



## 高频高速基板 (2020.4)

HIGH FREQUENCY & HIGH SPEED LAMINATE

自主研发 科技创新

军工优选 民族品牌

专业制造高频基材35年



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# C 企业简介

## Company Profile

我厂成立于一九八四年，是高频微波印制电路基板的专业生产厂家。其主导产品有聚四氟乙烯玻纤布覆铜箔板、陶瓷填充聚四氟乙烯玻纤布覆铜箔板系列、微波复合介质基片系列、高频高速基材有机聚合物特种陶瓷玻纤布覆铜板系列、微波多层板、防粘漆布类。产品广泛应用于航天、航空、卫星通讯、导航、宇航、雷达、电子对抗、3G、4G、5G通信、北斗卫星系统、纺织、服装和食品等领域。年生产能力覆铜箔板180万平方米、微波复合介质基片6万平方米，有机聚合物特种陶瓷玻纤布覆铜板200万平方米。多次与国家重点工程配套成功，受到航天、航空及中国载人航天工程办公室等部门的表彰。企业通过质量管理体系认证，环境管理体系认证，职业健康安全管理体系认证，武器装备质量管理体系认证。2007年通过UL认证。2016年8月获得相关军工资质。本厂是江苏省高新技术企业、江苏省AAA级资信等级企业、“重合同、守信用”企业。企业成立了省级工程技术研究中心，本着以提高产品质量为中心，以顾客为关注焦点，不断满足顾客需求来实现企业与顾客更广泛、更完美、更持久的合作。

Established in 1984, the TAIZHOU WANGLING insulating materials factory is the professional manufacturer of the high frequency microwave printed circuit board. 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, high frequency and high speed hydrocarbon polymer ceramic woven fiberglass copper-clad laminates, microwave multilayer printed circuit board, 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, "Beidou" satellite positioning system, textile, clothing, food and so on. Our company has an annual production capacity of 1.8 million square meters for copper-clad laminate, 60 thousand square meters for microwave composite dielectric copper-clad substrate and 2 million square meters for hydrocarbon polymer ceramic copper-clad laminates. We have successfully cooperated with national key projects many times and were praised by relevant departments from aerospace, aviation and China manned space project. Our company has passed the Quality Management System certification, the Environmental management system certification, the occupational health and safety management system certification and the quality management system of weapon equipment certification. UL certification was passed in 2007. Our company obtained relevant military industry qualification in August 2016. Our company was granted with Jiangsu high technology enterprise, Jiangsu AAA credit grade enterprise and "observe contracts and keep promises" enterprise. Our enterprise had founded Provincial Research Center for Engineering Technology. We are always based on the concept of "quality-focused and customer-oriented" and continually meet customers requirements to achieve a better cooperation.



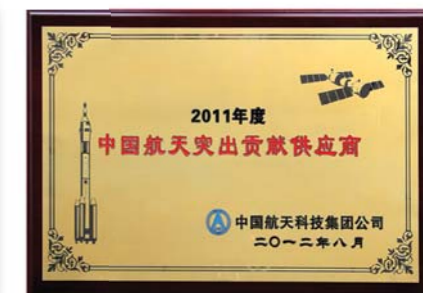
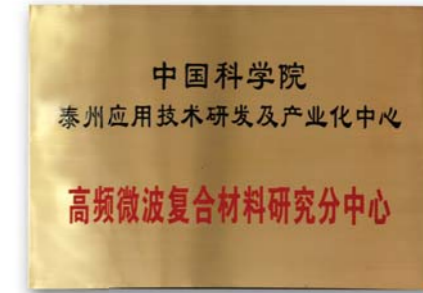
# 资质证书

## CERTIFICATE OF HONOR



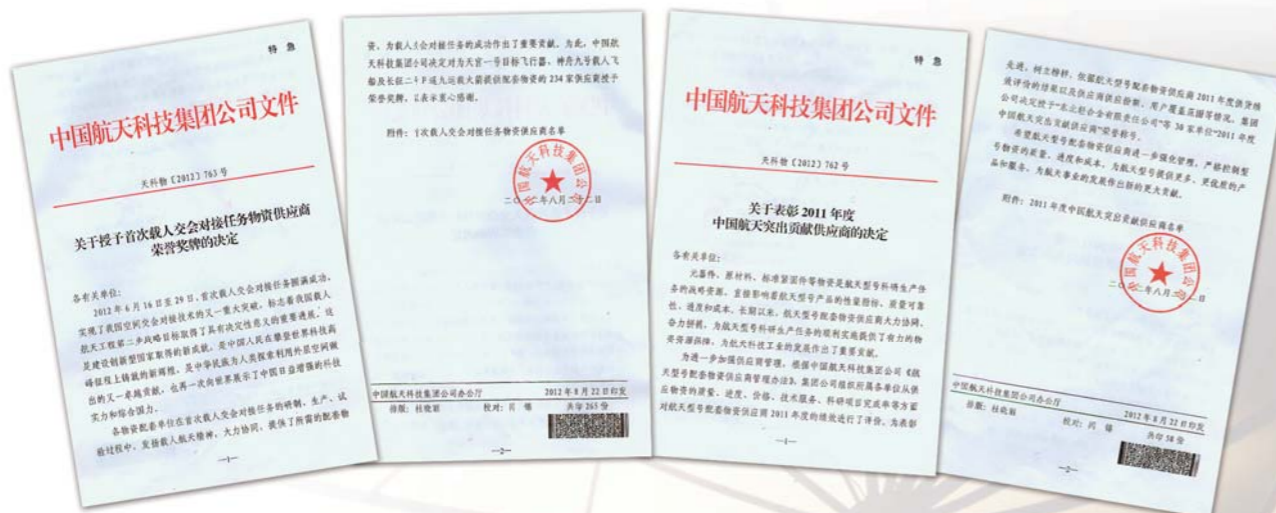
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## 一、板材特点及应用

型号	产品特点	产品终端应用
<b>F4BM</b> <b>F4BME</b> <b>F4BM-2-A</b> <b>F4BME-2-A</b>	<p>这4款材料是传统的PTFE+玻纤布的高频材料，可控的PTFE含量和玻纤含量使DK在2.2~3.0可选择，并且具有低的DF值（其中F4BM220的Df值只有0.001）。</p> <p>F4BM(E)2-A的介质表面采用的是纳米陶瓷膜，介质表面是白色的，除了F4BM固有的优良性能外，表面绝缘电阻提升，外观一致性优良。</p> <p>F4BME和F4BME-2-A这两款板材搭配的是低粗糙度的RTF铜箔，PIM指标优良，导体损耗变低，也便于细线路加工和化金加工。</p>	基站天线，分布式天线，馈电网络，商用天线，贴片式天线（GNSS、GPS、SDAR.....），机载和雷达，滤波器，功分器，耦合器，移动互联设备，航空航天，汽车电子，移相等
<b>F4BTM</b> <b>F4BTME</b>	<p>这两款材料比传统的PTFE材料中添加了陶瓷颗粒，改善了材料的性能，与传统的PTFE相比：DK值在2.55~6.15可选择，具有低的DK值，TCDK值更小，热膨胀系数降低，导热系数降低，尺寸稳定性更好，PCB可加工性更优。</p> <p>F4BTME板材搭配的是低粗糙度的RTF铜箔，PIM指标优良，导体损耗变低，也便于细线路加工和化金加工。</p>	基站天线，分布式天线，馈电网络，商用天线，贴片式天线（GNSS、GPS、SDAR.....），机载和雷达，滤波器，功分器，耦合器，移动互联设备，航空航天，汽车电子，移相等
<b>F4BTMS</b>	<p>采用超薄超细玻纤布、均匀分散的陶瓷填料和聚四氟乙烯树脂经特殊工艺压制而成。是F4BTM(E)的升级产品，其玻纤布的含量非常少，树脂和填料含量增加，是高可靠性材料。</p> <p>较传统PTFE板材相比，采用的超薄超细玻纤布和均匀分散的填料使材料有极低的DF值，介电常数和介质损耗随温度变化系数非常小，频率稳定性好，使用频率在40G以内具有稳定的介电常数和低的损耗值，能满足相位敏感的应用，X/Y/Z方向各项异性差距降低，热膨胀系数大幅降低，尺寸稳定性更优，导热系数更好，耐热性能和结合力优良。</p> <p>线路板可采用标准PTFE板材工艺技术加工，板材优良的机械性能和物料性能使板材能进行多次压合，适合多层、高多层、背板加工；同时在密集孔、细线路加工方面表现出优良的加工性能。</p>	航天航空设备，毫米波天线，各种高可靠性雷达，馈电网络，相位敏感天线，雷达遥感，雷达传感控制天线，卫星通信，相控阵天线等

