

Solution !

Thermal Conductivity

3W/mK

Inhibit Solder Crack

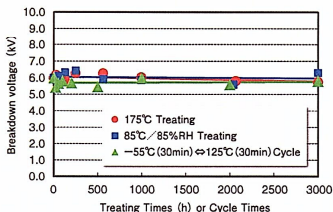
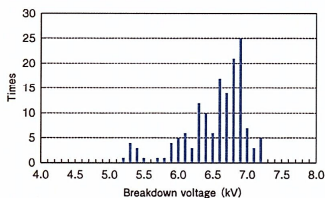
Features

- Thermal conductivity = 3W/mK
- Insulation layer has flexibility after heat curing (Young's modulus(RT) is less one – tenth than FR-4)
- 7303 series has excellent long term reliability

Applications

- Metal PCB requiring to suppress solder crack
- Metal PCB requiring flexibility (Automotive engine room)

Breakdown voltage (AC)

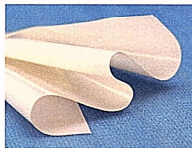


High thermal conductive & Low elastic PWB material

AD-7303 / AC-7303

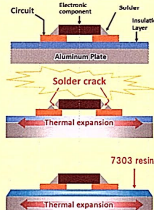
Bonding sheet

Aluminum-base CCL



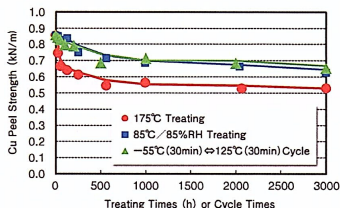
Insulation layer
After heat curing

Solder crack image and solution



7303 resin has superior flexibility after heat curing. AC-7303 is aluminum base material with 7303 resin. Solder crack doesn't happen easily even in extreme difference of temperature such as engine room of automotive.

Copper Peel Strength



Solution !

Thermal Conductivity

5W/mK

- Thermal conductivity = **5W/mK** (Insulation layer)
- Bonding sheet is flexible and good handling property
- Suitable for various customer's needs : Bonding sheet, Aluminum-base CCL

Applications Substrate for High power LED, Inverter, Power module

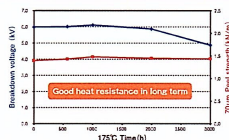
RISHO

High Thermal Conductive Materials

1 Metal PCB Material

AD-7200TY/AC-7200TY
Bonding sheet Aluminum-base CCL

Long term reliability (175°C)



Thermal Conductivity

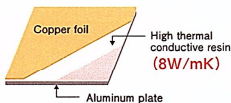
8W/mK

- High thermal conductivity = **8W/mK** (Insulation layer)
- High thermostability $T_g=270^\circ\text{C}$ (DMA)

Applications Substrate for High power LED, Power module

2 High Thermal Conductive Metal PCB material

Composition



AC-7208/CD-7208
Aluminum-base CCL Resin coated copper

NEW

Test items	Unit	
Thermal conductivity	W/mK	8
Peel strength (Cu35μm)	kN/m	1.2
Glass transition temperature T_g	°C	270
Coefficient of thermal expansion α_1/α_2	ppm/°C	9/22
Breakdown voltage (120μm)	kV	5.5

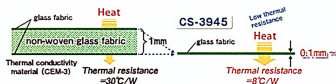
Thermal Conductivity

1.3W/mK

- Thermal Conductivity : **1.3W/mK**
- Minimum Thickness : **0.1mm**
- Advanced cooling design
- UL approved

Applications • LED lighting, LCD back-light, Automotive lamp (Daytime running lamp, Combination lamp, Clearance lamp)

3 White Copper Clad Laminates



CS-3945
Copper Clad Laminates

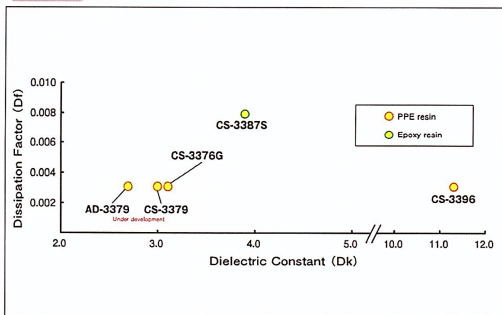


0.1mm thickness can be installed with curved shape design

Solution !**High
frequency****High frequency substrate materials
for high-speed & large-capacity
communication device****Line-ups**

Base resin	PPE resin						Epoxy resin
Product Code	AD-3379	CS-3379			CS-3376G	CS-3396	CS-3387S
	Under development	Under development					
Glass cloth	Bonding sheet	Low Df	Low Dk	E	E	E	E
Dk (1GHz)	2.7	2.9	2.9	3.0	3.1	11.3*	3.9
Df (1GHz)	0.0025	0.0015	0.0020	0.0025	0.003	0.003*	0.008
Low profile Cu foil	●	●	●	●	●	●	●
Multi layer process	●		●	●		●	●
Halogen free						●	●
Flammability	V-0 Equiv.	V-0 Equiv.	V-0	V-0	V-0	V-1	V-0

