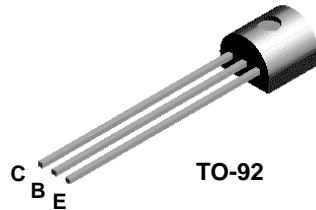
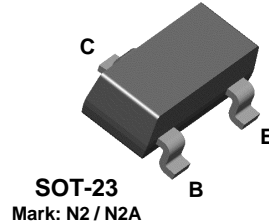


**PN200
PN200A**



**MMBT200
MMBT200A**



PNP General Purpose Amplifier

This device is designed for general purpose amplifier applications at collector currents to 300 mA. Sourced from Process 68.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

| Symbol | Parameter | Value | Units |
|-----------------------------------|--|-------------|-------|
| V _{CEO} | Collector-Emitter Voltage | 45 | V |
| V _{CB0} | Collector-Base Voltage | 60 | V |
| V _{EBO} | Emitter-Base Voltage | 6.0 | V |
| I _C | Collector Current - Continuous | 500 | mA |
| T _J , T _{stg} | 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.
- 3) All voltages (V) and currents (A) are negative polarity for PNP transistors.

Thermal Characteristics

TA = 25°C unless otherwise noted

| Symbol | Characteristic | Max | | Units |
|------------------|---|-----------------|-----------------------|-------|
| | | PN200 PN200A | *MMBT200 *MMBT200A | |
| P _D | Total Device Dissipation Derate above 25°C | 625 | 350 | mW |
| | | 5.0 | 2.8 | mW/°C |
| R _{θJC} | Thermal Resistance, Junction to Case | 83.3 | | °C/W |
| R _{θJA} | Thermal Resistance, Junction to Ambient | 200 | 357 | °C/W |

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

PNP General Purpose Amplifier

(continued)

Electrical Characteristics

TA = 25°C unless otherwise noted

| Symbol | Parameter | Test Conditions | Min | Max | Units |
|----------------------------|--------------------------------------|-----------------------------------|-----|-----|-------|
| OFF CHARACTERISTICS | | | | | |
| BV_{CBO} | Collector-Base Breakdown Voltage | $I_C = 10 \mu A, I_B = 0$ | 60 | | V |
| BV_{CEO} | Collector-Emitter Breakdown Voltage* | $I_C = 1.0 \text{ mA}, I_E = 0$ | 45 | | V |
| BV_{EBO} | Emitter-Base Breakdown Voltage | $I_E = 10 \mu A, I_C = 0$ | 6.0 | | V |
| I_{CBO} | Collector Cutoff Current | $V_{CB} = 50 \text{ V}, I_E = 0$ | | 50 | nA |
| I_{CES} | Collector Cutoff Current | $V_{CE} = 40 \text{ V}, I_E = 10$ | | 50 | nA |
| I_{EBO} | Emitter Cutoff Current | $V_{EB} = 4.0 \text{ V}, I_C = 0$ | | 50 | nA |

ON CHARACTERISTICS

| | | | | | | |
|---------------|--------------------------------------|--|-------------|------|-----|--|
| h_{FE} | DC Current Gain | $I_C = 100 \mu A, V_{CE} = 1.0 \text{ V}$ | 200 | 80 | | |
| | | | 200A | 240 | | |
| | | $I_C = 10 \text{ mA}, V_{CE} = 1.0 \text{ V}$ | 200 | 100 | 450 | |
| | | | 200A | 300 | 600 | |
| | | $I_C = 100 \text{ mA}, V_{CE} = 1.0 \text{ V}^*$ | 200A | 100 | | |
| | | $I_C = 150 \text{ mA}, V_{CE} = 5.0 \text{ V}^*$ | 200 | 100 | 350 | |
| | | | 200A | 100 | | |
| $V_{CE(sat)}$ | Collector-Emitter Saturation Voltage | $I_C = 10 \text{ mA}, I_B = 1.0 \text{ mA}$ | | 0.2 | V | |
| | | $I_C = 200 \text{ mA}, I_B = 20 \text{ mA}^*$ | | 0.4 | V | |
| $V_{BE(sat)}$ | Base-Emitter Saturation Voltage | $I_C = 10 \text{ mA}, I_B = 1.0 \text{ mA}$ | | 0.85 | V | |
| | | $I_C = 200 \text{ mA}, I_B = 20 \text{ mA}^*$ | | 1.0 | V | |

