
PACKAGING OF ELECTRONIC DEVICES AND COMPONENTS FOR AUTOMATED AND BATCH ASSEMBLY

1.0 SCOPE

This standard provides for the packaging of electronic devices and components for automated and batch assembly.

NOTE: This document supersedes/replaces LMSC Packaging Standards P-114 and PHE-S-8140.

IMPORTANT: SOME DEVICES ARE ELECTROSTATIC DISCHARGE SENSITIVE (ESDS) AND CAN BE DAMAGED BY ELECTROSTATIC DISCHARGE AND FIELD FORCES. PROPER PACKAGING MATERIALS, AND HANDLING METHODS SHOULD BE USED FOR ESDS DEVICES TO PRESERVE ELECTRICAL CONTINUITY.

2.0 REFERENCES

2.1 LMSC DOCUMENTS

- 2.1.1 LPS 40-001, LMSC Packaging Standard, "General Requirements Specification"
- 2.1.2 LAC 3250, LMSC Specification, "Protection of Electrostatic Sensitive Parts and Assemblies"

2.2 GOVERNMENT/MILITARY DOCUMENTS

- 2.2.1 MIL-M-55565, "Microcircuits, Preparation for Delivery of"
- 2.2.2 MIL-S-19500, "Semiconductor Devices"
- 2.2.3 MIL-R-39032, "Resistors, Preparation for Delivery of"
- 2.2.4 MIL-S-19491, "Semiconductor Devices, Packaging of"
- 2.2.5 MIL-M-38510, "Microcircuits, General Specification for"
- 2.2.6 MIL-B-81705, "Barrier Materials, Flexible, Electrostatic Free, Heat Sealable"
- 2.2.7 "Code of Federal Regulations" (CFR) Title 49
- 2.2.8 MIL-STD-129, "Marking for Shipment and Storage"
- 2.2.9 DOD-STD-1686, "Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices)"
- 2.2.10 DOD-HNBK-263, "Electrostatic Discharge Control Handbook for Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices)."

2.3 INDUSTRIAL DOCUMENTS

- 2.3.1 EIA-RS-296-D, "Lead Taping of Components in the Axial Configuration for Automatic Insertion"
- 2.3.2 EIA-RS-468, "Lead Taping of Components in the Radial Configuration for Automatic Insertion"

3.0 REQUIREMENTS

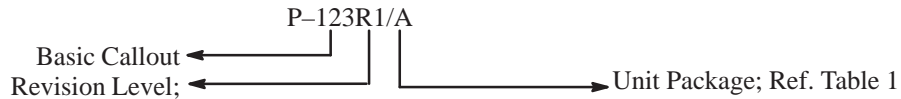
3.1 GENERAL

- 3.1.1 The requirements of LPS 40-001 shall be met in addition to provisions of this Packaging Standard.
- 3.1.2 The quantity per unit package shall be per purchase order.

CAUTION: ELECTROSTATIC SENSITIVE DEVICES/ASSEMBLIES ARE SUSCEPTIBLE TO DAMAGE BY ELECTROSTATIC DISCHARGE (ESD). USERS, DISTRIBUTORS/JOBBERs SHALL OBSERVE THE FOLLOWING PRECAUTIONS WHEN HANDLING THESE TYPES OF DEVICES OR ASSEMBLIES:

- DO NOT HANDLE/TRANSPORT UNLESS THE ITEMS ARE IN STATIC PROTECTIVE PACKAGES/TRAYS OR AT A CERTIFIED GROUNDED WORK STATION WITH PERSONNEL PROPERLY GROUNDED.
- DO NOT REMOVE DEVICE(S) FROM PROTECTIVE PACKAGES EXCEPT AT A CERTIFIED GROUNDED WORK STATION.
- WHEN DEVICE(S) ARE REMOVED FROM STATIC PROTECTIVE CONTAINERS, TRAYS, ETC., OPERATORS SHOULD BE PROPERLY GROUNDED e.g., STATIC PROTECTIVE WRIST STRAPS, STATIC PROTECTIVE SURFACES, HANDLING TRAYS, ETC.
- THE REQUIREMENTS OF LAC 3250 MUST BE MET IN HANDLING, PACKAGING AND SHIPPING OF THESE DEVICES/ASSEMBLIES.

3.1.3 The basic callout (P-123R1) prescribes the packaging of electronic devices and components for automated and batch assembly. The suffix letter following the basic callout, e.g., P-123R1/A identifies the type of unit packaging required (Table 1).



3.1.4 Contact the responsible buyer or subcontract administrator if packaging for a specific component is unobtainable or differs from package configurations in this specification.

Table 1	
LPS Suffix	Unit Package
A	Reel, Cassette and Ammo-Pack (See 3.2.1 and 3.2.2.)
B	Rail/Tube (See 3.2.3)
C	Special Tray (See 3.2.4)

3.2 UNIT PACKAGING

3.2.1 Reel, Cassette, and Ammo-Pack Packaging: Axial Leaded Components (Figure 1, Figure 2, Figure 3 and Figure 4).

- 3.2.1.1 Component leads shall be positioned perpendicularly between strips of pressure-sensitive tape, having the width of 0.197" to 0.250" +0.016". The leads are to be held without any relative motion to the tape (Figure 2).
- 3.2.1.2 Exposed adhesive shall be no greater than 0.031" maximum (Figure 2).
- 3.2.1.3 Lead ends shall not extend beyond the tape more than a maximum of 0.063", with no extension preferred (Figure 2).
- 3.2.1.4 Leads shall not be bent beyond 0.047" from their nominal position when measured from the leading edge of the component lead at the inside tape (Figure 2).
- 3.2.1.5 Each component lead shall be sandwiched between tapes for a minimum of 0.126" (Figure 2).
- 3.2.1.6 All polarized components must be oriented in one direction. The cathode lead tape shall be a color and the anode lead tape shall be white.

