

Company Introduction

Established in 1984, the TAIZHOU WANGLING insulating materials factory is the professional manufacturer of the high frequency microwave printed circuit board, and is an integrated economical entity of science research、 production and management in the field of electronic information material. Our company employs 86 engineering technicians, of which 15 employees own title senior professional post.. Our major products include Teflon woven glass fabric copper-clad laminates、 Teflon woven glass fabric copper-clad laminates with ceramic filled、 microwave composite dielectric copper-clad substrate、 microwave multilayer printed circuit board、 microwave electronic device and insulation 、 anti-sticking fabric, etc.. Our products are widely applied to the industries of aerospace、 aviation 、 satellite communication 、 navigation 、 aerospace 、 radar 、 electronic countermeasure、 3G、4G、5G communication、compass navigation satellite system、textile、 clothing、 food and so on. Our company has an annual production capacity of 1.36 million square meters for copper-clad laminate and 50000 square meters for microwave composite dielectric copper-clad substrate. We have successfully cooperated with national key projects many times and were approved by relevant departments from navigation, aviation, China manned space project and received the honor of “National Key New product” . Our company has passed the Quality Management System certification、 the Environmental management system certification、 the occupational health and safety management system certification、the quality management system of weapon equipment certification、and passed through the secrecy qualification level 3 certification. UL certification was passed in 2007.

Our company was granted with Jiangsu high technology enterprise, Jiangsu AAA credit grade enterprise and “observe contracts and keep promises” enterprise. In the scientific research, we rely on the support of domestic tertiary institutions and scientific research departments and founded Provincial Research Center for Engineering Technology. With the development of this industry, we are always based on the concept of “quality-focused and customer-oriented” and continually meet customers requirements to achieve a better cooperation.

In order to let new and old customers learn more our products and have a wider choice, we specially edit this instruction.

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Teflon woven glass fabric copper-clad laminates

F₄B-1/2

F₄B-1/2 is laminated with excellent material according to the requirements of microwave circuit in electrical performance. It is a kind of laminate of microwave PCB due to its excellent electrical performance and higher mechanical strength.

Technical Specifications:

Appearance	Meet the specification requirements for the laminate of microwave PCB by National and Military Standards.					
Types	F ₄ B255	F ₄ B265				
Dielectric Constant	2.55	2.65				
Dimension (mm)	300×250	380×350	440×550	500×500	460×610	600×500
	840×840	1200×1000	1500×1000	Special dimension can be customized according to customer's requirement.		
Copper thickness	0.018mm,0.035mm					
Thickness and Tolerance (mm)	Laminate thickness	0.17、0.25	0.5、0.8、1.0	1.5、2.0	3.0、4.0、5.0	
	Tolerance	±0.025	±0.05	±0.05	±0.09	
	The laminate thickness includes the copper thickness. For special dimension, customized laminates is available.					
Mechanical Strength	Warp	Thickness (mm)	Maximum Warp			
			Original board	Single side	Double side	
		0.25~0.5	0.030	0.050	0.025	
		0.8~1.0	0.025	0.030	0.020	
		1.5~2.0	0.020	0.025	0.015	
	3.0~5.0	0.015	0.020	0.010		
	Cutting/punching Strength	Thickness<1mm, no burrs after cutting, minimum space between two punching holes is 0.55mm, no delamination.				
	Thickness≥1mm, no burrs after cutting, minimum space between two punching holes is 1.10mm, no delamination.					
Peel strength (1oz copper)	Normal state: ≥15N/cm; No bubble、delamination、peel strength≥12N/cm (in the constant humidity and temperature、and keep in the melting solder of 260℃±2℃ for 20 seconds) .					
Chemical Property	According to the properties of laminate, the chemical etching method for PCB can be used. The dielectric properties of laminate are not changed. The plating through hole can be done, but the					

sodium treatment or the plasma treatment must be used.					
Electrical Property	Name	Test condition		Unit	Value
	Density	Normal state		g/ cm ³	2.2~2.3
	Moisture Absorption	Dip in the distilled water of 20±2°C for 24 hours		%	≤0.1
	Operating Temperature	High-low temperature chamber		°C	-50°C~+260°C
	Thermal Conductivity			W/m/k	0.3
	CTE (typical)	0~-100°C		ppm/°C	16 (x)
					21 (y)
					186 (z)
	Shrinkage Factor	2 hours in boiling water		%	< 0.0002
	Surface Resistivity	500V DC	Normal state	M • Ω	≥1 × 10 ⁴
			Constant humidity and temperature		≥5 × 10 ³
	Volume Resistivity	Normal state		MΩ.cm	≥1 × 10 ⁶
		Constant humidity and temperature			≥9 × 10 ⁴
	Surface dielectric strength	Normal state		δ=1mm (Kv/mm)	≥1.2
Constant humidity and temperature		≥1.1			
Dielectric Constant	10GHz		ε r	2.55, 2.65 (±2%)	
Dissipation Factor	10GHz		tgδ	≤1.5 × 10 ⁻³	

Teflon woven glass fabric copper-clad laminates with high permittivity

F₄BK-1/2

F₄BK-1/2 is laminated by laying up of woven glass fabric with Teflon resin, according to the scientific formulation and strict technology process. This product takes some advantages over F₄B series in the electrical performance (wider range of dielectric constant) .

Technical Specifications:

Appearance	Meet the specification requirements for the laminate of microwave PCB by National and Military Standards.					
Types	F ₄ BK225	F ₄ BK265				
Dielectric Constant	2.25	2.65				
Dimension (mm)	300×250 840×840	380×350 1200×1000	440×550 1500×1000	500×500	460×610	600×500
	For special dimension, customized laminates is available.					
Thickness and Tolerance (mm)	Laminate thickness	0.25	0.5	0.8	1.0	
	Tolerance	±0.025	±0.05	±0.05	±0.05	
	Laminate thickness	1.5	2.0	3.0	4.0	5.0
	Tolerance	±0.05	±0.075	±0.09	±0.10	±0.10
	The laminate thickness includes the copper thickness. For special dimension, customized laminates is available.					
Mechanical Strength	Warp	Thickness (mm)	Maximum Warp			
			Original board	Single side	Double side	
		0.25~0.5	0.030	0.050	0.025	
		0.8~1.0	0.025	0.030	0.020	
		1.5~2.0	0.020	0.025	0.015	
	3.0~5.0	0.015	0.020	0.010		
	Cutting/punching Strength	Thickness<1mm, no burrs after cutting, minimum space between two punching holes is 0.55mm, no delamination. Thickness≥1mm, no burrs after cutting, minimum space between two punching holes is 1.10mm, no delamination.				
Peel strength (1oz copper)	Normal state: ≥12N/cm; No bubble、delamination、peel strength≥10N/cm (in the constant humidity and temperature、and keep in the melting solder					

