

TLF-35A Advanced TLF - Improved PTH and PIMD Performance

Features and Benefits :

- Improved PIMD with DK3.5
- Improved PTH Quality
- Stable at high frequency
- Stable at high temp.
- Low moisture absorption
- Excellent Peel Strength
- Excellent price/performance Ratio

Applications :

- Size effective Antenna
- Power Amplifiers
 - High Gain
 - TD-SCDMA
 - WCDMA
 - LTE
 - WLAN
 - BWA
- LNA, Repeater PA
- Passive Components
 - Filters / Couplers

TLF-35 is an organic-ceramic laminate in Taconic's family of product. It is based on woven glass reinforcement. TLF-35 is a result of Taconic's expertise in both ceramic fill technology and in coated PTFE fiberglass.

TLF-35A is the best choice for low cost, high volume commercial microwave and radio frequency application. TLF-35A has excellent peel strength for ½ ounce and 1 ounce copper (even in comparison to standard epoxy materials), a critical aspect whenever rework is required. TLF-35A is designed to offer superior high frequency performance.

TLF-35A's ultra low moisture absorption rate and low dissipation factor minimize phase shift with frequency.

Advanced TLF-35 (TLF-35A) laminates show similar electrical properties as TLF-35 but tighter DK tolerance. TLF-35A is designed to obtaining improved PIMD performances on size effective boards for antenna application. Most of sensitive PIMD required base material's Dielectric constant is around 3.0 whereas TLF-35A laminates dielectric constant is 3.5 with similar PIMD levels.

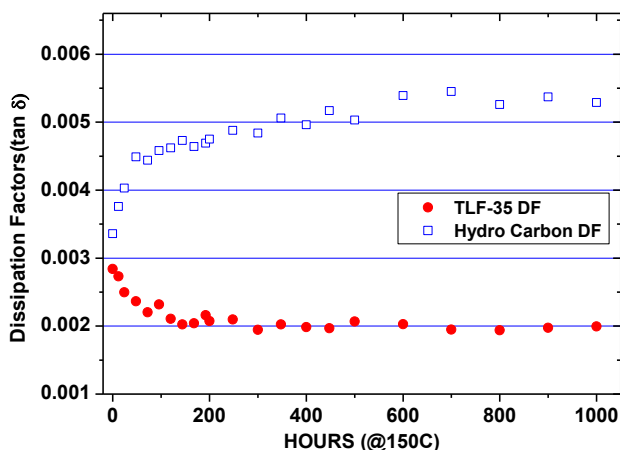
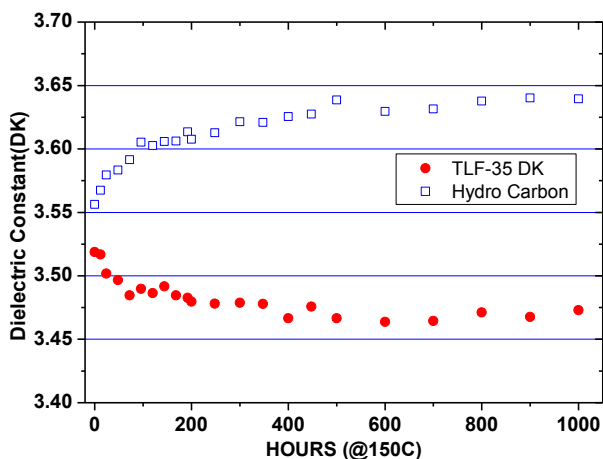
TLF-35-A laminates show better PTH quality which results in more stable hole wall and insulation resistance even for the smaller drilled holes.

See "How to Order" on the back page for a complete product listing.

PTFE Composites vs. Rubber (Hydrocarbon) Composites:

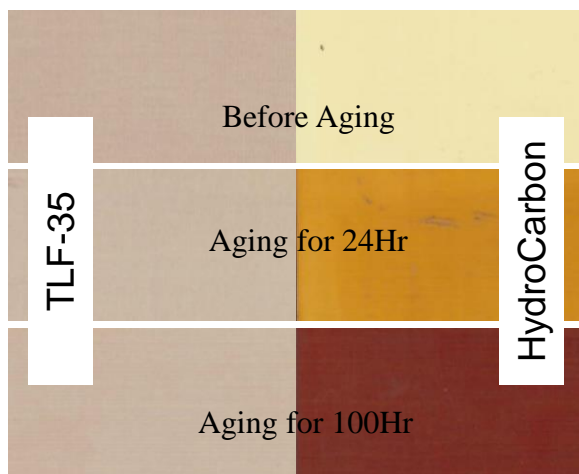
A primary difference between PTFE-based composites and rubber based (hydrocarbon) substrates is PTFE is oxidation resistant. PTFE starts to degrade near 600° C when the carbon-fluorine bond starts to fail. PTFE is a thermoplastic and does not have unreactive chemistry after processing. Rubbers, however, cure by a thermosetting mechanism and never cure to completion, thus leaving some level of unreacted chemistry. Rubber substrates are not temperature stable or oxidation resistant which causes these materials to turn yellow and then black with air/heat. Automotive rubber is typically sulfur cured and contains a high level of carbon black. These additives cannot be used in laminates due to their poor electrical properties.

