

**OVERVIEW**

There are three basic methods used to deliver semiconductor devices to end-users: Tape and Reel, Shipping Tube and Bulk packing. After unpacking the devices, however, handle them with care not to let ICs become loose or protrude to prevent them from being damaged. Brief definitions of each packing configuration are:

- **Tape and Reel** – Tape-and-reel is one of the primary methods for shipping surface mount devices. The configuration is designed to feed surface-mount devices (SMDs) for automated circuit board assembly systems. This configuration consists of a carrier tape loaded with the SMDs wound onto a reel and a cover tape sealed to the carrier tape (See Figure 17). The reel is placed in a shipping box for transport and delivery.
- **Shipping Tube** – The shipping tubes (also called “Stick Magazines”) are constructed of rigid clear or poly- vinylchloride (PVC) material, and extruded in applicable standard outlines that meet current industry standards, and protect devices during shipping and handling.
- **Bulk** – The devices are placed inside a small box laid with labeled anti-static bag. These smaller boxes are individually labeled and placed finally inside a labeled shipping carton which still comes in different sizes depending on the number of devices shipped.

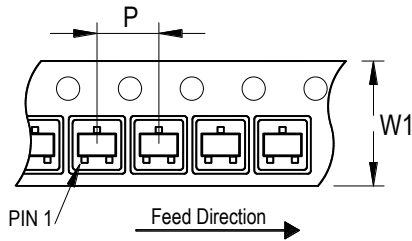
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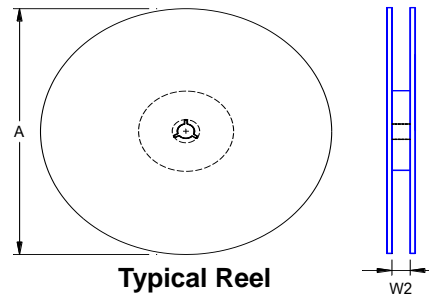
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**Tape & Reel Data:**

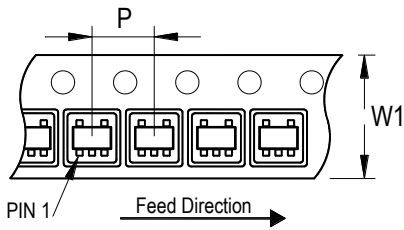
**SOT/TSOT-23, SOT-89, SOT-223, SC-70, SC-82 and SOT-143, SOT-563**



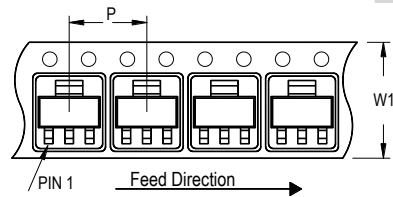
**Figure 1. SOT/TSOT-23-3 / SC-70-3**



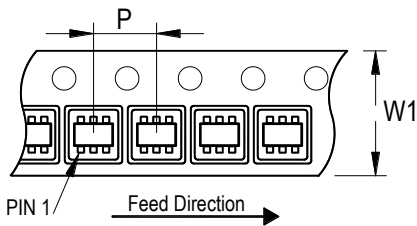
**Typical Reel**



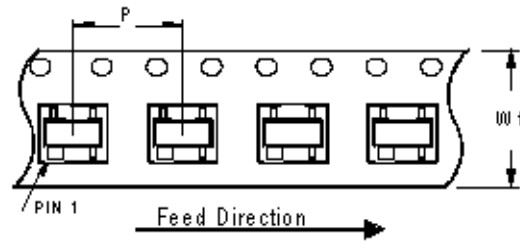
**Figure 2. SOT/TSOT-23-5 / SC-70-5**



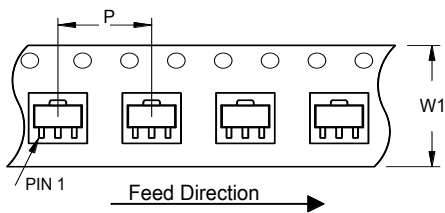
**Figure 6. SOT-223**



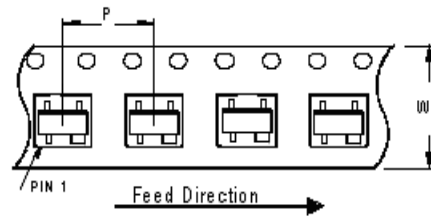
**Figure 3. SOT/TSOT-23-6/8 / SC-70-4/6/8,**



