3M™ EMI/EMC Electronic Materials

Solutions for Today's Electronics

- EMI Shielding Tapes
- EMI Grounding Adhesives and Gaskets
- EMI Absorbers
- Flux Field Directional Materials
- NFC, Wireless Power, Magnetic Shielding Materials

3M

Easy-to-use shielding, absorbing, grounding and bonding technology for today's electronics

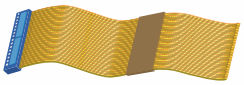
The continuing trend toward designing electronic devices with smaller enclosures, denser circuits and higher speeds has made managing electromagnetic/radio frequency interference (EMI/RFI) and electrostatic discharge (ESD) a growing challenge for electronics manufacturers.

3M can help you meet that challenge, with a variety of advanced shielding and grounding solutions designed to help you speed assembly time… reduce weight…save space…control costs…and give you more design flexibility. Let 3M help you get connected!

Laptop EMI/EMC Solutions

Very soft and conformable 3M™ Electrically Conductive Foam Gasket Materials MSG-6100 for grounding, gap filling and EMI shielding

3M Multi-functional EMI Shielding, Grounding and Heat Spreading Solutions for LED and other heat sources device temperature management



3M™ EMI Absorbers AB5050/AB6005/AB7050 to reduce EMI Noise level within device or on Flex/Connector

3M™ Electrically Conductive Adhesive Transfer Tape 9707/9709S/9720S/9750 for Flex/PCB grounding and attachment, grounded parts assembly versus screws and clips. Lower device bias, reduce flex EMI interference.

3M™ EMI Shielding Foil and Fabric Tape for display grounding and EMI Shielding

- LCD Driver EMI Shielding
- 3M EMI Shielding Foil Tapes 1170 and 1183
- 3M EMI Shielding Fabric Tapes CN3490, CN3190 and CEF-3T

3M EMI Absorbers AB5100/AB7050 to reduce the EMI interference between LCD back panel and Wi-LWAN antenna

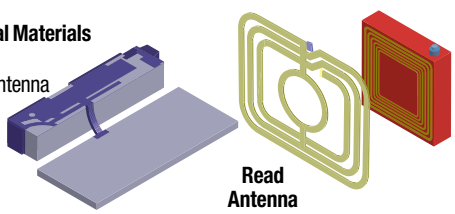
3M EMI Absorbers AB5050/AB6005/AB7050 to reduce the EMI noise radiation from high speed devices like CPU/MPU/memory. Attach AB series sheet on the specific noise source.

3M™ Electrically Conductive Gasket ECG-7073 for grounding and EMI shielding.

3M EMI Absorbers AB7050/AB5100 to reduce EMI noise within enclosure / EMI Faraday Cage / Reduce cavity resonance. Attach absorber sheet on the wall of shielding parts.

End user device using NFC/RFID Antenna & 3M Flux Field Directional Material (FFDM)

3M™ Flux Field Directional Materials EM16TF/RFIC15 for improved NFC & RFID antenna read range performance. Less eddy current losses in surrounding materials.



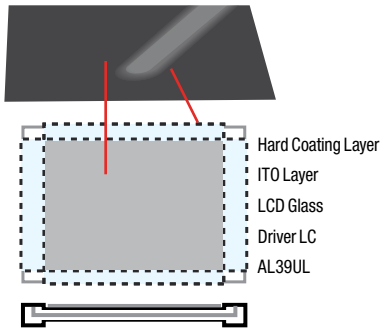
Read Antenna

3M EMI/EMC Solutions

Foil and Fabric Tapes

Product	Backing	Adhesive	Total Thickness mils (mm)	Features
3M™ Metallized Cloth				
2191FR	Nickel on copper-plated polyester ripstop fabric	Acrylic Conductive	5.5 (0.140)	Lightweight, conformable, oxidation resistant and high strength for EMI shielding and grounding. Easily die cut.
AG-0927	Silver-coated polyester fabric	Acrylic Conductive	4.3 (0.110)	Lightweight, conformable, oxidation resistant and high strength for EMI shielding and grounding. Easily die cut.
AU-2190	Gold-coated polyester fabric	Acrylic Conductive	4.3 (0.110)	Lightweight, conformable, oxidation resistant and high strength for EMI shielding and grounding. Easily die cut.
X-7001	Copper-plated polyester ripstop fabric	Acrylic Conductive Coated on Both Sides	4.3 (0.110)	Typically used to bond two surfaces, both physically and electrically. Also can provide EMI shielding, static charge draining, grounding. Lightweight, conformable and easily die cut.
CN 3190	Nickel on copper-plated polyester ripstop fabric	Acrylic Conductive	4.3 (0.110)	Lightweight, conformable, oxidation resistant and high strength for EMI shielding and grounding.
CN3490	Non-woven copper-nickel fabric	Acrylic Conductive	2.4 (.06)	Lightweight, thin, conformable non-woven fabric. Ideal for shielding, grounding, and static dissipation. Easily die cut.
CN4490	Non-woven copper-nickel fabric	Double Coated Acrylic Conductive	2.0 (.05)	Double coated with adhesive. Lightweight, thin, conformable non-woven fabric. Ideal for shielding, grounding, and static dissipation. Ideal for use as a thin, conductive, repositionable gasket material. Easily die cut.
CEF-6**	Cu/Ni plated fabric	Acrylic Conductive coated on both sides	5.5 (0.14)	Bonding and grounding two surfaces. EMI shielding, static discharge draining. Flexible and conformable design.
CEF-6R **	Cu/Ni plated fabric	Acrylic Conductive coated on both sides	4.7 (0.12)	Bonding and grounding two surfaces. EMI shielding, static discharge draining. Flexible and conformable design.
CEF-1**	Cu/Ni plated fabric	Acrylic Conductive	4.3 (0.11)	Bonding and grounding two surfaces. EMI shielding, static discharge draining. Flexible and conformable design.
CEF-3**	Cu/Ni plated fabric	Acrylic Conductive	4.7 (0.12)	Bonding and grounding two surfaces. EMI shielding, static discharge draining. Flexible and conformable design.
CEF-8**	Cu/Ni plated fabric	Acrylic Conductive coated on both sides	3.0 (0.075)	Bonding and grounding two surfaces. EMI shielding, static discharge draining. Flexible and conformable design.
CEF-3T** CEF-3B**	Cu/Ni plated fabric	Acrylic Conductive	2.4 (0.06) Grey 2.4 (0.06) Black	Bonding and grounding two surfaces. EMI shielding, static discharge draining. Flexible and conformable design.
3M™ EMI Shielding Sheets and Films				
CU-10S**	Epoxy FR film + copper foil	None	6.7 (0.170)	Softened copper foil with flame-retardant film on one side. Excellent EMI shielding for PCBs and assemblies. Lightweight, flexible and easily die cut.

**Products are special order in the USA. Please contact your 3M sales support for details.



EMI Custom Foil Tape Solutions

- Shielding
- Grounding
- ESD Protection
- Conformability
- Ease of use in assembly
- Customized thickness

* For 3M custom solutions please contact your local 3M product specialist. Products are special order. AL39UL and 3006ALB.