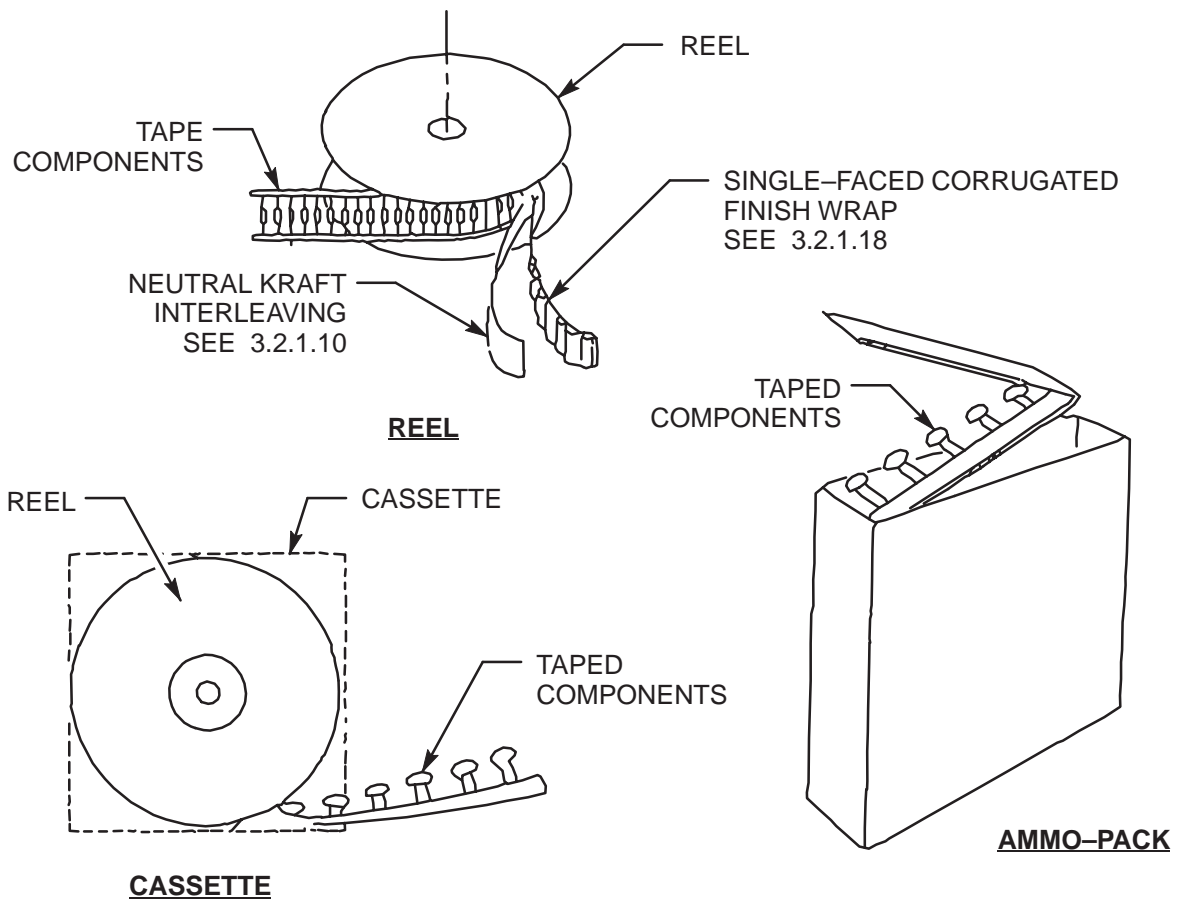


Figure 1. Unit Package

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- 3.2.1.7 Reels shall be disposable metal, paperboard, plastic, etc. (Figure 3). The reel shall be rigid to protect components and shall allow the free unreeling of taped components.
- 3.2.1.8 A minimum 12" leader shall be provided at each end of the reel.
- 3.2.1.9 The distance between the reel flanges and end of component lead shall be 1/8 to 5/8 inch greater than the overall component length (Figure 3).
- 3.2.1.10 Protection between layers of components shall be provided by using a neutral kraft paper interleaving (50 or 60 lbs). Kraft protection paper shall have minimum gap of 1/8" between reel flanges and paper edge. All materials used for lead taping, reeling and packing shall not cause deterioration of the component or lead solderability. (Figure 1 and Figure 3).
- 3.2.1.11 For reeled components the body must be centered between lead tapes such that the difference between the gaps (the distance from the end of component body to tape) does not exceed 0.055". (Figure 2).
- 3.2.1.12 Splicing may be accomplished by taping or with splicing clips. Staples are not to be used for splicing (Figure 4).

Table 2			
Component Body Length	Component Body Diameter	Component Spacing "A" +/- 0.020"	Inside Tape Spacing "B" +/- 0.059"
0" to .750"	Very Small Component Lengths With Dia. to 0.197"	.200	2.062"
	0" to 0.197"	.200	2.062"
	0.198" to 0.394"	.400	2.062"

