PNP General Purpose Amplifier

This device is designed for general purpose amplifier and switching applications at collector currents of 10 µA to 100 mA.

**Absolute Maximum Ratings** $T_A = 25^\circ$C unless otherwise noted

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Value</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{CEO}$</td>
<td>Collector-Emitter Voltage</td>
<td>40</td>
<td>V</td>
</tr>
<tr>
<td>$V_{CBQ}$</td>
<td>Collector-Base Voltage</td>
<td>40</td>
<td>V</td>
</tr>
<tr>
<td>$V_{EBQ}$</td>
<td>Emitter-Base Voltage</td>
<td>5.0</td>
<td>V</td>
</tr>
<tr>
<td>$I_C$</td>
<td>Collector Current - Continuous</td>
<td>200</td>
<td>mA</td>
</tr>
<tr>
<td>$T_{Jr}, T_{stg}$</td>
<td>Operating and Storage Junction Temperature Range</td>
<td>-55 to +150</td>
<td>°C</td>
</tr>
</tbody>
</table>

*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.
3) All voltages (V) and currents (A) are negative polarity for PNP transistors.

**Thermal Characteristics** $T_A = 25^\circ$C unless otherwise noted

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Characteristic</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>$P_D$</td>
<td>Total Device Dissipation</td>
<td>625</td>
<td>mW</td>
</tr>
<tr>
<td></td>
<td>Derate above 25°C</td>
<td>5.0</td>
<td>mW/°C</td>
</tr>
<tr>
<td>$R_{JJC}$</td>
<td>Thermal Resistance, Junction to Case</td>
<td>83.3</td>
<td>°C/W</td>
</tr>
<tr>
<td>$R_{JJA}$</td>
<td>Thermal Resistance, Junction to Ambient</td>
<td>200</td>
<td>°C/W</td>
</tr>
</tbody>
</table>