SMALL SIGNAL CHARACTERISTICS

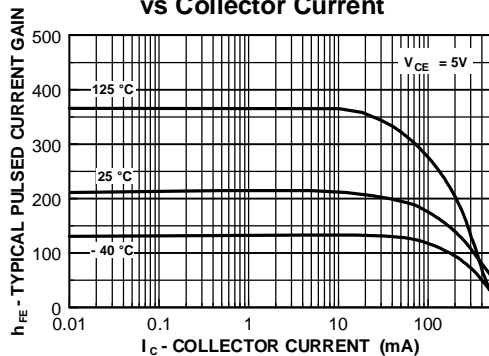
| | | | | | |
|-----------|----------------------------------|--|-----|-----|-----|
| f_r | Current Gain - Bandwidth Product | $V_{CE} = 20 \text{ V}, I_C = 20 \text{ mA}$ | 250 | | MHz |
| C_{obo} | Output Capacitance | $V_{CB} = 10 \text{ V}, f = 1.0 \text{ MHz}$ | | 6.0 | pF |
| NF | Noise Figure | $I_C = 100 \mu A, V_{CE} = 5.0 \text{ V},$ $R_G = 2.0 \text{ k}\Omega, f = 1.0 \text{ kHz}$ | | | dB |
| | | | | 4.0 | dB |

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

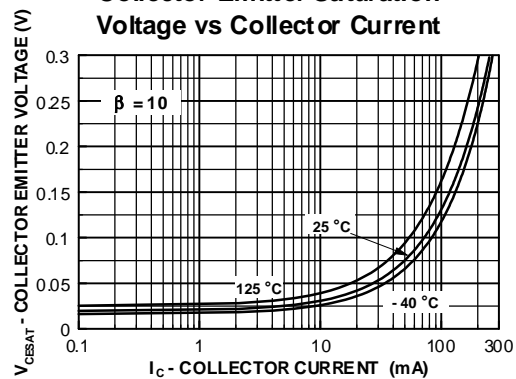
NOTE: All voltages (V) and currents (A) are negative polarity for PNP transistors.

Typical Characteristics

Typical Pulsed Current Gain vs Collector Current



Collector-Emitter Saturation Voltage vs Collector Current



PN200 / MMBT200 / PN200A / MMBT200A

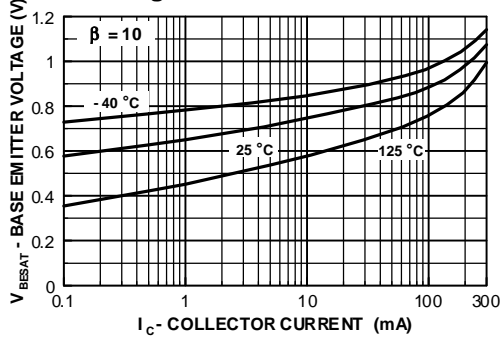
PNP General Purpose Amplifier

(continued)

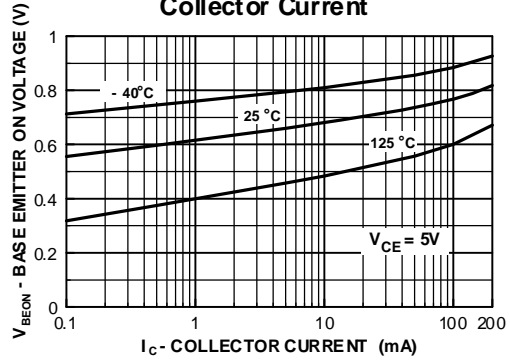
PN200 / MMBT200 / PN200A / MMBT200A

Typical Characteristics (continued)

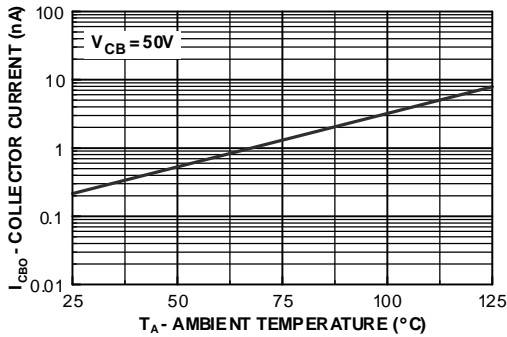
Base-Emitter Saturation Voltage vs Collector Current