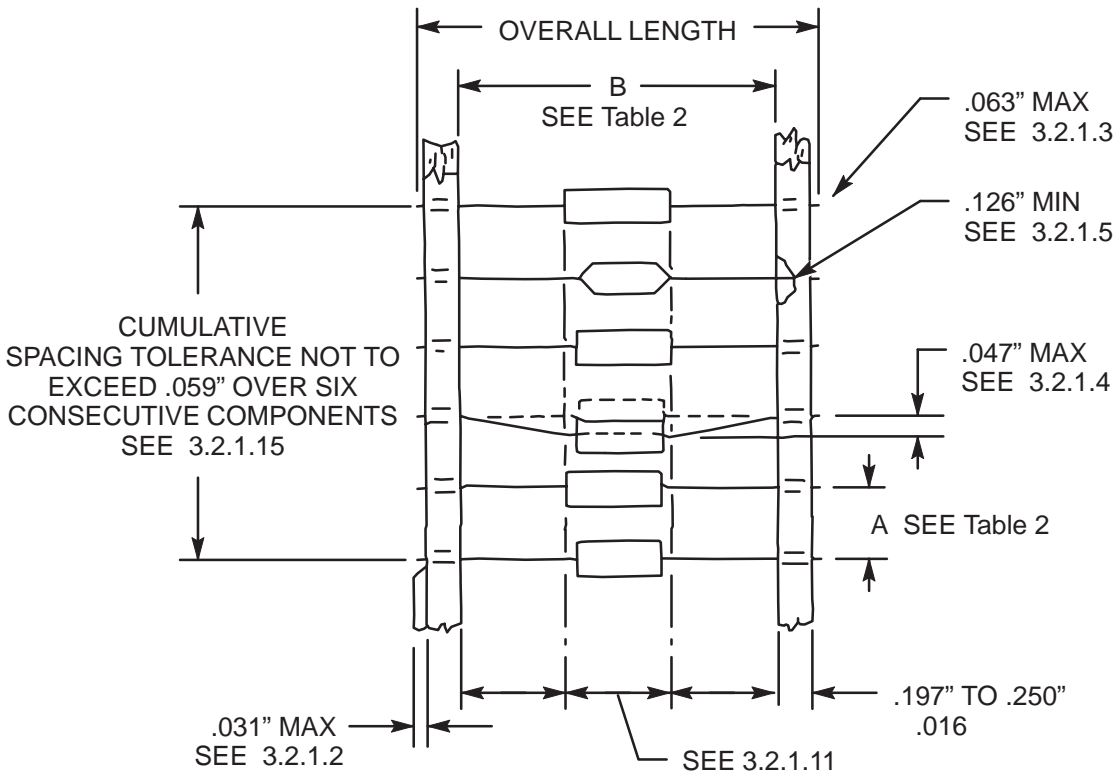


Figure 2. Axial Lead Tape Component Positioning

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- 3.2.1.12.1 When splicing with tape, no more than 4 layers of tape shall be used in any splice area and no tape shall be offset from another by more than 1/32 inch noncumulative. Tape splices shall overlap at least 6 inches for butt joints and at least 3 inches for lap joints. Joints shall not be weaker than unspliced tape.
- 3.2.1.12.2 When using splicing clips the correct pitch (distances from lead-to-lead of taped components) must be used.
- 3.2.1.12.3 Prepare both tape strips to be joined by trimming beyond last components to slightly less than 1/2 of pitch (Figure 4B).

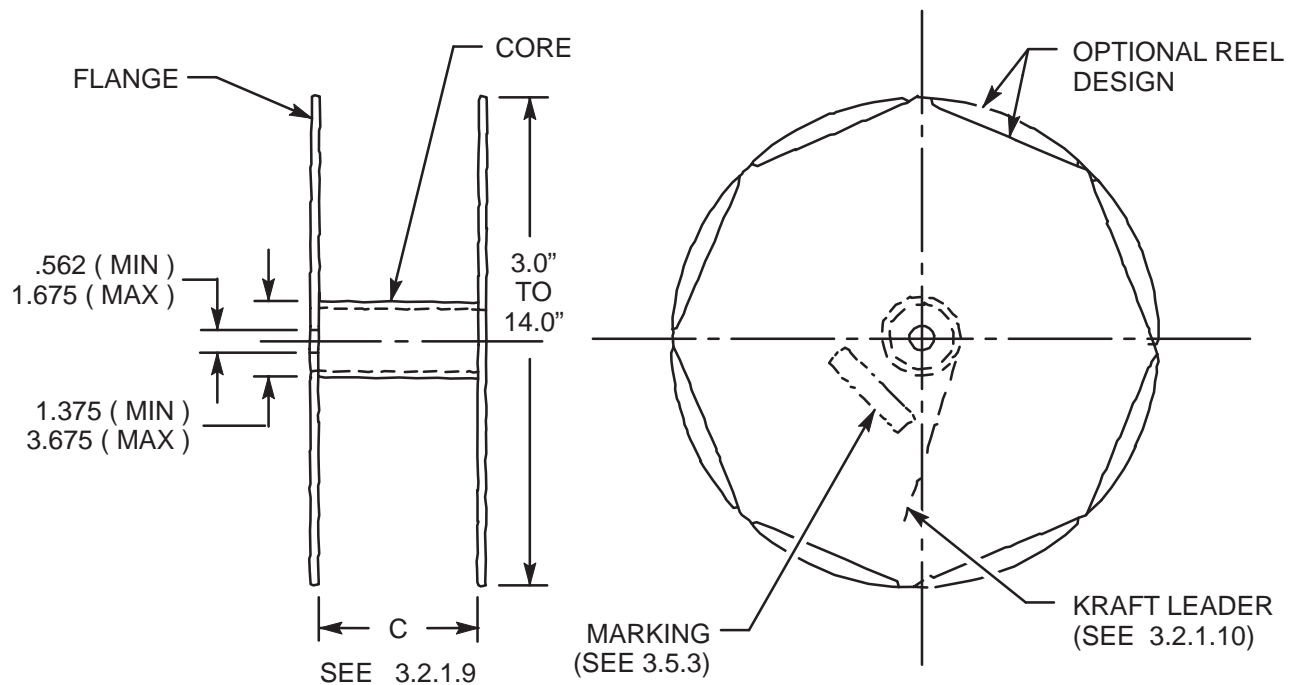


Figure 3. Reel Configuration

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- 3.2.1.12.4 Place splice clip over two leads on one strip. Bend “legs” over tightly. **NO TOOLS NEEDED.** Repeat with other side of same strip (Figure 4C).
- 3.2.1.12.5 Lay second strip into notches in clips so tape ends almost touch. Bend over legs tightly (Figure 4D).
- 3.2.1.13 A maximum of 0.25% of the components per unit package may be missing without consecutive missing components.
- 3.2.1.14 Component spacing along the length of tape shall be per Table 2 .
- 3.2.1.15 Cumulative spacing tolerance of dimension “A” shall not exceed 0.059” over six consecutive components (Figure 2).
- 3.2.1.16 Quantity per reel shall be controlled so that components and cover shall not extend beyond the smallest dimension of the flange (either across flats or diameter). For ammo-packs, components shall not rise above box edge after folding.
- 3.2.1.17 All reels shall be as full as practical. Use the smallest size diameter reel to accommodate the remaining quantity of components in the shipment.
- 3.2.1.18 A piece of single-faced corrugated shall be wrapped around the finished reel and taped securely. Width of corrugated wrap shall be the distance between flange of the reel less 1/8 inch (Figure 1).
- 3.2.2 Reel, Cassette, and Ammo-Pack Packaging: Radial Leded Components (Figures 1, Figure 3 and Figure 5)
 - 3.2.2.1 Items 3.2.1.7, 3.2.1.10, 3.2.1.16, 3.2.1.17, and 3.2.1.18 also apply to radial leded components.
 - 3.2.2.2 Deflection when measured at the bottom center of the component body, shall not deviate more than the indicated value from the projected theoretical centerline including inclination due to lead bend (Figure 5.).

