# SANYO SEMICONDUCTOR

| NPN | PNP |
|---|---|
| TIP120 | TIP125 |
| TIP121 | TIP126 |
| TIP122 | TIP127 |

## DARLINGTON COMPLEMENTARY SILICON POWER TRANSISTORS

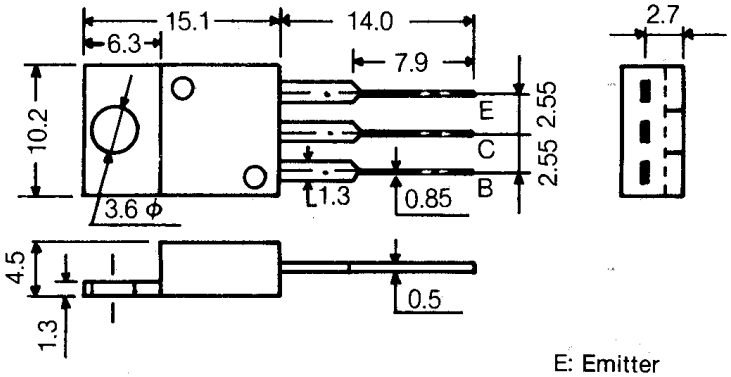
**60-80-100 VOLTS, 5 AMPERE**

HIGH CURRENT GAIN $h_{FE}$ = 2500 typ. @3V, 3A
LOW SATURATION VOLTAGE $V_{CE(SAT)}$ = 1.0V typ. @2.5A
MONOLITHIC CONSTRUCTION WITH BUILT-IN
(1) BASE-EMITTER RESISTORS AND
(2) COLLECTOR-EMITTER DIODE

### ABSOLUTE MAXIMUM RATINGS @ Ta = 25°C

| RATING | SYMBOL | TIP120, TIP125 | TIP121, TIP126 | TIP122, TIP127 | UNIT |
|---|---|---|---|---|---|
| COLLECTOR-EMITTER VOLTAGE | $V_{CEO}$ | 60 | 80 | 100 | Vdc |
| COLLECTOR-BASE VOLTAGE | $V_{CB}$ | 60 | 80 | 100 | Vdc |
| EMITTER-BASE VOLTAGE | $V_{EB}$ | ← 5.0 → | | | Vdc |
| COLLECTOR CURRENT- CONTINUOUS<br>PEAK | $I_C$ | ← 5.0 →<br>← 8.0 → | | | Adc |
| TOTAL POWER DISSIPATION @ $T_C$ = 25°C | $P_D$ | ← 65 → | | | W |
| TOTAL POWER DISSIPATION @ $T_A$ = 25°C | $P_D$ | ← 2.0 → | | | W |
| OPERATING AND STORAGE JUNCTION TEMPERATURE RANGE | $T_J, T_{stg}$ | ← – 55 to + 150 → | | | °C |

