

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

General Description

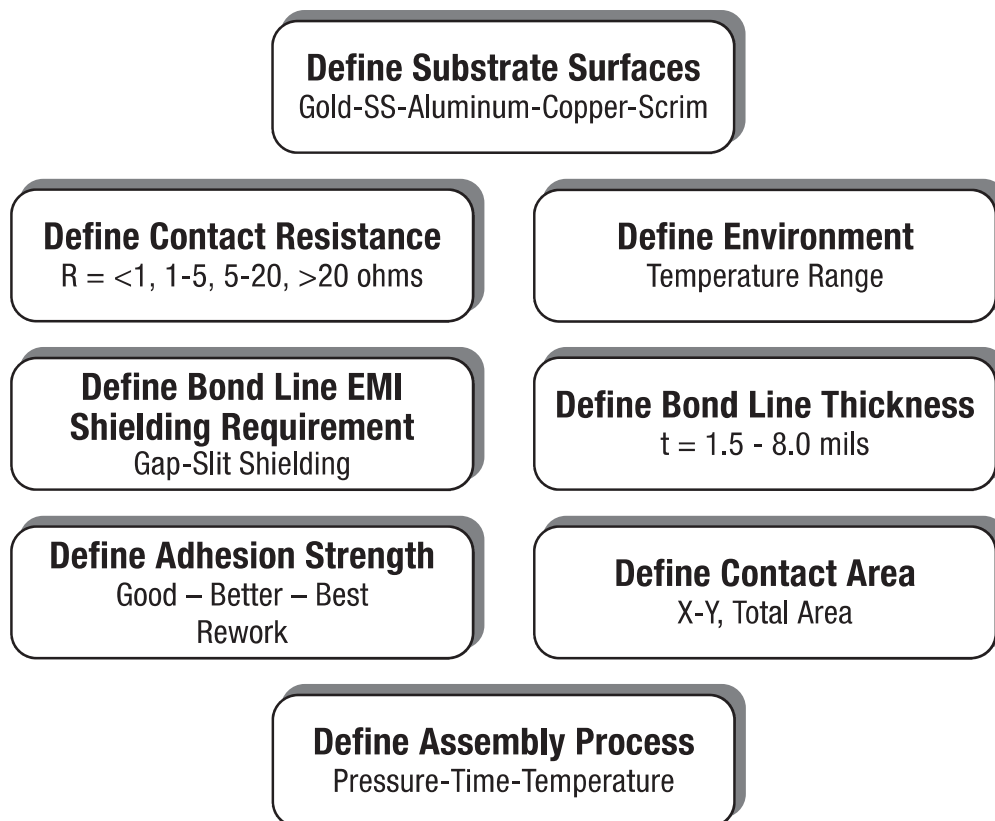
This technical bulletin describes a decision process flow to narrow and select the 3M™ Electrically Conductive Adhesive Transfer Tapes (ECATT) for a grounding, EMI Shielding and attachment applications.

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



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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

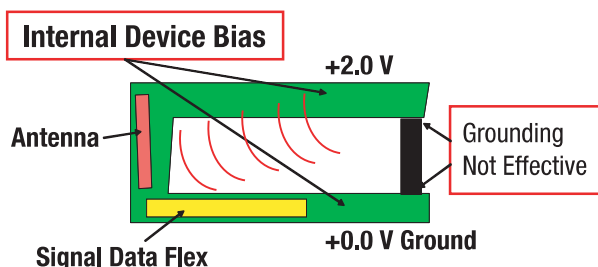
The ECATT’s are designed to provide for different contact resistance based on the substrate types. The contact resistance value (ohms) will lead to different performance aspects of the final assembly and device.

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

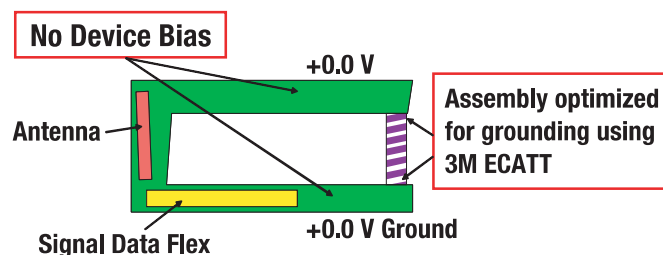
Electrical Bias Degrades Performance



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.

