

Helping enable the next generation of electronics.

3M[™] EMI/RFI Management Solutions

Why is minimizing EMI/RFI important?

When the amount of noise (EMI) rises higher than the signal's strength, resulting in a low signal-to-noise ratio (SNR), it can degrade electronic performance. This results in errors, data loss, delayed or incorrect readings, or even temporary shutdowns. Which is why it is critical to prevent EMI as much as possible.

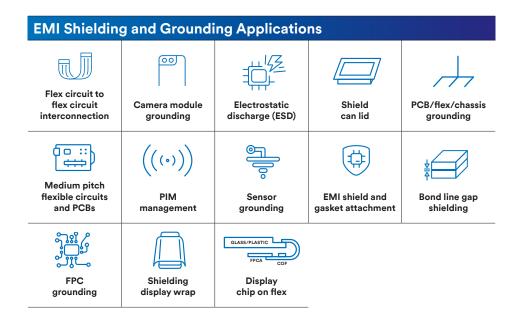
3M[™] EMI/RFI Management Solutions will help you:

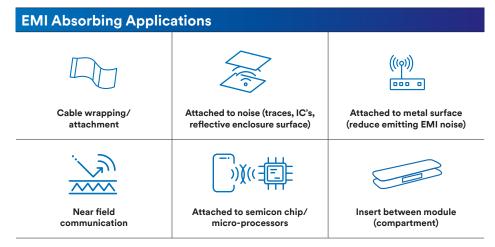
- » Minimize EMI noise and crosstalk
- » Improve signal integrity
- » Enable high performing and reliable materials
- » Be more cost-effective
- » Achieve quick and easy application with peel and stick solutions

Generated by electronic devices, communications signals, electromagnetic frequencies and static electricity, Electromagnetic Interference (EMI) – also known as Radio Frequency Interference (RFI) – is an electronic emission that interferes with the performance of electronic components, RF systems and other critical equipment.

Help manage EMI with 3M[™] EMI/RFI Solutions

Help protect your systems and achieve efficient and reliable operations with solutions from 3M. We bring decades of expertise in EMI/RFI management and materials science to help you solve complex and dynamic design challenges. Our EMI/RFI management solutions are known for helping boost signal-to-noise ratios in industrial electronics, improving antenna signal integrity, and even grounding displays for connected and smart products.





3M[™] Electrically Conductive Tapes Selection Criteria

Selecting a 3M[™] Electrically Conductive Tape for grounding, shielding, and attachment includes identifying several application requirements. For instance, the selection process could consider the following items, among others:

- 1 Contact R target
- 2 Contact surface type
- 3 Adhesion level desired
- 4 Bond line thickness
- 5 XYZ or Z conductivity path
- 6 Operating temperature range and environmental conditions
- 7 EMI shielding in bond line "gap/slit" for higher frequencies
- 8 Surface contact area for adhesion
- 9 Assembly pressure, temperature and time

Meet your "go-to" materials

3M created the EMI/RFI Management Solutions Go-To Material List (GTML) to provide fast and reliable service on our go-to materials. The GTML includes materials that cover most applications and provide differentiated solutions for various EMI design challenges.

Make these materials the first, go-to options for EMI challenges, supplemented by a broader line of 3M EMI/RFI materials for niche applications.

 Indicates which material and thickness are part of the GTML.

The "Good-Better-Best" rankings are based on the 3M Test Method and tape performance in a nominal application.

*This information is based on tests performed at 3M laboratory facilities. While we believe that these test results are reliable, your results may vary due to differences in test conditions, your facility/lab environment, or the other conditions within your control. This information is intended for industrial/occupational use by persons with the knowledge and technical skills to analyze, handle and use such information. It is supplemental only and is not intended to replace the detailed information found in written 3M product literature. For additional information, including important safety and warranty information, regarding 3M EMSD products, please refer to the data sheets, instruction and/or installation manuals.

