

Tape and Reel Packaging

Introduction

The electronics industry is making a tremendous investment in surface-mount technology. The reasons for this investment include cost savings resulting from automated component placement and increased density of PCB layout due to smaller package sizes.

Today's placement machines can pick and place thousands of components per hour with a very high degree of accuracy. To achieve this performance, the component delivery system must be capable of feeding parts at high speeds in a consistent orientation, positively indexed to the demands of the machine. The leads of the components must be protected from damage during shipment, handling, and placement.

The preferred packing material available today for these demands is tape and reel. Analog Devices' tape and reel system is fully compatible with the detaping equipment that is standard in most automated placement equipment.

In the tape and reel format, the components are placed in specifically designed pockets embossed in a plastic carrier tape. The cover tape is sealed to the carrier tape to keep the parts in place in these pockets. A row of sprocket holes is provided along one edge of the embossed tape to facilitate positive indexing. The tape is then wound onto a rigid plastic reel that provides mechanical protection during handling and storage. These reels are dust-free and compatible with a clean environment.

Specifications

Analog Devices' tape and reel specifications are in conformance with the EIA Standard 481 "Taping of Surface-Mount Components for Automatic Placement."

ESD Protection

Analog Devices' tape and reel delivery system is designed to offer a very high degree of protection against electrostatic discharge (ESD). All tape and reel materials are static-dissipative. In addition, drypacked reels are shipped in moisture barrier bags; nondrypacked reels are shipped in a box with ESD conductive coating or in a conductive ESD bag. To retain the benefits of this protection, the bags should be opened only at ESD controlled workstations by trained personnel.

Peel Back Strength

The peel back force will be between 10 *g* and 100 *g* for 8 mm wide tape and 10 *g* to 130 *g* for tapes 12 mm and wider when tested at room temperature and pulled at a 175° to 180° angle with a peel-off speed of 300 ± 10 mm/min.

Direction of Feed

Direction of feed is defined as the direction in which the end user unreels the tape. The direction of feed for all products is counterclockwise when the reel is held with the round sprocket holes facing the observer.

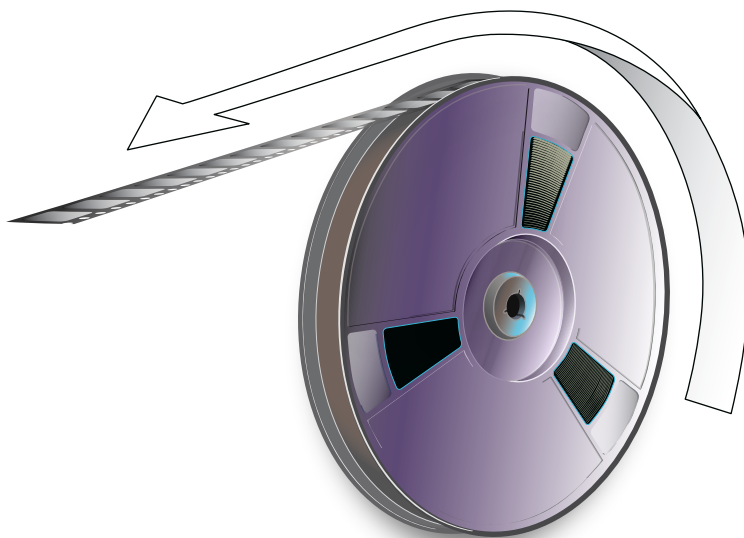


Figure 1. Direction of feed.

Pin 1 Orientation

Devices are reeled so that Pin 1 is oriented properly with the direction of feed and round sprocket holes. Pin 1 orientation is denoted as C1 to C4, or M1, with respect to the direction of feed and round sprocket holes, as illustrated below.

