NPN General Purpose Amplifier

This device is designed as a general purpose amplifier and switch. The useful dynamic range extends to 100 mA as a switch and to 100 MHz as an amplifier.

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_{CBO} )</td>
<td>Collector-Base Voltage</td>
<td>60</td>
<td>V</td>
</tr>
<tr>
<td>( V_{EBO} )</td>
<td>Emitter-Base Voltage</td>
<td>6.0</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_{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.

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>°C/W</td>
</tr>
<tr>
<td>( R_{JUC} )</td>
<td>Thermal Resistance, Junction to Case</td>
<td>83.3</td>
<td>°C/W</td>
</tr>
<tr>
<td>( R_{JUA} )</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>$V_{BRCEO}$</td>
<td>Collector-Emitter Breakdown Voltage</td>
<td>$I_C = 1.0 \ mA, I_B = 0$</td>
<td>40</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>$V_{BRCBO}$</td>
<td>Collector-Base Breakdown Voltage</td>
<td>$I_C = 10 \ \mu A, I_E = 0$</td>
<td>60</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>$V_{BREBO}$</td>
<td>Emitter-Base Breakdown Voltage</td>
<td>$I_E = 10 \ \mu A, I_C = 0$</td>
<td>6.0</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>$I_{BL}$</td>
<td>Base Cutoff Current</td>
<td>$V_{CE} = 30 \ V, V_{EB} = 3V$</td>
<td>50</td>
<td></td>
<td>nA</td>
</tr>
<tr>
<td>$I_{CEX}$</td>
<td>Collector Cutoff Current</td>
<td>$V_{CE} = 30 \ V, V_{EB} = 3V$</td>
<td>50</td>
<td></td>
<td>nA</td>
</tr>
</tbody>
</table>

#### OFF CHARACTERISTICS

#### ON CHARACTERISTICS*

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>$h_{FE}$</td>
<td>DC Current Gain</td>
<td>$I_C = 0.1 \ mA, V_{CE} = 1.0 \ V$</td>
<td>40</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_C = 1.0 \ mA, V_{CE} = 1.0 \ V$</td>
<td>70</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_C = 10 \ mA, V_{CE} = 1.0 \ V$</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_C = 100 \ mA, V_{CE} = 1.0 \ V$</td>
<td>60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$V_{CE(sat)}$</td>
<td>Collector-Emitter Saturation Voltage</td>
<td>$I_C = 10 \ mA, I_B = 1.0 \ mA$</td>
<td>0.2</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_C = 50 \ mA, I_B = 5.0 \ mA$</td>
<td>0.3</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>$V_{BE(sat)}$</td>
<td>Base-Emitter Saturation Voltage</td>
<td>$I_C = 10 \ mA, I_B = 1.0 \ mA$</td>
<td>0.65</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_C = 50 \ mA, I_B = 5.0 \ mA$</td>
<td>0.85</td>
<td></td>
<td>V</td>
</tr>
</tbody>
</table>

#### SMALL SIGNAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>$f_T$</td>
<td>Current Gain - Bandwidth Product</td>
<td>$I_C = 10 \ mA, V_{CE} = 20 \ V, f = 100 \ MHz$</td>
<td>300</td>
<td></td>
<td>MHz</td>
</tr>
<tr>
<td>$C_{obo}$</td>
<td>Output Capacitance</td>
<td>$V_{CE} = 5.0 \ V, I_E = 0, f = 1.0 \ MHz$</td>
<td>4.0</td>
<td></td>
<td>pF</td>
</tr>
<tr>
<td>$C_{rbo}$</td>
<td>Input Capacitance</td>
<td>$V_{CE} = 5.0 \ V, I_C = 0, f = 1.0 \ MHz$</td>
<td>8.0</td>
<td></td>
<td>pF</td>
</tr>
<tr>
<td>NF</td>
<td>Noise Figure</td>
<td>$I_C = 100 \ \mu A, V_{CE} = 5.0 \ V, R_B = 1.0k \Omega, f = 10 \ Hz$ to $15.7kHz$</td>
<td>5.0</td>
<td></td>
<td>dB</td>
</tr>
</tbody>
</table>

