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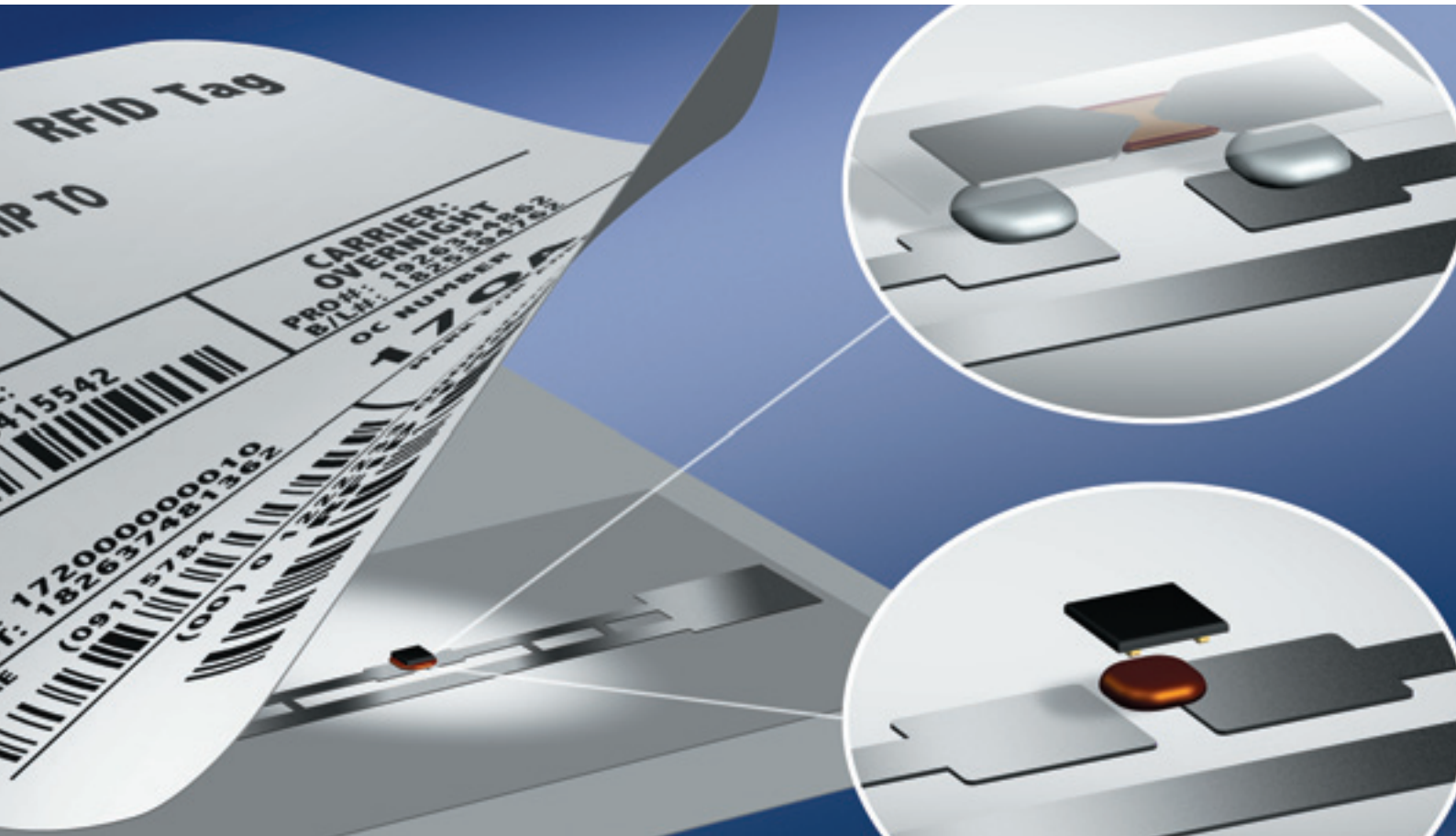
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# SELECTOR GUIDE

## RFID INTERCONNECT ADHESIVES

ANISOTROPIC CONDUCTIVE ADHESIVES - NON-CONDUCTIVE ADHESIVES - ISOTROPIC CONDUCTIVE ADHESIVES

## BACKGROUND

A RFID (Radio Frequency IDentification) tag is a device that is capable of uniquely identifying an object via a preprogrammed response when the device is queried by an external radio frequency wave.

A RFID tag consists of a graphic overlay and an inlay. The inlay is the functional or active part of a tag. It contains the die (used to carry the coded information) and the antenna (used to both transmit and receive RF signals). Adhesives are critical to the assembly of reliable tags. They are used to attach dies onto antennas to build the inlay. Inlays can be

built in one of two ways: (1) an interconnect adhesive is used to attach a small bare die directly to an antenna, or (2) an interconnect adhesive is first used to build a much larger packaged die (interposer or die strap), which is then adhered onto an antenna (see figure 1). Both methods of assembly have been successfully used to make active and passive RFID tags.