		of 250°C ± 2°C for 20 seconds) .			
Chemical Property	According to the properties of laminate, the chemical etching method for PCB can be used. The dielectric properties of laminate are not changed. The plating through hole can be done, but the sodium treatment or the plasma treatment must be used.				
Electrical Property	Name	Test condition		Unit	Value
	Density	Normal state		g/ cm ³	2.2~2.3
	Moisture Absorption	Dip in the distilled water of 20±2°C for 24 hours		%	≤0.1
	Operating Temperature	High-low temperature chamber		°C	-50°C ~ +250°C
	Thermal Conductivity			W/m/k	0.3
	CTE (typical)	0~100°C (ε _r : 2.1~2.3)		ppm/°C	25 (x)
					34 (y)
					240 (z)
	CTE (typical)	0~100°C (ε _r : 2.3~2.9)		ppm/°C	16 (x)
					21 (y)
					186 (z)
	Shrinkage Factor	2 hours in boiling water		%	< 0.0002
	Surface Resistivity	500V DC	Normal state	M • Ω	≥ 3 × 10 ⁴
			Constant humidity and temperature		≥ 8 × 10 ³
	Volume Resistivity	Normal state		MΩ.cm	≥ 2 × 10 ⁶
Constant humidity and temperature		≥ 2 × 10 ⁵			
Surface dielectric strength	Normal state		δ=1mm (Kv/mm)	≥ 1.2	
	Constant humidity and temperature			≥ 1.1	
Dielectric Constant	10GHz		ε _r	2.25, 2.65 (±2%)	
Dissipation Factor	10GHz		tgδ	≤ 1.5 × 10 ⁻³	

Teflon woven glass fabric copper-clad laminates with high permittivity

F₄BM-1/2

F₄BM-1/2 is laminated by laying up of non-alkali fiberglass fabric、bond film、with Teflon resin and Polytetrafluoroethylene film, according to the scientific formulation and strict technology process. This product takes some advantages over F₄B series in the electrical performance (wider range of dielectric constant、lower dielectric loss angle tangent、increased resistance、and more reliable performance) .

Technical Specifications:

Appearance	Meet the specification requirements for the laminate of microwave PCB by National and Military Standards.					
Types	F ₄ BM220	F ₄ BM255	F ₄ BM265	F ₄ BM300		
Dielectric Constant	2.20	2.55	2.65	3.0		
Dimension (mm)	300×250	380×350	440×550	500×500	460×610	600×500
	840×840	840×1200	1500×1000	For special dimension, customized laminates is available.		
Thickness and Tolerance (mm)	Laminate thickness	0.25	0.5	0.8	1.0	
	Tolerance	±0.025	±0.05	±0.05	±0.05	
	Laminate thickness	1.5	2.0	3.0	4.0	5.0
	Tolerance	±0.05	±0.075	±0.09	±0.10	±0.10
	Laminate thickness	6.0	8.0	10.0	12.0	(Thickness ≥5.0mm, dimension ≤600 X500)
	Tolerance	±0.12	±0.15	±0.18	±0.20	
The laminate thickness includes the copper thickness. For special dimension, customized laminates is available.						
Mechanical Strength	Warp	Thickness (mm)	Maximum Warp			
			Original board	Single side	Double side	
		0.25~0.5	0.030	0.050	0.025	
		0.8~1.0	0.025	0.030	0.020	
		1.5~2.0	0.020	0.025	0.015	
	3.0~5.0	0.015	0.020	0.010		
Cutting/punching Strength	Thickness < 1mm, no burrs after cutting, minimum space between two punching holes is 0.55mm, no delamination.					

		Thickness \geq 1mm, no burrs after cutting, minimum space between two punching holes is 1.10mm, no delamination.			
	Peel strength (1oz copper)	Normal state: \geq 18N/cm; No bubble, delamination, peel strength \geq 15N/cm (in the constant humidity and temperature, and keep in the melting solder of 260°C \pm 2°C for 20 seconds) .			
Chemical Property	According to the properties of laminate, the chemical etching method for PCB can be used. The dielectric properties of laminate are not changed. The plating through hole can be done, but the sodium treatment or the plasma treatment must be used. The Hot Air Level temperature can not be higher than 253°C, and can not be repeated.				
Electrical Property	Name	Test condition		Unit	Value
	Density	Normal state		g/ cm ³	2.1~2.35
	Moisture Absorption	Dip in the distilled water of 20 \pm 2°C for 24 hours		%	\leq 0.09
	Operating Temperature	High-low temperature chamber		°C	-50°C~+260°C
	Thermal Conductivity			W/m/k	0.3~0.5
	CTE (typical)	0~100°C (ϵ_r : 2.1~2.3)		ppm/°C	25 (x)
					34 (y)
					240 (z)
	CTE (typical)	0~100°C (ϵ_r : 2.3~2.9)		ppm/°C	16 (x)
					21 (y)
					173 (z)
	CTE (typical)	0~100°C (ϵ_r : 2.9~3.5)		ppm/°C	12 (x)
					15 (y)
					95 (z)
	Shrinkage Factor	2 hours in boiling water		%	< 0.0002
	Surface Resistivity	500 V DC	Normal state	M $\cdot\Omega$	\geq 1 \times 10 ⁵
			Constant humidity and temperature		\geq 1 \times 10 ⁴
	Volume Resistivity	Normal state		M Ω .cm	\geq 6 \times 10 ⁶
		Constant humidity and temperature			\geq 1 \times 10 ⁵
Surface dielectric strength	Normal state		$\delta=$ 1mm (Kv/mm)	\geq 1.2	
	Constant humidity and temperature			\geq 1.1	
Dielectric Constant	10GHz		ϵ_r	2.20, 2.55, 2.65, 3.0 (\pm 2%)	
Thermal Coefficient of ϵ_r	ϵ_r			Value	
	2.17 2.2			-142	

	(PPM/°C) -50~150°C	2.45 2.55		-110	
		2.65 2.78		-100	
		2.85 2.95		-90	
		3.0		-80	
UL Flammability Rating	94 V-0				
Dissipation Factor	10GHz	tgδ	2.2	≤1×10 ⁻³	
			2.55~3.0	≤1.5×10 ⁻³	

Teflon woven glass fabric copper-clad laminates with high permittivity

F₄BMX-1/2

F₄BMX-1/2 is laminated by laying up of imported varnished glass cloth with Teflon resin and Polytetrafluoroethylene film, according to the scientific formulation and strict technology process. This product takes some advantages over F₄B series in the electrical performance (wider range of dielectric constant、lower dielectric loss angle tangent、increased resistance、and more stability of performance) .Compared with the F₄BM, the consistency of the laminate various properties can be insured through using the imported woven glass fabric.