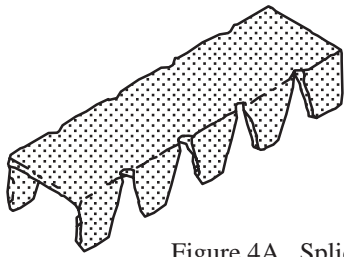


Figure 4A. Splice Clip

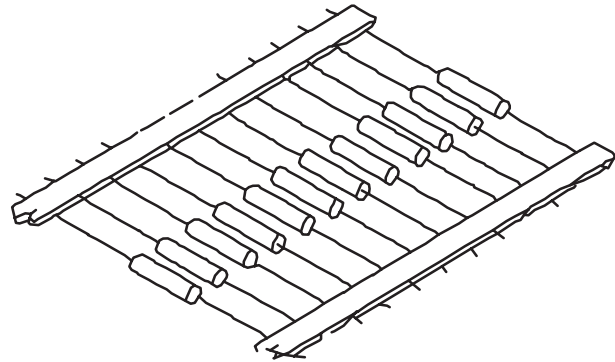


Figure 4C. Attach Clips to Tape

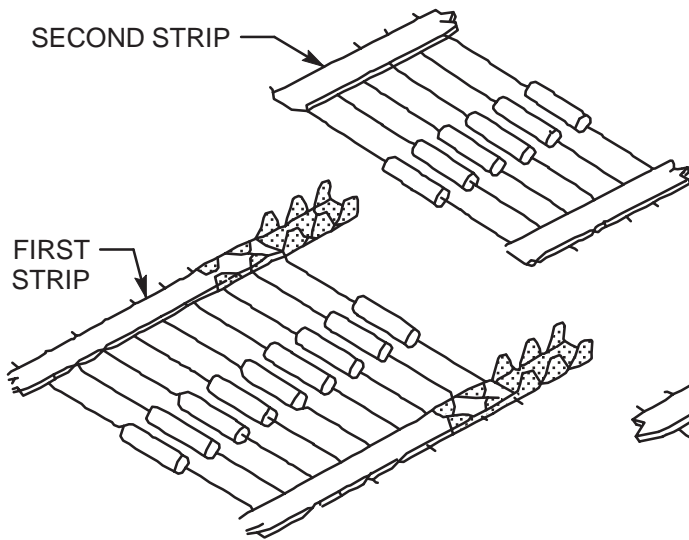


Figure 4B. Trim Tape

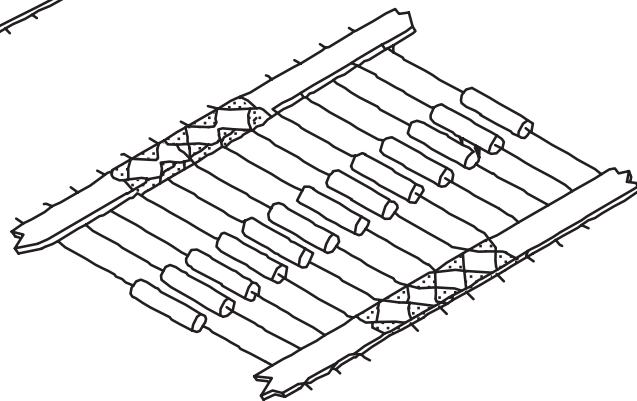


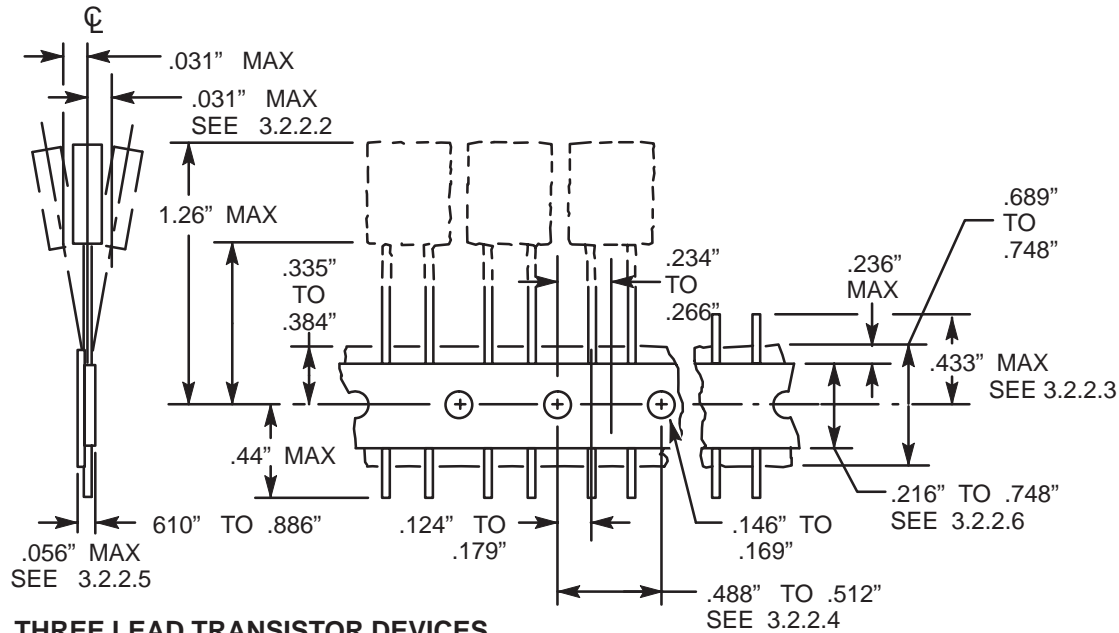
Figure 4D. Completed Splice

Figure 4. Splicing – Splice Clips

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- 3.2.2.3 Defective components will be clipped from the carrier tape such that the remaining protrusion of the leads does not exceed .433" (Figure 5).
- 3.2.2.4 Maximum non-cumulative variation between tape feed holes shall not exceed +.020" in four pitches (Figure 5).
- 3.2.2.5 Overall tape package thickness, including component leads and tape splices, shall not exceed .056" (Figure 5).
- 3.2.2.6 Holddown tape not to extend beyond the edges of the carrier tape and there shall be no exposure of the adhesive (Figure 5).
- 3.2.2.7 There shall be no more than three consecutive missing components.
- 3.2.2.8 A tape trailer having at least three feed holes is required at the end of the tape.

