

# In Pursuit of the Perfect Cover Tape

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**SUMMARY:** *When it comes to tape-and-reel packaging, no flawless solution exists for sealing components into carriers. However, a newer breed of cover tape approaches perfection.*

Choosing the right cover tape for tape-and-reel packaging of electronic components can present a challenge. Two types of cover tapes are commonly used with embossed carrier tapes today: Heat-activated adhesive (HAA) cover tapes and pressure-sensitive adhesive (PSA) cover tapes.

Both types have served the electronics component and PCB manufacturing industries well for decades. They still have their place, but more choices are often needed for today's smaller components.

Heat-activated adhesives may peel unevenly. With very small components, inconsistent peels may result in component migration induced by vibration as the tape is peeled back in feeders during carrier advancement at board assembly, contributing to mis-picks, assembly downtime, and yield loss. Pressure-sensitive adhesives offer a smoother peel, lessening the likelihood of mis-picks, but they tend to adhere to assembly equipment, potentially leading to machinery failures if proper maintenance is not performed on the machines.

Recent innovations in cover tape design have virtually eliminated many of the challenges associated with traditional products. A



newer cover tape, called universal cover tape because it can be used with a majority of carrier tape materials and most sealing and feeder equipment, is designed to solve many of the issues associated with HAA and PSA tapes. Universal cover tape is engineered so that only the

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**Figure 1:** Universal cover tape is engineered so that only the middle portion is removed from carrier tape during assembly.

middle portion is removed or pulled from carrier tape during assembly by a uniform peeling action. The edges, which are adhered to the carrier tape, remain in place. The result is an exceptionally smooth, consistent peel force with narrow ranges and controlled variability. Moreover, the adhesive is not exposed to assembly equipment, virtually eliminating the risk of adhesive transfer.

### **Traditional Cover Tape Technology**

HAA cover tapes are the most widely used cover tapes in the electronic component man-

ufacturing industry. The entire surface of one side of the tape's film backing is coated with a primer and adhesive, providing the user the choice of the seal width and location. In the taping process, a heated sealing shoe presses the tape onto the edges of the carrier tape where adhesion is desired, sealing the cover tape onto the carrier and leaving the component free of active adhesive.

HAA cover tapes can be reliable for larger components. However, the tapes' relatively wide peel force range compared to more advanced cover tapes prompted manufacturers of very small components to seek alternatives. A wide peel force range may result in inconsistent de-taping during the pick-and-place process at the assembly plant. Inconsistent de-taping may cause tiny components to pop out of the carrier tape (a phenomenon referred to as trampolining), leading to mis-picks and assembly line downtime.

Cover tapes made with pressure-sensitive adhesive appeared on the market in the 1990s. PSA tapes generally exhibit tighter peel force

ranges, meaning a smoother peel off of the carrier. Therefore, they can reduce the incidence of chip migration and mis-picks due to vibration during the cover tape peeling process, particularly for very small components.

PSA adhesive is a synthetic adhesive formulated to remain tacky over a wide range of temperatures, including room temperature. Hence, PSA cover tapes do not require heat to seal them to the carrier and, with no process window to worry about, equipment setup procedures are simplified. PSA tapes will adhere to most acceptable surfaces with the application of suf-

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ficient pressure to bring the two surfaces into intimate contact.

Because the adhesive is tacky at room temperature, PSA tapes require some caution when used with pick-and-place feeders. Care must be taken not to allow the exposed adhesive to contact stationary surfaces, such as guide pins or pinch rolls, to help prevent adhesive transferring to and gumming up machinery. Using equipment coated with a low-surface-energy material and periodic cleaning with isopropyl alcohol can help prevent adhesive transfer.

### **A Better Solution for Shrinking Components**

HAA and PSA cover tapes continue to reliably serve the electronics components industry. However, as components shrink in size, the industry is searching for new alternatives. Among the needs expressed by PCB manufacturers are:

- Tighter peel ranges with less variability.
- Elimination of adhesive transfer to sealing and feeder equipment.
- Reduced component migration during cover tape removal from carrier.
- Address future small component packaging needs.
- Improved yields associated with pick-and-place equipment operations.

Universal cover tape was developed to address such needs.

A high-performing cover tape must strike a balance between adhesion strength and smooth de-taping. The adhesive must be strong enough to prevent delamination and the minimum risk of components spilling out of the carrier. On the other hand, it must be removed easily enough to minimize vibration-induced chip mis-picks. The smoother the tape peeling operation is on a feeder, the less likely it is that components will rotate within the carrier cavity or catapult from the carrier as the tape is peeled. Smooth peeling is accomplished by narrow peel force ranges.

Universal cover tape takes the adhesive out of the peel force range equation. This marks a radical departure from HAA and PSA tapes. Universal cover tape is applied using a pressure-sensitive adhesive. However, once the cover tape is

applied it does not leave the carrier, so the risk of adhesive transfer is virtually eliminated.

With HAA and PSA tapes, the entire cover tape lifts off the carrier during de-taping. With universal cover tape, only the middle portion is removed. The portion with the adhesive remains on the carrier tape edges. The tape's peel-initiation feature allows it to tear effortlessly from the carrier along a straight line. The tearing action produces an exceptionally tight peel force range, resulting in an ultra-smooth peel. A typical HAA tape exhibits a peel force range above 30 grams. The peel force range of PSA tapes generally fall below 30 grams. Universal cover tape typically exhibits a peel force range below 15 grams.

Universal cover tape combines the desirable features of HAA and PSA cover tapes and improves on them. A simplified process window makes application easy and low risk for the component manufacturer. An exceptionally smooth peel is generally considered to reduce the risk of mis-picks and assembly line failures for the PCB manufacturer. Tape-and-reel packaging users dealing in very small, thin components need a high-performing cover tape. Choosing a universal cover tape may help them achieve their goal of failure-free pick-and-place operations. **SMT**



James T. Adams joined 3M in 1979 and has more than 30 years of experience in various businesses, including magnetic media, telecommunications, and electronics. Adams specializes in establishing design criteria for packaging various surface mountable components and/or subassemblies into tape and reel, problem solving, technical marketing, and troubleshooting the complex equipment used in the electronics industry. Other areas of specialization include data transmission, contact resistance, ESD, and technical writing. He is also a member of the Electronic Industries Association/Automated Component Handling (EIA/ACH) and International Electrotechnical Commission, IEC standards committees.