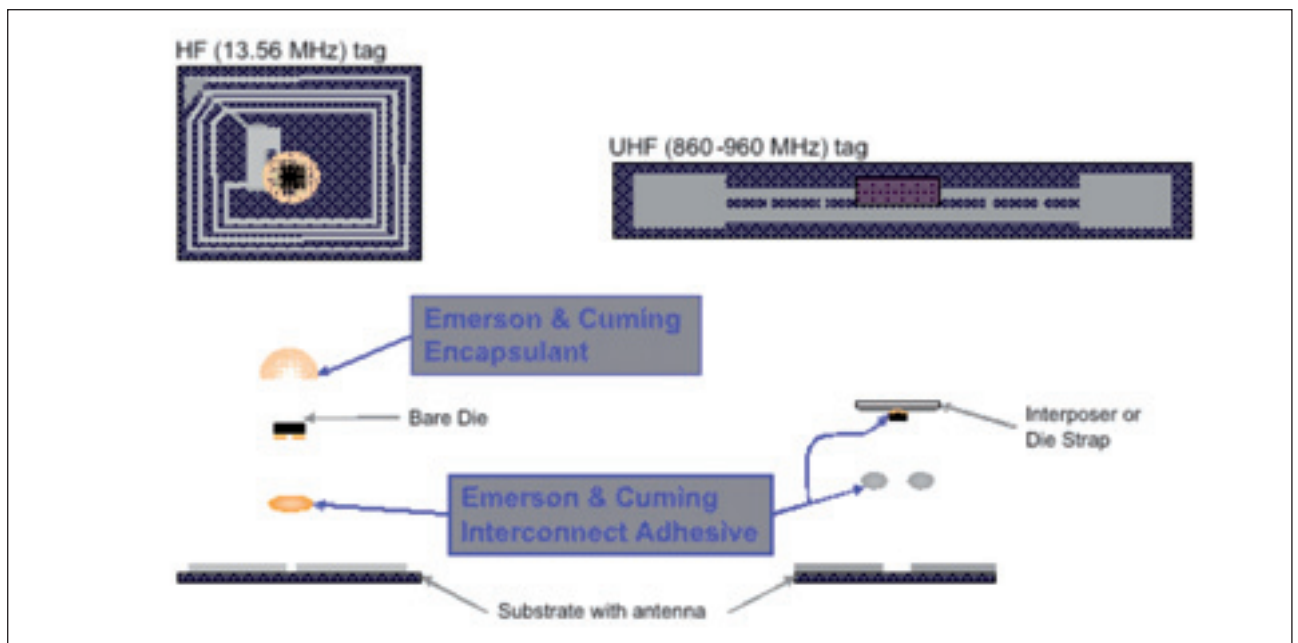


Figure 1: Schematic of a RFID inlay

## DIRECT ATTACHMENT OF BARE DIES

The most common method of inlay assembly today uses an **Anisotropic Conductive Adhesives** to attach bare dies onto antenna. Anisotropic conductive adhesives conduct in only one direction (along the z-axis). These adhesives are filled with small amounts of electrically conductive particles that have a tightly controlled size distribution. They are most suitable for the direct attachment of small dies (0.8x0.8mm typical) with flat bumps onto antennas. They, however, require pressure during cure to establish a reliable connection.

## MECHANICAL SUPPORT OF BARE DIES

Another method of inlay assembly requires the use of a **Non-Conductive Adhesives** to attach a small bare die onto an antenna. In this case, the die bumps are directly connected to the antenna pads using mechanical means. The purpose of the adhesive is to then provide structural support and increase tag reliability. Pressure is usually required during adhesive cure.

## ATTACHMENT OF DIE STRAPS

While inlay assembly using direct bare die attach is suitable for many tag applications, assembly speeds using this approach require high precision equipment and a clean manufacturing environment. Die straps are much larger in size (5x10mm typical). Greater latitude in placement is, therefore, possible. **Isotropic Conductive Adhesives** are the preferred interconnect solution in this application. Isotropic conductive adhesives conduct in all directions. Also, unlike anisotropic conductive adhesives, pressure is not required during cure. Isotropic conductive adhesives are not well suited for the direct attachment of small dies to antennas because of the high likelihood of shorting. These adhesives are best suited for attaching die straps to antennas at high assembly speeds.



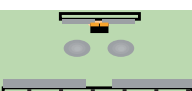
## ENCAPSULATION OF BARE DIES

In some applications, die encapsulation may be necessary to provide additional protection against the environment or to increase data security. A **Glob Top Encapsulant** is best suited for this because it completely encases the die in a protective coating.

## CRITERIA FOR ADHESIVE SELECTION

Bonding surfaces are critical to all types of adhesives. The adhesive must adhere well to all surfaces that it contacts to yield a reliable inlay. These surfaces include the antenna (copper, aluminum or conductive ink), the die or die strap metallization (copper, aluminum, silver, gold, palladium, conductive ink or die passivation layer), and the substrate (PET, paper or PVC). Please call the adhesive experts at Emerson & Cuming for product recommendations.

## SNAP CURE INTERCONNECT ADHESIVES AND GLOB TOP ENCAPSULANTS FOR RFID TAG ASSEMBLY

APPLICATION: Direct Attachment of Bare Dies 					
Antenna type	Anisotropic conductive adhesive	Filler	Mean Filler Particle Size (µm)	Recommended Cure Condition	Worklife at 25°C
Conductive ink	<b>XCE 3120</b>	Gold-coated polymer	5 µm	150°C for 5 seconds	3 days
APPLICATION: Direct Attachment of Bare Dies 					
Antenna type	Non-conductive adhesive	Recommended Cure Condition		Worklife at 25°C	
Etched Aluminum or Copper or Conductive ink	<b>XA 80215</b>	150°C for 5 seconds		2 days	
APPLICATION: Attachment of Die Straps 					
Antenna type	Isotropic conductive adhesive	Recommended Cure Condition		Worklife at 25°C	
Conductive ink	<b>XCE 3111</b>	110°C for for less than 10 seconds		2 days	