3M offers a wide range of EMI/RFI shielding tapes and absorbing materials, mesh and sleeving products, gaskets and conductive materials.

Customized XY and XYZ Foil & Fabric Tape Options

Typical Product Constructions

XY-axis Conductivity

XYZ-axis Conductivity

3M EMI/EMC Solutions

Foil and Fabric Tapes

These solutions include an innovative line of 3M™ Electromagnetic Compatible Products that can control electromagnetic interference from internal sources, limit EMI susceptibility from external sources and help manufacturers meet high certification standards around the world.

- Provide electromagnetic compatibility
- Shield or absorb electromagnetic and radio frequency interference
- Ground sensitive electronic components and boards
- Cushion components
- Protect cables
- Provide conductive properties

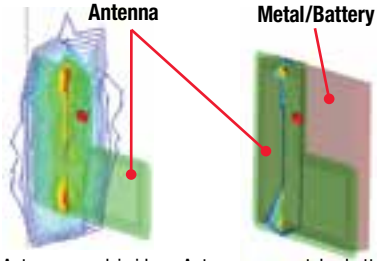
3M™ EMC Products can provide EMI/RFI shielding and absorbing, static charge grounding, anti-static masking, cushioning, mechanical protection and conductive properties for a wide variety of applications.

Product	Backing	Adhesive	Total Thickness mils (mm)	Features
3M™ Aluminum Foil				
300PL	1.9 mil aluminum foil*	Acrylic Non-Conductive	3.0 (0.078)	Economical EMI shielding aluminum foil tape. Excellent adhesion and environmental resistance.
1120	2 mil aluminum foil	Acrylic Conductive	4.0 (0.102)	For EMI shielding, static charge draining, grounding. Good for cable wrap. Easily die cut.
1170	2 mil aluminum foil	Acrylic Conductive	3.2 (0.081)	For EMI shielding, static charge draining, grounding. Easily die cut.
1178**	1.8 mil aluminum foil	Acrylic Conductive	3.3 (0.084)	EMI shielding, static discharge draining and grounding.
AL-25BT**	1 mil aluminum foil	Acrylic Conductive	2.4 (0.061)	For EMI shielding, static charge draining, grounding. Easily die cut.
AL-25DC**	1 mil aluminum foil	Acrylic Conductive Coated on Both Sides	3.3 (0.084)	For EMI shielding, static charge draining, grounding. Easily die cut.
AL-50BT**	2 mil aluminum foil	Acrylic Conductive	3.1 (0.079)	For EMI shielding, static charge draining, grounding. Easily die cut.
1115B	4.5 mil aluminum foil	Acrylic Conductive	6.0 (0.152)	For EMI shielding, grounding and static dissipation. 4.5 mil thickness provides excellent shielding and structural support characteristics. Easily die cut.
3M™ Aluminum Foil Laminated with Polyester Film				
AL-36FR	1 mil aluminum foil + polyester film	Acrylic Conductive	2.4 (0.061)	Foil backing laminated with polyester film. Good resistance to oxidation, solvents and oils. Easily die cut.
AL-36NC	1 mil aluminum foil + polyester film	Acrylic Non-Conductive	2.2 (0.055)	Foil backing laminated with polyester film. Good resistance to oxidation, solvents and oils. Easily die cut.
AL-37BLK**	1 mil aluminum foil + black matte polyester film	Acrylic Conductive	2.8 (0.071)	Foil backing laminated with polyester film. Matte surface finish. Good electrical insulation, resistance to oxidation, solvents and oils. Easily die cut.
CEAP-1**	2.0 Aluminum Foil + PET film	Acrylic Non-Conductive	3.2 (0.080)	EMI shielding, assembly aide tape.
CEAP-6B**	1.0-1.4 total Aluminum Foil + Black PET film	Acrylic Conductive	2.6 (0.065)	EMI shielding, static discharge draining, grounding.
3M™ Copper Foil				
508SN	1.4 mil copper foil	Acrylic Non-Conductive	3.2 (0.080)	Economical EMI shielding on a wide range of applications.
1125	1.4 mil copper foil	Acrylic Non-Conductive	3.5 (0.089)	For EMI shielding on a wide range of applications. Easily die cut.
1126	1.4 mil copper foil	Acrylic Conductive	3.5 (0.089)	For EMI shielding, static charge draining when grounded. Easily die cut.
1181	1.4 mil copper foil	Acrylic Conductive	2.6 (0.066)	For EMI shielding, static charge draining, grounding. Easily die cut.
1182	1.4 mil copper foil	Acrylic Conductive Coated on Both Sides	3.5 (0.089)	Typically used to bond two surfaces, both physically and electrically. Also can provide EMI shielding, static charge draining, grounding. Easily die cut.
1183	1.4 mil tin-plated copper foil	Acrylic Conductive	2.6 (0.066)	Oxidation resistant for long-term EMI shielding, static charge draining, grounding. Solderable and easily die cut.
1188**	1.3 mil Copper Foil	Acrylic Conductive	2.9 (0.074)	EMI shielding, static discharge draining and grounding.
1194	1.4 mil copper foil	Acrylic Non-Conductive	2.6 (0.066)	For EMI shielding, static charge draining, grounding. Easily die cut.
CU-35C**	1.4 mil copper foil	Acrylic Conductive	2.8 (0.07)	For grounding and EMI shielding. Solderable and easily die cut.
CEC-2**	0.79 mil copper foil	Acrylic Conductive coated on both sides	2.2 (0.055)	EMI shielding, static discharge draining and grounding.
CEC-2B**	1.18 mil copper foil	Acrylic Conductive coated on both sides	3.6 (0.092)	Differential adhesion for side 1 vs side 2 for easier rework. EMI shielding, static discharge draining, assembly of substrates and grounding.
CEC-3**	0.79 mil copper foil	Acrylic Conductive	2.0 (0.05)	EMI shielding, static discharge draining and grounding.
3M™ Embossed Foil				
1245	Embossed copper foil	Acrylic Non-Conductive	4.0 (0.102)	For EMI shielding, static charge draining, grounding. Solderable and easily die cut.
1267	Embossed aluminum foil	Acrylic Non-Conductive	5.0 (0.127)	For EMI shielding, static charge draining, grounding. Solderable and easily die cut.
1345	Embossed tin-plated copper foil	Acrylic Non-Conductive	4.0 (0.102)	Oxidation resistant for long-term EMI shielding, static charge draining, grounding. Solderable and easily die cut.
2245**	Embossed copper foil	Acrylic Conductive	4.0 (0.102)	For grounding and EMI shielding. Solderable and easily die cut.
3245	Reverse embossed copper foil	Acrylic Conductive	5.9 (0.150)	For EMI shielding, static charge draining, grounding. Solderable, easily die cut.

*For information on the copper foil version of 300PL, contact your 3M representative.