**OUTLINE DIMENSION**
**JEDEC: TO-220**
**UNIT: MM**




JEDEC: TO-220AB
EIAJ: SC-46

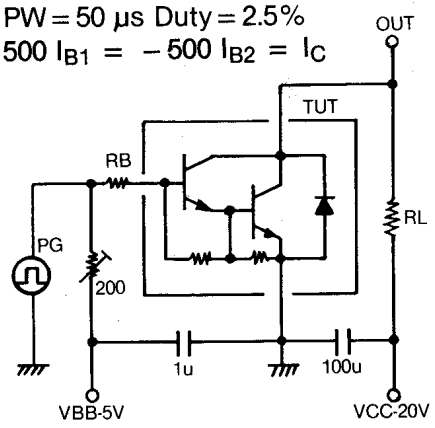
E: Emitter
C: Collector
B: Base

## ELECTRICAL CHARACTERISTICS @ Ta = 25°C

| CHARACTERISTIC | | SYMBOL | MIN | MAX | UNIT |
|---|---|---|---|---|---|
| COLLECTOR-EMITTER SUSTAINING VOLTAGE | | $V_{CEO(SUS)}$ | | | Vdc |
| ($I_C$ = 30 mAdc, $I_B$ = 0) | TIP120, TIP125 | | 60 | — | |
| | TIP121, TIP126 | | 80 | — | |
| | TIP122, TIP127 | | 100 | — | |
| COLLECTOR CUTOFF CURRENT | | $I_{CEO}$ | | | mAdc |
| ($V_{CE}$ = 30 Vdc, $I_B$ = 0) | TIP120, TIP125 | | — | 0.5 | |
| ($V_{CE}$ = 40 Vdc, $I_B$ = 0) | TIP121, TIP126 | | — | 0.5 | |
| ($V_{CE}$ = 50 Vdc, $I_B$ = 0) | TIP122, TIP127 | | — | 0.5 | |
| COLLECTOR CUTOFF CURRENT | | $I_{CBO}$ | | | mAdc |
| ($V_{CB}$ = 60 Vdc, $I_E$ = 0) | TIP120, TIP125 | | — | 0.2 | |
| ($V_{CB}$ = 80 Vdc, $I_E$ = 0) | TIP121, TIP126 | | — | 0.2 | |
| ($V_{CB}$ = 100 Vdc, $I_E$ = 0) | TIP122, TIP127 | | — | 0.2 | |
| EMITTER CUTOFF CURRENT | | $I_{EBO}$ | | | mAdc |
| ($V_{BE}$ = 5.0 Vdc, $I_C$ = 0) | | | — | 2.0 | |
| DC CURRENT GAIN | | $h_{FE}$ | | | — |
| ($I_C$ = 0.5 Adc, $V_{CE}$ = 3.0 Vdc) | | | 1000 | — | |
| ($I_C$ = 3.0 Adc, $V_{CE}$ = 3.0 Vdc) | | | 1000 | — | |
| COLLECTOR-EMITTER SATURATION VOLTAGE | | $V_{CE(SAT)}$ | | | Vdc |
| ($I_C$ = 3.0 Adc, $I_B$ = 12 mAdc) | | | — | 2.0 | |
| ($I_C$ = 5.0 Adc, $I_B$ = 20 mAdc) | | | — | 4.0 | |
| BASE-EMITTER ON VOLTAGE | | $V_{BE(ON)}$ | | | Vdc |
| ($I_C$ = 3.0 Adc, $V_{CE}$ = 3.0 Vdc) | | | — | 2.5 | |
| GAIN BANDWIDTH PRODUCT | | $f_T$ | 20 typ. | | mHz |
| ($I_C$ = 2.5 A, $V_{CE}$ = 5.0V) | | | | | |
| | | | | | |