TWO LEAD DEVICES



THREE LEAD TRANSISTOR DEVICES

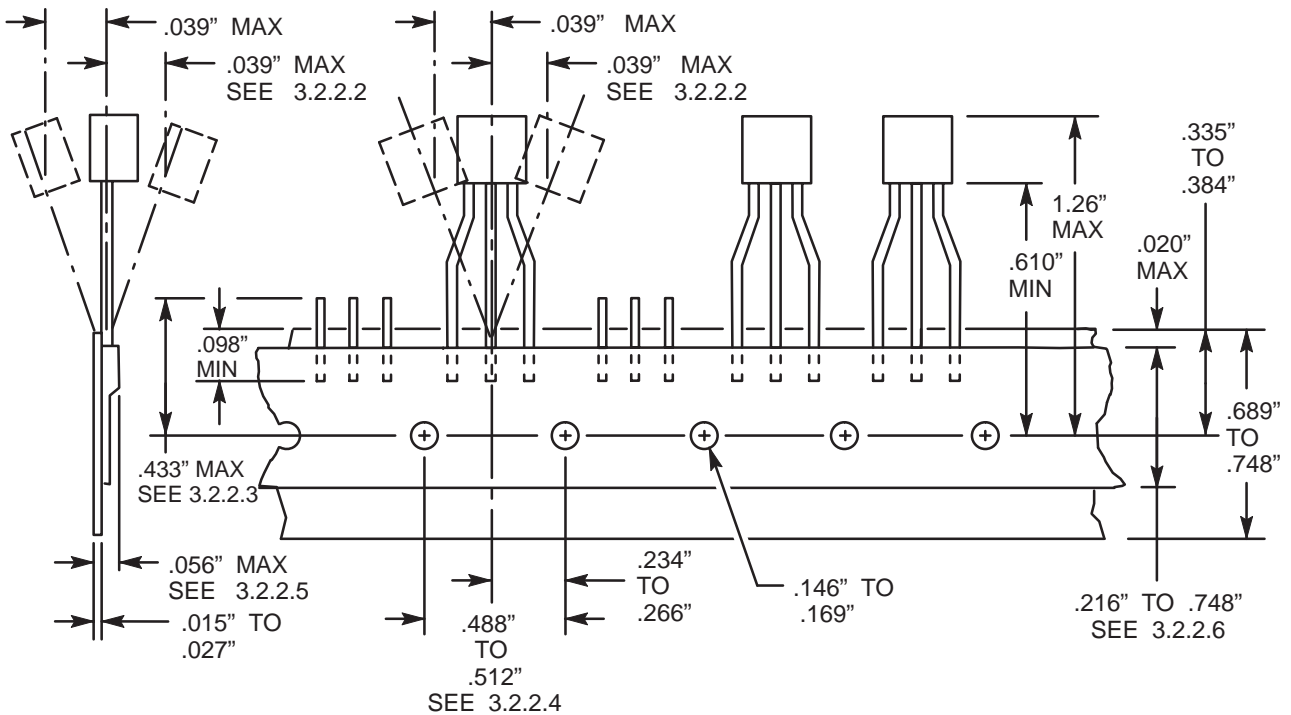


Figure 5. Radial Leaded Components

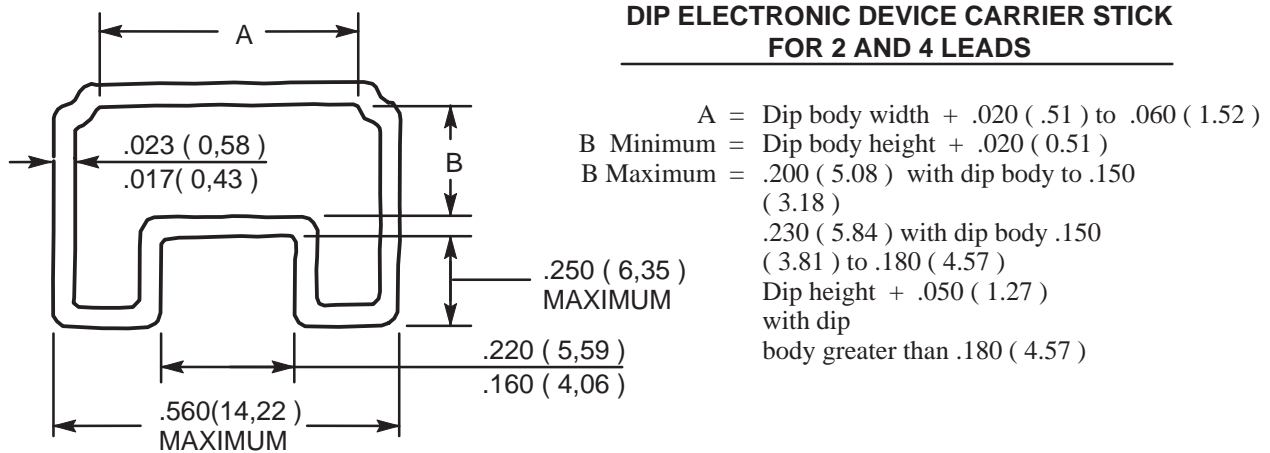
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3.2.3 Rail/Tube Package (Figure 6 thru Figure 14)

3.2.3.1 Dual Inline Package (DIP) Electronic Devices shall be packaged in tubes or rails following current industry standard, and marked per this specification.