#### SWITCHING CHARACTERISTICS

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>$t_d$</td>
<td>Delay Time</td>
<td>$V_{CC} = 3.0 \ V, V_{BE} = 0.5 \ V, V_{CE} = 1.0 \ V$</td>
<td>35</td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td>$t_r$</td>
<td>Rise Time</td>
<td>$I_C = 10 \ mA, I_{BS} = 1.0 \ mA$</td>
<td>35</td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td>$t_s$</td>
<td>Storage Time</td>
<td>$V_{CC} = 3.0 \ V, I_C = 10mA$</td>
<td>200</td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td>$t_f$</td>
<td>Fall Time</td>
<td>$I_{BS} = I_{BE} = 1.0 \ mA$</td>
<td>50</td>
<td></td>
<td>ns</td>
</tr>
</tbody>
</table>

*Pulse Test: Pulse Width ≤ 300 \mu s, Duty Cycle ≤ 2.0%*

### Spice Model

NPN (Is=6.734f Xti=3 Eg=1.11 Vaf=74.03 Bf=416.4 Ne=1.259 Isin=6.734 Isin=66.78m Xtb=1.5 Br=7.371 Nc=2 Isc=0 Ikr=0 Re=1 Cjc=3.638p Mjc=.3085 Vjc=.75 Fc=.5 Cje=4.493p Mje=.2593 Vje=.75 Tr=239.5n Tf=301.2p Itf=.4 Vtf=4 Xtf=2 Rb=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-Emmiter ON Voltage vs Collector Current**

**Collector-Cutoff Current vs Ambient Temperature**

**Capacitance vs Reverse Bias Voltage**
Typical Characteristics (continued)

- Noise Figure vs Frequency
- Noise Figure vs Source Resistance
- Current Gain and Phase Angle vs Frequency
- Power Dissipation vs Ambient Temperature
- Turn-On Time vs Collector Current
- Rise Time vs Collector Current

Diagram showing various characteristics of an NPN General Purpose Amplifier, including noise figure, current gain, power dissipation, turn-on time, and rise time. The diagrams cover frequency, source resistance, and collector current for different temperature conditions.
Typical Characteristics (continued)

Storage Time vs Collector Current

Fall Time vs Collector Current

Current Gain

Output Admittance

Input Impedance

Voltage Feedback Ratio
Test Circuits

FIGURE 1: Delay and Rise Time Equivalent Test Circuit

FIGURE 2: Storage and Fall Time Equivalent Test Circuit
TO-92 Tape and Reel Data

TO-92 Packaging
Configuration: Figure 1.0

TO-92 Tape and Reel Data

TAPE and REEL OPTION
See Fig 2.0 for various Reeling Styles

AMMO PACK OPTION
See Fig 3.0 for 2 Ammo Pack Options

BULK OPTION
See Bulk Packing Information table

(EO70) BULK PACKING INFORMATION

<table>
<thead>
<tr>
<th>EOL CODE</th>
<th>DESCRIPTION</th>
<th>LEADCLIP</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>J18Z</td>
<td>TO-18 OPTION STD</td>
<td>NO LEAD CLIP</td>
<td>2.0 K / BOX</td>
</tr>
<tr>
<td>J55Z</td>
<td>TO-5 OPTION STD</td>
<td>NO LEAD CLIP</td>
<td>1.5 K / BOX</td>
</tr>
<tr>
<td>NO EOL</td>
<td>TO-92 STANDARD STRAIGHT FOR: PKG 92, 94 (NON PROELECTRON SERIES), 96</td>
<td>NO LEAD CLIP</td>
<td>2.0 K / BOX</td>
</tr>
<tr>
<td>L34Z</td>
<td>TO-92 STANDARD STRAIGHT FOR: PKG 94 (PROELECTRON SERIES) BXXX, BFXXX, BSXXX, BT, BB</td>
<td>NO LEAD CLIP</td>
<td>2.0 K / BOX</td>
</tr>
</tbody>
</table>

