

喜星素材 MCCL 介绍

2013年 6月



喜星素材（株）忠州工厂

HEESUNG MATERIAL

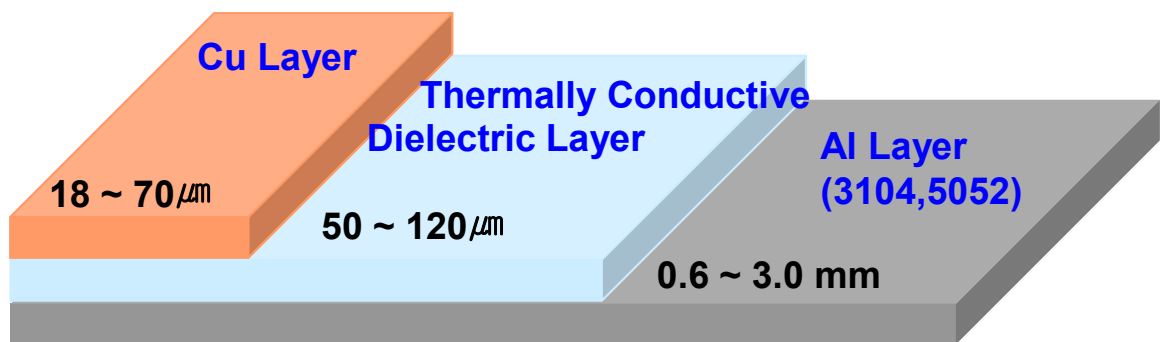
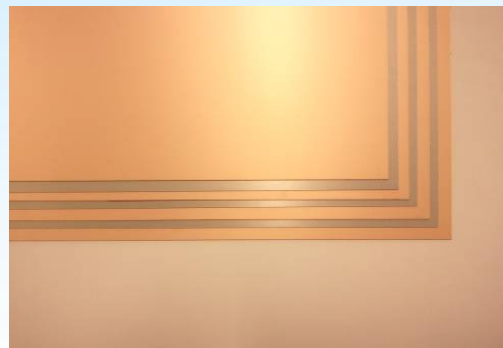
I. MCCL 概要

II. MCCL 摘要

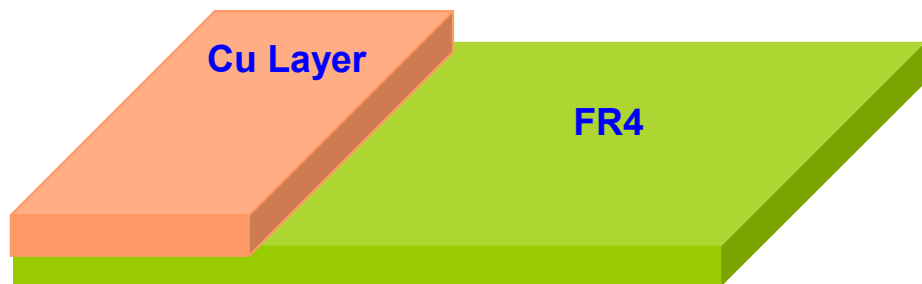
III. MCCL 物性评估

IV. 相关认证

- MCCL (Metal Copper Clad Laminate) : 即金属铜箔逐层叠加基板，是可减少LED chip最大发热弱点的基板材料。
- Metal PCB与一般PCB相比散热性更好，因此被广泛应用于LED用基板上。

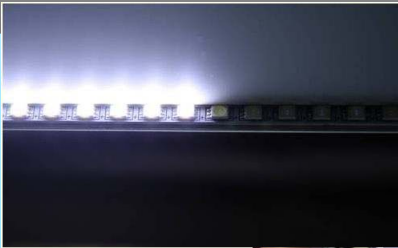
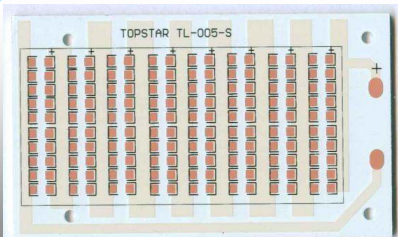


