Selection of Grounding, EMI Shielding and Attachment 3M™ Electrically Conductive Adhesive Transfer Tapes (ECATT)

General Description

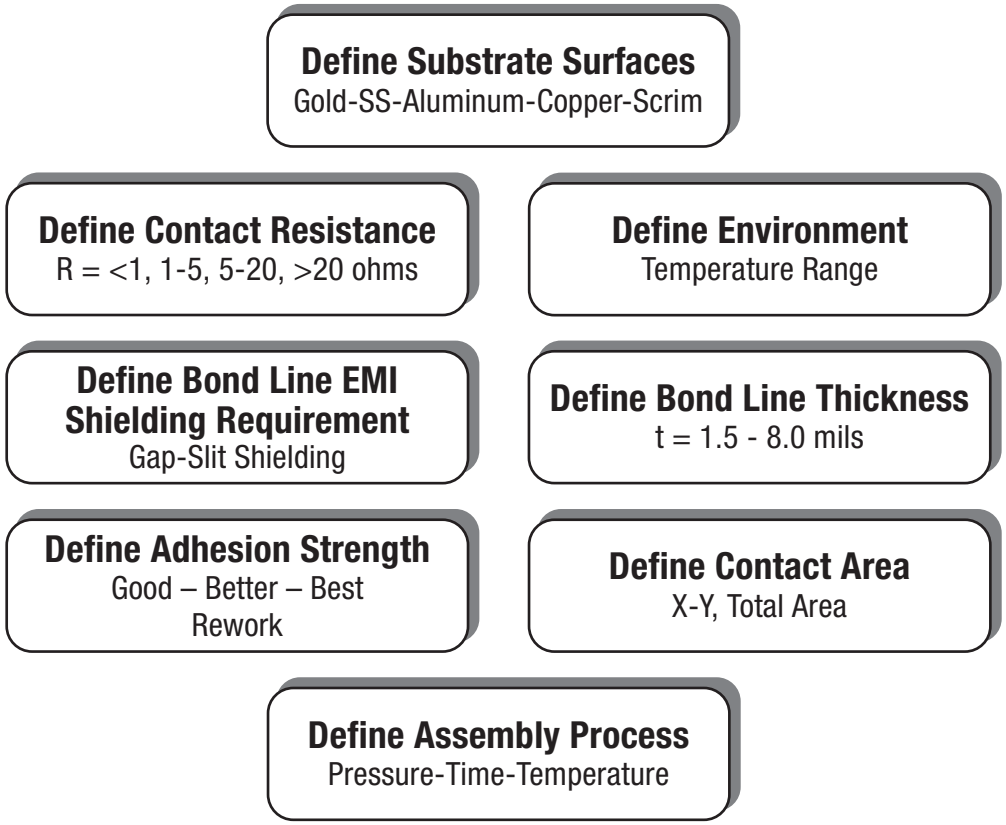
This technical bulletin describes a decision process flow to narrow and select the 3M™ Electrically Conductive Adhesive Transfer Tapes (ECATT) for a grounding, EMI Shielding and attachment applications.

ECATT Selection Process Overview

The process for the selection of a set of ECATT products to test in a given end use application is defined by the answers to a series of application questions. Understanding how potential answers influence the end use application electrical/grounding/EMI Shielding performance and the end use application's primary assembly function leads to a set of products that can be tested for an application.

The selection process also ensures the design team understands the multi-functional aspects of ECATT selections that impact specific attributes of the application. The process also educates the design team member on the "why" of a selection may be important to one member and less important to others (ie: One engineer selects an ECATT for adhesion for assembly strength or a "mechanical" function, while the second engineer selects the ECATT for contact grounding resistance to ensure "electronics" function of the design).