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Define Environment Temperature Range

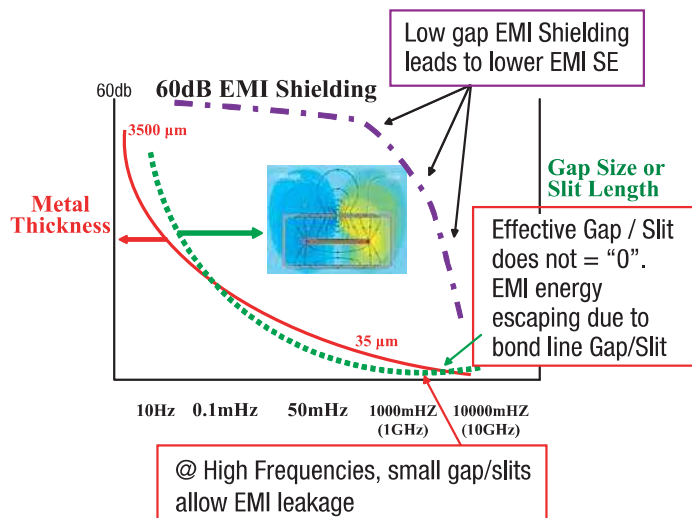
The environmental conditions can influence the 3M™ Electrically Conductive Adhesive Transfer Tape (ECATT) contact R and adhesion performance. Environmental conditions may impact contact resistance performance as the environmental conditions lead to modulus changes in the adhesive that can change the “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.

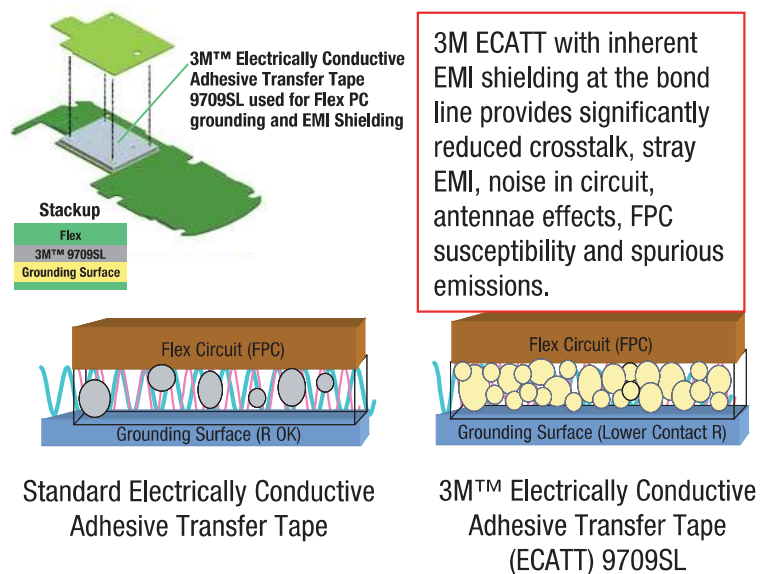
• Problem

Higher frequencies require optimized grounding and Faraday Cage design



• Solution

Inherent bond line EMI shielding



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

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.

