TLF Base material for Power Amplifier

Features and Benefits :

- **Exceptionally low loss**
- **Stable at high frequency**
- **Stable at high temp.**
- **Low moisture absorption**
- **Excellent Peel Strength**
- **Excellent price/performance Ratio**

Applications :

- **Power Amplifiers**
  - **High Gain**
  - **TD-SCDMA**
  - **WLAN**
  - **BWA**
- **LNA, Repeater PA**
- **Passive Components**
  - **Filters / Couplers**

TLF is an organic-ceramic laminate in Taconic's family of products. It is based on woven glass reinforcement.

TLF is the best choice for low cost, high volume commercial microwave and radio frequency application.

TLF 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 is designed to offer superior high frequency performance.

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

TLF is dimensionally stable due to the use of woven fabrics in its design.

TLF laminates are generally ordered clad on one or both side with ½, 1, and 2 oz electrodeposited copper.

TLF laminates exhibit flammability of V-0, and are tested in accordance with IPC-TM 650. A certificate of compliance containing lot-specific test data accompanies each shipment.

TACONIC

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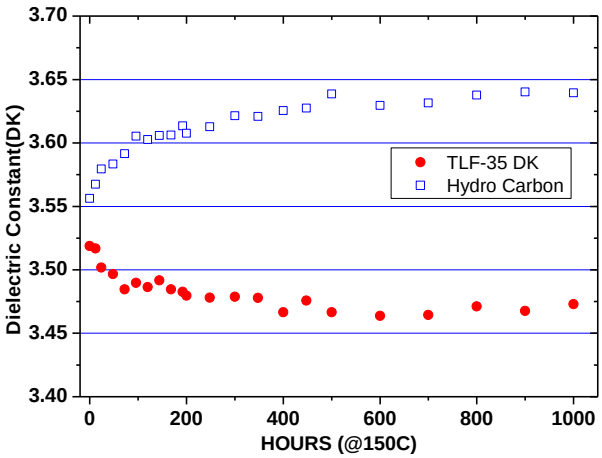
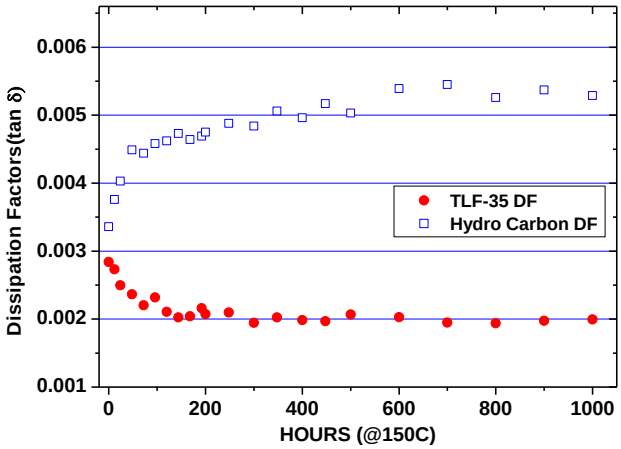
PTFE Composites vs. Rubber (Hydrocarbon) Composites:

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.

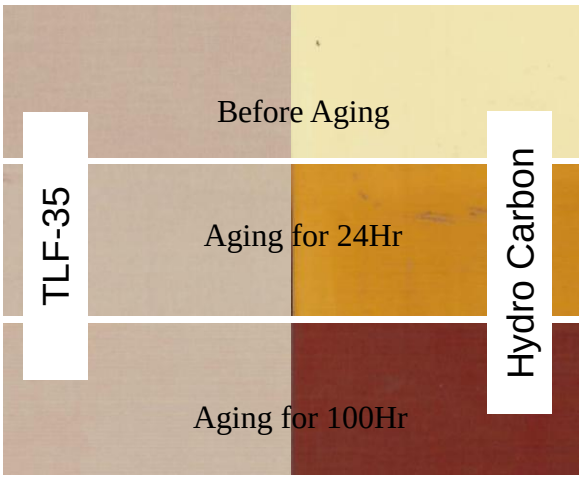
Laminate suppliers cannot use the same strategies as the automotive industry to stabilize their rubber. This leaves the rubber (hydrocarbon) products susceptible to temperature driven oxidation (a time and temperature-based phenomenon). Oxidation, diffusion, stress relaxation and any process that is 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℃.

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℃ over prolonged time periods.