ECATT General Design Guide Categories



Define Substrate Surfaces
Gold-SS-Aluminum-Copper-Scrim

The substrate surface types are characterized by a surface resistance, hardness & topography. These features influence how the conductive aspects of the 3M™ Electrically Conductive Adhesive Transfer Tape (ECATT) solution will interface with these surfaces to achieve a final assembly with associated contact resistance, peel strength, etc. Each ECATT type "conductive filler" (particles, non-woven's, etc.) interact with the substrate surfaces to allow for a contact resistance.

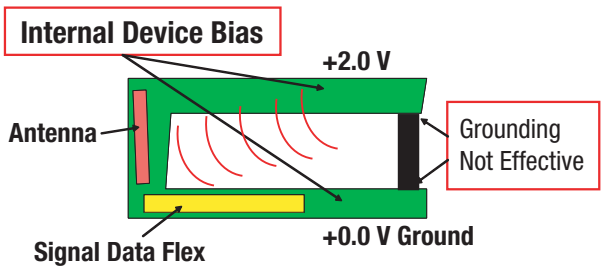
Define Contact Resistance
R = <1, 1-5, 5-20, >20 ohms

The ECATT's are designed to provide for different contact resistance based on the substrate types. The contact resistance value (ohms) will lead to different performance aspects of the final assembly and device.

Assembly contact resistance can effect:

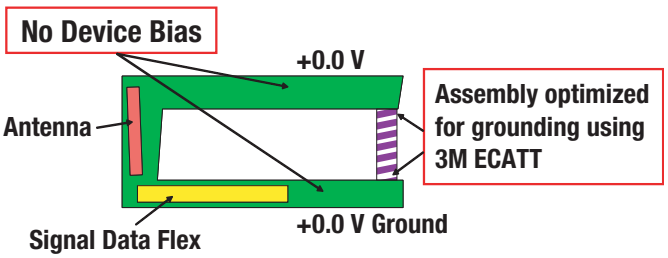
- Assembly electrical bias or EMI Shielding Performance as ECATT grounds the EMI shield
- Bias can generate antenna or RF signal affects that can lead to lower performance of device
- Lower R can allow for improved EMI shielding of a design. 3M™ Electrically Conductive Adhesive Transfer Tape (ECATT) 9709S-9707 has "inherent" bond line EMI shielding in addition to excellent grounding for improved high frequency performance.

• Problem
Electrical Bias Degrades Performance



If device is not well grounded, the "bias" voltage in the device acts as a "transmitter" of a signal that the signal line flex, antennae flex, etc. pick up, leading to poor performance.

• Solution
Effectively Ground Device



Device is well grounded so the "bias" voltage in the device is "baseline" and no "RF signal" is emitted.

Define Environment
Temperature Range

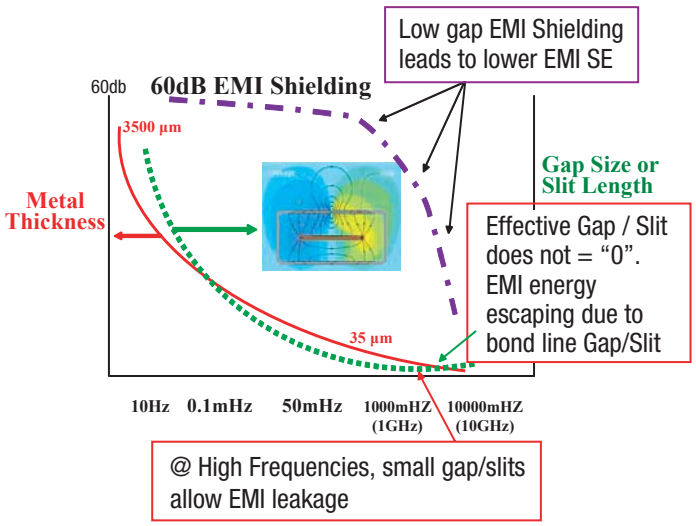
The environmental conditions can influence the 3M™ Electrically Conductive Adhesive Transfer Tape (ECATT) contact R and adhesion performance. Environmental conditions may impact contact resistance performance as the environmental conditions lead to modulus changes in the adhesive that can change the "effective" contact of the conductive filler type to a surface. See Data page for detailed information.

