

# BandSorb® ES

Machinable, Magnetically Loaded Epoxy Absorber Material

## Description:

BandSorb® ES is a rigid, magnetically loaded epoxy material engineered for precision machining and optimized for microwave and RF applications. It is commonly used in RF loads, attenuators, waveguide terminations, and as a surface current suppressor on antenna elements.

Bonding can be achieved using epoxy adhesives, and our technical team is available to assist in selecting the most appropriate adhesive for your application. For mechanical mounting, components can be supplied with pre-threaded holes for straightforward installation.

## Availability:

BandSorb® ES is available in multiple grades (ES-6 to ES-140), each tailored to specific frequency ranges and attenuation requirements. Standard formats include:

- Flat Sheets: 305 x 305 mm, thicknesses from 6 mm to 75 mm
- Bars and Rods: Various diameters
- Custom Shapes: 3D geometries available upon request

## Features and Benefits :

- Rigid and durable
- Easily machinable
- Customizable for specific RF applications

## Applications

- Waveguide terminators
- Wall attenuators
- Strip lines and cavity absorbers
- Antenna array surface current suppression
- High-Q inductor cores (e.g., slug tuners)
- RF filters and free-space absorbers

## Physical Properties :

Datasheet for Performance Characteristics			
CHARACTERISTICS	TEST	UNIT	SPECIFICATIONS
SEM Elastomers absorber	-		ES
Typical Frequency Range	-	GHz	≥ 1
Elastomer Binder	-	-	Epoxy
Density	-	g/cc	1.5 - 4.7
Hardness	ASTM D 2240	Shore D	>70
Thermal Expansion per °C	ASTM E 831	1/°C	<0.002
Thermal Conductivity		W/mK	0.47 - 1.65
Tensile Strength	ASTM D 412	MPa	>29
Maximum Service Temperature	-	°C (°F)	<180 (<356)
Colour	-	-	Grey
Volume Resistivity	ASTM D 991	Ω-cm (Ω-in)	> 10 <sup>10</sup> (> 4 x 10 <sup>9</sup> )
Water Absorption		% 24 hours	<0.3
Compliance			2011/65/EU(RoHS 2.0) Compliance, REACH SVHC Compliance, Halogen free

\*Tested in according to UL94 specification

-The technical specification data is based on SEM tests and analysis that we believe to be reliable. However, in no event, shall SEM be liable for inaccuracies or omissions contained therein. In all cases, details and values should be verified by the customer

