

## TAPE AND REEL SPECIFICATIONS—SURFACE MOUNT

### Tape and Reel Packing

Tape and reel packing is available for all SO, TSOT (thin SOT-23), SOT-23 3L/4L, SOT-223, SSOP, TSSOP, QFN, DFN and DD packages in accordance with EIA Specification 481-C with the following exceptions: **(TSOT and SC70 pin 1 is placed into quadrant 2, and the largest axis of the component outline is parallel to the tape length as was established for the packages early. Any later revision of EIA-481 with change of orientation in the cavity will require a special order.** Table 1 lists the applicable tape widths, dimensions and quantities for all LTC surface mount products. Consult a sales office for tape and reel

pricing and minimum order requirements. **Tape and reel packaging is ordered with a '#TRPBF' suffix for lead free finish parts or a '#TR' suffix for lead based finish parts.**

**\*Packages marked with an asterisk (\*) below are available in 500 unit reels through designated sales channels. 500 unit reels are ordered with a '#TRMPBF' or '#TRM' suffix.**

**\*\*Tape Widths marked with a double asterisk (\*\*) converted to 8mm width in July 2007.**

**Table 1. Tape and Reel Specifications**

| LTC Package Code Designator | LTC Package Type  | Number of Leads Offered | W Tape Width | P <sub>1</sub> Component Pitch | P <sub>0</sub> Hole Pitch | Reel Diameter | Units per Reel |
|-----------------------------|-------------------|-------------------------|--------------|--------------------------------|---------------------------|---------------|----------------|
| DC*                         | DFN (2mm × 2mm)   | 3, 4, 6, 8              | 8/12mm**     | 4mm                            | 4mm                       | 180mm (7")    | 2,500*         |
| DCB*                        | DFN (2mm × 3mm)   | 6, 8                    | 8/12mm**     | 4mm                            | 4mm                       | 180mm (7")    | 2,500*         |
| DD                          | DFN (3mm × 3mm)   | 8, 10, 12               | 12mm         | 8mm                            | 4mm                       | 330mm (13")   | 2,500          |
| DDB*                        | DFN (3mm × 2mm)   | 8, 10, 12               | 8/12mm**     | 4mm                            | 4mm                       | 180mm (7")    | 2,500*         |
| DE, UE                      | DFN (4mm × 3mm)   | 12, 14                  | 12mm         | 8mm                            | 4mm                       | 330mm (13")   | 2,500          |
| DF                          | DFN (4mm × 4mm)   | 12                      | 12mm         | 8mm                            | 4mm                       | 330mm (13")   | 2,500          |
| DH                          | DFN (5mm × 5mm)   | 16                      | 12mm         | 8mm                            | 4mm                       | 330mm (13")   | 2,500          |
| DHC                         | DFN (5mm × 3mm)   | 16                      | 12mm         | 8mm                            | 4mm                       | 330mm (13")   | 2,500          |
| DHD                         | DFN (5mm × 4mm)   | 16                      | 12mm         | 8mm                            | 4mm                       | 330mm (13")   | 2,500          |
| DJC                         | DFN (6mm × 3mm)   | 22                      | 16mm         | 8mm                            | 4mm                       | 330mm (13")   | 2,500          |
| DKD                         | DFN (7mm × 4mm)   | 24, 32                  | 12mm         | 8mm                            | 4mm                       | 330mm (13")   | 2,500          |
| F                           | TSSOP (4.4mm)     | 14, 20                  | 16mm         | 8mm                            | 4mm                       | 330mm (13")   | 2,500          |
| FE                          | TSSOP (4.4mm)     | 16, 20, 24              | 16mm         | 8mm                            | 4mm                       | 330mm (13")   | 2,500          |
| FE                          | TSSOP (4.4mm)     | 28, 38                  | 16mm         | 12mm                           | 4mm                       | 330mm (13")   | 2,000          |
| FW                          | TSSOP (6.1mm)     | 48, 56                  | 24mm         | 12mm                           | 4mm                       | 330mm (13")   | 1,800          |
| G                           | SSOP (5.3mm)      | 16                      | 16mm         | 12mm                           | 4mm                       | 330mm (13")   | 2,000          |
| G                           | SSOP (5.3mm)      | 20, 24                  | 16mm         | 12mm                           | 4mm                       | 330mm (13")   | 1,800          |
| G                           | SSOP (5.3mm)      | 28, 36, 44              | 24mm         | 12mm                           | 4mm                       | 330mm (13")   | 2,000          |
| GN                          | SSOP (0.150)      | 16                      | 12mm         | 8mm                            | 4mm                       | 330mm (13")   | 2,500          |
| GN                          | SSOP (0.150)      | 20, 24, 28              | 16mm         | 8mm                            | 4mm                       | 330mm (13")   | 2,500          |
| GW                          | SSOP (7.62mm)     | 36, 44                  | 24mm         | 12mm                           | 4mm                       | 330mm (13")   | 1,000          |
| KC                          | UTDFN (2mm × 2mm) | 8                       | 8mm          | 8mm                            | 4mm                       | 180mm (7")    | 2,500          |
| KD                          | UTDFN (3mm × 3mm) | 10                      | 12mm         | 8mm                            | 4mm                       | 330mm (13")   | 2,500          |
| KE                          | UTDFN (4mm × 3mm) | 14                      | 12mm         | 8mm                            | 4mm                       | 330mm (13")   | 2,500          |
| M, Q, R                     | DD                | 3, 5 or 7               | 24mm         | 16mm                           | 4mm                       | 330mm (13")   | 750            |
| MS8, MS8E                   | MSOP (0.118)      | 8                       | 12mm         | 8mm                            | 4mm                       | 330mm (13")   | 2,500          |