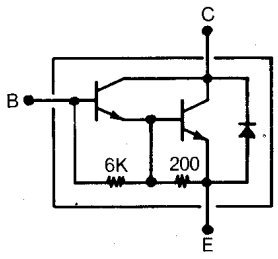
## SWITCHING TIME TEST CIRCUIT

PW = 50 µs Duty = 2.5%
500 $I_{B1}$ = −500 $I_{B2}$ = $I_C$

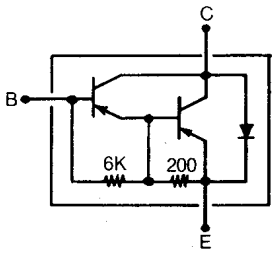



## DARLINGTON SCHEMATIC

NPN
TIP120
TIP121
TIP122



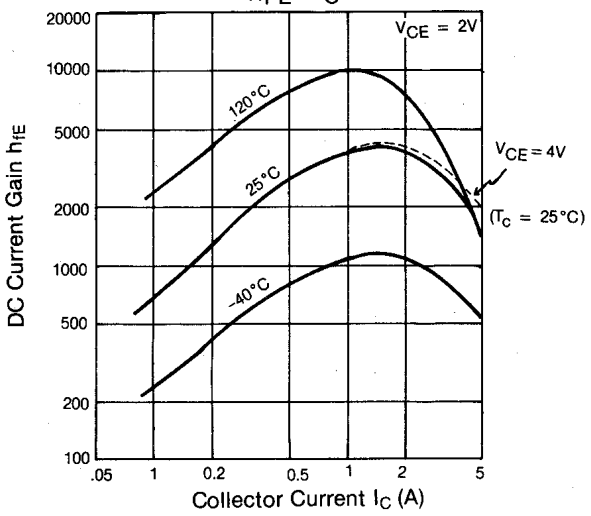

PNP
TIP125
TIP126
TIP127



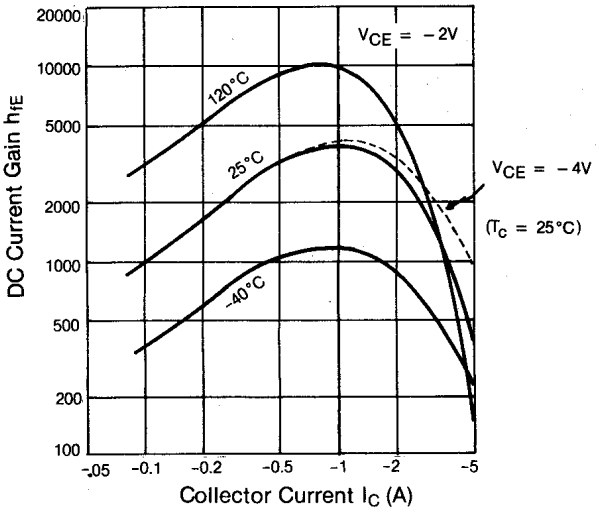
NPN
TIP 120, TIP 121, TIP 122

PNP
TIP 125, TIP 126, TIP 127

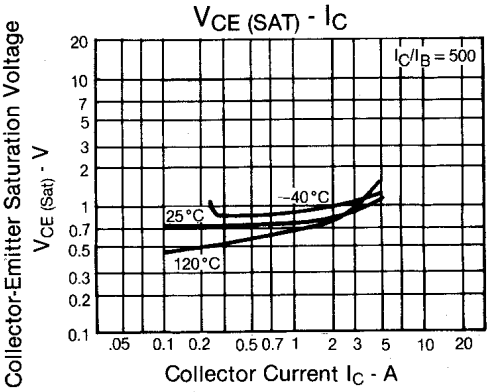
