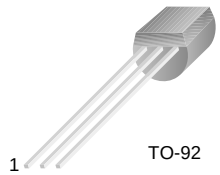
FAIRCHILD
SEMICONDUCTOR®

# PN100/PN100A/MMBT100/MMBT100A

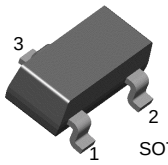
## NPN General Purpose Amplifier

- This device is designed for general purpose amplifier applications at collector currents to 300mA.
- Sourced from process 10.




TO-92

1. Emitter 2. Base 3. Collector
Mark: PN100/PN100A




SOT-23

1. Base 2. Emitter 3. Collector
Mark: N1/N1A

## Absolute Maximum Ratings* $T_C$=25°C unless otherwise noted

| Symbol | Parameter | Value | Units |
|---|---|---|---|
| $V_{CEO}$ | Collector-Emitter Voltage | 45 | V |
| $V_{CBO}$ | Collector-Base Voltage | 75 | V |
| $V_{EBO}$ | Emitter-Base Voltage | 6.0 | V |
| $I_C$ | Collector current - Continuous | 500 | mA |
| $T_J$, $T_{stg}$ | Junction and Storage Temperature | -55 ~ +150 | °C |

* These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

**NOTES:**
1. These ratings are based on a maximum junction temperature of 150 degrees C.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

## Electrical Characteristics $T_C$=25°C unless otherwise noted

| Symbol | Parameter | Test Condition | | Min. | Max. | Units |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| $BV_{CBO}$ | Collector-Base Breakdown Voltage | $I_C$ = 10μA, $I_E$ = 0 | | 75 | | V |
| $BV_{CEO}$ | Collector-Emitter Breakdown Voltage * | $I_C$ = 1mA, $I_B$ = 0 | | 45 | | V |
| $BV_{EBO}$ | Emitter-Base Breakdown Voltage | $I_E$ = 10μA, $I_C$ = 0 | | 6.0 | | V |
| $I_{CBO}$ | Collector-Base Cutoff Current | $V_{CB}$ = 60V | | | 50 | nA |
| $I_{CES}$ | Collector-Emiitter Cutoff Current | $V_{CE}$ = 40V | | | 50 | nA |
| $I_{EBO}$ | Emitter Cutoff Current | $V_{EB}$ = 4V | | | 50 | nA |
| **On Characteristics** | | | | | | |
| $h_{FE}$ | DC Current Gain | $I_C$ = 100μA, $V_{CE}$ = 1.0V | 100 | 80 | | |
| | | | 100A | 240 | | |
| | | $I_C$ = 10mA, $V_{CE}$ = 1.0V | 100 | 100 | 450 | |
| | | | 100A | 300 | 600 | |
| | | $I_C$ = 100mA, $V_{CE}$ = 1.0V* | | 100 | | |
| | | $I_C$ = 150mA, $V_{CE}$ = 5.0V * | 100 | 100 | 350 | |
| | | | 100A | 100 | | |
| $V_{CE(sat)}$ | Collector-Emitter Saturation Voltage | $I_C$ = 10mA, $I_B$ = 1.0mA | | | 0.2 | V |
| | | $I_C$ = 200mA, $I_B$ = 20mA | | | 0.4 | V |
| $V_{BE(sat)}$ | Base-Emitter Saturation Voltage | $I_C$ = 10mA, $I_B$ = 1.0mA | | | 0.85 | V |
| | | $I_C$ = 200mA, $I_B$ = 20mA | | | 1.0 | V |
| **Small Signal Characteristics** | | | | | | |
| $f_T$ | Current Gain Bandwidth Product | $V_{CE}$ = 20V, $I_C$ = 20mA | | 250 | | MHz |
| $C_{obo}$ | Output Capacitance | $V_{CB}$ = 5.0V, f = 1.0MHz | | | 4.5 | pF |
| NF | Noise Figure | $I_C$ = 100μA, $V_{CE}$ = 5.0V | 100 | | 5.0 | dB |
| | | $R_G$ = 2.0kΩ, f = 1.0KHz | 100A | | 4.0 | dB |

* Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2.0%

## Thermal Characteristics $T_A$=25°C unless otherwise noted

| Symbol | Parameter | Max. | | Units |
|---|---|---|---|---|
| | | PN100<br>PN100A | *MMBT100<br>*MMBT100A | |
| $P_D$ | Total Device Dissipation<br>Derate above 25°C | 625<br>5.0 | 350<br>2.8 | mW<br>mW/°C |
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case | 83.3 | | °C/W |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | 200 | 357 | °C/W |

* Device mounted on FR-4 PCB 1.6" × 1.6" × 0.06."

