AIN Co., Ltd.

TEL: +81-266-72-7165 For Quotation & Inquiry

Message

Since the establishment of “AIN MEIWAINDUSTRY” in 1970, we have concentrated on manufacturing printed wiring boards of high quality.

In 1973, the company renamed “AIN Co., Ltd.” and made a fresh start, and a new factory equipped with the latest production machinery was completed in 1983 to stand prepared to cope with the increasingly complicated and diversified electronics industry.

And now, AIN is looking to the future. At the start of the 21st century, a new “wave” has rushed to the printed wiring board industry.

Under such circumstances, developing human resources to meet the needs of the new era, and obtaining a well-earned reputation for quality is our ultimate goal.

Please look forward to the future AIN.

President and Representative Director, **Shuji Hosoda**

Corporate Profile

Corporate Name

AIN Co., Ltd.

Location

Head Office・Factory

374-2 (FukuzawAINdustrial Park), Toyohira, Chino-shi, Nagano-ken

TEL +81-266-72-7003 (key number)

FAX +81-266-73-5031

Electronic Equipment Department・NC Center

530-5 (FukuzawAINdustrial Park), Toyohira, Chino-shi, Nagano-ken

(NC)

TEL +81-266-72-7072

FAX +81-266-82-1121

(Electronic)

TEL 0266-72-5672

FAX 0266-73-5338

Technical Center

445-2 (FukuzawAINdustrial Park), Toyohira, Chino-shi, Nagano-ken

TEL +81-266-82-0152

Tokyo Office

Sun Gray Ariyama, 1-11-13, Oowada-cho, Hachioji-shi, Tokyo

TEL +81-426-46-7981

FAX +81-426-46-7983

Nagoya Office

Room South 2A, Sunshine Johshin, 3-21-12, JohsAINishi-ku, Nagoya-shi, Aichi-ken

TEL +81-52-846-5902

FAX +81-52-846-5903

Business

1.Printed wiring board designing, manufacturing and sales
2.Information control equipment manufacturing and sales
3.Printed wiring board production machine manufacturing, sales and leasing
4.Sales of chemical agents and industrial chemicals

Capital	¥60,000,000
Annual Sales	¥1,500,000,000
Employees	100
MAIN Banks	Suwa Shinkin Bank – Chino Branch
	Japan Finance Corporation－Matsumoto Branch
	Sumitomo Mitsui Banking Corporation – Suwa Branch
	Shoko Chukin Bank – Suwa Branch
	Hachijuni Bank, Ltd. – Chino Branch
Officer	President and Representative Director, Shuji Hosoda
	Executive Managing Director, Kaoru Ono
	Managing Director, Hideo Ogawa
	Executive Manager, Kazumi Naruse
	Executive Technical Manager, Makoto Hosoda
	Auditor (part-time), Mitsuhiko Hosoda
Premises	Land/4,300m^2 Building/3,008m^2

Corporate History

1968	Akihito Ogawa, the present counselor, established a capacitor manufacturing company, Meiwa Industry Limited.
1970	The company's mainstay largely shifted to communication equipment and printed wiring boards for computers and the company's name was renamed AIN Meiwa Industry.
1973	Through-hole wiring board manufacturing and plating facilities and production lines have been set up.
1974	AIN Co., Ltd. has been established and Akito Ogawa was inaugurated as representative director.
1976	Obtainment of UL Certification, No. E62255
1982	Tokyo Office was set up at Oiwake-cho, Hachioji-shi.
1983	Plant relocation and the headquarters building was newly built (Fukuzawa Industrial Park).
1984	Nagoya Office was set up at Tsuchihashi-cho, Toyota-shi. NC Center, intended exclusively for machining, was set up (in Fukuzawa Industrial Park).
1985	Electronic Equipment Department got started. Enhancement and expansion of the assembly and set-up departments
1988	Toshiba Corporation certified AIN as Excellent & High Quality Control Manufacturer.
1988	Solder Leveling Process Line was brought into the production facilities.
1989	Introduction of Clean Room and Pattern Forming Line
1990	Office computer based production control system got started.
1992	Heat-resistant Flux Line was brought into operation.
1995	Ceramic wiring substrate production got started.
1996	Nisca Corporation awarded AIN for its excellent VA activity.
1996	AIN won Excellent Manufacture Award from Fuji Electric Co., Ltd. for the third time.
1997	Multi-layer Wiring Board Forming Hot Press machine was introduced.
1998	Desmear Process Line was installed.
2000	Management Office was newly added and relocated.
2000	Obtainment of ISO9001 Certification Coverage: Printed wiring board designing, development and manufacturing (Electronic Equipment Department is the only exception).

2001 Plasma Processing equipment and Dicing machine were brought into operation.

2002 AIN acquired the adjacent land and initiated internal printing operation.

2004 Obtainment of ISO14001 Certification.
Coverage: Printed wiring board designing, development and manufacturing (Electronic Equipment Department is the only exception).