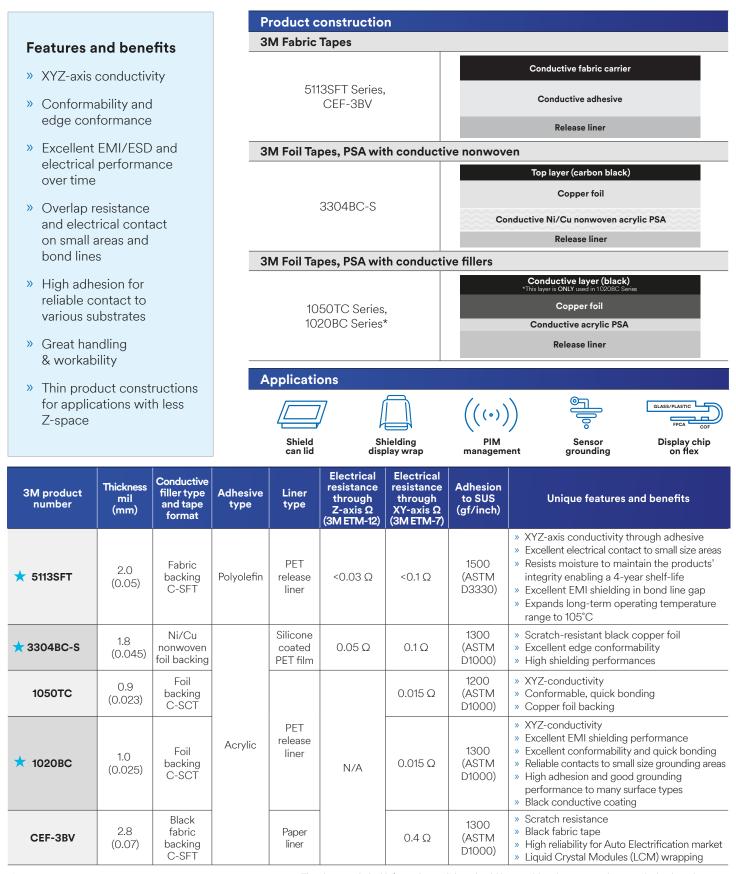
Typical Product contact resistance (R ohms Ω)		EMI Flex to PCB shielding in bond line contact resistance gap/slit (R ohms Ω)		Peel strength (24 hr/RT)	Workability	Thermal conductivity/resistance (W/mK or C/W)	
3M [™] Electrically Co	nductive Double	-Sided Tapes					
3M [™] Electrically Conduct	tive Adhesive Transfe	er Tapes					
🕇 3M tape 9703	3M tape 9703 Good		Better	Good	Good	Good	
3M tape 9709SL	3M tape 9709SL Better		Best	Good	Better	Best	
3M tape 9712 Good		Good	Good	Better	Good	Good	
3M tape 9713	Better	Good	Good	Better	Good	Good	
3M [™] Electrically Conduct	tive Double-Coated	Tapes					
🗧 3M tape 5113DFT	3M tape 5113DFT Best B		Best	Better	Best	Better	
🗧 3M tape 9772	M tape 9772 Best		Good	Good	Best	Best	
3M tape 9711S	Best	Better	Best	Best	Best	Better	
3M tape 9723	Good	Good	Better	Best	Good	Good	
3M [™] Electrically Co	nductive Single-	Sided Tapes					
🗧 3M tape 5113SFT	Better	Good	Better	Good	Better	Good	
3M tape 3304BC-S	Best	Best	Best	Better	Better	Good	
🗧 3M tape 1020BC	tape 1020BC Best Better		Best	Good	Best	Better	
3M tape 1050TC	Best	Better	Best	Good	Better	Best	
3M tape CEF-3BV	Good	Good	Good	Better	Better	Good	

» Typical contact resistance - Gold flex bonded to stainless steel (SS). "Best" results relate to a lower contact R potential on SS Contact R can vary with SS type tested. Lower contact resistance can allow for improved EMI shielding of a design.