$h_{FE}$ - $I_C$



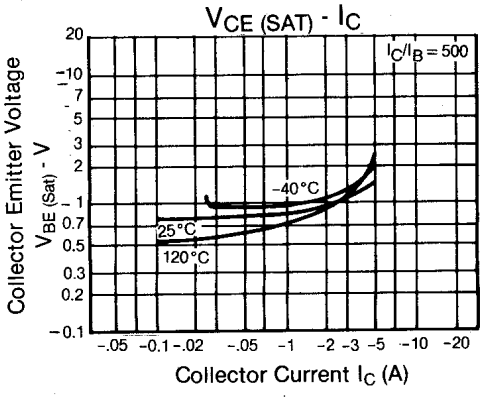

$h_{FE}$ - $I_C$



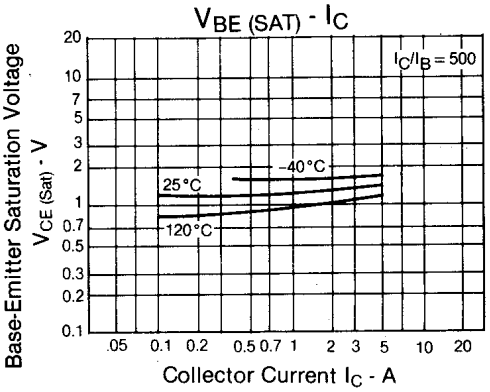

$V_{CE\ (SAT)}$ - $I_C$



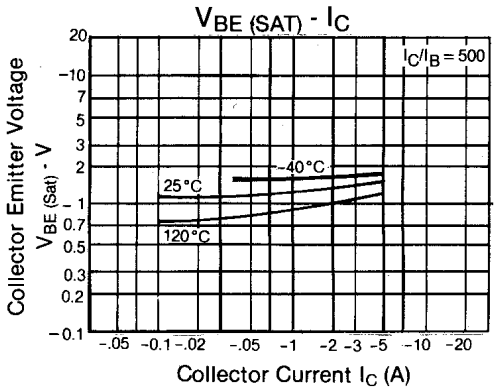

$V_{CE\ (SAT)}$ - $I_C$



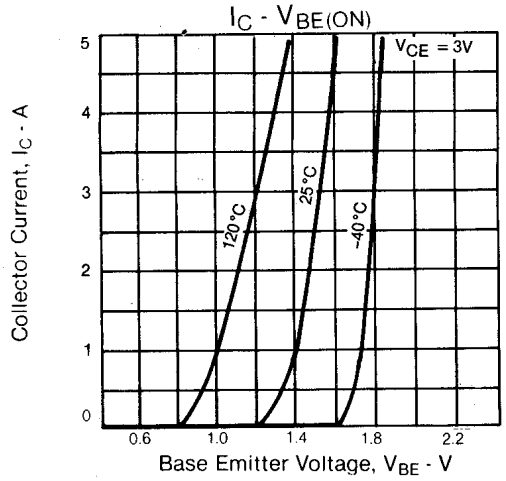

$V_{BE\ (SAT)}$ - $I_C$



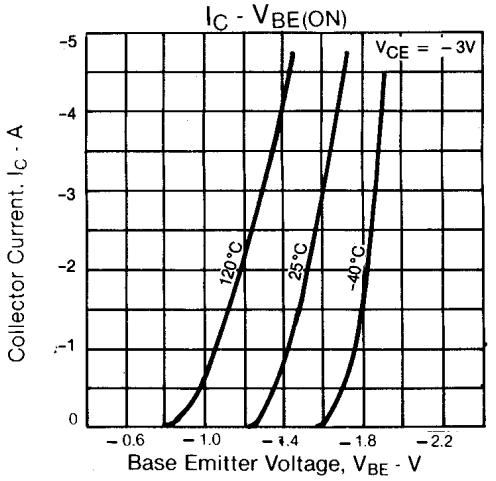

$V_{BE\ (SAT)}$ - $I_C$



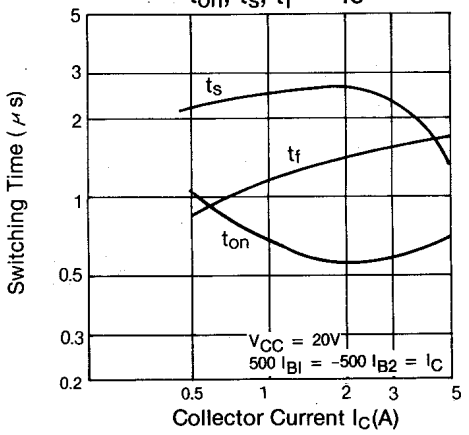

$I_C$ - $V_{BE(ON)}$



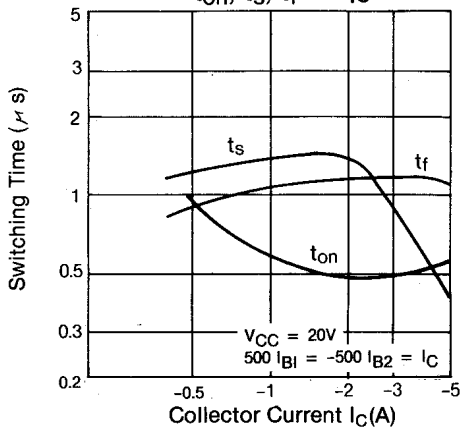