Technical Specifications:

Appearance	Meet the specification requirements for the laminate of microwave PCB by National and Military Standards.					
Types	F ₄ BMX217	F ₄ BMX220	F ₄ BMX245	F ₄ BMX255	F ₄ BMX265	F ₄ BMX275
Dielectric Constant	2.17	2.20	2.45	2.55	2.65	2.75
Types	F ₄ BMX285	F ₄ BMX294	F ₄ BMX300			
Dielectric Constant	2.85	2.94	3.0			
Dimension (mm)	300×250	380×350	440×550	500×500	460×610	600×500
	840×840	840×1200	1500×1000	1800×1000		
	For special dimension, customized laminates is available.					
Thickness and Tolerance (mm)	Laminate thickness	0.25	0.5	0.8	1.0	
	Tolerance	±0.025	±0.05	±0.05	±0.05	
	Laminate thickness	1.5	2.0	3.0	4.0	5.0
	Tolerance	±0.05	±0.075	±0.09	±0.10	±0.10
	Laminate thickness	6.0	8.0	10.0	12.0	(Thickness ≥ 5.0mm, dimension ≤ 600x500)
	Tolerance	±0.12	±0.15	±0.18	±0.2	

	The laminate thickness includes the copper thickness. For special dimension, customized laminates is available.				
Mechanical Strength	Warp	Thickness (mm)	Maximum Warp		
			Original board	Single side	Double side
		0.25~0.5	0.030	0.050	0.025
		0.8~1.0	0.025	0.030	0.020
		1.5~2.0	0.020	0.025	0.015
	3.0~5.0	0.015	0.020	0.010	
Cutting/punching Strength	Thickness<1mm, no burrs after cutting, minimum space between two punching holes is 0.55mm, no delamination.				
	Thickness≥1mm, no burrs after cutting, minimum space between two punching holes is 1.10mm, no delamination.				
Peel strength (1oz copper)	Normal state: ≥18N/cm; No bubble、delamination、peel strength≥15N/cm (in the constant humidity and temperature、and keep in the melting solder of 260°C±2°C for 20 seconds) .				
Chemical Property	According to the properties of laminate, the chemical etching method for PCB can be used. The dielectric properties of laminate are not changed. The plating through hole can be done, but the sodium treatment or the plasma treatment must be used. The Hot Air Level temperature can not be higher than 253°C, and can not be repeated.				
Electrical Property	Name	Test condition		Unit	Value
	Density	Normal state		g/ cm ³	2.1~2.35
	Moisture Absorption	Dip in the distilled water of 20±2°C for 24 hours		%	≤0.08
	Operating Temperature	High-low temperature chamber		°C	-50°C~+260°C
	Thermal Conductivity			W/m/k	0.3~0.5
	CTE (typical)	0~100°C (ε _r : 2.1~2.3)		ppm/°C	24 (x)
					34 (y)
					235 (z)
	CTE (typical)	0~100°C (ε _r : 2.3~2.9)		ppm/°C	16 (x)
					20 (y)
					168 (z)
	CTE (typical)	0~100°C (ε _r : 2.9~3.38)		ppm/°C	12 (x)
					15 (y)
92 (z)					
Shrinkage Factor	2 hours in boiling water		%	< 0.0002	
Surface Resistivity	500V DC	Normal state		M • Ω	≥2×10 ⁵
		Constant humidity and temperature			≥8×10 ⁴

	Volume Resistivity	Normal state	MΩ.cm	$\geq 8 \times 10^6$		
		Constant humidity and temperature		$\geq 2 \times 10^5$		
	Surface dielectric strength	Normal state	$\delta=1\text{mm (Kv/mm)}$	≥ 1.2		
		Constant humidity and temperature		≥ 1.1		
	Dielectric Constant	10GHz	ϵ_r	2.17, 2.20, 2.45, 2.55, 2.65, 2.75, 2.85, 2.94, 3.0 ($\pm 2\%$)		
	Dissipation Factor	10GHz	$\text{tg}\delta$	2.17~2.2	$\leq 1 \times 10^{-3}$	
				2.45~3.0	$\leq 1.4 \times 10^{-3}$	

Teflon woven glass fabric copper-clad laminates with high permittivity

F₄BME-1/2

F₄BME-1/2 is laminated by laying up of the varnished glass cloth with Teflon resin and Polytetrafluoroethylene film, according to the scientific formulation and strict technology process. This product takes some advantages over F₄BM series in the electrical performance and the passive intermodulation indicators increased.

Technical Specifications:

Appearance	Meet the specification requirements for the laminate of microwave PCB by National and Military Standards.					
Types	F ₄ BME217	F ₄ BME220	F ₄ BME245	F ₄ BME255	F ₄ BME265	F ₄ BME275
	F ₄ BME285	F ₄ BME295	F ₄ BME300			
Dimension (mm)	300×250	380×350	440×550	500×500	460×610	600×500
	840×840	840×1200	1500×1000	For special dimension, customized laminates is available.		
Thickness and Tolerance (mm)	Laminate thickness	0.25	0.5	0.8	1.0	
	Tolerance	±0.025	±0.05	±0.05	±0.05	
	Laminate thickness	1.5	2.0	3.0	4.0	5.0
	Tolerance	±0.05	±0.075	±0.09	±0.10	±0.10
	Laminate thickness	6.0	8.0	10.0	12.0	
	Tolerance	±0.12	±0.15	±0.18	±0.20	
The laminate thickness includes the copper thickness. For special dimension, customized laminates is available.						
Mechanical Strength	Warp	Thickness (mm)	Maximum Warp			
			Original board	Single side	Double side	
		0.25~0.5	0.030	0.050	0.025	
		0.8~1.0	0.025	0.030	0.020	
		1.5~2.0	0.020	0.025	0.015	
	3.0~5.0	0.015	0.020	0.010		
	Cutting/punching Strength	Thickness<1mm, no burrs after cutting, minimum space between two punching holes is 0.55mm, no delamination.				
Thickness≥1mm, no burrs after cutting, minimum space between two						