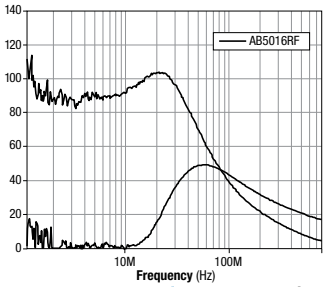
**Products are special order in the USA. Please contact your 3M sales support for details.

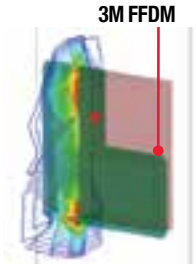
3M™ Flux Field Directional Materials for NFC/RFID and Wireless Power Applications



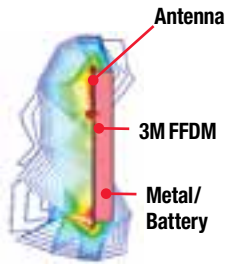
Antenna on polyimide carrier. EM field along Y-Axis in free space

Antenna near metal or battery surface. EM field significantly reduced due to eddy current losses of EM field into the battery/metal parts.



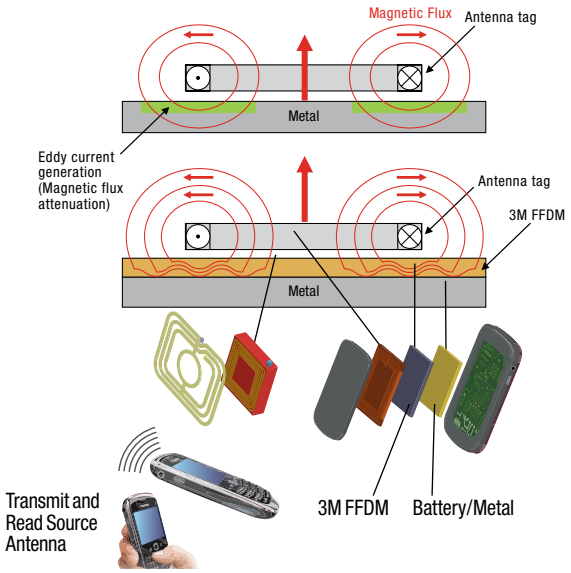


Antenna with 3M FFDM between the antenna and metal/battery parts. EM field strength increased significantly with 3M FFDM use.



Side view of antenna with 3M FFDM between antenna and metal/battery surface.

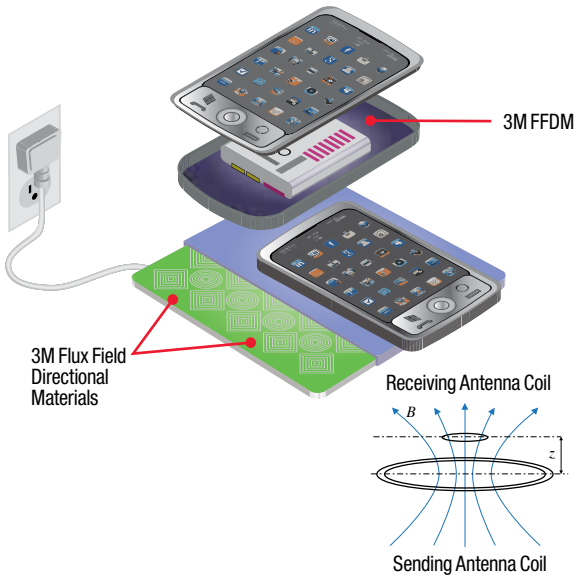
Improve NFC/RFID Antenna Read Range with 3M Flux Field Directional Materials (FFDM)



3M Flux Field Directional Materials EM16TF and RFIC15 reduce eddy current losses and improve read range

3M Solution: Thin / high permeability, low signal loss FFDM (Optimized to 13.56MHz)

Improve Power Transfer Efficiency and Range with 3M Flux Field Directional Materials (FFDM)

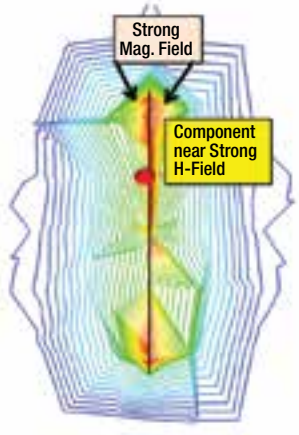


3M Flux Field Directional Materials EM80KM and RFIC30 improve EM energy transfer via inductive coupling (short range) or magnetic coupled resonance (longer range)

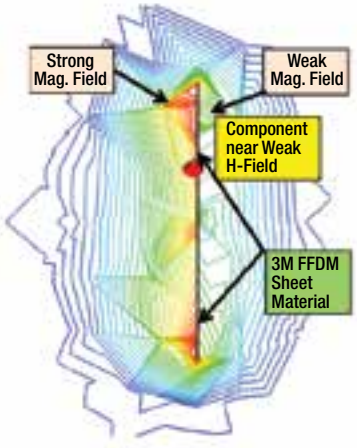
3M Solution: High permeability, low energy loss FFDM at operating frequencies

