N-Channel Switch
(continued)

Electrical Characteristics
TA = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions		Min	Max	Units
OFF CHARACTERISTICS						
$V_{(BR)GSS}$	Gate-Source Breakdown Voltage	I_G = 1.0 µA, V_{DS} = 0		- 30		V
I_{GSS}	Gate Reverse Current	V_{GS} = - 15 V, V_{DS} = 0			- 1.0	nA
		V_{GS} = - 15 V, V_{DS} = 0, T_A = 150°C			- 0.2	µA
$V_{GS(off)}$	Gate-Source Cutoff Voltage	V_{DS} = 20 V, I_D = 1.0 nA	**4391**	- 4.0	- 10	V
			4392	- 2.0	- 5.0	V
			4393	- 0.5	- 3.0	V
$V_{GS(f)}$	Gate-Source Forward Voltage	I_G = 1.0 mA, V_{DS} = 0			1.0	V
$I_{D(off)}$	Drain Cutoff Leakage Current	V_{DS} = 20 V, V_{GS} = - 12 V	**4391**		0.1	nA
		V_{DS} = 20 V, V_{GS} = - 7.0 V	**4392**		0.1	nA
		V_{DS} = 20 V, V_{GS} = - 5.0 V	**4393**		0.1	nA
		V_{DS}= 20 V, V_{GS}= - 12 V, T_A = 150°C	**4391**		0.2	µA
		V_{DS} = 20 V, V_{GS} = - 7.0 V, T_A = 150°C	**4392**		0.2	µA
		V_{DS} = 20 V, V_{GS} = - 5.0 V, T_A = 150°C	**4393**		0.2	µA
ON CHARACTERISTICS						
I_{DSS}	Zero-Gate Voltage Drain Current*	V_{DS} = 20 V, V_{GS} = 0	**4391**	50	150	mA
			4392	25	75	mA
			4393	5.0	30	mA
$V_{DS(on)}$	Drain-Source On Voltage	I_D = 12 mA, V_{GS} = 0	**4391**		0.4	V
		I_D = 6.0 mA, V_{GS} = 0	**4392**		0.4	V
		I_D = 3.0 mA, V_{GS} = 0	**4393**		0.4	V
$r_{DS(on)}$	Drain-Source On Resistance	I_D = 1.0 mA, V_{GS} = 0	**4391**		30	Ω
			4392		60	Ω
			4393		100	Ω
SMALL-SIGNAL CHARACTERISTICS						
$r_{ds(on)}$	Drain-Source On Resistance	V_{DS} = V_{GS} = 0, f= 1.0 kHz	**4391**		30	Ω
			4392		60	Ω
			4393		100	Ω
C_{iss}	Input Capacitance	V_{DS} = 20, V_{GS} = 0, f = 1.0 MHz			14	pF
C_{rss}	Reverse Transfer Capacitance	V_{GS} = - 12 V, f = 1.0 MHz	**4391**		3.5	pF
		V_{GS} = - 7.0 V, f = 1.0 MHz	**4392**		3.5	pF
		V_{GS} = - 5.0 V, f = 1.0 MHz	**4393**		3.5	pF
SWITCHING CHARACTERISTICS						
t_r	Rise Time	$I_{D(on)}$ = 12 mA	**4391**		5.0	ns
		$I_{D(on)}$ = 6.0 mA	**4392**		5.0	ns
		$I_{D(on)}$ = 3.0 mA	**4393**		5.0	ns
t_f	Fall Time	$V_{GS(off)}$ = 12 V	**4391**		15	ns
		$V_{GS(off)}$ = 6.0 V	**4392**		20	ns
		$V_{GS(off)}$ = 3.0 V	**4393**		30	ns
t_{on}	Turn-On Time	$I_{D(on)}$ = 12 mA	**4391**		15	ns
		$I_{D(on)}$ = 6.0 mA	**4392**		15	ns
		$I_{D(on)}$ = 3.0 mA	**4393**		15	ns
t_{off}	Turn-Off Time	$V_{GS(off)}$ = 12 V	**4391**		20	ns
		$V_{GS(off)}$ = 6.0 V	**4392**		35	ns
		$V_{GS(off)}$ = 3.0 V	**4393**		50	ns

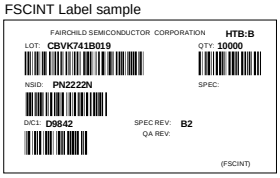
*Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 1.0%