# Typical Characteristics

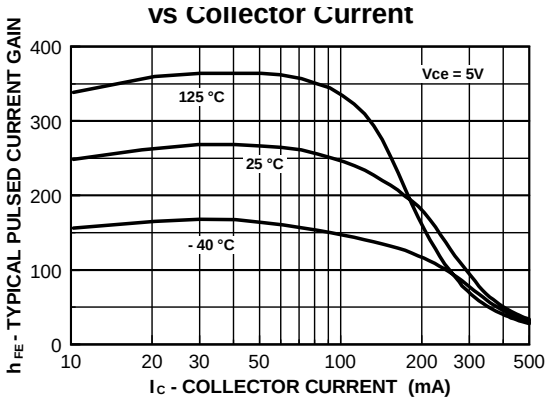



**Figure 1. Typical Pulsed Current Gain vs Collector Current**

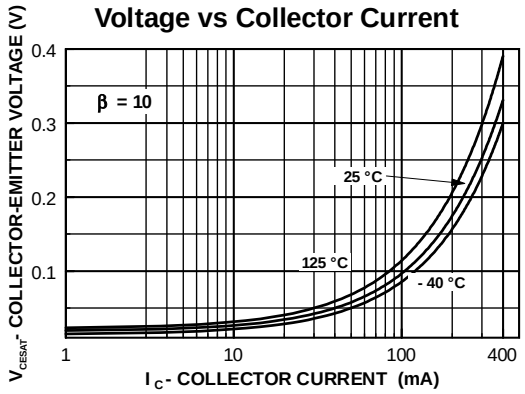



**Figure 2. Collector-Emitter Saturation Voltage vs Collector Current**

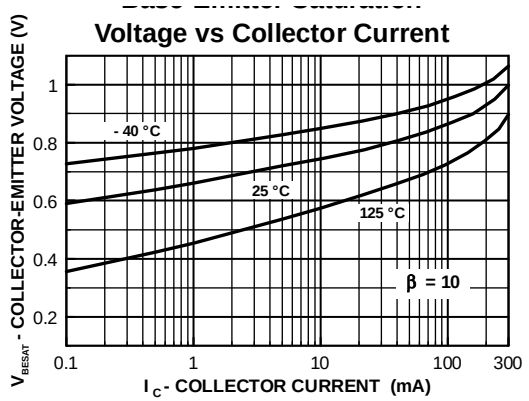



**Figure 3. Base-Emitter Saturation Voltage vs Collector Current**

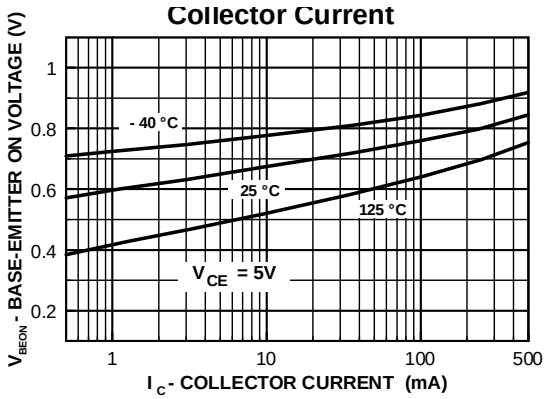