3M™ Flux Field Directional Materials (FFDM) for Magnetic Shielding Applications

H-Field of Device
No Magnetic Shielding

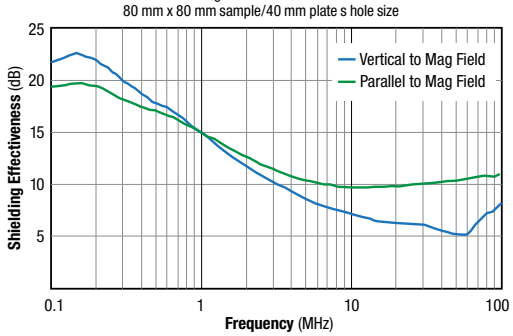


H-Field of Device
FFDM Magnetic Shielding



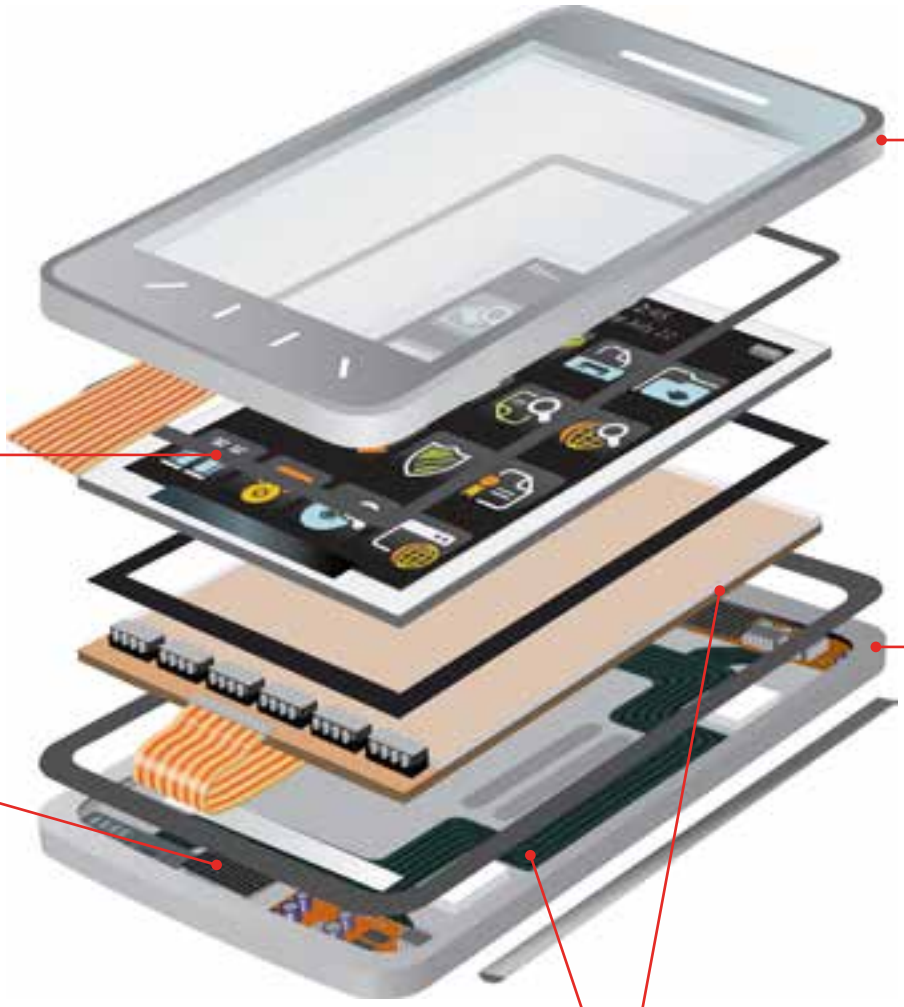
3M FFDMs can be used to provide magnetic shielding of stray field generating devices or materials that impact neighbor device or component performance (i.e. inductor, wireless power, etc.).

3M FFDM Type EM80KM
0.02 mm Soft Magnetic Layer Thickness
KEC Magnetic Field Test Method
80 mm x 80 mm sample/40 mm plate s hole size



Mobile Handheld & Tablet EMI/EMC Solutions

3M Multi-functional EMI Shielding, Grounding and Heat Spreading Solutions.
Hot device heat spreading & grounding, LED heat spreading and attachment. EMI and thermal management materials.



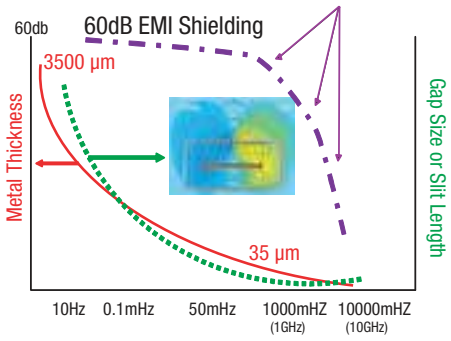
3M™ Electrically Conductive Gaskets ECG-7050/ECG-8055/MSG-6100

As frequency increases, is the "bond line gap" leading to stray EMI? (Cross talk, spurious EMI, signal degradation and noise.)

Problem

Higher frequencies require optimized grounding and Faraday Cage design

Poor "through tape" EMI Shielding leads to lower EMI SE at High Frequencies.

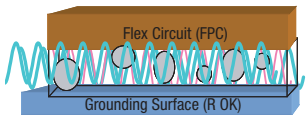


At High Frequencies, the effect of "through the tape thickness" EMI gaps or EMI slits is to allow EMI leakage. If the effective EMI gap/slit does not = "0", EMI energy at high frequency can pass through a "standard conductive adhesive tape material" via the gap related to the adhesive thickness. The "Tape Bond Line Gap/Slit leakage effect" leads to poor EMI Shielding, cross-talk, degraded Signal-to-Noise ratio, etc.

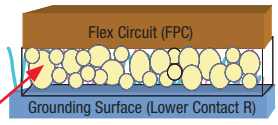
Solution

Inherent bond line thickness
EMI Shielding using 3M™ Electrically Conductive Adhesive Transfer Tape (ECATT)

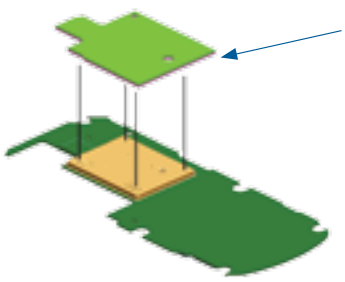
Standard electrically conductive tape leads to EMI leakage through bond line tape thickness.



3M ECATT 9709SL



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 9709SL used for FPC grounding and EMI Shielding

Flex Printed Circuit

- Flex
- 3M ECATT 9709SL
- Grounding Surface
- Substrate Layer

3M ECATT 9707, 9709S

These long-lasting adhesive transfer tapes can eliminate the need for screws and mechanical fasteners – while allowing the use of lighter, more compact fabric and layered foil shielding materials.

And, unlike other electrically conductive adhesives that can be messy and difficult to handle, 3M delivers advanced adhesive and conductive properties in an easy-to-use, pressure-sensitive tape that can be hand or machine applied and die cut to virtually any shape!

Product	Contact Resistance (R ohms) between a Gold Flexible Test Strip and a SS panel using the 3M ECATT	Bond Line EMI Shielding (Bond Line Gap/Slit EMI Shielding Potential)	Potential to improve contact R of a Flex to a PCB grounding locations via improved surface conformability and XYZ conductive potential with an ECATT product type vs. a generic Z-axis only conductive PSA	Adhesion to SS type substrate/3M TM/24 hour RT dwell	Ease of Rework based on a standard set of substrates	Thermal Conductivity (W/mK) or an effective Thermal Resistance (C/W) for a given thickness vs a generic Z-Axis only PSA
	Gold flex bonded to SS using the ECATT. "Best" results relate to a lower contact R potential on SS. Contact R can vary with SS type tested as the oxide layer thickness on a SS type affects the final R results. See note 1.	Best = High dB EMI Shielding in Bond Line "Gap/Slit"	Contact R between a Flex and a PCB	Peel Strength	ECATT design can effect rework based on acrylic adhesive type & conductive filler type.	Effective Thermal resistance and Thermal Conductivity vs a generic Z-Axis only PSA.
9703	Best		Good	Good	Better	Good
9704	Best		Good	Best	Good	Good
9705	Best		Good	Good	Better	Good
9706	Best		Good	Best	Good	Good
9707	Best	Best	Best	Best	Good	Best
9709	Good	Best	Best	Good	Better	Best
9709S	Best	Best	Best	Good	Better	Best
9709SL	Best	Best	Best	Good	Better	Best
7805	Good	Better	Good	Best	Better	Better
7850	Good	Good	Good	Best	Good	Best
7772	Better	Good	Good	Good	Good	Good
9712	Good	Good	Good	Better	Good	Good
9713	Better	Good	Good	Good	Good	Good
9719	Good	Good	Good	Better	Good	Good
9720S	Better	Good	Good	Good	Good	Good
9723	Better	Good	Better	Best	Good	Good
9750	Best	Best	Best	Best	Good	Good
9732	Best	Better	Better	Best	Good	Good
9760	Best	Better	Better	Good	Best	Good
9764	Better	Better	Good	Good	Best	Good
9780	Better	Better	Good	Good	Best	Good