TO-92 Tape and Reel Data

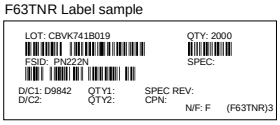
FAIRCHILD SEMICONDUCTOR TM

TO-92 Packaging Configuration: Figure 1.0

FSCINT Label sample

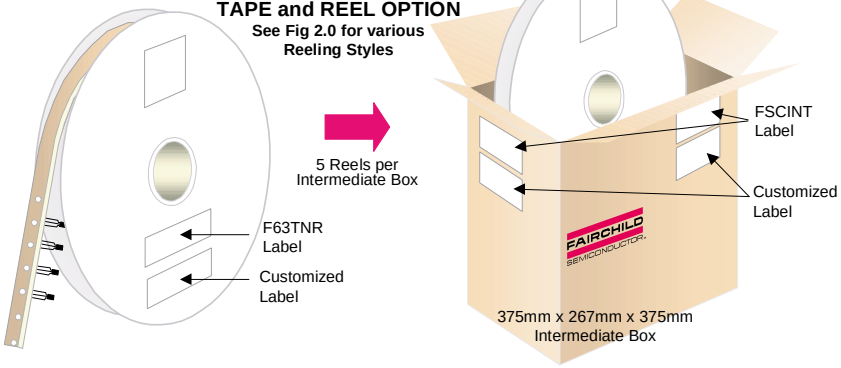


F63TNR Label sample



TAPE and REEL OPTION

See Fig 2.0 for various Reeling Styles



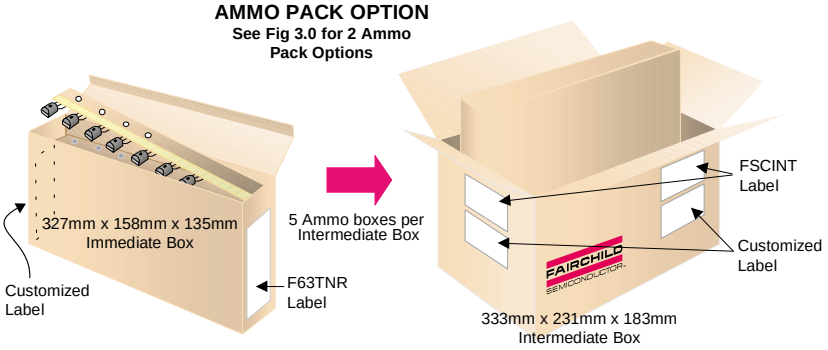
TO-92 TNR/AMMO PACKING INFROMATION

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

AMMO PACK OPTION

See Fig 3.0 for 2 Ammo Pack Options

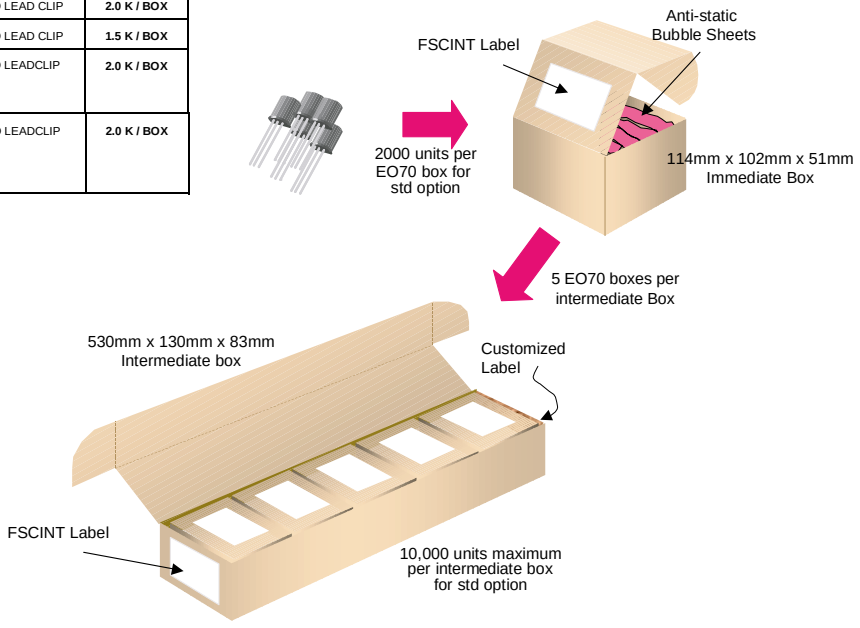


(TO-92) BULK PACKING INFORMATION

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

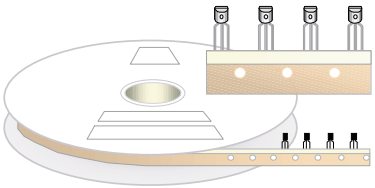


March 2001, Rev. B1

TO-92 Tape and Reel Data, continued

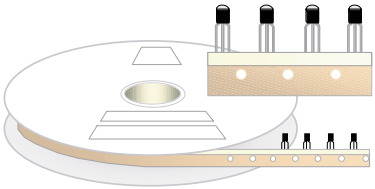