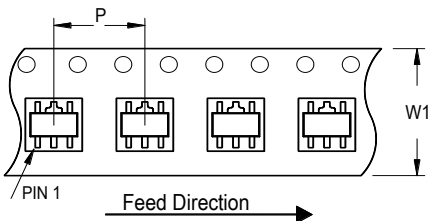
**Figure 7. SOT-143**



**Figure 4. SOT-89**



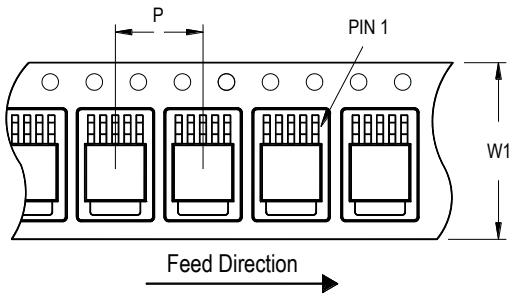
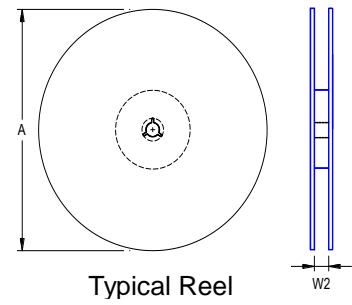
**Figure 8. SC-82**



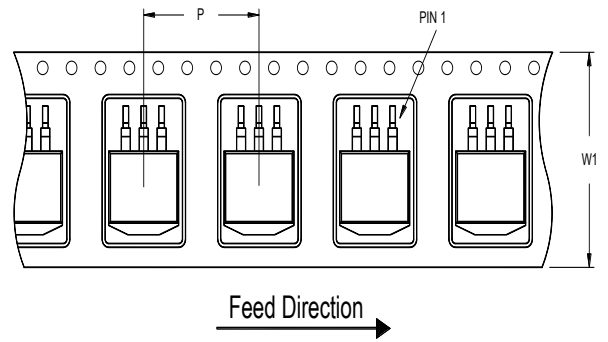
**Figure 5.**

Package Type Lead Count	Tape Size (W1) (mm)	Pocket Pitch (P) (mm)	Reel Size (A)		Units per Reel	Reel Width (W2) Min./Max. (mm)	Figure
			(mm)	(in)			
<b>SOT/TSOT-23</b>							
3-Lead	8	4	180	7	3,000	8.4/9.9	1
5-Lead	8	4	180	7	3,000	8.4/9.9	2
6-Lead	8	4	180	7	3,000	8.4/9.9	3
8-Lead	8	4	180	7	3,000	8.4/9.9	3
<b>SOT-89</b>							
3-Lead	12	8	180	7	1,000	12.4/14.4	4
5-Lead	12	8	180	7	1,000	12.4/14.4	5
<b>SOT-223</b>							
3-Lead	12	8	330	13	2,500	12.4/14.4	6
<b>SC-70</b>							
3-Lead	8	4	180	7	3,000	8.4/9.9	1
4-Lead	8	4	180	7	3,000	8.4/9.9	2
5-Lead	8	4	180	7	3,000	8.4/9.9	3
6-Lead	8	4	180	7	3,000	8.4/9.9	3
8-Lead	8	4	180	7	3,000	8.4/9.9	3
<b>SC-82</b>							
4-Lead	8	4	180	7	3,000	8.4/9.9	7
<b>SOT-143</b>							
4-Lead	8	4	180	7	3,000	8.4/9.9	8
<b>SOT-563</b>							
6-Lead	8	4	180	7	5,000	8.4/9.9	3