3.2.3.2 All components must be oriented in one direction (pin one or notched end all pointing in one direction).

- 3.2.3.3 Tube or rail minimum height must be at least 0.020" greater than component body thickness to permit component to free fall through carrier stick.
 - 3.2.3.4 Tube or rail lead trough must be at least 0.020" greater than component lead length.
 - 3.2.3.5 The maximum space in the tube or rail for component height in Figure 6, Figure 7, and Figure 8 is:
 - For DIP bodies to 0.150", 0.200"
 - For DIP bodies from 0.150" to 0.180", 0.230"
 - For DIP bodies above 0.180", DIP height +0.050".
 - 3.2.3.6 Quantity per tube or rail shall not be forced into tube so that they buckle or overlap.
 - 3.2.3.7 The required tube or rail length is min. 19" to max 22".
 - 3.2.3.8 Material for tube or rail can be clear or opaque. Tubes or rails for ESD parts must be made of any approved static protective material and marked ESD.
 - 3.2.3.9 Do not place spacers between parts.
 - 3.2.3.10 Cut ends of tubes or rails shall be free of any deformation or burrs.
 - 3.2.3.11 Stoppers or pins shall be placed only in the ends of tubes and rails. Stoppers are the preferred method. Foam or any other stuffing material is permitted in partial tubes only. Partial tubes containing stuffing material should be labeled as such.
- 3.2.4 Special tray packaging.
- 3.2.4.1 Place individual component into part particular trays so that polarity or pin one orientation is in the same direction.



For use only with 2 and 4 lead dip IC modules

Figure 6.

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Minimum/Maximum Dimensions are expressed as:

Inch (Millimeter) = Maximum Condition

Inch (Millimeter) = Minimum Condition

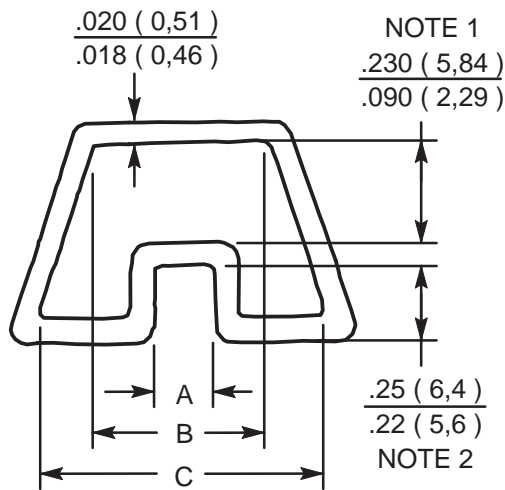
All dimensions are expressed in inches –

Millimeter equivalents are enclosed in brackets.

Millimeter equivalents are enclosed in brackets.

NOTE: Other configurations possible – consult factory.

**DIP ELECTRONIC CARRIER STICK
FOR 6 THRU 42 LEADS**



NOTES:

- Minimum – .020 (0.51) greater than dip module body thickness to permit component free fall through carrier stick

Maximum – .200 (5.08) with dip body to .150 (3.81)
.230 (5.84) with dip body to .150 (3.81) to .180 (4.57)
Dip height + .050 (1.27) with dip body greater than .180 (4.57)
Must not permit overlap of dip IC bodies.
- Must be at least .020 (0.51) greater than dip module lead length.

DIP INSERT SPAN		DIMENSION		
		A	B	C
.300	MAX	.220 (5.59)	.350 (8.89)	.500 (12.7)
(7.62)	MIN	.160 (4.06)	.250 (6.35)	.440 (11.18)
.400	MAX	.320 (8.13)	.450 (11.43)	.600 (15.24)
(10.16)	MIN	.260 (6,6)	.350 (8.89)	.540 (13.72)
.600	MAX	.520 (13.21)	.650 (16.51)	.800 (20.32)
(15.24)	MIN	.460 (11.68)	.550 (13.97)	.740 (18,8)

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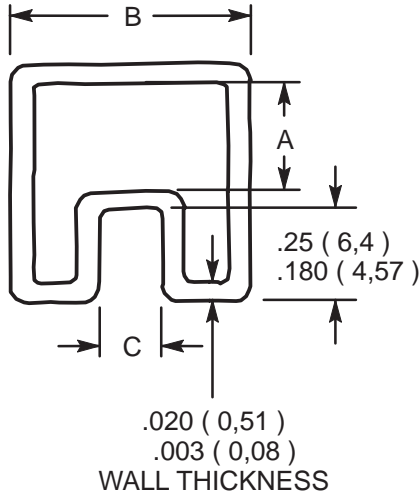
Figure 7. Tube Configuration

- 3.2.4.2 Secure tray lids with adhesive tape. Affix tape a minimum of two places on opposite sides.
- 3.2.4.3 Tray configuration and size must be approved by LMSC prior to shipment.

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Dip Socket	DIMENSION		
Insert Span	A	B	C
.300(7.62)	Minimum – Socket body thickness + .020 (0.51)	.610 (15.49) .010 (.25)	.320 (8.13) MAX .260 (6.6) MIN
.400(10.16)	Maximum – .200 (5.08) with socket body to .150 (3.81)	.610 (15.49) .010 (.25)	.320 (8.13) MAX .260 (6.6) MIN
.600(15.24)	.230 (5.84) with dip body .150 (3.81) to .180 (4.57) Socket body thickness + .050 (1.27) with socket body greater than .180 (4.57) must not permit overlap of dip socket bodies.	.810 (20.57) .010 (.25)	.520 (13.21) MAX .460 (11.68) MIN

Only for use with dip sockets.

Figure 8. Tube Configuration (Continued)

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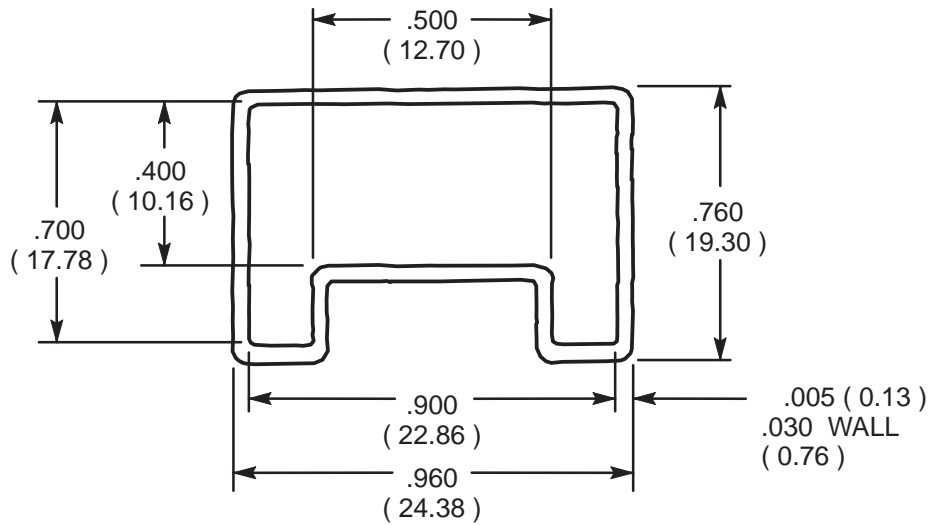


Figure 9.