< Metal PCB >



< FR4-PCB >

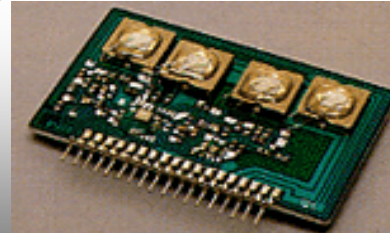
Display



Automobile



Power Supply



LED Illumination



I. MCCL 摘要

CAPA: 20万张/月

搅拌



cotter



Lay-up



press



包装



叠层



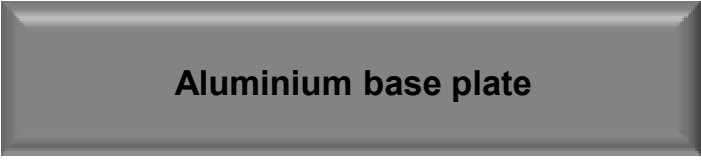


变型矫正

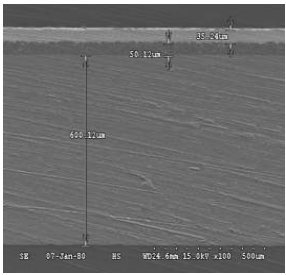
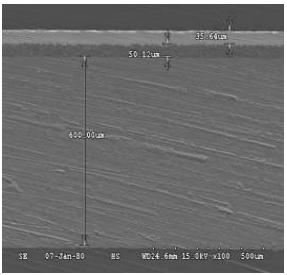
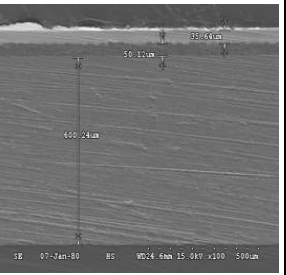
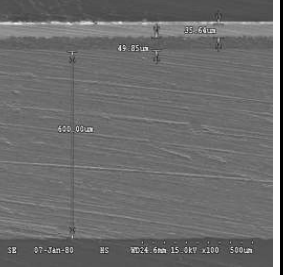
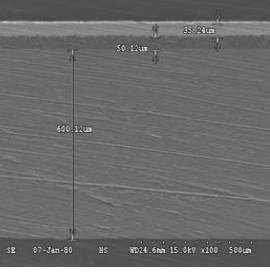


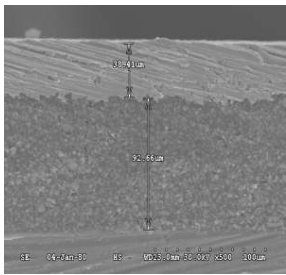
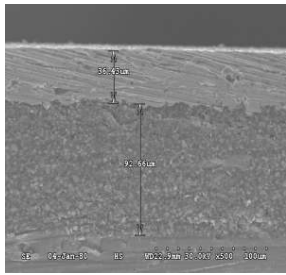
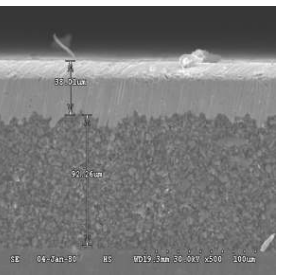
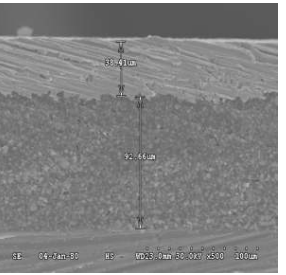
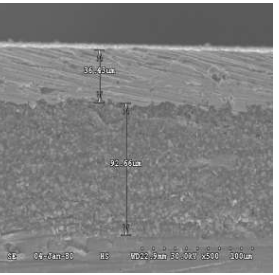
截断