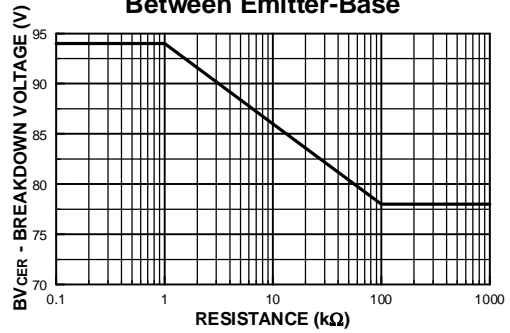
Base Emitter ON Voltage vs Collector Current



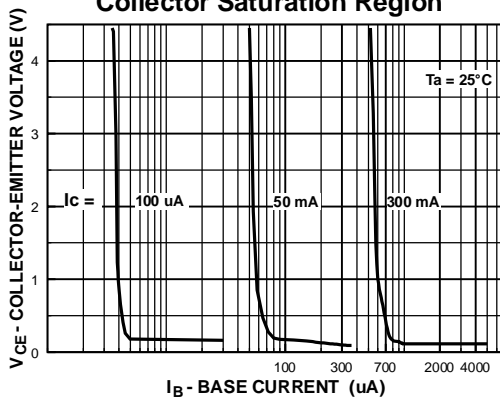
Collector-Cutoff Current vs Ambient Temperature



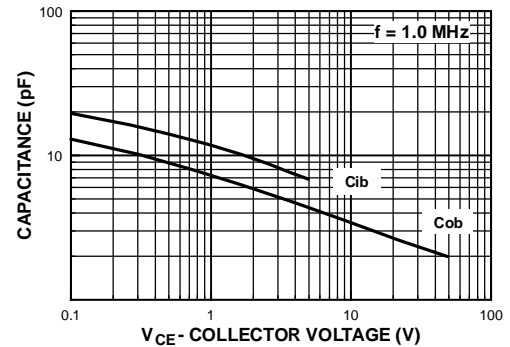
Collector-Emitter Breakdown Voltage with Resistance Between Emitter-Base



Collector Saturation Region



Input and Output Capacitance vs Reverse Voltage

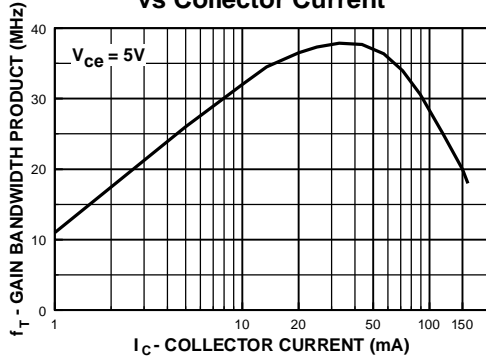


PNP General Purpose Amplifier

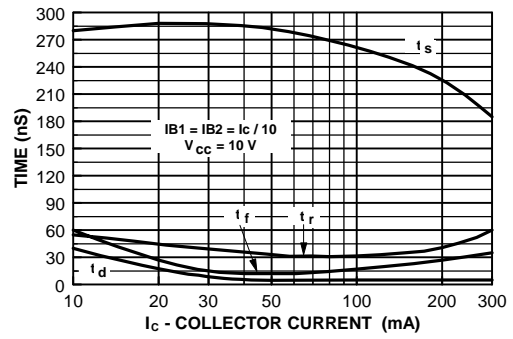
(continued)

Typical Characteristics (continued)

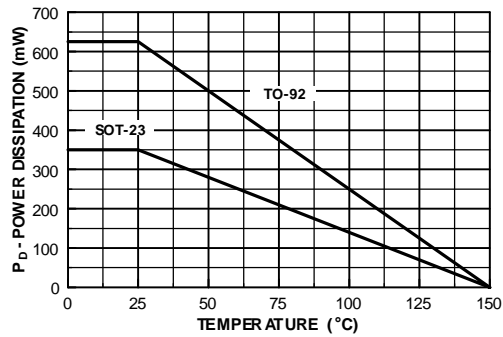
Gain Bandwidth Product vs Collector Current



