



Science.
Applied to Life.™



Helping enable the next generation of electronics.

3M™ EMI/RFI Management Solutions

Don't let unwanted frequencies interfere with electronics components performance.

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:













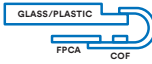
- » Minimize EMI noise and crosstalk
- » Improve signal integrity
- » Enable high performing and reliable materials
- » Be more cost-effective
- » Achieve quick and easy application with peel and stick solutions

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.






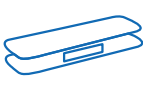
Help manage EMI with 3M™ EMI/RFI Solutions

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.

EMI Shielding and Grounding Applications

 Flex circuit to flex circuit interconnection	 Camera module grounding	 Electrostatic discharge (ESD)	 Shield can lid	 PCB/flex/chassis grounding
 Medium pitch flexible circuits and PCBs	 PIM management	 Sensor grounding	 EMI shield and gasket attachment	 Bond line gap shielding
 FPC grounding	 Shielding display wrap	 Display chip on flex		

EMI Absorbing Applications

 Cable wrapping/attachment	 Attached to noise (traces, IC's, reflective enclosure surface)	 Attached to metal surface (reduce emitting EMI noise)
 Near field communication	 Attached to semicon chip/micro-processors	 Insert between module (compartment)

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.*

Product	Typical contact resistance (R ohms Ω)	EMI shielding in bond line gap/slit	Flex to PCB contact resistance (R ohms Ω)	Peel strength (24 hr/RT)	Workability	Thermal conductivity/resistance (W/mK or C/W)
3M™ Electrically Conductive Double-Sided Tapes						
3M™ Electrically Conductive Adhesive Transfer Tapes						
★ 3M tape 9703	Good	N/A	Better	Good	Good	Good
3M tape 9709SL	Better	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 Conductive Double-Coated Tapes						
★ 3M tape 5113DFT	Best	Best	Best	Better	Best	Better
★ 3M tape 9772	Best	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 Conductive 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	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.

Features and benefits

- » XYZ-axis conductivity
- » Conformability and edge conformance
- » Excellent EMI/ESD and electrical performance over time
- » Overlap resistance and electrical contact on small areas and bond lines
- » High adhesion for reliable contact to various substrates
- » Great handling & workability
- » Thin product constructions for applications with less Z-space

Product construction

3M Fabric Tapes

5113SFT Series,
CEF-3BV

Conductive fabric carrier

Conductive adhesive

Release liner

3M Foil Tapes, PSA with conductive nonwoven

3304BC-S

Top layer (carbon black)

Copper foil

Conductive Ni/Cu nonwoven acrylic PSA

Release liner

3M Foil Tapes, PSA with conductive fillers

1050TC Series,
1020BC Series*

Conductive layer (black)

*This layer is ONLY used in 1020BC Series

Copper foil

Conductive acrylic PSA

Release liner

Applications



Shield can lid



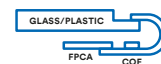
Shielding display wrap



PIM management



Sensor grounding



Display chip on flex

3M product number	Thickness mil (mm)	Conductive filler type and tape format	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
★ 5113SFT	2.0 (0.05)	Fabric backing C-SFT	Polyolefin	PET release liner	<0.03 Ω	<0.1 Ω	1500 (ASTM D3330)	<ul style="list-style-type: none"> » XYZ-axis conductivity through adhesive » Excellent electrical contact to small size areas » Resists moisture to maintain the products' integrity enabling a 4-year shelf-life » Excellent EMI shielding in bond line gap » Expands long-term operating temperature range to 105°C
★ 3304BC-S	1.8 (0.045)	Ni/Cu nonwoven foil backing	Acrylic	Silicone coated PET film	0.05 Ω	0.1 Ω	1300 (ASTM D1000)	<ul style="list-style-type: none"> » Scratch-resistant black copper foil » Excellent edge conformability » High shielding performances
1050TC	0.9 (0.023)	Foil backing C-SCT		PET release liner	N/A	0.015 Ω	1200 (ASTM D1000)	<ul style="list-style-type: none"> » XYZ-conductivity » Conformable, quick bonding » Copper foil backing
★ 1020BC	1.0 (0.025)	Foil backing C-SCT				0.015 Ω	1300 (ASTM D1000)	<ul style="list-style-type: none"> » XYZ-conductivity » Excellent EMI shielding performance » Excellent conformability and quick bonding » Reliable contacts to small size grounding areas » High adhesion and good grounding performance to many surface types » Black conductive coating
CEF-3BV	2.8 (0.07)	Black fabric backing C-SFT		Paper liner	0.4 Ω	1300 (ASTM D1000)	<ul style="list-style-type: none"> » Scratch resistance » Black fabric tape » High reliability for Auto Electrification market » Liquid Crystal Modules (LCM) wrapping 	

★ = 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.

