

## Thermoset Dielectric Substrate for RF Antennas

### Benefits

- 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

### Applications

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



HF-340 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.

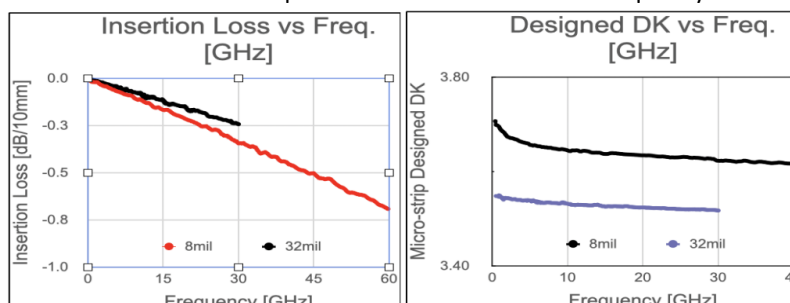
HF-340 bonds well to reverse treated copper (RTF) with a smooth profile. The low loss dielectric properties combined with the use of smooth RTF copper results in low PIMD values of  $\approx -160$  dBc and lower insertion loss at higher frequency. These benefits lead to higher signal gain and optimized 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-340 has been developed with much better resistance to oxidation. HF-340 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-340 can be fabricated using standard FR-4 PCB fabrication without special hole wall preparation. The low CTE values enable reliable hybrid multilayer constructions.

HF-340 is a highly engineered composite designed to meet the demands of high volume RF / microwave applications.

HF-340 Offers Superior RF Performance Over Frequency



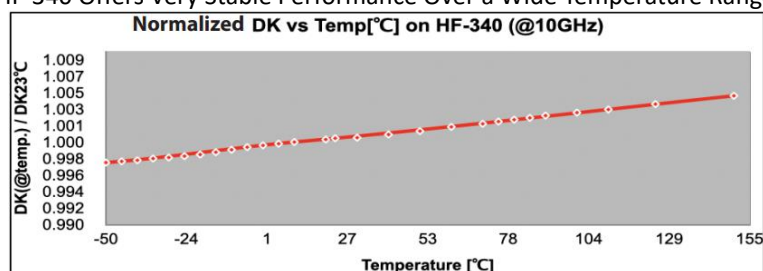
1 oz. RTF Copper has been used for Insertion Loss measurement.

Designed DK measured by Micro-strip Differential Phase Length.

For HF-340 –32 mil products, 50 $\Omega$  impedance line width is wider than  $\lambda/4$  from 20~30GHz.

Properties	Conditions	Typical Value	Unit	Test Method
Electrical Properties				
Dielectric Constant	@ 10 GHz	3.45 ± 0.08		IPC-650 2.5.5.5.1 Mod.
Designed DK(32 mil)	@ 10 GHz	3.53		MS Differential Phase Length
Dissipation Factor	@ 10 GHz	0.0025		IPC-650 2.5.5.5.1 Mod.
Volume Resistivity		1.1 x 10 <sup>9</sup>	Mohm/cm	IPC-TM 650 2.5.17.1
Surface Resistivity		8.5 x 10 <sup>8</sup>	Mohm	IPC-TM 650 2.5.17.1
Thermal Properties				
Thermal Conductivity	Unclad	0.6	W/M*K	IPC-650 2.4.50
CTE (50 to 150 °C)	X	12	ppm/°C	IPC-650 2.4.41
	Y	18		
	Z	45		
TcK (-50 to 150 °C)		+38	ppm/°C	IPC-650 2.5.5.5
T <sub>d</sub>	2% wt. loss	405 (761)	°C (°F)	IPC-650 2.4.24.6/TGA
	5% wt. loss	435 (815)	°C (°F)	
T <sub>g</sub>		>280 (>536)	°C (°F)	IPC-650 2.4.24
Mechanical Properties				
Peel Strength	1 oz. RTF copper	0.09 (5)	N/mm (lbs/in)	IPC-650 2.4.8 (Solder)
Dimensional Stability	MD	-0.008	%	IPC-650 2.4.39 (After Etch)
	CD	-0.005	%	
	MD	-0.041	%	IPC-650 2.4.39 (After Bake)
	CD	-0.026	%	
	MD	-0.057	%	IPC-650 2.4.39 (After Stress)
	CD	-0.044	%	
Chemical / Physical Properties				
Moisture Absorption		0.04	%	IPC-650 2.6.2.1
Density	Specific Gravity	1.77	g/cm³	IPC-650 2.3.5
Specific Heat		0.90	J/g°C	IPC-650 2.4.50

HF-340 Offers Very Stable Performance Over a Wide Temperature Range.



Typical Thicknesses		
Standard Dielectric Thickness (mil)	Standard Panel Size	Standard Copper
16, 24, 32, 64 (available in 8 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

- \* All test data provided are typical values and not intended to be specification values. For review of critical specification tolerances, please contact a company representative directly.
- \* HF-340 can be manufactured in increments of 0.008"(0.200mm).
- \* Standard panel size is 18" x 24" (457 mm x 610 mm).
- \* Please contact AGC for availability of additional thicknesses, other sizes & any other type of cladding.