TO-92 Reeling Style
Configuration: Figure 2.0

Machine Option “A” (H)



Style “A”, D26Z, D70Z (s/h)

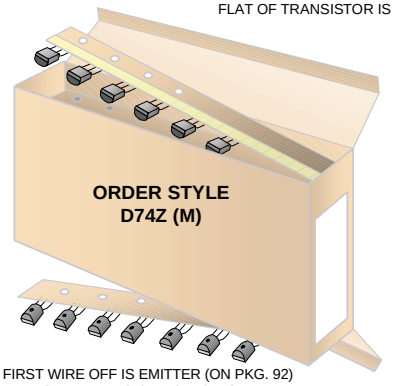
Machine Option “E” (J)



Style “E”, D27Z, D71Z (s/h)

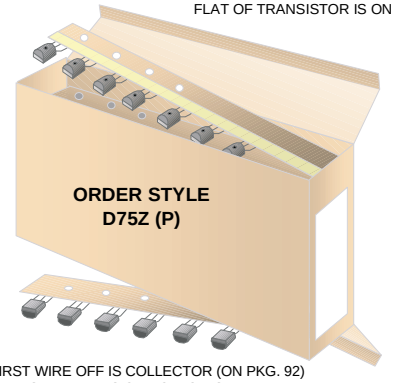
TO-92 Radial Ammo Packaging
Configuration: Figure 3.0

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



FIRST WIRE OFF IS EMITTER (ON PKG. 92)
ADHESIVE TAPE IS ON BOTTOM SIDE
FLAT OF TRANSISTOR IS ON BOTTOM

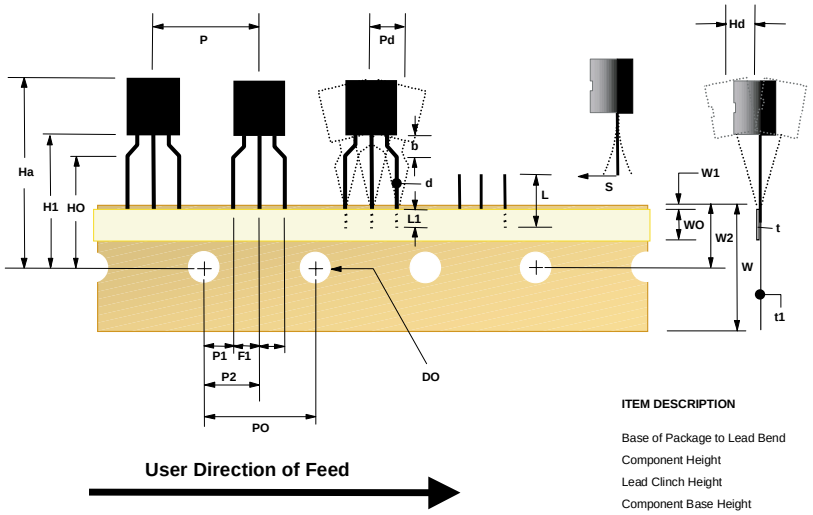
FIRST WIRE OFF IS EMITTER
ADHESIVE TAPE IS ON THE TOP SIDE
FLAT OF TRANSISTOR IS ON BOTTOM



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

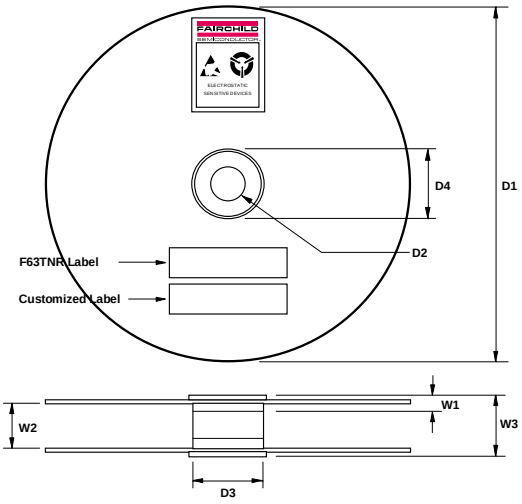
TO-92 Tape and Reel Taping
Dimension Configuration: Figure 4.0