型号	产品特点	产品终端应用
<b>TP</b> <b>TF</b> <b>TPH</b>	<p>TP介质成分是聚苯醚+陶瓷，TF介质成分是PTFE+陶瓷，板材介质中无玻纤成分，DK值在3.0~25可选，DF值非常低，是行业内独特的宽介电常数、高介电常数的无玻纤产品；DK/DF随频率变化很小，可用于毫米波；TP长期使用温度范围为-100℃~+150℃，TF长期使用温度范围为-80℃~+200℃；吸水率低；尺寸稳定性优良；PCB可加工性优良；TP和TPH还具有比重轻的特点。</p>	雷达，GPS/北斗定位系统，航空航天，炮弹应用，测量测绘天线，无人机侦察，各类天线，小型化小尺寸天线，汽车天线等
<b>TFA</b>	<p>TFA是采用将聚四氟乙烯树脂、特殊陶瓷填充料科学复合，不含玻纤布，经特殊工艺压制而成，是TF的升级材料，可提供TF所不能提供的超薄尺寸和大尺寸，是热塑型高可靠性材料。</p> <p>TFA有极低的介质损耗角；可以搭配各种类型铜箔；X/Y/Z各向介电性能基本一致；DK/DF的频率稳定性非常优越，TFA294和TFA300可以应用于毫米波和77G雷达天线；DK/DF的温度稳定性非常优越，适合温度敏感的应用；具有优良的尺寸稳定性，适合各种多层板的设计；极低的热膨胀系数，使材料在严酷的环境下仍然保持良好的通孔稳定性；线路板可采用标准PTFE板材工艺技术加工，板材优良的机械性能和物料性能使板材能进行多次压合，适合多层、高多层、背板加工；同时在密集孔、细线路加工方面表现出优良的加工性能。</p>	毫米波天线，相位天线，阵列天线，贴片天线，射频元件，毫米波雷达，防撞雷达，定位雷达，GPS/北斗定位系统，双边网络，功分器，耦合器，滤波器，各种背板，高密度多层电路，高性能电路板等
<b>WL-CT</b>	<p>有机聚合物陶瓷玻纤布是热固性树脂体系，比PTFE热塑性树脂体系硬度更好；比PTFE材料有更好的绝缘性能和热处理能力，特别适合无铅焊接工艺；导热比PTFE优良；低的热膨胀系数，提高了镀通孔的可靠性和尺寸稳定性。PCB可加工性最优良，不需要进行等离子处理，能用FR-4的标准加工工艺进行加工，可兼容大多数PP片，特别适合PCB多层板加工。</p> <p>其中WL-CT300/WL-CT330/WL-CT338是天线、传感、高频头等产品的理想材料，WL-CT350是功率放大器、雷达等产品的理想材料，而WL-CT440与常规FR4材料的介电常数一致。</p>	4G/5G基站天线，WIMAX天线网络，汽车雷达，传感器，功率放大器，高可靠性雷达，卫星高频头，测量测绘天线，分布式天线，射频器件，微波器件，耦合器件，合路器，无人机，导航天线，小基站天线等

## LAMINATE CHARACTERISTICS AND APPLICATION

Product name	Product characteristics	Product terminal application
F4BM F4BME F4BM-2-A F4BME-2-A	<p>These four materials are traditional high-frequency laminates with PTFE and woven fiberglass. The content of PTFE and glass fiber can be controlled so that DK can be selected between 2.2 and 3.0. It has low DF value (the Df value of F4BM220 is only 0.001).</p> <p>The dielectric surface of F4BM(E)-2-A adopts nanometer ceramic film, and the dielectric surface is white. In addition to the inherent excellent performance of F4BM, the surface insulation resistance is improved and the appearance consistency is excellent.</p> <p>Both F4BME and F4BME-2-A are made of RTF copper foil with low roughness. PIM index is excellent, conductor loss is low, and it is also convenient for fine line processing and chemical nickel and gold processing.</p>	<p>Base station antenna, distributed antenna, feed network, commercial antenna, patch antenna (GNSS, GPS, SDAR...), airborne and radar, filter, power divider, coupler, mobile interconnection equipment, aerospace, automotive electronics, phase shifter, etc</p>
F4BTM F4BTME	<p>Compared with the traditional PTFE materials, these two materials add ceramic particles to improve the performance of the laminates. DK value can be selected between 2.55 and 6.15. Low DK value, smaller TcDk value, lower thermal expansion coefficient, reduction of thermal conductivity, better dimensional stability, and better processing of PCB.</p> <p>F4BTME laminate is made of RTF copper foil with low roughness. PIM index is excellent, conductor loss is low, and it is also convenient for fine line processing and chemical nickel and gold processing.</p>	<p>Base station antenna, distributed antenna, feed network, commercial antenna, patch antenna (GNSS, GPS, SDAR...), airborne and radar, filter, power divider, coupler, mobile interconnection equipment, aerospace, automotive electronics, phase shifter, etc</p>
F4BTMS	<p>F4BTMS-2 is laminated by the Nano-ceramic filled PTFE resin reinforced with the ultra thin woven fiberglass, according to the scientific formulation and strict process control. It is the upgrading material of F4BTM(E), the material formula and manufacturing process were improved. The content of fiberglass is very small, resin and filler content increased, it's a high reliability material.</p> <p>Compared with the traditional PTFE laminates, the ultra-thin and ultra-fine fiberglass cloth and uniformly dispersed filler make the DF value of the material extremely low. The coefficient of change of dielectric constant and dielectric loss with temperature is very small. The frequency stability is better, and the use frequency has stable dielectric constant and low loss value within 40G, which can meet the phase sensitive application. In the X/Y/Z direction, the difference of anisotropy is reduced, the coefficient of thermal expansion is greatly reduced, the dimensional stability is better, the coefficient of thermal conductivity is better, and the heat resistance and binding force are excellent.</p> <p>The circuit board can be manufactured by standard PTFE laminates technology. The excellent mechanical properties and material properties of the laminates enable to be pressed many times, which is suitable for multi-layer, high multi-layer and backplane manufactured. Meanwhile, it has excellent processing performance in dense hole and fine line processing.</p>	<p>Aerospace equipment, millimeter wave antenna, various high reliability radars, feed network, phase sensitive antenna, radar remote sensing, radar sensor control antenna, satellite communication, phased array antenna, etc</p>

Product name	Product characteristics	Product terminal application
TP TF TPH	<p>The dielectric layer of TP material is made of PPO and ceramics. The dielectric layer of TF material is PTFE and ceramics. There is no glass fiber cloth component in the laminates. Dk value can be selected between 3.0 and 25.0.</p> <p>Df value is very low, which is a unique non glass fiber laminates with wide dielectric constant and high dielectric constant in the industry. Dk/DF has little change with frequency and can be used in millimeter wave applications. Long-term use temperature range of TP is - 100 °C ~ + 150 °C and TF is - 80 °C ~ + 200 °C.</p> <p>Low moisture absorption, better dimensional stability and better processing of PCB. TP and TPH also have the characteristics of light specific gravity.</p>	<p>Radar, GPS/Beidou Positioning System, aerospace, shell application, surveying and mapping antenna, UAV detective, various antennas, miniaturized small-size antenna, automotive antenna, etc</p>
TFA	<p>TFA-2 is made of poly-tetrafluoroethylene resin with ceramic filler by scientific compounding and special pressing process. It is the upgrading material of TF, which can provide ultra-thin size and large size that TF can't provide, and it is a thermoplastic high reliability material.</p> <p>TFA has a very low dissipation factor, can be matched with various types of copper foil. The performance of X/Y/Z is basically the same. Dk/DF has excellent frequency stability. TFA294 and TFA300 can be applied to millimeter wave and 77GHz radar antennas. The temperature stability of Dk/DF is very good, suitable for temperature sensitive applications. It has excellent dimensional stability and is suitable for the design of various multilayer printed circuit boards. Extremely low thermal expansion coefficient, so that the material still maintains good plated through hole stability in harsh environment.</p> <p>These materials can be fabricated into printed circuit boards using standard PTFE circuit board processing techniques. The excellent mechanical properties and material properties of the laminates enable to be manufactured many times, which is suitable for the multilayer, high multilayer and backplane manufactured. Meanwhile, it shows excellent machinability in the manufacturing of dense holes and fine lines processing.</p>	<p>Millimeter wave antenna, phase antenna, array antenna, patch antenna, RF component, millimeter wave radar, anti-collision radar, positioning radar, GPS/Beidou Positioning System, bilateral network, power divider, coupler, filter, various backboards, high-density multilayer circuit, high-performance circuit board, etc</p>
WL-CT	<p>Hydrocarbon polymer ceramic copper laminates with woven fiberglass is a thermosetting resin system, which has better hardness than PTFE thermoplastic resin system. Better insulation performance and heat treatment ability than PTFE material, especially suitable for lead-free welding process. Better thermal conductivity than PTFE material. Low thermal expansion coefficient improves the reliability and dimensional stability of the plating through hole. Best processing of PCB, it can be compatible with the standard of process of FR-4, no need for plasma treatment. Besides, the laminates compatible with most PP films, especially suitable for the manufacturing of multilayer of PCB.</p> <p>WL-CT300/WL-CT330/WL-CT338 are ideal materials for antenna, sensor, LBN and other products. WL-CT350 is an ideal material for power amplifier, radar and other products. The dielectric constant of WL-CT440 is consistent with that of conventional FR4.</p>	<p>4G/5G base station antenna, WIMAX antenna network, automotive radar, sensor, Power amplifier, high reliability radar, LNB, measurement and mapping antenna, distributed antenna, RF device, microwave device, coupling device, combiner, UAV, navigation antenna, small base station antenna, etc</p>

