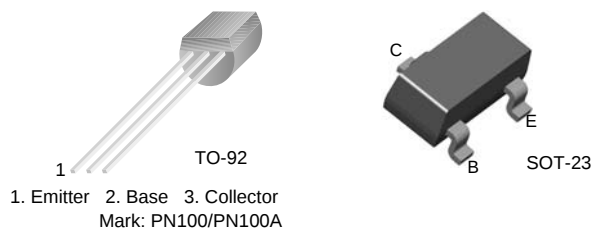


# PN100/PN100A/MMBT100/MMBT100A

## NPN General Purpose Amplifier

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



### Absolute Maximum Ratings\* $T_A = 25^\circ\text{C}$ unless otherwise noted

| Symbol         | Parameter                        | Ratings      | Units           |
|----------------|----------------------------------|--------------|-----------------|
| $V_{CEO}$      | Collector-Emitter Voltage        |              | 45              |
| $V_{CBO}$      | Collector-Base Voltage           |              | 75              |
| $V_{EBO}$      | Emitter-Base Voltage             |              | 6.0             |
| $I_C$          | Collector current                | - Continuous | 500             |
| $T_J, T_{stg}$ | Junction and Storage Temperature |              | $-55 \sim +150$ |

\* 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.

\* Pulse Test: Pulse Width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 2\%$

### Thermal Characteristics $T_A = 25^\circ\text{C}$ unless otherwise noted

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

\* Device mounted on FR-4 PCB  $1.6'' \times 1.6'' \times 0.06''$

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

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

\* Pulse Test: Pulse Width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 2.0\%$