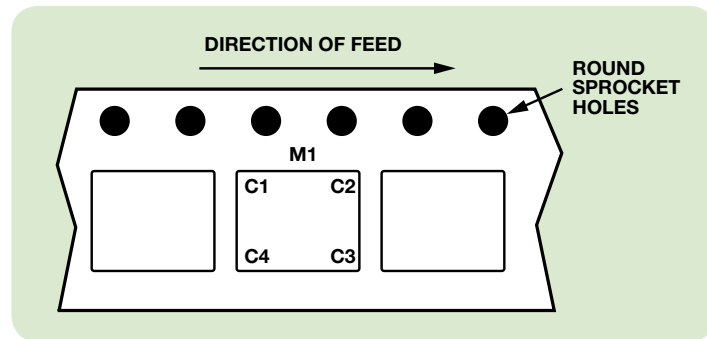


Figure 2. Pin 1 orientation reference.

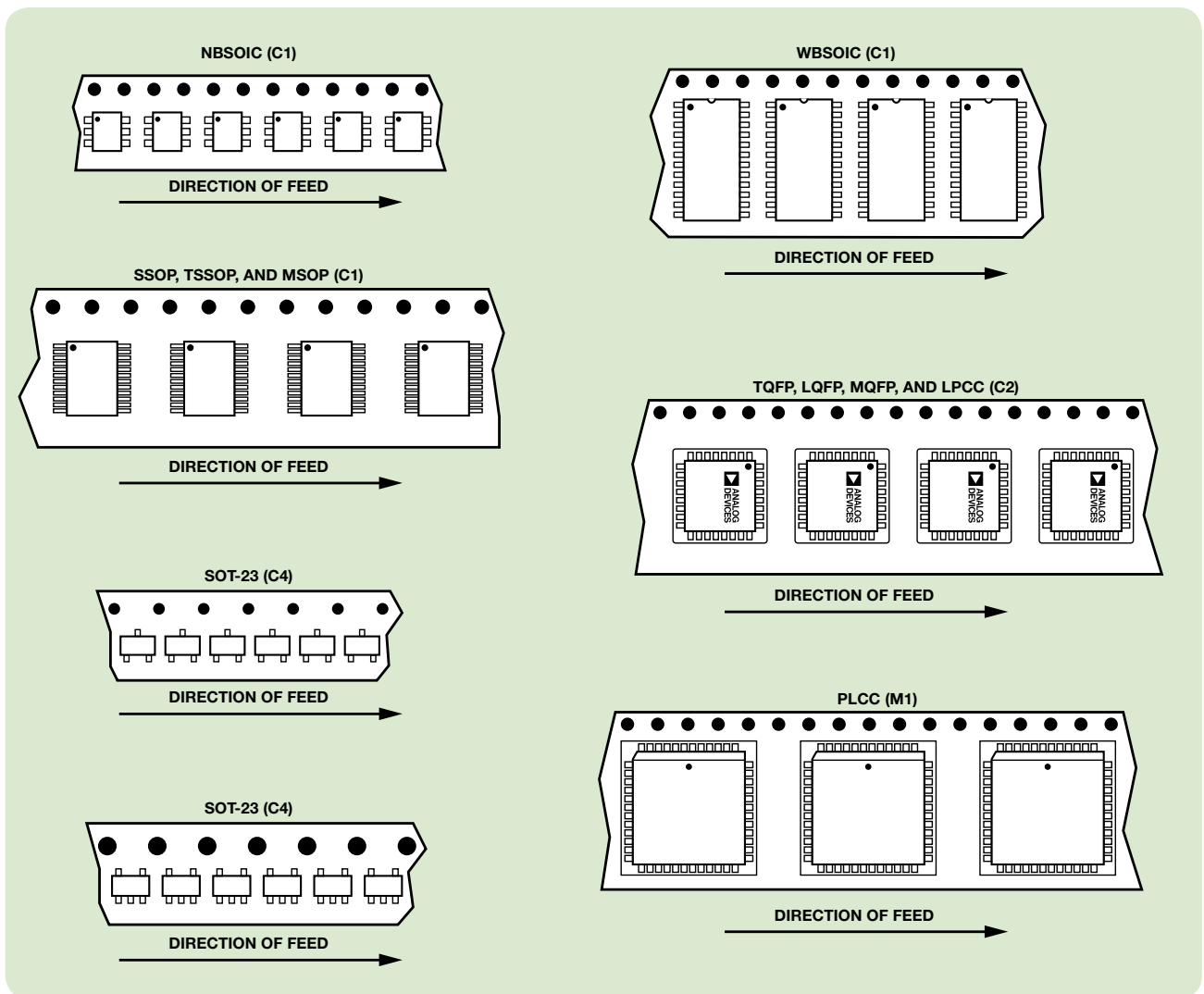


Figure 3. Examples of standard Pin 1 orientation.

Table 1. Standard Package Tape and Reel (See Page 5 for Reel Definitions)

Device Package Type	Package Designator	Body Size (mm)	Number of Leads	Reel Quantity			Tape Width (mm)	Tape Pitch (mm)	Pin 1 Orientation
				7" Reel	13" Reel (4" Hub)	13" Reel (6" Hub)			
PLCC	P	N/A	20	250	1000	N/A	16	12	M1
PLCC	P	N/A	28, 32	Not offered	750	N/A	24	16	M1
PLCC	P	N/A	44	Not offered	500	N/A	32	24	M1
PLCC	P	N/A	68	Not offered	N/A	250	44	32	M1
PLCC	P	N/A	84	Not offered	N/A	250	44	36	M1
JLCC	J	N/A	28	Not offered	250	N/A	24	16	M1
JLCC	J	N/A	44	Not offered	500	N/A	32	24	M1
LCC	E	N/A	8	250	3000	N/A	12	8	M1
SOIC_N/SOIC_N_EP	R/RD	N/A	8	1000	2500	N/A	12	8	C1
SOIC_N/SOIC_N_EP	R/RD	N/A	14, 16	1000	2500	N/A	16	8	C1
QSOP	RQ/RC	N/A	16	1000	2500	N/A	12	8	C1
QSOP	RQ	N/A	20, 24, 28	1000	2500	N/A	16	8	C1
SOIC_W/SOIC_W_BAT	RW/RB	N/A	14, 16	400	1000	N/A	16	12	C1
SOIC_W/SOIC_W_BAT	RW/RB	N/A	18	400	1000	N/A	24	16	C1
SOIC_W/SOIC_W_BAT	RW/RB	N/A	20, 24	400	1000	N/A	24	12	C1
SOIC_W/SOIC_W_BAT	RW/RB	N/A	28	400	1000	N/A	32	12	C1
SSOP	RS	N/A	16, 20, 24	500	1500	N/A	16	12	C1