## 二、产品系列 PRODUCT SERIES

### 1.1 聚四氟乙烯玻纤布覆铜板系列 Teflon (PTFE) copper-clad laminate series:

产品 Product	材质成分 Material Composition		产品型号 Product Type	DK及公差 Dk (εr)@10GHZ & Tolerance	Dk热变化率 TcDk (ppm/°C) (Typical)	损耗因子Df Loss Tangent, Df @10GHZ	导热系数 Thermal Conductivity (W/m/°k)	热膨胀系数 Coefficient of Thermal Expansion -50°~260°C (ppm/°C)			密度 Density (g/cm3)	体积电阻 Volume Resistivity (Mohm.cm)	表面电阻 Surface Resistivity (Mohm)	吸水率 Moisture Absorption (%)	抗剥强度 Peel Strength (N/cm) (1OZ)	阻燃等级 Flammability Rating UL 94	PIM (dBc)
	介质层 Dielectric Layer	铜箔及铜厚 Copper foil						X	Y	Z							
F4BM	PTFE/玻纤布 PTFE/Woven glass	电解铜箔 ED (1/2,1,2oz)	F4BM220	2.20±0.04	-142	0.0010	0.30	25	34	240	2.20	≥6×10 <sup>6</sup>	≥1×10 <sup>5</sup>	≤0.08	≥18	V-0	None
			F4BM255	2.55±0.05	-110	0.0013	0.35	16	21	173	2.25	≥6×10 <sup>6</sup>	≥1×10 <sup>5</sup>	≤0.08	≥18	V-0	None
			F4BM265	2.65±0.05	-100	0.0015	0.37	14	17	142	2.25	≥6×10 <sup>6</sup>	≥1×10 <sup>5</sup>	≤0.08	≥18	V-0	None
			F4BM300	3.00±0.05	-80	0.0017	0.42	12	15	95	2.29	≥6×10 <sup>6</sup>	≥1×10 <sup>5</sup>	≤0.08	≥18	V-0	None
F4BME	PTFE/玻纤布 PTFE/Woven glass	反转铜箔 RTF (1/2,1,2OZ)	F4BME220	2.20±0.04	-142	0.0009	0.30	25	34	240	2.20	≥6×10 <sup>6</sup>	≥1×10 <sup>5</sup>	≤0.08	≥16	V-0	≤-159
			F4BME255	2.55±0.05	-110	0.0013	0.35	16	21	173	2.25	≥6×10 <sup>6</sup>	≥1×10 <sup>5</sup>	≤0.08	≥16	V-0	≤-159
			F4BME265	2.65±0.05	-100	0.0015	0.37	14	17	142	2.25	≥6×10 <sup>6</sup>	≥1×10 <sup>5</sup>	≤0.08	≥16	V-0	≤-159
			F4BME300	3.00±0.05	-80	0.0017	0.42	12	15	95	2.29	≥6×10 <sup>6</sup>	≥1×10 <sup>5</sup>	≤0.08	≥16	V-0	≤-159
F4BM-2-A	PTFE/玻纤布/纳米 陶瓷膜 PTFE/Woven glass/Nano-ceramic membrane	电解铜箔 ED (1/2,1,2oz)	F4BM-2-A255	2.55±0.05	-100	0.0013	0.35	16	20	170	2.25	≥6×10 <sup>6</sup>	≥4×10 <sup>5</sup>	≤0.07	≥16	V-0	None
			F4BM-2-A265	2.65±0.05	-90	0.0015	0.37	14	17	140	2.25	≥6×10 <sup>6</sup>	≥4×10 <sup>5</sup>	≤0.07	≥16	V-0	None
			F4BM-2-A294	2.94±0.05	-85	0.0016	0.41	12	15	95	2.28	≥6×10 <sup>6</sup>	≥4×10 <sup>5</sup>	≤0.07	≥16	V-0	None
			F4BM-2-A300	3.00±0.06	-75	0.0017	0.42	12	14	90	2.29	≥6×10 <sup>6</sup>	≥4×10 <sup>5</sup>	≤0.07	≥16	V-0	None
F4BME-2-A	PTFE/玻纤布/纳米 陶瓷膜 PTFE/Woven glass/Nano-ceramic membrane	反转铜箔 RTF (1/2,1,2OZ)	F4BME-2-A255	2.55±0.05	-100	0.0013	0.35	16	20	170	2.25	≥6×10 <sup>6</sup>	≥4×10 <sup>5</sup>	≤0.07	≥14	V-0	≤-160
			F4BME-2-A265	2.65±0.05	-90	0.0015	0.37	14	17	140	2.25	≥6×10 <sup>6</sup>	≥4×10 <sup>5</sup>	≤0.07	≥14	V-0	≤-160
			F4BME-2-A294	2.94±0.05	-85	0.0016	0.41	12	15	95	2.28	≥6×10 <sup>6</sup>	≥4×10 <sup>5</sup>	≤0.07	≥14	V-0	≤-160
			F4BME-2-A300	3.00±0.06	-75	0.0017	0.42	12	14	90	2.29	≥6×10 <sup>6</sup>	≥4×10 <sup>5</sup>	≤0.07	≥14	V-0	≤-160

备注：以上是常规材料，F4BM和F4BME的介电常数可以从2.2-3.0之间任意定制。

Note: These are conventional materials. Dielectric constant of F4BM and F4BME can be customized from 2.2 to 3.0.

## 1.2 聚四氟乙烯玻纤布覆铜板系列 Teflon (PTFE) copper-clad laminate series:

产品 Product	材质成分 Material Composition		产品型号 Product Type	DK及公差 Dk(εr)@10GHZ & Tolerance	Dk热变化率 TcDk (ppm/°C) (Typical)	损耗因子Df Loss Tangent, Df@10GHZ	导热系数 Thermal Conductivity (W/m/°k)	热膨胀系数 Coefficient of Thermal Expansion -50°~260°C (ppm/°C)			密度 Density (g/cm3)	体积电阻 Volume Resistivity (Mohm.cm)	表面电阻 Surface Resistivity (Mohm)	吸水率 Moisture Absorption (%)	抗剥强度 Peel Strength (N/cm) (1OZ)	阻燃等级 Flammability Rating UL 94	PIM (dBc)
	介质层 Dielectric Layer	铜箔及铜厚 Copper foil						X	Y	Z							
F4BTM	PTFE/陶瓷/玻纤布 PTFE/Ceramic/Woven glass	电解铜箔 ED (1/2,1,2oz)	F4BTM255	2.55±0.05	-90	0.0013	0.39	15	20	81	2.24	≥1×10 <sup>7</sup>	≥1×10 <sup>6</sup>	≤0.05	≥18	V-0	None
			F4BTM265	2.65±0.05	-90	0.0015	0.41	14	19	75	2.24	≥1×10 <sup>7</sup>	≥1×10 <sup>6</sup>	≤0.05	≥18	V-0	None
			F4BTM294	2.94±0.05	-85	0.0017	0.46	15	16	68	2.25	≥1×10 <sup>7</sup>	≥1×10 <sup>6</sup>	≤0.05	≥18	V-0	None
			F4BTM300	3.00±0.06	-75	0.0018	0.48	15	16	62	2.25	≥1×10 <sup>7</sup>	≥1×10 <sup>6</sup>	≤0.05	≥18	V-0	None
			F4BTM320	3.20±0.06	-75	0.0020	0.52	13	15	58	2.20	≥1×10 <sup>7</sup>	≥1×10 <sup>6</sup>	≤0.05	≥18	V-0	None
			F4BTM350	3.50±0.06	-60	0.0025	0.56	10	12	51	2.20	≥1×10 <sup>7</sup>	≥1×10 <sup>6</sup>	≤0.05	≥18	V-0	None
			F4BTM400	4.00±0.08	-60	0.0030	0.60	9	10	48	2.40	≥1×10 <sup>7</sup>	≥1×10 <sup>6</sup>	≤0.05	≥18	V-0	None
			F4BTM440	4.40±0.10	-60	0.0033	0.62	8	9	42	2.46	≥1×10 <sup>7</sup>	≥1×10 <sup>6</sup>	≤0.05	≥18	V-0	None
			F4BTM615	6.15±0.12	-55	0.0045	0.70	12	15	38	2.90	≥1×10 <sup>7</sup>	≥1×10 <sup>6</sup>	≤0.05	≥18	V-0	None
F4BTME	PTFE/陶瓷/玻纤布 PTFE/Ceramic/Woven glass	反转铜箔 RTF (1/2,1,2OZ)	F4BTME255	2.55±0.05	-90	0.0013	0.39	15	20	81	2.24	≥1×10 <sup>7</sup>	≥1×10 <sup>6</sup>	≤0.05	≥16	V-0	≤-161
			F4BTME265	2.65±0.05	-90	0.0015	0.41	14	19	75	2.24	≥1×10 <sup>7</sup>	≥1×10 <sup>6</sup>	≤0.05	≥16	V-0	≤-161
			F4BTME294	2.94±0.05	-85	0.0017	0.46	15	16	68	2.25	≥1×10 <sup>7</sup>	≥1×10 <sup>6</sup>	≤0.05	≥16	V-0	≤-161
			F4BTME300	3.00±0.06	-75	0.0018	0.48	15	16	62	2.25	≥1×10 <sup>7</sup>	≥1×10 <sup>6</sup>	≤0.05	≥16	V-0	≤-161
			F4BTME320	3.20±0.06	-75	0.0020	0.52	13	15	58	2.20	≥1×10 <sup>7</sup>	≥1×10 <sup>6</sup>	≤0.05	≥16	V-0	≤-161
			F4BTME350	3.50±0.06	-60	0.0025	0.56	10	12	51	2.20	≥1×10 <sup>7</sup>	≥1×10 <sup>6</sup>	≤0.05	≥16	V-0	≤-161
			F4BTME400	4.00±0.08	-60	0.0030	0.60	9	10	48	2.40	≥1×10 <sup>7</sup>	≥1×10 <sup>6</sup>	≤0.05	≥16	V-0	≤-161
			F4BTME440	4.40±0.10	-60	0.0033	0.62	8	9	42	2.46	≥1×10 <sup>7</sup>	≥1×10 <sup>6</sup>	≤0.05	≥16	V-0	≤-161
			F4BTME615	6.15±0.12	-55	0.0045	0.70	12	15	38	2.90	≥1×10 <sup>7</sup>	≥1×10 <sup>6</sup>	≤0.05	≥16	V-0	None