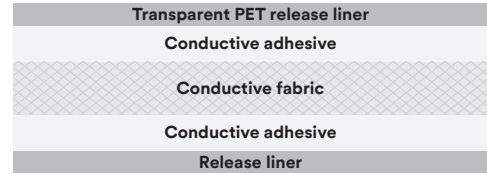
Features and benefits

- » XYZ-axis conductivity
- » A broad range of thicknesses
- » Electrical contact to small contact areas and bond lines
- » Excellent grounding performance over time
- » Great EMI shielding in bond line gap
- » Multiple levels of adhesion, conformability, and flexibility
- » Adhesion to a variety of substrates and surfaces
- » Great handling & workability

Product construction

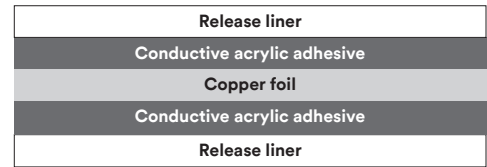
3M Woven Fabric Tapes

5113DFT Series,
9711S Series



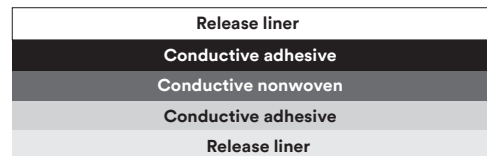
3M High Performing Foil Tapes

9772 Series



3M Nonwoven Tapes

9723



Applications



Flex circuit
to flex circuit
interconnection



Sensor
grounding



Electrostatic
discharge
(ESD)



EMI shield
and gasket
attachment



PCB/flex/
chassis
grounding



Flexible
circuits
and PCBs



FPC
grounding

3M product number	Thickness mil (mm)	Conductive filler type and tape format	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
★ 5113DFT	2.0 (0.05)	Fabric backing	Polyolefin	PET release liner	0.03 Ω	0.1 Ω	1500 (ASTM D3330)	<ul style="list-style-type: none"> » XYZ-axis conductivity through adhesive » Excellent electrical contact to small size areas » Resists moisture to maintain the products' integrity enabling a 4-year shelf-life » Excellent EMI shielding in bond line gap » Expands long-term operating temperature range to 105°C
★ 9772	2 (0.05)	Foil backing	Acrylic		N/A	0.015 Ω	1000 (ASTM D1000)	<ul style="list-style-type: none"> » Good EMI shielding in the bondline gap » Best XY-axis electrical resistance in double-sided conductive PSAs » Low PIM
9711S	2 (0.05) 4 (0.1)	Ni/Cu woven			0.05 Ω	0.15 Ω	1800 (ASTM D1000)	<ul style="list-style-type: none"> » Low contact resistance » High adhesion » Excellent conformability » Quick bonding » Wide range of thickness options
9723	2.4 (0.06)	Ni/Cu nonwoven			0.15	0.30	1500 (ASTM D3330)	<ul style="list-style-type: none"> » Good adhesion to most metal surfaces » Low electrical resistance that is stable over time » Dual PET Liner

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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.

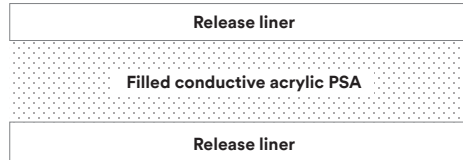
Features and benefits

- » XYZ-axis conductivity or Z-axis based conductivity
- » A broad range of thicknesses
- » Electrical contact to small contact areas and bond lines
- » Excellent grounding performance over time
- » Great EMI shielding in bond line gap
- » Multiple levels of adhesion, conformability, and flexibility
- » Adhesion to a variety of substrates and surfaces
- » Great handling & workability