		punching holes is 1.10mm, no delamination.		
	Peel strength (1oz copper)	Normal state: $\geq 16\text{N/cm}$; No bubble、delamination、peel strength $\geq 12\text{N/cm}$ (in the constant humidity and temperature、and keep in the melting solder of $260^{\circ}\text{C}\pm 2^{\circ}\text{C}$ for 20 seconds) .		
Chemical Property	According to the properties of laminate, the chemical etching method for PCB can be used. The dielectric properties of laminate are not changed. The plating through hole can be done, but the sodium treatment or the plasma treatment must be used. The Hot Air Level temperature can not be higher than 260°C , and can not be repeated.			
Electrical Property	Name	Test condition	Unit	Value
	Density	Normal state	g/cm^3	2.1~2.35
	Moisture Absorption	Dip in the distilled water of $20\pm 2^{\circ}\text{C}$ for 24 hours	%	≤ 0.08
	Operating Temperature	High-low temperature chamber	$^{\circ}\text{C}$	$-50^{\circ}\text{C}\sim +260^{\circ}\text{C}$
	Thermal Conductivity		W/m/k	0.3~0.5
	CTE (typical)	$0\sim 100^{\circ}\text{C}$ ($\epsilon_r : 2.1\sim 2.3$)	$\text{ppm}/^{\circ}\text{C}$	25 (x)
				34 (y)
				240 (z)
	CTE (typical)	$0\sim 100^{\circ}\text{C}$ ($\epsilon_r : 2.3\sim 2.9$)	$\text{ppm}/^{\circ}\text{C}$	16 (x)
				21 (y)
				173 (z)
	CTE (typical)	$0\sim 100^{\circ}\text{C}$ ($\epsilon_r : 2.9\sim 3.5$)	$\text{ppm}/^{\circ}\text{C}$	12 (x)
				15 (y)
				95 (z)
	Shrinkage Factor	2 hours in boiling water	%	< 0.0002
	Surface Resistivity	500V DC	Normal state	$\geq 1\times 10^5$
			Constant humidity and temperature	$\geq 1\times 10^4$
	Volume Resistivity	Normal state		$\geq 6\times 10^6$
Constant humidity and temperature		$\geq 1\times 10^5$		
Surface dielectric strength	Normal state		≥ 1.2	
	Constant humidity and temperature		≥ 1.1	
Dielectric Constant	10GHz	ϵ_r	2.17, 2.20, 2.45, 2.55, 2.65, 2.75, 2.85, 2.95, 3.0 ($\pm 2\%$)	
Dissipation Factor	10GHz	$\text{tg}\delta$	2.17~2.2	
			$\leq 1\times 10^{-3}$	
			2.45~3.0	
PIMD	2.5 GHz	dbc	≤ -158	

	Thermal Coefficient of ϵ_r (PPM/°C) -50~150°C	ϵ_r	Value
		2.17 2.2	-142
		2.45 2.55	-110
		2.65 2.78	-100
		2.85 2.95	-90
	3.0	-80	
	UL Flammability Rating	94 V-0	

Teflon woven glass fabric with ceramic membrane copper-clad laminates

F₄BM-2-A

F₄BM-2-A is laminated by laying up of the imported varnished glass cloth with the Nano-ceramic membrane and Teflon resin, according to the scientific formulation and strict technology process. This product takes advantages over F₄BM series in the electrical performance and the surface insulation resistance stability.

Technical Specifications:

Appearance	Meet the specification requirements for the laminate of microwave PCB by National and Military Standards.					
Types	F ₄ BM-2-A255	F ₄ BM-2-A262	F ₄ BM-2-A275	F ₄ BM-2-A285	F ₄ BM-2-A294	F ₄ BM-2-A300
Dimension (mm)	550×440	500×500	600×500	650×500		
	1000×850	1100×1000	1220×1000	1500×1000		
For special dimension, customized laminates is available.						
Thickness and Tolerance (mm)	Laminate thickness	0.254	0.508	0.762	0.787	1.016
	Tolerance	±0.025	±0.05	±0.05	±0.05	±0.05
	Laminate thickness	1.27	1.524	2.0	3.0	4.0
	Tolerance	±0.05	±0.05	±0.075	±0.09	±0.1
	Laminate thickness	5.0	6.0	9.0	10.0	12.0
	Tolerance	±0.1	±0.12	±0.18	±0.18	±0.2
Mechanical Strength	Cutting/punching Strength	Thickness<1mm, no burrs after cutting, minimum space between two punching holes is 0.55mm, no delamination.				
		Thickness≥1mm, no burrs after cutting, minimum space between two punching holes is 1.10mm, no delamination.				
	Peel strength (1oz copper)	Normal state: ≥16N/cm; No bubble、delamination、peel strength≥12N/cm (in the constant humidity and temperature、and keep in the melting solder of 265℃±2℃ for 20 seconds) .				
Chemical Property	According to the properties of laminate, the chemical etching method for PCB can be used. The dielectric properties of laminate are not changed. The plating through hole can be done, but the sodium treatment or the plasma treatment must be used.					
Electrical Property	Name	Test condition		Unit	Value	
	Density	Normal state		g/cm ³	2.1~2.35	

Moisture Absorption	Dip in the distilled water of 20±2°C for 24 hours		%	≤0.07	
Operating Temperature	High-low temperature chamber		°C	-50°C~+260°C	
Thermal Conductivity			W/m/k	0.45~0.55	
CTE (typical)	-55~288°C (ε r : 2.5~2.9)	ppm/°C	16 (x)		
			20 (y)		
			170 (z)		
CTE (typical)	-55~288°C (ε r : 2.9~3.0)	ppm/°C	12 (x)		
			15 (y)		
			90 (z)		
Shrinkage Factor	2 hours in boiling water		%	< 0.0002	
Surface Resistivity	500V DC	Normal state	M • Ω	≥4×10 ⁵	
		Constant humidity and temperature		≥6×10 ⁴	
Volume Resistivity	Normal state		MΩ.cm	≥6×10 ⁶	
	Constant humidity and temperature			≥1×10 ⁵	
Surface dielectric strength	Normal state		δ=1mm (Kv/mm)	≥1.2	
	Constant humidity and temperature			≥1.1	
Dielectric Constant	10GHz		ε r	2.55±0.05、2.62±0.05 2.75±0.05、2.85±0.05 2.94±0.05、3.0±0.05	
Thermal Coefficient of ε r (PPM/°C) -50~150°C	ε r		Value		
	2.55		-100		
	2.62		-90		
	2.75		-90		
	2.85		-85		
	2.94		-85		
	3.0		-75		
Dissipation Factor	10GHz	tgδ	2.55~2.85	≤1.5×10 ⁻³	
			2.94~3.0	≤2.0×10 ⁻³	
UL Flammability Rating	94 V-0				

Teflon woven glass fabric with ceramic membrane copper-clad laminates

F₄BME-2-A

F₄BME-2-A is laminated by laying up of the imported woven glass fabric with Teflon resin and filler with the Nano-ceramic membrane, according to the scientific formulation and strict technology process. The low roughness copper foil is adopted. This product takes advantages over F₄BM series in the electrical performance and the surface insulation resistance stability. The passiveInter-modulation index is higher than F₄BME-1/2.

