

TN2219A (TN2222A)



NPN General Purpose Amplifier

This device is for use as a medium power amplifier and switch requiring collector currents up to 500 mA. Sourced from Process 19. See PN2222A for characteristics.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V _{CEO}	Collector-Emitter Voltage	40	V
V _{CBO}	Collector-Base Voltage	75	V
V _{EBO}	Emitter-Base Voltage	6.0	V
I _C	Collector Current - Continuous	1.0	A
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.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max	Units
		TN2219A	
P _D	Total Device Dissipation Derate above 25°C	1.0	W
		8.0	W/°C
R _{θJC}	Thermal Resistance, Junction to Case	125	°C/W
R _{θJA}	Thermal Resistance, Junction to Ambient	50	°C/W

NPN General Purpose Amplifier

(continued)

TN2219A

Electrical Characteristics

TA = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage*	$I_C = 10 \text{ mA}, I_B = 0$	40		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	$I_C = 10 \text{ } \mu\text{A}, I_E = 0$	75		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	$I_E = 10 \text{ } \mu\text{A}, I_C = 0$	6.0		V
I_{CEX}	Collector Cutoff Current	$V_{CE} = 60 \text{ V}, V_{EB(OFF)} = 3.0 \text{ V}$		10	nA
I_{CBO}	Collector Cutoff Current	$V_{CB} = 60 \text{ V}, I_E = 0$ $V_{CB} = 60 \text{ V}, I_E = 0, T_A = 150^\circ\text{C}$		10 10	nA μA
I_{EBO}	Emitter Cutoff Current	$V_{EB} = 3.0 \text{ V}, I_C = 0$		10	nA
I_{BL}	Base Cutoff Current	$V_{CE} = 60 \text{ V}, V_{EB(OFF)} = 3.0$		20	nA

ON CHARACTERISTICS

h_{FE}	DC Current Gain	$I_C = 0.1 \text{ mA}, V_{CE} = 10 \text{ V}$ $I_C = 1.0 \text{ mA}, V_{CE} = 10 \text{ V}$ $I_C = 10 \text{ mA}, V_{CE} = 10 \text{ V}$ $I_C = 150 \text{ mA}, V_{CE} = 10 \text{ V}$ $I_C = 150 \text{ mA}, V_{CE} = 1.0 \text{ V}$ $I_C = 500 \text{ mA}, V_{CE} = 10 \text{ V}$	35 50 75 100 50 40	300	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage*	$I_C = 150 \text{ mA}, I_B = 15 \text{ mA}$ $I_C = 500 \text{ mA}, I_B = 50 \text{ mA}$		0.3 1.0	V V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage*	$I_C = 150 \text{ mA}, I_B = 1.0 \text{ mA}$ $I_C = 500 \text{ mA}, I_B = 5.0 \text{ mA}$	0.6	1.2 2.0	V V

SMALL SIGNAL CHARACTERISTICS

C_{obo}	Output Capacitance	$V_{CB} = 10 \text{ V}, I_E = 0, f = 100 \text{ kHz}$		8.0	pF
C_{ibo}	Input Capacitance	$V_{EB} = 0.5 \text{ V}, I_C = 0, f = 100 \text{ kHz}$		25	pF
h_{fe}	Small-Signal Current Gain	$I_C = 1.0 \text{ mA}, V_{CE} = 10 \text{ V}, f = 1.0 \text{ kHz}$ $I_C = 10 \text{ mA}, V_{CE} = 10 \text{ V}, f = 1.0 \text{ kHz}$	50 75	300 375	
$rb'C_C$	Collector Base Time Constant	$I_E = 20 \text{ mA}, V_{CB} = 20 \text{ V}, f = 31.8 \text{ MHz}$		150	pS
NF	Noise Figure	$I_C = 100 \text{ } \mu\text{A}, V_{CE} = 10 \text{ V}, R_S = 1.0 \text{ k}\Omega$ $f = 1.0 \text{ kHz}, B_W = 1.0 \text{ kHz}$		4.0	dB
$Re(h_{ie})$	Real Part of Common-Emitter High Frequency Input Impedance	$I_C = 20 \text{ mA}, V_{CE} = 20 \text{ V}, f = 300 \text{ MHz}$		60	Ω