Laminate suppliers cannot use the same strategies as the automotive industry to stabilize their rubber. This leaves the rubber (hydrocarbon) products susceptible to temperature driven oxidation (a time and temperature-based phenomenon). Oxidation, diffusion, stress relaxation and any process that is temperature related generally follows an Arrhenius relationship where the rate of oxidation doubles with every ten degree rise. Rubber oxidation is no exception; with exposure to temperature and air, rubbers oxidize, embrittle and their elongation and peel strength decrease while their dielectric constant and dissipation factor increase.



PTFE-fiberglass products such as TLF-35 do not suffer from a change in their dielectric constant or dissipation factor with temperature exposure. Above figures show the change in dielectric constant and dissipation factor of a non-brominated rubber and a PTFE ceramic fiberglass laminate with exposure to air at 150°C.

Copper peel strength will decline with temperature due to the oxidation of the copper in addition to any factors that would cause embrittlement of resin system. This oxidation (Yellowing) will occur at as low as 95°C over prolonged time periods.

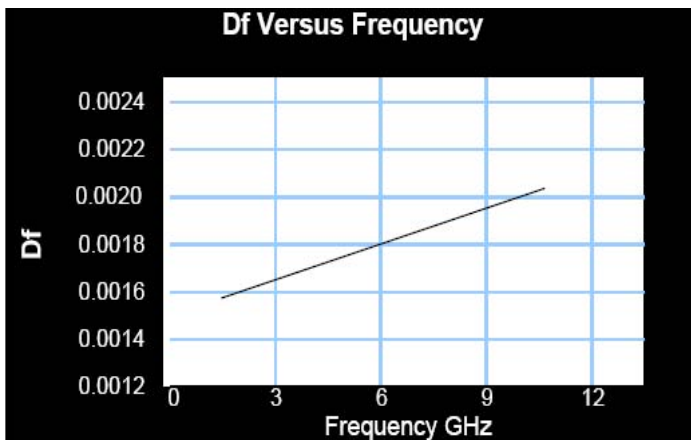
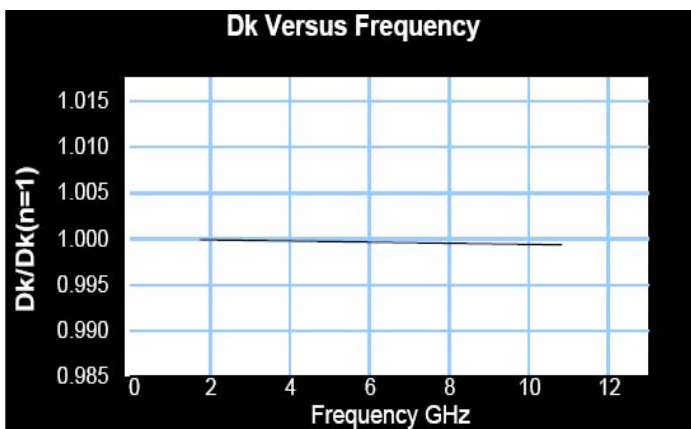


Effect of thermal aging on color

TLF-35-A TYPICAL VALUES

Property	Test Method	Units	Value	Units	Value
Dielectric Constant @ 1.9 GHz	IPC-TM 650 2.5.5.5.1 Mod		3.50±0.05		3.50±0.05
Dissipation Factor @ 1.9 GHz	IPC-TM 650 2.5.5.5.1 Mod		0.0016		0.0016
Dissipation Factor @ 10 GHz	IPC-TM 650 2.5.5.5.1 Mod		0.0022		0.0022
Water absorption	IPC-TM 650 2.6.2.1	%	0.03	%	0.03
Peel Strength (1 oz. copper)	IPC-TM 650 2.4.8	Lbs./linear inch	10	N/mm	1.8
Volume Resistivity	IPC-TM 650 2.5.17.1	Mohm-cm	2.0 x 10 ⁹	Mohm-cm	2.0 x 10 ⁹
Surface Resistivity	IPC-TM 650 2.5.17.1	Mohm	3.0 x 10 ⁸	Mohm	3.0 x 10 ⁸
Flexural Strength Lengthwise	IPC-TM 650 2.4.4	psi	13,000	N/mm ²	90
Flexural Strength Crosswise	IPC-TM 650 2.4.4	psi	13,000	N/mm ²	90
Thermal Conductivity	IPC-TM-650 2.4.50	W/m/K	0.37	W/m/K	0.37
x-y CTE (50 ~ 150°C)	IPC-TM 650 2.4.41	ppm/°C	9-12	ppm/°C	9-12
z CTE (50 ~ 150°C)	IPC-TM 650 2.4.41	ppm/°C	80	ppm/°C	80
Flammability	UL-94		V-0		V-0