Switching Times vs Collector Current



Power Dissipation vs Ambient Temperature



PN200 / MMBT200 / PN200A / MMBT200A

TO-92 Tape and Reel Data



TO-92 Packaging Configuration: Figure 1.0

FSCINT Label sample



F63TNR Label sample



TO-92 TNR/AMMO PACKING INFORMATION

| Packing | Style | Quantity | EOL code |
|---------|-------|----------|----------|
| Reel | A | 2,000 | D26Z |
| | E | 2,000 | D27Z |
| Ammo | M | 2,000 | D74Z |
| | P | 2,000 | D75Z |

Unit weight = 0.22 gm
 Reel weight with components = 1.04 kg
 Ammo weight with components = 1.02 kg
 Max quantity per intermediate box = 10,000 units

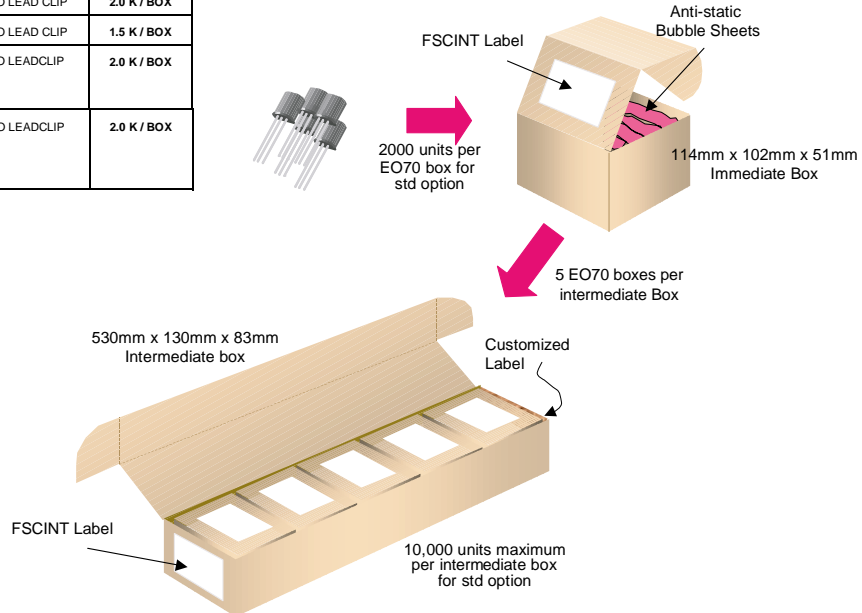


(TO-92) BULK PACKING INFORMATION

| EOL CODE | DESCRIPTION | LEADCLIP DIMENSION | QUANTITY |
|-------------|---|--------------------|-------------|
| J18Z | TO-18 OPTION STD | NO LEAD CLIP | 2.0 K / BOX |
| J05Z | TO-5 OPTION STD | NO LEAD CLIP | 1.5 K / BOX |
| NO EOL CODE | TO-92 STANDARD STRAIGHT FOR: PKG 92, 94 (NON PROELECTRON SERIES), 96 | NO LEADCLIP | 2.0 K / BOX |
| L34Z | TO-92 STANDARD STRAIGHT FOR: PKG 94 (PROELECTRON SERIES BCXXX, BFXXX, BSRXXX), 97, 98 | NO LEADCLIP | 2.0 K / BOX |

BULK OPTION

See Bulk Packing Information table



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)

Machine Option "E" (J)

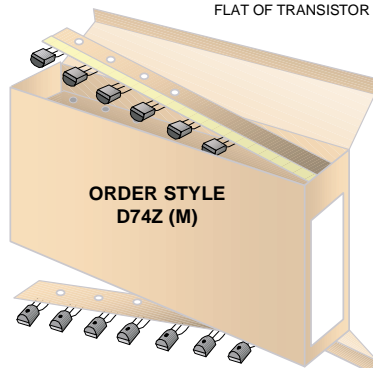


Style "E", D27Z, D71Z (s/h)