3M™ Electrically Conductive Adhesive Transfer Tape (ECATT) Selection Process

Selection of Grounding, EMI Shielding and attachment ECATTs consists of determining several application requirements: For example, an ECATT general selection process could take into consideration items such as, but not limited to:

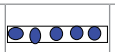
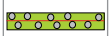
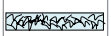
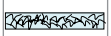
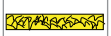
1. Determine contact R target
2. Define contact surface type
3. Adhesion level desired - from High-Medium-Standard Adhesion, and High/Low adhesion sided ECATTs
4. Bond line thickness
5. Z or XYZ conductive type ECATT
6. Operating temperature range and environmental conditions
7. EMI Shielding in bond line "Gap/Slit" for high frequencies
8. Determine contact area for ECATT used for R and adhesion of surfaces
9. Assembly Pressure, temperature and time limits
10. After assembly bond line stresses and need for added mechanical support

3M EMI/EMC Solutions

3M™ Electrically Conductive Adhesive Transfer Tapes

3M™ Electrically Conductive Adhesive Transfer Tapes are designed to help you save time in a variety of specialized electronics assembly operations – from attaching EMI shields and gaskets to grounding and bonding flexible circuits and PCBs – while improving the performance and reliability of your finished products.

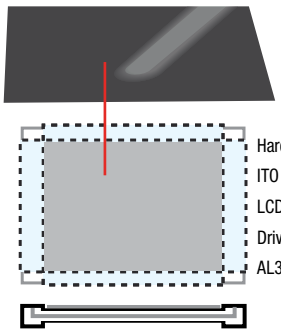
3M ECATT General Overview Comparative Reference Table

Product	Pictorial Design	Thickness (µm)	Z or XYZ Conductivity (Based on 3M Test Method)	Conductive Filler Type	Adhesive Type	Features, Advantages, and Benefits	Contact Resistance (R ohms) between a Copper foil test panel and a 2nd Sheet of a Copper foil test panel using the 3M ECATT Copper foil bonded to a Copper Foil using the 3M ECATT / 3M 2-point Resistance Test Method / 645 mm² Overlap Contact Area / 1 hour RT Dwell. See note 1.	Contact Resistance (R ohms) between a Gold Flexible Test Strip and a Gold Pad PCB panel using the 3M ECATT Gold flex bonded to PCB gold test pad. 6 mm² overlap contact area. 1 hour RT Dwell. See note 1.
9703		50	Z	Silver	Low Outgassing Acrylic ECATT	Z- Axis, Low outgassing	< 0.2	< 0.2
9704		50	Z	Silver	Low Outgassing Acrylic ECATT	Z-axis, High adhesion, Low outgassing	< 0.2	< 0.2
9705		50	Z	Silver	Standard Acrylic ECATT	Z-Axis, Standard outgassing version of 9703	< 0.2	< 0.2
9706		50	Z	Silver	High Adhesion Acrylic ECATT	High adhesion version of the 9705	< 0.2	< 0.3
9707		50	XYZ	Silver	High Adhesion Acrylic ECATT	High adhesion, "Bond Line Gap/Slit" EMI shielding for High Frequency, Low contact R to SS	< 0.2	< 0.3
9709		50	XYZ	Silver	Standard Acrylic ECATT	Standard adhesion, "Bond Line Gap/Slit" EMI shielding for High Frequency	< 0.2	< 0.3
9709S		50	XYZ	Silver	Standard Acrylic ECATT	Standard adhesion, "Bond Line Gap/Slit" EMI shielding for High Frequency, Low contact R to SS	< 0.2	< 0.2
9709SL		50	XYZ	Silver	Standard Acrylic ECATT	Premium low liner release version of 9709S	< 0.2	< 0.2
7805		150	XYZ	Silver	Standard Acrylic ECATT	Thicker ECATT for gap filling	< 1.0	< 0.2
7850		150	XYZ	Carbon	High Adhesion Acrylic ECATT	Higher thermal conductivity & Thicker ECATT for gap filling	< 1.0	< 10.0
7772		66	XYZ	Nickle & Alum DC	Medium Adhesion Acrylic D/C	Double coated aluminum foil	< 0.5	< 2.0
9712		125	XYZ	Carbon	Standard Acrylic ECATT	Non-woven conductive scrim & Standard acrylic adhesive	< 1.5	< 15.0
9713		89	XYZ	Nickel/C	Standard Acrylic ECATT	Lower R non-woven conductive scrim vs. 9712 & Standard acrylic adhesive	< 0.4	< 7.5
9719		100	XYZ	Nickel/C	Silicone ECATT	Low surface energy silicone adhesive, Higher temperature resistance, Lower R non-woven conductive scrim vs. 9712	< 1.0	< 20.0
9720S		30	XYZ	Nickel/Cu	High Adhesion Acrylic ECATT	Lower R non-woven conductive scrim vs. 9713, Thinner scrim design & Medium adhesion	< 0.2	< 0.5
9723		60	XYZ	Nickel/Cu	High Adhesion Acrylic ECATT	Lower R non-woven conductive scrim vs. 9713, Thinner scrim design & High adhesion	< 0.2	< 0.4
9750		50	XYZ	Nickel/Cu	High Adhesion Acrylic ECATT	Lower R non-woven conductive scrim vs. 9713 & High adhesion	< 0.2	< 0.5
9732		100	XYZ	Nickel/Cu	Medium Adhesion Acrylic ECATT	Lower R non-woven conductive scrim vs. 9713, Thicker scrim design & High adhesion	< 0.2	< 2.5
9760		50	XYZ	Nickel/Cu	High / Low Adhesion Double sided reworkable Acrylic ECATT	Easier rework as greater Face Side to Back Side adhesion delta. Easier rework version of 9725. High and Low adhesion sides.	< 0.2	< 0.8
9764		150	XYZ	Nickel/Cu	High / Low Adhesion Double sided reworkable Acrylic ECATT	Easier rework as greater Face Side to Back Side adhesion delta. Easier rework and thicker version of 9732. High and Low adhesion sides.	< 0.5	< 5.0
9780		200	XYZ	Nickel/Cu	High / Low Adhesion Double sided reworkable Acrylic ECATT	Easier rework as greater Face Side to Back Side adhesion delta. Easier rework and thicker version of 9732. High and Low adhesion sides.	< 0.5	< 5.0

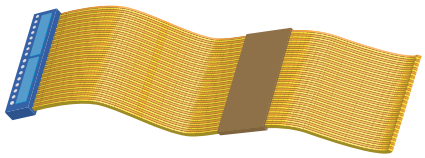
ECATT Basic Comparative Reference Table: Based on the suggested "ECATT Selection Process", the end user should identify 2-4 ECATT products to test in an application to determine fitness for use. As each application is unique, it is difficult to identify the "Optimum" ECATT product without testing the ECATT products in an end use assembly design. The ECATT Selection Process of "Good-Better-Best" ranks products as they might perform in a nominal application. As each ECATT may employ different conductive particles, scrim or non-woven, thickness variations, acrylic adhesive type, etc., they will perform differently based on end use application – hence the need for the end users' own comparative testing. The following technical information and data should be considered representative or typical and should not be used for specification purposes.

