

Marking

Because of the limited space available for part marking on some SMT packages, abbreviated marking codes are used to identify the device. These codes, if used, are identified in the individual SMT package data sheets.

Lead Finish and Solderability

Standard lead finish is electroplated PbSn (15% Pb/85% Sn). LTC offers 100% matte tin lead finish upon request. Both are electroplated with < 0.05% carbon content. Solderability meets the requirements of MIL-STD-883C, Method 2003. Recommended minimum solder pad dimensions are given with each package. (Note: Consideration should be given to your process and power requirements.)

Wave and Reflow Soldering

Following are the recommended procedures for soldering surface mount packages to PC boards.

1. Wave Soldering

- Use solder plating boards.
- Dispense adhesive to hold components on board.
- Place components on board.
- Cure adhesive per adhesive manufacturer's specification.
- Preheat package temperature shall be between 100°C and 130°C.
- Foam flux using RMA (Rosin Mildly Activating) flux.
- Wave solder using a dual wave soldering system at 230°C to 250°C for 2 seconds per wave.
- Clean board.
- **Wave soldering is not recommended for SOT-223, QFN and DFN packages.**

2. Reflow Soldering (PbSn and Matte Tin Lead Finish)

Note: LTC offers products with either PbSn or pure matte tin lead finish. Both finishes are compatible with typical PbSn and SnAgCu pastes. See matte tin (Pb free) update at www.linear.com/about/pbfree.html.

- Screen solder paste on board.
- Mount components on board.
- Infrared or forced hot air convection reflow is recommended for best performance. Parameters:
 - Preheat peak temperature 135°C ± 15°C and 2°C to 4°C per second rise
 - Time above reflow temperature:
 - PbSn (37/63) Paste 183°C – 120 seconds max
 - SnAgCu (95.5/4/0.5) Paste 217°C – 120 seconds max
 - Peak package body temperature:
 - PbSn Paste 220°C to 255°C
 - SnAgCu Paste 245°C to 260°C
 - Dwell time at peak temperature 20 to 40 seconds
 - Cooling rate 2°C to 4°C per second
- Clean boards.
- For Vapor Phase Reflow (PbSn), recommended parameter ranges for:
 - Heating rate: 4°C per second max
 - Preheat temperature: 45°C to 80°C
 - Time above 200°C: 50 seconds to 90 seconds
 - Peak package temperature: 212°C to 219°C

3. Hand Soldering

- **Hand soldering of packages is not recommended.**

Dry Pack in Moisture Barrier Bags

In the event of a requirement for Dry Pack, LTC employs as a guideline the methods of IPC-SM-786A, Procedures for Characterization of Moisture/Reflow Sensitive ICs.

SURFACE MOUNT PRODUCTS

Thermal Information

Table 1 shows the range of junction-to-ambient thermal resistance of SO devices mounted on a PCB of FR4 material with copper traces, in still air at 25°C. θ_{JA} with a ceramic substrate is about 70% of the FR4 value. Maximum power dissipation may be calculated by the following formula:

$$P_{D\text{MAX}}(T_A) = \frac{T_{J\text{MAX}} - T_A}{\theta_{JA}}$$

where,

$T_{J\text{MAX}}$ = Maximum operating junction temperature.

T_A = Desired ambient operating temperature.

θ_{JA} = Junction-to-ambient thermal resistance.

Table 1. Typical Thermal Resistance Values

SO-8	150°C/W to 200°C/W	SO-18	70°C/W to 100°C/W
SO-14	100°C/W to 140°C/W	SO-20	70°C/W to 90°C/W
SO-16 (0.150)	90°C/W to 130°C/W	SO-24	60°C/W to 80°C/W
SO-16 (0.300)	85°C/W to 100°C/W	SO-28	55°C/W to 75°C/W

Conditions: PCB mount on FR4 material, still air at 25°C, copper trace.

Thermal resistance for power packages (DD and SOT-223) depends greatly on the individual device type. Please consult the device data sheets for thermal information.

More current data, by device type, may be obtained by contacting LTC, Marketing Department.

