

MAGT_xREX™ 555

High Impedance Laminates

MAGT_xREX™ 555 laminate is an industry first low loss laminate with controlled permeability and permittivity. MAGT_xREX 555 materials are constructed from a proprietary, low loss, high resistivity ceramic filler and a high temperature thermoplastic matrix. This yields a system which is conformable, PCB processable, and mechanically and electrically stable.

MAGT_xREX 555 materials offer a miniaturization factor comparable to a material with a dielectric constant of 30, with an intrinsic impedance comparable to a material with dielectric constant of 1. This makes the material ideal for miniaturizing antennas below 500 MHz in operating frequency.

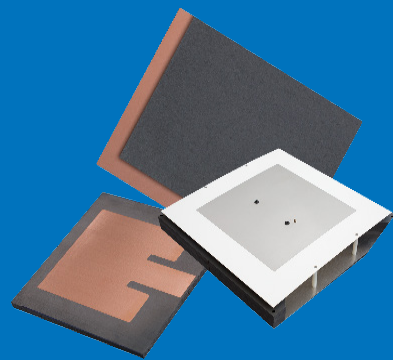
When used as part of an antenna design, MAGT_xREX 555 materials offer designers the ability to produce electrically small antennas with bandwidth and efficiencies not previously possible.

MAGT_xREX 555 materials are available with copper, for use as a laminate material, or without copper for use as a loading element for cavity backed antennas.

When ordering MAGT_xREX 555 materials, it is important to specify laminate thickness and whether copper is required, and if so, the copper thickness.



Data Sheet



Features and Benefits:

Matched permeability and permittivity with high miniaturization factor $\sqrt{\epsilon_r \mu_r}$

- Substrate impedance matched to air
- Antenna miniaturization with improved bandwidth

High temperature thermoplastic composite laminate with low moisture absorption


- Environmentally stable electrical performance
- Flexible and mechanically robust

Low dielectric and magnetic loss below 500 MHz

- High antenna efficiency

Typical Applications:

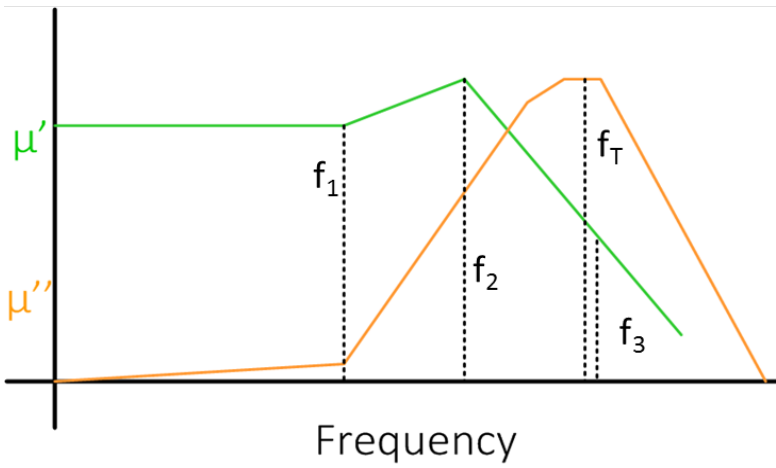
- Low profile VHF/UHF antennas
- Electrically small VHF / UHF antennas
- VHF magnetic components (eg. Inductor, Transformer)