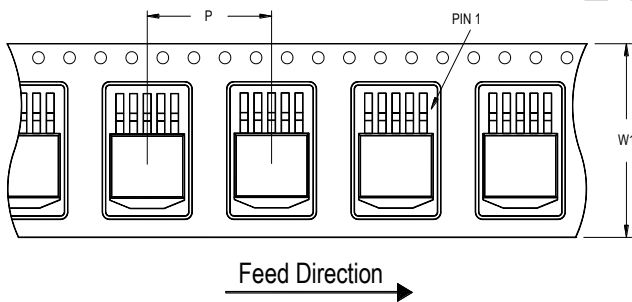
**TO-252 and TO-263**



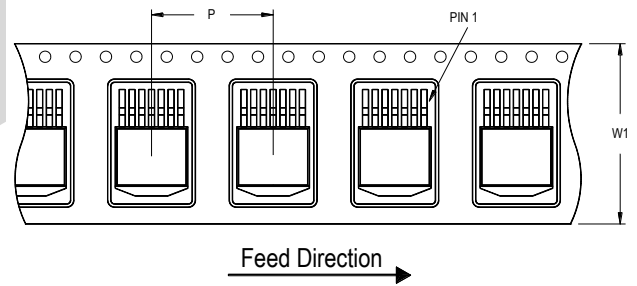
**Figure 10. TO-252-5**



**Figure 11. TO-263-3**



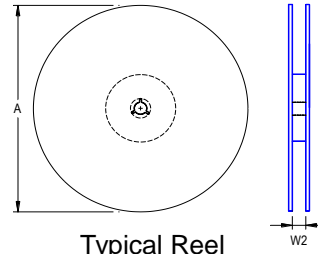
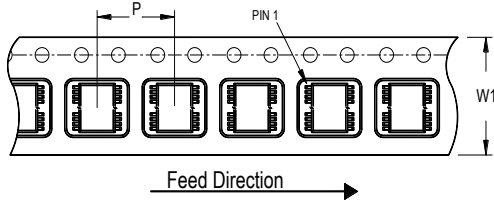
**Figure 12. TO-263-5**



**Figure 13. TO-263-7**

Package Type Lead Count	Tape Size (W1) (mm)	Pocket Pitch (P) (mm)	Reel Size (A)		Units per Reel	Reel Width (W2) Min./Max. (mm)	Figure
			(mm)	(in)			
<b>TO-252</b>							
3-Lead	16	8	330	13	2,500	16.4/18.4	9
5-Lead	16	8	330	13	2,500	16.4/18.4	10
<b>TO-263</b>							
3-Lead	24	16	380	15	1,000	24.4/26.4	11
5-Lead	24	16	380	15	1,000	24.4/26.4	12
7-Lead	24	16	380	15	1,000	24.4/26.4	13