备注：以上是常规材料，F4BTM和F4BTME的介电常数可以从2.55-6.15之间任意定制

Note: These are conventional materials. Dielectric constant of F4BTM and F4BTME can be customized from 2.55 to 6.15.



## 2. 微波复合介质基板系列 Microwave composite dielectric substrate series:

产品 Product	材质成分 Material Composition		产品型号 Product Type	DK及公差 Dk ( $\epsilon_r$ )@10GHZ &Tolerance	Dk热变化率 TcDk (ppm/°C) (Typical)	损耗因子Df Loss Tangent, Df@10GHZ	导热系数 Thermal Conductivity (W/m <sup>2</sup> k)	热膨胀系数 Coefficient of Thermal Expansion -50°~260°C (ppm/°C)			密度 Density (g/cm <sup>3</sup> )	体积电阻 Volume Resistivity (Mohm.cm)	表面电阻 Surface Resistivity (Mohm)	吸水率 Moisture Absorption (%)	抗剥强度 Peel Strength (N/cm) (1OZ)
	介质层 Dielectric Layer	铜箔及铜厚 Copper foil						X	Y	Z					
TP	陶瓷/聚苯醚 Ceramic/PPO 模压工艺 (Technology of pressure molding)	电解铜箔 ED (1/2,1oz)	TP300	3.00±0.06	-50	0.0012	0.40	50	50	70	1.69	≥1×10 <sup>9</sup>	≥1×10 <sup>7</sup>	≤0.02	≥6
			TP440	4.4±0.09	-46	0.0012	0.42	50	50	70	1.89	≥1×10 <sup>9</sup>	≥1×10 <sup>7</sup>	≤0.02	≥6
			TP615	6.15±0.12	-41	0.0012	0.55	50	50	70	2.10	≥1×10 <sup>9</sup>	≥1×10 <sup>7</sup>	≤0.02	≥6
			TP960	9.6±0.2	-43	0.0014	0.70	40	40	60	2.26	≥1×10 <sup>9</sup>	≥1×10 <sup>7</sup>	≤0.02	≥6
			TP1020	10.2±0.2	-44	0.0015	0.72	40	40	60	2.33	≥1×10 <sup>9</sup>	≥1×10 <sup>7</sup>	≤0.02	≥6
			TP1600	16±0.32	-43	0.0020	0.80	40	40	60	2.76	≥1×10 <sup>9</sup>	≥1×10 <sup>7</sup>	≤0.02	≥6
			TP2000	20±0.4	-62	0.0022	0.82	35	35	45	2.73	≥1×10 <sup>9</sup>	≥1×10 <sup>7</sup>	≤0.02	≥6
			TP2200	22±0.44	-55	0.0025	0.85	35	35	45	2.77	≥1×10 <sup>9</sup>	≥1×10 <sup>7</sup>	≤0.02	≥6
			TP2500	25±0.5	-50	0.0030	0.85	35	35	45	2.94	≥1×10 <sup>9</sup>	≥1×10 <sup>7</sup>	≤0.02	≥6
TF	陶瓷/PTFE Ceramic/PTFE 模压工艺 (Technology of pressure molding)	电解铜箔 ED (1/2,1oz)	TF300	3.00±0.06	-30	0.0011	0.30	60	60	80	2.41	≥1×10 <sup>7</sup>	≥1×10 <sup>5</sup>	≤0.05	≥6
			TF440	4.4±0.09	-28	0.0011	0.32	60	60	80	2.58	≥1×10 <sup>7</sup>	≥1×10 <sup>5</sup>	≤0.05	≥6
			TF615	6.15±0.12	-24	0.0011	0.45	60	60	80	2.78	≥1×10 <sup>7</sup>	≥1×10 <sup>5</sup>	≤0.05	≥6
			TF960	9.6±0.2	-28	0.0013	0.68	50	50	65	3.02	≥1×10 <sup>7</sup>	≥1×10 <sup>5</sup>	≤0.05	≥6
			TF1020	10.2±0.2	-24	0.0013	0.70	50	50	65	3.07	≥1×10 <sup>7</sup>	≥1×10 <sup>5</sup>	≤0.05	≥6
			TF1600	16±0.32	-34	0.0018	0.72	40	40	55	3.27	≥1×10 <sup>7</sup>	≥1×10 <sup>5</sup>	≤0.05	≥6
			TF2000	20±0.4	-40	0.0020	0.78	40	40	55	3.39	≥1×10 <sup>7</sup>	≥1×10 <sup>5</sup>	≤0.05	≥6
			TF2200	22±0.44	-45	0.0022	0.82	40	40	55	3.44	≥1×10 <sup>7</sup>	≥1×10 <sup>5</sup>	≤0.05	≥6
			TF2500	25±0.5	-45	0.0025	0.85	40	40	55	3.51	≥1×10 <sup>7</sup>	≥1×10 <sup>5</sup>	≤0.05	≥6
TPH	聚苯醚 PPO 模压工艺 (Technology of pressure molding)	电解铜箔 ED (1/2,1oz)	TPH	2.65±0.05	-60	0.0010	0.30	50	50	50	1.05	≥1×10 <sup>9</sup>	≥1×10 <sup>6</sup>	≤0.02	≥6

备注：以上是常规材料，TP和TF材料的介电常数可以从3.0-25之间任意定制

Note: These are conventional materials. Dielectric constant of TP and TF can be customized from 3.0 to 25.

