

## PN4122



### PNP General Purpose Amplifier

This device is designed for use as general purpose amplifiers and switches requiring collector currents to 100 mA. Sourced from Process 66. See 2N3906 for characteristics.

#### Absolute Maximum Ratings\*

TA = 25°C unless otherwise noted

| Symbol                            | Parameter                                        | Value       | Units |
|-----------------------------------|--------------------------------------------------|-------------|-------|
| V <sub>CEO</sub>                  | Collector-Emitter Voltage                        | 40          | V     |
| V <sub>CBO</sub>                  | Collector-Base Voltage                           | 40          | V     |
| V <sub>EBO</sub>                  | Emitter-Base Voltage                             | 5.0         | V     |
| I <sub>C</sub>                    | Collector Current - Continuous                   | 200         | mA    |
| T <sub>J</sub> , T <sub>stg</sub> | Operating and Storage Junction Temperature Range | -55 to +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.

#### Thermal Characteristics

TA = 25°C unless otherwise noted

| Symbol           | Characteristic                                | Max        | Units       |
|------------------|-----------------------------------------------|------------|-------------|
|                  |                                               | PN4122     |             |
| P <sub>D</sub>   | Total Device Dissipation<br>Derate above 25°C | 625<br>5.0 | mW<br>mW/°C |
| R <sub>θJC</sub> | Thermal Resistance, Junction to Case          | 83.3       | °C/W        |
| R <sub>θJA</sub> | Thermal Resistance, Junction to Ambient       | 200        | °C/W        |

# PNP General Purpose Amplifier

(continued)

PN4122

## Electrical Characteristics

TA = 25°C unless otherwise noted

| Symbol | Parameter | Test Conditions | Min | Max | Units |
|--------|-----------|-----------------|-----|-----|-------|
|--------|-----------|-----------------|-----|-----|-------|

### OFF CHARACTERISTICS

|               |                                      |                                                                                     |     |          |                     |
|---------------|--------------------------------------|-------------------------------------------------------------------------------------|-----|----------|---------------------|
| $V_{(BR)CEO}$ | Collector-Emitter Breakdown Voltage* | $I_C = 10 \text{ mA}, I_B = 0$                                                      | 40  |          | V                   |
| $V_{(BR)CBO}$ | Collector-Base Breakdown Voltage     | $I_C = 10 \text{ }\mu\text{A}, I_E = 0$                                             | 40  |          | V                   |
| $V_{(BR)EBO}$ | Emitter-Base Breakdown Voltage       | $I_E = 10 \text{ }\mu\text{A}, I_C = 0$                                             | 5.0 |          | V                   |
| $V_{(BR)CES}$ | Collector-Emitter Breakdown Voltage  | $I_C = 10 \text{ }\mu\text{A}$                                                      | 40  |          | nA                  |
| $I_B$         | Base Cutoff Current                  | $V_{CE} = 30 \text{ V}$                                                             |     | 25       | nA                  |
| $I_{CES}$     | Collector Cutoff Current             | $V_{CE} = 30 \text{ V}$<br>$V_{CE} = 30 \text{ V}, T_A = 65 \text{ }^\circ\text{C}$ |     | 25<br>25 | nA<br>$\mu\text{A}$ |

### ON CHARACTERISTICS\*

|               |                                      |                                                                                                                                                                                                             |                         |                      |             |
|---------------|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|----------------------|-------------|
| $h_{FE}$      | DC Current Gain                      | $V_{CE} = 1.0 \text{ V}, I_C = 100 \text{ }\mu\text{A}$<br>$V_{CE} = 1.0 \text{ V}, I_C = 1.0 \text{ mA}$<br>$V_{CE} = 1.0 \text{ V}, I_C = 10 \text{ mA}$<br>$V_{CE} = 1.0 \text{ V}, I_C = 50 \text{ mA}$ | 100<br>150<br>150<br>30 | 300                  |             |
| $V_{CE(sat)}$ | Collector-Emitter Saturation Voltage | $I_C = 1.0 \text{ mA}, I_B = 0.1 \text{ mA}$<br>$I_C = 10 \text{ mA}, I_B = 1.0 \text{ mA}$<br>$I_C = 50 \text{ mA}, I_B = 5.0 \text{ mA}$                                                                  |                         | 0.13<br>0.14<br>0.30 | V<br>V<br>V |
| $V_{BE(sat)}$ | Base-Emitter Saturation Voltage      | $I_C = 1.0 \text{ mA}, I_B = 0.1 \text{ mA}$<br>$I_C = 10 \text{ mA}, I_B = 1.0 \text{ mA}$<br>$I_C = 50 \text{ mA}, I_B = 5.0 \text{ mA}$                                                                  | 0.70                    | 0.75<br>0.90<br>1.10 | V<br>V<br>V |