Type	Dk	
TLY-5A	2.17	
TLY-5	2.20	
TLY-3	2.33	
TLT-0	TLX-0	2.45
TLT-9	TLX-9	2.50
TLT-8	TLX-8	2.55
TLT-7	TLX-7	2.60
TLT-6	TLX-6	2.65
TLE-95	2.95	
TLC-27	2.75	
TLC-30	RF-30	3.00
TLC-32		3.20
TLF-35	3.50	
TLF-35-A	3.50	
RF-35	RF-35A2	3.50
TRF-41		4.10
TRF-43		4.30
TRF-45		4.50
RF-60A		6.15
CER-10		10



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.

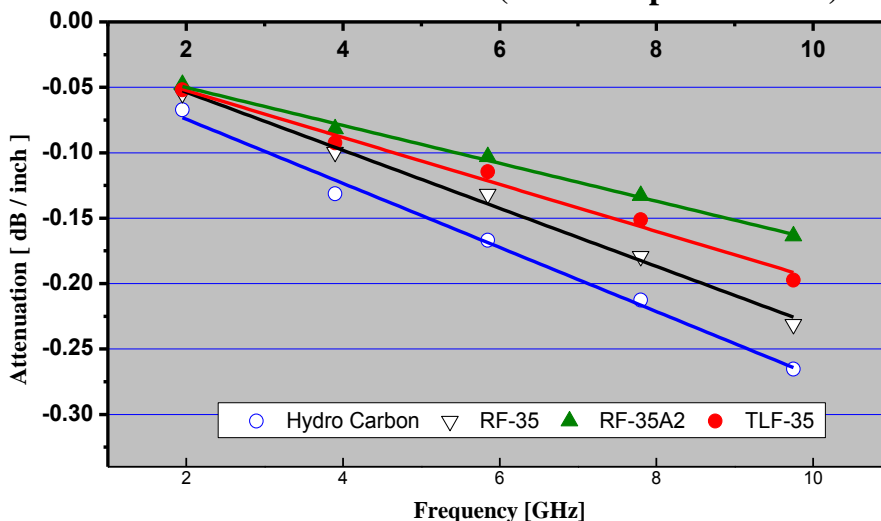
Designation	Dielectric Constant	Typical Thickness ¹		Typical Panel Size ²	
		Inches	mm		
TLF-35-A	3.5 +/- 0.05	0.030"	0.76	12"x18"	305mmx457mm
		0.060"	1.52	16"x18"	406mmx457mm
				18"x24"	457mmx610mm
				36"x48"	914mmx1220mm

¹ TLF-35-A series can be manufactured in increments of 0.030". Please call for availability of additional thicknesses.

² Our Standard sheet size is 36"x48"(914mm X 1220mm). Please contact our customer service department for availability of other sizes.

Available Copper Cladding						
Designation	Weight	Copper Thickness		R _{ms} Treated Side		Description
CVH (CH)	½ oz./sq. ft.	~ .0007"	~ 18µm	19µin	0.48µm	Very low profile / Electrodeposited
CV1 (C1)	1 oz./sq. ft.	~ .0014"	~ 35µm	25µin	0.64µm	Very low profile / Electrodeposited
CLH	½ oz./sq. ft.	~ .0007"	~ 18µm	18µin	0.46µm	Reverse Treated / Electrodeposited
CL1	1 oz./sq. ft.	~ .0014"	~ 35µm	16µin	0.41µm	Reverse Treated / Electrodeposited
C2	2 oz./sq. ft.	~ .0028"	~ 70µm	27µin	0.69µm	Electrodeposited

Total Attenuation (Microstrip Resonator)



Total Attenuation were measured with microstrip ring resonator. Material under test were 20mil dielectric thickness and 1 oz. copper.

**An example of a 30mil material with 1 oz. RTF Copper on both sides is part# :
TLF-35-0300-A-CL1/CL1-18" x 24"(TLF-35-0300-A-CL1/CL1-457mm x 610mm)**