TO-92 Radial Ammo Packaging

Configuration: Figure 3.0

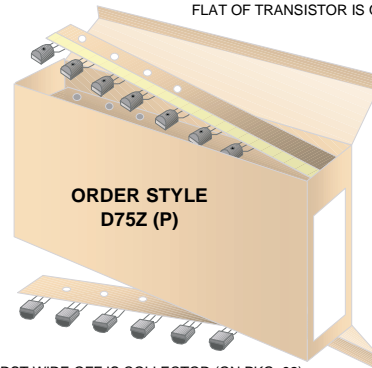
FIRST WIRE OFF IS COLLECTOR
ADHESIVE TAPE IS ON THE TOP SIDE
FLAT OF TRANSISTOR IS ON TOP



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 EMITTER
ADHESIVE TAPE IS ON THE TOP 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**



| ITEM DESCRIPTION | SYMBOL | DIMENSION |
|------------------------------------|--------|------------------------|
| Base of Package to Lead Bend | b | 0.098 (max) |
| Component Height | Ha | 0.928 (+/- 0.025) |
| Lead Clinch Height | HO | 0.630 (+/- 0.020) |
| Component Base Height | H1 | 0.748 (+/- 0.020) |
| Component Alignment (side/side) | Pd | 0.040 (max) |
| Component Alignment (front/back) | Hd | 0.031 (max) |
| Component Pitch | P | 0.500 (+/- 0.020) |
| Feed Hole Pitch | PO | 0.500 (+/- 0.008) |
| Hole Center to First Lead | P1 | 0.150 (+0.009, -0.010) |
| Hole Center to Component Center | P2 | 0.247 (+/- 0.007) |
| Lead Spread | F1/F2 | 0.104 (+/- 0.010) |
| Lead Thickness | d | 0.018 (+0.002, -0.003) |
| Cut Lead Length | L | 0.429 (max) |
| Taped Lead Length | L1 | 0.209 (+0.051, -0.052) |
| Taped Lead Thickness | t | 0.032 (+/- 0.006) |
| Carrier Tape Thickness | t1 | 0.021 (+/- 0.006) |
| Carrier Tape Width | W | 0.708 (+0.020, -0.019) |
| Hold - down Tape Width | WO | 0.236 (+/- 0.012) |
| Hold - down Tape position | W1 | 0.035 (max) |
| Feed Hole Position | W2 | 0.360 (+/- 0.025) |
| Sprocket Hole Diameter | DO | 0.157 (+0.008, -0.007) |
| Lead Spring Out | S | 0.004 (max) |

Note : All dimensions are in inches.

**TO-92 Reel
Configuration: Figure 5.0**



| ITEM DESCRIPTION | SYMBOL | MINIMUM | MAXIMUM |
|--------------------------------|--------|---------|---------|
| Reel Diameter | D1 | 13.975 | 14.025 |
| Arbor Hole Diameter (Standard) | D2 | 1.160 | 1.200 |
| (Small Hole) | D2 | 0.650 | 0.700 |
| Core Diameter | D3 | 3.100 | 3.300 |
| Hub Recess Inner Diameter | D4 | 2.700 | 3.100 |
| Hub Recess Depth | W1 | 0.370 | 0.570 |
| Flange to Flange Inner Width | W2 | 1.630 | 1.690 |
| Hub to Hub Center Width | W3 | | 2.090 |

Note: All dimensions are in inches

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

TO-92 (92,94,96)

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



SOT-23 Tape and Reel Data



SOT-23 Packaging Configuration: Figure 10



Packaging Description:

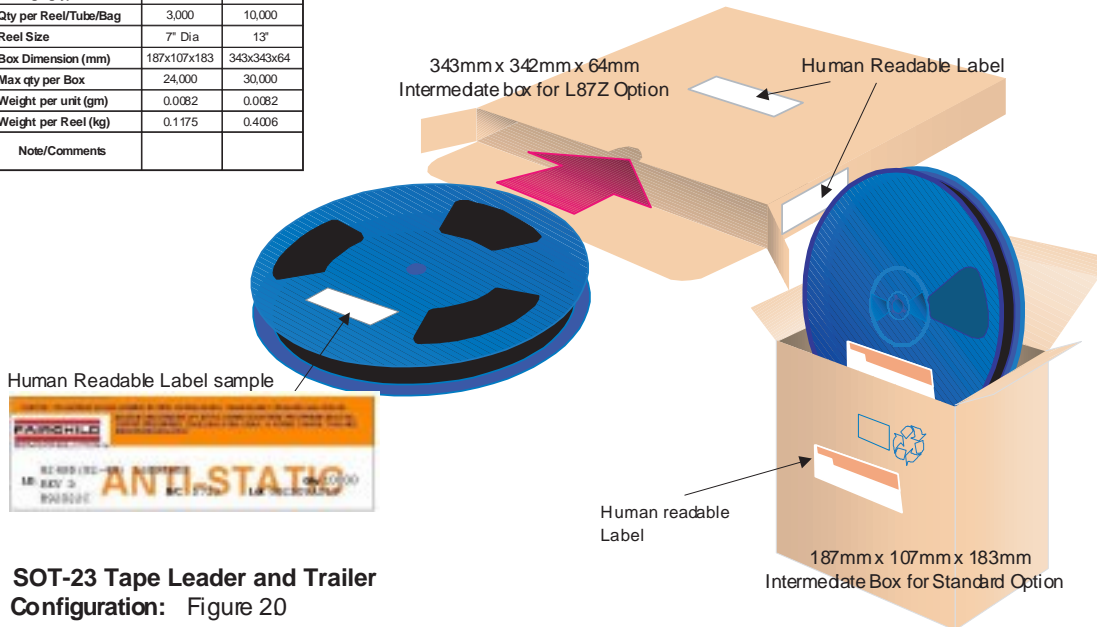
SOT-23 parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Heat Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed agent. These reeled parts in standard option are shipped with 3,000 units per 7" or 177mm diameter reel. The reels are dark blue in color and is made of polystyrene plastic (anti-static coated). Other option comes in 10,000 units per 13" or 330mm 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 | | |
|------------------------------|-------------------------|------------|
| Packaging Option | Standard (no flow code) | D87Z |
| Packaging type | TNR | TNR |
| Qty per Reel/Tube/Bag | 3,000 | 10,000 |
| Reel Size | 7" Dia | 13" |
| Box Dimension (mm) | 187x107x183 | 343x343x64 |
| Max qty per Box | 24,000 | 30,000 |
| Weight per unit (gm) | 0.0082 | 0.0082 |
| Weight per Reel (kg) | 0.1175 | 0.4006 |
| Note/Comments | | |



SOT-23 Unit Orientation



Human Readable Label sample



SOT-23 Tape Leader and Trailer Configuration: Figure 20



SOT-23 Tape and Reel Data, continued

SOT-23 Embossed Carrier Tape Configuration: Figure 3.0



| Dimensions are in millimeter | | | | | | | | | | | | | | |
|------------------------------|---------------|---------------|-------------|---------------|-----------------|---------------|-------------|---------------|-------------|-------------|---------------|-----------------|-------------|---------------|
| Pkg type | A0 | B0 | W | D0 | D1 | E1 | E2 | F | P1 | P0 | K0 | T | Wc | Tc |
| SOT-23 (8mm) | 3.15 ±0.10 | 2.77 ±0.10 | 8.0 ±0.3 | 1.55 ±0.05 | 1.125 ±0.125 | 1.75 ±0.10 | 6.25 min | 3.50 ±0.05 | 4.0 ±0.1 | 4.0 ±0.1 | 1.30 ±0.10 | 0.228 ±0.013 | 5.2 ±0.3 | 0.06 ±0.02 |

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).



Sketch A (Side or Front Sectional View)
Component Rotation



Sketch B (Top View)
Component Rotation



Sketch C (Top View)
Component lateral movement

SOT-23 Reel Configuration: Figure 4.0



| Dimensions are in inches and millimeters | | | | | | | | | |
|--|-------------|---------------|--------------|-----------------------------------|---------------|-------------|-----------------------------------|---------------|----------------------------|
| Tape Size | Reel Option | Dim A | Dim B | Dim C | Dim D | Dim N | Dim W1 | Dim W2 | Dim W3 (LSL-USL) |
| 8mm | 7" Dia | 7.00 177.8 | 0.059 1.5 | 512 +0.020/-0.008 13 +0.5/-0.2 | 0.795 20.2 | 2.165 55 | 0.331 +0.059/-0.000 8.4 +1.5/0 | 0.567 14.4 | 0.311 -0.429 7.9 - 10.9 |
| 8mm | 13" Dia | 13.00 330 | 0.059 1.5 | 512 +0.020/-0.008 13 +0.5/-0.2 | 0.795 20.2 | 4.00 100 | 0.331 +0.059/-0.000 8.4 +1.5/0 | 0.567 14.4 | 0.311 -0.429 7.9 - 10.9 |

