

## 3M™ Flux Field Directional Material (FFDM) EM25TP

### Product Description

3M™ Flux Field Directional Material (FFDM) EM25TP is a composite material consisting of a carrier resin, magnetic fillers and an optional acrylic pressure sensitive adhesive (PSA) and optional Black PET top film layer. This magnetic material is designed to interact and influence an Electro-Magnetic (EM) field. The EM field could be generated for various reasons and in many applications it is desired to focus the EM field across a specific volumetric area, such as a secondary EM field pick-up coil or antenna in a frequency range of below 5-10 MHz typically.

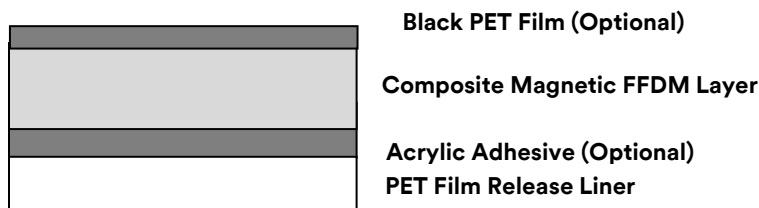
The 3M FFDM EM25TP uses in the frequency range above the 5-10 MHz range is typically as an EMI EM field absorber as the higher loss ( $\mu$ ) characteristics of the 3M FFDM EM25TP provide for excellent EM field reduction.

3M FFDM EM25TP is designed to efficiently couple to the EM field and redirect and focus the field as desired in a given application or to provide EM absorbing.

### Key Features

- Targeted permeability for < 5-10MHz FFDM performance for EM field coupling.
- Excellent EMI absorber performance for frequencies above 5-10 MHz.
- Excellent Absorbing performance from 100MHz to 4 GHz
- Multiple thickness options
- Black PET protection tape cover film (optional)
- Pressure sensitive acrylic adhesive (optional)
- Supplied on a removable liner for ease handling

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### Product Construction/ Materials Description

Note: The following technical information and data should be considered representative or typical only and should not be used for specification purposes.

## 3M™ Flux Field Directional Material (FFDM) EM25TP

| 3M™ Flux Field Directional Material EM25TP                                          |                                                                                                                                                            |                                                                                                                                                                                                                    |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Structure                                                                           | Type                                                                                                                                                       | Thickness                                                                                                                                                                                                          |
| Cover Film Type                                                                     | Black Colored PET (C is optional)                                                                                                                          | 10µm                                                                                                                                                                                                               |
| Magnetic Type                                                                       | Soft Magnetic Composite                                                                                                                                    | Options below (L= Layers)                                                                                                                                                                                          |
| Adhesive Type                                                                       | Acrylic Adhesive (ADH optional)                                                                                                                            | 10 – 30 µm                                                                                                                                                                                                         |
| <b>Magnetic Layer Thickness</b><br>(excluding protective film)<br>Tolerance: +/-10% | EM25TP-0025<br>EM25TP-0035 ( See Note**)<br>EM25TP-0050<br>EM25TP-0150<br>EM25TP-0250<br>EM25TP-XXX-Azz-Czz*<br>EM25TP-0035-A10-C10<br>EM25TP-0050-A10-C10 | L = 0.025 mm<br>L= 0.035 mm<br>L= 0.050 mm magnetic layer<br>L= 0.150 mm magnetic layer<br>L= 0.250 mm magnetic layer<br>L = -XXX-Azz-Czz<br>L=0.035mm magnetic+10um A+10um C<br>L=0.050mm magnetic+ 10um A+10um C |
| <b>Total Thickness</b>                                                              |                                                                                                                                                            | Cover Film (Optional) +<br><b>Magnetic Layer +</b><br>Adhesive Layer (Optional)                                                                                                                                    |

\*XXX = custom magnetic layer thickness options, Azz = optional Adhesive layer thickness micron (um) A= Adhesive, Czz= optional Cover film thickness (um), C= Cover film; Adhesive layer thickness can vary based on application need. Heat Activated Films (HAF) can also be options. L= Layers

\*\* In an earlier version of the product, the numbering was also stated as EM25TP-004 = 35um magnetic layer. For 2019 new project the EM25TP will now use 4 digits to clarify thickness in microns or mm.

## Application Ideas

3M FFDM EM25TP has potential to be used for:

- Shield DC and low frequency magnetic field
- Wireless power system power transfer efficiency improvement
- EMI Absorber
- Potential devices include mobile phone, computers, tablets, measurement and sensors.
- Protect magnetic flux sensitive device such as a hall sensor and a flux gate from external low frequency magnetic fields
- Assembly of magnet coil for Wireless Charging System
- Electronic equipment protection for automobile applications

As an initial design, it is suggested to test the 3M™ Flux Field Directional Materials at the greatest thickness allowed (1x, 2x, 3x layers, etc.), largest XY dimension, in multiple locations or use multiple parts to determine a potential maximum performance level associated with the material and the end use assembly. Once a baseline level of performance is established, the 3M FFDM material thickness, XY shape, location, etc. can be reduced or changed to determine the minimum material needed to meet a specification.