**SOP, PSOP, TSSOP, MSOP, PMSOP, SSOP and SOJ**



**Figure 14. SOP, PSOP, TSSOP, MSOP, PMSOP, SSOP**

Package Type Lead Count	Tape Size (W1) (mm)	Pocket Pitch (P) (mm)	Reel Size (A)		Units per Reel	Reel Width (W2) Min./Max. (mm)	Figure
			(mm)	(in)			
<b>SOP/ PSOP (150mil)</b>							
8-Lead	12	8	330	13	2,500	12.4/14.4	14
14-Lead	16	8	330	13	2,500	16.4/18.4	14
16-Lead	16	8	330	13	2,500	16.4/18.4	14
<b>SOP (300mil)</b>							
16-Lead	24	12	330	13	1,000	24.4/26.4	14
18-Lead	24	12	330	13	1,000	24.4/26.4	14
20-Lead	24	12	330	13	1,000	24.4/26.4	14
24-Lead	24	12	330	13	1,000	24.4/26.4	14
28-Lead	24	12	330	13	1,000	24.4/26.4	14
32-Lead	32	12	330	13	1,000	32.4/34.4	14
<b>TSSOP (173mil)</b>							
8-Lead	12	8	330	13	2,500	12.4/14.4	14
14-Lead	12	8	330	13	2,500	12.4/14.4	14
16-Lead	12	8	330	13	2,500	12.4/14.4	14
20-Lead	16	8	330	13	2,500	16.4/18.4	14
24-Lead	16	8	330	13	2,500	16.4/18.4	14
28-Lead	16	8	330	13	2,500	16.4/18.4	14
32-Lead	24	8	330	13	2,500	24.4/28.4	14
<b>MSOP/ PMSOP</b>							
8-Lead	12	8	330	13	2,500	12.4/14.4	14
10-Lead	12	8	330	13	2,500	12.4/14.4	14
<b>SSOP</b>							
16-Lead	12	8	330	13	2,500	12.4/14.4	14
24-Lead	16	8	330	13	2,500	16.4/18.4	14
28-Lead	16	8	330	13	2,500	16.4/18.4	14
48-Lead	24	12	330	13	1,000	24.4/26.4	14
<b>SSOP (236mil)</b>							
24-Lead	24	12	330	13	1,000	24.4/26.4	14
<b>SSOP (209mil)</b>							
30-Lead	24	12	330	13	2,000	24.4/26.4	14
<b>SOJ</b>							
10-Lead	8	4	180	7	3,000	8.4/9.9	14

QFN and DFN

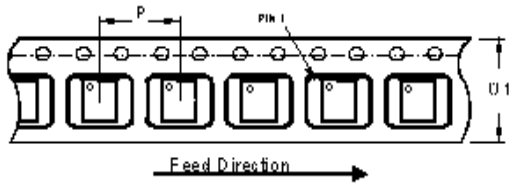
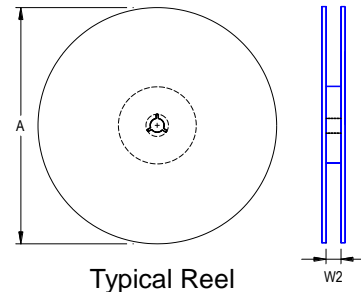


Figure 15. QFN / DFN



Typical Reel

Package Type Lead Count	Tape Size (W1) (mm)	Pocket Pitch (P) (mm)	Reel Size (A)		Units per Reel	Reel Width (W2) Min./Max. (mm)	Figure
			(mm)	(in)			
<b>QFN/ DFN</b>							
$\leq 2 \times 2$	8	4	180	7	2,500	8.4/9.9	15
$> 2 \times 2$ & $\leq 5 \times 5$	12	8	180	7	1,500	12.4/14.4	15
$> 5 \times 5$ & $\leq 9 \times 9$	16	12	330	13	2,500	16.4/18.4	15

WLCSP/BGA/LGA

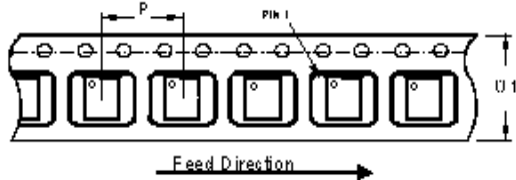
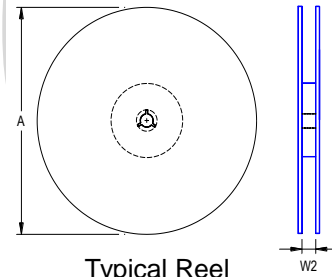


Figure 16. WLCSP/BGA/LGA

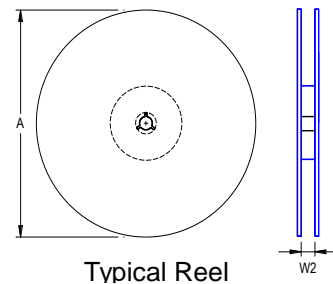
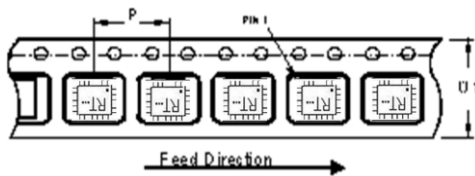