# TAPE AND REEL

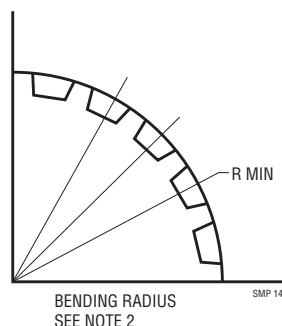
## TAPE AND REEL SPECIFICATIONS—SURFACE MOUNT

Table 1. Tape and Reel Specifications (cont)

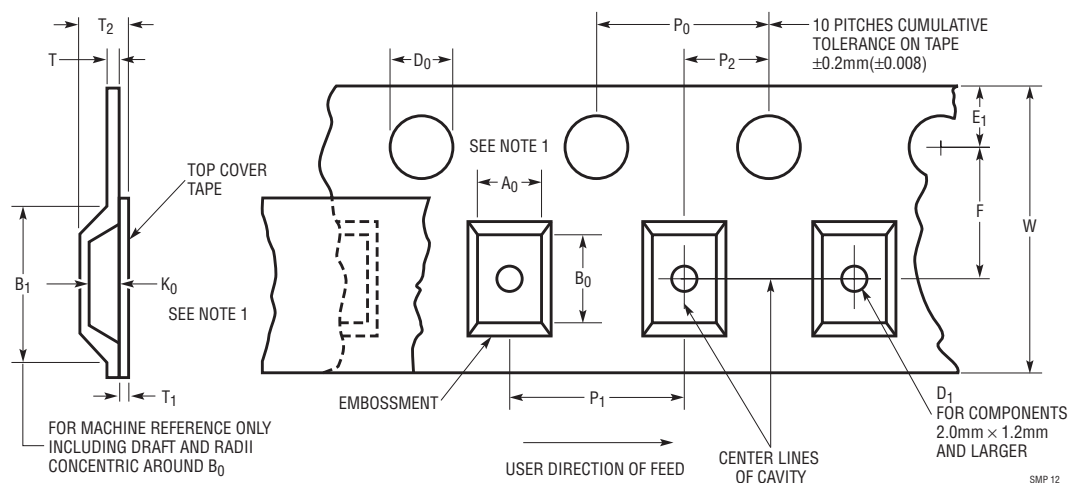
| LTC Package Code Designator | LTC Package Type  | Number of Leads Offered | W Tape Width | P <sub>1</sub> Component Pitch | P <sub>0</sub> Hole Pitch | Reel Diameter | Units per Reel |
|-----------------------------|-------------------|-------------------------|--------------|--------------------------------|---------------------------|---------------|----------------|
| MS, MSE                     | MSOP (0.118)      | 10, 12, 16              | 12mm         | 8mm                            | 4mm                       | 330mm (13")   | 2,500          |
| PD                          | UTQFN (3mm × 3mm) | 16                      | 12mm         | 8mm                            | 4mm                       | 330mm (13")   | 2,500          |
| PDC                         | UTQFN (3mm × 4mm) | 20                      | 12mm         | 8mm                            | 4mm                       | 330mm (13")   | 2,500          |
| PF                          | UTQFN (4mm × 4mm) | 24, 28                  | 12mm         | 8mm                            | 4mm                       | 330mm (13")   | 2,500          |
| S8, S8E                     | SO (0.150)        | 8                       | 12mm         | 8mm                            | 4mm                       | 330mm (13")   | 2,500          |
| S                           | SO (0.150)        | 14                      | 16mm         | 8mm                            | 4mm                       | 330mm (13")   | 2,500          |
| S                           | SO (0.150)        | 16                      | 16mm         | 8mm                            | 4mm                       | 330mm (13")   | 2,500          |
| ST                          | SOT-223           | 3                       | 16mm         | 12mm                           | 4mm                       | 330mm (13")   | 2,000          |
| SW                          | SO (0.300)        | 16                      | 16mm         | 12mm                           | 4mm                       | 330mm (13")   | 1,000          |
| SW                          | SO (0.300)        | 18                      | 24mm         | 12mm                           | 4mm                       | 330mm (13")   | 1,000          |
| SW                          | SO (0.300)        | 20                      | 24mm         | 12mm                           | 4mm                       | 330mm (13")   | 1,000          |
| SW                          | SO (0.300)        | 24                      | 24mm         | 12mm                           | 4mm                       | 330mm (13")   | 1,000          |
| SW                          | SO (0.300)        | 28                      | 24mm         | 12mm                           | 4mm                       | 330mm (13")   | 1,000          |
| S3*                         | SOT-23            | 3                       | 8mm          | 4mm                            | 4mm                       | 180mm (7")    | 2,500*         |
| S5*                         | SOT-23, TSOT      | 5                       | 8mm          | 4mm                            | 4mm                       | 180mm (7")    | 2,500*         |
| S6*                         | SOT-23, TSOT      | 6                       | 8mm          | 4mm                            | 4mm                       | 180mm (7")    | 2,500*         |
| SC6*                        | SC70              | 6                       | 8mm          | 4mm                            | 4mm                       | 180mm (7")    | 2,500*         |
| SC8*                        | SC70              | 8                       | 8mm          | 4mm                            | 4mm                       | 180mm (7")    | 2,500*         |