- » EMI Shielding in Bond Line "Gap/Slit" Best = High dB EMI Shielding. Inherent EMI shielding at the bond line provides significantly reduced crosstalk, stray EMI, noise in circuit, antennae effects, FPC susceptibility and spurious emissions.
- » Flex to PCB Contact Resistance Potential to improve contact R grounding locations via improved surface conformability and XYZ conductive potential with a 3M electrically conductive tape or film vs. a generic Z-axis only conductive PSA.
- » Peel Strength Adhesion to SS type substrate/3M Test Method/24 hour room temp dwell.
- » Workability Ease of Rework based on a standard set of high surface energy substrates. The tape design can affect rework based on adhesive type and conductive filler type.
- » Thermal Conductivity/Thermal Resistance Effective Thermal Resistance and Thermal Conductivity vs. a generic PSA without conductive fillers. Important for thermal connection performance between substrates.

3M[™] Electrically Conductive Single-Sided Tapes

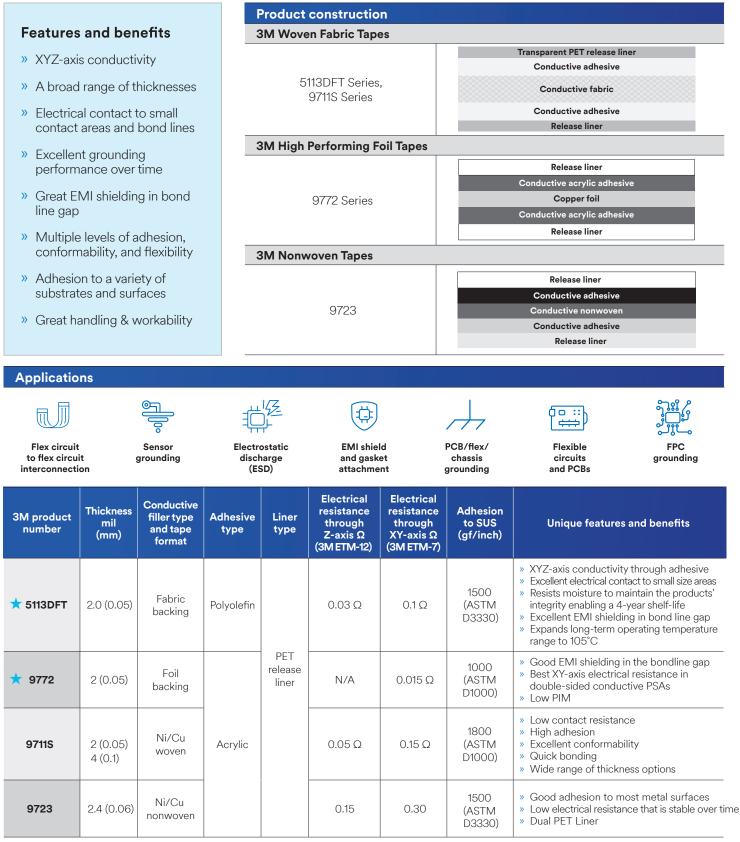
3M[™] Electrically Conductive Single-Sided Tapes offer XYZ-axis conductivity in a variety of conductive adhesives, carriers, and fillers to provide enhanced EMI performance where you need it (flexibility, conformability, adhesion, temperature range, etc.). These tapes are available in multiple thicknesses and provide EMI/RFI shielding and/or grounding across multiple frequencies.



★ = Indicates which material and thickness are part of the GTML The above technical information and data should be considered representative or typical only and should not be used for specification purposes. Contact your 3M Technical Representative for details.

3M[™] Electrically Conductive Double-Coated Tapes

3M[™] Electrically Conductive Double-Coated Tapes feature XYZ-axis conductivity and have a layer of adhesive coated on both sides of the carrier and are easier to die-cut and handle than adhesive transfer tapes (no carrier). They come in a variety of conductive adhesives, carriers and fillers to provide enhanced EMI performance where you need it (flexibility, conformability, adhesion, temperature resistance). The tapes provide a broad spectrum of performance in a variety of applications.