Technical Specifications:

Appearance	Meet the specification requirements for the laminate of microwave PCB by National and Military Standards.					
Types	F ₄ BME-2-A2 55	F ₄ BME-2-A2 65	F ₄ BME-2-A2 75	F ₄ BME-2-A2 85	F ₄ BME-2-A2 94	F ₄ BME-2-A3 00
Dimension (mm)	550×440	500×500	600×500	650×500		
	1000×850	1100×1000	1220×1000	1500×1000		
For special dimension, customized laminates is available.						
Thickness and Tolerance (mm)	Laminate thickness	0.254	0.508	0.762	0.787	1.016
	Tolerance	±0.025	±0.05	±0.05	±0.05	±0.05
	Laminate thickness	1.27	1.524	2.0	3.0	4.0
	Tolerance	±0.05	±0.05	±0.075	±0.09	±0.1
	Laminate thickness	5.0	6.0	9.0	10.0	12.0
	Tolerance	±0.1	±0.12	±0.18	±0.18	±0.20
Mechanical Strength	Cutting/punching Strength	Thickness<1mm, no burrs after cutting, minimum space between two punching holes is 0.55mm, no delamination.				
		Thickness≥1mm, no burrs after cutting, minimum space between two punching holes is 1.10mm, no delamination.				
	Peel strength (1oz copper)	Normal state: ≥14N/cm; No bubble、delamination、peel strength≥12N/cm (in the constant humidity and temperature、and keep in the melting solder of 265°C±2°C for 20 seconds) .				
Chemical Property	According to the properties of laminate, the chemical etching method for PCB can be used. The dielectric properties of laminate are not changed. The plating through hole can be done, but the					

sodium treatment or the plasma treatment must be used.				
Electrical Property	Name	Test condition	Unit	Value
	Density	Normal state	g/cm ³	2.1~2.35
	Moisture Absorption	Dip in the distilled water of 20±2°C for 24 hours	%	≤0.07
	Operating Temperature	High-low temperature chamber	°C	-50°C~+260°C
	Thermal Conductivity		W/m/k	0.45~0.55
	CTE (typical)	-55~288°C (εr : 2.5~2.9)	ppm/°C	16 (x)
				20 (y)
				170 (z)
	CTE (typical)	-55~288°C (εr : 2.9~3.0)	ppm/°C	12 (x)
				15 (y)
				90 (z)
	Shrinkage Factor	2 hours in boiling water	%	< 0.0002
	Surface Resistivity	500V DC	Normal state	≥4×10 ⁵
			Constant humidity and temperature	≥6×10 ⁴
	Volume Resistivity	Normal state		≥6×10 ⁶
		Constant humidity and temperature		≥1×10 ⁵
	Surface dielectric strength	Normal state		≥1.2
		Constant humidity and temperature		≥1.1
	Dielectric Constant	10GHz	εr	2.55±0.05、2.65±0.05 2.75±0.05、2.85±0.05 2.94±0.05、3.0±0.05
	Thermal Coefficient of εr (PPM/°C) -50~150°C	εr		Value
2.55		-100		
2.65		-90		
2.75		-90		
2.85		-85		
2.94		-85		
3.0		-75		
Dissipation Factor	10GHz	tgδ	2.55~2.85	≤1.5×10 ⁻³
			2.94~3.0	≤2.0×10 ⁻³
PIMD	2.5 GHz	dbc	≤-160	
UL Flammability Rating	94 V-0			

Teflon woven glass fabric with ceramic filler copper-clad laminates

F₄BTM-1/2

F₄BTM-1/2 is laminated by laying up of the varnished glass cloth with Teflon resin and filler with the Nano-ceramic, according to the scientific formulation and strict technology process. This product takes advantages over F₄BM series in the electrical performance、improves the heat dissipation effect and has the small coefficient of thermal expansion.

Technical Specifications:

Appearance	Meet the specification requirements for the laminate of microwave PCB by National and Military Standards.					
Types	F ₄ BTM-1/2 (255)	F ₄ BTM-1/2 (265)	F ₄ BTM-1/2 (285)	F ₄ BTM-1/2 (294)	F ₄ BTM-1/2 (300)	F ₄ BTM-1/2 (320)
	F ₄ BTM-1/2 (338)	F ₄ BTM-1/2 (350)	F ₄ BTM-1/2 (400)	F ₄ BTM-1/2 (440)	F ₄ BTM-1/2 (615)	F ₄ BTM-1/2 (1020)
Dimension (mm)	610×460	600×500	1220×914	1220×1000	1500×1000	
	For special dimension, customized laminates is available.					
Thickness and Tolerance (mm)	Laminate thickness	0.254	0.508	0.762	0.787	1.016
	Tolerance	±0.025	±0.05	±0.05	±0.05	±0.05
	Laminate thickness	1.27	1.524	2.0	3.0	4.0
	Tolerance	±0.05	±0.05	±0.075	±0.09	±0.1
	Laminate thickness	5.0	6.0	9.0	10.0	12.0
	Tolerance	±0.1	±0.12	±0.18	±0.18	±0.2
Mechanical property	Peel strength (1oz copper)	Normal state: ≥18N/cm; No bubble、delamination、peel strength ≥15N/cm (in the constant humidity and temperature、and keep in the melting solder of 265℃ ±2℃ for 20 seconds) .				
Thermal stress	After solder float, 260° C, 10s, ≥3 times , no delamination and blister.					
Chemical Property	According to the properties of laminate, the chemical etching method for PCB can be used. The dielectric properties of laminate are not changed. The plating through hole can be done, but the sodium treatment or the plasma treatment must be used.					
	Name	Test condition	Unit	Value		

Electrical Property	Density	Normal state		g/ cm ³	2.1~3.0
	Moisture Absorption	Dip in the distilled water of 20±2℃ for 24 hours		%	≤0.05
	Operating Temperature	High-low temperature chamber		℃	-50℃~+260℃
	Thermal Conductivity			W/m/k	0.6~0.9
	CTE (typical)	-55~288℃ (ε r : 2.55~3.0)	ppm/℃	15 (x)	
				15 (y)	
				65 (z)	
	CTE (typical)	-55~288℃ (ε r : 3.2~3.5)	ppm/℃	15 (x)	
				15 (y)	
				55 (z)	
	CTE (typical)	-55~288℃ (ε r : 4.0~10.2)	ppm/℃	12 (x)	
				14 (y)	
				50 (z)	
	Shrinkage Factor	2 hours in boiling water		%	< 0.0002
	Surface Resistivity	500V DC	Normal state	M • Ω	≥1 × 10 ⁶
			Constant humidity and temperature		≥1 × 10 ⁵
	Volume Resistivity	Normal state		MΩ.cm	≥1 × 10 ⁷
		Constant humidity and temperature			≥1 × 10 ⁶
	Surface dielectric strength	Normal state		δ=1mm (Kv/mm)	≥1.2
		Constant humidity and temperature			≥1.1
Dielectric Constant	10GHz		ε r	2.85 ± 0.05、2.94 ± 0.05 3.00 ± 0.05、3.20 ± 0.05 3.38 ± 0.05、3.50 ± 0.05 4.00 ± 0.08、4.40 ± 0.10 6.15 ± 0.15、10.2 ± 0.25	
Thermal Coefficient of ε r (PPM/℃) -50~150℃	ε r		Value		
	2.85, 2.94		-85		
	3.0, 3.2		-75		
	3.38		-65		
	3.5		-60		
	4.0		-60		
	4.4		-60		
6.15		-55			