* : RF I-V method

Dk & Df**Low Dk/Low Df****Dk2.9 CS-3379**

- For millimeter-wave radar, Server, Router

Dk3.1 CS-3376G

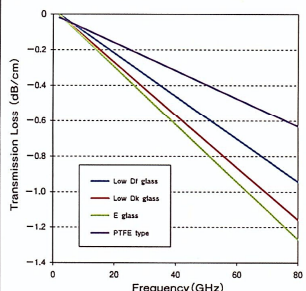
- For mobile base station antenna
- Low PIM & High signal speed
- Low cost

Dk3.9 CS-3387S

- For mobile base station antenna, optical communication device
- Halogen free.
- Capable of supplying multi-lamination

High Dk/Low Df**Dk11.3 CS-3396**

- Downsizing

CS-3379**Transmission Loss vs Frequency**

Epoxy Laminates

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Product Code		High Thermal Conductivity								
		AC-7900	AC-7004C	AC-7303	AC-7200TY	AC-7208	AD-7006 AD-7006W	AD-7303	AD-7200TY CD-7200TY [®]	ES-3245
Material form		Aluminum base CCL					Bonding sheet			Prepreg
T _g (DMA)	℃	160	180	—17/177	200	270	124	—17/177	200	180
CTE(α ₁ /α ₂)	ppm/℃	40/180	27/48	18/35/74	6/36	9/22	48/358	18/35/74	6/36	20/70
Thermal conductivity	W/mK	1.0	3.0	3.0	5.0	8.0	0.2	3.0	5.0	3.0
Min. thickness	mm	0.06	0.08	0.12	0.12	0.12	0.04	0.12	0.12	0.06
Multi layer process									●	●
Halogen free		●	●	●	●	●	●	●	●	●
Flammability		V-0	V-0	V-0 Equiv.	V-0 Equiv.	V-0 Equiv.	—	—	—	V-0 Equiv.
Applications		LED lighting	LED lighting Power supply	LED lighting Automotive	High power LED	High power LED	COB-LED Power supply	LED lighting Automotive	High power LED Automotive	Metal base PWB (Insulation layer)

※: Resin coated copper (RCC)

Product Code		High Thermal Conductivity	White Colored				High Thermal Resistance		Standard	
		CS-3295	CS-3945	CS-3965V	CS-3965C	CS-3975A [※]	CS-3305A	CS-3305K	CS-3356S	CS-3667B
Material form		CCL								
T _g (DMA)	℃	180	140	210	160	—	300<	300<	180	200
CTE($X=Y=Z$)	ppm/℃	15/15/20	13/14/25	13/14/35	13/14/40	8/8/210	6/6/13	12/13/60	12/13/27	13/13/34
Thermal conductivity	W/mK	3.0	1.3	0.5	0.8	0.4	0.6	0.4	0.7	0.6
Min. thickness	mm	0.06	0.11	0.06	0.06	0.1	0.03	0.06	0.06	0.1
Multi layer process		●					●	●	●	
Halogen free		●	●	●	●	●	●	●	●	●
Flammability		V-0 Equiv.	V-0	HB	HB	V-0 Equiv.	V-0 Equiv.	V-0 Equiv.	V-0	V-0 Equiv.
Applications		Power module	LCD backlight LED lighting	Chip-LED COB-LED	Chip-LED COB-LED	High power LED Substitute of ceramic PWB	Automotive Power device	Automotive Burn-in board	Module Automotive	Optical sensor

※: Silicone resin based material

PPE Materials

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Base resin	PPE resin										Epoxy resin
Product Code	AD-3379	CS-3379			CS-3376G CS-3376GV	CS-3376C	CS-3376B	CS-3396M	CS-3396	AD-3396	CS-3387S
Glass fabric	Bonding sheet	Low Df glass	Low Df glass	E glass	E glass	E glass	E glass	E glass	E glass	Bonding sheet	E glass
Dk (1GHz)	2.7	2.9	2.9	3.0	3.1	3.3	3.4	6~7	11.3	16.5	3.9
Df (1GHz)	0.0020	0.0015	0.0020	0.0025	0.003	0.003	0.004	0.003	0.003	0.003	0.008
Low profile Cu foil	●	●	●	●	● GRTF GV-HVLP		●		●		●
Multi layer process	●		●	●			●	●	●	●	●
Halogen free								●	●	●	●
Flammability	V-0 Equiv.	V-0 Equiv.	V-0	V-0	V-0	V-0	V-0	V-0 Equiv.	V-1	V-0 Equiv.	V-0
Applications	Server, Router, milli-wave				Antenna, Amplifier Wi-Fi, DSRC	Semiconductor inspection		Antenna, Military Aerospace		Embedded capacitor	Antenna RFID