SWITCHING CHARACTERISTICS

t_d	Delay Time	$V_{CC} = 30 \text{ V}, V_{BE(OFF)} = 0.5 \text{ V},$		10	ns
t_r	Rise Time	$I_C = 150 \text{ mA}, I_{B1} = 15 \text{ mA}$		25	ns
t_s	Storage Time	$V_{CC} = 30 \text{ V}, I_C = 150 \text{ mA},$		225	ns
t_f	Fall Time	$I_{B1} = I_{B2} = 15 \text{ mA}$		60	ns

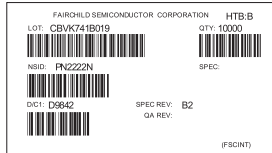
*Pulse Test: Pulse Width $\leq 300 \text{ } \mu\text{s}$, Duty Cycle $\leq 2.0\%$

TO-226AE Tape and Reel Data

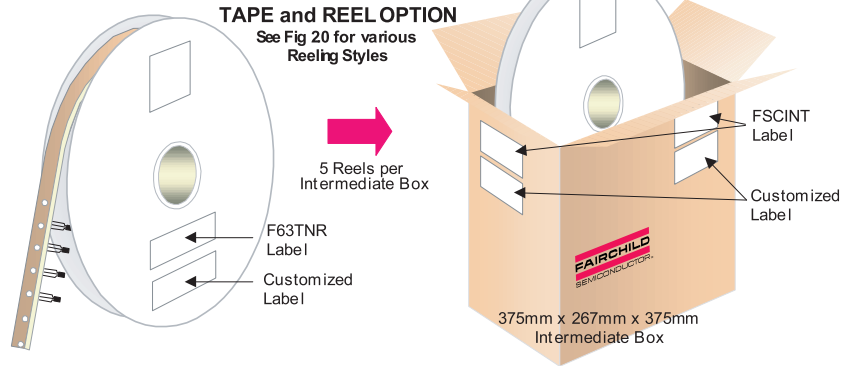


TO-226AE Packaging
Configuration: Figure 1.0

FSCINT Label sample



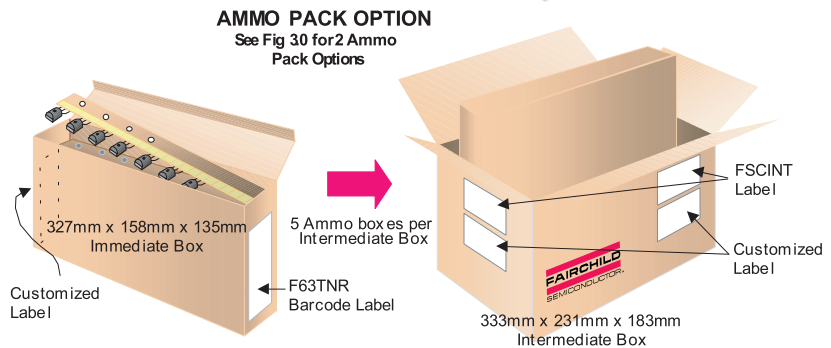
F63TNR Label sample



TO-226AE 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 = 0.300gm
Reel weight with components = 0.868 kg
Ammo weight with components = 0.880 kg
Max quantity per intermediate box = 10,000 units

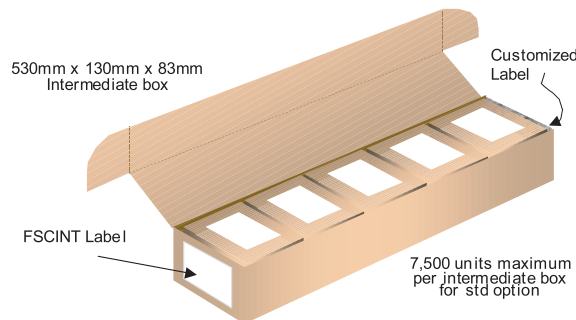
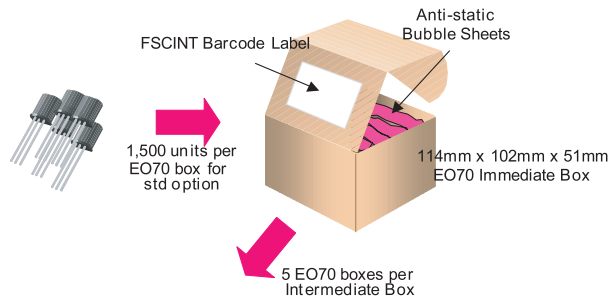