## 3. 有机聚合物覆铜板系列 Hydrocarbon polymer ceramic copper-clad laminates series:

产品型号 Product	材质成分 Material Composition		DK及公差 Dk ( $\epsilon_r$ )@10GHZ & Tolerance	Tg ℃	Td ℃	Dk热变化率 TcDk (ppm/°C) (Typical)	损耗因子Df Loss Tangent, Df @10GHZ	抗剥强度 Peel Strength (N/cm) (1OZ)	导热系数 Thermal Conductivity (W/m/°k)	热膨胀系数 Coefficient of Thermal Expansion -50°~260°C (ppm/°C)			体积电阻 Volume Resistivity (Mohm.cm)	表面电阻 Surface Resistivity (Mohm)	吸水率 Moisture Absorption (%)	密度 Density (g/cm3)	阻燃等级 Flammability Rating UL 94	含卤素 Halogen	PIM (dBc)
	介质层 Dielectric Layer	铜箔及铜厚 Copper foil								X	Y	Z							
WL-CT300	有机聚合物/陶瓷/玻纤布 Hydrocarbon/ Ceramic/ Woven glass	正转铜箔 ED (1/2,1oz)	3.00±0.05	>280	412	27	0.0031	8.5	0.41	15	14	31	$\geq 3 \times 10^8$	$\geq 2.0 \times 10^8$	0.25	1.57	V-0	是 YES	None
		反转背胶铜箔 RTF (1/2,1oz)																	7.2
WL-CT330	有机聚合物/陶瓷/玻纤布 Hydrocarbon/ Ceramic/ Woven glass	正转铜箔 ED (1/2,1oz)	3.30±0.06	>280	None	43	0.0026	10.0	0.59	15	13	39	$\geq 5 \times 10^9$	$\geq 6.0 \times 10^8$	0.25	1.82	NON FR	否 NO	None
		反转背胶铜箔 RTF (1/2,1oz)																	8.0
WL-CT330Z	有机聚合物/陶瓷/玻纤布 Hydrocarbon/ Ceramic/ Woven glass	正转铜箔 ED (1/2,1oz)	3.30±0.06	>280	None	43	0.0030	10.0	0.59	15	13	39	$\geq 5 \times 10^9$	$\geq 6.0 \times 10^8$	0.25	1.82	V-0	是 YES	None
		反转背胶铜箔 RTF(1/2,1oz)																	8.0
WL-CT350	有机聚合物/陶瓷/玻纤布 Hydrocarbon/Ceramic/ Woven glass	正转铜箔 ED (1/2,1oz)	3.48±0.05	>280	386	52	0.0040	8.5	0.70	11	14	34	$\geq 1 \times 10^9$	$\geq 4.0 \times 10^8$	0.15	1.90	V-0	是 YES	None
WL-CT338	有机聚合物/陶瓷/玻纤布 Hydrocarbon/Ceramic/ Woven glass	正转铜箔 ED (1/2,1oz)	3.38±0.05	>280	421	45	0.0029	10.0	0.70	14	16	50	$\geq 6 \times 10^9$	$\geq 7.0 \times 10^8$	0.15	1.78	NON FR	否 NO	None
		反转背胶铜箔 RTF(1/2,1oz)																	8.0
WL-CT440	有机聚合物/陶瓷/玻纤布 Hydrocarbon/Ceramic/ Woven glass	正转铜箔 ED(1/2,1oz)	4.40±0.10	>280	402	-21	0.0050	10.0	0.66	14	18	45	$\geq 1 \times 10^9$	$\geq 5 \times 10^7$	0.30	2.00	V-0	是 YES	None
WL-CT615	有机聚合物/陶瓷/玻纤布 Hydrocarbon/Ceramic/ Woven glass	正转铜箔 ED(1/2, 1oz)	6.15±0.15	>280	398	-122	0.0040	9.0	0.72	15	17	33	$\geq 2 \times 10^7$	$\geq 5 \times 10^6$	0.09	2.18	V-0	是 YES	None

## 半固化片-粘结材料 Prepreg and Bonding Film

产品型号 Product	材质成分 Material Composition	厚度及公差 Thickness(mm) & Tolerance	尺寸 Size (mm)	DK及公差 Dk( $\epsilon_r$ )@10GHZ & Tolerance	Tg ℃	Td ℃	损耗因子 Df Loss Tangent, Df@10GHZ	抗剥强度 Peel Strength (N/cm) (1OZ)	导热系数 Thermal Conductivity (W/m/°k)	热膨胀系数 Coefficient of Thermal Expansion -50°~260°C (ppm/°C)			体积电阻 Volume Resistivity (Mohm.cm)	表面电阻 Surface Resistivity (Mohm)	吸水率 Moisture Absorption (%)	密度 Density (g/cm3)	阻燃等级 Flammability Rating UL 94	含卤素 Halogen	无铅处理相 容 Lead free treatment compatible
										X	Y	Z							
WL-PP350	有机聚合物/ 陶瓷/玻纤布 Hydrocarbon/ Ceramic/Woven glass	压合前(Thickness before pressing): 0.11±0.01 压合后(Thickness after pressing): 0.09±0.01	460*610 600*500其他 尺寸与我司联系 (Other sizes,pls contact us)	3.50±0.05	>280	386	0.0042	8.0	0.7	20	18	52	$6 \times 10^8$	$1.0 \times 10^7$	0.09	1.85	V-0	是 YES	是 YES

**4.改良型PTFE超薄超细玻纤布陶瓷填充基板 Modified woven fabric glass Teflon (PTFE) copper-clad laminates with ceramic filler**

产品 Product	材质成分 Material Composition	产品型号 Product Type	DK及公差 Dk ( $\epsilon_r$ )@10GHZ & Tolerance	Dk热变化率 TcDk (ppm/°C) (Typical)	损耗因子Df Loss Tangent, Df@10GHZ	导热系数 Thermal Conductivity (W/m/°k)	Td (°C)	热膨胀系数 Coefficient of Thermal Expansion -50 °~260°C (ppm/°C)			密度 Density (g/cm <sup>3</sup> )	体积电阻 Volume Resistivity (Mohm.cm)	表面电阻 Surface Resistivity (Mohm)	吸水率 Moisture Absorption (%)	抗剥强度 Peel Strength (N/cm) (10Z)	阻燃等级 Flammability Rating UL 94
	介质层 Dielectric Layer							X Y Z								
								X	Y	Z						
F4BTMS	PTFE/陶瓷/超薄玻纤布 PTFE/Ceramic/Superfine woven glass	F4BTMS220	2.20±0.03	-48	0.0010	0.35	476	40	45	98	1.80	1×10 <sup>8</sup>	1×10 <sup>8</sup>	0.02	20	V-0
		F4BTMS294	2.94±0.04	-20	0.0012	0.58	490	10	12	22	2.25	1×10 <sup>8</sup>	1×10 <sup>8</sup>	0.03	12	V-0
		F4BTMS300	3.00±0.04	-20	0.0013	0.58	490	10	11	22	2.28	1×10 <sup>8</sup>	1×10 <sup>8</sup>	0.04	12	V-0

**5. PTFE陶瓷复合基板 Teflon(PTFE) ceramic-filled composite substrate**

产品 Product	材质成分 Material Composition	产品型号 Product Type	DK及公差 Dk ( $\epsilon_r$ )@10GHZ & Tolerance	Dk热变化率 TcDk (ppm/°C) (Typical)	损耗因子Df Loss Tangent, Df@10GHZ	导热系数 Thermal Conductivity (W/m/°k)	Td (°C)	热膨胀系数 Coefficient of Thermal Expansion -50 °~260°C (ppm/°C)			密度 Density (g/cm <sup>3</sup> )	体积电阻 Volume Resistivity (Mohm.cm)	表面电阻 Surface Resistivity (Mohm)	吸水率 Moisture Absorption (%)	抗剥强度 Peel Strength (N/cm) (10Z)	阻燃等级 Flammability Rating UL 94
	介质层 Dielectric Layer							X Y Z								
								X	Y	Z						
TFA	PTFE/陶瓷 PTFE/Ceramic 层压工艺 (Laminating Processes)	TFA294	2.94±0.04	-5	$\leq 1.0 \times 10^{-3}$	0.49	498	18	18	32	2.05	5×10 <sup>7</sup>	5×10 <sup>7</sup>	0.03	16	V-0
		TFA300	3.00±0.04	-8	$\leq 1.0 \times 10^{-3}$	0.48	489	18	18	30	2.10	5×10 <sup>7</sup>	5×10 <sup>7</sup>	0.04	16	V-0
		TFA350	3.50±0.05	-55	$\leq 1.5 \times 10^{-3}$	0.52	489	16	16	30	2.20	5×10 <sup>7</sup>	5×10 <sup>7</sup>	0.05	16	V-0
		TFA615	6.15±0.12	-240	$\leq 2.2 \times 10^{-3}$	0.80	496	16	16	29	2.50	5×10 <sup>7</sup>	5×10 <sup>7</sup>	0.06	16	V-0
		TFA1020	10.20±0.20	-360	$\leq 2.5 \times 10^{-3}$	0.80	496	16	16	30	2.70	5×10 <sup>7</sup>	5×10 <sup>7</sup>	0.08	16	V-0

**6. 金属基高频板材 Metal based high frequency substrate**

产品说明：金属基板是中间采用F4BM/TP/TF/F4BTMS/TFA等高频材料的介质层，一面敷上铜箔，另一面敷上铜基（铝基），组合而成的金属基高频材料

Product Description: Metal base plate is a combination of metal base high-frequency materials. The intermediate medium layer is made of F4BM/TP/TF/F4BTMS/TFA and other high-frequency materials, one side is coated with copper foil, the other side is coated with copper base (aluminum base).