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



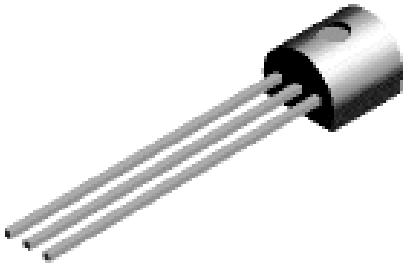
ITEM DESCRIPTION	SYSMBOL	MINIMUM	MAXIMUM
Reel Diameter	D1	13.975	14.025
Arbor Hole Diameter (Standard)	D2	1.160	1.200
(Small Hole)	D2	0.650	0.700
Core Diameter	D3	3.100	3.300
Hub Recess Inner Diameter	D4	2.700	3.100
Hub Recess Depth	W1	0.370	0.570
Flange to Flange Inner Width	W2	1.630	1.690
Hub to Hub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

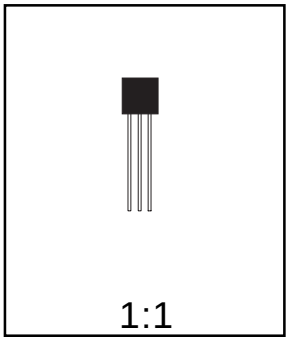
Note: All dimensions are inches

TO-92 Package Dimensions

FAIRCHILD SEMICONDUCTOR™

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





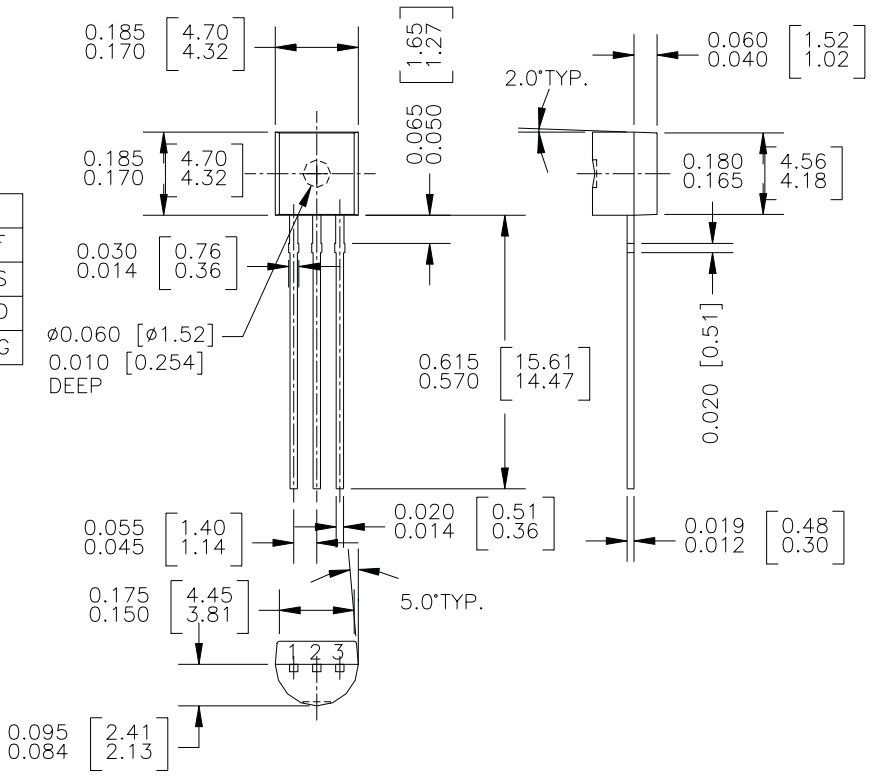
Scale 1:1 on letter size paper

Dimensions shown below are in:
inches [millimeters]

Part Weight per unit (gram): 0.1977

TO−92 (92,94,96)