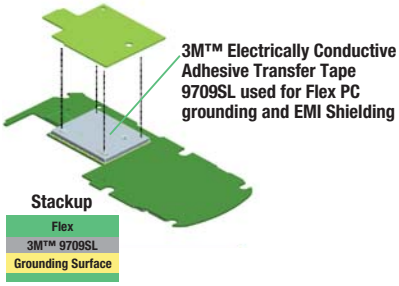
Define Bond Line EMI Shielding Requirement
Gap-Slit Shielding

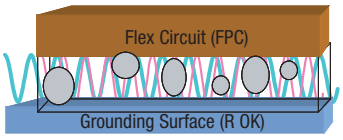
ECATT products can have varying degrees of EMI shielding in the "bond line" "gap/slit" due to the conductive filler type. 3M™ Electrically Conductive Adhesive Transfer Tapes (ECATT) 9709SL, 9709S, 9707, 9709 have a high degree of EMI Shielding in the "bond line" leading to improved EMI Shielding and grounding performance and reduced EMI affects.

- **Problem**
  Higher frequencies require optimized grounding and Faraday Cage design

- **Solution**
  Inherent bond line EMI shielding

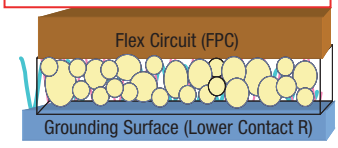






Standard Electrically Conductive Adhesive Transfer Tape

3M ECATT with inherent EMI shielding at the bond line provides significantly reduced crosstalk, stray EMI, noise in circuit, antennae effects, FPC susceptibility and spurious emissions.



3M™ Electrically Conductive Adhesive Transfer Tape (ECATT) 9709SL

Define Adhesion Strength
Good – Better – Best
Rework

Define Bond Line Thickness
t = 1.5 - 8.0 mils

3M™ Electrically Conductive Adhesive Transfer Tape(ECATT) products vary in thickness to meet defined gap requirements. Adhesion is achieved through adhesive type and bond line thickness. Adhesion can range from "standard" type adhesion that can allow easier rework and good assembly performance. High adhesions ECATT's provide for greater holding strength. Enhanced reworkable ECATT's have a High Adhesion and Low Adhesion sides to the ECATT to enhance rework.

Define Assembly Process
Pressure-Time-Temperature

Each design will require a Design of Experiment (DOE) to determine an optimum assembly method for Time-Temperature and Pressure of the ECATT assembly.

Key Application Questions:

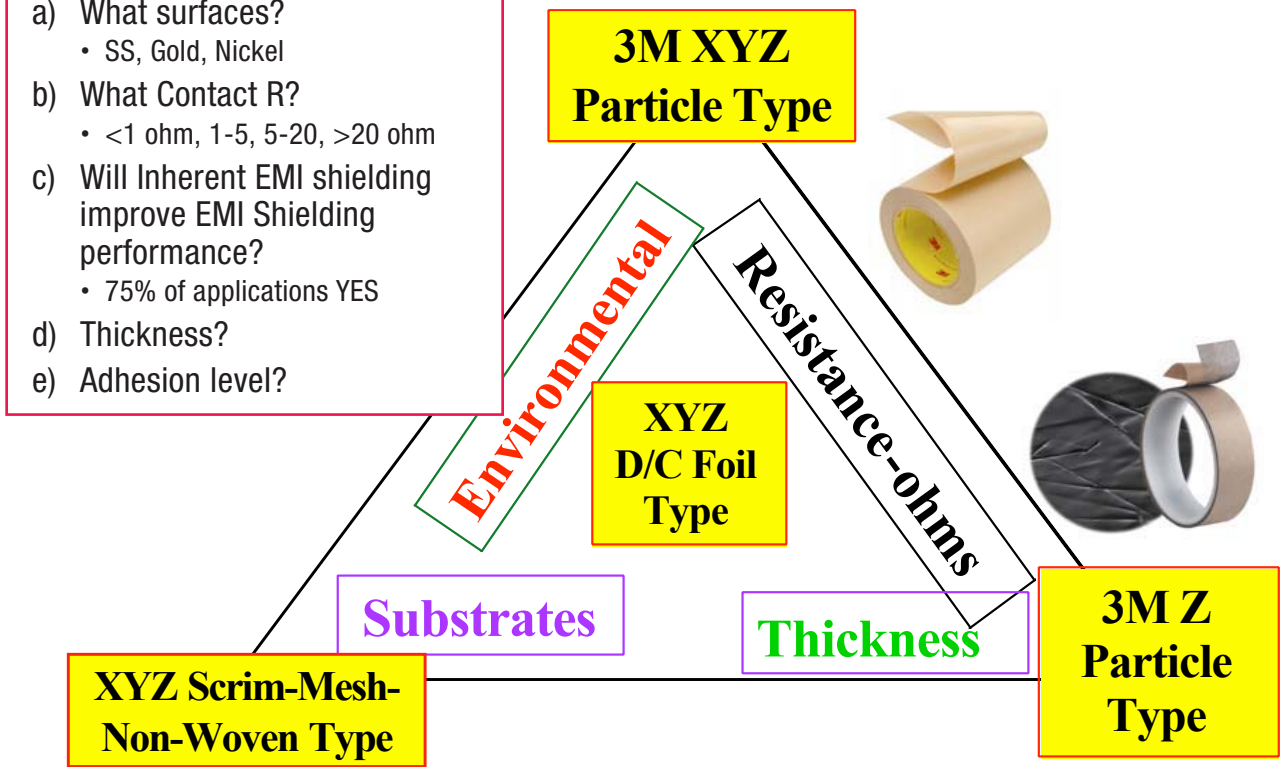
a) What surfaces?
- SS, Gold, Nickel

b) What Contact R?
- <1 ohm, 1-5, 5-20, >20 ohm

c) Will Inherent EMI shielding improve EMI Shielding performance?
- 75% of applications YES

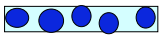
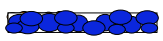
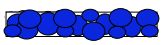
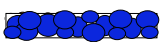
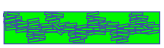
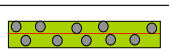
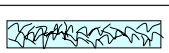
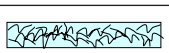
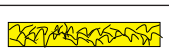
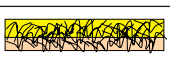
d) Thickness?

e) Adhesion level?



ECATT Selection Options
Features – Advantages – Benefits

3M™ Electrically Conductive Adhesive Transfer Tapes (ECATT's) offer a range of adhesive types, thickness and a range of conductive fillers. Working with the 3M representative, a design team can select 2-3 options to test for a given application and validate the final application performance.