Note 1: Test & performance results will vary based on items such as, but are not limited to: Contact area; Assembly method; Testing conditions; Normal variations in product performance from one mfg. lot to a different mfg. lot of material – along with the normal variations found in a material within a mfg. lot (i.e., thickness, available conductive material in an actual sample tested, variations in conductive filler materials and uniformity of conductive materials dispersed within a lot of material, variations in adhesives, etc.); Test methods; Environmental aging; Exact test surface material type utilized, etc. The "Copper to Copper" & "Gold Flex to PCB" testing also should be noted for the differences related to the "Contact area" difference in the Test Methods (645 mm^2 vs. 6 mm^2) as this does impact the test results. Testing of ECATT materials and the noted test substrates does not imply that the ECATT is suitable for an end use application of similar materials. End user is responsible to determine if an ECATT and substrate combination is fit for use in their intended end use application.

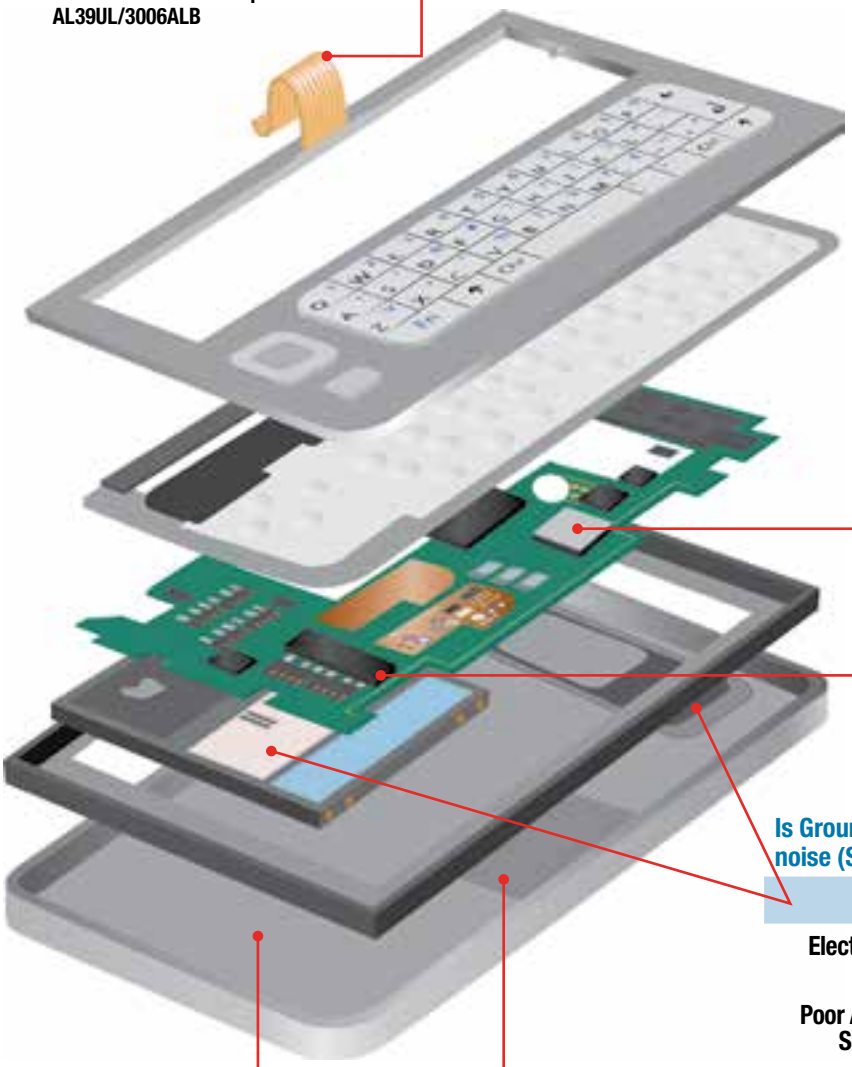
Note 2: More ECATT options are available. Chart references typical type options. Contact your 3M Technical Service Representative for more details.

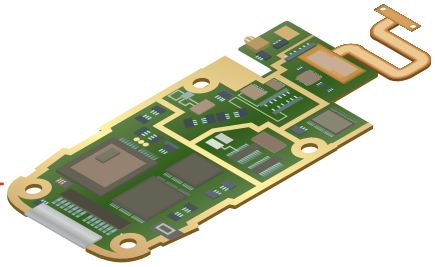


3M™ EMI Custom Foil Tape AL39UL/3006ALB

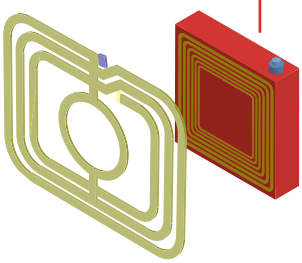


3M™ EMI Absorbers AB5100/AB6005/AB7050 to reduce EMI noise level on flex/connector.

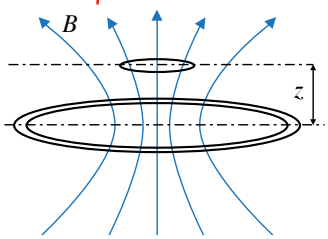




3M EMI Absorbers AB5100/AB6005/ AB7050 to reduce EMI noise within device.

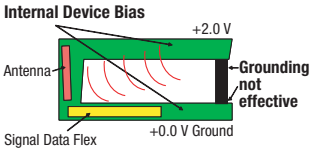
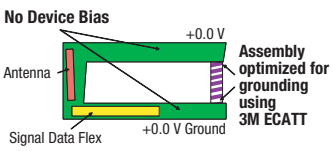


3M™ Flux Field Directional Material AB5016RF/RFIC15 for improved NFC & RFID performance.



3M Flux Field Directional Material RFIC/EM16TF/EM80KM for improved Wireless Power Efficiency.

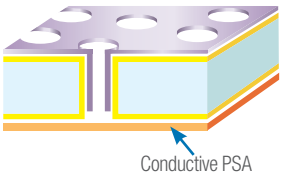
Is Grounding Bias degrading your antenna or data flex signal to noise (S/N) performance?

