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PNP RF Transistor

This device is designed for general RF amplifier and mixer applications to 250 mHz with collector currents in the 1.0 mA to 30 mA range. Sourced from Process 75.

Absolute Maximum Ratings*  \( TA = 25°C \) 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>20</td>
<td>V</td>
</tr>
<tr>
<td>( V_{CBO} )</td>
<td>Collector-Base Voltage</td>
<td>20</td>
<td>V</td>
</tr>
<tr>
<td>( V_{EBO} )</td>
<td>Emitter-Base Voltage</td>
<td>3.0</td>
<td>V</td>
</tr>
<tr>
<td>( I_C )</td>
<td>Collector Current - Continuous</td>
<td>50</td>
<td>mA</td>
</tr>
<tr>
<td>( T_J, 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  \( TA = 25°C \) 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>MPSH81 350</td>
<td>mW</td>
</tr>
<tr>
<td></td>
<td>Derate above 25°C</td>
<td>*MMBTH81 225</td>
<td>mW</td>
</tr>
<tr>
<td>( R_{JAC} )</td>
<td>Thermal Resistance, Junction to Case</td>
<td>125</td>
<td>°C/W</td>
</tr>
<tr>
<td>( R_{JAI} )</td>
<td>Thermal Resistance, Junction to Ambient</td>
<td>357</td>
<td>°C/W</td>
</tr>
</tbody>
</table>

*Device mounted on FR-4 PCB 1.6" X 1.6" X 0.06."
Electrical Characteristics  \[ TA = 25^\circ C \] unless otherwise noted

### OFF CHARACTERISTICS

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter Description</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>( V_{(BR)CEO} )</td>
<td>Collector-Emitter Breakdown Voltage* ( I_C = 1.0 , mA, I_B = 0 )</td>
<td>20</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( V_{(BR)CBO} )</td>
<td>Collector-Base Breakdown Voltage ( I_C = 10 , \mu A, I_E = 0 )</td>
<td>20</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( V_{(BR)EBO} )</td>
<td>Emitter-Base Breakdown Voltage ( I_E = 10 , \mu A, I_C = 0 )</td>
<td>3.0</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( I_{CEO} )</td>
<td>Collector Cutoff Current ( V_{CE} = 10 , V, I_E = 0 )</td>
<td>100</td>
<td>nA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( I_{EBO} )</td>
<td>Emitter Cutoff Current ( V_{EB} = 2.0 , V, I_C = 0 )</td>
<td>100</td>
<td>nA</td>
<td></td>
<td></td>
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</table>

### ON CHARACTERISTICS

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter Description</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>( h_{FE} )</td>
<td>DC Current Gain ( I_C = 5.0 , mA, V_{CE} = 10 , V )</td>
<td>60</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( V_{CESAT} )</td>
<td>Collector-Emitter Saturation Voltage ( I_C = 5.0 , mA, I_E = 0.5 , mA )</td>
<td>0.5</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( V_{BE(on)} )</td>
<td>Base-Emitter On Voltage ( I_C = 5.0 , mA, V_{CE} = 10 , V )</td>
<td>0.9</td>
<td>V</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### SMALL SIGNAL CHARACTERISTICS

<table>
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<tr>
<th>Symbol</th>
<th>Parameter Description</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>( f_T )</td>
<td>Current Gain - Bandwidth Product ( I_C = 5.0 , mA, V_{CE} = 10 , V, f = 100 , MHz )</td>
<td>600</td>
<td>MHz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( C_{CB} )</td>
<td>Collector-Base Capacitance ( V_{CB} = 10 , V, I_E = 0, f = 1.0 , MHz )</td>
<td>0.85</td>
<td>pF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( C_{CE} )</td>
<td>Collector Emitter Capacitance ( V_{CE} = 10 , V, I_B = 0, f = 1.0 , MHz )</td>
<td>0.65</td>
<td>pF</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Pulse Test: Pulse Width \( \leq 300 \, \mu s \), Duty Cycle \( \leq 2.0\% \)

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

**Spice Model**

\[ \text{PNP}(I_s=10f \, X_t=3 \, E_g=1.11 \, V_a=100 \, B_f=123.8 \, I_s=1.678 \, p \, N_e=2.159 \, N_k=-1658 \, N_k=901 \, X_{lb}=1.5 \, V_{ar}=100 \, B_r=1 \, I_s=9.519 \, N_c=0.18 \, I_{kr}=5.813 \, R_c=7.838 \, C_j=2.81 \, p \, M_j=1.615 \, V_j=8282 \, F_c=5 \, C_j=2.695 \, p \, M_j=3214 \, V_j=7026 \, T_r=11.32 \, F_t=97.83 \, I_f=69.29 \, X_f=599 \, V_{tf}=10) \]