SSOP	RS	N/A	28	500	1500	N/A	24	12	C1
PSOP2	RP	N/A	20, 28	200	1000	N/A	24	12	C1
PSOP3	RR	N/A	20	Not offered	750	N/A	24	20	C1
SOT_23_3	RT	N/A	3	3000	10,000	N/A	8	4	C4
SOT_23 ¹	RJ/RT	N/A	5, 6, 8	3000	10,000	N/A	8	4	C4
SOT-143	RA	N/A	4	3000	10,000	N/A	8	4	C4
TSOT	UJ	N/A	5, 6, 8	3000	10,000	N/A	8	4	C4
SOT-223	KC	N/A	3	500	2500	N/A	16	12	C4
SC70	KS	N/A	3, 4, 5, 6	3000	10,000	N/A	8	4	C4
TSSOP_4.4	RU/RE	N/A	8, 14, 16, 20, 24, 28, 38	1000	2500	N/A	16	8	C1
TSSOP_6.1	RV	N/A	28, 48	Not offered	2500	N/A	24	12	C1
MSOP	RM/RH	N/A	8, 10	1000	3000	N/A	12	8	C1
CERPAK	QC	N/A	14	Not offered	750	N/A	24	16	C1
TQFP	SU/SV	7 × 7 × 1.0	All counts	500	2000	Not offered	16	12	C2
TQFP	SU/SV	10 × 10 × 1.0	All counts	Not offered	1500	Not offered	24	16	C2
TQFP	SU/SV	12 × 12 × 1.0	All counts	Not offered	1000	Not offered	24	24	C2
TQFP	SU/SV	14 × 14 × 1.0	All counts	Not offered	1000	Not offered	32	24	C2
LQFP	ST	7 × 7 × 1.4	All counts	500	2000	Not offered	16	12	C2
LQFP	ST	10 × 10 × 1.4	All counts	Not offered	1500	Not offered	24	16	C2
LQFP	ST	12 × 12 × 1.4	All counts	Not offered	1000	Not offered	24	24	C2
LQFP	ST	14 × 14 × 1.4	All counts	Not offered	1000	Not offered	32	24	C2
LQFP	ST	14 × 20 × 1.4	All counts	Not offered	1000	Not offered	44	24	C1