2006 Plant construction site was acquired (in Toyohira, Chino-shi) to develop new business in the future.

2008 New production line is introduced to start new business

2010 Sputter, dicing machine, belt grinder are newly introduced

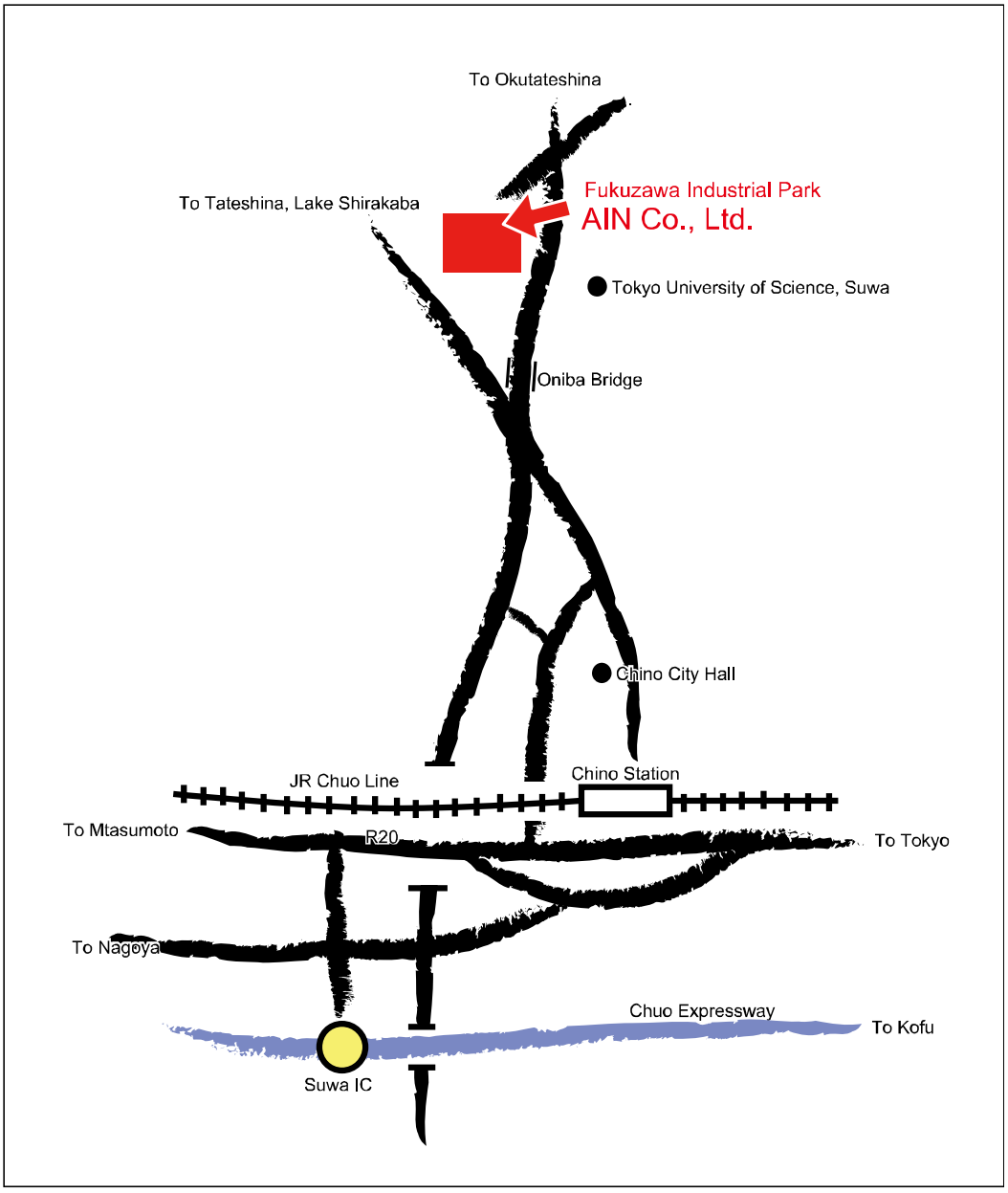
Access Map

Head Office・Factory

374-2 (Fukuzawa Industrial Park), Toyohira, Chino-shi, Nagano-ken

TEL +81-266-72-7003 (key number)

FAX +81-266-73-5031



Plating-method Ceramics Wiring Board

AIN Co.. Ltd.
374-2 Toyohira, Chino-shi, Nagano-ken
TEL +81-266-72-7003 FAX +81-266-73-5031

Ceramic materials have outstanding thermal conductivity and it is really remarkable that even 96% aluminum material's thermal conductivity is as high as 60 times as compared with plastic materials such as epoxy resin, and in particular, aluminum nitride materials' thermal conductivity is as high as 500 times. Some types of electronic components like power supply boards, thermo module (Peltier or seebeck element) are manufactured by the application of this high-quality heat radiation property.
In addition to the superior heat radiation property, ceramic boards offer stable dielectric constants and show low dielectric loss tangent. For this merit, high-frequency loss can be saved at low levels and application to types of high-frequency circuits is realized.
To assure highly reliable through-hole performance and to offer finely patterned circuits on a substrate having an adequate thickness allowing good electric conductivity is one of the much-sought-after challenges in this ceramic field. AIN, in consideration of this point, focused on the plating method and established ceramic wiring boards manufacturing technology based upon plating methods by making the most of Fluorocarbon resin wiring boards manufacturing experience for many years. The details and superior factors are explained hereunder.

