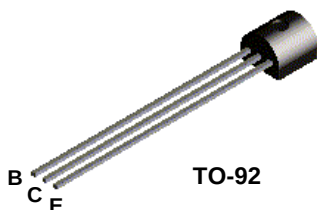




## 2N3416 2N3417



### NPN General Purpose Amplifier

This device is designed for use as general purpose amplifiers and switches requiring collector currents to 300 mA. Sourced from Process 10. See PN100A for characteristics.

#### Absolute Maximum Ratings\*

TA = 25°C unless otherwise noted

| Symbol                            | Parameter                                        | Value       | Units |
|-----------------------------------|--------------------------------------------------|-------------|-------|
| V <sub>CEO</sub>                  | Collector-Emitter Voltage                        | 50          | V     |
| V <sub>CBO</sub>                  | Collector-Base Voltage                           | 50          | V     |
| V <sub>EBO</sub>                  | Emitter-Base Voltage                             | 5.0         | V     |
| I <sub>C</sub>                    | Collector Current - Continuous                   | 500         | mA    |
| T <sub>J</sub> , T <sub>stg</sub> | 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       |
|------------------|-----------------------------------------------|-----------------|-------------|
|                  |                                               | 2N3416 / 2N3417 |             |
| P <sub>D</sub>   | Total Device Dissipation<br>Derate above 25°C | 625<br>5.0      | mW<br>mW/°C |
| R <sub>θJC</sub> | Thermal Resistance, Junction to Case          | 83.3            | °C/W        |
| R <sub>θJA</sub> | Thermal Resistance, Junction to Ambient       | 200             | °C/W        |

2N3416 / 2N3417

# NPN General Purpose Amplifier

(continued)

2N3416 / 2N3417

## Electrical Characteristics

TA = 25°C unless otherwise noted

| Symbol | Parameter | Test Conditions | Min | Max | Units |
|--------|-----------|-----------------|-----|-----|-------|
|--------|-----------|-----------------|-----|-----|-------|

### OFF CHARACTERISTICS

|               |                                      |                                                                                               |     |           |                     |
|---------------|--------------------------------------|-----------------------------------------------------------------------------------------------|-----|-----------|---------------------|
| $V_{(BR)CEO}$ | Collector-Emitter Breakdown Voltage* | $I_C = 10 \text{ mA}, I_B = 0$                                                                | 50  |           | V                   |
| $V_{(BR)CBO}$ | Collector-Base Breakdown Voltage     | $I_C = 10 \text{ } \mu\text{A}, I_E = 0$                                                      | 50  |           | V                   |
| $V_{(BR)EBO}$ | Emitter-Base Breakdown Voltage       | $I_E = 10 \text{ } \mu\text{A}, I_C = 0$                                                      | 5.0 |           | V                   |
| $I_{CBO}$     | Collector-Cutoff Current             | $V_{CB} = 25 \text{ V}, I_E = 0$<br>$V_{CB} = 18 \text{ V}, I_E = 0, T_A = 100^\circ\text{C}$ |     | 100<br>15 | nA<br>$\mu\text{A}$ |
| $I_{EBO}$     | Emitter-Cutoff Current               | $V_{EB} = 5.0 \text{ V}, I_C = 0$                                                             |     | 100       | nA                  |

### ON CHARACTERISTICS\*

|               |                                      |                                                                                  |           |            |   |
|---------------|--------------------------------------|----------------------------------------------------------------------------------|-----------|------------|---|
| $h_{FE}$      | DC Current Gain                      | $V_{CE} = 4.5 \text{ V}, I_C = 2.0 \text{ mA}$<br><b>2N3416</b><br><b>2N3417</b> | 75<br>180 | 225<br>540 |   |
| $V_{CE(sat)}$ | Collector-Emitter Saturation Voltage | $I_C = 50 \text{ mA}, I_B = 3.0 \text{ mA}$                                      |           | 0.3        | V |
| $V_{BE(sat)}$ | Base-Emitter Saturation Voltage      | $I_C = 50 \text{ mA}, I_B = 3.0 \text{ mA}$                                      | 0.6       | 1.3        | V |