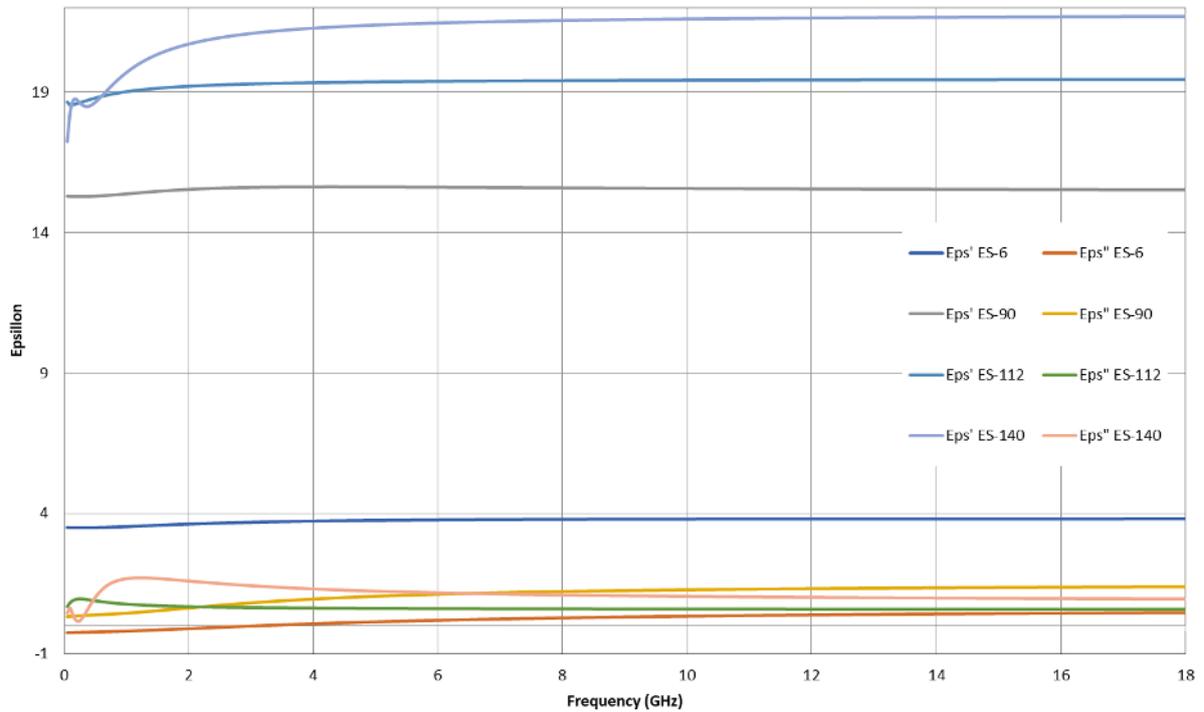
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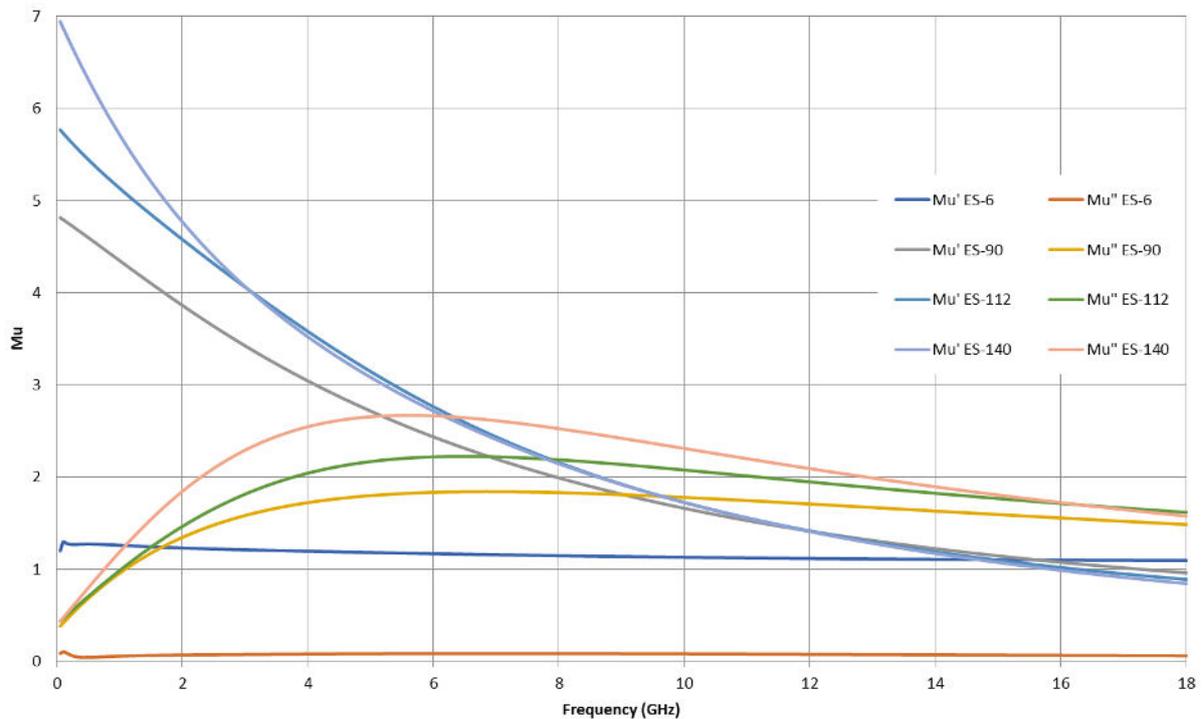
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**Electromagnetic Properties:**