It should be noted that once a maximum performance level is established for the end use device using the 3M FFDM EM25TP as an EMI absorber, the overall design can be reviewed to understand if other, non-FFDM changes not initially considered, but now possible with the new performance level associated with using the 3M FFDM materials could be considered. An example would be the absorber reducing EMI noise levels to allow for improved antenna Signal to Noise (SNR) ratio that could allow for higher data transfer speeds and/or longer range performance.

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## Effectiveness

3M™ Flux Field Directional Materials EM25TP performance and effectiveness is based on several application considerations:

- 1) Permeability ( $\mu'$ ) and Loss ( $\mu''$ ) of this material at the frequency range or frequency peak of the intended application can affect the performance. Permeability and Loss of the 3M FFDM EM25TP varies with frequency and is a measure of how well the EM material may couple with the EM field and impact performance.
- 2) Thickness of the 3M FFDM EM25TP product can be used to optimize an applications performance.
- 3) End use application orientation and location affects the 3M EM products interaction with an EM field.

## Typical Physical Properties and Performance Characteristics

**Note:** The following technical information and data should be considered representative or typical only and should not be used for specification purposes. Final product specifications and testing methods will be outlined in the products Certificate of Analysis (COA) that is provided once the product is approved by 3M for general commercialization and development work is completed.

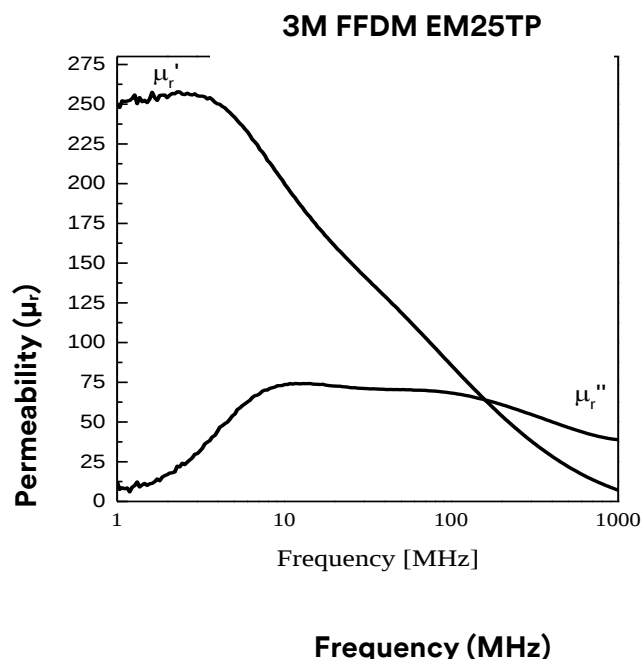
| 3M™ Flux Field Directional Material EM25TP |                                |
|--------------------------------------------|--------------------------------|
| Property                                   | Value                          |
| Electrical Resistivity***                  | $2 \times 10^4 \Omega\text{m}$ |
| Typical Permeability (@1 MHz)*             | 250                            |
| Temperature Range**                        | -25 ~ 90°C                     |

\*Permeability and noted results of Vibrating Sample Magnetometers (VSMs) can vary with test method and/or equipment used for testing at different test sites

\*\* Based on general environmental performance characteristics of the polymer binder resin type. Each application should verify temperature and environmental performance in the end-use specific configuration.

\*\*\* ASTM D257 Type Test Method

**Figure 1. Real and Imaginary Part of Permeability with Frequency**



## **3M™ Flux Field Directional Material (FFDM) EM25TP**

### **Storage and Shelf Life**

The shelf life of 3M™ Flux Field Directional Material EM25TP is 12 months from the date of manufacture when stored in the original packaging materials and stored at 21°C (70°F) and 50% relative humidity.

### **Certificate of Analysis (COA)**

The 3M Certificate of Analysis (COA) for this product is established when the product is commercially available from 3M. The commercially available product will have a COA specification established. The COA contains the 3M specifications and test methods for the products performance limits that the product will be supplied against. The 3M product is supplied to 3M COA test specifications and the COA test methods. Contact your local 3M representative for this product's COA.

Final product specifications and testing methods will be outlined in the products Certificate of Analysis (COA) that is shipped with the commercialized product.

# 3M™ Flux Field Directional Material (FFDM) EM25TP

**Safety Data Sheet:** Consult Safety Data Sheet before use.

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

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