TSM-30

Excellent Thermal Stability
Exceptionally Low Loss
Phase Stable Material
Tight DK Tolerance
DK Stable over Temperature

TACONIC

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APPLICATIONS

Printed circuit filters
Front end down convertors
Modulators
Low-loss antennas
Radar Systems

TSM-30

Thermally Stable Material

TSM-30 was specifically engineered by Taconic to offer our customers a high reliability material with consistent performance over broad temperature and frequency ranges. The low dielectric loss properties of this material are well suited for high frequency microwave applications.

Typically, non-woven ceramic filled PTFE laminates are low loss materials, however, they also exhibit undesirable moisture and solvent absorption. The woven reinforced ceramic filled PTFE laminates have significantly lower moisture absorption but much higher loss. Taconic's TSM-30 material was created to offer customers the best of both worlds. TSM-30 delivers an exceptionally low loss tangent *and* low moisture and solvent absorption.

Insertion loss is a combination of material losses (Df or loss tangent), conductor losses, and radiation losses. TSM-30 is typically used at frequencies above 1 GHz, and at these higher frequencies, the surface roughness of the copper cladding will contribute to the conductor losses and overall insertion loss of the design. We recognize that smoother surface roughness on the copper will give lower insertion loss and better performance and because of that, we have standardized on a very low profile copper. Our very low profile copper has an R_{MS} surface roughness of approximately one-third standard electrodeposited copper. This choice results in the lowest possible insertion loss while still maintaining exceptional copper bond strength.

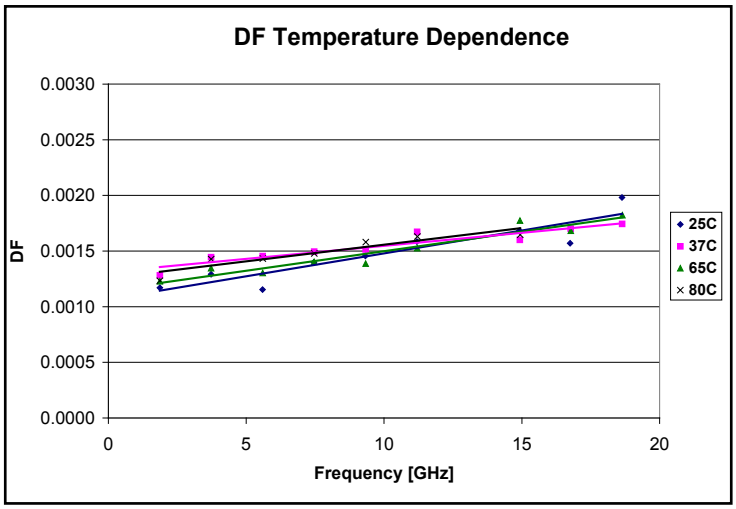
TSM-30 laminates are generally ordered clad on both sides with 1/2, 1 or 2 oz. very low profile electrodeposited copper.

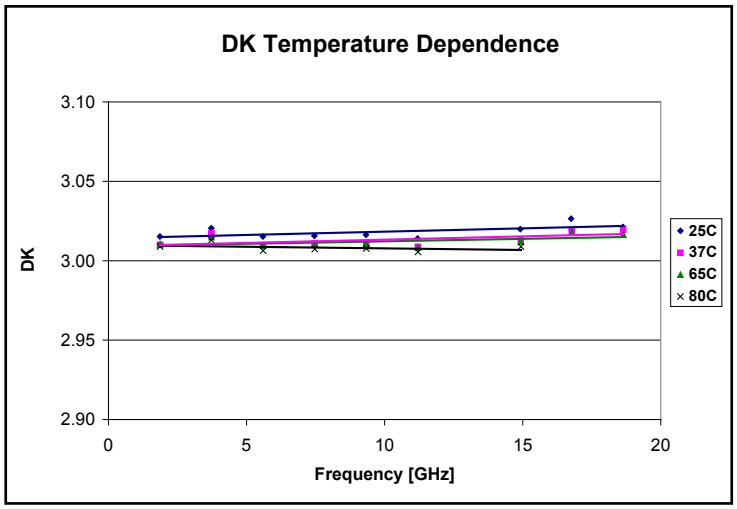
TSM-30 laminates are tested in accordance with IPC-TM 650. A certificate of compliance containing lot-specific data accompanies each shipment.