**Figure 4. Base-Emitter On Voltage vs Collector Current**

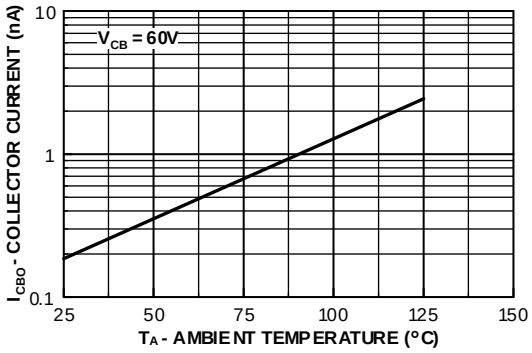



**Figure 5. Collector Cutoff Current vs Ambient Temperature**

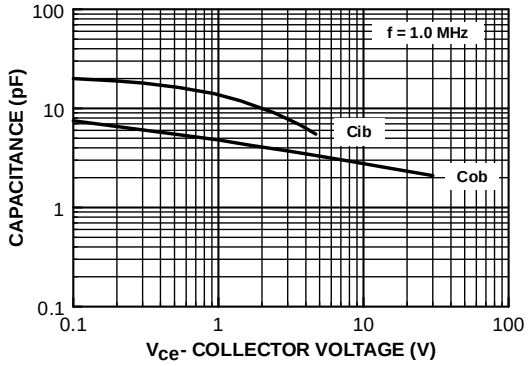



**Figure 6. Input and Output Capacitance vs Reverse Voltag**

## Typical Characteristics (Continued)

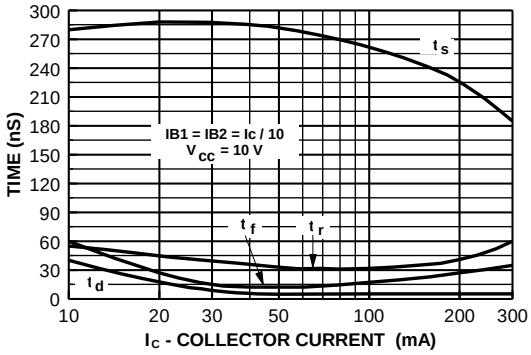



**Figure 7. Switching Times vs Collector Current**

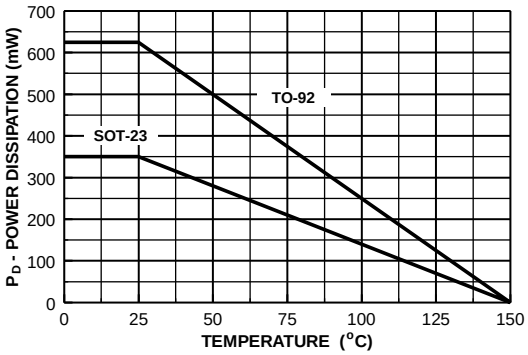
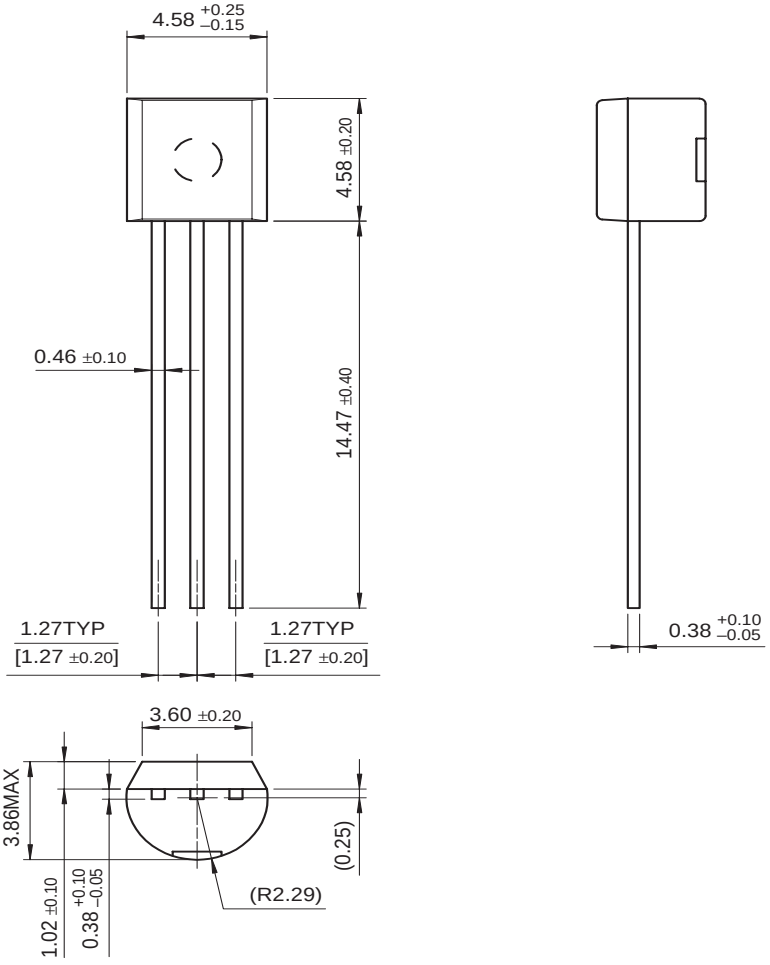