1. The conventional circuit forming methods for ceramics PWB are classified in two groups.
The one is the Thick-film method where electric conductive paste is transcribed by screen printing and baked. And the other is the Thin-film method where very thin electric conducible metal is formed under vacuum deposition/spattering

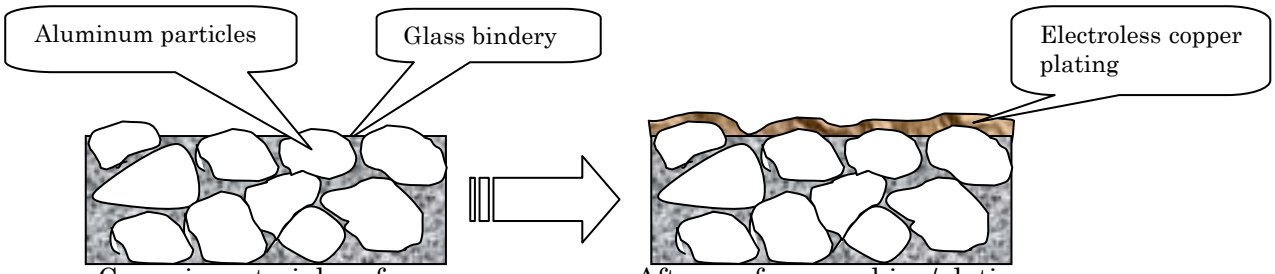
Item	Plating Method	Thin-film	Thick-film	Co-fire
Conductor Metal	Cu・Ni・Pd・Au・Sn Pb・Cr・Ag ……	Pt・Pd・Au・Ag Sn・Pb・Cu	Cu・Ni・Pd・Au・Sn Pb・Cr・Ti	Mo・W・Mg
Wire Forming	Electroless Plating Electro Plating	Screen printing High-temperature Baking	Sputtering deposition	Screen printing Ultra-hi-temperature Baking
Line Sectional Form				
Fine Line Resolution	Sharp	Not sharp	Sharp	Not sharp
Conductor Thickness	Thicker plating OK High degrees of freedom	Can be thicker via a repeated printing but lower conductivity	Thin	Can be thicker via a repeated printing but higher resistance
Pattern Pitch	Line width/distance	Line width/distance	Line width/distance	Line width/distance
Ordinary (μm)	75/75	200/250	75/75	125/200
Limit (μm)	40/50	80/80	20/20	100/125
Through-hole	Allowable High reliability a and lower resistance	Not favorable Lower reliability	Not favorable Lower reliability	Not favorable Lower reliability
Via-hole	Plating coat	Paste squeezee	Metal dip	Metal dip
	High reproducibility High adhesiveness Lower resistance	Lower reliability Higher resistance	Lower adhesiveness Lower resistance	Lower adhesiveness Lower resistance
Wire-bonding performance	Favorable (can be thinner) High surface smoothness	Low Poor surface smoothness	Favorable (in the case of thicker gold) High surface smoothness	Lower Poor surface smoothness
Cost	Rather expensive	Inexpensive	Expensive	Expensive
Cost-cut sensibilities At The time of mass-production	Ordinary	Very low	Low	Ordinary

2. Ceramics Plating Methods

The ceramic plating methods of our own adopt direct copper plating process and ceramics are plated with copper directly and this eliminated the need of intermediate metal substances like nickel or paste particles. For this merit, the ceramic plating method does not impair any of the ceramics' superior characteristics.

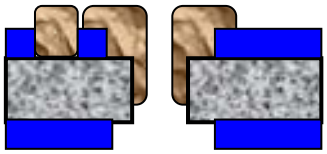
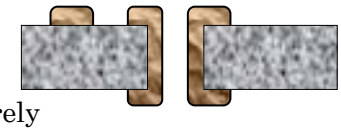
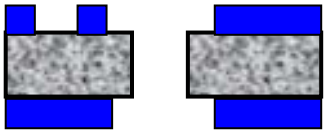
The metal wettability of ceramics, when ceramics are used as they are, is very low and even plating is impossible.

For this reason, the ceramic plate surface has to be roughed slightly under well-controlled conditions to give it an anchor effect.



3. Circuit forming method

One of the circuit forming technologies that can take is the tinting method where plating to the predetermined thickness is performed first and then image forming/etching is performed. However, as material itself does not have any metals before plating operation, the so-called semi-additive method can be taken instead by making the most of the absence of any intermediate metal substances.

Semi-additive style ceramic plating	
① Ceramic material 	⑤ Electro plating Ni/Au soldering will be added on copper plate as necessary 
② Surface roughing 	⑥ Plating resist peeling 
③ Electroless Copper Plating Thin coating of 0.3μm approximately 	⑦Copper base etching High accuracy can be maintained because of thin copper base of merely 
④ Image resolution (negative pattern) 	There are cases where solder resist/marking and other processes may be added as necessary.