Table 1. Standard Package Tape and Reel (Continued) (See Page 5 for Reel Definitions)

Device Package Type	Package Designator	Body Size (mm)	Number of Leads	Reel Quantity			Tape Width (mm)	Tape Pitch (mm)	Pin 1 Orientation
				7" Reel	13" Reel (4" Hub)	13" Reel (6" Hub)			
MQFP	S	10 × 10 × 2.0	All counts	Not offered	800	Not offered	24	24	C2
MQFP	S	14 × 14 × 2.0	All counts	Not offered	600	Not offered	32	24	C2
MQFP ²	S	14 × 14 × 2.7	All counts	Not offered	500 ²	Not offered	12	8	C2
CSP_BGA	BC	5 × 5	All counts	Not offered	4000	Not offered	12	8	C2
CSP_BGA	BC	6 × 6	All counts	Not offered	2500	Not offered	12	8	C2
CSP_BGA	BC	7 × 7	All counts	Not offered	2000	Not offered	16	12	C2
CSP_BGA	BC	8 × 8	All counts	Not offered	2000	Not offered	16	12	C2
CSP_BGA	BC	9 × 9	All counts	500	2000	Not offered	16	12	C2
CSP_BGA	BC	10 × 10	All counts	400	1500	Not offered	24	16	C2
CSP_BGA	BC	12 × 12	All counts	Not offered	1500	Not offered	24	16	C2
CSP_BGA	BC	13 × 13	All counts	Not offered	1000	Not offered	24	24	C2
CSP_BGA	BC	17 × 17	All counts	Not offered	1000	Not offered	24	24	C2
BGA	B	19 × 19	All counts	Not offered	Not offered	700	32	24	C2
BGA	B	23 × 23	All counts	Not offered	Not offered	450	44	32	C2
BGA	B	27 × 27	All counts	Not offered	Not offered	450	44	32	C2
BGA	B	35 × 35	All counts	Not offered	Not offered	300	56	40	C2
CBGA	BG	7 × 7	32 balls	Not offered	500	Not offered	16	12	C2
LGA	CC	3.5 × 4.5	24	1500	5000	Not offered	12	8	C1
LGA	CC	6 × 8	All counts	1000	4000	Not offered	16	8	C1
LGA	CC	8 × 10	All counts	Not offered	2000	Not offered	24	12	C1
LGA	CC	10 × 10	All counts	Not offered	2000	Not offered	24	12	C2
LFCSP ⁴	CP	3 × 2	All counts	3000	10,000	Not offered	12	4	C1
LFCSP	CP	3 × 3	All counts	1500	5000	Not offered	12	8	C2
LFCSP	CP	4 × 4	All counts	1500	5000	Not offered	12	8	C2
LFCSP	CP	4 × 5	All counts	1500	5000	Not offered	12	8	C1
LFCSP	CP	5 × 5	All counts	1500	5000	Not offered	12	8	C2
LFCSP	CP	6 × 6	All counts	750	2500	Not offered	16	12	C2
LFCSP	CP	7 × 7	All counts	750	2500	Not offered	16	12	C2
LFCSP	CP	8 × 8	All counts	750	2500	Not offered	16	12	C2
LFCSP	CP	9 × 9	All counts	750	2500	Not offered	16	12	C2
LFCSP	CP	10 × 10	All counts	Not offered	2000	Not offered	24	16	C2
LFCSP	CP	5 × 5 × 1.45	All counts	Not offered	4000	Not offered	12	8	C2
LFCSP	CP	4 × 4 × 1.45	All counts	Not offered	4000	Not offered	12	8	C2
LFCSP	CP	3 × 5 × 1.45	All counts	1000	4000	Not offered	12	8	C1
LFCSP	CP	2 × 3 × 0.75	All counts	3000	10,000	Not offered	12	4	C2
LFCSP	CP	1.6 × 1.3 × 0.55	All counts	3000	10,000	Not offered	8	4	C1
LFCSP	CP	2.1 × 2.1 × 0.55	All counts	3000	10,000	Not offered	8	4	C1
LFCSP	CP	3 × 3 × 0.75	All counts	1500	5000	Not offered	12	8	C2