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

**Device mounted on FR-4 PCB 36 mm X 18 mm X 1.5 mm; mounting pad for the collector lead min. 6 cm².
**Electrical Characteristics**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OFF CHARACTERISTICS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$V_{BR(CEO)}$</td>
<td>Collector-Emitter Breakdown Voltage*</td>
<td>$I_C = 1.0 \text{ mA}, I_B = 0$</td>
<td>40</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>$V_{BR(CBO)}$</td>
<td>Collector-Base Breakdown Voltage</td>
<td>$I_C = 10 \mu\text{A}, I_B = 0$</td>
<td>40</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>$V_{BR(EBO)}$</td>
<td>Emitter-Base Breakdown Voltage</td>
<td>$I_E = 10 \mu\text{A}, I_C = 0$</td>
<td>5.0</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>$I_{BL}$</td>
<td>Base Cutoff Current</td>
<td>$V_{CE} = 30 \text{ V}, V_{BE} = 3.0 \text{ V}$</td>
<td>50</td>
<td>nA</td>
<td></td>
</tr>
<tr>
<td>$I_{CEX}$</td>
<td>Collector Cutoff Current</td>
<td>$V_{CE} = 30 \text{ V}, V_{BE} = 3.0 \text{ V}$</td>
<td>50</td>
<td>nA</td>
<td></td>
</tr>
<tr>
<td><strong>ON CHARACTERISTICS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$h_{FE}$</td>
<td>DC Current Gain *</td>
<td>$I_C = 0.1 \text{ mA}, V_{CE} = 1.0 \text{ V}$</td>
<td>60</td>
<td>300</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_C = 1.0 \text{ mA}, V_{CE} = 1.0 \text{ V}$</td>
<td>80</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_C = 10 \text{ mA}, V_{CE} = 1.0 \text{ V}$</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_C = 50 \text{ mA}, V_{CE} = 1.0 \text{ V}$</td>
<td>60</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_C = 100 \text{ mA}, V_{CE} = 1.0 \text{ V}$</td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$V_{CE(sat)}$</td>
<td>Collector-Emitter Saturation Voltage</td>
<td>$I_C = 10 \text{ mA}, I_B = 1.0 \text{ mA}$</td>
<td>0.25</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_C = 50 \text{ mA}, I_B = 5.0 \text{ mA}$</td>
<td>0.4</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>$V_{BE(sat)}$</td>
<td>Base-Emitter Saturation Voltage</td>
<td>$I_C = 10 \text{ mA}, I_B = 1.0 \text{ mA}$</td>
<td>0.65</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_C = 50 \text{ mA}, I_B = 5.0 \text{ mA}$</td>
<td>0.85</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.95</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td><strong>SMALL SIGNAL CHARACTERISTICS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$f_T$</td>
<td>Current Gain - Bandwidth Product</td>
<td>$I_C = 10 \text{ mA}, V_{CE} = 20 \text{ V}$, $f = 100 \text{ MHz}$</td>
<td>250</td>
<td>MHz</td>
<td></td>
</tr>
<tr>
<td>$C_{obo}$</td>
<td>Output Capacitance</td>
<td>$V_{CE} = 5.0 \text{ V}, I_E = 0$, $f = 100 \text{ kHz}$</td>
<td>4.5</td>
<td>pF</td>
<td></td>
</tr>
<tr>
<td>$C_{obo}$</td>
<td>Input Capacitance</td>
<td>$V_{BE} = 0.5 \text{ V}, I_C = 0$, $f = 100 \text{ kHz}$</td>
<td>10.0</td>
<td>pF</td>
<td></td>
</tr>
<tr>
<td>$NF$</td>
<td>Noise Figure</td>
<td>$I_C = 100 \mu\text{A}, V_{CE} = 5.0 \text{ V}$, $R_S = 1.0k\Omega, f = 10 \text{ Hz to } 15.7 \text{ kHz}$</td>
<td>4.0</td>
<td>dB</td>
<td></td>
</tr>
<tr>
<td><strong>SWITCHING CHARACTERISTICS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$t_d$</td>
<td>Delay Time</td>
<td>$V_{CC} = 3.0 \text{ V}, V_{BE} = 0.5 \text{ V}$,</td>
<td>35</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>$t_r$</td>
<td>Rise Time</td>
<td>$I_C = 10 \text{ mA}, I_{B1} = 1.0 \text{ mA}$</td>
<td>35</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>$t_s$</td>
<td>Storage Time</td>
<td>$V_{CC} = 3.0 \text{ V}, I_C = 10\text{mA}$</td>
<td>225</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>$t_f$</td>
<td>Fall Time</td>
<td>$I_{B1} = I_{B2} = 1.0 \text{ mA}$</td>
<td>75</td>
<td>ns</td>
<td></td>
</tr>
</tbody>
</table>

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

**NOTE:** All voltages (V) and currents (A) are negative polarity for PNP transistors.

**Spice Model**

PNP (Is=1.41f Xii=3 Eg=1.11 Vaf=18.7 Bf=180.7 Ne=1.5 Ise=0 Ikf=80m Xlb=1.5 Br=4.977 Nc=2 Isc=0 Ikr=0 Rc=2.5 Cjc=9.728p Mjc=.5776 Vjc=.75 Fc=.5 Cje=8.063p Mje=.3677 Vje=.75 Tr=33.42n Tf=179.3p Itf=.4 Vtf=4 XIf=6 Rd=10)
Typical Characteristics

Typical Pulsed Current Gain vs Collector Current

Collector-Emitter Saturation Voltage vs Collector Current

Base-Emitter Saturation Voltage vs Collector Current

Base Emitter ON Voltage vs Collector Current

Collector-Cutoff Current vs Ambient Temperature

Common-Base Open Circuit Input and Output Capacitance vs Reverse Bias Voltage
Typical Characteristics (continued)

- **Noise Figure vs Frequency**
- **Noise Figure vs Source Resistance**
- **Switching Times vs Collector Current**
- **Turn On and Turn Off Times vs Collector Current**
- **Power Dissipation vs Ambient Temperature**
PNP General Purpose Amplifier

Typical Characteristics (continued)

Voltage Feedback Ratio

Input Impedance

Output Admittance

Current Gain

- Voltage Feedback Ratio
- Input Impedance
- Output Admittance
- Current Gain
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<th>Product Status</th>
<th>Definition</th>
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