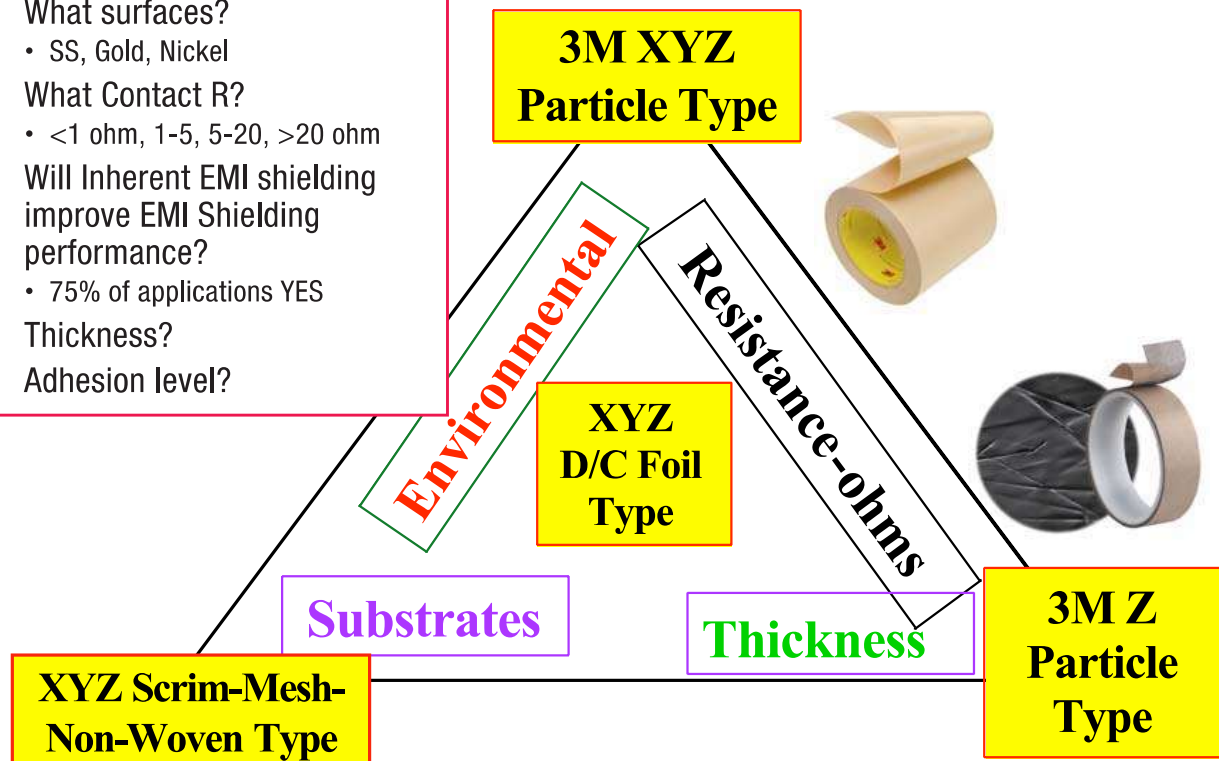
Define Assembly Process

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:

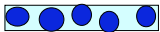
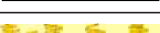
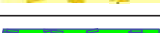
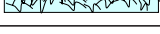
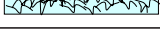
- What surfaces?
 - SS, Gold, Nickel
- What Contact R?
 - <1 ohm, 1-5, 5-20, >20 ohm
- Will Inherent EMI shielding improve EMI Shielding performance?
 - 75% of applications YES
- Thickness?
- Adhesion level?



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

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	<i>Best</i>	<i>Best</i>		<i>Good</i>	<i>Good</i>	<i>Better</i>	<i>Good</i>
9705		Silver	Z-Axis, Standard Outgassing	<i>Best</i>	<i>Best</i>		<i>Good</i>	<i>Good</i>	<i>Better</i>	<i>Good</i>
9706		Silver	High Adhesion	<i>Best</i>	<i>Best</i>		<i>Good</i>	<i>Best</i>	<i>Good</i>	<i>Good</i>
9707		Silver	High Adhesion, EMI Shielding	<i>Best</i>	<i>Best</i>	<i>Best</i>	<i>Best</i>	<i>Best</i>	<i>Good</i>	<i>Best</i>
9709		Silver	XYZ, EMI Shielding	<i>Good</i>	<i>Best</i>	<i>Best</i>	<i>Best</i>	<i>Good</i>	<i>Better</i>	<i>Best</i>
9709S		Silver	Low R to SS, EMI Shielding	<i>Best</i>	<i>Best</i>	<i>Best</i>	<i>Best</i>	<i>Good</i>	<i>Better</i>	<i>Best</i>
9709SL		Silver	Premium Liners	<i>Best</i>	<i>Best</i>	<i>Best</i>	<i>Best</i>	<i>Good</i>	<i>Better</i>	<i>Best</i>
7810		Nickel	Thicker	<i>Better</i>	<i>Good</i>	<i>Better</i>	<i>Good</i>	<i>Best</i>	<i>Good</i>	<i>Better</i>
7805		Silver	Thicker	<i>Good</i>	<i>Best</i>	<i>Better</i>	<i>Good</i>	<i>Best</i>	<i>Better</i>	<i>Better</i>
7850		Carbon	Thicker	<i>Good</i>	<i>Good</i>	<i>Good</i>	<i>Good</i>	<i>Best</i>	<i>Good</i>	<i>Best</i>
7772		Nickel and Alum DC	DC Foil	<i>Better</i>	<i>Better</i>	<i>Good</i>	<i>Good</i>	<i>Good</i>	<i>Good</i>	<i>Good</i>
9712		Carbon	Non-woven Scrim	<i>Good</i>	<i>Good</i>	<i>Good</i>	<i>Good</i>	<i>Better</i>	<i>Good</i>	<i>Good</i>
9713		Nickel/C	Non-woven Scrim	<i>Better</i>	<i>Good</i>	<i>Good</i>	<i>Good</i>	<i>Good</i>	<i>Good</i>	<i>Good</i>
9719		Nickel/C	Silicone ECATT	<i>Good</i>	<i>Good</i>	<i>Good</i>	<i>Good</i>	<i>Better</i>	<i>Good</i>	<i>Good</i>
9723		Nickel/Cu	High Adhesion	<i>Better</i>	<i>Best</i>	<i>Good</i>	<i>Better</i>	<i>Best</i>	<i>Good</i>	<i>Good</i>
9725		Nickel/Cu	Lower R to SS	<i>Best</i>	<i>Best</i>	<i>Better</i>	<i>Better</i>	<i>Better</i>	<i>Good</i>	<i>Good</i>
9760		Nickel/Cu	Reworkable	<i>Best</i>	<i>Best</i>	<i>Better</i>	<i>Better</i>	<i>Good</i>	<i>Best</i>	<i>Good</i>

Good
Good
Better
Better
Best
Best

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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.

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