BULK OPTION

See Bulk Packing Information table

(TO-226AE) BULK PACKING INFORMATION

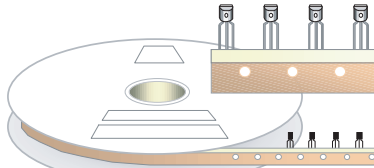
EOL CODE	DESCRIPTION	LEADCLIP DIMENSION	QUANTITY
J18Z	TO-18 OPTION STD	NO LEAD CLIP	1.0 K / BOX
J05Z	TO-5 OPTION STD	NO LEAD CLIP	1.0 K / BOX
NO EOL CODE	TO-226 STANDARD STRAIGHT	NO LEADCLIP	1.5 K / BOX



TO-226AE Tape and Reel Data, continued

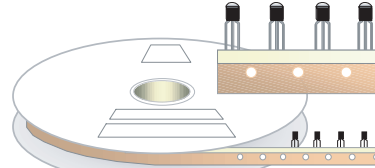
TO-226AE Reeling Style Configuration: Figure 2.0

Machine Option "A"(H)



Style "A" D26Z, D70Z (s/h)

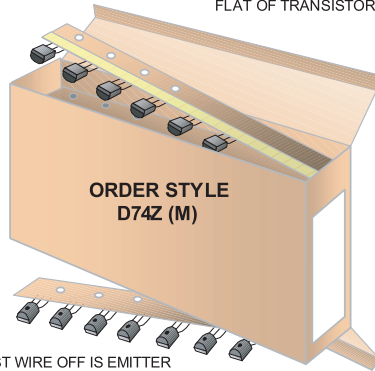
Machine Option "E"(J)



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

TO-226AE Radial Ammo Packaging Configuration: Figure 3.0

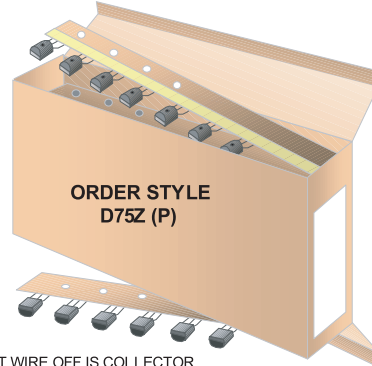
FIRST WIRE OFF IS COLLECTOR (ON PKG. 92)
ADHESIVE TAPE IS ON THE TOP SIDE
FLAT OF TRANSISTOR IS ON TOP



ORDER STYLE
D74Z (M)

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

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

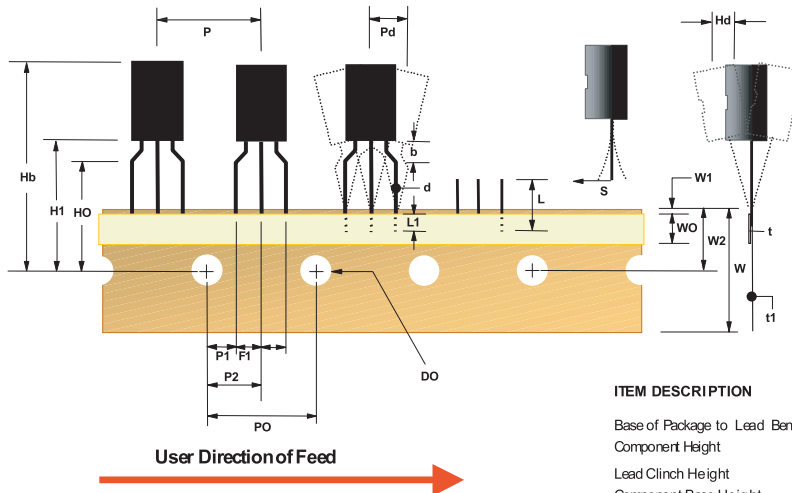


ORDER STYLE
D75Z (P)

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

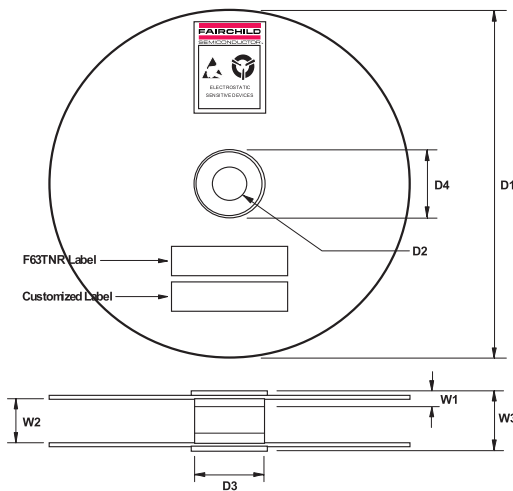
TO-226AE Tape and Reel Data, continued

**TO-226AE 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	Hb	1.078 (+/- 0.050)
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)
Out 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 (+0.02, -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)

**TO-226AE Reel
Configuration:** Figure 5.0



Note: All dimensions are in inches.