		10.2	-50		
	Dissipation Factor	10GHz	tgδ	2.55~3.0	$\leq 1.5 \times 10^{-3}$
			tgδ	3.0~3.5	$\leq 2.0 \times 10^{-3}$
			tgδ	4.0~10.20	$\leq 2.5 \times 10^{-3}$
	UL Flammability Rating	94 V-0			

Teflon woven glass fabric with ceramic filler copper-clad laminates

F₄BTME-1/2

F₄BTME-1/2 is laminated by laying up of the imported varnished glass cloth with Teflon resin and filler with the Nano-ceramic membrane, according to the scientific formulation and strict technology process. The low roughness copper foil is adopted. This product takes advantages over F4BM-2-A series in the electrical performance, improves the heat dissipation effect and has the small coefficient of thermal expansion. PIM stability, applicable for the communication of 4G and 5G.

Technical Specifications:

Appearance	Meet the specification requirements for the laminate of microwave PCB by National and Military Standards.					
Types	F ₄ BTME-1/2 (255)	F ₄ BTME-1/2 (265)	F ₄ BTME-1/2 (285)	F ₄ BTME-1/2 (294)	F ₄ BTME-1/2 (300)	F ₄ BTME-1/2 (320)
	F ₄ BTME-1/2 (338)	F ₄ BTME-1/2 (350)	F ₄ BTME-1/2 (400)	F ₄ BTME-1/2 (440)		
Dimension (mm)	610×460	600×500	1220×914	1220×1000	1500×1000	
	For special dimension, customized laminates is available.					
Dimension (mm)	Laminate thickness	0.254	0.508	0.762	0.787	1.016
	Tolerance	±0.025	±0.05	±0.05	±0.05	±0.05
	Laminate thickness	1.27	1.524	2.0	3.0	4.0
	Tolerance	±0.05	±0.05	±0.075	±0.09	±0.1
	Laminate thickness	5.0	6.0	9.0	10.0	12.0
	Tolerance	±0.1	±0.12	±0.18	±0.18	±0.2
Mechanical property	Peel strength (1oz copper)	Normal state: ≥16N/cm; No bubble、delamination、peel strength ≥14N/cm (in the constant humidity and temperature、and keep in the melting solder of 265°C ±2°C for 20 seconds) .				
Thermal stress		After tin dipping, 260° C X10s, ≥3 times , no delamination and blister.				

Chemical Property	According to the properties of laminate, the chemical etching method for PCB can be used. The dielectric properties of laminate are not changed. The plated through hole can be done, but the sodium treatment or the plasma treatment must be used.				
Electrical Property	Name	Test condition		Unit	Value
	Density	Normal state		g/cm ³	2.1~2.8
	Moisture Absorption	Dip in the distilled water of 20±2°C for 24 hours		%	≤0.05
	Operating Temperature	High-low temperature chamber		°C	-50°C~+260°C
	Thermal Conductivity			W/m/k	0.6~0.9
	CTE (typical)	-55~288°C (ε _r : 2.55~3.0)		ppm/°C	15 (x)
					15 (y)
					65 (z)
	CTE (typical)	-55~288°C (ε _r : 3.2~3.5)		ppm/°C	15 (x)
					15 (y)
					55 (z)
	CTE (typical)	-55~288°C (ε _r : 4.0~4.4)		ppm/°C	12 (x)
					14 (y)
					50 (z)
	Shrinkage Factor	2 hours in boiling water		%	< 0.0002
	Surface Resistivity	500V DC	Normal state	M • Ω	≥1×10 ⁶
			Constant humidity and temperature		≥1×10 ⁵
	Volume Resistivity	Normal state		MΩ.cm	≥1×10 ⁷
		Constant humidity and temperature			≥1×10 ⁶
	Surface dielectric strength	Normal state		δ=1mm (Kv/mm)	≥1.2
Constant humidity and temperature		≥1.1			
Dielectric Constant	10GHz		ε _r	2.55±0.05、2.65±0.05 2.85±0.05、2.94±0.05 3.00±0.05、3.20±0.05 3.38±0.05、3.50±0.05 4.00±0.08、4.40±0.1 6.15±0.15	
Thermal Coefficient of ε _r (PPM/°C)	ε _r		Value		
	2.55, 2.65		-90		
	2.85 2.94		-85		

	-50~150°C	3.0 3.2	-75		
		3.38	-65		
		3.5 4.0 4.4	-60		
		6.15	-55		
	Dissipation Factor	10GHz	tgδ	2.55~3.0	≤1.5×10 ⁻³
			tgδ	3.0~3.5	≤2.0×10 ⁻³
			tgδ	4.0~4.4	≤2.5×10 ⁻³
	PIMD	2.5 GHz	dbc	≤-163	
	UL Flammability Rating	94 V-0			

Teflon woven glass fabric planar resistor copper-clad laminates

F₄BDZ294

1. Introduction:

F₄BDZ294 is a kind of Teflon woven glass fabric planar resistor copper-clad laminates with the dielectric constant of 2.94. This kind of high frequency laminates is manufactured by Teflon woven glass fabric (with low dielectric constant and low dissipation factor) with the planar resistor copper foil. It features with excellent electrical and mechanical performance. Its high mechanical reliability and excellent electrical stability is suitable for the design of the complicated microwave circuit.

Specification for the planar resistor copper foil:

Square resistance	Thickness of nickel-phosphorous alloy corresponding to the square resistance left	Tolerance
50 Ω / □	0.20 μ m	5%
100 Ω / □	0.10 μ m	5%

Structure of the material: One side is clad with resistor copper foil, and the other side is clad with traditional copper foil, and the dielectric material with Teflon woven glass fabric. The dielectric constant is 2.94.

Features of the material: low dielectric constant and loss; excellent electrical and mechanical performance; lower thermal coefficient of dielectric constant; low outgassing.

2. Application scope

- (1) Ground-based and airborne radar system;
- (2) Phased array antenna;
- (3) GPS antenna;
- (4) Power backboard;
- (5) Multilayer PCB;
- (6) Spotlight network.

Metal base Teflon woven glass fabric copper-clad laminates

F₄B-1/AL (Cu)

F₄B-1/AL (Cu) is a kind of microwave circuit metal base material based on Teflon woven glass fabric copper-clad laminates, which is pressed with copper on one side、 and aluminum (copper) plate on the other side.

