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EIA STANDARD

EIA-481-F

4 mm Through 200 mm Embossed Carrier Taping and 8 mm & 12 mm Punched Carrier Taping of Surface Mount Components for Automatic Handling

EIA-481-F
(Revision of EIA-481-E)

August 2021



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(From Standards Proposal No. 5430, formulated under the cognizance of the EIA Automated Component Handling Standards Committee).

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**4 mm THROUGH 200 mm EMBOSSED CARRIER TAPING
AND
8 mm & 12 mm PUNCHED CARRIER TAPING OF
SURFACE MOUNT COMPONENTS FOR AUTOMATIC HANDLING**

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(From Standards Proposal No. 5430, formulated under the cognizance of the EIA Automated Component Handling Committee (ACH).)

1 Scope

This Standard covers requirements for taping surface mount components. Complementary standards for specialized taping requirements are included in the addendum.

2 Introduction

This Standard was formulated to provide dimensions and tolerances necessary to tape surface mount components such that they may be automatically handled.

3 Applicable Documents

Unless otherwise specified the following documents form a part of this standard to the extent specified herein:

MH10.8.6 *Bar Codes & Two-Dimensional Symbols for Packaging*

JEDEC JEP95 *JEDEC Registered and Standard Outlines for Solid State and Related Products*

EIGP 114.2018: ECIA Labeling Specification for Product and Shipment Identification in the Electronics Industry - 2D Barcode (Including Human Readable and 1D Barcode)

EIA-383 *Preparation for the Delivery of Electrical and Electronic Components*

ANSI/ESD S541 *For the Protection of Electrostatic Discharge Susceptible Items Packaging Materials*

CEA-556 *Outer Shipping Container Bar Code Label Standard*

EIA-583 *Packaging Material Standards for Moisture Sensitive Items*

CTA-624 *Product Package Bar Code Label Standard for Non-Retail Applications*

IPC 7351 *Generic Requirements for Surface Mount Design and Land Pattern Standard*

4 Requirements

4.1 Carrier tapes, cover tapes, reels, and taped components must meet the requirements defined in the Figures and Tables presented herein.

4.2 Procurement documents and quotation requests shall include the following information:

- (a) Reference to this Standard by Title and Number.
- (b) Taping quality requirements including maximum number of missing components.
- (c) Container and reel marking requirements (including bar code labeling if required), and reel diameter (refer to 4.12 and Figure 10).
- (d) Shipping conditions, storage conditions and storage time.
- (e) Weight of the reel containing components. NOTE: A heavy reel may not work on all feeders. Also, a reel containing components attached to a feeder may exceed regulatory or corporate weight limits for lifting by workers.

4.3 Several conditions exist that may cause functional problems with carrier tapes and/or tape feeding systems even though the dimensions are within the parameters specified in the tables and figures of this document:

- (a) Based on the carrier style, tape thickness T , tape cavity depth T_2 , outside pocket width B_1 , the cavity pitch P_1 , or the reel flange diameter A , the following conditions may cause problems with tape feeding systems and should be considered as part of the procurement documents and quotation requests as applicable:

Type (Punched/Embossed)	Tape Width (mm)	Dimension (mm)	See Figure
Punched/Embossed	8, 12	$A > 360$	14
Embossed	8	$B_1 > 4.2$	6
Punched	8, 12	$T > 1.1$	4
Embossed	8, 12	$P_1 = 2.0$	5
Punched	12	$P_1 = 2.0$	5
Embossed	12	$T_2 > 4.5$	6
Embossed	16, 24	$T_2 > 6.5$	6
Embossed	32 to 200	$T_2 > 10.1$	7
Embossed	72 to 200	$P_1 > 56$	7

- (b) For 8, 12, 16 and 24 mm wide embossed tapes, if $S_1 < 1.0$ mm (Table 2 and Figure 6), there may not be enough area to obtain a proper seal between the carrier and cover tapes according to paragraphs 4.5 and 4.11 and must be considered as part of the procurement documents and quotation requests as applicable.
- (c) Users may experience problems feeding low mass components due to electrostatic effects (attraction and/or repulsion) associated with the separation of the cover tape and carrier tape during the feeding operation. The result of this phenomenon could

cause devices to migrate, or be propelled away from the user pick up point, resulting in a mis-pick or non-pick situation during placement. To minimize this phenomenon, it is recommended that the packaging materials, component placement equipment, and controlled environmental conditions be optimized to effectively dissipate any charge buildup. This charge, commonly referred to as tribo-electric charge, should be controlled per the guidelines in ANSI/ESD S541.

- (d) Carrier tapes may experience feeding problems when passed through tracks with lengths in excess of 250 mm. Figure 12 outlines the suggested measurement of camber.
- (e) Camber in excess of 1 mm over 250 mm may be generated when empty carrier tape is supplied on level-wound reels. Camber of 2 mm maximum is permissible for 8-mm wide level wound tapes (see Figure 12).