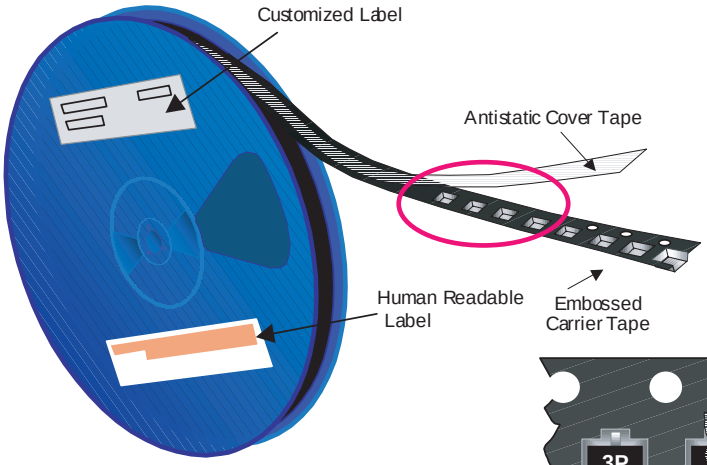
PIN	92		94		96	
	B	F	B	F	B	F
1	E	D	E	D	B	S
2	B	S	C	G	E	D
3	C	G	B	S	C	G



SOT-23 Tape and Reel Data

FAIRCHILD SEMICONDUCTOR™

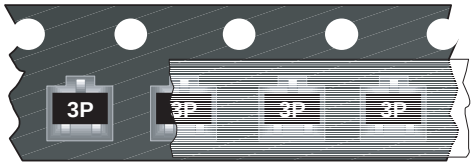
SOT-23 Packaging Configuration: Figure 10



Packaging Description:

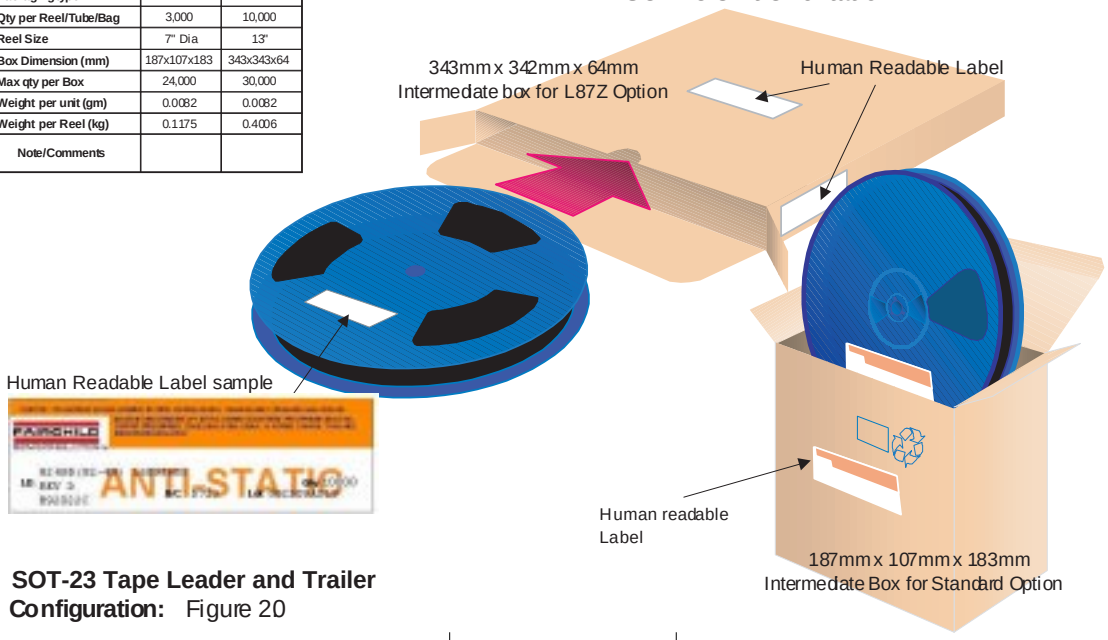
SOT-23 parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Heat Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed agent. These reeled parts in standard option are shipped with 3,000 units per 7" or 177cm 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 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.