MAGTREX 555 Property	Typical Value ⁽¹⁾	Direction X=CMD Y=MD	Units	Condition	Test Method
Electric & Magnetic Properties					
Dielectric Constant, (ϵ_r)	6.5	X/Y	-	400 MHz	Coaxial Airline 1" NRW Extraction
Dielectric Constant, (ϵ_r)	5.3	Z	-	400 MHz	FSR, IPC-TM-650, 2.5.5.6
Permeability (μ_r)	6.0	X/Y	-	400 MHz	Coaxial Airline 1" NRW Extraction
Dielectric Loss Tangent	0.01	X/Y	-	400 MHz	Coaxial Airline 1" NRW Extraction
Magnetic Loss Tangent	<.05	X/Y	-	400 MHz	Coaxial Airline 1" NRW Extraction
Thermal Coefficient of $\sqrt{\epsilon_r \mu_r}$	~+1000	-	ppm/°C	250 MHz, 0-100C	FSR, IPC-TM-650, 2.5.5.6
Thermal Coefficient of ϵ_r	TBD	TBD	ppm/°C	TBD MHz	TBD
Thermal Coefficient of μ_r	TBD	TBD	ppm/°C	TBD MHz	TBD
Volume Resistivity	615	-	MΩ·cm	Condition A ⁽²⁾	IPC-TM-650 2.5.17.1
Surface Resistivity	174	-	MΩ	Condition A ⁽²⁾	IPC-TM-650 2.5.17.1
Electrical Strength	131	Z	V/mil	-	IPC-TM-650 2.5.6.2
Dielectric Breakdown	14.35	-	kV	-	IPC-TM-650 2.5.6
Curie Temperature	241	-	C	-	VSM
f1 (see Figures 1 & 2)	499	-	MHz	23C	Coaxial Airline 1" NRW Extraction
f2 (see Figures 1 & 2)	715	-	MHz	23C	Coaxial Airline 1" NRW Extraction
f3 (see Figures 1 & 2)	3900	-	MHz	23C	Coaxial Airline 1" NRW Extraction
ft (see Figures 1 & 2)	2800	-	MHz	23C	Coaxial Airline 1" NRW Extraction
Mechanical Properties					
Peel Strength	>3.1	-	pli	1oz ED After Solder Float	IPC-TM-650 2.4.8
Dimensional Stability	0.15 0.18	X Y	%	Condition A 0.50" sample thickness	IPC-TM-650 2.2.4
Flexural Strength	10.6 (1.54) 10.8 (1.57)	X Y	MPa (ksi)	-	ASTM D790
Flexural Modulus	550 (79.8) 572 (82.9)	X Y	MPa (ksi)	-	ASTM D790
Tensile Strength	8.6 (1.25) 6.7 (0.97)	X Y	MPa (ksi)	-	ASTM D638
Tensile Modulus	1482 (214.9) 1502 (217.7)	X Y	MPa (ksi)	-	ASTM D638
Compressive Strength	>143.8 (>20.8)	-	MPa (ksi)	-	ASTM D3410/D3410M-16
Compressive Modulus	2092 (303.4)	-	MPa (ksi)	-	ASTM D3410/D3410M-16
Poisson's Ratio	0.3685	-	-	-	ASTM D3039/D3039M-14
Impact Strength	9.77 (4.65)	-	kJ/m ² (ft lb/in ²)	-	ASTM D256 - 10e1
Thermal Properties					
Coefficient of Thermal Expansion	22	X	ppm/°C	-55 to 288°C	IPC TM-650 2.4.41
	25	Y			
	25	Z			
Thermal Conductivity	0.47	-	W/m ² K	-55 to 288°C	ASTM C518
Decomposition Temperature (Td)	500	-	C	5% weight loss	IPC-TM-650 2.3.40
T260	>30	-	min	TMA	IPC-TM-650 2.4.24.1
T288	>30	-	min	TMA	IPC-TM-650 2.4.24.1
Physical Properties					
Flammability	N/A	-	-	-	-
Moisture Absorption	<.25	-	%	D48/50	IPC TM-650 2.6.2.1
Density	3.45	-	g/cm ³	C-24/23/50	ASTM D792 Method A
Specific Heat	.765	-	J/g°C	DSC	ASTM E1269-11
Lead Free Process Compatible	PASS	-	-	-	-
Outgassing	0.02	-	%	TML/CVCM	ASTM E595-15
Fungus Resistance	PASS	-	-	-	IPC-TM-650 2.6.1

(1) Typical values are a representation of an average value for the population of the property. For specification values contact Rogers Corp.