### SMALL SIGNAL CHARACTERISTICS

|          |                           |                                                                                                            |           |  |  |
|----------|---------------------------|------------------------------------------------------------------------------------------------------------|-----------|--|--|
| $h_{fe}$ | Small-Signal Current Gain | $I_C = 2.0 \text{ mA}, V_{CE} = 4.5 \text{ V},$<br>$f = 1.0 \text{ kHz}$<br><b>2N3416</b><br><b>2N3417</b> | 75<br>180 |  |  |
|----------|---------------------------|------------------------------------------------------------------------------------------------------------|-----------|--|--|

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

# TO-92 Tape and Reel Data

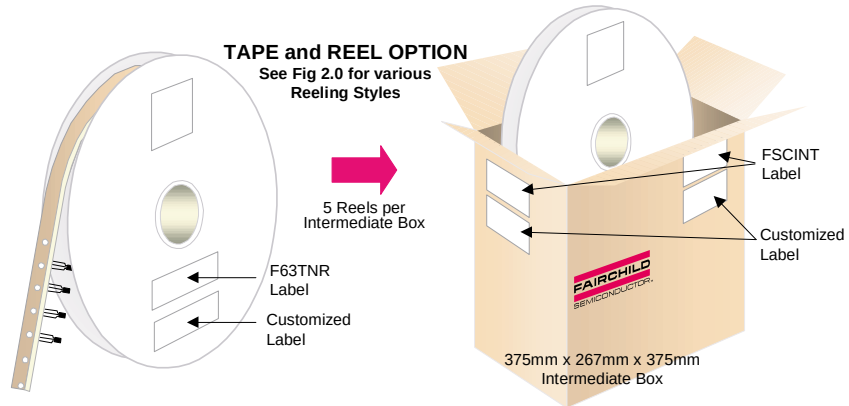


## TO-92 Packaging Configuration: Figure 1.0

FSCINT Label sample



F63TNR Label sample



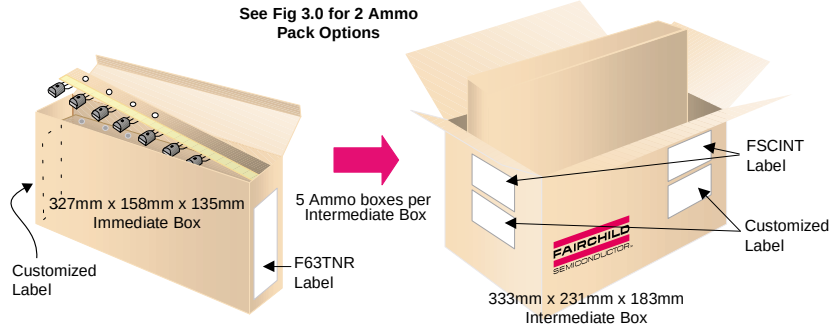
### TO-92 TNR/AMMO PACKING INFORMATION

| 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

### AMMO PACK OPTION

See Fig 3.0 for 2 Ammo Pack Options

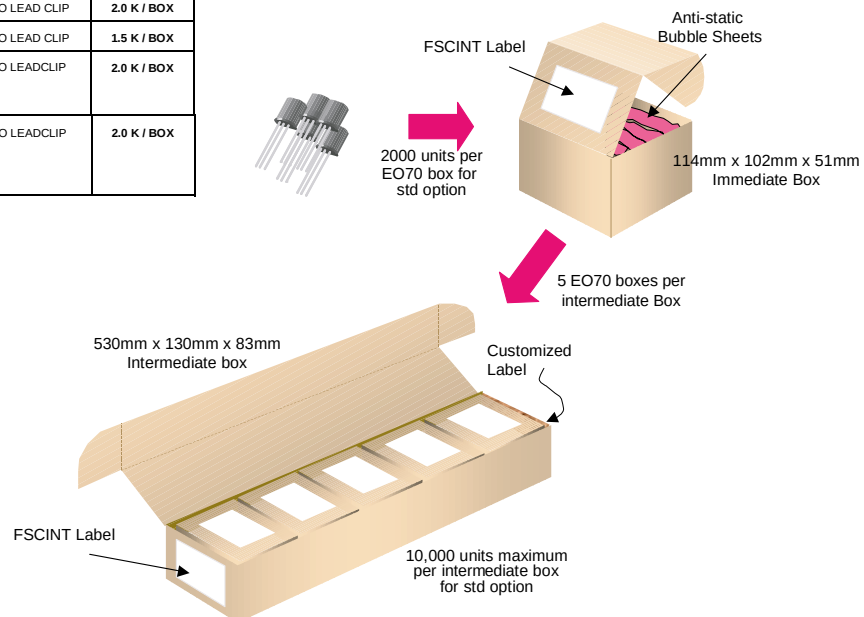


### (TO-92) BULK PACKING INFORMATION

| 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 |

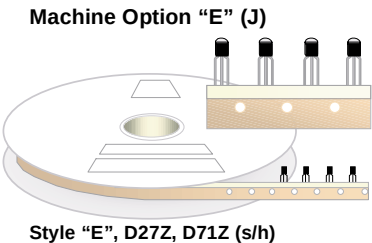
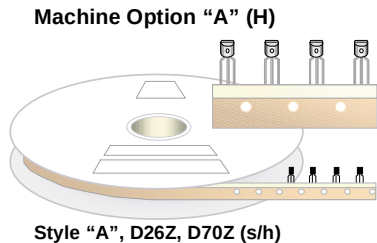
### BULK OPTION

See Bulk Packing Information table

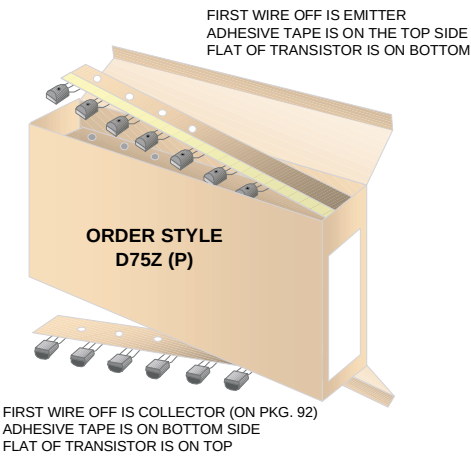
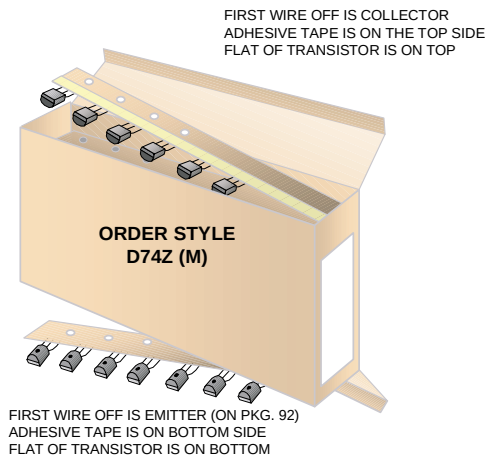


