

## HF-330 Thermoset Dielectric Substrate for RF Antennas

HF-330 is a ceramic-filled hydrocarbon-based copper clad laminate reinforced with woven fiberglass. The special ceramic-filled hydrocarbon composite offers low signal loss and superior, stable PIMD performance in microwave antenna applications.

HF-330 bonds well to reverse treated copper (RTF) with a smooth profile. The low loss dielectric properties combined with the use of smooth RTF copper results in low PIMD values of  $\approx -160$  dBc and lower insertion loss at higher frequency. These benefits lead to higher signal gain and optimized signal to noise ratio.

Traditional thermoset laminates can degrade over time by oxidation with time and elevated temperatures. Oxidation is permanent and leads to a shift toward a higher dielectric constant, elevated loss values, and changing color. The impact of shifting dielectric properties depends on circuit design, operating power, and use temperature. HF-330 has been developed with much better resistance to oxidation. HF-330 has also been designed with low moisture absorption. The combination of low moisture resistance and stable dielectric properties over time, temperature, and frequency, satisfy the most demanding antenna applications.

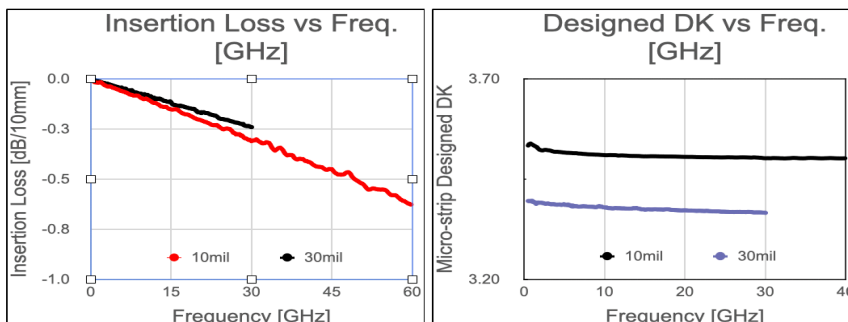
HF-330 can be fabricated using standard FR-4 PCB fabrication without special hole wall preparation. The low CTE values enable reliable hybrid multilayer constructions.

HF-330 is a highly engineered composite designed to meet the demands of high volume RF / microwave applications.

### Benefits & Applications:

- Excellent PIMD performance
- Low DF / Insertion loss
- Controlled DK & Impedance
- Well Suited for Hybrid Multilayers
- Enhanced Oxidation Resistance
- Stable Dielectric Properties over Temperature and Frequency
- Low Moisture Absorption
- Low CTE for Multilayer Applications
- Dimensionally Stable
- High Performance / Price Ratio

- Phase Shift
- LNA/LNB
- ETC Antenna
- Satellite Microstrip Patch Antennas
- RFIC
- Passive Components (Dividers, Filters, Couplers, Up/Down Converter)



### HF-330 Offers Superior RF Performance Over Frequency.

1 oz. RTF Copper has been used for Insertion Loss measurement.

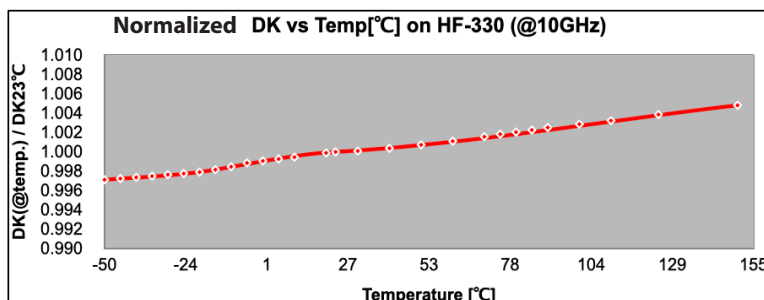
Designed DK measured by Micro-strip Differential Phase Length.

For HF-330 –30 mil products, 50 $\Omega$  impedance line width is wider than  $\lambda/4$  from 20~30GHz.

HF-330 Typical Values					
Property	Test Method	Unit	Value	Unit	Value
Dk @ 10 GHz	IPC-650 2.5.5.5.1 Mod.		3.35 ± 0.08		3.35 ± 0.08
Designed DK (30 mil)	MS Differential Phase Length		3.38		3.38
Df @ 2 GHz	IPC-650 2.5.5.5.1 Mod.		0.0019		0.0019
Df @ 10 GHz	IPC-650 2.5.5.5.1 Mod.		0.0025		0.0025
TcK (-50 to 150 °C)	IPC-650 2.5.5.5	ppm/°C	+39	ppm/°C	+39
PIMD (Typical)	43dBm swept @1800MHz	dBc	-160	dBm	-117
Moisture Absorption	IPC-650 2.6.2.1	%	0.04	%	0.04
Peel Strength (1 oz. RTF copper)	IPC-650 2.4.8 (Solder)	lbs/in	5	N/mm	0.9
Dimensional Stability	IPC-650 2.4.39 (After Etch)	% (MD)	-0.008	% (CD)	-0.005
Dimensional Stability	IPC-650 2.4.39 (After Bake)	% (MD)	-0.041	% (CD)	-0.026
Dimensional Stability	IPC-650 2.4.39 (After Stress)	% (MD)	-0.057	% (CD)	-0.044
Density (Specific Gravity)	IPC-650 2.3.5	g/cm <sup>3</sup>	1.75	g/cm <sup>3</sup>	1.75
Specific Heat	IPC-650 2.4.50	J/g°C	0.9	J/g°C	0.9
Thermal Conductivity (Unclad)	IPC-650 2.4.50	W/M*K	0.6	W/M*K	0.6
T <sub>d</sub> (2% wt. loss)	IPC-650 2.4.24.6/TGA	°F	761	°C	405
T <sub>d</sub> (5% wt. loss)	IPC-650 2.4.24.6/TGA	°F	815	°C	435
CTE (X -Y axis) (50 to 150 °C)	IPC-650 2.4.41	ppm/°C	12-18	ppm/°C	12-18
CTE (Z axis) (50 to 150 °C)	IPC-650 2.4.41	ppm/°C	50	ppm/°C	50
T <sub>g</sub>	IPC-650 2.4.24	°F	>536	°C	>280
Flammability	Internal		NON-FR		NON-FR
Lead Free Process Compatible	Internal		Yes		Yes

All reported values are typical and should not be used for specification purposes. In all instances, the user shall determine suitability in any given application.

### HF-330 Offers Very Stable Performance Over a Wide Temperature Range.



Dielectric layers of HF-330 are on the basis of hydrocarbon thermoset composite materials.

Standard HF-330 series can be manufactured in increments of 0.010" (10 mil). Please call for availability of additional thicknesses.

PIMD performance can be influenced by many factors including copper. Values were measured with 120mm circuit length on 60 mil dielectric materials with reverse treated copper foil.

Our Standard panel size is 18" x 24" (457mm X 610mm). Please call for availability of other sizes.

Please call for other types of cladding.

Standard Dielectric Thickness (mil)	Standard Panel Size	Standard Copper
10, 20, 30, 60 (available in 10 mil increments)	12" x 18", 18" x 24" 12" x 48", 36" x 48"	½ oz. Reverse Treated ED Foil 1 oz. Reverse Treated ED Foil

An example of 30 mil material with 1 oz. Reverse Treated Cu on both sides is part# : **HF-330-0300-CL1/CL1-18"x24"(HF-330-0300-CL1/CL1-457mm x 610mm)**