4. Ceramic materials suitable for plating

Up to 99.99% aluminum ceramics, aluminum nitride, silicon nitride, barium titanate base ceramics, mica base machinable ceramics…

For other ceramics, we will tailor suitable conditions newly upon your request.

Note that processing conditions differ by maker-by-maker even if they are the same type ceramic material. For this reason, let us know the manufacturer's name when supplying your intended material to us.

5. General Properties

(A) Board Characteristics

Item	Unit	Condition	96% aluminum	99.5% aluminum
Bulk Density			3.8	3.8
Water Absorption	%		0.0	0.0
Bending Strength	kg／㎠		2800	2800
Color			White	White
Linear Expansion Coefficient	1／℃×10^{-6}	40～400℃ 40～800℃	7.1 7.8	6.9 7.5
Thermal Conductivity	cal・cm・sec・℃ W／m・K	20℃	0.06 27	0.08 34
Specific Heat	cal／g・℃		0.19	0.19
Dielectric Strength	kV／mm		12	12
Volumetric Specific Resistance	Ω－cm	20℃ 300℃ 500℃	＞10^{14} 10^{10} 10^{8}	＞10^{14} 10^{13} 10^{10}
Dielectric Constant		1MHz	9.4	9.9
Dielectric Loss Tangent	×10^{-4}	1MHz	4	1

(B) Print Wiring Board - Properties

Item	Unit	Condition	96% aluminum	99.5% aluminum
Adhesion strength	kg／㎟	Pull after soldering	2.75	2.5
Peel strength	2mm□	L-shape peel after soldering	5.0	5.0
Minimum Line width	μm	When a dry film is in use	約50	約50
Minimum Line distance	μm	When a dry film is in use	約50	約50
Conductor resistance	mΩ／□		3以下	3以下
Wire bonding performance (NG%)	%	Gold thickness 0.5μm When a 30μm gold wire is in use	0%	0%
Solder wetting	%	JISC5012	100%	100%
Through-hole diameter	mmφ	Ditto for drilling limit Laser Punching	＞0.1 ＞0.2	＞0.1 ＞0.2
Inner hole plate thickness	μm	Standard	10～20	10～20
Through-hole reliability			High	High

VCM配線板
Various Clad Metal

AIN Co., Ltd.

◆For information◆
Sales Department
TEL: +81-266- 72- 7165
FAX: +81-266- 73- 5031

Heavy-current・High Heat Conductivity Wiring Board

Features

Clad materials (like Cu, Ni, Cu:80, 1.500μm) are used for the VCM wiring boards and the following two construction types are available.

<Construction A>

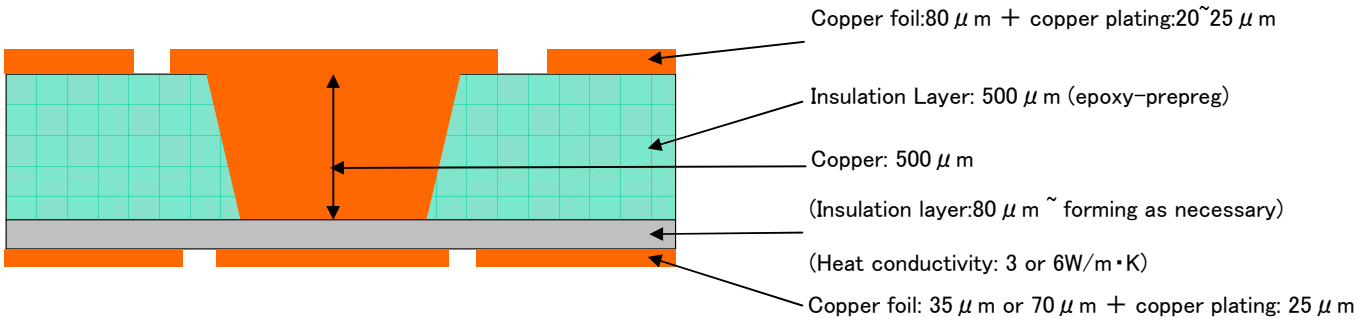
①. Wires of different thickness can be formed on the same plane (80μm, 500μm). Both heavy-current power circuits and control circuits can be mixed.
②. Free of bumps and dips on the surface and thick copper wirings can be formed (in other words, solder resist can easily be formed).
③. Through-hole, both-side circuit forming is allowable.

<Construction B>

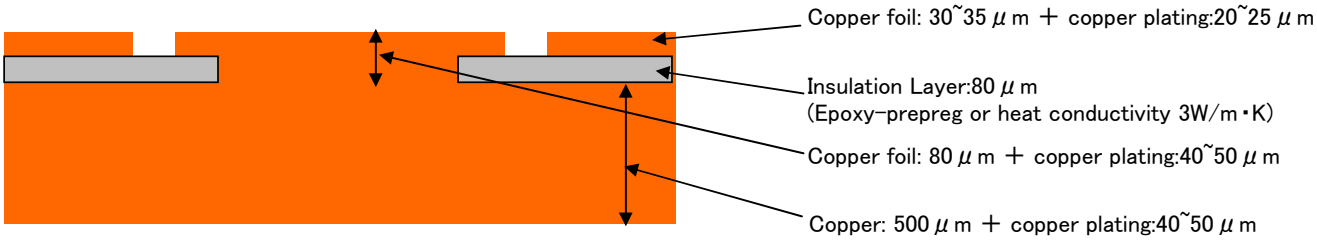
①. Thinner copper-base substrate (500μm) is available.
②. Structure allowing direct mating to copper base and heat sink is possible.