Problem	Solution
Electrical Bias Degrades Performance	**Effectively Ground Device**
Poor Antenna or Data Flex Signal/Noise ratio	**Optimized Signal/Noise Ratio**
	
If device is not well grounded, the "bias" voltage in the device acts as a "transmitter" of a signal that the signal line flex, antenna flex, etc. pick up, leading to poor S/N performance and higher error rates.	Device is well grounded so the "bias" voltage in the device is "baseline" and no "RF signal" is emitted. Optimized Antenna and data flex S/N performance.
	3M ECATT 9707, 9709S, 9720S and 9750

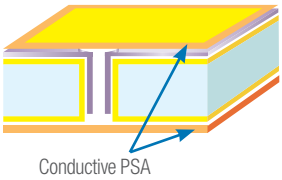
3M EMI/EMC Solutions

Electrically Conductive Cushioning Gasket Selections

3M™ Electrically Conductive Cushioning Gasket ECG-7033, ECG-7053, ECG-7073, Single Coat



3M™ Electrically Conductive Cushioning Gasket ECG-8035, ECG-8055, ECG-8075, Double Coat



3M™ Electrically Conductive Gaskets solutions encompass three distinct product types:

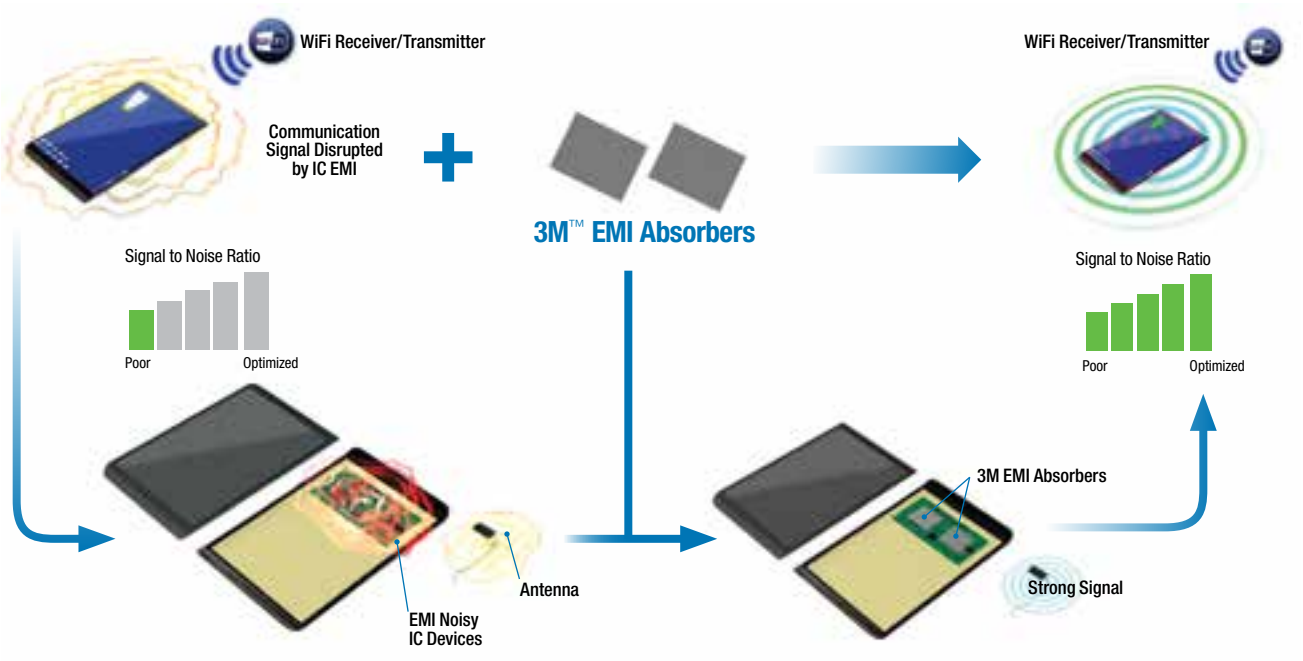
- 3M Electrically Conductive Gaskets **(ECG)**: Single coated and double coated conductive foam products (less than 1mm thickness)
- 3M Metal Shielding Gaskets **(MSG)**: Very soft single coated conductive foam products with a metal carrier (greater than 1 mm thickness).
- 3M Electrically Conductive Acrylic Pads **(eCAP)**: Solid core single coated acrylic conductive gaskets with a conductive fabric carrier (less than 1 mm thickness).

The 3M ECG series has two versions. The single coated version ECG-70xx and the double coated version ECG-80xx. The 3M MSG products are available in greater than 1mm thickness with a metal carrier layer that is either a metal foil or a magnetic foil type. The eCAP product 7830N is an acrylic conductive ECATT with a conductive fabric carrier layer to make a single sided eCAP gasket product.

Product	Conductive Carrier Type	Conductive Adhesive / Fillers	Conductive Core	Total Thickness (mm)	Features
eCAP 7830N	Conductive Fabric	Acrylic adhesive with Ni coated graphite filler / 1 side, single coated	Acrylic adhesive with Ni coated graphite filler	0.2, 0.3, 0.4, 0.5	XYZ electrical conductivity, single sided, provides EMI Shielding and Grounding, Good adhesion to many substrates.
ECG-70xx (ex: ECG-7033)	Conductive Fabric	Acrylic adhesive with Ni filler / 1 side, single coated	Metal plated open cell urethane foam	0.33, 0.53, 0.73 (0.xx)	XYZ electrical conductivity, Conformable-Soft, single sided, provides EMI Shielding and Grounding, Good adhesion to many substrates, single sided adhesive.
ECG-80xx (ex: ECG-8035)	Conductive Fabric	Acrylic adhesive with Ni filler / 2 sided, double coated	Metal plated open cell urethane foam	0.35, 0.55, 0.75 (0.xx)	XYZ electrical conductivity, Conformable-Soft, provides EMI Shielding and Grounding, Good adhesion to many substrates, dual sided adhesive.
MSG-6xxx (MSG-6180)	Metal Foil	Acrylic adhesive with Ni filler / 1 side, single coated	Metal plated open cell foam	0.6, 1.0, 1.8 (optional thicknesses/ inquire @ 3M)	XYZ electrical conductivity, Very Conformable-Soft, single sided, provides EMI Shielding and Grounding, Good adhesion to many substrates, single sided adhesive

3M EMI Absorbers & 3M Grounding Solutions for Optimized Antenna Performance

3M EMI Absorbers and 3M ECATT Grounding Solutions (Conductive PSA ECATT, Conductive Foils & Fabrics) provide for an optimized antenna performance solution. Absorbers reduce line of sight or reflected EMI noise near an antenna, Conductive PSAs and Gaskets offer grounding for a thickness range potential of 0.03 mm to 3.3 mm gaps, to reduce stray flowing currents and associated EMI that degrades antenna performance (S/N).



3M Wide Frequency EMI Absorbers (AB) and 3M Flux Field Directional Materials (FFDM) – Specific Target Application Frequency Range

3M EMI Absorbers (AB) for wide frequency applications:

- 3M EMI Absorbers are used to reduce EMI and RF noise in electronic systems. 3M EMI Absorbers can be applied to noisy traces, ICs and reflective surfaces in an enclosure.

