

ECCOSORB[®] MFS

High-Loss, Non-Rigid, Dielectric Load Stock

Material Characteristics

- High loss stock based on silicone rubber with excellent thermal conductivity
- This product was developed to overcome the physical limitations of rigid high-loss dielectrics
- Frequency range from 1 - 18 GHz
- Being flexible, ECCOSORB[®] MFS can be fitted to compound curves
- Low out-gassing properties for space applications

Applications

- ECCOSORB[®] MFS is engineered for terminations, loads, attenuators in microwave circuits, and in waveguides and transmission systems
- Can be bonded to low-expansion-coefficient ceramics, such as sintered ferrites

Availability

- Available in two types, ECCOSORB[®] MFS-117 and ECCOSORB[®] MFS-124
- **Sheets:** 12" x 12" (30.5cm x 30.5cm) in thicknesses of: 1/8" (0.32cm), 1/4" (0.64cm), 1/2" (1.27cm) & 1.0" (2.54cm)
- **Bars:** 12" long (30.5cm) in squares of 1/4, 1/2, 1.0" (0.64, 1.27, 2.54 cm).
- For most applications ECCOSORB[®] MFS can be supplied with a Pressure Sensitive Adhesive (PSA). Product designation denoting ECCOSORB[®] MFS with a PSA is ECCOSORB[®] MFS-XXX/SS6M
- ECCOSORB[®] MFS is available in other thicknesses, sizes, and customer specified shapes upon request

Instructions for Use

- Can be cut with a sharp knife, sawed, sanded, and ground to form pyramids, cones and other machines parts. Magnetic holding devices can be used for machine operations
- Bonding of ECCOSORB[®] MFS is best accomplished with ECCOBOND[®] TP-50. Where ECCOSORB[®] MFS is to be used at elevated temperatures or in direct contact with metals, a thin wipe-on coat of ECCOBOND[®] TP-50 will protect the product.

Typical Properties

Service Temperature	Cryogenic to 320°F (160°C)
Density, g/cc	4.15 - 4.3
Hardness, Shore A	>70
Volume Resistivity, ohm-cm	10 ¹⁰
Thermal Expansion per °F (°C)	35 x 10 ⁻⁶ (63 x 10 ⁻⁶)
Thermal Conductivity, (cal)(cm)/(sec)(cm ²)(°C) (BTU)(in)/(hr)(ft ²)(°F)	0.0021 6.0
Water Absorption, % 24 hours	<0.1
Dielectric Strength, volts/mil	>10
%TML (MFS-124/SS-6M 0.100")	0.16
%CVCM (MFS-124/SS-6M 0.100")	0.06
Weight, lb/ft ² (kg/m ²) (.250" thick)	5.85 (28.56)

Temperature Cycling

- Many rigid materials can not be bonded to metal surfaces and then temperature cycled. Temperature changes break this bond. This is due to the difference in the thermal expansion coefficient between the metal and the load material. Since ECCOSORB[®] MFS is a true elastomer, it deforms slightly to accommodate dimensional changes. In addition, a pyramid or wedge of ECCOSORB[®] MFS can be bonded over a large area to a waveguide wall to improve heat dissipation.

Related E&C Products

- ECCOSORB[®] MF - corresponds in electrical properties to ECCOSORB[®] MFS counterpart yet is a rigid epoxy
- ECCOSORB[®] CRS - castable 2-part RTV silicone resin electrically similar to ECCOSORB[®] MFS used for casting parts

Typical Electrical Properties

	GHz	10 ⁻⁷	10 ⁻⁶	10 ⁻⁵	10 ⁻⁴	10 ⁻³	10 ⁻²	10 ⁻¹	1.0	3.0	8.6	10.0	18.0
MFS-117	K'	195	158	120	85	62	48	38	28	22.9	21.4	21	20.6
	tan δ _d	0.18	0.21	0.23	0.24	0.22	0.18	0.12	0.09	0.06	0.02	0.02	0.02
	K''	35	33	28	20	14	8.6	4.6	2.5	1.4	0.42	0.42	0.41
	M'	5	5	5	5	5	5	4.8	4.1	3.4	1.2	1.1	1
	tan δ _m	0	0	0	0	0	0	0.1	0.2	0.39	1.36	1.5	2
	M''	0	0	0	0	0	0	0.48	0.82	1.33	1.63	1.7	2
	dB/cm	0	0	0	0	0	0.03	0.27	2.8	11	46	56	119
	dB/in	0	0	0	0	0	0.08	0.69	7.1	28	117	142	302
MFS-124	Z /Z ₀	0.16	0.18	0.2	0.24	0.28	0.32	0.36	0.39	0.4	0.3	0.31	0.33
	K'	260	205	145	95	70	52	40	32	25.8	23.8	23.6	23
	tan δ _d	0.4	0.39	0.36	0.31	0.26	0.2	0.14	0.08	0.07	0.05	0.03	0.04
	K''	104	80	52	29	18	1	5.6	2.6	1.8	1.19	0.71	0.92
	M'	7	6.9	6.8	6.7	6.6	6.3	6	5	3.8	2.5	1.5	1
	tan δ _m	0	0	0	0	0	0	0.2	0.45	0.69	1.1	1.4	2.5
	M''	0	0	0	0	0	0	1.2	2.3	2.62	2.75	2.1	2.5
	dB/cm	0	0	0	0	0	0.03	0.48	6.5	20	63	67	149
dB/in	0	0	0	0	0	0.08	1.2	16.51	50	160	170	378	
Z /Z ₀	0.16	0.18	0.21	0.26	0.3	0.34	0.39	0.42	0.42	0.39	0.33	0.34	

*Note: Attenuation is a theoretical property calculated from the Complex Permittivity and Complex Permeability of a lossy material and is strictly a means of comparing one absorbing material to another. The attenuation properties are not an indication of how the material will perform inside a microwave device. The frequencies of use recommended for ECCOSORB® MFS-117 & ECCOSORB® MFS-124 in the Typical Properties Table of this

Typical Electrical Properties Legend

K'	Real part of the permittivity (dielectric constant)
tan δ _d	Dielectric loss tangent
K''	Imaginary part of the permittivity (loss)
M'	Real part of the magnetic permeability
tan δ _m	Magnetic loss tangent
M''	Imaginary part of the magnetic permeability (loss)
dB/cm	Attenuation per unit distance
dB/in	Attenuation per unit distance
Z /Z ₀	Normalized impedance magnitude ratio