**TO-92 Tape and Reel Data, continued**

**TO-92 Reeling Style**  
**Configuration: Figure 2.0**

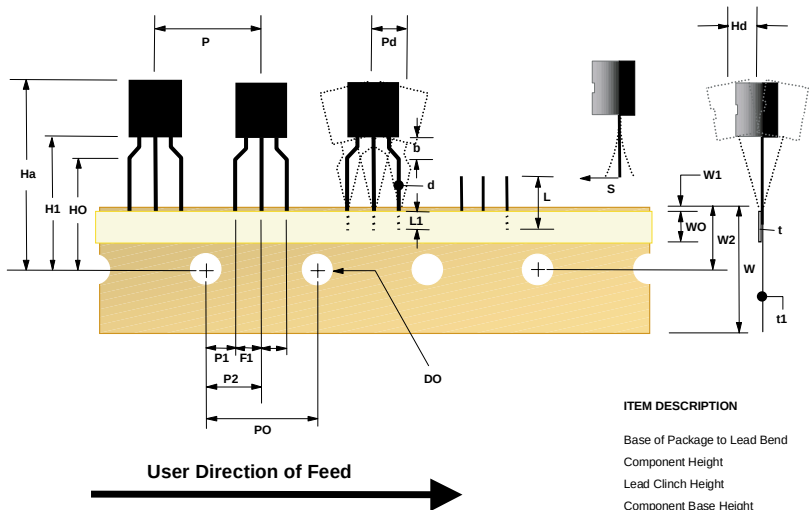


**TO-92 Radial Ammo Packaging**  
**Configuration: Figure 3.0**



# TO-92 Tape and Reel Data, continued

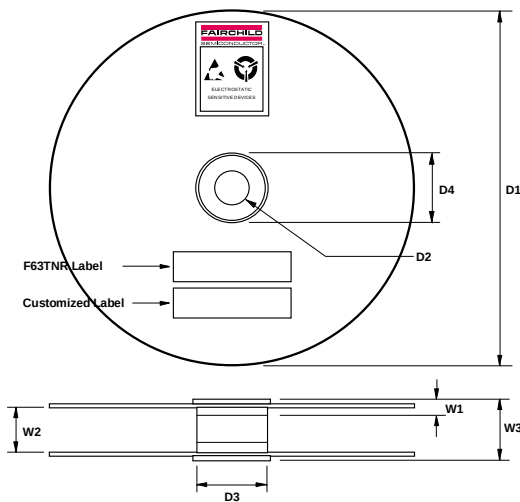
## TO-92 Tape and Reel Taping Dimension Configuration: Figure 4.0



| 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



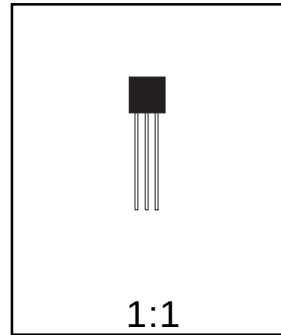
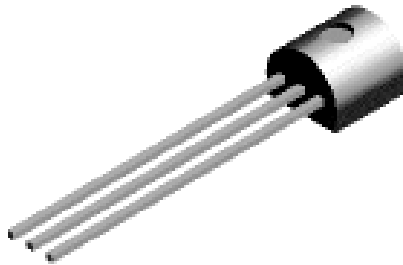
| ITEM DESCRIPTION                 | SYMBOL | MINIMUM | MAXIMUM |
|----------------------------------|--------|---------|---------|
| Reel Diameter                    | D1     | 13.975  | 14.025  |
| Arbor Hole Diameter (Standard)   | D2     | 1.160   | 1.200   |
| Arbor Hole Diameter (Small Hole) | D3     | 0.650   | 0.700   |
| Core Diameter                    | D4     | 3.100   | 3.300   |
| Hub Recess Inner Diameter        | D5     | 2.700   | 3.100   |
| Hub Recess Depth                 | D6     | 0.370   | 0.570   |
| Flange to Flange Inner Width     | W1     | 1.630   | 1.690   |
| Hub to Hub Center Width          | W2     |         | 2.090   |
| Hub to Hub Center Width          | W3     |         |         |