Tape and Reel Packing (See Tape and Reel Section)

Plastic Tube Packing

LTC's Surface Mount products are packed in "antistatic" plastic tubes with the tube dimensions indicated in Figure 2. Unit quantities packaged per tube are listed below in Table 2.

Table 2. Devices Per Tube

LTC Package Code Designator	LTC Package Type	Actual Lead Count	Number of Units
DD	DFN (3mm × 3mm)	8, 10, 12	121
DE, UE	DFN (4mm × 3mm)	12, 14	91
DF	DFN (4mm × 4mm)	12	91
DH	DFN (5mm × 5mm)	16	73
DHC	DFN (5mm × 3mm)	16	73
DHD	DFN (5mm × 4mm)	16	73
DJC	DFN (6mm × 3mm)	22	61
DKD	DFN (7mm × 4mm)	24, 32	52

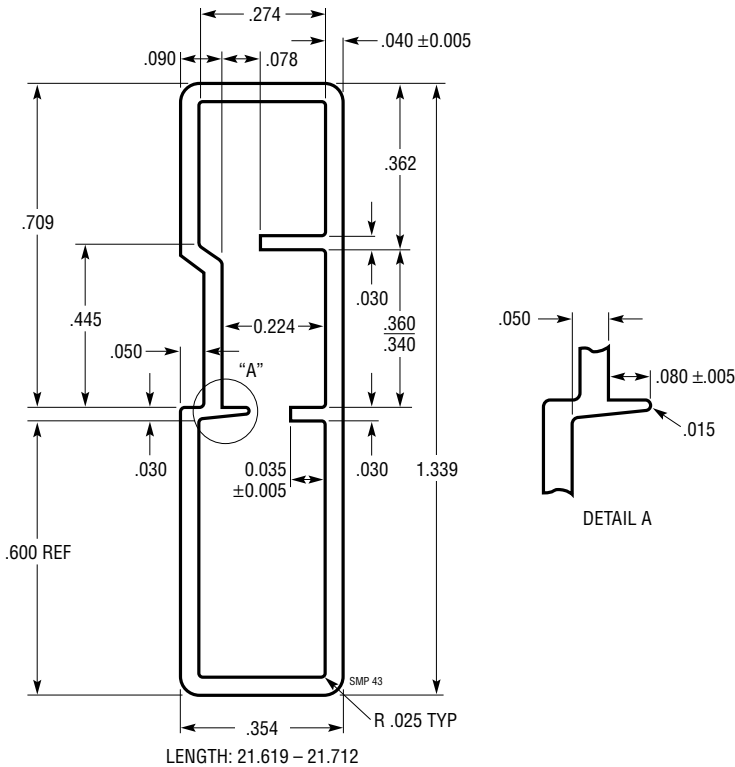
Table 2. Devices Per Tube (Continued)

LTC Package Code Designator	LTC Package Type	Actual Lead Count	Number of Units
F	TSSOP (4.4mm)	20	74
F, FE	TSSOP (4.4mm)	14/16	94
FW	TSSOP (6.1mm)	48	39
FW	TSSOP (6.1mm)	56	35
G	SSOP (5.3mm)	16	77
G	SSOP (5.3mm)	20	66
G	SSOP (5.3mm)	24	59
G	SSOP (5.3mm)	28	47
G	SSOP (5.3mm)	36	37
GN	SSOP (0.150)	16	100
GN	SSOP (0.150)	20, 24	55
GW	SSOP (7.62mm)	36	32
GW	SSOP (7.62mm)	44	27
MS8, MS8E	MSOP (0.118)	8	50
MS, MSE	MSOP (0.118)	10	50
M, Q, R	DD	3, 5, 7	50
S8	SO (0.150)	8	100
S	SO (0.150)	14	55
S	SO (0.150)	16	50
ST	SOT-223	3	78
SW	SO (0.300)	16	47
SW	SO (0.300)	18	40
SW	SO (0.300)	20	38
SW	SO (0.300)	24	32
SW	SO (0.300)	28	27
UD	QFN (3mm × 3mm)	16, 20	121
UDC	QFN (3mm × 4mm)	20, 24	91
UF	QFN (4mm × 4mm)	16, 20, 24, 28	91
UFD	QFN (4mm × 5mm)	20, 24, 28	73
UFE	QFN (4mm × 6mm)	38	61
UFF	QFN (4mm × 7mm)	34	52
UH	QFN (5mm × 5mm)	32, 40	73
UHE	QFN (5mm × 6mm)	36	61
UHF	QFN (5mm × 7mm)	38	52
UHG	QFN (5mm × 8mm)	52	45
UHH	QFN (5mm × 9mm)	56	40
UJ	QFN (6mm × 6mm)	40	61
UK	QFN (7mm × 7mm)	48	52
UKG	QFN (7mm × 8mm)	52	45
UP	QFN (9mm × 9mm)	64	40