Effect of thermal aging on color

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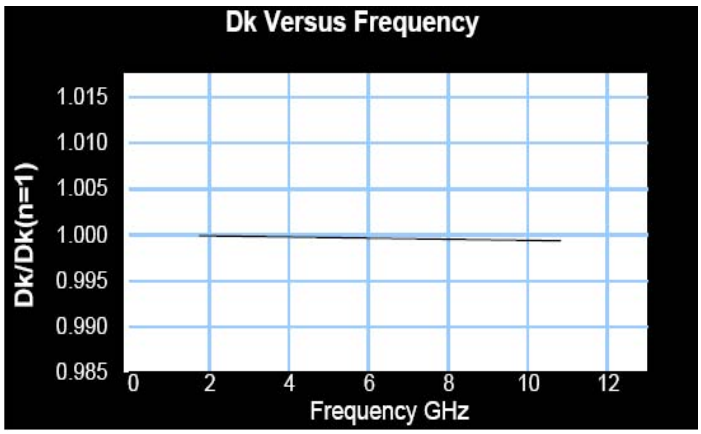
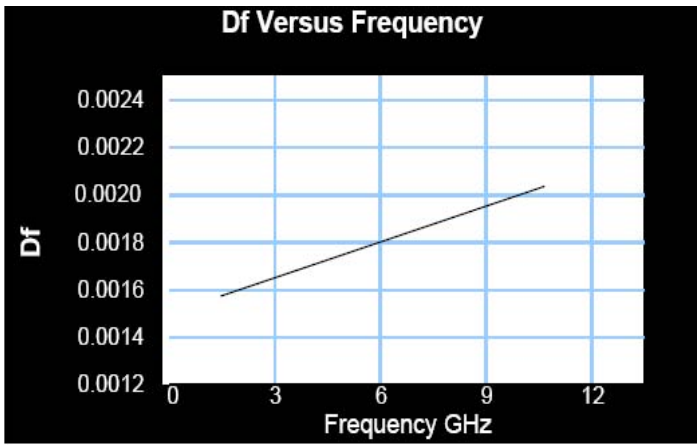
TLF TYPICAL VALUES					
Property	**Test Method**	**Units**	**Value**	**Units**	**Value**
Dielectric Constant @ 1.9 GHz	IPC-TM 650 2.5.5.5.1 Mod		TLF-34 : 3.40 TLF-35 : 3.50		TLF-34 : 3.40 TLF-35 : 3.50
Dissipation Factor @ 1.9 GHz	IPC-TM 650 2.5.5.5.1 Mod		0.0016		0.0016
Dissipation Factor @ 10 GHz	IPC-TM 650 2.5.5.5.1 Mod		0.0020		0.0020
Water absorption	IPC-TM 650 2.6.2.1	%	0.02	%	0.02
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	1.7×10^9	Mohm·cm	1.7×10^9
Surface Resistivity	IPC-TM 650 2.5.17.1	Mohm	2.8×10^8	Mohm	2.8×10^8
Flexural Strength Lengthwise	IPC-TM 650 2.4.4	psi	18,500	N/mm^2	128
Flexural Strength Crosswise	IPC-TM 650 2.4.4	psi	14,500	N/mm^2	100
Thermal Conductivity	ASTM F433	W/m/K	0.36	W/m/K	0.36
x-y CTE (50 ~ 150℃)	ASTM D3386 (TMA)	ppm/℃	21-23	ppm/℃	21-23
z CTE (50 ~ 150℃)	ASTM D3386 (TMA)	ppm/℃	85	ppm/℃	85
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-34		**3.40**
TLF-35		**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.

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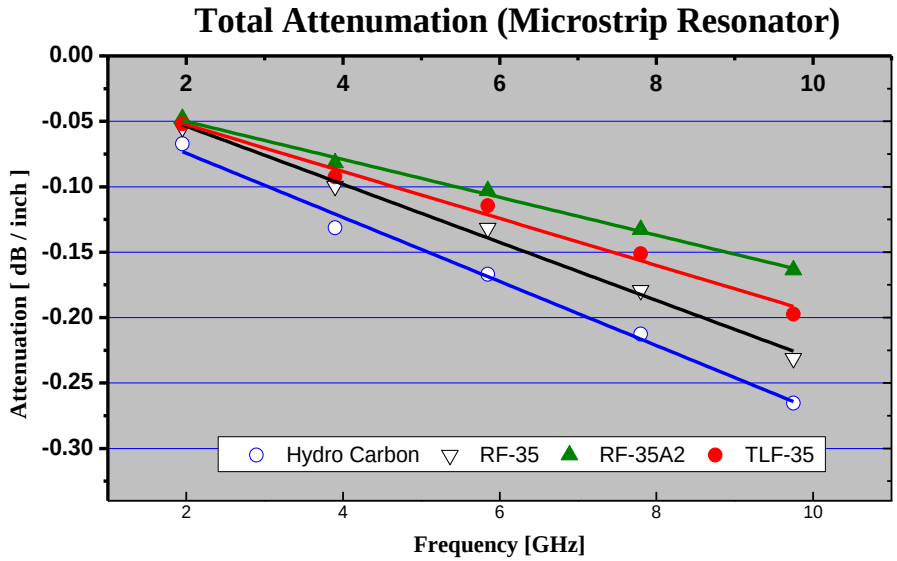
Designation	Dielectric Constant
TLF-34	3.4 +/- .07
TLF-35	3.5 +/- .07

Typical Thickness [1]	
Inches	㎜
0.0100”	0.25
0.0200”	0.51
0.0300”	0.76
0.0600”	1.52

Typical Panel Size [2]	
12”x18”	305mmx457mm
16”x18”	406mmx457mm
18”x24”	457mmx610mm
16”x36”	406mmx914mm
24”x36”	610mmx914mm
18”x48”	457mmx1220mm

[1] TLF series can be manufactured in increments of 0.0100”. Please call for availability of additional thicknesses.
[2] Our Standard sheet size is 36”*48”(914mm X 1220㎜). Please contact our customer service department for availability of other size.

Available Copper Cladding						
Designation	Weight	Copper Thickness		R_{ms} Treated Side		Description
CH	½ oz./sq. ft.	~ .0007”	~ 18㎛	27µin	0.7㎛	Very low profile / Electrodeposited
C1	1 oz./sq. ft.	~ .0014”	~ 35㎛	25µin	0.6㎛	Very low profile / Electrodeposited
C2	2 oz./sq. ft.	~ .0028”	~ 70㎛	77µin	2.0㎛	Electrodeposited



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

An example of a 60mil material with 1 oz. copper on both sides is part # : TLF-35-0200-C1/C1-18” x 24”(TLF-35-0200-C1/C1-457mm x 610mm)