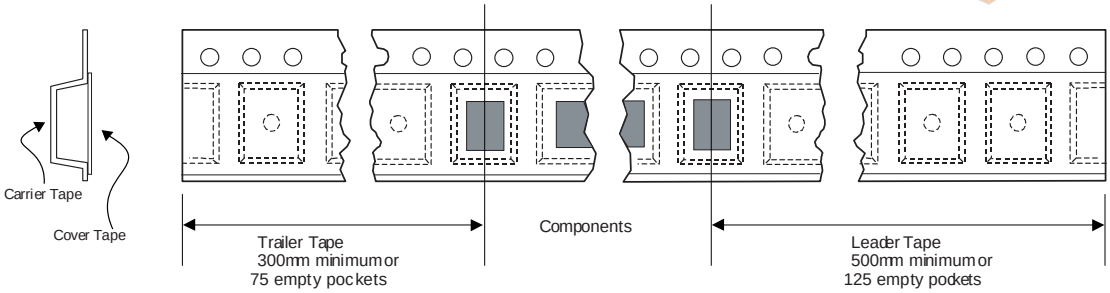


SOT-23 Packaging Information		
Packaging Option	Standard (no flow code)	D87Z
Packaging type	TNR	TNR
Qty per Reel/Tube/Bag	3,000	10,000
Reel Size	7" Dia	13"
Box Dimension (mm)	187x107x183	343x343x64
Max qty per Box	24,000	30,000
Weight per unit (gm)	0.0082	0.0082
Weight per Reel (kg)	0.1175	0.4006
Note/Comments		

SOT-23 Unit Orientation

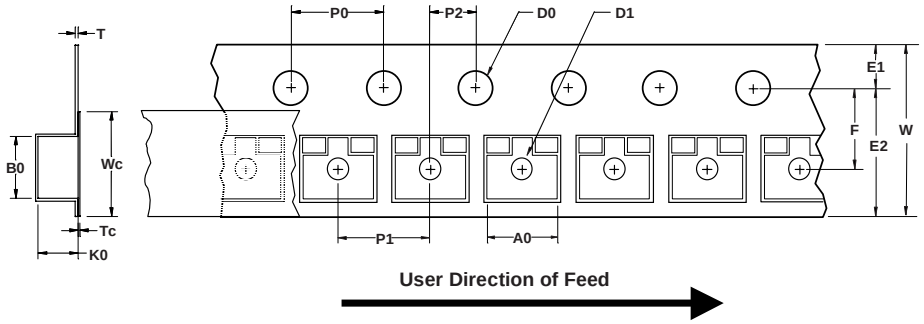


SOT-23 Tape Leader and Trailer Configuration: Figure 20



SOT-23 Tape and Reel Data, continued

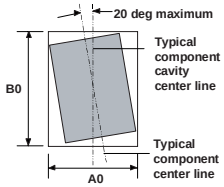
SOT-23 Embossed Carrier Tape
Configuration: Figure 3.0



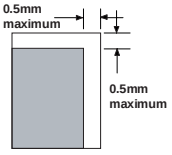
Dimensions are in millimeter														
Pkg type	**A0**	**B0**	**W**	**D0**	**D1**	**E1**	**E2**	**F**	**P1**	**P0**	**K0**	**T**	**Wc**	**Tc**
SOT-23 (8mm)	3.15 +/-0.10	2.77 +/-0.10	8.0 +/-0.3	1.55 +/-0.05	1.125 +/-0.125	1.75 +/-0.10	6.25 min	3.50 +/-0.05	4.0 +/-0.1	4.0 +/-0.1	1.30 +/-0.10	0.228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