| TS8*                        | TSOT              | 8                       | 8mm          | 4mm                            | 4mm                       | 180mm (7")    | 2,500*         |
| UD                          | QFN (3mm × 3mm)   | 16, 20                  | 12mm         | 8mm                            | 4mm                       | 330mm (13")   | 2,500          |
| UDC                         | QFN (3mm × 4mm)   | 20, 24                  | 12mm         | 8mm                            | 4mm                       | 330mm (13")   | 2,500          |
| UDD                         | QFN (3mm × 5mm)   | 24                      | 12mm         | 8mm                            | 4mm                       | 330mm (13")   | 2,500          |
| UF                          | QFN (4mm × 4mm)   | 16, 20, 24, 28          | 12mm         | 8mm                            | 4mm                       | 330mm (13")   | 2,500          |
| UFD                         | QFN (4mm × 5mm)   | 20, 24, 28              | 12mm         | 8mm                            | 4mm                       | 330mm (13")   | 2,500          |
| UFE                         | QFN (4mm × 6mm)   | 26, 38                  | 12mm         | 8mm                            | 4mm                       | 330mm (13")   | 2,500          |
| UFF                         | QFN (4mm × 7mm)   | 34, 36, 44              | 12mm         | 8mm                            | 4mm                       | 330mm (13")   | 2,500          |
| UH                          | QFN (5mm × 5mm)   | 20, 24, 32, 40          | 12mm         | 8mm                            | 4mm                       | 330mm (13")   | 2,500          |
| UHE                         | QFN (5mm × 6mm)   | 28, 36, 42              | 12mm         | 8mm                            | 4mm                       | 330mm (13")   | 2,500          |
| UHF                         | QFN (5mm × 7mm)   | 38                      | 16mm         | 8mm                            | 4mm                       | 330mm (13")   | 2,500          |
| UHG                         | QFN (5mm × 8mm)   | 39, 52                  | 12mm         | 8mm                            | 4mm                       | 330mm (13")   | 2,500          |
| UHH                         | QFN (5mm × 9mm)   | 48, 56                  | 16mm         | 8mm                            | 4mm                       | 330mm (13")   | 2,500          |
| UJ                          | QFN (6mm × 6mm)   | 40                      | 16mm         | 12mm                           | 4mm                       | 330mm (13")   | 2,000          |
| UK                          | QFN (7mm × 7mm)   | 48                      | 16mm         | 12mm                           | 4mm                       | 330mm (13")   | 2,000          |
| UKG                         | QFN (7mm × 8mm)   | 47, 52                  | 16mm         | 12mm                           | 4mm                       | 330mm (13")   | 2,000          |
| UKH                         | QFN (7mm × 9mm)   | 64                      | 16mm         | 12mm                           | 4mm                       | 330mm (13")   | 2,000          |
| UKJ                         | QFN (7mm × 11mm)  | 64                      | 24mm         | 12mm                           | 4mm                       | 330mm (13")   | 2,000          |
| UKK                         | QFN (7mm × 12mm)  | 68                      | 24mm         | 12mm                           | 4mm                       | 330mm (13")   | 2,000          |
| UP                          | QFN (9mm × 9mm)   | 64                      | 16mm         | 12mm                           | 4mm                       | 330mm (13")   | 2,000          |
| WKG                         | QFN (7mm × 8mm)   | 52                      | 16mm         | 12mm                           | 4mm                       | 330mm (13")   | 2,000          |
| WP                          | QFN (9mm × 9mm)   | 64                      | 16mm         | 12mm                           | 4mm                       | 330mm (13")   | 2,000          |

