高性能散热材料——铝基板

Al-Substrate CCL

产品简介/ Product description

华正新材铝基板具有高导热性、高耐热性、良好的电绝缘性和极佳的环境可靠性的特点，其导热系数为传统覆铜板的 5 ~10 倍以上。采用该基板制作的 PCB 能将电子元件产生的热量经由基板结构，快速传导至后端散热基座或其他散热模组。其结构由铜箔电路层、导热绝缘层以及金属基板所组成，导热层是由特殊的高分子树脂和导热填充料制作而成，相关产品已通过多项苛刻的长时间环境测试，获得国际认证。

华正新材拥有强大的研发实力，相续开发出多款高性能铝基板产品。热导率为 1.0～3.0 W/ M·K，可满足中高端产品需求，性价比高。所有产品均通过 RoHS 等国际规范的禁用物质检验，兼顾良好的产品特性与低碳节能环保之趋势。

Thermal conduct Al-Substrate CCL provides the advantages of high thermal conductivity, Excellent solder heat endurance, Excellent Breakdowm Voltage, reliability, Thermal Conductivity is about five~ ten times higher than the FR-4 , PCB produced by the substrate can transfer heat , which is electrionic components generate , throughing the substrate structure rapid conduct to the back-end cooling base or other cooling modules.

Al-Substrate CCL is a sandwich structure, which includes layers of conductor ,insulator and metal base. In genaral, this insulator is made of epoxy resin and high thermal Conductivity filler. The products have been through a number of demanding for a long time environmental testing, access to international certification.

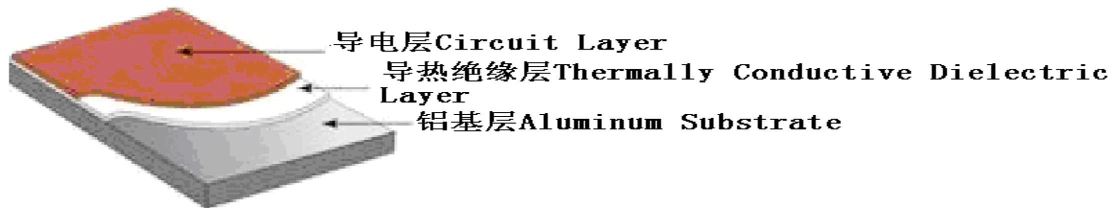
Huazheng new material has a strong R&D strength, which continued to develop avariety of high Thermal Conductivity products. Thermal conductivity 1.0～3.0 W/ M·K，It can fit the demand of high end and mid-range products，with high cost performance. All products pass RoHS standard, have good property andmeet low-carbon environmental trend.

特性/ Features

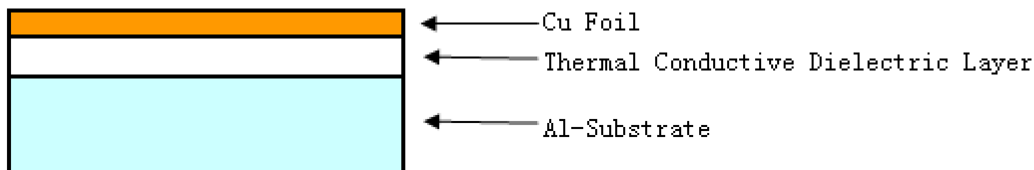
优异的散热性能	Excellent thermal conductivity
电气绝缘性能佳	Excellent Breakdowm Voltage
符合 RoHS 要求	RoHS compliance
良好的耐热性能	Excellent solder heat endurance
良好的机械加工性能	Excellent mechanical properties
电磁屏蔽性能	Excellent electromagnetic shielding
可直接外接散热装置	Can use external cooling device directly
优良的性价比	High cost performance