**Bandsorb ES  
 Typical Epsilon**



**Bandsorb ES  
 Typical Mu**

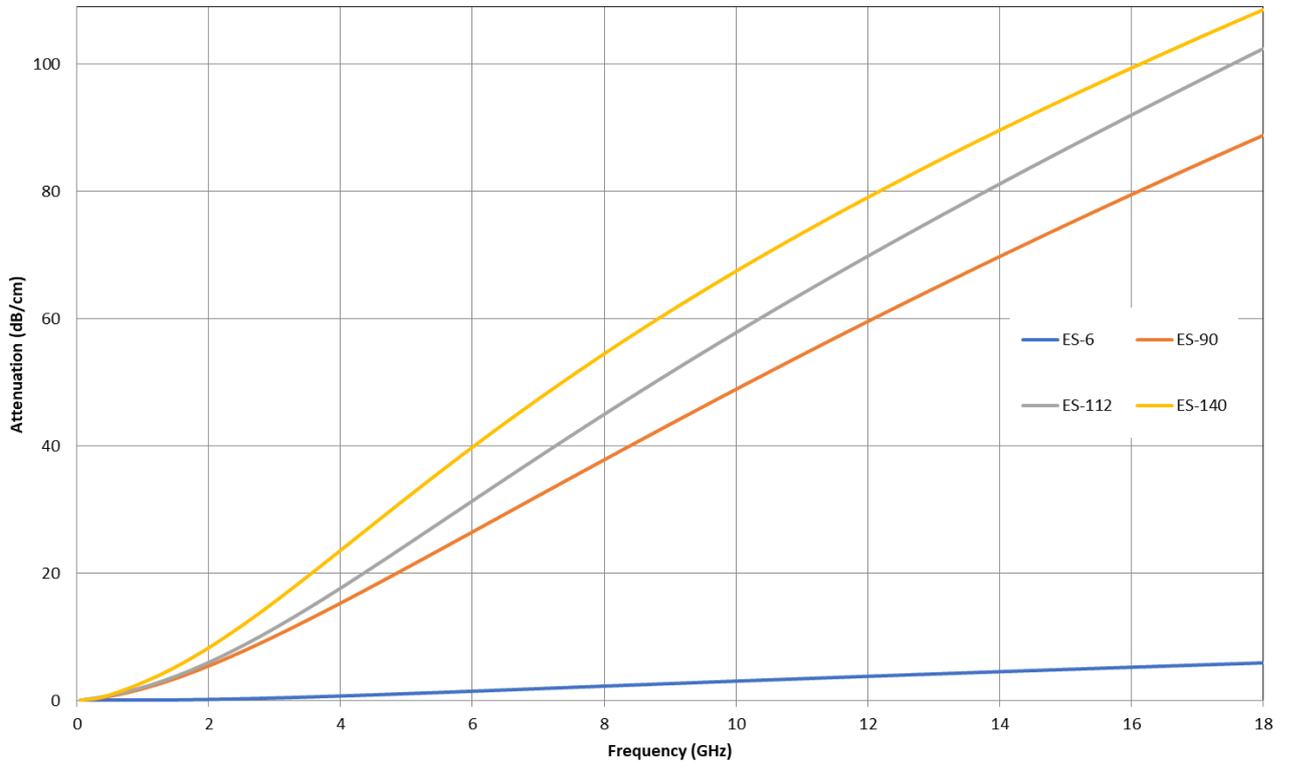


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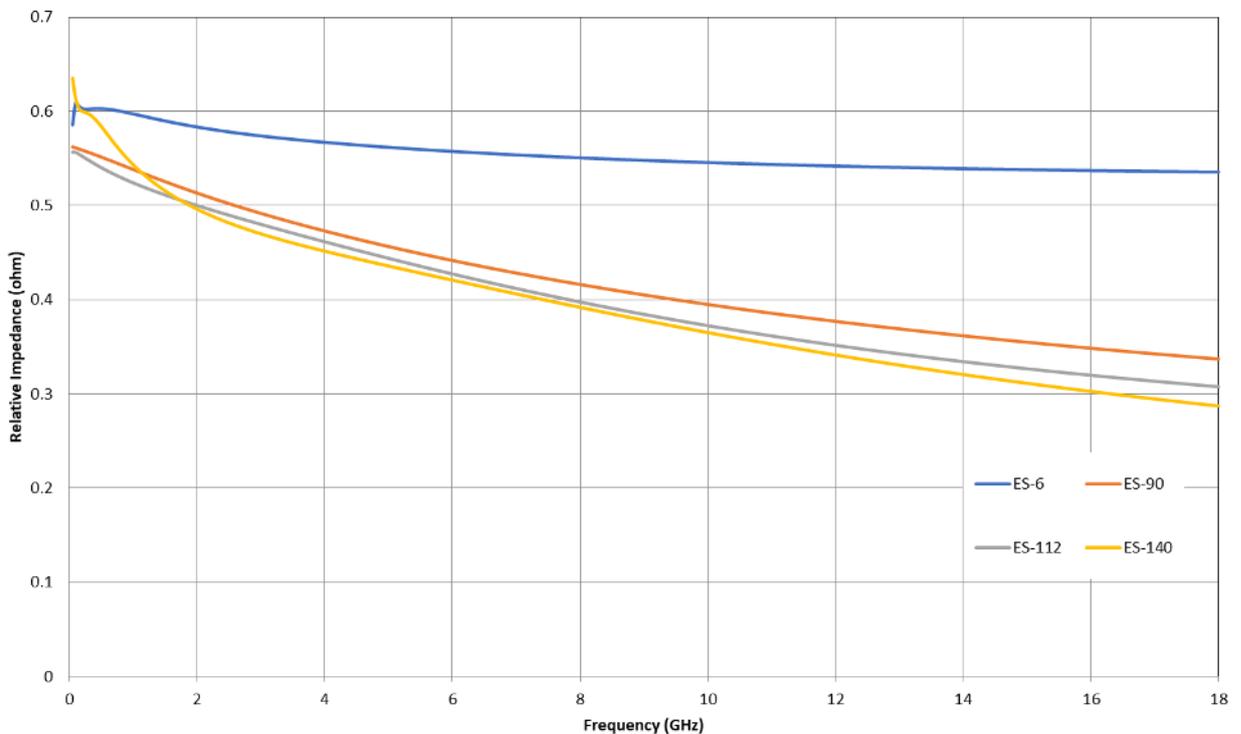
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**Bandsorb ES**  
 Typical Attenuation



**Bandsorb ES**  
 Typical Relative impedance



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Definitions and equations are detailed in the SEM EMI/RF Absorber Material Reference Guide, available upon request.

- $\epsilon'$ : Real part of dielectric epsilon
- $\epsilon''$ : Imaginary part of dielectric epsilon
- $\mu'$ : Real part of magnetic permeability
- $\mu''$ : Imaginary part of magnetic permeability
- dB/cm: Attenuation per unit length

The definition of dB/unit length is included in the reference, both in mathematical form and in words. The value is useful in comparing one material against another to determine which offers the most loss independent of interface reflection coefficients

- $Z/Z_0$ : Relative impedance (ideal match  $\approx 1$ )

$|Z|/Z_0$ , the normalized impedance magnitude ratio, can be used as a qualitative measure of the impedance match between free space and the material. An impedance ratio that is closest to 1 is the most desirable because at that ratio, the impedance match between the material and free space is perfect.

Important Notes:

- Dielectric constant (Epsilon') decreases with frequency
- Dielectric loss tangent typically decreases with frequency
- Magnetic loading increases from ES-6 to ES-140
- Nominal values provided; not suitable for procurement specifications
- Density is recommended for quality control over dielectric/magnetic measurements
- If specifications are needed, the customer should consult with the SEM Sales Department.

The use of dielectric/magnetic properties for Quality Control, i.e., incoming or outgoing inspection, is not recommended, because the measurement of these properties is very time consuming and complicated.

### Part number system example

ES	-	112
(Epoxy Structural)		
Product name		Load indication

### Termination Design Considerations :

- ES-90 is the most commonly used grade and ideal for initial testing
- Step-tapered terminations: Suitable for narrow-band, single-frequency applications
- Uniformly tapered terminations: Preferred for wide-band applications due to low VSWR and dimensional tolerance
- Wall-type tapers: Recommended for high-power applications due to superior heat dissipation.