Construction

< Construction A>



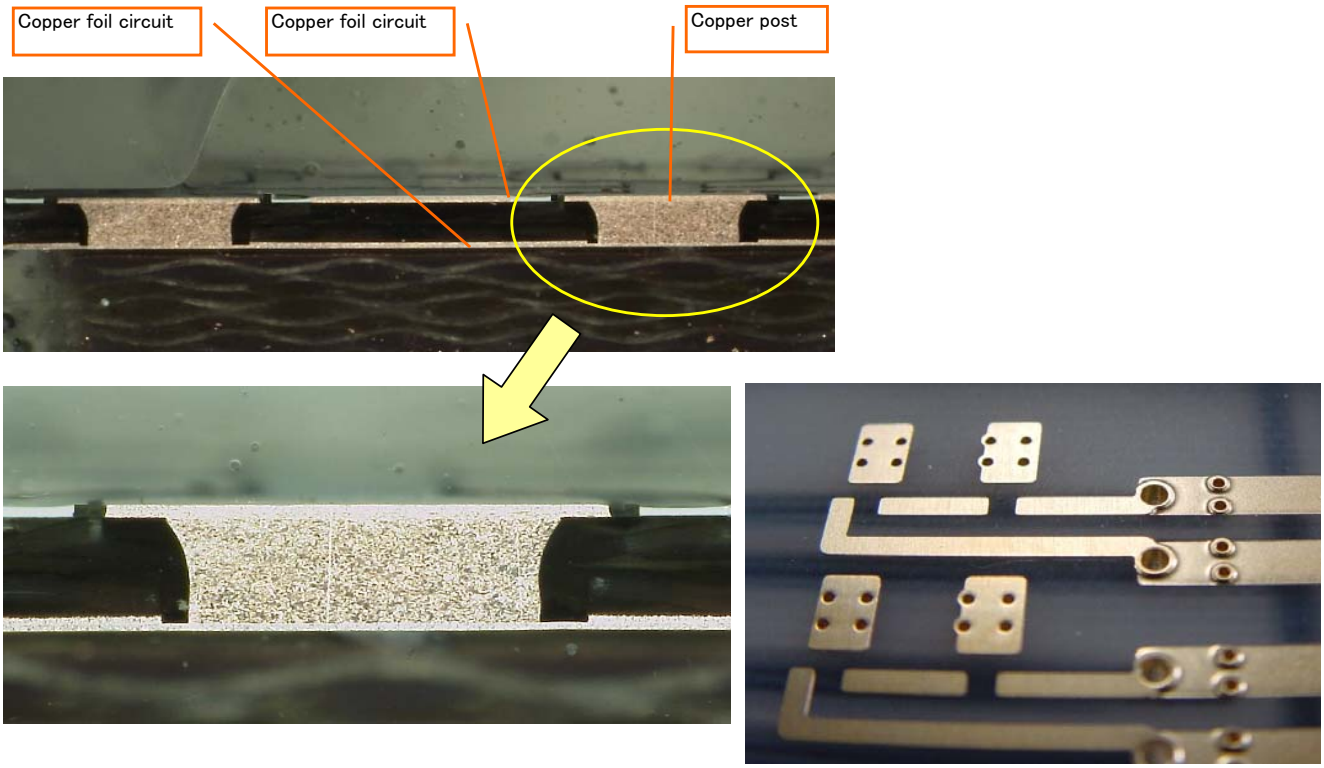
<Construction B>



Cross-sectional Picture

株式会社アイン

<Construction A>



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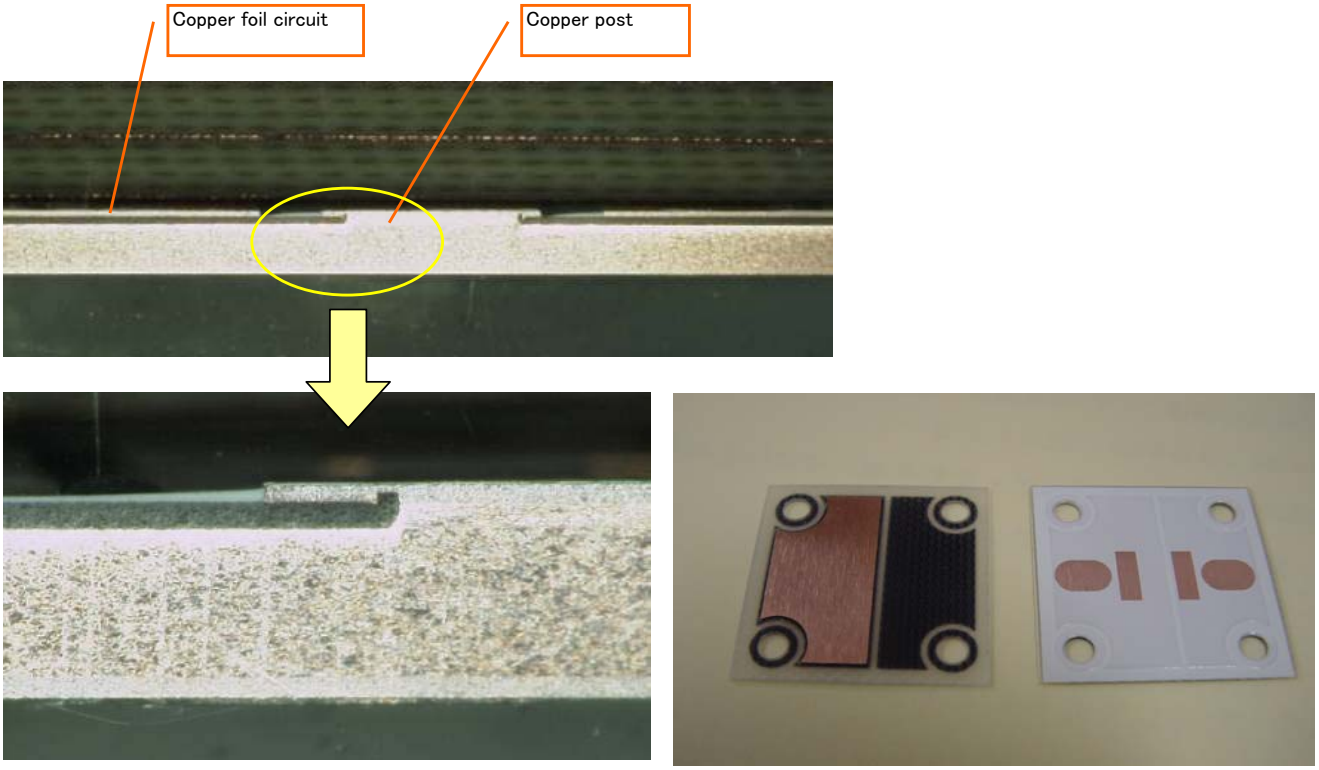


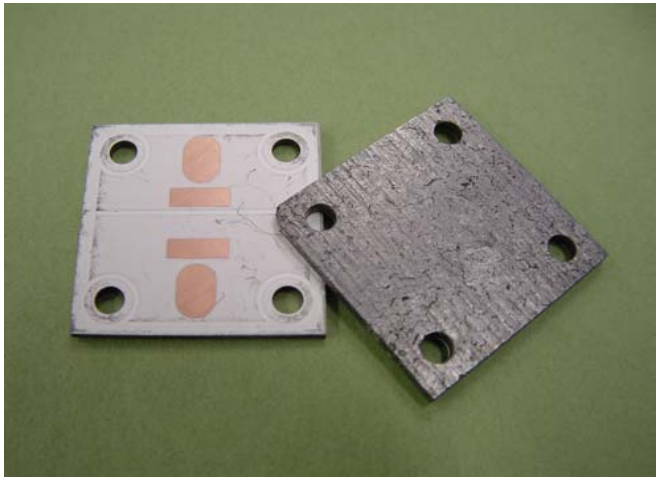
Heat Sink (Aluminum/SiC or Glaphite) Characteristic

	Item	Unit	Graphite					SiC-Graphite	SiC		Aluminum	Copper	AlN
			Al-C200	Al-C300	Al-C400	Al-CF(*)		Graphite coted SiC+Al	Al-SiC(55)	Al-SiC(70)	A1060H12	C1020	Tokuyama
1	Bending strength	Mpa	40	40	40	1000	50	100	350	380	80	350	356
2	Young modulus	Gpa	12	12	12	550	9	25	200	265	70	119	320
3	Coefficient of thermal expansion	10^{-6}/K	8	7	7	0	12	7	10	7	24	17	4
4	Thermal conductivity	W/m・K	180	290	425	500	40	375	240	270	203	390	190
5	Electric resistance	μΩ・cm	4.0	4.0	4.0	4.0	4.0	4.0	3.0	4.0	2.8	1.7	2×10^{5}
6	Spacific gravity	–	2.40	2.40	2.30	2.20		2.40	2.90	3.00	2.70	8.93	3.26
7	Specific heat	J/gk	0.70	0.70	0.75	0.70		0.80	1.00	1.00	1.00	0.50	0.70
8	Thermal diffusion coefficient	cm^2/sec	–	1.50	2.55	–		2.40	–	0.80	0.90	1.00	0.80

(*)Left ⇒ Fiber direction right ⇒ Tangental direction of fiber

⇒ Our new product

⇒ Comparison materials



Al-C400 on high thermal conductivity circuit bord.

Ceramic Ink

Ain Co., Ltd.

Not-seen-before, inorganic and cold curing ink that is highly heat-resistant and ultraviolet resistant.