基本结构/ Basic Structure

典型结构



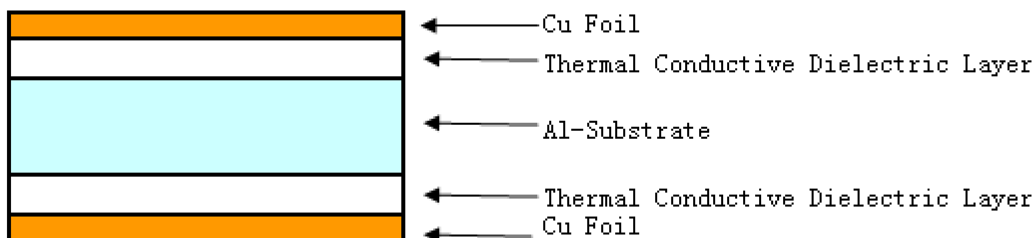
单面铝基板 single Al-Substrate CCL



单面铝基板产品能够针对各种铜厚、绝缘层特性、金属板规格需求，提供符合客户要求的高性能产品；

Single Al-Substrate CCL offers various kinds ouf combination of base metal,copper foil,and dielectric layers to meet the general requirement of single layer thermal conductive printed circuit board

双面铝基板 Double Al-Substrate CCL



双面铝基板产品其为导热绝缘层双面黏贴铜箔的三层结构，适用于一般用途多层板及薄型电路板。

Double Al-Substrate CCL is good for general requirement ouf multilayer or thineer shape printed circuit board. ACCL is a sandwich structure, which includes layers of copper foil, thermal conductive dielectric layer, and lower copper foil

说明 / Instruction

导电层—电解铜箔 / Circuit Layer – Electrolysis copper foil

导热绝缘层—以最小的热阻提供电学上的绝缘，分为玻璃布增强型和无玻璃布增强型两种

Thermally Conductive Dielectric Layer –This offers electrical isolation with minimum thermal resistance. two types: Fiberglass support & non-fiberglass support.

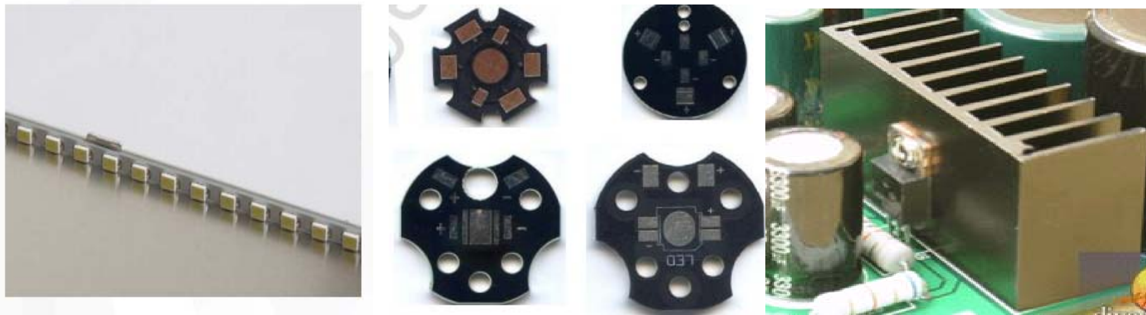
铝基层—是整个结构的支撑和热量的发散，材料为铝合金板

Aluminum SubstrateIt –supports the entire structure and conducts the heat.

The material is aluminum alloy plate.

应用领域 / Application

照明、LED 显示	LED lighting、Public lighting、Backlight module、outdoor LED display
汽车应用	Automotive (Vehiche lighting、regulator、converters、Power module)
工业电子	Industrial electronics（DC-DC converter、Power supplies、Solid-State Relays transistor modules)
通讯产品	Digital、PC、Audio
需要高散热的领域	The area needs high heat dissipation



产品分类 /Type

Type1：普通型，一般应用在家用照明、户外显示屏、背光源领域
General purpose. It is used widely in consumer lighting、outdoor LED display and backlight applications

Type2：标准导热型，广泛应用在公用照明、通讯、数码、汽车应用领域
Standard thermal conductivity. It is used in public lighting、Digital、PC、Audio、Automotive applications
Type3：高导热型，应用在大高亮度 LED、汽车应用、工业电子领域
High thermal conductivity. It is used in high power LED lighting、Automotive applications、Industrial electronics