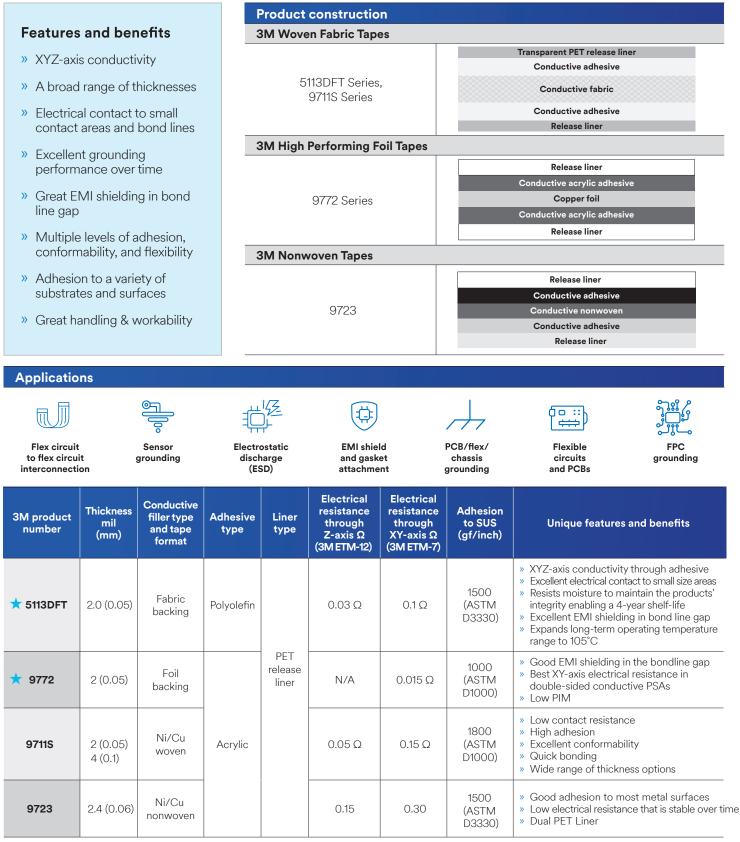


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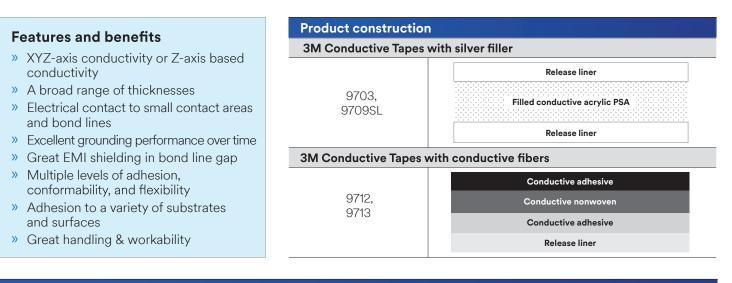


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3M[™] Electrically Conductive Adhesive Transfer Tapes

3M[™] Electrically Conductive Adhesive Transfer Tapes deliver a broad spectrum of performance, including high EMI shielding in the bond line gap for high-frequency attenuation, stable contact resistance for reliable electrical conductivity, and conformability for creating a strong bond. Multiple thicknesses, conductive fillers, and particle designs are available.



Applications



Flex circuit to flex circuit

interconnection

Electrostatic discharge grounding (ESD)