BULK OPTION
See Bulk Packing Information table

5 EO70 boxes per intermediate box

TO-92 Tape and Reel Data
TO-92 Tape and Reel Data, continued

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

ORDER STYLE
D75Z (P)

Machine Option “E” (J)
Style “E”, D27Z, D71Z (s/h)

FIRST WIRE OFF IS COLLECTOR
ADHESIVE TAPE IS ON THE TOP SIDE
FLAT OF TRANSISTOR IS ON TOP

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

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

User Direction of Feed

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
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 polyester film, adhesive layer, sealant, and anti-static sprayed agent). These rolled 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 options come 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 placed inside a standard intermediate made of recyclable corrugated brown paper with a Fairchild logo printing. One pizza box contains eight reels maximum. And these intermediate boxes are placed inside a labeled shipping box which comes in different sizes depending on the number of parts shipped.

---

### SOT-23 Packaging Information

<table>
<thead>
<tr>
<th>Packaging Option</th>
<th>Standard</th>
<th>D87Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>Packaging type</td>
<td>TN1</td>
<td>TN1</td>
</tr>
<tr>
<td>Qty per Reel/Tub/Bag</td>
<td>3,000</td>
<td>10,000</td>
</tr>
<tr>
<td>Reel Diameter (mm)</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>0.175</td>
<td>0.486</td>
</tr>
</tbody>
</table>

**Note/Comments**

---

**SOT-23 Unit Orientation**

343mm x 342mm x 64mm
Intermediate box for L87Z Option

187mm x 107mm x 183mm
Intermediate Box for Standard Option

---

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September 1999, Rev. C
SOT-23 Tape and Reel Data, continued

SOT-23 Embossed Carrier Tape
Configuration: Figure 3.0

Dimensions are in millimeter

<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>0.15</td>
<td>2.77</td>
<td>8.0</td>
<td>1.55</td>
<td>1.125</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>3.5</td>
<td>0.96</td>
</tr>
<tr>
<td>(8mm)</td>
<td>+/-0.10</td>
<td>+/-0.10</td>
<td>+/-0.3</td>
<td>+/-0.05</td>
<td>+/-0.125</td>
<td>+/-0.10</td>
<td>min</td>
<td>+/-0.05</td>
<td>+/-0.1</td>
<td>+/-0.1</td>
<td>+/-0.10</td>
<td>+/-0.013</td>
<td>+/-0.3</td>
<td>+/-0.02</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).

20 deg maximum component rotation

Sketch A (Side or Front Sectional View)
Component Rotation

Sketch B (Top View)
Component Rotation

SOT-23 Reel Configuration: Figure 4.0

Dimensions are in inches and millimeters

<table>
<thead>
<tr>
<th>Tape Size</th>
<th>Reel Option</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</td>
<td>7” Dia</td>
<td>0.039</td>
<td>0.09</td>
<td>0.039+0.020-0.008</td>
<td>0.795</td>
<td>2.165</td>
<td>0.331+0.059-0.000</td>
<td>0.567</td>
<td>0.311 – 0.429</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.75</td>
<td>1.5</td>
<td>13 +/-0.5/0.2</td>
<td>30.2</td>
<td>56</td>
<td>14.4</td>
<td>14.4</td>
<td>7.9 – 10.9</td>
</tr>
<tr>
<td>8mm</td>
<td>13” Dia</td>
<td>0.039</td>
<td>0.09</td>
<td>0.039+0.020-0.008</td>
<td>0.795</td>
<td>4.0</td>
<td>0.331+0.059-0.000</td>
<td>0.567</td>
<td>0.311 – 0.429</td>
</tr>
<tr>
<td></td>
<td></td>
<td>330</td>
<td>1.5</td>
<td>13 +/-0.5/0.2</td>
<td>30.2</td>
<td>100</td>
<td>14.4</td>
<td>14.4</td>
<td>7.9 – 10.9</td>
</tr>
</tbody>
</table>

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

Part Weight per unit (gram): 0.0082

Dimensions shown below are in:

- Inches [millimeters]