4.4 Components are to be prevented from falling out of the cavity of the carrier tape, and shall remain in position for automatic handling after removal of the top cover tape (see Note 1, Tables 1, 2 & 3).

4.5 The cover tape(s) shall not interfere with the proper function of the tape and reel process.

4.6 Tape in adjacent layers shall not stick together when wound on the carrier reel.

4.7 The packaging, materials and processes shall not adversely affect the mechanical and electrical characteristics or marking of the components. For intermediate and final packaging, refer to EIA-383 "Preparation for the Delivery of Electrical and Electronic Components," ANSI/ESD S541 "Packaging Materials for the Protection of Electrostatic Discharge Susceptible Items," and EIA-583 "Packaging Material Standards for Moisture Sensitive Items," and EIA-624 "Product Package Bar Code Label Standard for Non-Retail Applications."

4.8 The tapes shall be suitable to withstand storage of the taped components without danger of migration of contaminants onto the terminations, or the emission of vapors which would make soldering difficult or deteriorate the component properties or terminations by chemical action. In addition, the cover tape(s) shall not become detached, such that the components do not remain in position after storage. The punched carrier material shall not age and lose strength such that it breaks or delaminates on unreeling when the taped components are fed from the package by hand or into the assembly machines (refer to 4.2(d)).

4.9 Components may be removed from the cavity by incising the bottom cover tape (see Figure 10) for punched carrier tape, or in the case of embossed carrier, by incising at or below the cavity depth midpoint ($K_0/2$). In no case shall the incising affect the package functionality.

4.10 There shall not be consecutive components missing from any reel for any reason.

4.11 The cover tape for each style and material of carrier tape shall have a total peel strength of the following for the specified carrier tape widths:

- 4mm: 0.1N to 0.7 N (10 grams to 70 grams calibrated scale reading)
- 8 mm: 0.1 N to 1.0 N (10 grams to 100 grams calibrated scale reading)
- 12 mm to 56 mm: 0.1 N to 1.3 N (10 grams to 130 grams calibrated scale reading)
- 72 mm and wider carrier tapes: 0.1 N to 1.5 N (10 grams to 150 grams calibrated scale reading)

Peel is defined as the separation of the full width of the cover tape from the carrier tape or the removal of the center portion of the cover tape from the carrier tape to enable component removal from the cavity. The direction of pull shall be opposite the direction of carrier tape travel such that the cover tape makes an angle of between 165 and 180 degrees with the top of the carrier tape. The cover tape, during peel force testing, shall be pulled with a velocity of 300 mm +/- 10 mm/minute, relative to the carrier tape, during peeling, which results in the cover/carrier tape seal being separated at a rate of 150 mm/minute.

4.12 Bar code labeling (if required) shall be on the side of the reel opposite the round sprocket holes (refer to 4.2(c) and Figure 10). Refer to EIA-556 and EIA-624.

4.13 Reels as defined by Figure 14 shall be permanently marked with visible recycling symbology.

4.14 The following orientation rules shall be considered as standard for multi-connection components.

- (a) Traditionally packaged components with leaded, bottom-only terminations (e.g. PLCC, SOIC, SOJ, and BGA) shall be packaged with the terminations facing the bottom of the carrier cavity. The following rules apply whether the terminations are facing downward or upward in the cavity.
- (b) Termination is the electrical or mechanical connection from the component to the board and can be described as lead, pin, bump, ball, wirepad, connector, etc.
- (c) Orienting feature is the attribute on the component that identifies a unique orientation. The most accurate description should be Termination 1 (refer to IPC 7351); however in absence of Termination 1 definition, the following features can be used: fiducial mark, chamfered edge, dimple, notch, wider termination, etc. If the orienting feature is located in the exact center of the component, or it lies on the shorter axis of the component, then an alternate orienting feature on the component should be chosen.
- (d) A component is considered square if the bounding rectangle around the outer extents of the component (including body and terminations) contains edges with a difference no greater than 0.3mm between the nominal length and width.
- (e) The tape pocket quadrant designations that describe the taped orientation of components are shown in Figure 1.
- (f) For existing Component Packages use Figure 2 "Orientation Guide for Commonly Used Devices".

- (g) If a package type is not contained in Figure 2, use the rules in the sequence shown in the following flow chart (Figure 3) to determine the correct orientation of the component in the tape pocket.
- (h) On 4mm wide tape, the longer axis of the component shall be oriented perpendicular to the length of the tape ($B0 > A0$).
- (i) On 4mm wide tape, polarized components shall be oriented in one direction. For components with two terminations, the cathode side shall be adjacent to the sprocket holes.