## TAPE AND REEL SPECIFICATIONS—SURFACE MOUNT

## Bending Radius



## Embossed Carrier Dimensions (8mm, 12mm, 16mm, 24mm Tape Only)



## Embossed Tape—Constant Dimensions

| Tape Width | $D_0$          | $E_1$  | $P_0$               | $P_2$               | T Max   | $T_1$ Max | $A_0$ $B_0$ $K_0$ |
|------------|----------------|--------|---------------------|---------------------|---------|-----------|-------------------|
| 8mm        | 1.5<br>(0.059) | +0.10  | $4.0 \pm 0.10$      | $2.0 \pm 0.05$      | 0.600   | 0.10      | See Note 1        |
| 12mm       |                | -0.0   | $(0.069 \pm 0.004)$ | $(0.157 \pm 0.004)$ | (0.024) | (0.004)   |                   |
| 16mm       |                | +0.004 |                     |                     |         |           |                   |
| 24mm       |                | -0.0   |                     |                     |         |           |                   |

## Embossed Tape Variable Dimensions

| Tape Width      | $B_1$ Max       | $D_1$ Min                  | F                                      | $T_2$ Max       | R Min         | W Max |
|-----------------|-----------------|----------------------------|----------------------------------------|-----------------|---------------|-------|
| 8mm             | 4.35<br>(0.171) | 1.0<br>(0.039)             | $3.5 \pm 0.05$                         | 2.5<br>(0.098)  | 25<br>0.984   | 8.3   |
| 12mm<br>(0.323) | 8.2<br>(0.059)  | 1.5<br>(0.217 $\pm$ 0.002) | $5.5 \pm 0.05$<br>(0.256)              | 6.5<br>(0.256)  | 30<br>(1.181) | 12.3  |
| 16mm            | 12.1<br>(0.476) | 1.5<br>(0.217 $\pm$ 0.002) | $7.5 \pm 0.10$<br>(0.295 $\pm$ 0.004)  | 8.0<br>(0.315)  | 40<br>(1.575) | 16.3  |
| 24mm            | 20.1<br>(0.791) | 1.5<br>(0.217 $\pm$ 0.002) | $11.5 \pm 0.10$<br>(0.453 $\pm$ 0.004) | 12.0<br>(0.472) | 50<br>(1.969) | 24.3  |

**Note 1:** The cavity defined by  $A_0$ ,  $B_0$  and  $K_0$  shall surround the component with sufficient clearance that:

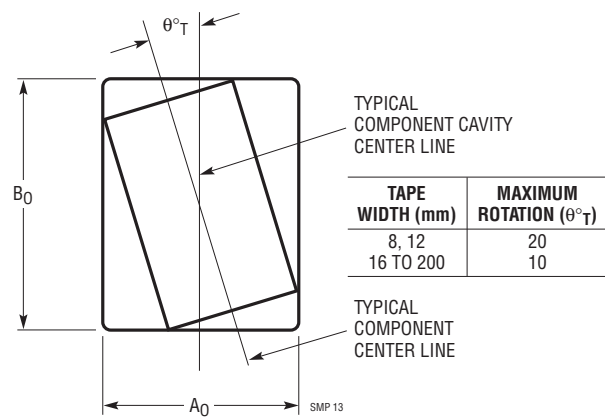
- the component does not protrude above the top surface of the carrier tape.
- the component can be removed from the cavity in a vertical direction without mechanical restriction after the top cover tape has been removed.

- rotation of the component is limited to 20° maximum for 8mm and 12mm tapes and 10° maximum for 16mm and 24mm tapes.
- lateral movement of the component is restricted to 0.5mm maximum for 8mm and 12mm wide tape and to 1.0mm maximum for 16mm and 24mm wide tape.

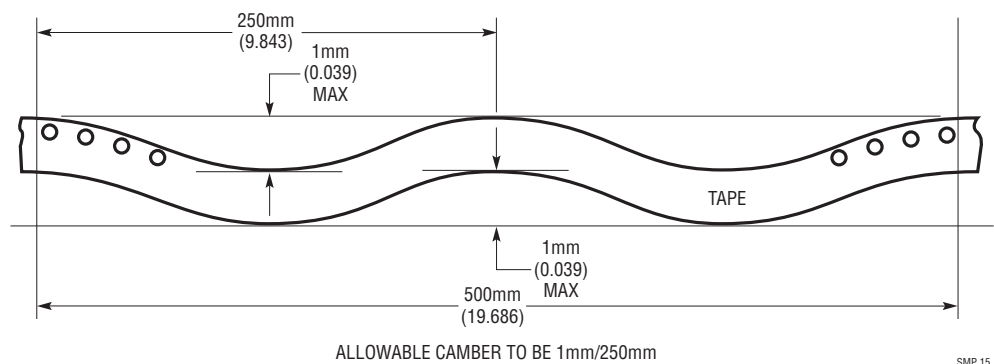
**Note 2:** The tape with or without components shall pass around R without damage.

TAPE AND REEL SPECIFICATIONS—SURFACE MOUNT

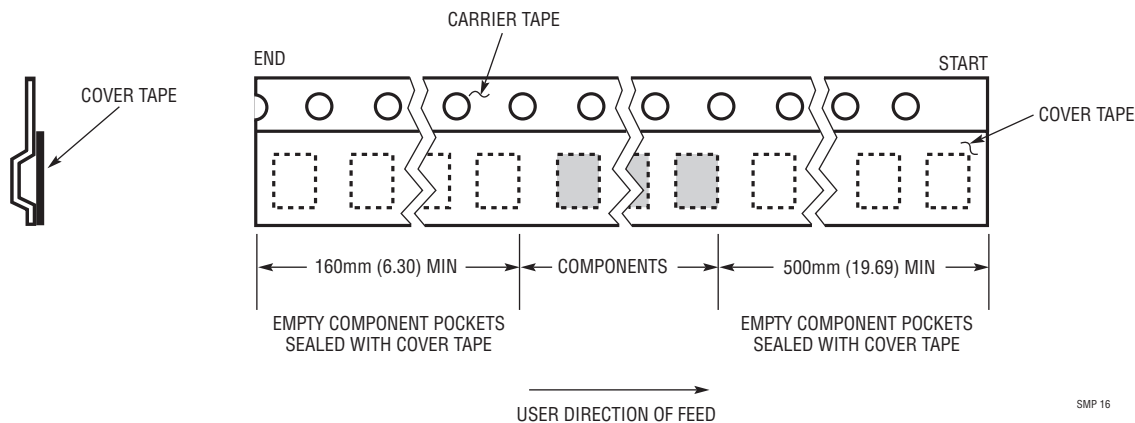
Component Rotation



Tape Camber (Top View)