Scale 1:1 on letter size paper

NOTE: UNLESS OTHERWISE SPECIFIED
1. STANDARD LEAD FINISH: 150 MICRON INCHES / 3.81 MICROMETERS
   MINIMUM TIN / LEAD (SOLDER) ON ALLOY 42
2. REFERENCE JEDEC REGISTRATION TO-236, VARIATION A9, ISSUE D, DATED JUL 1993
**SOT-223 Tape and Reel Data**

### SOT-223 Packaging Configuration: Figure 1.0

- **Carrier Tape**
- **Antistatic Cover Tape**
- **Static Dissipative Embossed Carrier Tape**
- **Customized Label**

**SOT-223 Tape Leader and Trailer Configuration: Figure 2.0**

- **Leader Tape**
  - 300mm minimum or 38 empty pockets
- **Trailer Tape**
  - 300mm minimum or 38 empty pockets

### Packaging Description:

SOT-223 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 polymer film, adhesive layer, wax, and an antistatic spray agent. These nested parts in standard option are shipped with 2,500 units per 13" or 330mm diameter reel. The reels are dark blue in color and are made of polystyrene plastic (antistatic coated). Other option comes in 500 units per 7" or 177mm diameter reel. This and some other options are further described in the Packaging Information table. These full reels are individually barcode labeled and placed inside a standard intermediate box (illustrated in Figure 1.0) made of recyclable corrugated brown paper. One box contains two reels maximum. And these boxes are placed inside a barcode labeled shipping box which comes in different sizes depending on the number of parts shipped.

### Packaging Option

- **SOT-223 Packaging Information**
  - **Packaging Option**
  - **Part Number (no flow code)**
  - **Reel Size**
  - **Weight per Reel**
  - **Weight per Reel (kg)**
  - **Box Dimensions**
  - **Max Qty per box**
  - **Weight per unit**

- **SOT-223 Unit Orientation**
  - **F63TNR Label**
  - **Intermediate box for Standard**
  - **Pizza box for D84Z Option**

- **F63TNR Label**
  - **LOT: CBVK741B019**
  - **FSID: PN2222A**

### September 1999, Rev. B

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### SOT-223 Tape and Reel Data, continued

#### SOT-223 Embossed Carrier Tape
Configuration: Figure 3.0

<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-223 (12mm)</td>
<td>6.83</td>
<td>7.42</td>
<td>12.0</td>
<td>1.55</td>
<td>1.75</td>
<td>10.25</td>
<td>5.50</td>
<td>9.0</td>
<td>4.0</td>
<td>1.88</td>
<td>0.292</td>
<td>5.50</td>
<td>+/-.025</td>
<td>+/-.025</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).

#### SOT-223 Reel Configuration: Figure 4.0

<table>
<thead>
<tr>
<th>Tape Size</th>
<th>Reel Option</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>12mm</td>
<td>7&quot; Dia</td>
<td>7.00</td>
<td>0.059</td>
<td>512</td>
<td>0.795</td>
<td>5.906</td>
<td>0.488</td>
<td>0.292</td>
<td>5.50 – 0.025</td>
</tr>
<tr>
<td></td>
<td>13&quot; Dia</td>
<td>13.00</td>
<td>0.059</td>
<td>512</td>
<td>0.795</td>
<td>5.906</td>
<td>0.488</td>
<td>0.292</td>
<td>11.9 – 15.4</td>
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July 1999, Rev. B
SOT-223 (FS PKG Code 47)

Part Weight per unit (gram): 0.1246

NOTES:
1. STANDARD LEAD FINISH TO BE 150 MICROINCHES/3.81 MICROMETERS
   MINIMUM Ti/LEAD (SOLDER) ON COPPER
2. REFERENCE JEDEC REGISTRATION TO-261, VARIATION AA, ISSUE A, DATED JAN 1990

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September 1999, Rev. C
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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

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<thead>
<tr>
<th>Datasheet Identification</th>
<th>Product Status</th>
<th>Definition</th>
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<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>
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<tr>
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<td>First Production</td>
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