¹For SOT-23 packages with greater than three leads, use the RJ designator.

²Advantek part number Q14X14-HHX52.OP2 is the only approved carrier tape for this package. When boxing this reel, dunnage (crumpled kraft paper) shall be used between the reel.

³For bumped die or WLCSP packages, see Table 2. Orientation for these devices is as per EIA783 (bumps facing bottom of carrier cavity; Pin 1 towards sprocket holes).

⁴Standard thickness for LFCSP is 0.85 mm, except when noted.

Table 2. WLCSP/Bumped Die Sales Tape and Reel

Part Number	Device Package Type	Package Designator	Die Size X (μm)	Die Size Y (μm)	Die Size Z (μm)	Reel Quantity			Tape Width (mm)	Tape Pitch (mm)	Pin 1 Orientation
						7" Reel	13" Reel (4" Hub)	13" Reel (6" Hub)			
ADG3304	WLCSP	CB	1610	2010	655	N/A	3000	10,000	8	4	C1
ADG787	WLCSP	CB	1500	2000	655	N/A	3000	10,000	8	4	C1
ADG819	WLCSP	CB	1140	2180	605	N/A	3000	10,000	8	4	C1
ADG884	WLCSP	CB	1500	2000	655	N/A	3000	10,000	8	4	C1
ADG888	WLCSP	CB	2000	2000	655	N/A	3000	10,000	8	4	C1
ADL5500 ¹	WLCSP	CB	1000	1000	596	250	3000	10,000	8	4	C1
ADM8834	WLCSP	CB	2000	2000	605	N/A	4000	15,000	8	4	C1
AD6548	Bumped chip	CD	3240	3140	350	N/A	N/A	3000	12	8	C2
AD7877	WLCSP	CB	2765	2545	600	N/A	3000	10,000	8	4	C1
AD8205	CHIP	C	1650	1650	710	N/A	4000	10,000	8	4	C1
AD8311/AD8312	WLCSP	CB	1000	1500	596	250	3000	N/A	8	4	C1
AD8605	WLCSP	CB	940	1330	496	N/A	4000	15,000	8	4	C1
AD9938	Bumped chip	CD	2675	4290	501	N/A	3000	N/A	12	4	C1
AD5801	WLCSP	CB	3270	3170	655	N/A	1500	5000	12	8	C4
AD5801 ²	WLCSP	CB	3270	3170	555	N/A	1500	5000	12	8	C4
AD5398	WLCSP	CB	1515	1690	655	N/A	3000	10,000	8	4	C1
AD9948/AD9949	WLCSP	CB	2710	3360	563	N/A	3000	10,000	8	4	C1
ADG3308	WLCSP	CB	1960	2460	600	N/A	3000	10,000	8	4	C1
ADG790	WLCSP	CB	2500	3000	656	N/A	3000	10,000	8	4	C1
AD5806	WLCSP	CB	2500	2500	656	N/A	3000	10,000	8	4	C1
ADAU1301	Bumped chip	CD	1275	875	350	N/A	5000	10,000	8	4	C1
AD5820	WLCSP	CB	1035	1500	656	N/A	3000	10,000	8	4	C1
AD5820 ²	WLCSP	CB	1035	1500	555	N/A	3000	10,000	8	4	C1
AD5805	WLCSP	CB	1170	1890	505	N/A	3000	10,000	8	4	C1
AD15/AD416	WLCSP	CB	1960	2460	600	N/A	3000	10,000	8	4	C2
AD5821	WLCSP	CB	1515	1690	655	N/A	3000	10,000	8	4	C1
ADV7521	WLCSP	CB	3500	3500	605	N/A	1500	5000	12	8	C1