3M Flux Field Directional Materials (FFDM): Wireless Power, NFC, Magnetic Shielding Digitizer, and HAC

- 3M FFDM products are useful for RFID and NFC applications to de-couple the NFC or RFID antenna from metal surfaces by directing the antenna flux fields away from the metal object or surface. 3M FFDM products can also be beneficial in Wireless Power systems to enhance power transfer efficiency between primary sending and receiving antenna coils. FFDMs such as EM80KM also are useful as magnetic field shielding materials in a thin format.

3M Wide Frequency EMI Absorbers (Ab)

Product	Carrier Binder Polymer and Filler	Adhesive Type	Magnetic Permeability @ 1 MHz	Absorber Thickness ONLY (mm)	Features
AB-5000 Series	Flexible polyethylene resin with magnetic fillers	Acrylic PSA	30	0.1, 0.2, 0.3, 0.5, 1.0 Example: AB-5000 series @ 0.50 mm absorber thickness (without PSA) = AB-5050	Reduce EMI and RF noise in electronic systems. Apply to noisy traces, ICs and reflective surfaces in an enclosure.
AB-5000S Series	Flexible polyethylene resin with magnetic fillers	Acrylic PSA	55	0.1, 0.2, 0.3, 0.5, 1.0	Improved lower frequency absorber vs. AB-5000 (@ < 1-2 GHz). Reduce EMI and RF noise in electronic systems. Apply to noisy traces, ICs and reflective surfaces in an enclosure.
AB-5000HF Series	Flexible poly resin with magnetic fillers	Acrylic PSA	30	0.1, 0.2, 0.3, 0.5, 1.0	Halogen Free version of the AB-5000
AB-5000SHF Series	Flexible poly resin with magnetic fillers	Acrylic PSA	55	0.1, 0.2, 0.3, 0.5, 1.0	Halogen Free version of the AB-5000S
AB-6000 Series	Flexible poly resin with magnetic fillers laminated to aluminum foil/ EMI Shielding & Absorbing combination.	Acrylic PSA or Conductive Acrylic PSA	Varies	See TDS	AB-6000 series combines an EMI Shielding layer with an EMI absorbing layer. Layer configuration can vary. AB-6000 series can be used as an EMI "Shielding Can/ Faraday Cage" design when other options are not practical. Halogen Free version available (AB-6000HF Series). Note: Ultra thin version of design is available as 3M AFM. 3M AFM uses a foil and thin ferrite design @ 0.05 mm – 0.12 mm.
AB-7000 Series	Flexible polyethylene resin with magnetic fillers	Acrylic PSA	110-120	0.05, 0.10, 0.20, 0.30, 0.50 Note: ex: AB-7000 series @ 0.30 mm absorber thickness (without PSA) = AB-7030	Improved lower frequency absorber vs the AB-5000 or AB-5000S (@ < 1 GHz). Reduce EMI and RF noise in electronic systems. Apply to noisy traces, ICs and reflective surfaces in an enclosure. Halogen Free version available (AB-7000HF Series).

*See technical data sheet (TDS) for added adhesive thickness for each version.

3M Flux Field Directional Materials (FFDM) - Specific Target Application Frequency Range

Product	Carrier Binder Polymer and Filler	Adhesive Type	Magnetic Permeability @ 13.56 MHz	Features
AB-5000R Series (EM45EP)	Flexible polyethylene resin with magnetic fillers	Acrylic PSA	45 - 50	AB-5000R series FFDM materials are designed for RFID and NFC applications to de-couple the NFC or RFID antenna from metal surfaces by directing the antenna flux fields away from the metal object or surface. Products can also be evaluated for Wireless Power systems to enhance power transfer efficiency between primary sending and pick-up antenna coils. **Products include: AB-5010R @ 0.15 mm/AB-5020R @ 0.2 mm.**
EM16TF	Sintered ferrite sheet between carrier films with optional PSA	Acrylic PSA	160	EM16TF series FFDM materials are designed for RFID and NFC applications to de-couple the NFC or RFID antenna from metal surfaces by directing the antenna flux fields away from the metal object or surface. Products can also be evaluated for Wireless Power systems to enhance power transfer efficiency between primary sending and pick-up antenna coils. **Products include: EM16TF @ different overall thicknesses (see TDS).**
AB-5000RF Series (EM10TF)	Sintered ferrite sheet between carrier films with optional PSA	Acrylic PSA	105	AB-5000RF series FFDM materials are designed for RFID and NFC applications to de-couple the NFC or RFID antenna from metal surfaces by directing the antenna flux fields away from the metal object or surface. Products can also be evaluated for Wireless Power systems to enhance power transfer efficiency between primary sending and pick-up antenna coils. **Products include: AB-5016RF@0.16 mm /AB-5026RF@0.26 mm. Thinner options are available.**
RFIC Series (EM42EP)	Flexible polyethylene resin with magnetic fillers	Acrylic PSA	42	RFIC series FFDM materials are designed for RFID and NFC applications to de-couple the NFC or RFID antenna from metal surfaces by directing the antenna flux fields away from the metal object or surface. Products can also be evaluated for Wireless Power systems to enhance power transfer efficiency between primary sending and pick-up antenna coils. **Products include: RFIC-XX @ 0.13 mm - 0.33 mm @ multiple thicknesses.** See TDS for details.
EM13TF	Sintered ferrite sheet between carrier films with optional PSA	Acrylic PSA	130	EMxxTF series FFDM materials are designed to be evaluated for Wireless Power systems to enhance power transfer efficiency between primary sending and pick-up antenna coils. Optional uses include RFID and NFC applications to de-couple the NFC or RFID antenna from metal surfaces by directing the antenna flux fields away from the metal object or surface. **Products include: EM13TF @ different overall thicknesses (see TDS).**
EM80KM	High permeability magnetic foil with cover film & PSA	Acrylic PSA	80,000 max	EM80KM series FFDM materials are designed for DC and low frequency magnetic field shielding to be evaluated for Wireless Power systems to enhance power transfer efficiency between primary sending and pick-up antenna coils. **Products include: EM80KM @ 0.12 mm** (Thinner versions and optional multi-layer designs are available for optimized thickness and flux field interaction).

Note: Reference EM # # Letter-Letter (i.e., EM80KM)
- EM = Electro-Magnetic
- # # = Permeability Peak
- 1st Letter: K=x1000, H=x100, T=x10, E=x1
- 2nd Letter = EM Material Type: M= Magnetic foil, F = Ferrite, P = Polymer composite with magnetic fillers.

After EM##LL, the product is identified by overall thickness in mm (ttt) and one- or two-sided adhesive (A).

Example: EM45EP @ 0.15 mm thickness with PSA on one side = EM45EP-ttt-A = EM45EP-015-1

Note that Ferrite Type always has a film on the non-PSA side.

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Contact 3M for the experience of 100 years of solutions for your design and production challenges.

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Die-cut Solutions	1-800-223-7427 Fax: 1-800-258-7511	www.3M.com/converter
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