金属基 based	Metal	比重 Proportion	热导率 Thermal Conductivity (W/m/°k)	热膨胀系数 Coefficient of Thermal Expansion	可搭配的材料形成型号 Product model	可提供金属基的厚度 Thickness of metal base	可提供的尺寸 Size
紫铜/黄铜 Copper/brass		8.9	380	17	F4BM-AL(CU) F4BME-AL(CU) F4BTM-AL(CU) F4BTME-AL(CU)	1.0mm 2.0mm 3.0mm 4.0mm	150*150mm 300*300mm 400*400mm
铝基 Aluminum base		2.7	180	24	TP-AL(CU) TF-AL(CU) F4BTMS-AL(CU) TFA-AL(CU)	其他厚度可定制(Other thickness can be customized)	TP-AL(CU)/TF-AL(CU) 只提供150*150mm (This size of TP- AL(CU)/TF-AL(CU)) is only 150*150mm

### 聚四氟乙烯玻璃漆布

本产品是聚四氟乙烯玻璃布覆铜箔板层压前的原材料，是用聚四氟乙烯分散液浸渍在无碱玻璃布上，经干燥、烘培、烧结而制成的耐热绝缘以及低损耗微波介质材料，具有优良电气性能、不粘性及耐高温性能。广泛应用于电子、电机、航空、纺织、化学和食品工业等部门。在微波电路器件上可以作为多层印制板之间的粘接片。

#### 一、材料分类：

- (1) 聚四氟乙烯玻璃防粘漆布            型号为：F4B-N  
 (2) 聚四氟乙烯玻璃透气漆布            型号为：F4B-T

#### 二、技术要求：

外观	表面光滑平整、胶量均匀，无裂缝及机械损伤							
外型尺寸	长度	A=1~200m						
	宽度	B=900mm~1260mm						
厚度 δ (mm)	防粘用 F <sub>4</sub> B-N				透气防粘漆布 F <sub>4</sub> B-T			
	0.08	0.10	0.15	0.40	0.04	0.07		
公差	±0.01	±0.015	±0.020	±0.04	±0.004	±0.005		
机械物理化学电气性能	指标名称	测试条件		单位	指标数值			
	撕裂强度	拉力机		N (±5%)	8			
	使用温度	烘箱中		℃	250℃长期使用，300℃间断使用			
	化学性能	浸入酸碱盐中			全部是惰性的			
	表面电阻系数	常温下		欧姆	≥10 <sup>12</sup>			
	体积电阻系数	常温下		欧姆·厘米	≥10 <sup>13</sup> MΩ cm			
	击穿电压	δ=0.8		KV	≥0.6			
		δ=0.1		KV	≥0.8			
		δ=0.15		KV	≥1.1			
		δ=0.20		KV	≥1.3			
	介电常数	δ=0.40		KV	≥1.5			
		1GHz	ε <sub>r</sub>		2.7±0.1			
1GHz		tg δ		≤2×10 <sup>-4</sup>				

### 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 <sub>4</sub> B-N				F <sub>4</sub> 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		℃	250℃ for long-term usage, 300℃ for discontinuous usage		
	Chemical properties	Dip in the acid、alkali and salt			All inert		
	Surface resistance coefficient	Normal temperature		Ω	≥10 <sup>12</sup>		
		Normal temperature		Ω.cm	≥1×10 <sup>13</sup>		
	Breakdown voltage	δ=0.8		KV	≥0.6		
		δ=0.1		KV	≥0.8		
		δ=0.15		KV	≥1.1		
		δ=0.20		KV	≥1.3		
		δ=0.40		KV	≥1.5		
	Dielectric Constant	1GHz		ε <sub>r</sub>	2.7±0.1		
Dissipation Factor	1GHz		tg δ	≤2×10 <sup>-4</sup>			

### 聚四氟乙烯玻璃布胶带 ( TWH002 )

该材料广泛应用于模具表面脱模。

**技术要求:**

项 目	单 位	特 性
基质材料		玻璃纤维
涂层材料		聚四氟乙烯
有效宽幅	mm	10—1000
单位面积质量	g/m <sup>2</sup>	150 210
厚 度	mm	0.083 0.13
工作温度	℃	-70—+260
胶粘力	g/m	12
粘胶种类		硅 胶
树脂含量	%	68
透明度	Scm/m/m <sup>2</sup>	无透孔

### 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 <sup>2</sup>	150 210
Thickness	mm	0.083 0.13
Working temperature	℃	-70—+260
Adhesive	g/m	12
Adhesive type		The silicone
Resin content	%	68
Transparency	Scm/m/m <sup>2</sup>	No through hole

### 三、产品规格：PRODUCT SPECIFICATION

#### 1. 聚四氟乙烯玻纤布覆铜板系列 Teflon (PTFE) copper-clad laminate series:

产品 Product	标准介质厚度（不含金属层）及公差 Standard Dielectric thickness and Tolerance	可用铜箔类型 Available Copper foil	标准板材尺寸 Standard Panel Sizes		
<b>F4BM</b> <b>F4BME</b>	0.1mm(4mil)±0.01mm(0.4mil)      0.127mm(5mil)±0.01mm(0.4mil) 0.17mm(6.7mil)±0.015mm(0.6mil)      0.203mm(8mil)±0.018mm(0.7mil) 以上厚度只适合DK≤2.65的产品，以下厚度适合该系列所有产品 (The above thickness is only suitable for DK ≤2.65 products, the following thickness is suitable for all products of this series) 0.254mm(10mil)±0.02mm(0.8mil)      0.508mm(20mil)±0.05mm(2mil) 0.762mm(30mil)±0.05mm(2mil)      1.016mm(40mil)±0.05mm(2mil) 1.524mm(60mil)±0.05mm(2mil)      2.0mm(78.7mil)±0.075mm(3mil) 3.00mm(120mil)±0.09mm(3.6mil)      4.00mm(158mil)±0.1mm(4mil) 5.00mm(197mil)±0.1mm(4mil)      6.00mm(237mil)±0.12mm(4.8mil) 最厚可做到12mm，超过12mm请与我司联系 (The maximum thickness is 12mm, more than 12mm please contact us)	1. 该系列板材可以在0.1~12mm之间定制厚度 1.The thickness of this series can be customized between 0.1 mm and 12 mm. 2. 该系列板材厚度可以做成不含铜厚度，也可以做成含铜总厚度，请客户注明厚度要求 2. The thickness of this series plate can be made without copper thickness, also can be made with copper. When you place an order, please note the thickness requirements clearly.	F4BM: 0.5, 1oz, 2oz (18, 35, 72μm) ED Copper Foil 电解铜箔 F4BME: 0.5, 1oz (18, 35μm) Reverse Treated Copper Foil(RTF) 反转铜箔	300mm*250mm(11.8" X 9.8") 350mm*380mm(13.8" X 15") 440mm*550mm(17.3" X 21.6") 460mm*610mm(18" X 24") 500mm*500mm(19.7" X 19.7") 500mm*600mm(19.7" X 23.6") 850mm*1200mm(33.5" X 47.2") 914mm*1220mm(36" X 48") 1000mm*1500mm(39.4" X 59.1") 1000mm*1800mm(39.4" X 70.9")	注意：板材厚度≥5.0mm,尺寸不能大于600mm*500mm Note: Thickness≥5.0mm, Size≤600mm*500mm
<b>F4BM-2-A</b> <b>F4BME-2-A</b>	0.254mm(10mil)±0.02mm(0.8mil) 0.254mm只适合DK≤2.65的产品，以下厚度适合该系列所有产品 (The thickness 0.254mm is only suitable for DK ≤2.65 products, the following thickness is suitable for all products of this series) 0.508mm(20mil)±0.05mm(2mil)      0.762mm(30mil)±0.05mm(2mil) 1.016mm(40mil)±0.05mm(2mil)      1.524mm(60mil)±0.05mm(2mil) 2.0mm(78.7mil)±0.075mm(3mil)      3.0mm(120mil)±0.09mm(3.6mil) 4.0mm(158mil)±0.1mm(4mil)      5.0mm(197mil)±0.1mm(4mil) 最厚可做到12mm，超过12mm请与我司联系 (The maximum thickness is 12mm, more than 12mm please contact us)	1. 该系列板材可以在0.1~12mm之间定制厚度 1.The thickness of this series can be customized between 0.1 mm and 12 mm. 2. 该系列板材厚度可以做成不含铜厚度，也可以做成含铜总厚度，请客户注明厚度要求。 2. The thickness of this series plate can be made without copper thickness, also can be made with copper. When you place an order, please note the thickness requirements clearly.	F4BM-2-A: 0.5, 1oz, 2oz (18, 35, 72μm) ED Copper Foil 电解铜箔 F4BME-2-A: 0.5, 1oz (18, 35μm) Reverse Treated Copper Foil(RTF) 反转铜箔	440mm*550mm(17.3" X 21.6") 460mm*610mm(18" X 24") 500mm*500mm(19.7" X 19.7") 500mm*600mm(19.7" X 23.6") 850mm*1200mm(33.5" X 47.2") 914mm*1220mm(36" X 48")	注意：板材厚度≥5.0mm,尺寸不能大于600mm*500mm Note: Thickness≥5.0mm, Size≤600mm*500mm
<b>F4BTM</b> <b>F4BTME</b>	0.1mm(4mil)±0.01mm(0.4mil)      0.127mm(5mil)±0.01mm(0.4mil) 0.17mm(6.7mil)±0.015mm(0.6mil)      0.203mm(8mil)±0.018mm(0.7mil) 以上厚度只适合DK≤3.0的产品，以下厚度适合该系列所有产品 (The above thickness is only suitable for DK ≤3.0 products, the following thickness is suitable for all products of this series) 0.254mm(10mil)±0.02mm(0.8mil)      0.508mm(20mil)±0.05mm(2mil) 0.762mm(30mil)±0.05mm(2mil)      1.016mm(40mil)±0.05mm(2mil) 1.524mm(60mil)±0.05mm(2mil)      2.0mm(78.7mil)±0.075mm(3mil) 3.00mm(120mil)±0.09mm(3.6mil)      4.00mm(158mil)±0.1mm(4mil) 5.00mm(197mil)±0.1mm(4mil)      6.00mm(237mil)±0.12mm(4.8mil) 最厚可做到12mm，超过12mm请与我司联系 (The maximum thickness is 12mm, more than 12mm please contact us)	1. 该系列板材可以在0.1~12mm之间定制厚度 1.The thickness of this series can be customized between 0.1 mm and 12 mm. 2. 该系列板材厚度可以做成不含铜厚度，也可以做成含铜总厚度，请客户注明厚度要求 2.The thickness of this series plate can be made without copper thickness, also can be made with copper. When you place an order, please note the thickness requirements clearly.	F4BTM: 0.5, 1oz, 2oz (18, 35, 72μm) ED Copper Foil 电解铜箔 F4BTME: 0.5, 1oz (18, 35μm) Reverse Treated Copper Foil(RTF) 反转铜箔	305mm*460mm(12" X 24") 460mm*610mm(18" X 24") 440mm*550mm(17.3" X 21.7") 500mm*500mm(19.7" X 19.7") 500mm*600mm(19.7" X 23.6") 914mm*1220mm(36" X 48") 1000mm*1500mm(39.4" X 59.1")	注意：板材厚度≥5.0mm,尺寸不能大于600mm*500mm Note: Thickness≥5.0mm, Size≤600mm*500mm