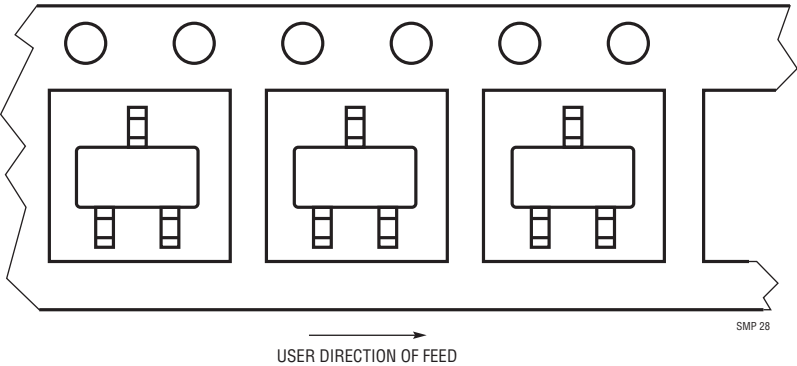


Tape Leader (Start/End) Specification

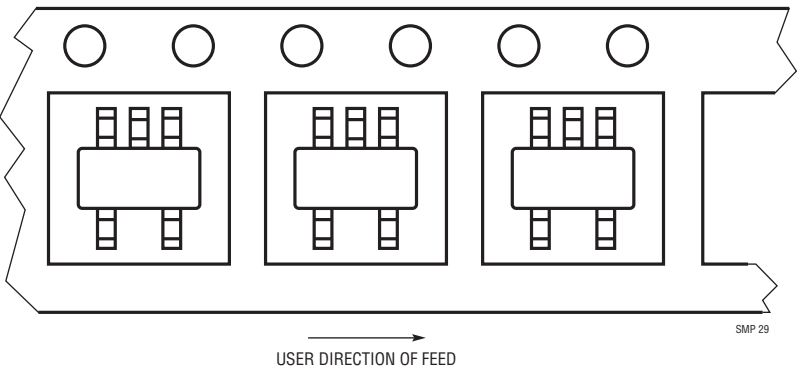


TAPE AND REEL SPECIFICATIONS—SURFACE MOUNT

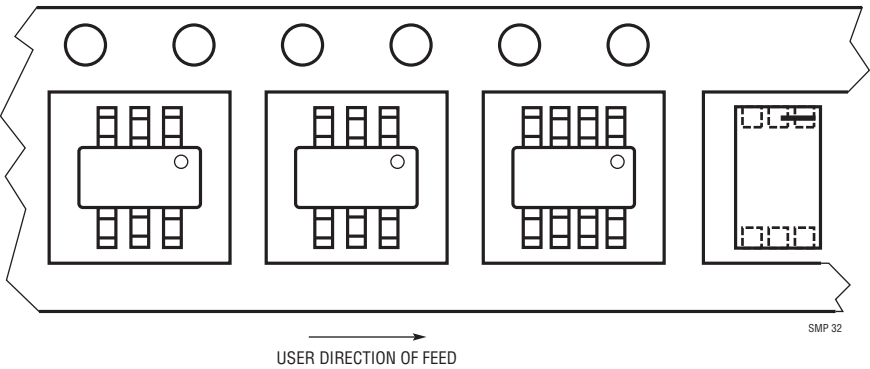
S3  
SOT-23 Devices



S5  
TSOT, SOT-23 Devices

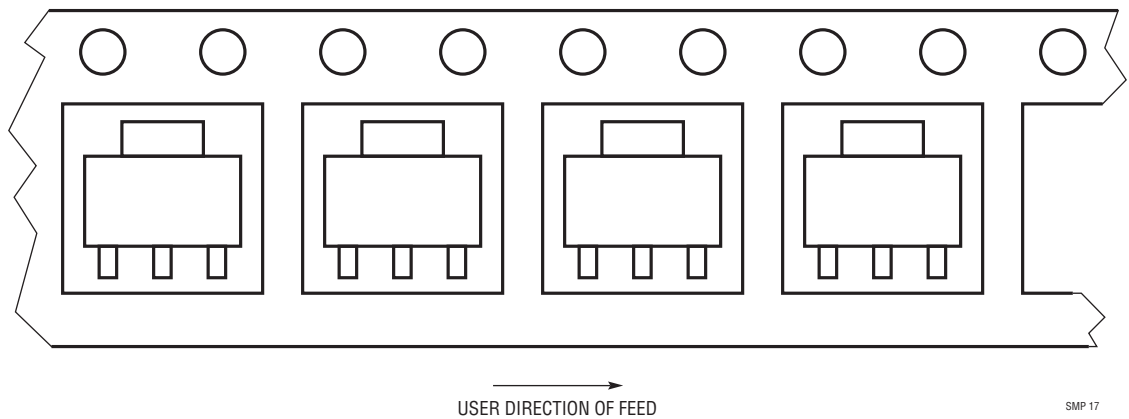


SC6, S6 and TS8  
SC70, TSOT, SOT-23, DFN (DCB) Devices