Technical Specifications:

Dimension (mm)	300×300 400×400				
	For special dimension, customized laminates is available.				
Thickness of metal base	Optional by the user.				
Warp	The specification meets the design requirement for base laminate.				
Electrical Property	Name	Test condition	Unit	Value	
	Density (Dielectric layer)	Normal state	g/ cm ³	2.2~2.3	
	Moisture Absorption	Dip in the distilled water of 20±2°C for 24 hours	%	≤0.02	
	Operating Temperature	High-low temperature chamber	°C	-50°C~+260°C	
	Thermal Conductivity (Dielectric layer)		W/m/k	0.3~0.5	
	CTE		ppm/°C	Same to the F ₄ BM-2	
	Shrinkage Factor	2 hours in boiling water	%	< 0.0002	
	Surface Resistivity	500V DC	Normal state	M • Ω	≥1×10 ⁻⁴
			Constant humidity and temperature		≥1×10 ⁻³
	Volume Resistivity	Normal state		MΩ.cm	≥1×10 ⁶
Constant humidity and temperature		≥1×10 ⁵			

	Surface dielectric strength	Normal state	$\delta=1\text{mm (Kv/mm)}$	≥ 1.2		
		Constant humidity and temperature		≥ 1.1		
	Dielectric Constant	10GHz	ϵ_r	2.25	2.65	$(\pm 2\%)$
				2.94	3.0	
				3.38	3.5	
4.0				4.4		
6.15	10.2					
Dissipation Factor	10GHz	$\text{tg}\delta$	$\leq 1.5 \times 10^{-3}$			
Thermal resistance	A	$^{\circ}\text{C/W}$	≥ 2.0			

Microwave composite dielectric copper-clad substrate

TP-1/2

The advantage of design for microwave circuit using TP-1/2 here:

(1) The dielectric constant is stable and can be optional within the range of 3~22 according to the design of circuit requirement. The operating temperature is $-100^{\circ}\text{C} \sim +150^{\circ}\text{C}$;

(2) The peel strength between the copper and the substrate is more reliable than the vacuum film coating of ceramic substrate. This substrate is created to offer customers easy for circuit processing, higher pass-rate of production, and the manufacturing cost is much lower than the ceramic substrate.

(3) Dissipation factor $\text{tg}\delta \leq 1 \times 10^{-3}$, and the loss has a slight variation with the rise of the frequency.

(4) It is easy for mechanical manufacturing, including drill、punch、grind、cut、etching, etc.. For these, the ceramic substrate cannot be compared.

Technical Specifications:

Appearance	Smooth and neat on both sides: no stain, scratch and dent.	
Dimension and tolerance (mm)	Dimensions A×B (mm)	Tolerance
	120×100, 150×150, 160×160, 180×180, 200×200, 170×240	-2
	Thickness and Tolerance	
	0.8±0.05, 1.0±0.05, 1.2±0.05, 1.5±0.06, 2.0±0.075, 3.0±0.10, 4.0±0.10, 5.0±0.12, 6.0±0.12, 10.0±0.2	
	For special dimensions, customized lamination is available.	
Mechanical Strength	Peel strength	In normal state: $\geq 6\text{N/cm}$; In the environment of alternating humidity and temperature: $\geq 4\text{N/cm}$.
	Chemical Property	According to the properties of laminate, the chemical etching method for PCB can be used. The dielectric properties of materials

		are not changed.		
Electrical property	Name	Test condition	Unit	Value
	Density	Normal state	g/cm ³	1.0~2.9
	Moisture Absorption	Dip in distilled water of 20±2°C for 24 hours	%	≤0.02
	Operating Temperature	High-low temperature chamber	°C	-100~+150 (Processing temperature should not exceed 200°C)
	Thermal Conductivity		W /m /k	0.6
	CTE	-55~288°C	ppm/°C	X<40
				Y<40
				Z<60
	Shrinkage Factor	2 hours in boiling water	%	0.0004
	Surface Resistivity	500V DC	Normal state	≥1×10 ⁷
			Constant humidity and temperature	≥1×10 ⁵
	Volume Resistivity	Normal state		≥1×10 ⁹
		Constant humidity and temperature		≥1×10 ⁶
	Surface dielectric strength	Normal state		≥1.5
		Constant humidity and temperature		≥1.2
Dielectric Constant	10GHZ	ε r	3、 6、 9.6、 10.2、 10.5、 11、 16、 20、 22、 25 (± 2%) (dielectric constant canbe customized)	
Dissipation Factor	10GHZ	Tgδ (ε r 3-11)	≤1×10 ⁻³	
		Tgδ (ε r 12-22)	≤1.5×10 ⁻³	

A special microwave composite dielectric copper-clad substrate

TPH-1/2

TPH-1/2 is made of a new type of inorganic and organic materials, with special process and compounding.

The advantage of design for microwave circuit using TPH-1/2 here:

(1) The substrate is black. The dielectric constant is 2.65 and stable. The operating temperature is $-100^{\circ}\text{C} \sim +150^{\circ}\text{C}$;

(2) The peel strength between the copper and the substrate is more reliable than the vacuum film coating of ceramic substrate. This substrate is created to offer customers easy for circuit processing, higher pass-rate of production, and the manufacturing cost is much lower than the ceramic substrate.

(3) Dissipation factor $\text{tg}\delta \leq 1 \times 10^{-3}$, and the loss has a slight variation with the rise of the frequency.

(4) It is easy for mechanical manufacturing, including drill、punch、grind、cut、etching, etc.. For these, the ceramic substrate cannot be compared.

(5) Due to the specific gravity less, the remarkable characteristics of the module are weight lighter manufacturing by this substrate, which but other materials can't compare.

(6) Copper thickness is: 0.035mm

Technical Specifications:

Appearance	Smooth and neat on both sides, no stain, no scratch ,no dent.	
Dimension and	Dimensions and Tolerance	
	$160 \times 160 \pm 2\text{mm}$	$200 \times 200 \pm 2\text{mm}$

tolerance (mm)	Thickness and Tolerance			
	δ (mm) : 2.5 ± 0.075 , 3.0 ± 0.1 , 4.0 ± 0.1 , 5.0 ± 0.2 , 6.0 ± 0.12 , 7.0 ± 0.15 , 8.0 ± 0.15 , 9.0 ± 0.2 , 10.0 ± 0.2 , 12.0 ± 0.2			
	For special dimensions, customized lamination is available.			
Mechanical Strength	Peel strength	In normal state: $\geq 6\text{N/cm}$; In the environment of alternating humidity and temperature: $\geq 4\text{N/cm}$.		
	Chemical Property	According to the properties of laminate, the chemical etching method for PCB can be used. The dielectric properties of materials are not changed.		
Electrical property	Name	Test condition	Unit	Value
	Density	Normal state	g/cm^3	1.05
	Moisture Absorption	Dip in distilled water of $20 \pm 2^\circ\text{C}$ for 24 hours	%	≤ 0.02
	Operating Temperature	High-low temperature chamber	$^\circ\text{C}$	-100~+150 (Processing temperature should not exceed 200°C)
	Thermal Conductivity	-55~288 $^\circ\text{C}$	W /m /k	0.3
	CTE	0~100 $^\circ\text{C}$	ppm/ $^\circ\text{C}$	50(x, y, z)
	Shrinkage Factor	2 hours in boiling water	%	0.0004
	Surface Resistivity		M. Ω	$\geq 1 \times 10^6$
	Volume Resistivity	Normal state	M Ω .cm	$\geq 1 \times 10^9$
		Constant humidity and temperature		$\geq 1 \times 10^6$
	Dielectric Breakdown		kv	≥ 20
	Dielectric Constant	10GHZ	ϵ_r	2.65 ($\pm 2\%$)
	Dissipation Factor	10GHZ	tg δ	$\leq 1 \times 10^{-3}$