"Feature - Advantage - Benefit" 3M™ Electrically Adhesive Transfer Tapes				Contact R Flex to SS	Contact R Flex to PCB (Gold/Gold)	Bond Line EMI Shielding (Low Noise	"Well" Flex Filling Potential	Adhesion	Rework	Thermal Conductivity (W/mK)
Product Number	**Design**	**Type**	**Features - Advantages - Benefits**	Lower R = Best	Lower R = Best	Best = EMI Shielding	Conform-ability	Peel Strength	High/Low Adhesion	R & K
9703		Silver	Z-Axis, Low Outgassing	*Best*	*Best*		Good	Good	Better	Good
9705		Silver	Z-Axis, Standard Outgassing	*Best*	*Best*		Good	Good	Better	Good
9706		Silver	High Adhesion	*Best*	*Best*		Good	*Best*	God	Good
9707		Silver	High Adhesion, EMI Shielding	*Best*	*Best*	*Best*	*Best*	*Best*	Good	*Best*
9709		Silver	XYZ, EMI Shielding	Good	*Best*	*Best*	*Best*	Good	Better	*Best*
9709S		Silver	Low R to SS, EMI Shielding	*Best*	*Best*	*Best*	*Best*	Good	Better	*Best*
9709SL		Silver	Premium Liners	*Best*	*Best*	*Best*	*Best*	Good	Better	*Best*
7810		Nickel	Thicker	Better	Good	Better	Good	*Best*	Good	Better
7805		Silver	Thicker	Good	*Best*	Better	Good	*Best*	Better	Better
7850		Carbon	Thicker	Good	Good	Good	Good	*Best*	Good	*Best*
7772		Nickel and Alum DC	DC Foil	Better	Better	Good	Good	Good	Good	Good
9712		Carbon	Non-woven Scrim	Good	Good	Good	Good	Better	Good	Good
9713		Nickel/C	Non-woven Scrim	Better	Good	Good	Good	Good	Good	Good
9719		Nickel/C	Silicone ECATT	Good	Good	Good	Good	Better	Good	Good
9723		Nickel/Cu	High Adhesion	Better	*Best*	Good	Better	*Best*	Good	Good
9725		Nickel/Cu	Lower R to SS	*Best*	*Best*	Better	Better	Better	Good	Good
9760		Nickel/Cu	Reworkable	*Best*	*Best*	Better	Better	Good	*Best*	Good

Good **Good** Better **Better** *Best* **Best**

Certification/Recognition

MSDS: 3M has not prepared a MSDS for these products which are not subject to the MSDS requirements of the Occupational Safety and Health Administration's Hazard Communication Standard, 29 C.F.R. 1910.1200(b)(6)(v). When used under reasonable conditions or in accordance with the 3M directions for use, these products should not present a health and safety hazard. However, use or processing of the product in a manner not in accordance with the directions for use may affect their performance and present potential health and safety hazards.

TSCA: These products are defined as articles under the Toxic Substances Control Act and therefore, are exempt from inventory listing requirements.

RoHS: These products comply with the requirements of EU Directive 2002/95/EC and 2005/618/EC.

For Additional Information

To request additional product information or to arrange for sales assistance, call toll free 1-800-251-8634. Address correspondence to: 3M, Electronics Markets Materials Division, 3M Center, Building 225-3S-06, St. Paul, MN 55144-1000. Our fax number is 651-778-4244 or 1-877-369-2923. In Canada, phone: 1-800-364-3577. In Puerto Rico, phone: 1-787-750-3000. In Mexico, phone: 52-70-04-00.

Important Notice

All statements, technical information, and recommendations related to 3M's products are based on information believed to be reliable, but the accuracy or completeness is not guaranteed. Before using this product, you must evaluate it and determine if it is suitable for your intended application. You assume all risks and liability associated with such use. Any statements related to the product which are not contained in 3M's current publications, or any contrary statements contained on your purchase order shall have no force or effect unless expressly agreed upon, in writing, by an authorized officer of 3M.

Warranty; Limited Remedy; Limited Liability.

This product will be free from defects in material and manufacture at the time of purchase. **3M MAKES NO OTHER WARRANTIES INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.** If this product is defective within the warranty period stated above, your exclusive remedy shall be, at 3M's option, to replace or repair the 3M product or refund the purchase price of the 3M product. **Except where prohibited by law, 3M will not be liable for any indirect, special, incidental or consequential loss or damage arising from this 3M product, regardless of the legal theory asserted.**

3M

Electronics Markets Materials Division
3M Center, Building 225-3S-06
St. Paul, MN 55144-1000
1-800-251-8634 phone
651-778-4244 fax
www.3M.com/electronics

3M is a trademark of 3M Company.
Please recycle. Printed in U.S.A.
©3M 2009. All rights reserved.
60-5002-0401-5