Type4：高导热低热阻型，可使用需要高导热及高功率方面
High thermal conductivity、Low thermal resistance. It is used in high power applications

产品规格 Specification

标准尺寸 Standard Size（mm）	500×610mm、550×610mm、500×1220mm、550×1220mm 1000×1220mm、1100×1220mm
导电层 Circuit Layer （电解铜箔 Copper foil）	18μm、35μm、70μm、105μm（Hoz、1oz、2oz、3oz）
导热绝缘层厚 Thermally Conductive Dielectric Layer Thickness	75μm、100μm、125μm、150μm (3mil、4mil、5mil、6mi)
铝基板厚度 Thickness	0.8mm、1.0mm、1.2mm、1.5mm、1.6mm、2.0mm
铝板类型及处理方法 Aluminum Substrate Type	1100、1060、3003、5052、6061 阳极氧化法 Anodization
保护膜类型 Masking Film	PE、PET、PI

如有特殊要求，可定制 any specific inquuiry could be available upon request。

主要性能 Main property

表 Table1

项目 Item	处理条件 Test condition	单位 Units	指标值 Spec	典型值 Typical Value				
				类型 1 Type1	类型 2 Type2	类型 3 Type3	类型 4 Type4	类型 5 Type5
热阻*（备注） thermal resistance (note)	激光法 （ASTM E1461）	K·m²/W	≤1.0×10^{-4}	0.72×10^{-4}				can be bend as 90degree
			≤0.7×10^{-4}		0.51×10^{-4}			
			≤0.5×10^{-4}			0.37×10^{-4}	0.28×10^{-4}	0.37×10^{-4}
热导率*（备注） Thermal Conductivity(note)	激光法 （ASTM E1461）	W/m·K	＞1.0	1.1				
			＞1.5		1.6			
			＞2.0			2.2	3.0	2.2
剥离强度 1OZ Peel Strength	A	N/mm	≥1.2	1.82	1.83	1.80	1.85	1.80
	热应力后			1.75	1.73	1.76	1.80	1.76
热应力 Thermal Stress	288℃, solder dip	S	≥120	180S No delamination				
	300*10s/cycle solder dip	cycle	—	≥3 次				
表面电阻 Surface Resistivity	C96/35/90	MΩ	≥10^{4}	10^{6}	10^{6}	10^{6}	10^{6}	10^{6}
	E-24/125		≥10^{3}	10^{5}	10^{5}	10^{5}	10^{5}	10^{5}
体积电阻 Volume Resistivity	C96/35/90	MΩ·cm	≥10^{6}	10^{7}	10^{7}	10^{7}	10^{7}	10^{7}
	E-24/125		≥10^{3}	10^{5}	10^{5}	10^{5}	10^{5}	10^{5}
电气强度*备注 （AC） BreakdowmVoltage	A IPC-TM-650 2.5.6.2	KV/mm V/mil	≥30 ≥750	40 1000	40 1000	40 1000	40 1000	40 1000
介电常数（1MHz） DielectricConstant	C 24/23/50 IPC-TM-650 2.5.5.2	—	—	5.1	5.3	5.5	5.8	5.5
耐电弧 Arc Resistance	D48/50＋D0.5/23 IPC-TM-650 2.5.1	S	≥60	120	120	120	120	120
燃烧性 Flammability	E-24/125	—	V-0	V-0	V-0	V-0	V-0	V-0
玻璃化温度 Tg	DSC	℃	≥110	121.2	122.6	121.8	122.3	121.8
吸水率 Water Absorption	D-24/23 IPC-TM-650 2.6.2.1	%	≤1.5	0.52	0.43	0.56	0.49	0.56
CTI	IEC60112	V	≥600	600	600	600	600	600

