

EIA/ACH-2000

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Registered New Technologies for Automated Component Handling

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REGISTERED NEW TECHNOLOGIES

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A claim has been made that the tape package shown in #NT-100-1 is the subject of patents. For additional information, please refer to disclosure information included in a footnote in the #NT-100-1.

A claim has been made that the tape package shown in #NT-101-1 is the subject of patents. For additional information, please refer to disclosure information included in a footnote in the #NT-101-1.

1 Scope

ACH-2000 defines those new technologies which have been submitted and approved by EIA-ACH for registration of new technologies.

2 Applicable EIA documents

EIA-705 "Guidelines and Procedures for Registration of New Technologies for Automated Component Handling".

3 General

- a) The Registered New Technologies Submittal includes the following: submitter, scope, abstract, technical details, and drawings.
- b) Annual review of the content of the ACH-2000 registrations are made. Those technologies which have become a final EIA standard or which are no longer in active use are removed and replaced with a notation indicating its disposition.
- c) All Registered New Technologies presented herein have demonstrated commercial use and acceptance.



Documents

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REGISTERED NEW TECHNOLOGIES FOR AUTOMATED COMPONENT HANDLING

MECHANICALLY INTERLOCKING TAPES

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1 Mechanically interlocking tapes

Recognizing that currently most odd form components are manually assembled to printed circuit boards, efforts were made to automate this assembly process. The resultant difficulties encountered were due to inconsistencies in part packaging, feeding and presentation. Existing tape and reel standards did not address the scope of packaging and feeding of odd form components for automated assembly.

2 Abstract

The process consists of tape packaging and tape feeding equipment, and the tapes - all designed around the concept that a common tape package is the solution to the numerous parts feeding problems.

The tape package consists of a two part tape system: A carrier tape which is prepunched with component lead registration patterns, tab patterns or precision formed pockets which act to consistently orient and locate the parts; and, a mechanically interlocking cover tape which interlocks with the carrier tape securing the parts on the tape. The tapes are mechanically unlocked and separated at the tape feeder pick point, exposing only one row (pitch) of parts.

The mechanically interlocking carrier and cover tapes were designed and developed to provide a tape and reel technology with which to reliably feed a wide variety of odd form parts for accelerated implementation of automated assembly. Selecting from the available tape widths, pitch lengths and part locating methods, a tape package can easily be designed for almost any small part. The technology provides the packaging and feeding solution for both surface mount technology (SMT) and thru-hole technology (THT) parts which heretofore could not be packaged and fed in high speed automated assembly.

Thru-hole designed parts are precisely positioned and registered in the prepunched carrier tape by their leads. Precise part and lead pattern positioning of THT odd forms within a tape and reel format eliminates the large space requirements, capital (e.g. vision or remote mechanical positioning), and comparatively lengthy cycle times demanded by trays. Positional uniformity of parts in the carrier tape eliminates difficulties caused by variations in part size and shape. This tape and reel technology offers improved flexibility and reliability in the automation process quite unlike plastic tubes with varying cross sections and lengths. An anti-static foam tape may be interleaved between layers as thru-hole parts are wound onto the supply reel during packaging. This foam interleave tape provides protection of the leads of thru-hole parts - the anti-static tape is easily and automatically removed by a function of the feeder prior to tape guide entry.

Surface mount designs of odd form parts can also be packaged and fed on tape and reel using this same process. Since the mechanically interlocking cover tape can loop over the parts and lock at several locations across the width of the carrier tape, a shallow formed pocket may be used to contain and locate the parts; orientation can be controlled by designing features of the pocket which only allow parts to be packaged in a singular direction/orientation. As with THT, the cover



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tape which secures the part provides a strong mechanical interlock and robust tape package, permitting the packaging of heavy parts such as magnetics. The shallow or semi-pocket carrier tape contains the lower portion of the part where lead coplanarity is protected. The upper portion of the part which protrudes above the pocket is available for convenient placement device or robotic end-effector access as well as component presence sensing. Holes can be provided in the carrier tape through which locator pins on the feeder can precisely locate parts for direct assembly, or hold parts in position prior to removal.

The cover tape is mechanically unlocked reliably and separated from the carrier tape at the pick point by a device on the tape feeder, thus eliminating any of the potential problems caused by adhesives or heat sealing. Peel force testing is eliminated.

In contrast to full depth pockets, shallow pockets facilitate the use of thinner and narrower carrier tape, as well as shorter pitches resulting in more parts per reel at lower cost. Semi-pocket carrier is more cost effective to manufacture, handle, store, ship, and dispose of because of its dense characteristics - minimized pocket volume per part and is, therefore, lower in cost when compared to full depth pockets.

Still another tape combination configuration is used for very low profile parts. The mechanically interlocking cover tape used in this application lays flat over the pocket and part, and does not loop over the part. This configuration has all the benefits of the mechanical interlock plus the added capability to feed on standard OEM tape feeders on existing installed base pick and place equipment. The two tapes are separated by a wedge-like device, provided at no charge, which is permanently attached to the feeder with two screws. It does not need to be removed in order to feed heat seal or adhesively attached cover tapes.

Further, the development of mechanically interlocking tapes provides a reliable and rugged tape system with unlimited shelf life. The mechanical interlock is unaffected by temperature and humidity and may be opened and re-interlocked repeatedly without degradation. Each individual pitch is separately and independently interlocked across the width of the carrier tape. The durable package allows for usage of large diameter supply reels or large volume fan fold containers to provide sufficient line inventory in the automation process, thus minimizing manual intervention for inventory replenishment.

Mechanically interlocking tapes offer an improved method of tape and reel or fan fold packaging and handling of both THT and SMT devices. This new technology complements certain widths of adhesive cover tape presently used to contain devices and simplifies the automated handling of components in both the packaging and board assembly processes that use a tape and reel or fan fold format.

Staple splicing of the tapes occurs while tapes continue to feed, both at the taping and feeding location, thus maximizing thruput. This results in significantly lower overall costs due to the elimination of scrap (waste generated by frequent insufficient tape on the input supply reel to make a full output reel), and increased taping equipment uptime (no purging and rethreading the