Note: All dimensions are inches

## TO-92 Package Dimensions



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



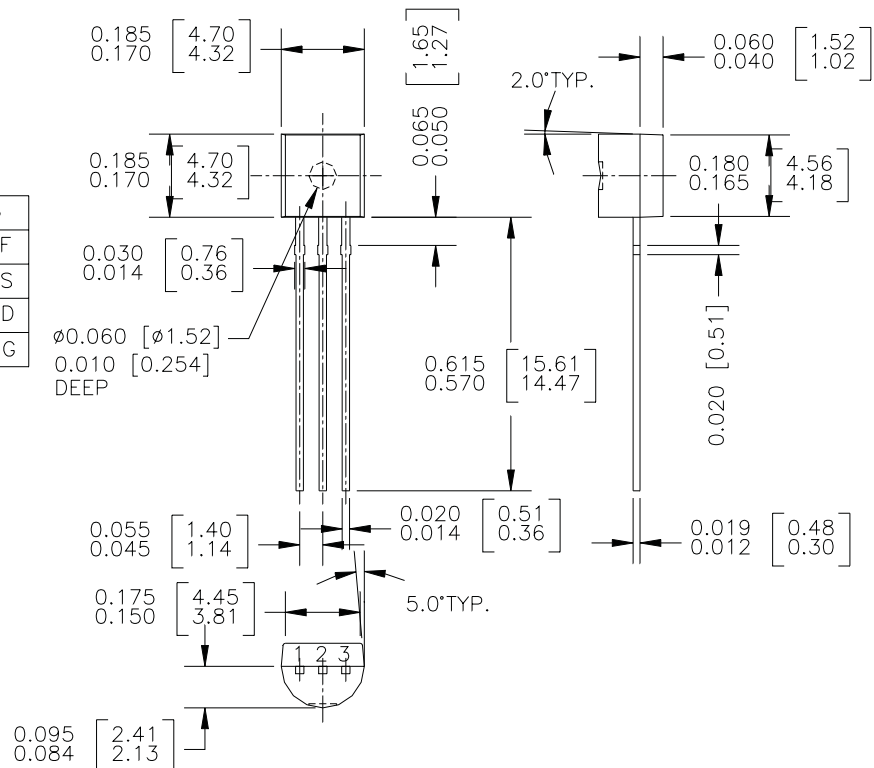
Scale 1:1 on letter size paper

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 |



## TRADEMARKS

The following are registered and unregistered trademarks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

|                                  |                                 |                                 |                        |
|----------------------------------|---------------------------------|---------------------------------|------------------------|
| ACE <sup>™</sup>                 | FAST <sup>™</sup>               | PowerTrench <sup>®</sup>        | SyncFET <sup>™</sup>   |
| Bottomless <sup>™</sup>          | GlobalOptoisolator <sup>™</sup> | QFET <sup>™</sup>               | TinyLogic <sup>™</sup> |
| CoolFET <sup>™</sup>             | GTO <sup>™</sup>                | QS <sup>™</sup>                 | UHC <sup>™</sup>       |
| CROSSVOLT <sup>™</sup>           | HiSeC <sup>™</sup>              | QT Optoelectronics <sup>™</sup> | VCX <sup>™</sup>       |
| DOME <sup>™</sup>                | ISOPLANAR <sup>™</sup>          | Quiet Series <sup>™</sup>       |                        |
| E <sup>2</sup> CMOS <sup>™</sup> | MICROWIRE <sup>™</sup>          | SILENT SWITCHER <sup>®</sup>    |                        |
| EnSigna <sup>™</sup>             | OPTOLOGIC <sup>™</sup>          | SMART START <sup>™</sup>        |                        |
| FACT <sup>™</sup>                | OPTOPLANAR <sup>™</sup>         | SuperSOT <sup>™</sup> -3        |                        |
| FACT Quiet Series <sup>™</sup>   | PACMAN <sup>™</sup>             | SuperSOT <sup>™</sup> -6        |                        |
| FAST <sup>®</sup>                | POP <sup>™</sup>                | SuperSOT <sup>™</sup> -8        |                        |

## DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

## LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION. As used herein:

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.                                                   |