SOT-23 Package Dimensions



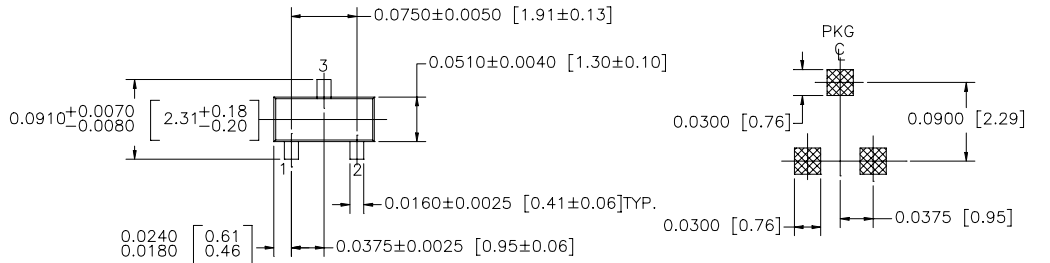
SOT-23 (FS PKG Code 49)



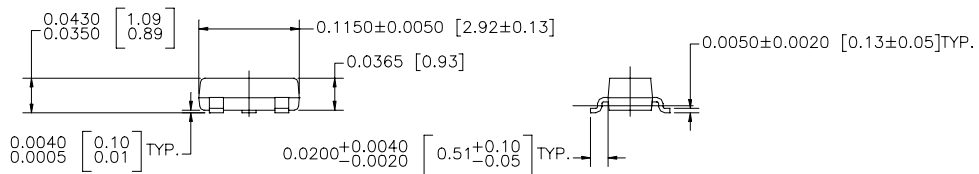
Scale 1:1 on letter size paper

Dimensions shown below are in:
inches [millimeters]

Part Weight per unit (gram): 0.0082



LAND PATTERN RECOMMENDATION



SOT 23, 3 LEADS LOW PROFILE

CONTROLLING DIMENSION IS INCH
VALUES IN [] ARE MILLIMETERS

NOTE : UNLESS OTHERWISE SPECIFIED

- STANDARD LEAD FINISH 150 MICRONS / 3.81 MICROMETERS
MINIMUM TIN / LEAD (SOLDER) ON ALLOY 42
- REFERENCE JEDEC REGISTRATION TO-236, VARIATION AB, ISSUE G, DATED JUL 1993

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| CROSSVOLT™ | HiSeC™ | QT Optoelectronics™ | VCX™ |
| DOME™ | ISOPLANAR™ | Quiet Series™ | |
| E ² CMOS™ | MICROWIRE™ | SILENT SWITCHER® | |
| EnSigna™ | OPTOLOGIC™ | SMART START™ | |
| FACT™ | OPTOPLANAR™ | SuperSOT™-3 | |
| FACT Quiet Series™ | PACMAN™ | SuperSOT™-6 | |
| FAST® | POP™ | SuperSOT™-8 | |

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PN200A
PNP General Purpose Amplifier

Contents
[General description](#) | [Product status/pricing/packageing](#)

General description

PNP General Purpose Amplifier

This device is designed for general purpose amplifier applications at collector currents to 300 mA. Sourced from Process 68.

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Product status/pricing/packageing

| Product | Product status | Pricing* | Package type | Leads | Package marking | Packing method |
|---------|-----------------|----------|--------------|-------|---------------------|----------------|
| PN200RM | Full Production | \$0.083 | TO-92 | 3 | \$Y&3 PN200 | AMMO |
| PN200A | Full Production | \$0.083 | TO-92 | 3 | \$Y&3 PN200 A | BULK |

* 1,000 piece Budgetary Pricing

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