Teflon ceramic composite dielectric substrate

TF-1/2

TF-1/2 is a kind of circuit laminate based on the Teflon (which have excellent microwave and temperature resistance performance) compound with ceramic. This kind of laminate can be comparable with the products (such as RT/duroid 6006/6010/TMM10) from Rogers Corporation in United State of America.

The advantage of design for microwave circuit using TF-1/2 here:

(1) The operating temperature is much higher than TP-series. It is applicable to long-term operation within temperature range of $-80^{\circ}\text{C} \sim +200^{\circ}\text{C}$, and can be used for wave-soldering and reflow-soldering.

(2) Used for the manufacturing of the microwave and millimeter wave printed circuit board .

(3) Better radiation performance, $30\text{min}20\text{rad}/\text{cm}^2$.

(4) Dielectric property is stable and has a slight variation with the rise of temperature and frequency. ($\epsilon_r=3.0; 6.0; 9.2; 9.6; 10.2; 16; 20; 22$)

Technical Specifications:

Appearance	Smooth and neat on both sides, no stain, no scratch ,no dent.			
Dimension (mm)	150×150		250×250	
Thickness (mm)	0.8、1.0、1.5、2.0、2.5 (Max thickness is 2.5mm,other thickness(<2.5mm) can be customized.)			
Mechanical Strength	Peel strength	$\geq 6\text{N}/\text{cm}$		
Chemical Property	According to the properties of laminate, the chemical etching method for PCB can be used. The dielectric properties of laminate are not changed. The plated through hole can be done.			
Electrical Property	Name	Test condition	Unit	Value
	Density	Normal state	g/cm^3	2.0~3.5

Moisture Absorption	Dip in the distilled water of $20\pm 2^{\circ}\text{C}$ for 24 hours		%	≤ 0.05	
Operating Temperature	High-low temperature chamber		$^{\circ}\text{C}$	$-80^{\circ}\text{C} \sim +260^{\circ}\text{C}$	
Thermal Conductivity			W/m/k	0.5	
CTE	$-55\sim 288^{\circ}\text{C}$		ppm/ $^{\circ}\text{C}$	50 (x)	
				50 (y)	
				60 (z)	
Shrinkage Factor	2 hours in boiling water		%	0.0001	
Surface Resistivity	500V DC	Normal state	$\text{M} \cdot \Omega$	$\geq 1 \times 10^5$	
		Constant humidity and temperature		$\geq 1 \times 10^3$	
Volume Resistivity	Normal state		$\text{M}\Omega \cdot \text{cm}$	$\geq 1 \times 10^5$	
	Constant humidity and temperature			$\geq 1 \times 10^4$	
Surface dielectric strength	Normal state		$\delta=1\text{mm (Kv/mm)}$	≥ 1.6	
	Constant humidity and temperature			≥ 1.4	
Dielectric Constant	10GHz		ϵ_r	3.0;6.0;9.2; 9.6;10.2;16; 20 ;22	($\pm 2\%$) (can be customized)
Dissipation Factor	10GHz		$\text{tg}\delta$ (3~11)	$\leq 1 \times 10^{-3}$	
			$\text{tg}\delta$ (12~22)	$\leq 1.5 \times 10^{-3}$	

Teflon woven glass fabric

F₄B-N / F₄B-T

This product is the raw material for the Teflon woven glass fabric copper-clad laminates. The technological process of manufacturing the microwave dielectric material is dipping treatment of the Teflon resin on the alkali-free woven glass fabric, drying, baking and sintering.. This product is characterized by some features, such as heat-resistance, insulation, low loss, excellent electrical performance, in-adhesion. The Teflon woven glass fabric is Widely used in electronics, motor, aviation, textile, chemical and food industry, etc.. In the area of microwave devices, it can be used as the bond film for the manufacturing of multilayer printed circuit board.

1. Type of material

(1) Anti-sticking Teflon woven glass fabric: F₄B-N ;

(2) Ventilated Teflon woven glass fabric: F₄B-T .

2. Technical Specifications:

Appearance	Smooth and neat surface、 uniform glue discharge and mechanical damage.					
Dimension (mm)	Length				A=1~200m	
	Width				B=900~1260mm	
Thickness δ (mm)	F ₄ B-N				F ₄ B-T	
	0.08	0.10	0.15	0.40	0.04	0.07
Tolerance	±0.01	±0.015	±0.02	±0.04	±0.004	±0.005
Mechanical 、 chemical、 electrical property	Name	Test condition			Unit	Value
	Tensile strength	Tensile machine			N (±5%)	8
	Operating temperature	In the oven			°C	250°C for long-term usage, 300°C for discontinuous usage
	Chemical properties	Dip in the acid、 alkali and salt				All inert

	Surface resistance coefficient	Normal temperature	Ω	$\geq 10^{12}$
	Volume resistance coefficient	Normal temperature	$\Omega \cdot \text{cm}$	$\geq 1 \times 10^{13}$
	Breakdown voltage	$\delta=0.8$	KV	≥ 0.6
		$\delta=0.1$	KV	≥ 0.8
		$\delta=0.15$	KV	≥ 1.1
		$\delta=0.20$	KV	≥ 1.3
		$\delta=0.40$	KV	≥ 1.5
Dielectric Constant	1GHz	ϵ_r	2.7 ± 0.1	
Dissipation Factor	1GHz	$\text{tg}\delta$	$\leq 2 \times 10^{-4}$	

Anti-adhesive tape (TWH002)

The materials are widely used for the anti-adhesive in the molding.

Technical Specifications:

Item	Unit	Feature
Substrate material		Glass fiber
Coating material		PTFE
Effective wide	mm	10—1000
Mass per unit	g/m ²	150 210
Thickness	mm	0.083 0.13
Working temperature	°C	-70—+260
Adhesive	g/m	12
Adhesive type		The silicone
Resin content	%	68
Transparency	Scm/m/m ²	No through hole