$I_C$ - $V_{BE(ON)}$



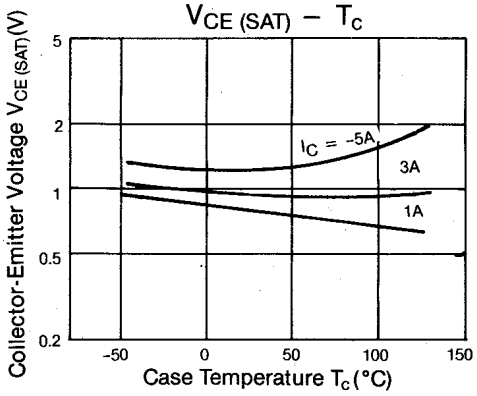
$t_{on}$, $t_s$, $t_f$ – $I_C$



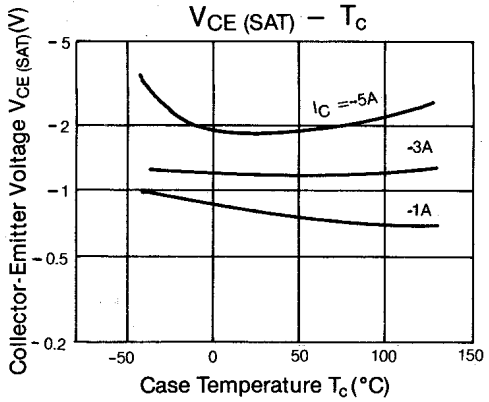

$t_{on}$, $t_s$, $t_f$ – $I_C$



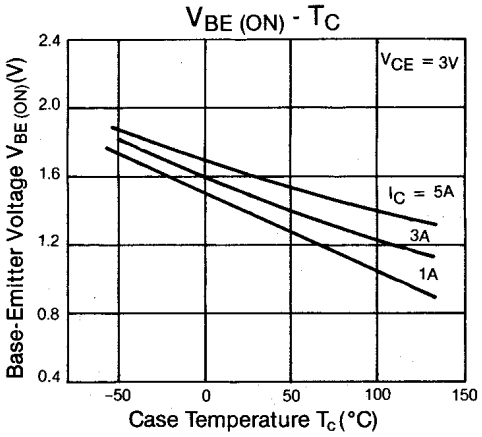

$V_{CE\ (SAT)}$ – $T_C$



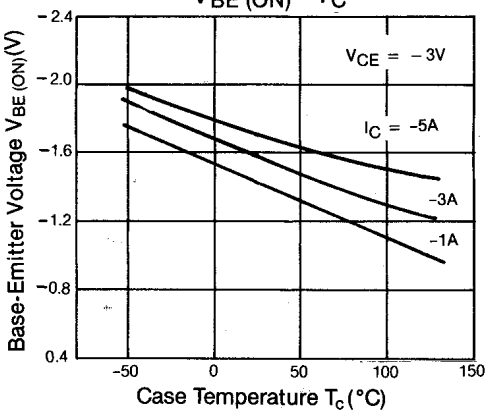

$V_{CE\ (SAT)}$ – $T_C$



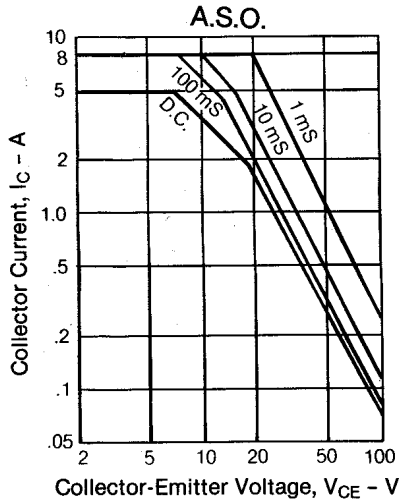

$V_{BE\ (ON)}$ - $T_C$




$V_{BE\ (ON)}$ - $T_C$




A.S.O.




A.S.O.