## Typical Characteristics

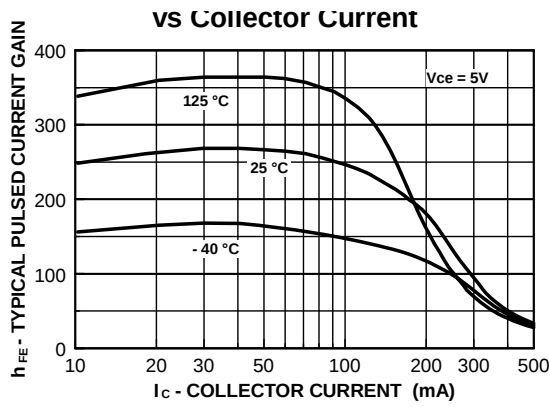


Figure 1. Typical Pulsed Current Gain vs Collector Current

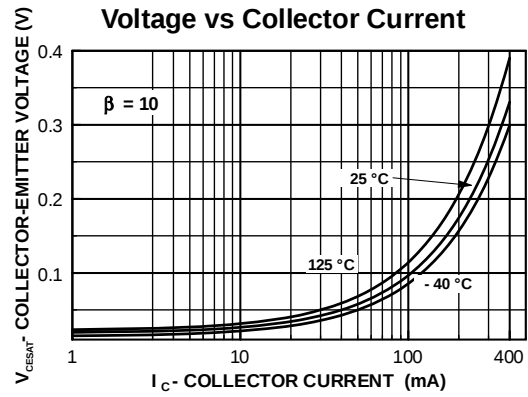


Figure 2. Collector-Emitter Saturation Voltage vs Collector Current

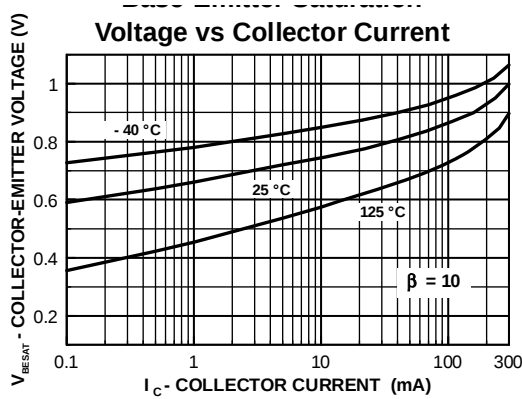


Figure 3. Base-Emitter Saturation Voltage vs Collector Current

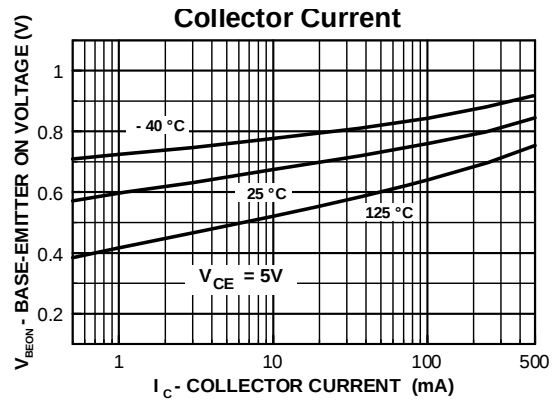


Figure 4. Base-Emitter On Voltage vs Collector Current

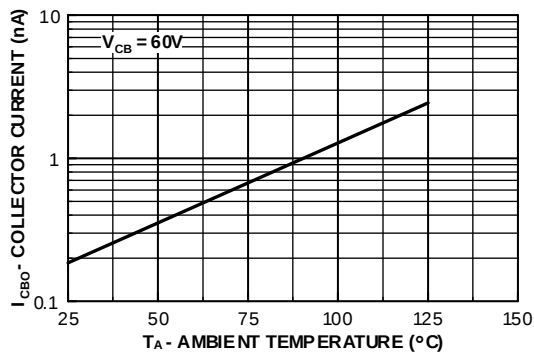


Figure 5. Collector Cutoff Current vs Ambient Temperature

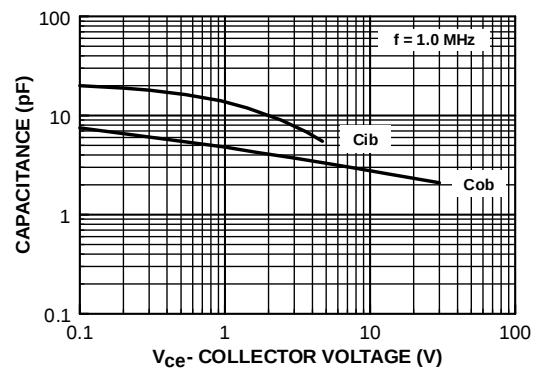


Figure 6. Input and Output Capacitance vs Reverse Voltage

## Typical Characteristics (Continued)

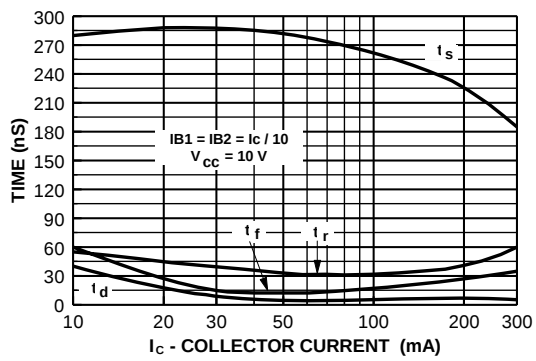


Figure 7. Switching Times vs Collector Current

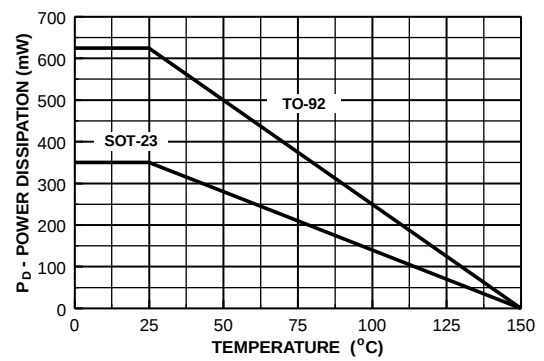
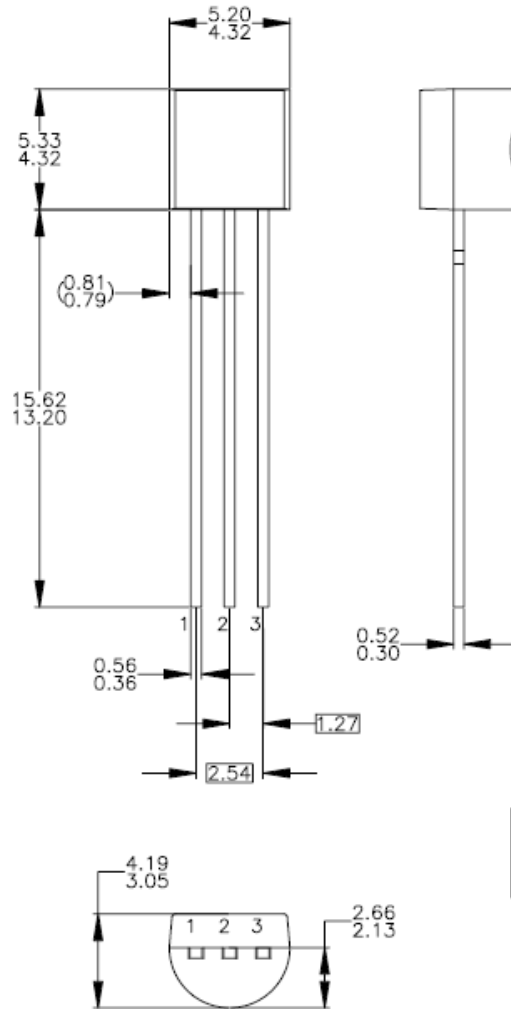