◆For information◆
Sales Department
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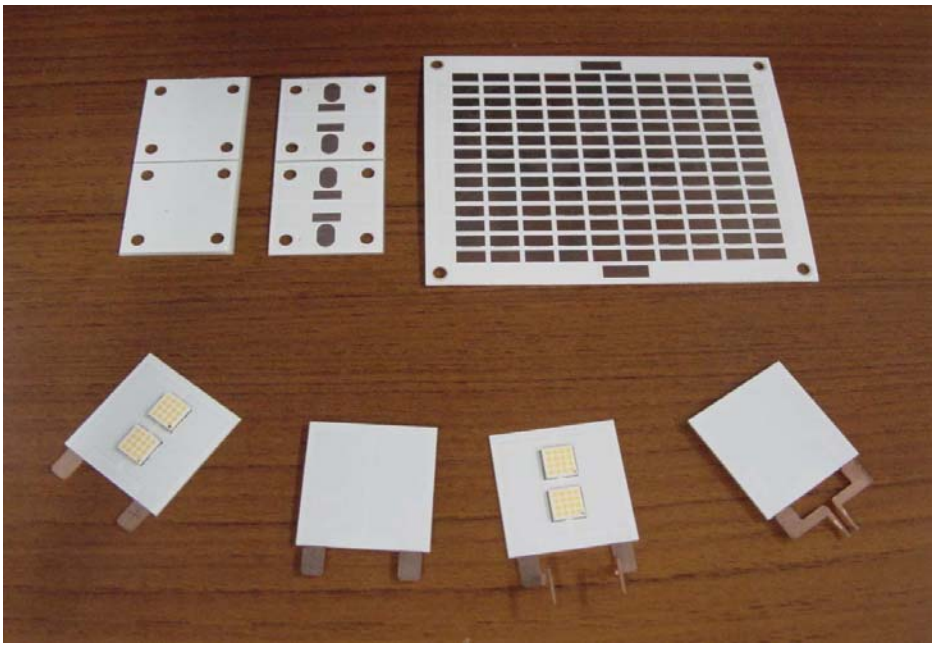
Features



1. Though they are inorganic ceramics but can cure at 160℃.
2. The heat resistance is as high as 700℃
3. Inorganic oxide powder materials realize high concealment levels against the base and they are insensitive to the base color.
4. Discoloration free thanks to the merit of inorganic oxide materials.
5. The inks offer high concealment levels and everlasting materials. So, ceramic inks can protect finish products from ultraviolet rays.
6. Higher heat transfer coefficient as compared with organic materials
7. Higher withstand voltage can assure ceramic ink's properties with a thin coating.

Coating Particulars

RG-12-6-2 Coating Characteristics (after thermo-setting)
(The followings are obtained from experiments under the predetermined coating standards and are not guaranteed values.)

Item	Test Conditions	Characteristics
Adhesion	Cellophane tape peeling	No peeling
Pencil Hardness	Harder than 6H (tested on a glass plate)	No peeling
Solder heat resistance	260℃ 10 sec×3 (immersion in the solder bath)	No swelling and peeling
Discoloring under heat	200℃ 24 hours (on a glass plate)	No discoloration
Acid resistance	2% sulfuric acid, immersion for 10 minutes at 20℃	No swelling and peeling
Alkaline resistance	2% caustic soda, immersion for 10minutes at 20℃	No swelling and peeling
Warm water resistance	Immersion for 2 hours in 60~70℃ warm water	No swelling and peeling
Solvent resistance	Immersion in methyl ethyl ketone for 2 hours at room temperature	No swelling and peeling
Dielectric resistance	10μm film, 1000V/second	Higher than $1x10^9\Omega$
Dielectric Voltage	①Film thick 20μm, higher than 1100V ②Film thick 30μm, higher than 2800V ③Film thick 70μm, higher than 5000V	No dielectric breakdown after applying 50Hz alternating voltage for 2 minutes

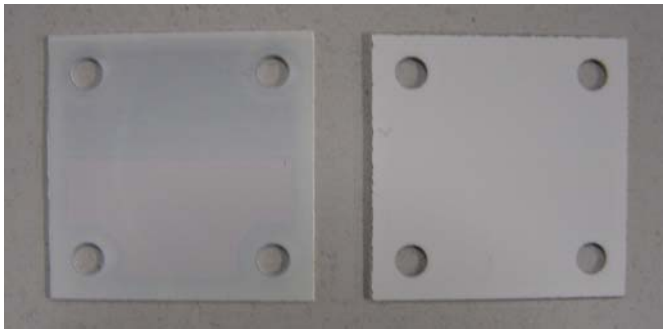
Operating Instructions

Surface grinding	Ordinary pre-printing surface treatment processes are applicable.
↓	
Screen printing	Printing on the necessary area Standard: 180-mesh
↓	
Predrying	For 20 minutes at 80℃ This eliminates organic substances before surface curing
↓	
Drying	For 30 minutes at 150℃ The higher the temperature the higher the adhesion

Concealment

LED-specific Solder resist

Ceramic inks



Applied on the same VCM wiring substrate
Wiring can merely be viewed in the case of LED-specific solder resist.