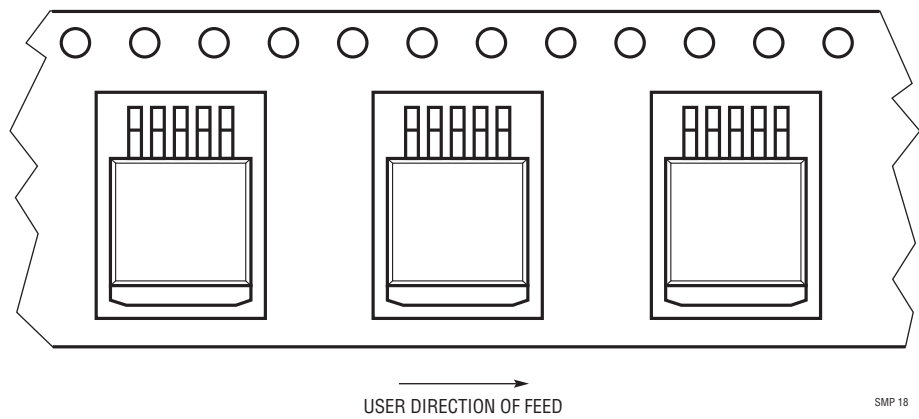


TAPE AND REEL SPECIFICATIONS—SURFACE MOUNT

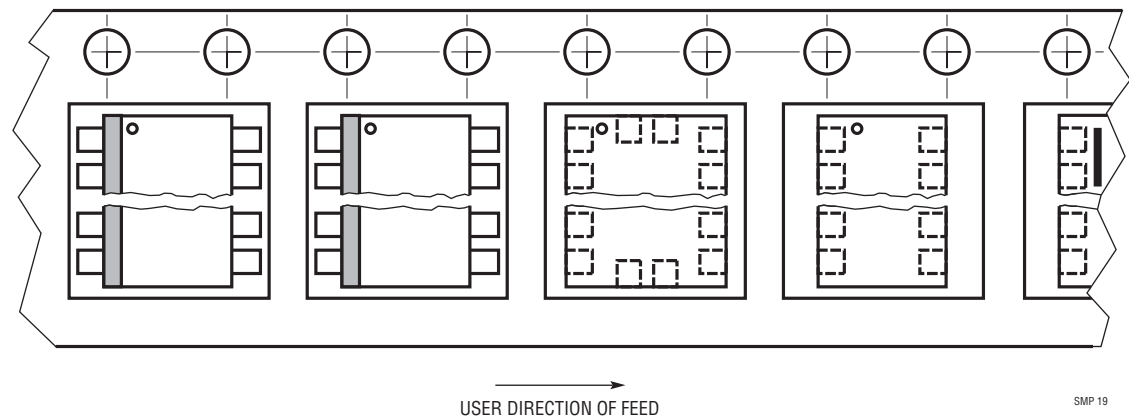
ST  
SOT-223 Devices



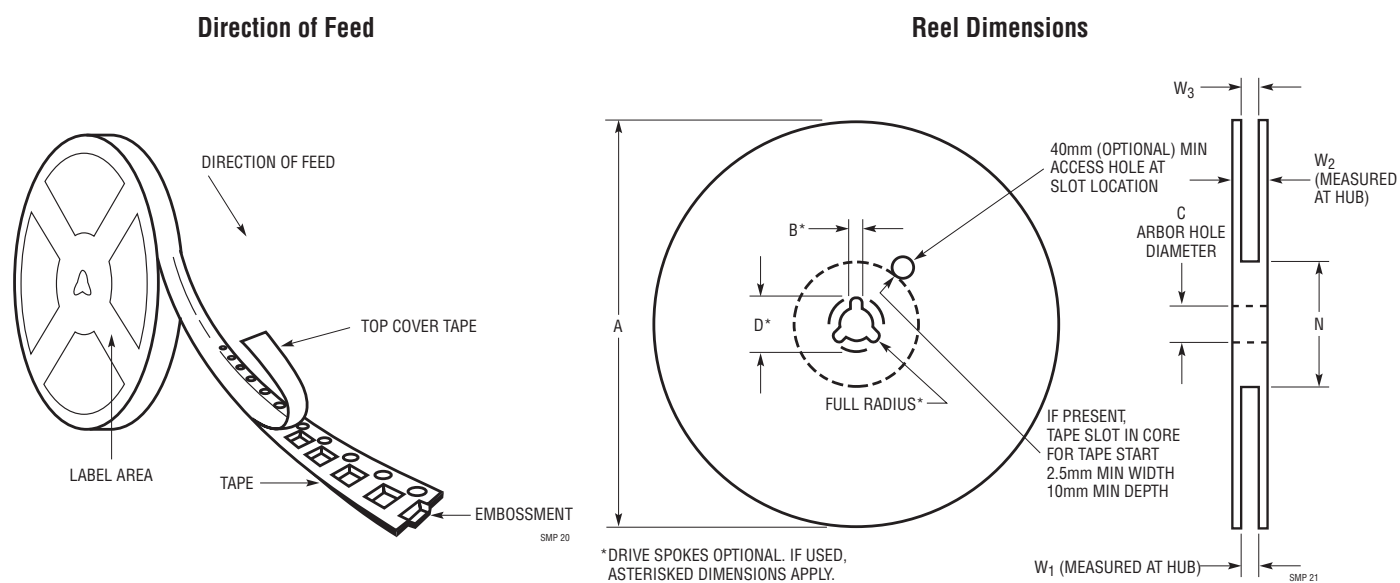
M, Q, R  
DD Pak Devices



F, FE, FW, G, GN, GW, S8, S, SW, MS8, MS, MS8E, MSE,  
SSOP, TSSOP, QFN, DFN, UTDFN and UTQFN Devices [except DFN (DCB)]