上述测试数据为典型值而非保证值。

*备注：

热阻试样采用铝合金板厚度 1.0mm、铜箔厚度 35um、绝缘层厚度 75um 的铝基板，采用激光法（ASTM E1461）法测试并计算所得。根据 CPCA4105-2010《印制电路用金属基覆铜箔层压板》行业标准，铝基板热阻与其绝缘层热导率存在下表 2 中的对应关系。

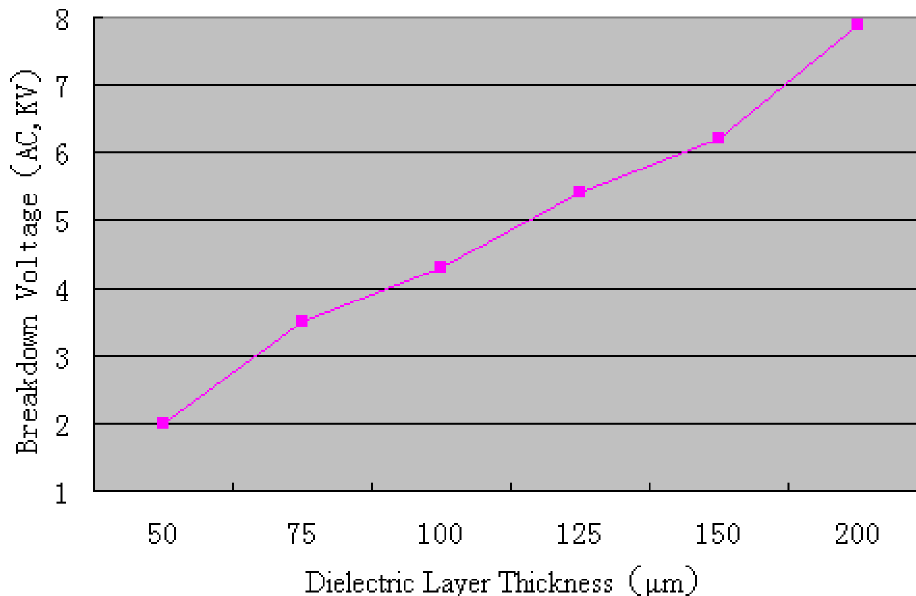
表 1 中绝缘层热导率是由铝基板热阻值推算所得。

*Note： Thermal resistance samples use Aluminum SubstrateIt with 1mm aluminium alloy plate ,35um copper foil and 75um insulating layer, Using laser (E1461) test method and calculate the result. According to CPCA4105-2010《 Printed Circuit Metal Base Copper-Clad Laminate 》, the Al-Substrate CCL thermal resistance and its insulating layer thermal conductivity have the relation as follows table2 .

The insulating layer thermal conductivity value of table1 is calculated by the Al-Substrate CCL thermal resistance value.

级别（class） 项目（Item）	1 级 Grade 1	2 级 Grade 2	3 级 Grade 3
热导率 λ （W/ m•K） Thermal conductivity	λ＞1.0	λ＞1.5	λ＞2.0
热阻 R （K •m²/ W） Thermal resistance	$R≤1.0×10^{-4}$	$R≤0.7×10^{-4}$	$R≤0.5×10^{-4}$
热阻 R 典型值（K •m²/ W） Typical thermal resistance	$0.72×10^{-4}$	$0.51×10^{-4}$	$0.37×10^{-4}$ $0.30×10^{-4}$

绝缘层厚度与耐电压关系 relationship of Dielectric Layer Thickness and Breakdown Voltage



可靠性测试数据/ ReliabilityTesting Data

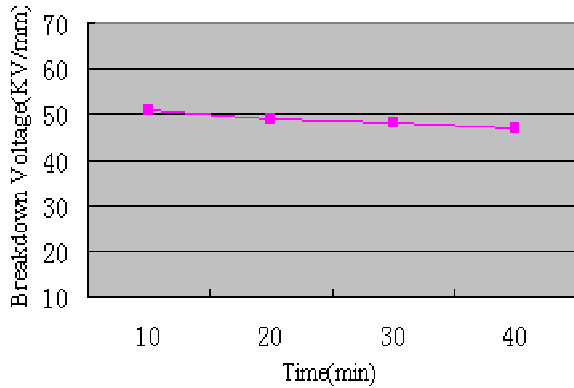
测试基板：HA50-tyle3（铝板厚度：1.36mm，绝缘层厚度：100μm，铜箔厚度：1oz）