**Typical Characteristics**

**DC Current Gain vs Collector Current**

**Collector Saturation Voltage vs Collector Current**
Typical Characteristics (continued)

Base-Emitter Saturation Voltage vs Collector Current

Base-Emitter ON Voltage vs Collector Current

Collector Reverse Current vs Ambient Temperature

Input / Output Capacitance vs Reverse Bias Voltage

Contours of Constant Gain Bandwidth Product ($f_t$)

Power Dissipation vs Ambient Temperature
TO-92 Tape and Reel Data

**TO-92 Packaging Configuration:** Figure 1.0

**TO-92 TNR/AMMO PACKING INFORMATION**

<table>
<thead>
<tr>
<th>Packing</th>
<th>Style</th>
<th>Quantity</th>
<th>EOL code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reel A</td>
<td>2,000</td>
<td>D362</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>2,000</td>
<td>D732</td>
<td></td>
</tr>
<tr>
<td>Ammo M</td>
<td>2,000</td>
<td>D742</td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>2,000</td>
<td>D752</td>
<td></td>
</tr>
</tbody>
</table>

Unit weight:
- Reel = 0.22 gm
- Ammo = 1.04 kg
- Max quantity per intermediate box = 10,000 units

**EOL CODE DESCRIPTION LEADCLIP DIMENSION QUANTITY**

- J18Z: TO-18 OPTION STD NO LEAD CLIP 2.0 K / BOX
- J55Z: TO-5 OPTION STD NO LEAD CLIP 1.5 K / BOX
- NO EOL CODE: TO-92 STANDARD STRAIGHT FOR: PKG 94 (NON PROELECTRON SERIES), M4 NO LEADCLIP 2.0 K / BOX
- L95Z: TO-92 STANDARD STRAIGHT FOR: PKG 94 PROELECTRON SERIES (BCXXX, BFXXX, BSRXXX), 94 NO LEADCLIP 2.0 K / BOX

**BULK OPTION**

See Bulk Packing Information table

**UNIT WEIGTH**
- Reel weight with components = 1.04 kg
- Ammo weight with components = 1.02 kg
- Max quantity per intermediate box = 10,000 units

**LOT:** CBVK741B019
**NSID:** PN2222N
**D/C1:** D9842
**SPEC REV:** B2
**SPEC:**
**QTY:** 10000

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March 2001, Rev. B1
TO-92 Reeling Style
Configuration: Figure 2.0

Machine Option “A” (H)
- Style “A”, D26Z, D70Z (s/h)
- First wire off is emitter
- Adhesive tape is on the top side
- Flat of transistor is on bottom

Machine Option “E” (J)
- Style “E”, D27Z, D71Z (s/h)
- First wire off is emitter
- Adhesive tape is on the top side
- Flat of transistor is on bottom

TO-92 Radial Ammo Packaging
Configuration: Figure 3.0

ORDER STYLE
D74Z (M)
- First wire off is emitter (on pkg. 92)
- Adhesive tape is on bottom side
- Flat of transistor is on bottom

ORDER STYLE
D75Z (P)
- First wire off is collector (on pkg. 92)
- Adhesive tape is on bottom side
- Flat of transistor is on top
TO-92 Tape and Reel Data, continued

TO-92 Tape and Reel Taping
Dimension Configuration: Figure 4.0

TO-92 Reel
Configuration: Figure 5.0

Note: All dimensions are in inches.

July 1999, Rev. A
TO-92 Package Dimensions

TO-92 (FS PKG Code 92, 94, 96)

Scale 1:1 on letter size paper
Dimensions shown below are in:
• inches [millimeters]

Part Weight per unit (gram): 0.1977

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SOT-23 Tape and Reel Data

SOT-23 Packaging
Configuration: Figure 10

Packaging Description:
SOT-23 parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Heat Activated Adhesive in nature) primarily composed of polyolefin film, adhesive layer, sealant, and anti-static sprayed agent. These reels of parts in standard option are shipped with 3,000 units per 7" or 177cm diameter reel. The reels are dark blue in color and made of polystyrene plastic anti-static coated. Other option comes in 10,000 units per 13" or 330cm diameter reel. This and some other options are described in the Packaging Information table.

These full reels are individually labeled and packed inside a standard intermediate made of recyclable corrugated brown paper with a Fairchild logo printing. One pizza box contains eight reels maximum. These intermediate boxes are placed inside a labeled shipping box which comes in different sizes depending on the number of parts shipped.

