

# MAGT<sub>x</sub>REX™ 555

## High Impedance Laminates

MAGT<sub>x</sub>REX™ 555 laminate is an industry first low loss laminate with controlled permeability and permittivity. MAGT<sub>x</sub>REX 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<sub>x</sub>REX 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.

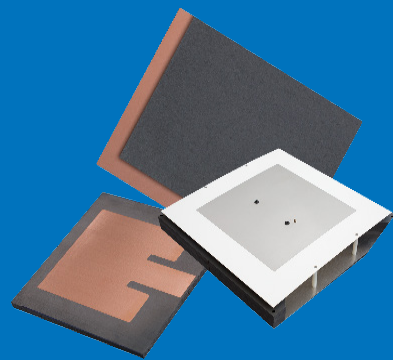
When used as part of an antenna design, MAGT<sub>x</sub>REX 555 materials offer designers the ability to produce electrically small antennas with bandwidth and efficiencies not previously possible.

MAGT<sub>x</sub>REX 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<sub>x</sub>REX 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:**

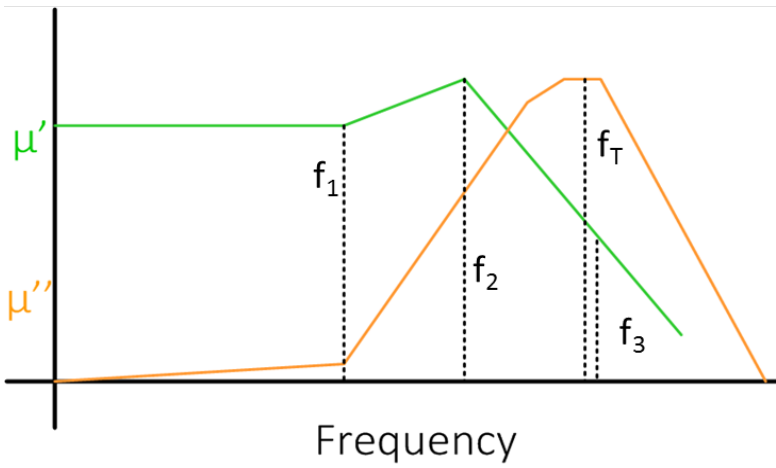
- Low profile VHF/UHF antennas
- Electrically small VHF / UHF antennas
- VHF magnetic components (eg. Inductor, Transformer)



MAGTREX 555 Property	Typical Value <sup>(1)</sup>	Direction X=CMD Y=MD	Units	Condition	Test Method
<b>Electric &amp; Magnetic Properties</b>					
Dielectric Constant, ( $\epsilon_r$ )	6.5	X/Y	-	400 MHz	Coaxial Airline 1" NRW Extraction
Dielectric Constant, ( $\epsilon_r$ )	5.3	Z	-	400 MHz	FSR, IPC-TM-650, 2.5.5.6
Permeability ( $\mu_r$ )	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 $\epsilon_r$	TBD	TBD	ppm/°C	TBD MHz	TBD
Thermal Coefficient of $\mu_r$	TBD	TBD	ppm/°C	TBD MHz	TBD
Volume Resistivity	615	-	M $\Omega$ ·cm	Condition A <sup>(2)</sup>	IPC-TM-650 2.5.17.1
Surface Resistivity	174	-	M $\Omega$	Condition A <sup>(2)</sup>	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
<b>Mechanical Properties</b>					
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 <sup>2</sup> (ft lb/in <sup>2</sup> )	-	ASTM D256 - 10e1
<b>Thermal Properties</b>					
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 <sup>2</sup> 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
<b>Physical Properties</b>					
Flammability	N/A	-	-	-	-
Moisture Absorption	<.25	-	%	D48/50	IPC TM-650 2.6.2.1
Density	3.45	-	g/cm <sup>3</sup>	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

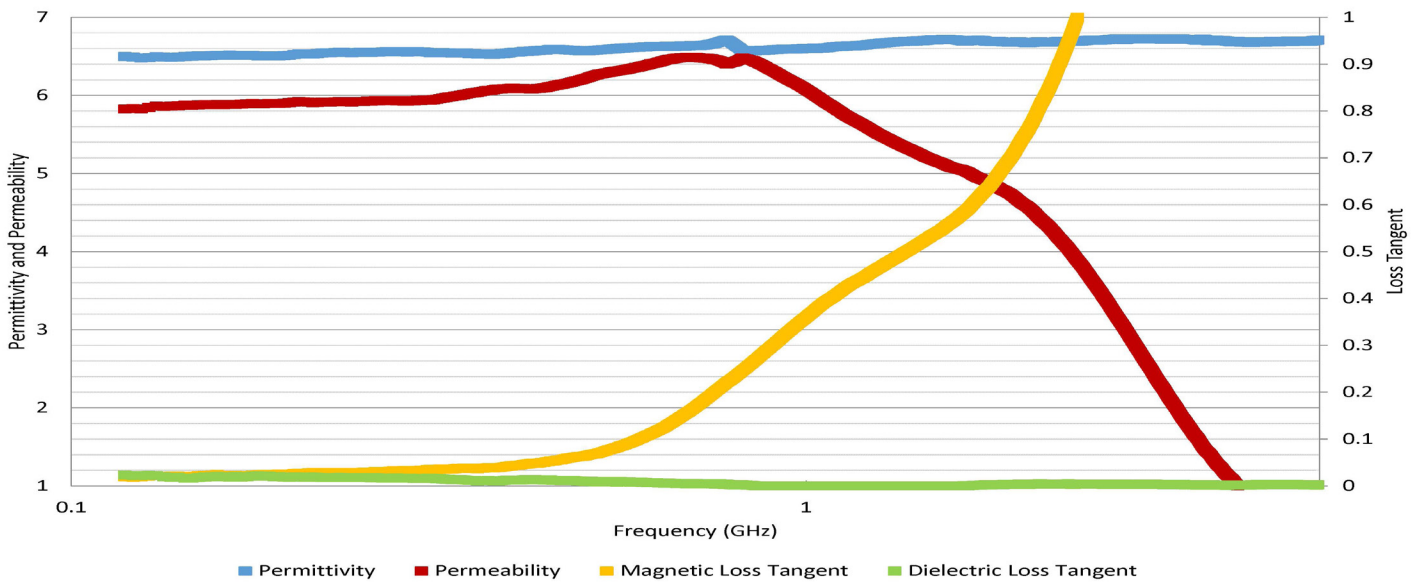


Figure 2 - Typical MAGTREX 555 properties at 23C

Standard Thicknesses		Standard Panel Size	Standard Cladding
0.040" (1.02mm) +/- 0.002"	0.140" (3.56mm) +/- 0.007"	12" X 18" (305 X 457 mm)	<u>Electrodeposited Copper Foil</u> 1 oz. (35μm)  <u>Unclad</u>
0.060" (1.52mm) +/- 0.003"	0.200" (5.08mm) +/- 0.010"		
0.080" (2.03mm) +/- 0.004"	0.260" (6.60mm) +/- 0.013"		
0.100" (2.54mm) +/- 0.005"			

**The information in this data sheet is intended to assist you in designing with Rogers' circuit materials. It is not intended to and does not create any warranties express or implied, including any warranty of merchantability or fitness for a particular purpose or that the results shown on this data sheet will be achieved by a user for a particular purpose. The user should determine the suitability of Rogers' circuit materials for each application.**

**MAGTREX 555 laminates are in production scale-up**

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