**Figure 8. Power Dissipation vs Ambient Temperature**

## Package Dimensions

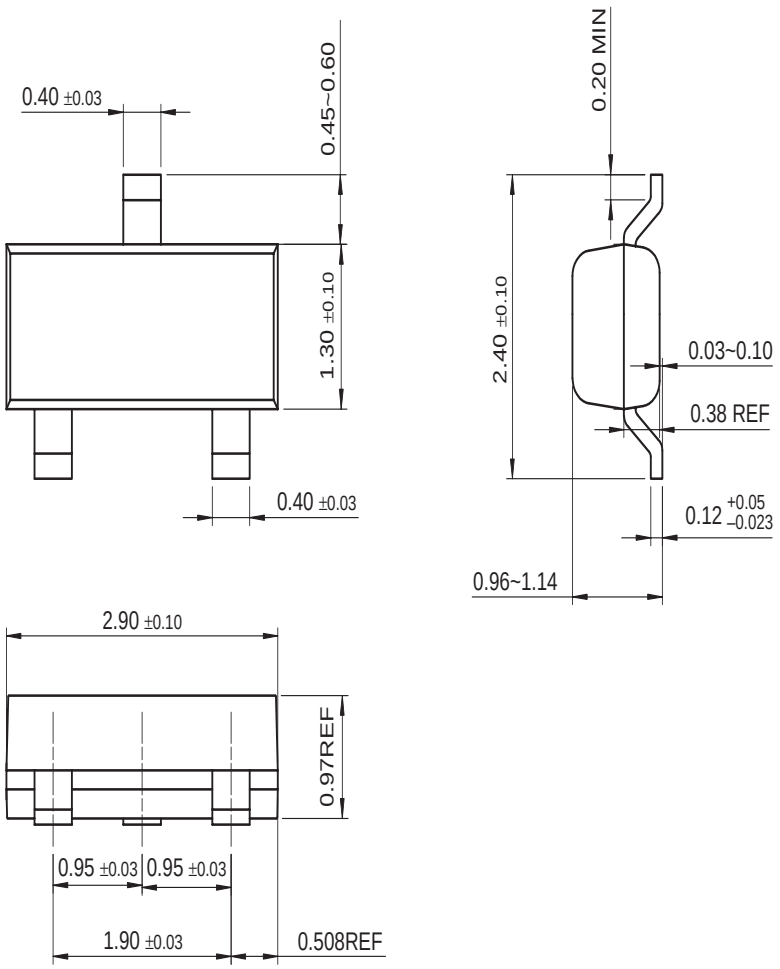
TO-92




Dimensions in Millimeters

## Package Dimensions (Continued)

# SOT-23




Dimensions in Millimeters

## TRADEMARKS

The following are registered and unregistered trademarks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

| | | | | |
|---|---|---|---|---|
| ACEx™ | FACT Quiet Series™ | OCX™ | SILENT SWITCHER® | UniFET™ |
| ActiveArray™ | GlobalOptoisolator™ | OCXPro™ | SMART START™ | UltraFET® |
| Bottomless™ | GTO™ | OPTOLOGIC® | SPM™ | VCX™ |
| Build it Now™ | HiSeC™ | OPTOPLANAR™ | Stealth™ | Wire™ |
| CoolFET™ | $I^2C$™ | PACMAN™ | SuperFET™ | |
| *CROSSVOLT*™ | *i-Lo*™ | POP™ | SuperSOT™-3 | |
| DOME™ | ImpliedDisconnect™ | Power247™ | SuperSOT™-6 | |
| EcoSPARK™ | IntelliMAX™ | PowerEdge™ | SuperSOT™-8 | |
| $E^2CMOS$™ | ISOPLANAR™ | PowerSaver™ | SyncFET™ | |
| EnSigna™ | LittleFET™ | PowerTrench® | TCM™ | |
| FACT™ | MICROCOUPLER™ | QFET® | TinyBoost™ | |
| FAST® | MicroFET™ | QS™ | TinyBuck™ | |
| FASTr™ | MicroPak™ | QT Optoelectronics™ | TinyPWM™ | |
| FPS™ | MICROWIRE™ | Quiet Series™ | TinyPower™ | |
| FRFET™ | MSX™ | RapidConfigure™ | TinyLogic® | |
| | MSXPro™ | RapidConnect™ | TINYOPTO™ | |
| Across the board. Around the world.™ | | µSerDes™ | TruTranslation™ | |
| The Power Franchise® | | ScalarPump™ | UHC™ | |
| Programmable Active Droop™ | | | | |

### DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION, OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS. THESE SPECIFICATIONS DO NOT EXPAND THE TERMS OF FAIRCHILD'S WORLDWIDE TERMS AND CONDITIONS, SPECIFICALLY THE WARRANTY THEREIN, WHICH COVERS THESE PRODUCTS.

### LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.

As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the user.

2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

### PRODUCT STATUS DEFINITIONS

**Definition of Terms**

| Datasheet Identification | Product Status | Definition |
|---|---|---|
| Advance Information | Formative or In Design | This datasheet contains the design specifications for product development. Specifications may change in any manner without notice. |
| Preliminary | First Production | This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design. |
| No Identification Needed | Full Production | This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design. |
| Obsolete | Not In Production | This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only. |