SURFACE MOUNT PRODUCTS

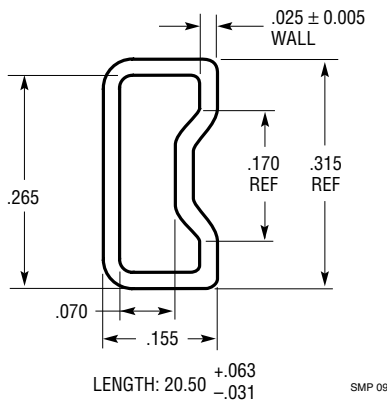
PLASTIC TUBE SPECIFICATIONS

DD Pak
M, Q, R Package Shipping Tube



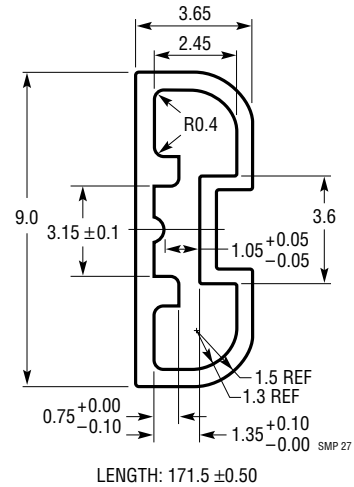
NOTE: ALL DIMENSIONS ARE IN INCHES, ± 0.010
UNLESS OTHERWISE STATED.
MATERIAL: PVC, ANTISTATIC TREATED

S (0.150)
SO Package Shipping Tube



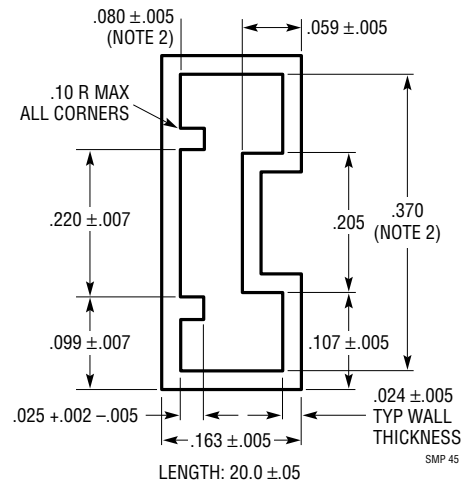
NOTE: ALL DIMENSIONS ARE IN INCHES, ± 0.010
UNLESS OTHERWISE STATED.
MATERIAL: PVC, ANTISTATIC TREATED