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Camera

module

EMI shield and gasket attachment

PCB/flex/ chassis grounding

Medium pitch flexible circuits and PCBs

11

FPC grounding

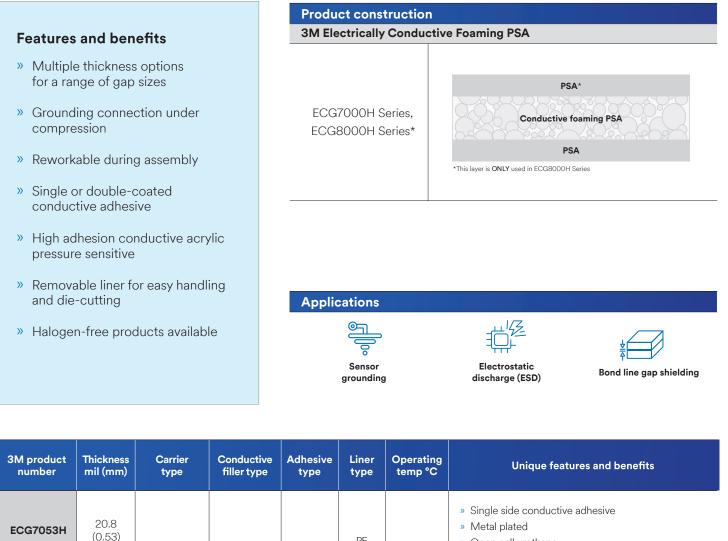
Sensor grounding

Bond line gap shielding

3M product number	Thickness mil (mm)	Conductive filler type	Adhesive type	Liner type	Electrical resistance through Z-axis Ω (3M ETM-12)	Electrical resistance through XY-axis Ω (3M ETM-7)	Adhesion to SUS (gf/inch)	Unique features and benefits
★ 9703			Acrylic	Silicone treated PCK	0.01 Ω	N/A	907 (ASTM D1000)	 » Anisotropic Z-axis electrical conductivity » Low outgassing » Pressure-sensitive adhesive (PSA) tack properties » Thermal curing not required
9709SL	- 2 (0.05)	Silver particles		PCK release liner, PET release liner	0.06 Ω	40 Ω	825 (ASTM D1000)	 » Standard adhesion » Good EMI shielding in bond line gap » High frequency » Thermal conductivity » Excellent conformability » Low liner release (SL)
9712	5 (0.127)	Carbon nonwoven		-	Silicone	13 Ω	50-70 Ω	1500
9713	3.5 (0.089)	Ni/Cu nonwoven		treated PCK	1.7 Ω		(ASTM D3330)	 » Standard adhesion » Isotropic XYZ-axis electrical connectivity » Uses nickel plated carbon scrim » Good contact with both hard and soft surfaces » Excellent die-cutting and converting capabilities

3M[™] Electrically Conductive Gasket Tapes

3M[™] Electrically Conductive Gasket Tapes are compressible electrically conductive open-cell urethane foam gaskets with single or double-coated conductive adhesives. These XYZ-axis conductive gaskets feature excellent conductivity to ground two surfaces with a wide gap and/or EMI shielding.



ΡE

coated

paper

liner

Acrylic

Ni

ST 125°C,

LT 80°C

- » Open cell urethane
- » Double side conductive adhesive
- » Metal plated
- » Open cell urethane

Plated

polyurethane

foam

29.5

(0.75)

ECG8075H

3M[™] EMI Absorbers

3M[™] EMI Absorbers are flexible composite materials incorporating specialized magnetic particles and a non-conductive PSA to absorb EMI. These absorbers help protect nearby electronics from EMI by absorbing EMI at multiple frequencies. 3M absorbers offer high permeability and magnetic loss in many target frequency ranges. They are used in a wide range of applications to help reduce EMI/RFI noise and improve signal integrity that could interfere with a system's operations.

Product construction 3M Composite EMI Absorber Features and benefits EM25TP Series, MFC-1H » Absorbing capabilities Target frequency: 500MHz – 4GHz up to 6GHz with targeted Absorber AB5000HF Series, AB5000SHF Series permeability Target frequency: 1GHz Acrylic adhesive AB7000HF Series » Absorbing performance Target frequency: 1GHz – 2GHz is thickness dependent **Release liner** AB1000 Series (ex. 100MHz to 4GHz Target frequency: 4GHz - 6GHz for 3M absorber EM25TP) **3M Hybrid Shielding EMI Absorber** » Helps improve antenna AL-PET layer performance and reduce EMI interference within Absorber AB6005HF (AL+PET) a device Acrylic adhesive » Multiple thickness options **Release liner** for diverse applications » Supplied on a removable Applications liner for easy handling » Halogen free products available Cable Attached to noise Attached to Insert between wrapping/ semicon chip/ module (traces, IC's, reflective attachment micro-processors (compartment) enclosure surface) Initial Operating Thickness Operating permeability temp **3M product number** Adhesive frequency Unique features and benefits mil @1MHz or range (°C) (mm) MHz-GHz 3MHz [µ'] » Broad frequency absorber EM25TP-005-A10, 2 (0.05), 100MHz -25 ~ » High permeability magnetic film EM25TP-0100-A10 4 (0.1) Acrylic 250 - 4GHz 90°C » Absorbing performance100MHz - 4GHz » Targeted permeability for magnetic shielding < 5MHz - 10MHz » High performance at high frequency (several GHz) Acrylic 2GHz -25 ~ AB1030 13 (0.33) 25 @ 3MHz conductive » Improved performance vs the 3M absorber AB7000HF +100°C – 6GHz PSA in the 3-6GHz range » Good workability AB7010HF, 5.2 (0.13), » High resistivity AB7020HF, 9.8 (0.25), 500MHz -25 ~ 110 » High permeability – 4GHz 85°C 22 (0.55) AB7050HF » Improved lower frequency absorber vs the AB5000 series (@ <1GHz) Acrylic non-» AB5000HF: Standard absorber conductive 100MHz -25 ~ 55 HF. AB5000SHF: Advanced EMI absorber, lower peak PSA AB5100HF/SHF 39 (1.0) 30 SHF – 3.5GHz 85°C absorber frequency than AB5000HF, thermal conductivity 0.7 W/m-K 10MHz -30 ~