Figure 8. Power Dissipation vs Ambient Temperature

## Package Dimension (TO92)



NOTES: UNLESS OTHERWISE SPECIFIED

- A) DRAWING WITH REFERENCE TO JEDEC TO-92 RECOMMENDATIONS.
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DRAWING CONFORMS TO ASME Y14.5M-1994.
- D) TO-92 (92,94,96,97,98) PIN CONFIGURATION:

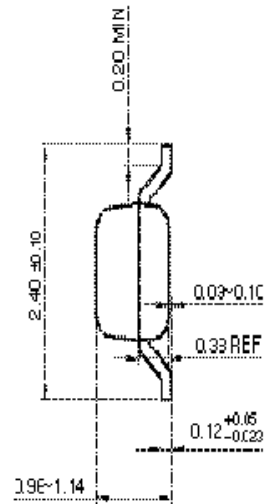
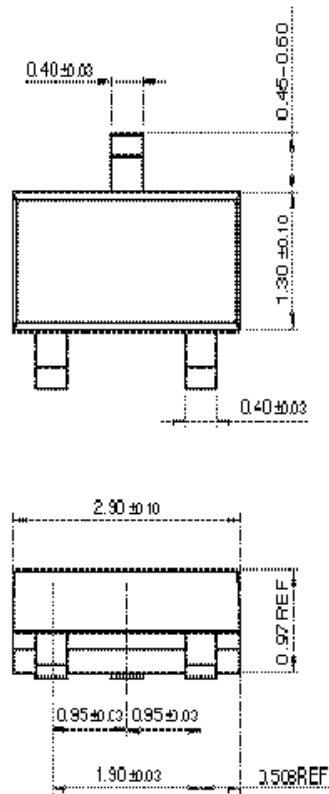
| PIN | 92    | 94    | 96    | 97    | 98    |
|-----|-------|-------|-------|-------|-------|
| 1   | E S S | E S S | B D G | C G D | C G D |
| 2   | B D G | C G D | E S S | B D G | E S S |
| 3   | C G D | B D G | C G D | E S S | B D G |

LEGEND:

P - BIPOLAR E - EMITTER D - DRAIN  
F - JFET B - BASE S - SOURCE  
M - DMOS C - COLLECTOR G - GATE

- E) FOR PACKAGE 92, 94, 96, 97 AND 98:  
PIN CONFIGURATION DRAIN "D" AND SOURCE "S"  
ARE INTERCHANGEABLE AT JFET "F" OPTION.
- F) DRAWING FILENAME: MKT-ZA030REV3.

## Package Dimension (SOT23)





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| Build it Now™                                                                     | Green FPS™ e-Series™                                                              | POWEREDGE®                 | SyncFET™                                                                            |
| CorePLUS™                                                                         | GTO™                                                                              | Power-SPM™                 | The Power Franchise®                                                                |
| CROSSVOLT™                                                                        | i-Lo™                                                                             | PowerTrench®               |  |
| CTL™                                                                              | IntelliMAX™                                                                       | Programmable Active Droop™ | TinyBoost™                                                                          |
| Current Transfer Logic™                                                           | ISOPANAR™                                                                         | QFET®                      | TinyBuck™                                                                           |
| EcoSPARK®                                                                         | MegaBuck™                                                                         | QS™                        | TinyLogic®                                                                          |
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| FastvCore™                                                                        | OPTOPLANAR®                                                                       | SuperFET™                  | UniFET™                                                                             |
| FPS™                                                                              |  | SuperSOT™-3                | VCX™                                                                                |
| FRFET®                                                                            | PDP-SPM™                                                                          | SuperSOT™-6                |                                                                                     |
| Global Power ResourceSM                                                           | Power220®                                                                         |                            |                                                                                     |

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