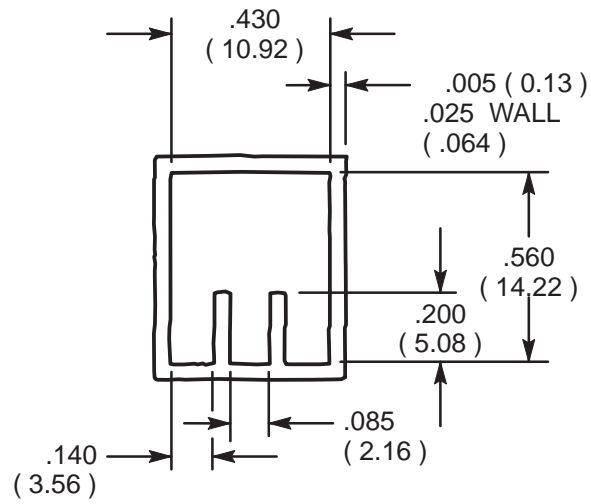


Figure 10.

See NOTES Following Figure 14.

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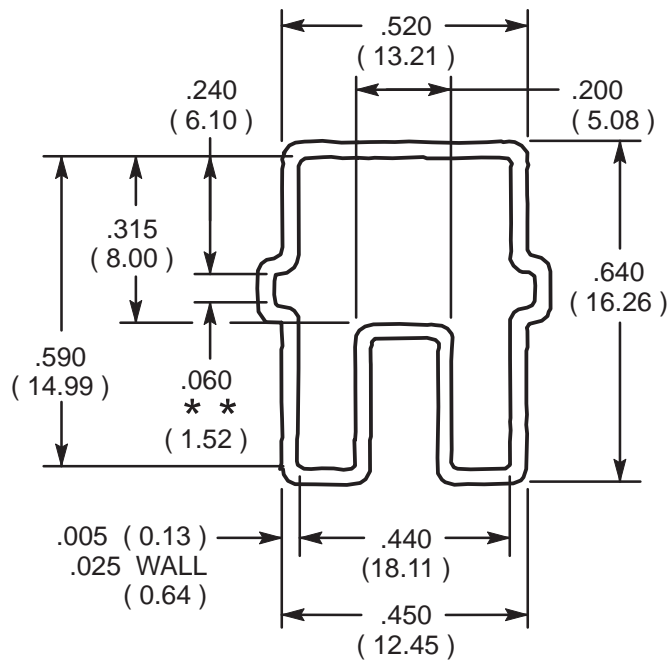


Figure 11.

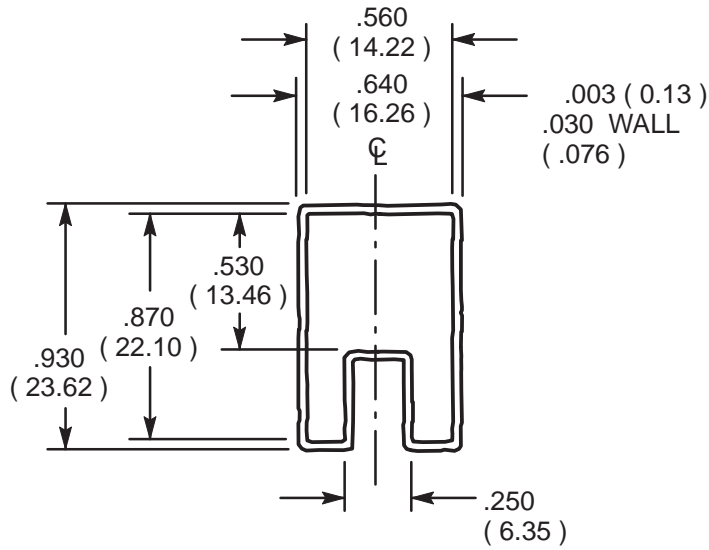
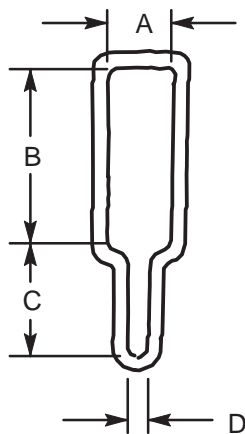


Figure 12.

See Notes Following Figure 14.

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SIP ELECTRONIC DEVICE CARRIER STICKS

DIMENSION			
A	B	C	D
.120 (3.05)	.280 (7.11)	.185 (4.70)	.050 (1.27)
.350 (8.89)	.400 (10.16)	.245 (6.22)	.100 (2.54)

Wall thickness = .025 .005

Figure 13. SIP Integrated Circuit Carrier Stick

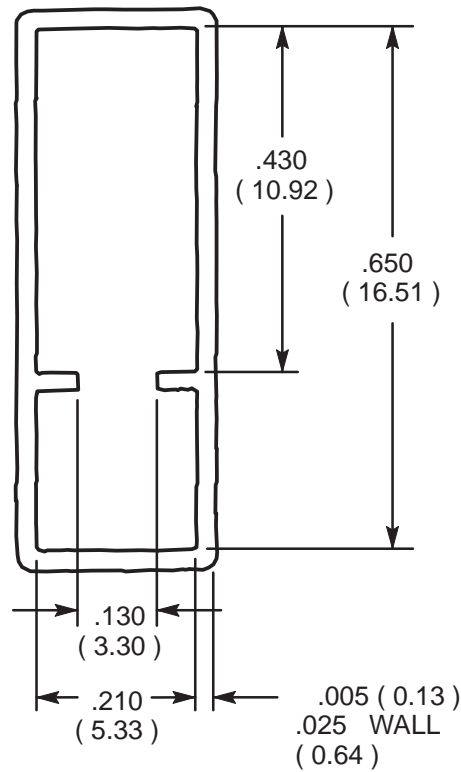


Figure 14.