Tested substrate: HA50-tyle3 (Aluminum thichness:1.36mm, thermal conductive dielectric layer thinckness: 100μm, copper foil thinckness: 1oz)

(1) **绝缘层耐电压测试** Dielectric Breakdown Voltage

HA50 产品在经过漂锡后仍然可保持良好的耐电压特性。

HA50 product has excellent dielectric Breakdown Voltage even after solder dippling



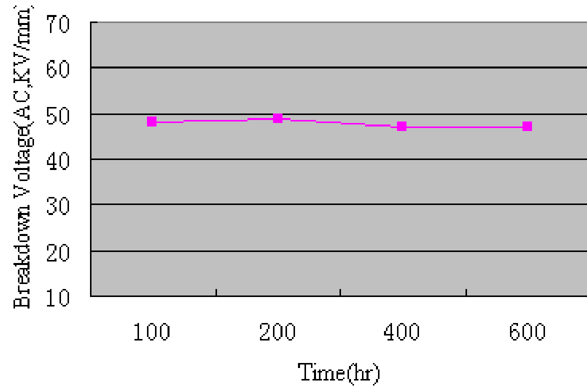


图 1.漂锡测试 260℃

图 2.冷热环境测试-40℃/30min 至 150℃/30min

Figure 1. Breakdown Voltage after aging test at 260℃

Figure 2. Breakdown Voltage after aging test at -40℃/30min&150℃/30min

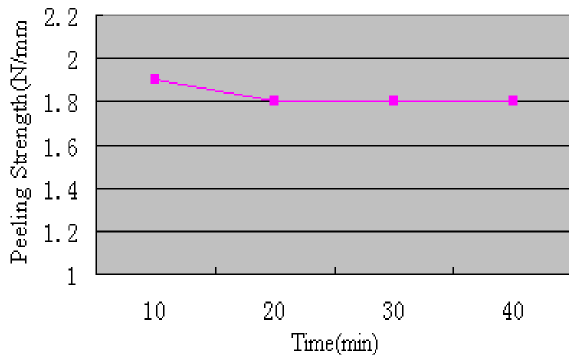
备注：上述耐电压测试值采用铝基覆铜板测试所得，而非制作成 PCB 的测试值。由于客户线路设计及空气导电因素，MPCB 的测试值会低于基板的值。

Dielectric Breakdown Voltage test value refers to the value of Al-Substrate CCL，and not Al-Substrate PCB test value. Because of design and the air facor, the Al-Substrate PCB test value will be lower than the value of substrate.

(2) **剥离强度测试** Peeling Strength

HA50 产品在经过漂锡后仍然可保持良好的剥离强度。

HA50 product has excellent Peeling Strength even after solder dippling



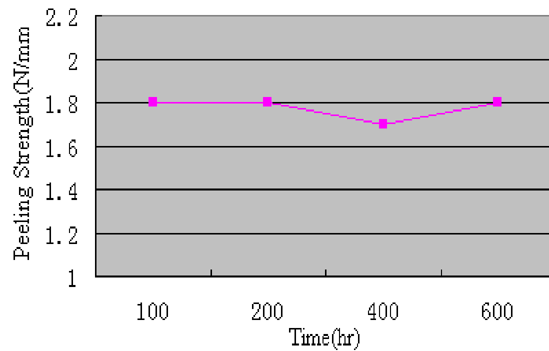


图 3.漂锡测试 260℃

冷热环境测试-40℃/30min 至 150℃/30min

Figure 4. Peeling Strength after aging test at 260℃

Figure 4. Peeling Strength after aging test -40℃/30min&150℃/30min