**2.微波复合介质基片系列 Microwave composite dielectric substrate series:**

产品 Product	厚度及公差 Thickness and Tolerance		可用铜箔类型 Available Copper foil	标准板材尺寸 Standard Panel Sizes		
<b>TP</b>	0.5mm(19.7mil)±0.04mm(1.6mil) 0.6mm(23.6mil)±0.04mm(1.6mil) 以上厚度只适合DK≤2.65的产品，以下厚度适合该系列所有产品 (The above thickness is only suitable for DK ≤2.65 products, the following thickness is suitable for all products of this series) 0.8mm(31.5mil)±0.05mm(2mil) 1.0mm(39.4mil)±0.05mm(2mil) 1.5mm(59mil)±0.05mm(2mil) 2.0mm(78.7mil)±0.075mm(3mil) 3.0mm(120mil)±0.10mm(4mil) 4.0mm(158mil)±0.1mm(4mil) 5.0mm(197mil)±0.12mm(4.8mil) 6.0mm(237mil)±0.12mm(4.8mil) 10.0mm(394mil)±0.20mm(7.9mil) 12.0mm(473mil)±0.25mm(10mil)		1. 该系列板材可以在0.5~12mm之间定制厚度 1.The thickness of this series can be customized between 0.5 mm and 12 mm 2. 该系列板材厚度可以做成不含铜厚度，也可以做成含铜总厚度，请客户注明厚度要求。 2. This series of plate thickness can be made without copper thickness, also can be made with copper total thickness, please note the thickness requirements.	0.5,1oz(18,35μm) ED Copper Foil 电解铜箔	120mm*100mm(4.7" X 3.9") 150mm*150mm(5.9" X 5.9") 160mm*160mm(6.3" X 6.3") 180mm*180mm(7.1" X 7.1") 200mm*200mm(7.9" X 7.9") 170mm*240mm(6.7" X 9.4")  DK值≥20时，尺寸只能提供150mm*150mm (When DK value ≥20, size can only be selected 150mm*150mm)	
<b>TF</b>	0.5mm(19.7mil)±0.04mm(1.6mil) 0.6mm(23.6mil)±0.04mm(1.6mil) 以上厚度只适合DK≤2.65的产品，以下厚度适合该系列所有产品 (The above thickness is only suitable for DK ≤2.65 products, the following thickness is suitable for all products of this series) 0.8mm(31.5mil)±0.05mm(2mil) 1.0mm(39.4mil)±0.05mm(2mil) 1.5mm(59mil)±0.05mm(2mil) 2.0mm(78.7mil)±0.075mm(3mil) 2.5mm(98.5mil)±0.10mm(4mil)		1. 该系列板材可以在0.5~2.5mm之间定制厚度 1.The thickness of this series can be customized between 0.5 mm and 2.5 mm 2. 该系列板材厚度可以做成不含铜厚度，也可以做成含铜总厚度，请客户注明厚度要求。 2. This series of plate thickness can be made without copper thickness, also can be made with copper total thickness, please note the thickness requirements.	0.5,1oz(18,35μm) ED Copper Foil 电解铜箔	150mm*150mm(5.9" X 5.9") 250mm*250mm(9.8" X 9.8")  DK值≥20时，尺寸只能提供150mm*150mm (When DK value ≥20, size can only be selected 150mm*150mm)	
<b>TPH</b>	2.5mm(99mil)±0.075mm(3mil) 3.0mm(120mil)±0.10mm(4mil) 4.0mm(158mil)±0.1mm(4mil) 5.0mm(197mil)±0.12mm(4.8mil) 6.0mm(237mil)±0.12mm(4.8mil) 7.0mm(276mil)±0.15mm(6mil) 8.0mm(315mil)±0.15mm(6mil) 9.0mm(355mil)±0.20mm(7.9mil) 10.0mm(394mil)±0.20mm(7.9mil) 12.0mm(473mil)±0.20mm(7.9mil)		1. 该系列板材可以在2.5~12mm之间定制厚度 1.The thickness of this series can be customized between 2.5 mm and 12 mm 2. 该系列板材厚度可以做成不含铜厚度，也可以做成含铜总厚度，请客户注明厚度要求。 2. This series of plate thickness can be made without copper thickness, also can be made with copper total thickness, please note the thickness requirements.	0.5,1oz(18,35μm) ED Copper Foil 电解铜箔	160mm*160mm(6.3" X 6.3") 200mm*200mm(7.9" X 7.9")	