Product construction

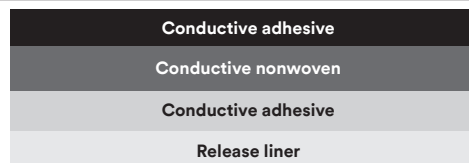
3M Conductive Tapes with silver filler

9703,
9709SL

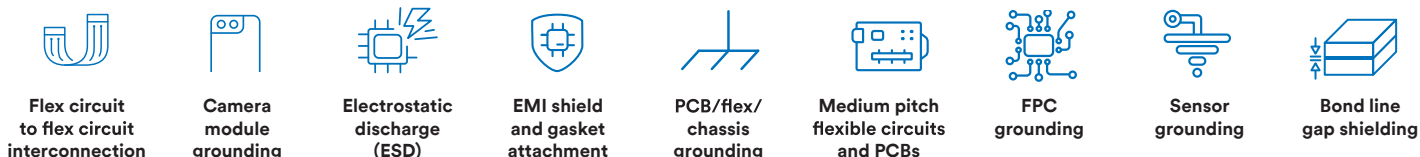


3M Conductive Tapes with conductive fibers

9712,
9713



Applications



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	2 (0.05)	Silver particles	Acrylic	Silicone treated PCK	0.01 Ω	N/A	907 (ASTM D1000)	<ul style="list-style-type: none"> » Anisotropic Z-axis electrical conductivity » Low outgassing » Pressure-sensitive adhesive (PSA) tack properties » Thermal curing not required
9709SL				PCK release liner, PET release liner	0.06 Ω	40 Ω	825 (ASTM D1000)	<ul style="list-style-type: none"> » 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 treated PCK	13 Ω	50-70 Ω	1500 (ASTM D3330)	<ul style="list-style-type: none"> » Standard adhesion » No nickel » Non-magnetic material » Nonwoven conductive scrim
9713	3.5 (0.089)	Ni/Cu nonwoven			1.7 Ω	5 Ω		<ul style="list-style-type: none"> » 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.

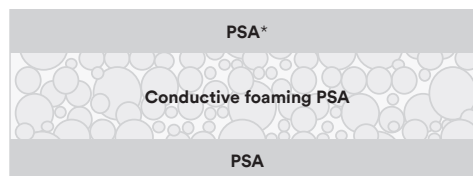
Features and benefits

- » Multiple thickness options for a range of gap sizes
- » Grounding connection under compression
- » Reworkable during assembly
- » Single or double-coated conductive adhesive
- » High adhesion conductive acrylic pressure sensitive
- » Removable liner for easy handling and die-cutting
- » Halogen-free products available

Product construction

3M Electrically Conductive Foaming PSA

ECG7000H Series,
ECG8000H Series*



*This layer is **ONLY** used in ECG8000H Series

Applications



Sensor
grounding



Electrostatic
discharge (ESD)



Bond line gap shielding

3M product number	Thickness mil (mm)	Carrier type	Conductive filler type	Adhesive type	Liner type	Operating temp °C	Unique features and benefits
ECG7053H	20.8 (0.53)	Plated polyurethane foam	Ni	Acrylic	PE coated paper liner	ST 125°C, LT 80°C	<ul style="list-style-type: none"> » Single side conductive adhesive » Metal plated » Open cell urethane
ECG8075H	29.5 (0.75)						<ul style="list-style-type: none"> » Double side conductive adhesive » Metal plated » Open cell urethane

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.

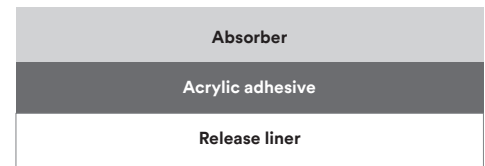
Features and benefits

- » Absorbing capabilities up to 6GHz with targeted permeability
- » Absorbing performance is thickness dependent (ex. 100MHz to 4GHz for 3M absorber EM25TP)
- » Helps improve antenna performance and reduce EMI interference within a device
- » Multiple thickness options for diverse applications
- » Supplied on a removable liner for easy handling
- » Halogen free products available