SOT-23 Unit Orientation
343mm x 342mm x 64mm Intermediate box for L87Z Option

Human Readable Label sample

SOT-23 Tape Leader and Trailer
Configuration: Figure 20

3P

Eleven Reel Tape
500mm minimum or 125 empty pockets

Components

SOT-23 Tape and Reel Data

<table>
<thead>
<tr>
<th>Packaging/Information</th>
<th>Standard</th>
<th>C87Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>Packaging Option</td>
<td>TNRI</td>
<td>TNRI</td>
</tr>
<tr>
<td>Qty per Reel/Tub/Bag</td>
<td>5000</td>
<td>10000</td>
</tr>
<tr>
<td>Reel Tape</td>
<td>7&quot; Dia.</td>
<td>13&quot;</td>
</tr>
<tr>
<td>Box Dimension (mm)</td>
<td>187x107x183</td>
<td>343x342x64</td>
</tr>
<tr>
<td>Max qty per Box</td>
<td>24,000</td>
<td>30,000</td>
</tr>
<tr>
<td>Weight per unit (gm)</td>
<td>0.0082</td>
<td>0.0082</td>
</tr>
<tr>
<td>Weight per Reel (kg)</td>
<td>0.1175</td>
<td>0.4006</td>
</tr>
</tbody>
</table>

Note/Comments
SOT-23 Tape and Reel Data, continued

SOT-23 Embossed Carrier Tape
Configuration: Figure 3.0

User Direction of Feed

<table>
<thead>
<tr>
<th>Pkg type</th>
<th>A0</th>
<th>B0</th>
<th>W</th>
<th>D0</th>
<th>D1</th>
<th>E1</th>
<th>E2</th>
<th>F</th>
<th>P1</th>
<th>P0</th>
<th>K0</th>
<th>T</th>
<th>Wc</th>
<th>Tc</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOT-23</td>
<td>1.15</td>
<td>2.27</td>
<td>1.55</td>
<td>1.75</td>
<td>6.25</td>
<td>3.50</td>
<td>4.0</td>
<td>4.0</td>
<td>1.35</td>
<td>0.238</td>
<td>6.2</td>
<td>3.5</td>
<td>+/-0.05</td>
<td></td>
</tr>
<tr>
<td>(8mm)</td>
<td>+/-0.10</td>
<td>+/-0.10</td>
<td>+/-0.05</td>
<td>+/-0.10</td>
<td>6.25</td>
<td>3.50</td>
<td>4.0</td>
<td>4.0</td>
<td>1.35</td>
<td>0.238</td>
<td>6.2</td>
<td>3.5</td>
<td>+/-0.05</td>
<td></td>
</tr>
</tbody>
</table>

Notes: A0, B0, and K0 dimensions are determined with respect to the EIA/Jedec RS-481 rotational and lateral movement requirements (see sketches A, B, and C).

W3 max Measured at Hub

SOT-23 Reel Configuration: Figure 4.0

Dimensions are in millimeter

<table>
<thead>
<tr>
<th>Tape Size</th>
<th>Dim A</th>
<th>Dim B</th>
<th>Dim C</th>
<th>Dim D</th>
<th>Dim N</th>
<th>Dim W1</th>
<th>Dim W2</th>
<th>Dim W3 (LSL-USL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8mm 7&quot; Dia</td>
<td>7.00</td>
<td>0.059</td>
<td>0.032</td>
<td>0.795</td>
<td>2.165</td>
<td>0.331</td>
<td>0.331</td>
<td>0.311 – 0.429</td>
</tr>
<tr>
<td>8mm 13&quot; Dia</td>
<td>13.00</td>
<td>0.059</td>
<td>0.032</td>
<td>0.795</td>
<td>4.00</td>
<td>0.331</td>
<td>0.331</td>
<td>0.311 – 0.429</td>
</tr>
</tbody>
</table>

See detail AA

Dimensions are in inches and millimeters

Tape Size | Reel Diameter | Dim A | Dim B | Dim C | Dim D | Dim N | Dim W1 | Dim W2 | Dim W3 (LSL-USL) |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
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<tbody>
<tr>
<td>8mm 7&quot; Dia</td>
<td>7.00</td>
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<td>0.331</td>
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<td></td>
</tr>
<tr>
<td>8mm 13&quot; Dia</td>
<td>13.00</td>
<td>0.059</td>
<td>0.032</td>
<td>0.795</td>
<td>4.00</td>
<td>0.331</td>
<td>0.331</td>
<td>0.311 – 0.429</td>
<td></td>
</tr>
</tbody>
</table>

September 1999, Rev. C
SOT-23 (FS PKG Code 49)

Scale 1:1 on letter size paper
Dimensions shown below are in:
inches [millimeters]

Part Weight per unit (gram): 0.0082

NOTE: UNLESS OTHERWISE SPECIFIED
1. STANDARD LEAD FINISH: 150 MICRONINCHES / 3.81 MICROMETERS
   MINIMUM TiN / LEAD (GOLD) ON ALLOY 42
2. REFERENCE: JEDEC REGISTRATION TO-236, VARIATION AB, ISSUE C, DATED JUL 1993
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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

<table>
<thead>
<tr>
<th>Datasheet Identification</th>
<th>Product Status</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advance Information</td>
<td>Formative or In Design</td>
<td>This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.</td>
</tr>
<tr>
<td>Preliminary</td>
<td>First Production</td>
<td>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 in order to improve design.</td>
</tr>
<tr>
<td>No Identification Needed</td>
<td>Full Production</td>
<td>This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.</td>
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<tr>
<td>Obsolete</td>
<td>Not In Production</td>
<td>This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.</td>
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