¹C-Pak part number 4205418-2/A (BD0090X0090) is the only approved carrier tape for the ADL5500 WLCSP.

²Special carrier tapes exist for these products, where the required wafer thickness is 12 mil and the required spheres are 250 μm.

Table 3. Small Quantity Reel

Device Package Type	Package Designator	Body Size (mm)	Number of Leads	Reel Quantity	Tape Width (mm)	Tape Pitch (mm)	Pin 1 Orientation
				7" Reel			
SOT-23	RT	N/A	3	250	8	4	C4
SOT-23 ¹	RJ/RT	N/A	5, 6, 8	250	8	4	C4
SOT-143	RT	N/A	4	250	8	4	C4
SC70	KS	N/A	3, 4, 5, 6	250	8	4	C4
MSOP	RM	N/A	8, 10	250	12	8	C1
WLCSP ²	CB	N/A	All counts	250	See Table 2	See Table 2	See Table 2
LFCSP	CP	3 × 2	All counts	250	12	4	C1
LFCSP	CP	3 × 3	All counts	250	12	8	C2
LFCSP	CP	4 × 4	All counts	250	12	8	C2
LFCSP	CP	5 × 5	All counts	250	12	8	C2

¹For SOT-23 packages prior to Rev. W, all products and lead counts use RT. For SOT-23 packages from Rev. W, all new products with greater than three leads use the RJ designator.

²For actual WLCSP products available in small quantity reels, please cross reference with "7" reel (small quantity)" column of Table 2.

Glossary

REEL7 (aka R7 or RL7)

This is a 7" reel. Quantities vary based on package size.

Reel (aka RL or R)

This is a 13" reel. Quantities vary based on package size.

Waffle Pack

A small 2" × 2" tray designed to contain a small quantity of product in small packages, such as LFCSP, and in die forms like bare die, bumped chip, and WLCSPs.

**Analog Devices, Inc.
Worldwide Headquarters**

Analog Devices, Inc.
One Technology Way
P.O. Box 9106
Norwood, MA 02062-9106
U.S.A.
Tel: 781.329.4700
(800.262.5643,
U.S.A. only)
Fax: 781.461.3113

**Analog Devices, Inc.
Europe Headquarters**

Analog Devices, Inc.
Wilhelm-Wagenfeld-Str. 6
80807 Munich
Germany
Tel: 49.89.76903.0
Fax: 49.89.76903.157

**Analog Devices, Inc.
Japan Headquarters**

Analog Devices, KK
New Pier Takeshiba
South Tower Building
1-16-1 Kaigan, Minato-ku,
Tokyo, 105-6891
Japan
Tel: 813.5402.8200
Fax: 813.5402.1064

**Analog Devices, Inc.
Southeast Asia
Headquarters**

Analog Devices
22/F One Corporate Avenue
222 Hu Bin Road
Shanghai, 200021
China
Tel: 86.21.2320.8000
Fax: 86.21.2320.8222