### SMALL SIGNAL CHARACTERISTICS

|              |                              |                                                                                                                                                                                                                                                      |            |            |                  |
|--------------|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------------|------------------|
| $C_{ob}$     | Output Capacitance           | $V_{CB} = 10 \text{ V}, f = 1.0 \text{ MHz}$                                                                                                                                                                                                         |            | 4.5        | pF               |
| $C_{ib}$     | Input Capacitance            | $V_{EB} = 0.5 \text{ V}, f = 1.0 \text{ MHz}$                                                                                                                                                                                                        |            | 8.0        | pF               |
| $h_{fe}$     | Small-Signal Current Gain    | $I_C = 10 \text{ mA}, V_{CE} = 20 \text{ V},$<br>$f = 100 \text{ MHz}$<br>$I_C = 1.0 \text{ mA}, V_{CE} = 10 \text{ V},$<br>$f = 1 \text{ kHz}$                                                                                                      | 4.5<br>150 | 450        |                  |
| $h_{ie}$     | Input Impedance              | $I_C = 1.0 \text{ mA}, V_{CE} = 10 \text{ V},$<br>$f = 1.0 \text{ kHz}$                                                                                                                                                                              | 4.0        | 12         | k $\Omega$       |
| $h_{re}$     | Voltage Feedback Ratio       |                                                                                                                                                                                                                                                      |            | 4.0        | $\times 10^{-4}$ |
| $h_{oe}$     | Output Admittance            |                                                                                                                                                                                                                                                      | 8.0        | 40         | $\mu\text{mhos}$ |
| $\tau_b/C_c$ | Collector-Base Time Constant | $V_{CE} = 20 \text{ V}, I_C = 10 \text{ mA}$<br>$f = 80 \text{ MHz}$                                                                                                                                                                                 |            | 50         | ps               |
| NF           | Noise Figure                 | $V_{CE} = 5.0 \text{ V}, I_C = 1.0 \text{ mA},$<br>$R_S = 100 \text{ }\Omega, f = 100 \text{ MHz},$<br>$B_W = 15 \text{ MHz}$<br>$V_{CE} = 5.0 \text{ V}, I_C = 100 \text{ }\mu\text{A},$<br>$R_S = 1.0 \text{ k}\Omega, P_{B_W} = 15.7 \text{ kHz}$ |            | 6.0<br>4.0 | dB<br>dB         |

### SWITCHING CHARACTERISTICS

|           |               |                                                                                                         |  |     |    |
|-----------|---------------|---------------------------------------------------------------------------------------------------------|--|-----|----|
| $t_{on}$  | Turn-on Time  | $V_{CC} = 30 \text{ V}, I_C = 50 \text{ mA},$<br>$I_{B1} = 5.0 \text{ mA}, V_{BE(off)} = 3.0 \text{ V}$ |  | 40  | ns |
| $t_d$     | Delay Time    |                                                                                                         |  | 15  | ns |
| $t_r$     | Rise Time     |                                                                                                         |  | 40  | ns |
| $t_{off}$ | Turn-off Time | $V_{CC} = 30 \text{ V}, I_C = 50 \text{ mA}$<br>$I_{B1} = I_{B2} = 5.0 \text{ mA}$                      |  | 150 | ns |
| $t_s$     | Storage Time  |                                                                                                         |  | 140 | ns |
| $t_f$     | Fall Time     |                                                                                                         |  | 40  | ns |

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