MSOP
MS8 Package Shipping Tube



NOTE: ALL DIMENSIONS ARE IN MILLIMETERS, ± 0.15
UNLESS OTHERWISE STATED.
MATERIAL: POLYCARBONATE, ANTISTATIC TREATED

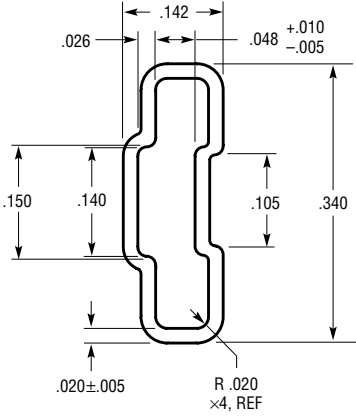
SSOP
G Package Shipping Tube



NOTE: ALL DIMENSIONS ARE IN INCHES, ± 0.010
UNLESS OTHERWISE STATED.
MATERIAL: PVC, ANTISTATIC TREATED

PLASTIC TUBE SPECIFICATIONS

ST
SOT-223 Package Shipping Tube

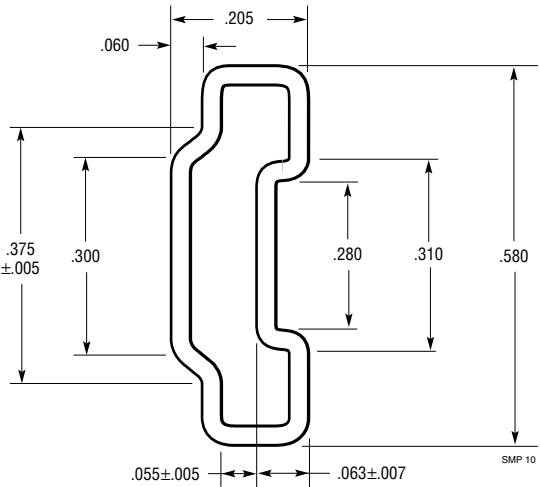


LENGTH: 21.288 - 21.381

NOTE: ALL DIMENSIONS ARE IN INCHES, ±.010 UNLESS OTHERWISE STATED.
MATERIAL: PVC, ANTISTATIC TREATED

SMP 11

SW (0.300)
SO Package Shipping Tube

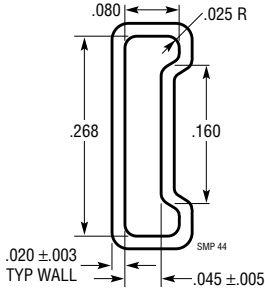


LENGTH: 20.75 +.031 / -.063

NOTE: ALL DIMENSIONS ARE IN INCHES, ±.010 UNLESS OTHERWISE STATED.
MATERIAL: PVC, ANTISTATIC TREATED

SMP 10

TSSOP
F, FE Package Shipping Tube



LENGTH: 20.0 ± .050

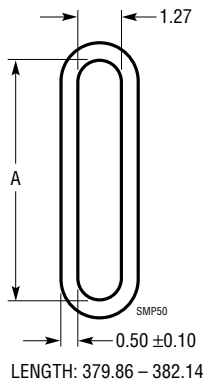
NOTE: ALL DIMENSIONS ARE IN INCHES, ±.010 UNLESS OTHERWISE STATED.
MATERIAL: PVC, ANTISTATIC TREATED

SMP 44

SURFACE MOUNT PRODUCTS

PLASTIC TUBE SPECIFICATIONS

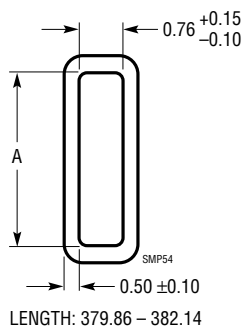
DFN/QFN 0.80mm Thick Package Shipping Tube



NOTE: ALL DIMENSIONS ARE IN MILLIMETERS, ± 0.25
UNLESS OTHERWISE STATED.
MATERIAL: PVC, ANTISTATIC TREATED

MINIMUM PACKAGE WIDTH	A DIMENSION
3mm	3.50 ± 0.20
4mm	4.50 ± 0.20
5mm	5.50 ± 0.20
6mm	6.50 ± 0.20
7mm	7.50 ± 0.20
9mm	9.50 ± 0.20

UTDFN/UTQFN 0.60mm Thick Package Shipping Tube



NOTE: ALL DIMENSIONS ARE IN MILLIMETERS, ± 0.25
UNLESS OTHERWISE STATED.
MATERIAL: PVC, ANTISTATIC TREATED

MINIMUM PACKAGE WIDTH	A DIMENSION
3mm	3.50 ± 0.20
4mm	4.50 ± 0.20
5mm	5.50 ± 0.20
7mm	7.50 ± 0.20