please make sure to consult with MOSPEC before you use these MOSPEC products in equipment which require specialized quality and/or reliability, and in equipment which could have major impact to the welfare of human life (atomic energy control, aeronautics , traffic control, combustion control, safety devices etc.)