Notes For Figure 9 through Figure 14:

All inside dimensions have a tolerance of + .010(.25).

Minimum component space is component body + .020(0.51).

Maximum component space is component body + .060(1.52).

Lead insert span must be at least .020(0.51) greater than distance between lead troughs.

Tube lead trough must be at least .020(0.51) greater than lead length.

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3.3 INTERMEDIATE PACKAGING

- 3.3.1 Consolidate tubes of identical part number, manufacturer and lot number into a bundle, place bundle into a static protective bag, if applicable, and seal.
- 3.3.2 Place bagged tubes into an intermediate container. Container size limited to the dimensions and gross weight provisions of the container specifications.
- 3.3.3 Pack reel unit packages uniformly in paperboard or fiberboard boxes. Gross weight of boxes not to exceed 35 pounds.
- 3.3.4 Place taped trays into a static protective bag, if applicable, and seal.

3.4 PACKING

- 3.4.1 Pack appropriate number of intermediate containers uniformly into each shipping container.
- 3.4.2 Shipping containers as packed, shall protect the item from damage during ordinary handling/shipping and shall meet the minimum requirements of common carriers for safe transportation at the lowest rate to the point of delivery (see contracting documents).
- 3.4.3 Fill all voids with suitable non-particulate generating dunnage to prevent damage during handling and/or shipment.

3.4.4 Intermediate containers which meet the requirements of Paragraph 3.4.2 may be used as shipping containers.

3.4.5 Enclose or attach a copy of packing slip to the shipping container.

3.5 MARKING

3.5.1 All marking shall be legible, uniform, durable and properly placed on containers to avoid loss of identity when package is opened.

3.5.2 Labels shall not be applied within 6" of either end of the rail/tube.

3.5.3 Unit package marking shall include:

3.5.3.1 Nomenclature.

3.5.3.2 Quantity per unit package.

3.5.3.3 Supplier/Manufacturer identity (may be abbreviated but logo only is not acceptable.) If supplier is not the manufacturer, then marking shall include both supplier and manufacturer identification.

3.5.3.4 Purchase order number.

3.5.3.5 Part number per contracting document.

3.5.3.6 Special marking if specified (Serial/Lot numbers, ESD CAUTION labels, etc.)

3.5.4 Intermediate package marking.

3.5.4.1 If rail/tube consolidation bag is transparent and unit package marking is readable through the material, then the intermediate container marking requirement is unnecessary.

3.5.4.2 Label intermediate packages per 3.5.3.1 thru 3.5.3.6.

3.5.5 Shipping container marking shall include:

3.5.5.1 Part number per contracting document.

3.5.5.2 Supplier and Name.

3.5.5.3 Total number of shipping containers and destination.

3.5.5.4 Special, precautionary, and handling markings for ESD devices.

3.5.5.5 Purchase order number.

NOTE: Attach or enclose a copy of the packing slip in shipping container.



UNIT PACKAGE



INTERMEDIATE PACKAGE / SHIPPER

BACKGROUND:

YELLOW

SYMBOL / WORDING:

BLACK

ELECTROSTATIC CAUTION LABEL

CAUTION: LABELS MUST ADHERE PERMANENTLY TO ALL APPLICABLE PACKAGE MATERIALS. SUPPLIERS SHOULD USE ONLY LABELS WITH PROPER ADHESIVE QUALITIES COMPATIBLE WITH THE STATIC PROTECTIVE PLASTIC PACKAGES. DEPICTED LABELS ARE NORMALLY AVAILABLE IN 3 SIZES (5/8" x 2", 2" x 2", 4" x 4"). IF ABOVE LABELS ARE NOT AVAILABLE, OTHER STYLES, COLOR AND MARKING MAY BE SUBSTITUTED, PROVIDING THAT EQUIVALENT STATIC PROTECTIVE PRECAUTIONARY WORDING IS USED AND THE ADHESIVE QUALITY IS ACCEPTABLE.

4.0 QUALITY ASSURANCE

4.1 Packaging shall be accomplished in such a manner as to prevent physical damage to, or degradation of, the packaged items during delivery to the using activity. It shall be the prerogative of LMSC to return damaged items, at supplier's expense, when such damage is attributable to improper or inadequate protection.

5.0 NOTES

5.1 Source for Splicing Clips – Universal Instruments Corp., Binghamton, New York 13902.

.200 Pitch – P/N 12128

.400 Pitch – P/N 12129

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5.2 PACKAGING MATERIALS

<u>Commodity</u>	<u>Specs/Matl</u>	<u>Sources*</u>
Bags, Static Protective	QPL, MIL-B-81705	1,2,3,4,5,7
Box, Corrugated, PPP-B-636	Fiberboard	1,2,3,4,7
Cushioning, Static Protective Foam	MIL-B-81705	1,3,4,6,7
Cushioning, Static Protective Foam Cellular, PPP-C-795	MIL-B-81705	1,3,4,6,7
Label, Electrostatic Caution Pressure-Sensitive	MIL-STD-129	1,2,3,4,5,6,7
Tubes, Static Protective Plastic		8

*See Source Chart

SOURCE CHARTS (Charts Update 9-1-87) (See NOTE below)		
Supplier No.	Supplier Location	
1	Biggam Enterprises	San Jose, CA
2	Ward-Bagby	Milpitas, CA
3	Colvin Packaging Products, Inc.	Anaheim, CA
4	Noland Paper Co.	San Jose, CA
5	Richmond Corp.	Redlands, CA
6	Controlled Static	Santa Fe Springs, CA
7	Sentinel Form Products	Hyannis, MA
8	Thielex Plastic Corp.	Piscataway, NJ
<p>If further information or details are required pertaining to any part of this LMSC Standard, or for approval of packaging that differs from this specification, contact "Operations Product Protection Engineering" through your LMSC Procurement Representative. (Signature cycle required for approval of alternative packaging.)</p> <p><u>Note:</u> This chart will be updated as new suppliers are found without affecting packaging specifications detailed in this standard. The latest chart revision date will be shown above as "Chart Update."</p>		