Typical Reel

Package Type Lead Count	Tape Size (W1) (mm)	Pocket Pitch (P) (mm)	Reel Size (A)		Units per Reel	Reel Width (W2) Min./Max. (mm)	Figure
			(mm)	(in)			
<b>WLCSP/BGA/LGA</b>							
$< 3 \times 3$	8	4	180	7	3,000	8.4/9.9	16
$\geq 3 \times 3$ & $\leq 5 \times 5$	12	8	180	7	1,500	12.4/14.4	16
$> 5 \times 5$	16	12	330	13	2,500	16.4/18.4	15

QFP

Figure 17. QFP



Typical Reel

Package Type Lead Count	Tape Size (W1) (mm)	Pocket Pitch (P) (mm)	Reel Size (A)		Units per Reel	Reel Width (W2) Min./Max. (mm)	Figure
			(mm)	(in)			
<b>QFP</b>							
7x7	16	12	330	13	2,500	16.4/18.4	17

Carrier Tape Specification

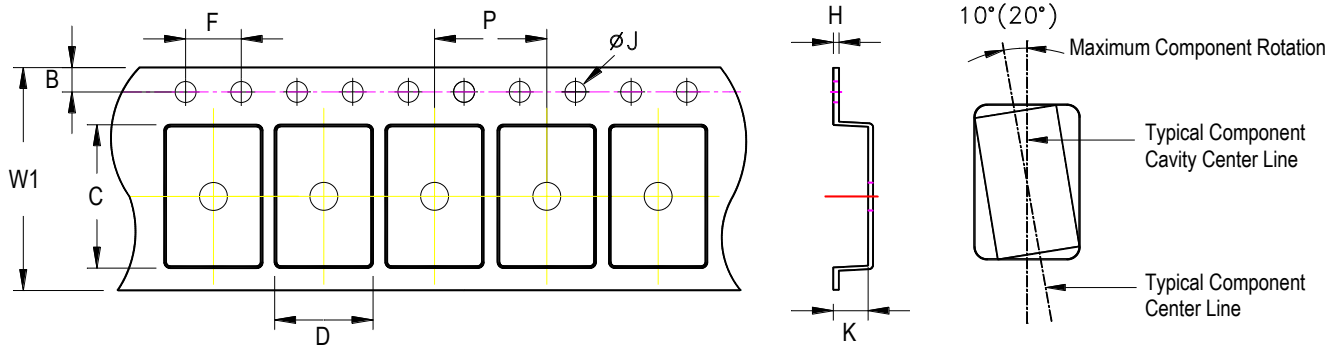


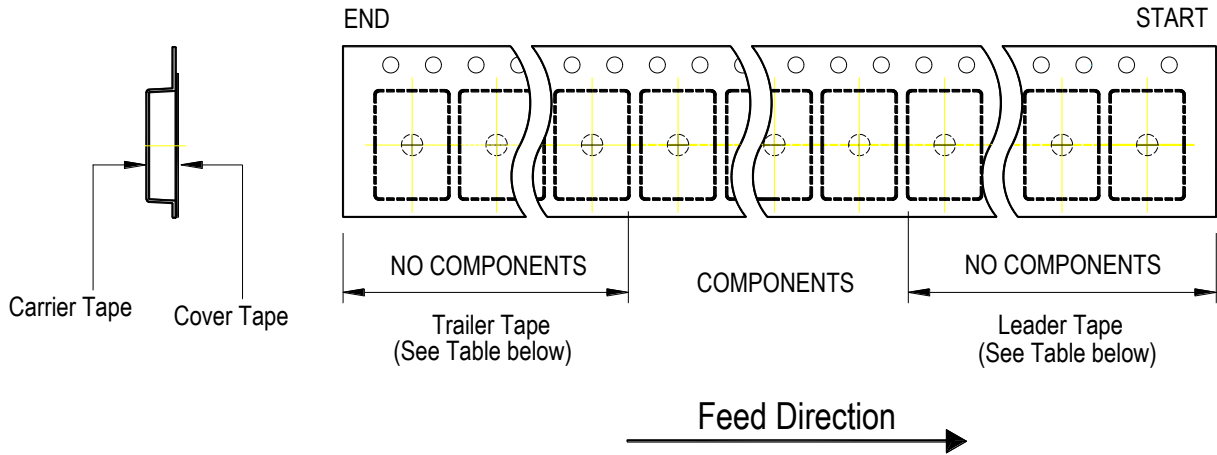
Figure 17. Carrier Tape Dimensions

Tape Size	W1	P		B		F		ØJ		H
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Max.
8mm	8.3mm	3.9mm	4.1mm	1.65mm	1.85mm	3.9mm	4.1mm	1.5mm	1.6mm	0.6mm
12mm	12.3mm	7.9mm	8.1mm	1.65mm	1.85mm	3.9mm	4.1mm	1.5mm	1.6mm	0.6mm
16mm	16.3mm	7.9mm	8.1mm	1.65mm	1.85mm	3.9mm	4.1mm	1.5mm	1.6mm	0.6mm
24mm	24.3mm	11.9mm	12.1mm	1.65mm	1.85mm	3.9mm	4.1mm	1.5mm	1.6mm	0.6mm
24mm	24.3mm	15.9mm	16.1mm	1.65mm	1.85mm	3.9mm	4.1mm	1.5mm	1.6mm	0.6mm
32mm	32.3mm	11.9mm	12.1mm	1.65mm	1.85mm	3.9mm	4.1mm	1.5mm	1.6mm	0.6mm

Note:

- C, D and K are determined by component size. The clearance between the components and the cavity is as follows:
  - For 8mm and 12mm carrier tape: 0.5mm max.
  - For 16mm, 24mm and 32mm carrier tape: 1.0mm max.
- Maximum Component Rotation
  - For 8mm and 12mm carrier tape: 20° max.
  - For 16mm, 24mm and 32mm carrier tape: 10° max.
- The tape-and-reel configuration, as shipped by RichTek, meets current industry standards. EIA-481-1, EIA-481-2, and EIA-481-3 apply to the embossed configurations.

**Tape Leader and Trailer**

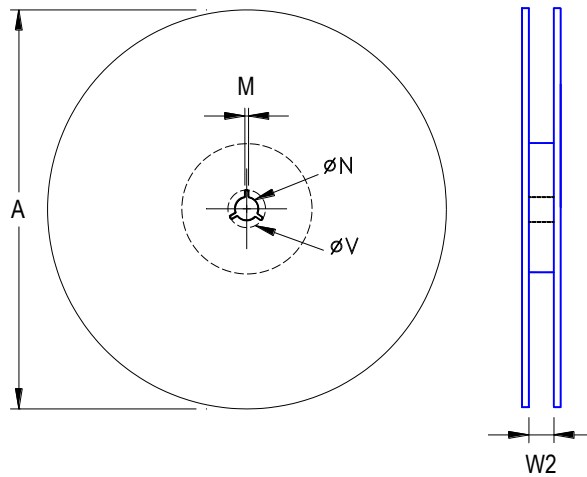


**Figure 18. Tape Leader and Trailer**

Package Type (Lead Count)	Leader (Empty Cavity)	Trailer
SOT/TSOT-23 (3, 5, 6, 8-Lead)	≥ 600mm	160mm
SOT-89 (3, 5-Lead)	≥ 600mm	160mm
SC-70 (3, 4, 5, 6, 8-Lead)	≥ 600mm	160mm
SC-82 (4-Lead)	≥ 600mm	160mm
SOT-143	≥ 600mm	160mm
SOT-223 (3-Lead)	≥ 600mm	160mm
SOT-563	≥ 600mm	160mm
TO-252 (3, 4, 5-Lead)	≥ 600mm	160mm
TO-263 (3, 5, 7-Lead)	≥ 600mm	160mm
SOP/PSOP (150mil) (8-Lead)	≥ 600mm	160mm
SOP (150mil) (14,16-Lead)	≥ 600mm	160mm
SOP (300mil) (20, 24, 28, 32-Lead)	≥ 600mm	160mm
TSSOP (8, 14, 16, 20, 24, 28, 32-Lead)	≥ 600mm	160mm
MSOP/PMSOP (8, 10-Lead)	≥ 600mm	160mm
SSOP (16, 24, 28, 48-Lead)	≥ 600mm	160mm
SSOP(236mil)(24- Lead)	≥ 600mm	160mm
SSOP (209mil)(30- Lead)	≥ 600mm	160mm
SOJ(10- Lead)	≥ 600mm	160mm
QFN/ DFN Series	≥ 600mm	160mm
WLCSP Series	≥ 600mm	160mm
QFP Series	≥ 600mm	160mm