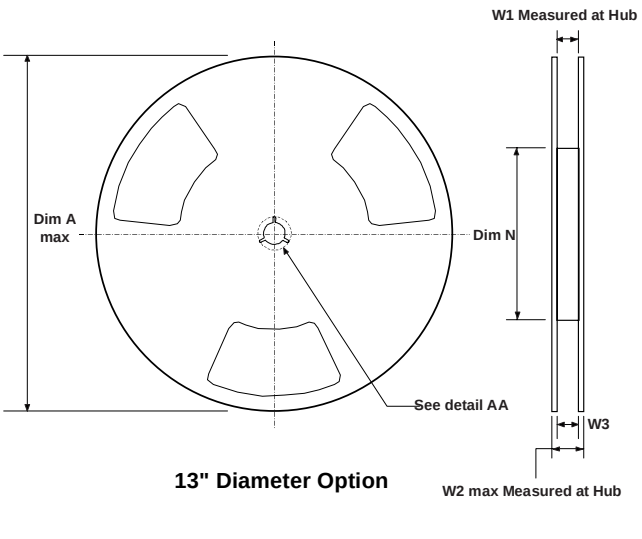


Sketch B (Top View)
Component Rotation

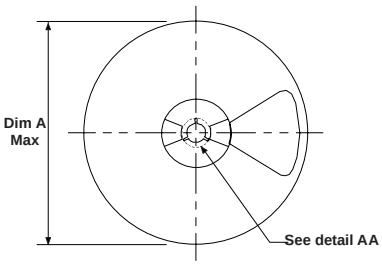


Sketch C (Top View)
Component lateral movement

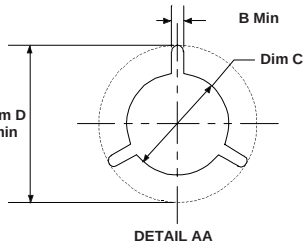
SOT-23 Reel Configuration: Figure 4.0



13" Diameter Option



7" Diameter Option



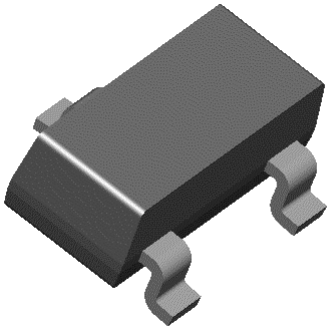
DETAIL AA

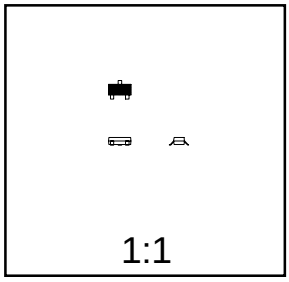
Dimensions are in inches and millimeters									
Tape Size	**Reel Option**	**Dim A**	**Dim B**	**Dim C**	**Dim D**	**Dim N**	**Dim W1**	**Dim W2**	**Dim W3 (LSL-USL)**
8mm	7" Dia	7.00 177.8	0.059 1.5	512 +0.020/-0.008 13 +0.5/-0.2	0.795 20.2	2.165 55	0.331 +0.059/-0.000 8.4 +1.5/0	0.567 14.4	0.311 –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

FAIRCHILD SEMICONDUCTOR™

SOT-23 (FS PKG Code 49)

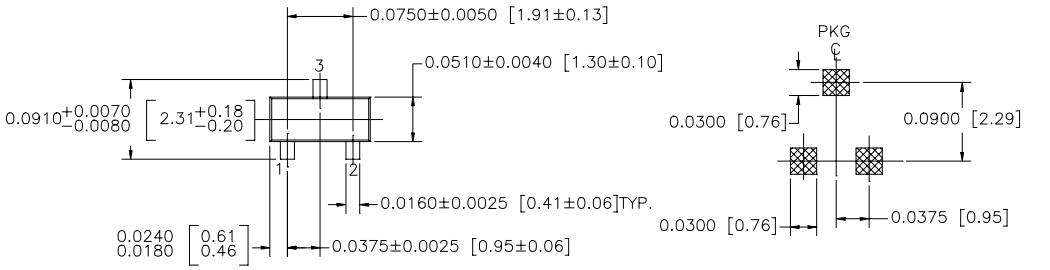


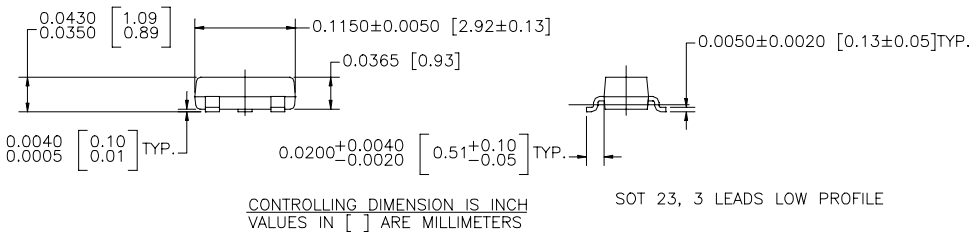


Scale 1:1 on letter size paper

Dimensions shown below are in:
inches [millimeters]

Part Weight per unit (gram): 0.0082





NOTE : UNLESS OTHERWISE SPECIFIED

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

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GTO™
HiSeC™
ISOPLANAR™
MICROWIRE™
OPTOLOGIC™
OPTOPLANAR™
PACMAN™
POP™
PowerTrench®
QFET™
QS™
QT Optoelectronics™
Quiet Series™
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SuperSOT™-6
SuperSOT™-8
SyncFET™
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VCX™

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1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the user.

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

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

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