 MFC-1H
 19.5 (0.5)
 Silicone
 10 − 130 @ 3MHz
 10 MHz − 4GHz
 -40 ~ 150°C

 ★ = Indicates which material and thickness are part of the GTML
 The above technical information ar

30 - 250

110 -130

- 18GHz

10MHz

AB6005HF

4 (0.1)

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reflow conditions

+105°C

-40 ~

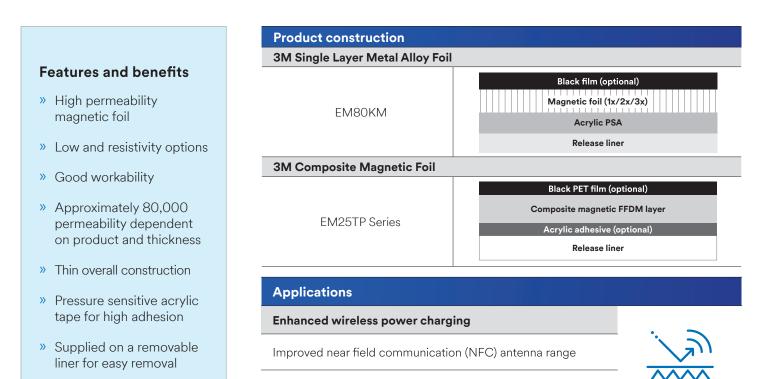
» EMI metal shielding layer and absorption layer

» High performance resin system stable under solder

» Higher temperature range than other 3M absorbers

3M[™] Magnetic Shielding Materials

3M[™] Magnetic Shielding Materials are thin magnetic materials that interact and influence electro-magnetic (EM) fields. These materials help protect sensitive electronic components and circuitry by shielding external low magnetic fields (<1MHz). Magnetic shielding materials "capture" the magnetic field and isolate the interference. The high magnetic permeability and low magnetic loss helps enable flux field redirection for applications less than 20MHz.



Improved radio frequency identification (RFID) antenna range

	3M product number	Total thickness mil (mm)	Magnetic type (magnetic foil layer type)	Adhesive type	Permeability (u')	Operating temp range (°C)	Unique features and benefits
*-	3M [™] Flux Field Directional Material EM80KM	2 (0.05)	Soft magnetic foil, nanocrystalline	Acrylic PSA	Max 80,000	-25 ~ 110°C	 » Low frequency focused for magnetic field » High permeability magnetic foil » Thin overall product construction allows for thinner design
*-	— EM25TP-005-A10, EM25TP-100-A10,	2 (0.05), 4 (0.1),	Soft magnetic composite	Acrylic PSA	250	-	 » Broad frequency absorber » High permeability magnetic film » Absorbing performance 100MHz - 4GHz » Targeted permeability for magnetic shielding <5MHz - 10MHz



Contact your 3M sales representative or visit 3m.com/electronicsassembly to learn more.

Regulatory: For regulatory information about this product, contact your 3M representative.

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Electronics Materials Solutions Division 3M United Kingdom plc 3M Centre, Cain Rd, Bracknell RG12 8HT, United Kingdom https://www.3m.co.uk/

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