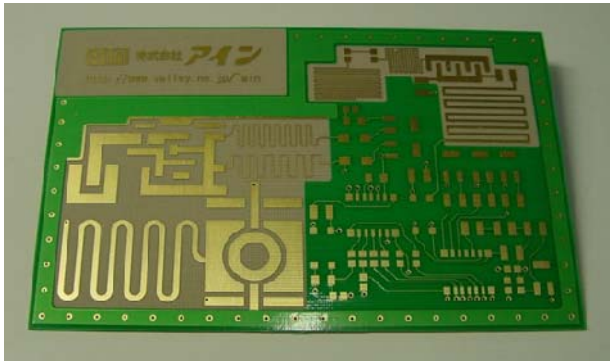
Types of Ceramic Inks

Model	Color	Features	Storage Limit
RG-12-6-2 RG-40-8	White	High reflectance, no discoloration, ultraviolet resistant, high-heat resistant UL QMUJ2 certified	(5℃, 22 days) -10℃, 60 days (30℃, 3 days)
RG-57-2-3	White	High reflectance (against RG-12-6-2), no discoloration, ultraviolet resistant, high-heat resistant, storage stability enhanced type. Micro fiber reinforced type.	(5℃, 30 days) -10℃, 60 days (30℃, 7 days)
AN-17-1-1	Quasi-white	High-heat transfer coefficiency, high radiation, high-heat resistant, storage stability enhanced type	(5℃, 20 days) -10℃, 30 days (30℃, 2days)
UV-8-1	White	High-ultraviolet reflectance, high-heat resistant, ultraviolet resistant	(5℃, 22 days) -10℃, 60 days (30℃, 3 days)

Comparison with resin-base solder resist

Material	RG-12-6-2	Solder resist of other manufacturers	Condition/Testing Methods
Substance	Inorganic silicon base	Organic epoxy resin base	
Adhesion	Excellent	Excellent	Tape peeling, JIS C5012 8.6.1
Pencil Hardness	6H	8H	JIS K5400, JIS C 5012 8.6.3
Reflow heat resistance (color difference)	ΔE=0.4	(FR-4 discoloration) ΔE=4.59	240℃, 30 seconds x 5 times
Reflow heat resistance (reflectance)	0%	-5%	240℃, 30 seconds x 5 times
Acid resistance	Excellent	Excellent	2 vol% H_2SO_4
Alkaline resistance	Excellent	Excellent	
Water resistance	Excellent	Excellent	
Solvent resistance	Excellent	Excellent	
Dielectric resistance	71kV/mm	64kV/mm	IPC-SM-840C 3.8.1
Ultraviolet resistance (color difference)	△E=0	△E=3.7	12J/cm^2(320~390nm)
Ultraviolet resistance (reflectance)	0%	-8%	12J/cm^2(320~390nm)
Coating methods	Screen print	Exposure to light･development	
Concealment	Highly excellent	Good	

◎High-frequency applicable wiring boards



AIN uses various materials available from the worldwide manufacturers supplying high-frequency specific materials and offers the optimal wiring boards that satisfy the performance specifications of your own at a reasonable cost with a favorable lead time. Materials are abundant and not only Poly Fluoro resin-- or Poly phenyl Ether base wiring boards but only alumina- or high ferroelectric ceramic-base ones are available from AIN.

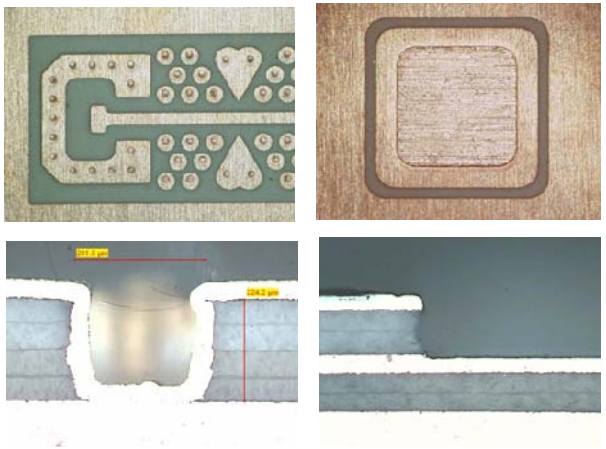
In these days, other types of products, including laminated products in combination of the above materials and FR-4, and partly cavity-employed wiring boards are also manufactured/provided from AIN.

Poly Fluoro resin- Wiring Boards

The low loss-of-signal type wiring boards based on Poly Fluoro resin- materials having low dielectric constant and dielectric loss tangent are used in BS, CS and satellite broadcasting equipments and also incorporated in high-frequency gears like radars and sensors.

For high-frequency materials, data obtained from the materials so far actually used becomes the key know-how. AIN is capable of acquiring various kinds of high-frequency materials and has expertise in processing those materials. So, please consult us.

Not only in high-frequency specific application but they are also highly useful as a heat



Copper-base Poly Fluoro resin- Wiring Boards

This is the Poly Fluoro resin- wiring boards for on-board high-frequency semiconductors, and 1mm thick copper plate, 0.127mm thick Poly Fluoro resin- insulation layer and copper foil are laminated and used as a material substrate and shielding via holes are provided by laser processing.

Semiconductors can be arranged on the plated portions on base metal copper surface using cavities.