## REEL DIMENSIONS—SURFACE MOUNT



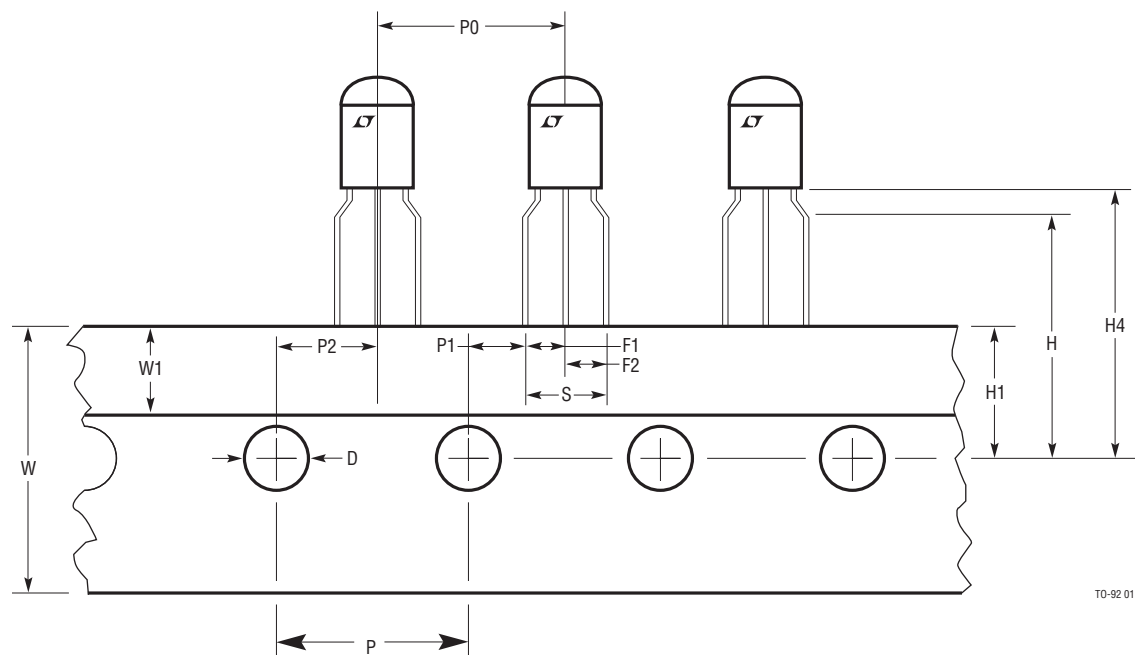
| Tape Width | A Max | B Min | C                                    | D* Min | N Min | W <sub>1</sub>                        | W <sub>2</sub> Max | W <sub>3</sub>                                    |
|------------|-------|-------|--------------------------------------|--------|-------|---------------------------------------|--------------------|---------------------------------------------------|
| 8mm        | 180   | 1.5   | 13.0 <sup>+0.5</sup> <sub>-0.2</sub> | 20.2   | 60    | 8.4 <sup>+1.5</sup> <sub>-0.0</sub>   | 14.4               | Shall Accommodate Tape Width Without Interference |
|            | 330   | 1.5   | 13.0 <sup>+0.5</sup> <sub>-0.2</sub> | 20.2   | 50    | 8.4 <sup>+1.5</sup> <sub>-0.0</sub>   | 14.4               |                                                   |
| 12mm       | 180   | 1.5   | 13.0 <sup>+0.5</sup> <sub>-0.2</sub> | 20.2   | 60    | 12.4 <sup>+2.0</sup> <sub>-0.0</sub>  | 18.4               |                                                   |
|            | 330   | 1.5   | 13.0 <sup>+0.5</sup> <sub>-0.2</sub> | 20.2   | 50    | 12.4 <sup>+2.0</sup> <sub>-0.0</sub>  | 18.4               |                                                   |
| 16mm       | 330   | 1.5   | 13.0 <sup>+0.5</sup> <sub>-0.2</sub> | 20.2   | 50    | 16.4 <sup>+2.0</sup> <sub>-0.00</sub> | 22.4               |                                                   |
| 24mm       | 330   | 1.5   | 13.0 <sup>+0.5</sup> <sub>-0.2</sub> | 20.2   | 60    | 24.4 <sup>+2.0</sup> <sub>-0.00</sub> | 30.4               |                                                   |