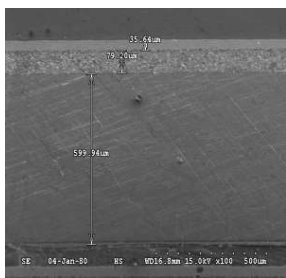
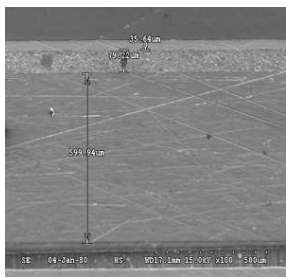
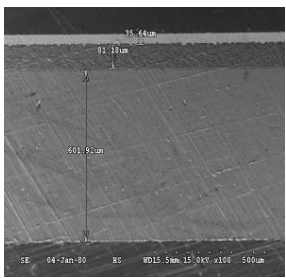
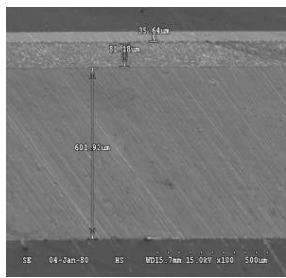
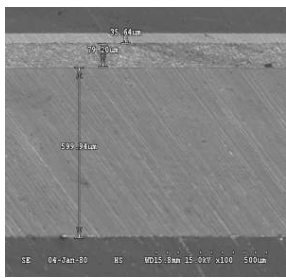


Layer	规格		
 <p>Copper foil</p>	Circuit layer	Cu[oz]	Electrolytic Copper Foil
		Thickness [μm]	1 ~ 4oz (Spec: $\pm 10\%$)
		导热系数 [W/mK]	380
 <p>Prepreg [Epoxy + Filler]</p>	Dielectric layer	Materials	Epoxy + Filler
		Thickness [μm]	50~120 (Spec: $\pm 10, 20$)
		导热系数 [W/mK]	2.0, 5.0
 <p>Aluminium base plate</p>	Substrate layer	Alloy	A5052 H32, A3104 H16
		Thickness [μm]	0.6~3.0 (Spec: $\pm 3\%$)
		导热系数 [W/mK]	138, 170

TEST项目	SPEC	2W		5W
		绝缘体50μm	绝缘体 90μm	绝缘体 80μm
Lay up Structure	Cu: ±10%, PP: ±,10, 20μm, Al: ±3%	OK	OK	OK
	Insulation Thickness	OK	OK	OK
Cu Peel Strength	Above 1.00Kgf/cm	2.02	2.00	1.85
Thermal Conductivity	1Layer(PP) W/mK	1.52	1.52	5.25
	3Layer[Cu(1oz)+PP+Al(0.6T)] W/mK	20.7	17.1	34.5
Break Down Voltage	AC 3.0Kv(2.0Kv), 10mA	4.1	6.2	5.5
Solder Float	at 288°C above 10min	10 ↑	10 ↑	10 ↑
Thermal Stress	No Delamination	Pass	Pass	Pass
Bending Test	No crack, No delamination	Pass	Pass	Pass

SPEC		结果				
		# 1	# 2	# 3	# 4	# 5
Metal	600 μ m \pm 3%	0.600	0.600	0.600	0.600	0.600
Insulation	50 μ m \pm 10 μ m	0.050	0.050	0.050	0.050	0.050
Copper Foil	35 μ m \pm 10%	0.035	0.036	0.036	0.035	0.035
Section	\times 100					
判定		OK	OK	OK	OK	OK