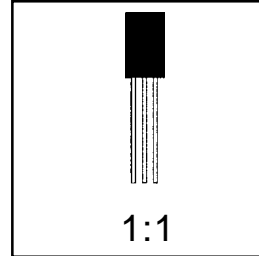
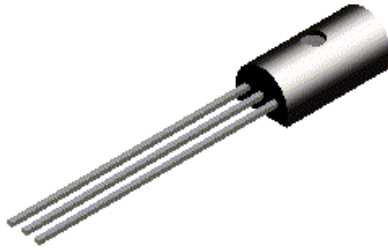
ITEM DESCRIPTION	SYMBOL	MINIMUM	MAXIMUM
Reel Diameter	D1	13.975	14.025
Arbor Hole Diameter (Standard)	D2	1.160	1.200
(Small Hole)	D2	0.650	0.700
Core Diameter	D3	3.100	3.300
Hub Recess Inner Diameter	D4	2.700	3.100
Hub Recess Depth	W1	0.370	0.570
Flange to Flange Inner Width	W2	1.630	1.690
Hub to Hub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

Note: All dimensions are in inches

TO-226AE Package Dimensions



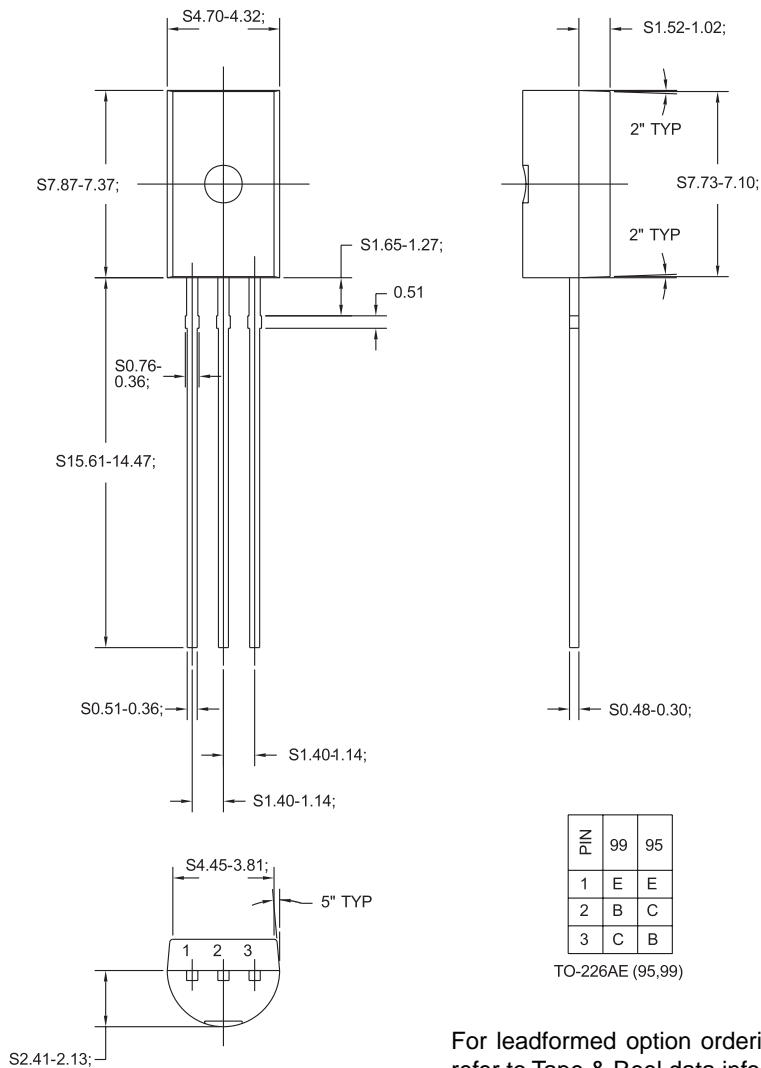
TO-226AE (FS PKG Code 95, 99)



Scale 1:1 on letter size paper

Dimensions shown below are in:
inches [millimeters]

Part Weight per unit (gram): 0.300



DIN	99	95
1	E	E
2	B	C
3	C	B

TO-226AE (95,99)

For leadformed option ordering,
refer to Tape & Reel data information.

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Rev. G