**Reels Specification**



**Figure 19. Typical Reel Outline**

Tape Size	A		M	ØN		ØV	W2	
	Min.	Max.	Min.	Min.	Max.	Min.	Min.	Max.
8mm	178mm	182mm	1.5mm	12.8mm	13.5mm	20.2mm	8.4mm	9.9mm
12mm	178mm	182mm	1.5mm	12.8mm	13.5mm	20.2mm	12.4mm	14.4mm
12mm	328mm	332mm	1.5mm	12.8mm	13.5mm	20.2mm	12.4mm	14.4mm
16mm	328mm	332mm	1.5mm	12.8mm	13.5mm	20.2mm	16.4mm	18.4mm
24mm	328mm	332mm	1.5mm	12.8mm	13.5mm	20.2mm	24.4mm	26.4mm
24mm	378mm	382mm	1.5mm	12.8mm	13.5mm	20.2mm	24.4mm	26.4mm
32mm	328mm	332mm	1.5mm	12.8mm	13.5mm	20.2mm	32.4mm	34.4mm

**Note:**

1. The reels can be constructed of one, two, or three parts.
2. Reel dimensions are within the EIA-481-1, EIA-481-2, and EIA-481-3 standards as shown in Figure 18.

**Box and Carton Packing**



**Box A**



**Box B & G**



**Carton A**

Packages	Container	Box			Carton		
		(LxWxH)	Reel(s)	Amount Q'ty	(LxWxH)	Boxes	Amount Q'ty
SOT/TOT-23 (3, 5, 6, 8-Lead)	A	(18.3x18.3x8)	3	9,000	A (38.3x27.2x38.3)	12	108,000
SC-70 (3, 4, 5, 6, 8-Lead)	A	(18.3x18.3x8)	3	9,000	A (38.3x27.2x38.3)	12	108,000
SC-82 (4-Lead)	A	(18.3x18.3x8)	3	9,000	A (38.3x27.2x38.3)	12	108,000
SOT-143	A	(18.3x18.3x8)	3	9,000	A (38.3x27.2x38.3)	12	108,000
SOT-223 (3-Lead)	G	(35.5x33.8x4)	1	2,500	A (38.3x27.2x38.3)	6	15,000
SOT-563	A	(18.3x18.3x8)	3	15,000	A (38.3x27.2x38.3)	12	180,000
TO-252 (3, 5-Lead)	B	(35.5x33.8x5)	1	2,500	A (38.3x27.2x38.3)	5	12,500
SOP (150mil) (7, 8-Lead)	G	(35.5x33.8x4)	1	2,500	A (38.3x27.2x38.3)	6	15,000
SOP (150mil) (14, 16-Lead)	G	(35.5x33.8x4)	1	2,500	A (38.3x27.2x38.3)	6	15,000
SOP (300mil) (20, 24, 28-Lead)	G	(35.5x33.8x4)	1	2,500	A (38.3x27.2x38.3)	6	15,000
SOP (300mil) 32-Lead	G	(35.5x33.8x4)	1	2,500	A (38.3x27.2x38.3)	6	15,000
TSSOP (8, 14, 16, 20, 24, 28-Lead)	G	(35.5x33.8x4)	1	2,500	A (38.3x27.2x38.3)	6	15,000
TSSOP 32-Lead	G	(35.5x33.8x4)	1	2,500	A (38.3x27.2x38.3)	6	15,000
MSOP (8, 10-Lead)	G	(35.5x33.8x4)	1	2,500	A (38.3x27.2x38.3)	6	15,000
SSOP (236mil)(24-Lead)	G	(35.5x33.8x4)	1	2,500	A (38.3x27.2x38.3)	6	15,000
SSOP (16, 24, 28-Lead)	G	(35.5x33.8x4)	1	2,500	A (38.3x27.2x38.3)	6	15,000
SSOP (48-Lead)	G	(35.5x33.8x4)	1	1,000	A (38.3x27.2x38.3)	6	6,000
SSOP (209mil)(30-Lead)	G	(35.5x33.8x4)	1	2,000	A (38.3x27.2x38.3)	6	12,000
SOJ(10-Lead)	G	(35.5x33.8x4)	1	2,500	A (38.3x27.2x38.3)	6	15,000
QFN/ DFN ≤2x2 Series	A	(18.3x18.3x8)	3	7,500	A (38.3x27.2x38.3)	12	90,000
2x2<QFN/DFN≤5x5 Series	A	(18.3x18.3x8)	3	4,500	A (38.3x27.2x38.3)	12	54,000
QFN/ DFN > 5x5 Series	G	(35.5x33.8x4)	1	2,500	A (38.3x27.2x38.3)	6	15,000
WLCSP < 3x3 Series	A	(18.3x18.3x8)	3	9,000	A (38.3x27.2x38.3)	12	108,000
3x3≤WLCSP≤5x5 Series	A	(18.3x18.3x8)	3	4,500	A (38.3x27.2x38.3)	12	54,000
WLCSP > 5x5 Series	G	(35.5x33.8x4)	1	2,500	A (38.3x27.2x38.3)	6	15,000