**3.有机聚合物覆铜板系列 Hydrocarbon polymer ceramic copper-clad laminates series:**

产品 Product	标准介质厚度及公差 (不含金属层) Standard Dielectric thickness(without the cladding) and Tolerance		可用铜箔类型 Available Copper foil	标准板材尺寸 Standard Panel Sizes
WL-CT300	搭配正转铜箔时 (Choosing ED Copper) : 0.127mm(5mil)±0.015mm(0.6mil) 0.254mm(10mil)±0.0254mm(1mil) 0.508mm(20mil)±0.038mm(1.5mil) 0.762mm(30mil)±0.05mm(2mil) 1.016mm(40mil)±0.076mm(3.0mil) 1.524mm(60.7mil)±0.1mm(4mil)	非标厚度以0.127 (5mil) 递增, 超过3.05mm (120mil) 时与我司联系 (Non-standard thickness starts from 0.127(5mil) increasing. More than 3.05 mm (120mil), please contact us.)	0.5, 1oz, 2oz (18,35,72μm) ED Copper Foil 电解铜箔	305mm*460mm(12" X 18") 460mm*610mm(18" X 24") 915mm*1220mm(36" X 48") 其他尺寸与我司联系(Other sizes, please contact us)
	搭配反转背胶转铜箔时(Choosing RTF Copper): 0.78mm(30.7mil)±0.05mm(2mil) 1.034mm(40.7mil)±0.076mm(3mil) 1.542mm(60.7mil)±0.1mm(4mil) 2.05mm(80.7mil)±0.127mm(5mil)		0.5, 1oz (18,35μm) Reverse Treated Copper Foil(RTF) 反转背胶铜箔	
WL-CT330 WL-CT330Z	搭配正转铜箔时 (Choosing ED Copper) : 0.254mm(10mil)±0.0254mm(1mil) 0.508mm(20mil)±0.038mm(1.5mil) 0.762mm(30mil)±0.05mm(2mil) 1.016mm(40mil)±0.076mm(3.0mil) 1.524mm(60.7mil)±0.1mm(4mil) 2.03mm(60mil)±0.127mm(5mil)	非标厚度以0.254 (10mil) 递增, 超过3.05mm (120mil) 时与我司联系 (Non-standard thickness starts from 0.254(10mil) increasing. More than 3.05 mm (120mil), please contact us.)	0.5, 1oz, 2oz (18,35,72μm) ED Copper Foil 电解铜箔	305mm*460mm(12" X 18") 460mm*610mm(18" X 24") 915mm*1220mm(36" X 48") 其他尺寸与我司联系(Other sizes, please contact us)
	搭配反转背胶转铜箔时(Choosing RTF Copper): 0.78mm(30.7mil)±0.05mm(2mil) 1.034mm(40.7mil)±0.076mm(3mil) 1.542mm(60.7mil)±0.1mm(4mil) 2.05mm(80.7mil)±0.127mm(5mil)		0.5, 1oz (18,35μm) Reverse Treated Copper Foil(RTF) 反转背胶铜箔	
WL-CT338	搭配正转铜箔时 (Choosing ED Copper) : 0.102mm(4mil)±0.01mm(0.4mil) 0.203mm(8mil)±0.025mm(1mil) 0.305mm(12mil)±0.025mm(1mil) 0.406mm(16mil)±0.038mm(1.5mil) 0.508mm(20mil)±0.038mm(1.5mil) 0.711mm(28mil)±0.05mm(2mil) 0.813mm(32mil)±0.05mm(2mil) 1.524mm(60mil)±0.1mm(4mil)	非标厚度从0.508 (20mil) 开始, 以0.1mm (4mil) 递增, 超过3.05mm (120mil) 时与我司联系 (Non-standard thickness starts from 0.508(20mil) increasing. More than 3.05 mm (120mil), please contact us.)	0.5, 1oz, 2oz (18,35,72μm) ED Copper Foil 电解铜箔	305mm*460mm(12" X 18") 460mm*610mm(18" X 24") 915mm*1220mm(36" X 48") 其他尺寸与我司联系(Other sizes, please contact us)
	搭配反转背胶转铜箔时(Choosing RTF Copper): 0.526mm(20.71mil)±0.038mm(1.5mil) 0.831mm(32.7mil)±0.05mm(2mil) 1.542mm(60.7mil)±0.1mm(4mil) 2.05mm(80.7mil)±0.127mm(5mil)		0.5, 1oz (18,35μm) Reverse Treated Copper Foil(RTF) 反转背胶铜箔	
WL-CT350	仅搭配正转铜箔 (Only use ED Copper) : 0.102mm(4.0mil)±0.018mm(0.7mil) 0.168mm(6.6mil)±0.018mm(0.7mil) 0.254mm(10mil)±0.02mm(1mil) 0.338mm(13.3mil)±0.038mm(1.5mil) 0.422mm(16.6mil)±0.038mm(1.5mil) 0.508mm(20mil)±0.038mm(1.5mil) 0.762mm(30mil)±0.05mm(2mil) 1.016mm(40mil)±0.076mm(3mil) 1.524mm(60mil)±0.1mm(4mil) 3.05mm(120mil)±0.15mm(6mil)	非标厚度从0.508 (20mil) 开始, 以0.0838 (3.3mil) 递增, 超过6.1mm (240mil) 时与我司联系 (Non-standard thickness starts from 0.508(20mil), with 0.0838(3.3 mil) increase. More than 6.1 mm (240mil), please contact us.)	0.5, 1oz(18,35μm) ED Copper Foil 电解铜箔	305mm*460mm(12" X 18") 460mm*610mm(18" X 24") 915mm*1220mm(36" X 48") 其他尺寸与我司联系(Other sizes, please contact us)



<b>WL-CT440</b>	仅搭配正转铜箔 (Only use ED Copper) : 0.254mm(10mil)±0.025mm(1mil)    0.508mm(20mil)±0.038mm(1.5mil) 0.762mm(30mil)±0.05mm(2mil)    1.016mm(40mil)±0.076mm(3mil) 1.524mm(60mil)±0.1mm(4mil)    2.03mm(80mil)±0.127mm(5mil)	非标厚度以0.254 (10mil) 递增, 超过6.1mm (240mil) 时与我司联系 ( Non-standard thickness is increased by 0.254(10mil).Over 6.1 mm (240mil), please contact us.)	0.5,1oz(18,35μm) ED Copper Foil 电解铜箔	305mm*460mm(12" X 18") 460mm*610mm(18" X 24") 915mm*1220mm(36" X 48") 其他尺寸与我司联系(Other sizes, please contact us)
<b>WL-CT615 (研发中)</b>	仅搭配正转铜箔 (Only use ED Copper) : 0.203mm(8mil)±0.025mm(1mil)    0.305mm(12mil)±0.025mm(1mil) 0.406mm(16mil)±0.038mm(1.5mil)    0.508mm(20mil)±0.038mm(1.5mil) 0.711mm(28mil)±0.05mm(2mil)    0.813mm(32mil)±0.05mm(2mil) 1.524mm(60mil)±0.1mm(4mil)    3.05mm(120mil)±0.15mm(6mil)	非标厚度从0.508 (20mil) 开始, 以0.254 (10mil) 递增, 超过6.1mm (240mil) 时与我司联系 Non-standard thickness starts from 0.508(20mil) , with 0.254(10mil) increase.More than 6.1 mm (240mil), please contact us.)	0.5,1oz, 2oz (18,35,72μm) ED Copper Foil 电解铜箔	305mm*460mm(12" X 18") 460mm*610mm(18" X 24") 915mm*1220mm(36" X 48") 其他尺寸与我司联系(Other sizes, please contact us)

#### 4. 改良型PTFE超薄超细玻纤布陶瓷填充基板 Modified woven fabric glass Teflon (PTFE) copper-clad laminates with ceramic filler

产品 Product	标准介质厚度及公差 (不含金属层) Standard Dielectric thickness(without the cladding) and Tolerance	可用铜箔类型 Available Copper foil	标准板材尺寸 Standard Panel Sizes	
<b>F4BTMS</b>	0.127mm(5mil)±0.0127mm(0.5mil) 0.254mm(10mil)±0.02mm(1mil) 0.508mm(20mil)±0.03mm(1.19mil) 0.762mm(30mil)±0.04mm(1.58mil) 1.016mm(40mil)±0.05mm(2mil) 1.524mm(60mil)±0.05mm(2mil) 3.05mm(120mil)±0.1mm(4mil) 5.08mm(200mil)±0.127mm(5mil)	非标厚度以0.254 (10mil) 递增, 超过6.1mm (240mil) 时与我司联系 (Non-standard thickness is increased by 0.254(10mil). Over 6.1 mm (240mil),please contact us)	0.5,1oz (18, 35μm) 正转铜箔、反转铜箔、HVLP铜箔、压延铜箔、50Ω电阻铜箔 ED Copper Foil, RTF Copper Foil, HVLP Copper Foil, Rolled Copper Foil, 50Ω Resistance Copper Foil	305mm*460mm(12" X 18") 460mm*610mm(18" X 24") 500mm*600mm(19.7" X 23.6") 915mm*1220mm(36" X 48")

#### 5. 无玻纤PTFE陶瓷复合基板 Teflon(PTFE) ceramic-filled composite substrate

产品 Product	标准介质厚度及公差 (不含金属层) Standard Dielectric thickness(without the cladding) and Tolerance	可用铜箔类型 Available Copper foil	标准板材尺寸 Standard Panel Sizes	
<b>TFA</b>	0.127mm(5mil)±0.0127mm(0.5mil) 该厚度只适应于TFA294和TFA300 (This thickness is only suitable for TFA294 and TFA300) 0.254mm(10mil)±0.02mm(1mil) 0.508mm(20mil)±0.03mm(1.19mil) 0.762mm(30mil)±0.04mm(1.58mil) 1.016mm(40mil)±0.05mm(2mil) 1.524mm(60mil)±0.05mm(2mil) 3.05mm(120mil)±0.1mm(4mil) 5.08mm(200mil)±0.127mm(5mil) 6.1mm(240mil)±0.15mm(6mil)	非标厚度以0.254 (10mil) 递增, 超过6.1mm (240mil) 时与我司联系 (Non-standard thickness is increased by 0.254(10mil). Over 6.1 mm (240mil),please contact us.)	0.5,1oz (18, 35μm) 正转铜箔、反转铜箔、HVLP铜箔、压延铜箔、50Ω电阻铜箔 ED Copper Foil, RTF Copper Foil, HVLP Copper Foil, Rolled Copper Foil, 50Ω Resistance Copper Foil	TFA294/TFA300/TFA350, 尺寸如下 (The sizes are as follows) : 460mm*610mm(18" X 24") TFA615/TFA1020, 尺寸如下(The sizes are as follows): 254mm*254mm(10" X 10") 305mm*457mm(12" X 18")

## 质量方针

QUALITY POLICY

以质量求生存 以管理求效益

QUALITY AS SUBSISTENCE, MANAGEMENT AS BENEFIT

以服务求信誉 以技术求发展

SERVICE AS PRESTIGE, DEVELOPMENT AS TECHNOLOGY

## 质量目标

QUALITY OBJECTIVES

成品一次检验合格率:  $\geq 97.2\%$

FINISHED PRODUCTS PASSING RATE OF ONE

EXPERIENCE:  $\geq 97.2\%$

客户年满意度:  $\geq 95.2\%$

ANNUAL CUSTOMER SATISFACTION:  $\geq 95.2\%$