**Note 1:** All dimensions in millimeters.

**Note 2:** See Table 1 for tape width and reel diameter of specific packages.

TAPE AND REEL SPECIFICATIONS—TO-92

TO-92 Tape Dimension

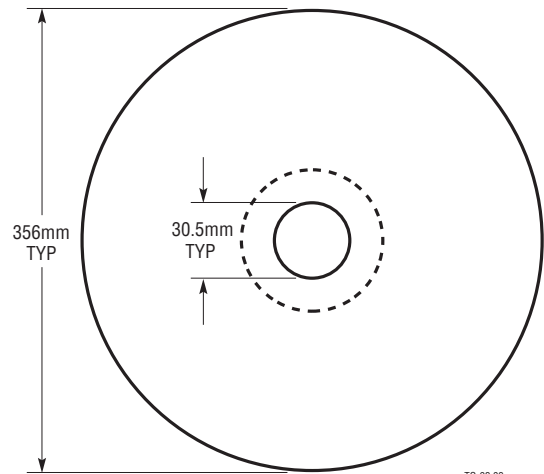


TO-92 01

Table 1

| Symbol | Description                      | Dimension (mm)   |
|--------|----------------------------------|------------------|
| D      | Sprocket Hole Diameter           | $4 \pm 0.2$      |
| H      | Length from Seating Plane        | $16 \pm 0.5$     |
| H1     | Sprocket Hole Location           | $9 \pm 0.5$      |
| H4     | Component Base Height            | 20 Max           |
| P      | Sprocket Hole Pitch              | $12.7 \pm 0.2$   |
| P0     | Pitch of Component               | $12.7 \pm 0.5$   |
| P1     | Lead Location                    | $3.85 \pm 0.5$   |
| P2     | Center of Seating Plane Location | $6.35 \pm 0.4$   |
| S      | Component Lead Spacing           | $5 +0.8/-0.2$    |
| W      | Carrier Tape Width               | $18 +1, -0.5$    |
| W1     | Adhesive Tape Width              | $6.0 \pm 1.0$    |
| F1, F2 | Lead-to-Lead Distance            | $2.5 +0.4, -0.1$ |

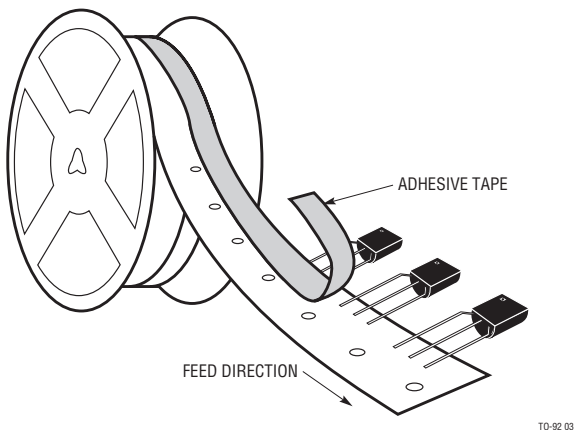
TO-92 Reel Dimensions



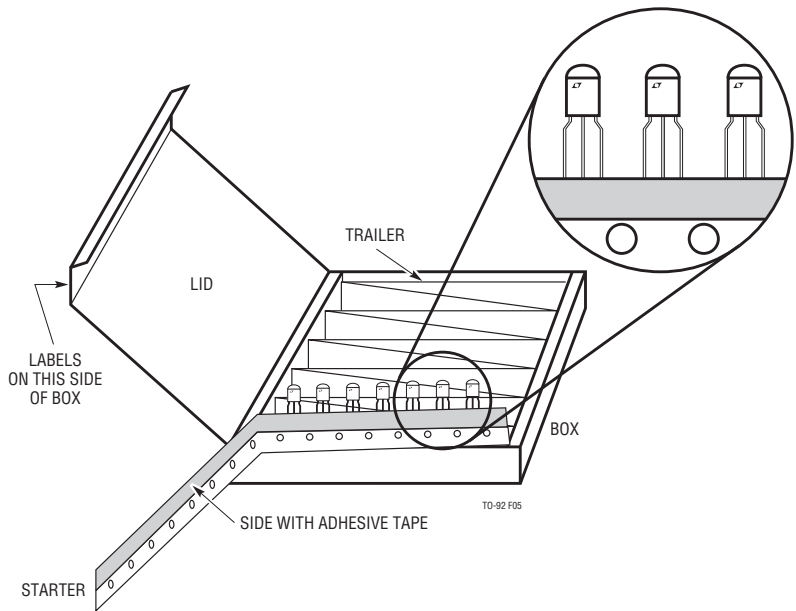
TO-92 02

TAPE AND REEL SPECIFICATIONS—TO-92

Reel Pak Tape Orientation on Reel

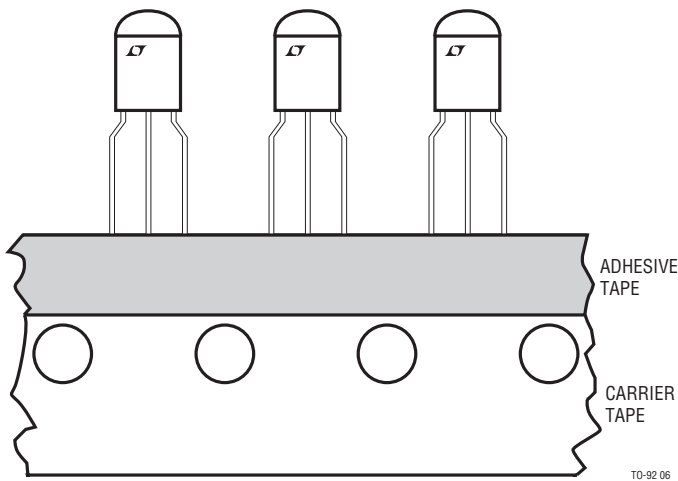


Ammo Pak Tape Orientation Inside Box



Package Orientation on Tape

STYLE E: Standard Flow TR  
(Flat Side of Package Faces Toward the Adhesive Tape)



STYLE A: Special Flow TRA  
(Rounded Side of Package Faces Toward the Adhesive Tape)

