

3M™ Flux Field Directional Materials Particle EM05EC

Product Description

3M™ Flux Field Directional Materials (FFDM) Particle EM05EC is a permeable multi-layered NiFe/insulator particulate material consisting of multiple sub-skin-depth magnetic layers alternated with dielectric spacer layers. This material may be used in flux field directional or absorber material constructions.

3M FFDM Particle EM05EC is available as a powder.

Features and Benefits

- High permeability and low loss magnetic material at frequencies below 20 MHz
- High magnetic loss above 50 MHz
- Sub-skin depth NiFe layers for effective penetration of RF fields at high frequencies
- Particle size <500µm x <500µm x <6µm

Product Construction/Material Description

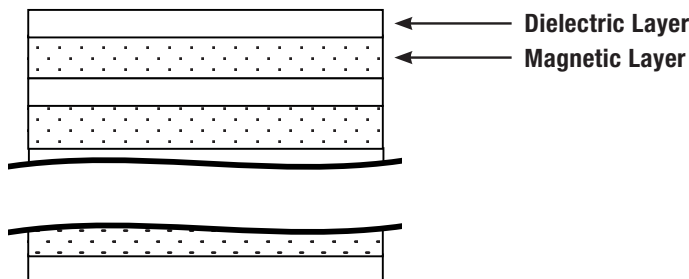


Figure 1: Construction of 3M FFDM Particle EM05EC

| 3M FFDM Particle EM05EC | |
|-------------------------|------------------------|
| Magnetic Layer Type | Ni Fe Alloy |
| Dielectric Layer Type | SiO |
| Particle Size | <500µm x <500µm x <6µm |
| Density (nominal) | 6.7 g/cm ³ |

Applications

3M™ Flux Field Directional Materials (FFDM) Particle EM05EC is engineered to provide:

- High permeability magnetic flux concentrators
 - Suitable for wireless power charge or NFC
- EMI absorbers
- RF heat generation for fusion bonding or curing of non-conductive polymer systems (Figure 3)

Magnetic permeability μ' : 5 (at 13.56 MHz and 25% loading by weight)
 70 (at 13.56 MHz and 86% loading by weight)

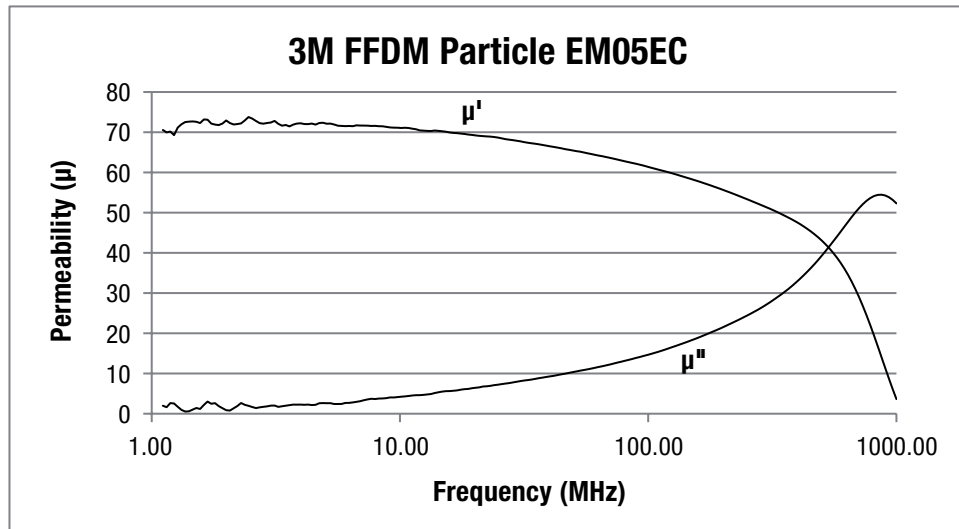


Figure 2: Real and Imaginary part of permeability with frequency – 86% weight loading.

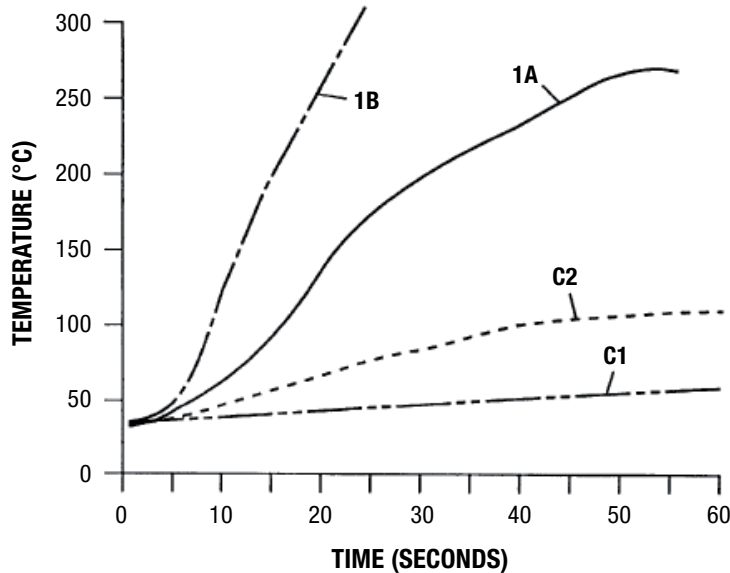


Figure 3: Thermal heating profiles (50W at 98 MHz)

- C1:** 5.85 vol% Comp S Ferrite powder
- C2:** 15.5 vol% Comp S Ferrite powder
- 1A:** 2.5 vol% 3M FFDM Particle EM05EC
- 1B:** 5.0 vol% 3M FFDM Particle EM05EC

Typical Physical Properties

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

| Properties | Typical Value |
|------------------------------------|--------------------------------------------------------------------------------------------|
| Particle Type | NiFe/insulator particle |
| Magnetic Permeability ¹ | 70 @ 3 MHz (86 wt% in Polyester Urethane) |
| Magnetic Permeability ² | 5 @ 13.56 MHz (25 wt% in Epoxy) |
| Magnetic Loss ¹ | 1.3 @ 3 MHz (86 wt% in Polyester Urethane) 50 @ 1000 MHz (86 wt% in Polyester Urethane) |
| Particle Size (µm) | <500µm x <500µm x <6µm |

¹Measured with E4991A RF Impedance/Material Analyzer at a 86 weight% loading. (Figure 2)

²Measured with E5071C Network Analyzer at a 25 weight% loading.

Storage and Shelf Life

The shelf life of 3M™ Flux Field Directional Materials Particle EM05EC is 24 months from the shipment date from the manufacturing location when stored in original packaging at 21°C (70°F) and 50% relative humidity.

Safety Data Sheet

Please consult the product Safety Data Sheet before use.

Regulatory

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

Technical Information

The technical information, recommendations and other statements contained in this document are based upon tests or experience that 3M believes are reliable, but the accuracy or completeness of such information is not guaranteed.

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