Note: All dimensions are in centimeters.

**Box and Carton Packing**



**Box A**



**Carton A**



**Box D**



**Carton C**

Container / Packages	Box			Carton		
	(LxWxH)	Reel(s)	Amount Q'ty	(LxWxH)	Boxes	Amount Q'ty
SOT-89 (3, 5-Lead)	A (18.3x18.3x8)	3	3,000	A (38.3x27.2x38.3)	12	36,000
TO-263 (3, 5, 7-Lead)	D (40.8x39.2x5.0)	1	1,000	C (43.0x28.0x43.5)	5	5,000

Note: All dimensions are in centimeters.

**Shipping Tube Data**



**Box C**



**Carton B**

Container Packages	Tube		Box		Carton	
	Units	Length	Units	Dimension (LxWxH)	Units	Dimension (LxWxH)
DIP (8-Lead)	50	50.2	3,000	C 55.0x16.5x10.5	12,000	B 56.9x35.0x25.0
DIP (14, 16-Lead)	25	50.2	1500	C 55.0x16.5x10.5	6,000	B 56.9x35.0x25.0
SOP / PSOP (150mil) (8 Lead)	100	52.45	10,000	C 55.0x16.5x10.5	40,000	B 56.9x35.0x25.0
SOP / PSOP (150mil) (14 Lead)	57	52.45	5,700	C 55.0x16.5x10.5	22,800	B 56.9x35.0x25.0
SOP / PSOP (150mil) (16 Lead)	50	52.45	5,000	C 55.0x16.5x10.5	20,000	B 56.9x35.0x25.0
TO-251 / TS-252 (3, 5-Lead)	80	54	6,000	C 55.0x16.5x10.5	24,000	B 56.9x35.0x25.0
TO-220 (3, 5, 7-Lead)	50	53.6	2,000	C 55.0x16.5x10.5	8,000	B 56.9x35.0x25.0
TO-263 (3, 5, 7-Lead)	50	53.6	2,000	C 55.0x16.5x10.5	8,000	B 56.9x35.0x25.0

Note: All dimensions are in centimeters.

**Bulk Data**



**Box A**



**Carton B**

Container Packages	Bag		Box		Carton	
	Units	Dimension	Units	Dimension (LxWxH)	Units	Dimension (LxWxH)
TO-92 (3-Lead)	1,000	17x17	4,000	A 18.3x18.3x8	48,000	B 56.9x35.0x25.0

Note: All dimensions are in centimeters.