(2) Measurements taken with Fluke 187 multimeter. Note: Resistance readings taken with a Fluke 189 Multimeter.



f_1 – Permeability starts rising
 f_2 – Peak of real permeability
 f_3 – Unity permeability frequency
 f_t – Cutoff frequency; Defined as peak of imaginary permeability

Figure 1 - Typical permeability curve as a function of frequency

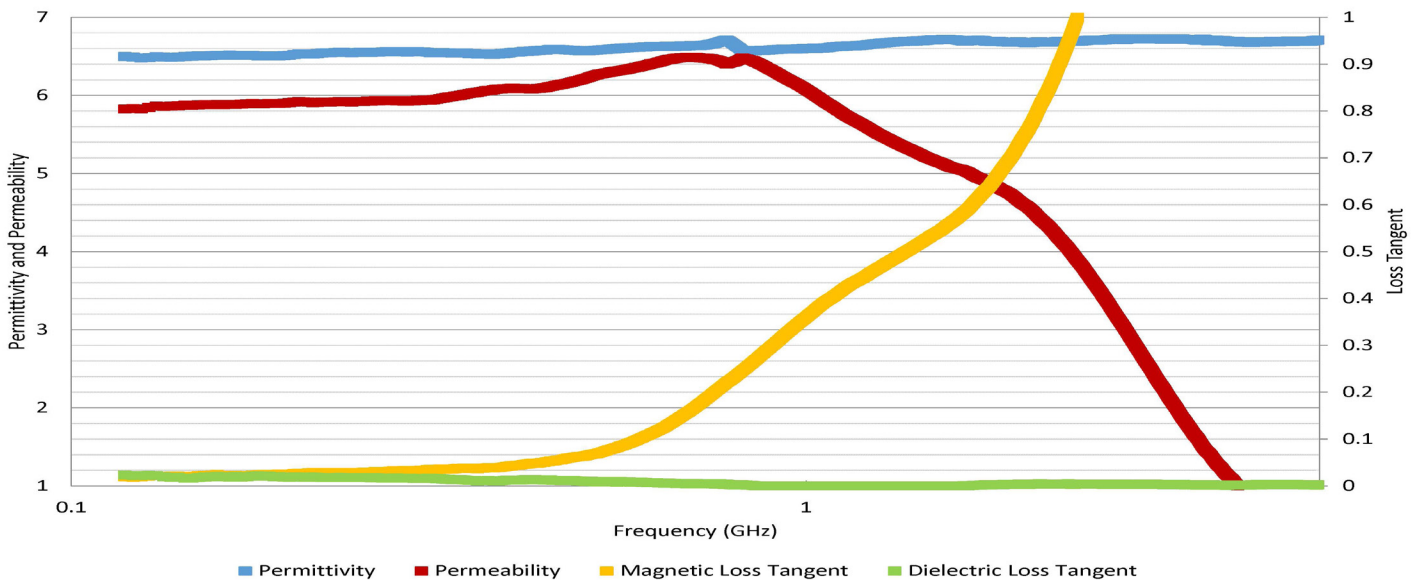


Figure 2 - Typical MAGTREX 555 properties at 23C

Standard Thicknesses		Standard Panel Size	Standard Cladding
0.040" (1.02mm) +/- 0.003"	0.140" (3.56mm) +/- 0.003"	12" X 18" (305 X 457 mm)	<u>Electrodeposited Copper Foil</u> 1 oz. (35µm) H1/H1 <u>Unclad</u>
0.060" (1.52mm) +/- 0.003"	0.200" (5.08mm) +/- 0.003"		
0.080" (2.03mm) +/- 0.003"	0.260" (6.60mm) +/- 0.003"		
0.100" (2.54mm) +/- 0.003"			

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MAGTREX 555 laminates are in production scale-up

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