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

TSM-30 Typical Values					
Property	Test Method	Unit	Value	Unit	Value
Dielectric Constant @ 10 GHz	IPC-TM-650 2.5.5.5.1 (Modified)		3.0		3.0
Dissipation Factor @ 10 GHz	IPC-TM-650 2.5.5.5.1 (Modified)		0.0015		0.0015
Moisture Absorption	IPC-TM-650 2.6.2.1	%	0.03	%	0.03
Dielectric Breakdown	ASTM D 149	kV	36	kV	36
Dielectric Strength	ASTM D 149	V/mil	610	V/mm	24016
Volume Resistivity	IPC-TM-650 2.5.17.1 (Humidity Conditioning)	Mohm/cm	1.7×10^8	Mohm/cm	1.7×10^8
Surface Resistivity	IPC-TM-650 2.5.17.1 (Elevated Temperature)	Mohm	5.6×10^7	Mohm	5.6×10^7
Arc Resistance	IPC-TM-650 2.5.1	Seconds	247	Seconds	247
Flexural Strength (MD)	ASTM D 790	psi	6900	bar	475
Flexural Strength (CD)	ASTM D 790	psi	6000	bar	414
Tensile Strength (MD)	ASTM D 3039	psi	5100	bar	352
Tensile Strength (CD)	ASTM D 3039	psi	3800	bar	262
Young's Modulus	ASTM D 3039	psi	4.75×10^5	bar	32000
Poisson's Ratio	ASTM D 3039		0.24		0.24
Compressive Modulus	ASTM D 695 (23ºC)	kpsi	465	bar	32100
Peel Strength (1 oz CV1)	IPC-TM-650 2.4.8 Sec 5.2.2 (Thermal Stress)	lbs/in	8	N/mm	1.46
Dimensional Stability (MD)	IPC-TM-650 2.4.39 Sec 5.4 (After bake)	mils/in	-0.25	mm/M	-0.25
Dimensional Stability (CD)	IPC-TM-650 2.4.39 Sec 5.4 (After bake)	mils/in	-0.22	mm/M	-0.22
Density (Specific Gravity)		g/cm^3	2.30	g/cm^3	2.30
Specific Heat	ASTM E 1269 (DSC)	J/g/K	0.627	J/g/K	0.627
Thermal Conductivity	ASTM F 433	W/m/K	0.27	W/m/K	0.27
CTE (x)	IPC-TM-650 2.4.41 / ASTM D 3386 (>RT - 125°C)	ppm/°C	23	ppm/°C	23
CTE (y)	IPC-TM-650 2.4.41 / ASTM D 3386 (>RT - 125°C)	ppm/°C	28	ppm/°C	28
CTE (z)	IPC-TM-650 2.4.41 / ASTM D 3386 (>RT - 125°C)	ppm/°C	78	ppm/°C	78
Outgassing (% TML)	ASTM E 595 *	%	0.05	%	0.05
Outgassing (% CVCM)	ASTM E 595 *	%	0.01	%	0.01
Outgassing (% WVR)	ASTM E 595 *	%	0.01	%	0.01
Flammability Rating	UL-94		V-0		V-0

*As reported by NASA. See http://outgassing.nasa.gov/og_disclaimer.html.





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.

How To Order

Designation	Dielectric Constant	Typical Thicknesses[1]	
TSM-30	3.00 +/- 0.05	0.0050”	0.13 mm
		0.0100”	0.25 mm
		0.0150”	0.38 mm
		0.0200”	0.51 mm
		0.0300”	0.76 mm
		0.0600”	1.52 mm

Available Sheet Sizes[2]	
12” x 18”	304 mm x 457 mm
16” x 18”	406 mm x 457 mm
18” x 24”	457 mm x 610 mm
16” x 36”	406 mm x 914 mm
24” x 36	610 mm x 914 mm

[1]Other thicknesses may be available. Please call for information.
[2]Our standard sheet size is 36” x 48” (914 mm x 1220 mm). Please contact our customer service department for availability of other sizes.

Available Copper Cladding						
Designation	Weight	Copper Thickness		R_{MS} Treated Side		Description
RH	1/2 oz / ft^2	~0.0007”	~18 µm	16 µin	0.4 µm	Rolled annealed
R1	1 oz / ft^2	~0.0014”	~35 µm	11 µin	0.3 µm	Rolled annealed
CVH (CH)	1/2 oz / ft^2	~0.0007”	~18 µm	27 µin	0.7 µm	Very low profile / Electrodeposited
CV1 (C1)	1 oz / ft^2	~0.0014”	~35 µm	25 µin	0.6 µm	Very low profile / Electrodeposited
C2	2 oz / ft^2	~0.0028”	~70 µm	77 µin	2.0 µm	Electrodeposited

Heavy metal claddings (aluminum, brass & copper) may also be available upon request. Please call for information.

An example of our part number is: **TSM-30-0300-CV1/CV1 - 18” x 24” (457 mm x 610 mm)**

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