Product construction

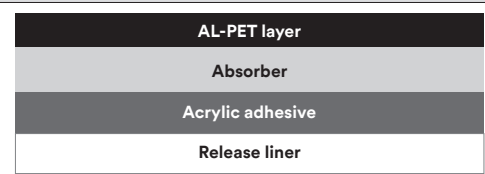
3M Composite EMI Absorber

EM25TP Series, MFC-1H <i>Target frequency: 500MHz – 4GHz</i>
AB5000HF Series, AB5000SHF Series <i>Target frequency: 1GHz</i>
AB7000HF Series <i>Target frequency: 1GHz – 2GHz</i>
AB1000 Series <i>Target frequency: 4GHz – 6GHz</i>



3M Hybrid Shielding EMI Absorber

AB6005HF (AL+PET)



Applications



Cable wrapping/attachment



Attached to semicon chip/micro-processors



Insert between module (compartment)



Attached to noise (traces, IC's, reflective enclosure surface)

3M product number	Thickness mil (mm)	Adhesive	Initial permeability @1MHz or 3MHz [μ']	Operating frequency MHz-GHz	Operating temp range (°C)	Unique features and benefits
★ EM25TP-005-A10, EM25TP-0100-A10	2 (0.05), 4 (0.1)	Acrylic	250	100MHz - 4GHz	-25 ~ 90°C	<ul style="list-style-type: none"> » Broad frequency absorber » High permeability magnetic film » Absorbing performance 100MHz – 4GHz » Targeted permeability for magnetic shielding < 5MHz – 10MHz
AB1030	13 (0.33)	Acrylic conductive PSA	25 @ 3MHz	2GHz – 6GHz	-25 ~ +100°C	<ul style="list-style-type: none"> » High performance at high frequency (several GHz) » Improved performance vs the 3M absorber AB7000HF in the 3-6GHz range
AB7010HF, AB7020HF, AB7050HF	5.2 (0.13), 9.8 (0.25), 22 (0.55)	Acrylic non-conductive PSA	110	500MHz – 4GHz	-25 ~ 85°C	<ul style="list-style-type: none"> » Good workability » High resistivity » High permeability » Improved lower frequency absorber vs the AB5000 series (@ <1GHz)
AB5100HF/SHF	39 (1.0)		55 HF, 30 SHF	100MHz – 3.5GHz	-25 ~ 85°C	<ul style="list-style-type: none"> » AB5000HF: Standard absorber » AB5000SHF: Advanced EMI absorber, lower peak absorber frequency than AB5000HF, thermal conductivity 0.7 W/m-K
AB6005HF	4 (0.1)		30 – 250	10MHz – 18GHz	-30 ~ +105°C	<ul style="list-style-type: none"> » EMI metal shielding layer and absorption layer
MFC-1H	19.5 (0.5)	Silicone	110 – 130 @ 3MHz	10MHz – 4GHz	-40 ~ 150°C	<ul style="list-style-type: none"> » High performance resin system stable under solder reflow conditions » Higher temperature range than other 3M absorbers

★ = Indicates which material and thickness are part of the GTML

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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.

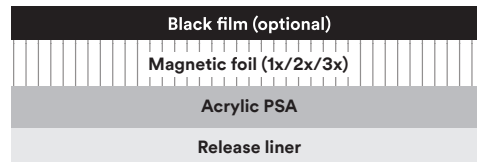
Features and benefits

- » High permeability magnetic foil
- » Low and resistivity options
- » Good workability
- » Approximately 80,000 permeability dependent on product and thickness
- » Thin overall construction
- » Pressure sensitive acrylic tape for high adhesion
- » Supplied on a removable liner for easy removal

Product construction

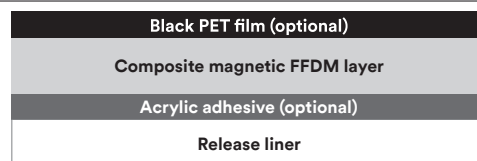
3M Single Layer Metal Alloy Foil

EM80KM



3M Composite Magnetic Foil

EM25TP Series



Applications

Enhanced wireless power charging

Improved near field communication (NFC) antenna range

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	<ul style="list-style-type: none"> » 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	–	<ul style="list-style-type: none"> » Broad frequency absorber » High permeability magnetic film » Absorbing performance 100MHz - 4GHz » Targeted permeability for magnetic shielding <5MHz - 10MHz

★ = Indicates which material and thickness are part of the GTML

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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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