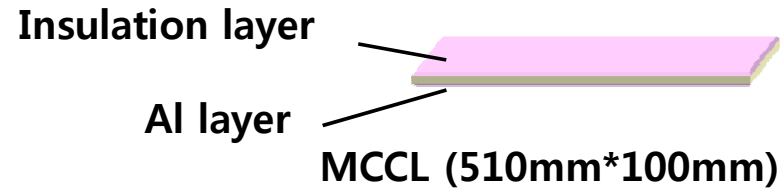
SPEC		结果				
		# 1	# 2	# 3	# 4	# 5
Metal	600 μ m \pm 3%	0.600	0.602	0.602	0.602	0.602
Insulation	90 μ m \pm 20 μ m	0.093	0.093	0.093	0.093	0.093
Copper Foil	35 μ m \pm 10%	0.036	0.036	0.038	0.038	0.036
Section	\times 500					
判定		OK	OK	OK	OK	OK

SPEC		结果				
		# 1	# 2	# 3	# 4	# 5
Metal	600 μ m \pm 3%	0.600	0.600	0.602	0.602	0.600
Insulation	80 μ m \pm 20 μ m	0.080	0.080	0.081	0.081	0.080
Copper Foil	35 μ m \pm 10%	0.035	0.035	0.035	0.035	0.035
Section	\times 100					
判定		OK	OK	OK	OK	OK

Test Method

Measuring instrument : ISOSCOPE FMP30 (FISCHER)

Test condition	
# of measuring points	10 point以上
Spec.	50±10μm, 90±20μm



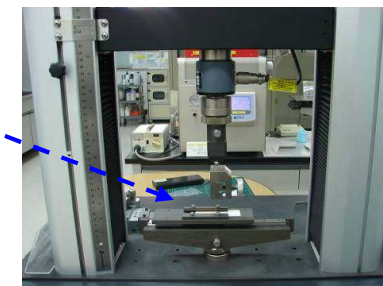
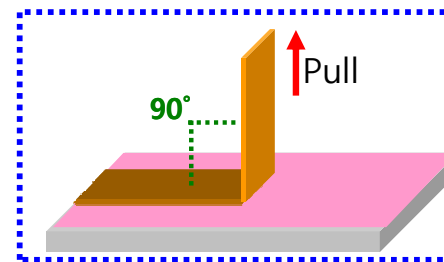
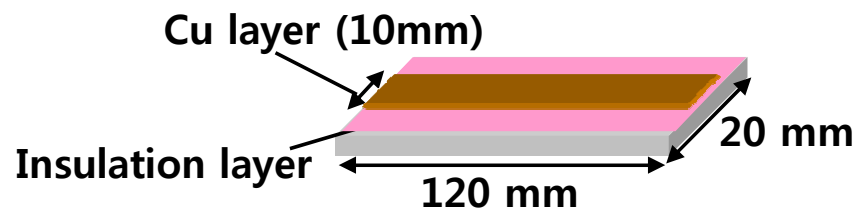
Test Result

[Unit=μm]

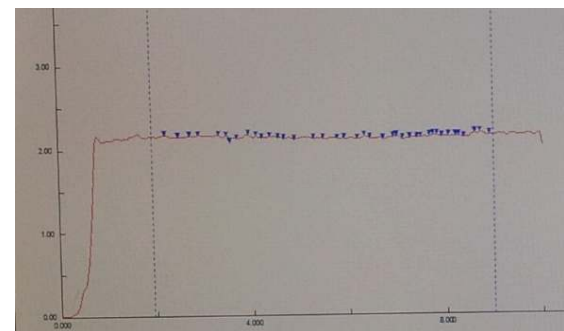
Item	Spec.	厚度	判定
2W	50 μm ±10μm	Min 50 50 50 50 50 51 51 51 52 52 52 51 Max	OK
	90 μm ±20μm	Min 95 96 96 96 97 97 96 97 96 96 96 96 96 95 95 Max	OK
5W	80 μm ±20μm	Min 80 80 81 82 81 82 83 82 82 81 80 81 80 Max	OK

Test Method

- ❖ JIS C 6481
- ❖ Measuring instrument : QC-506B1(Cometech)



Test condition	
Cu layer width	10mm
Speed	50mm/minute



Test Result

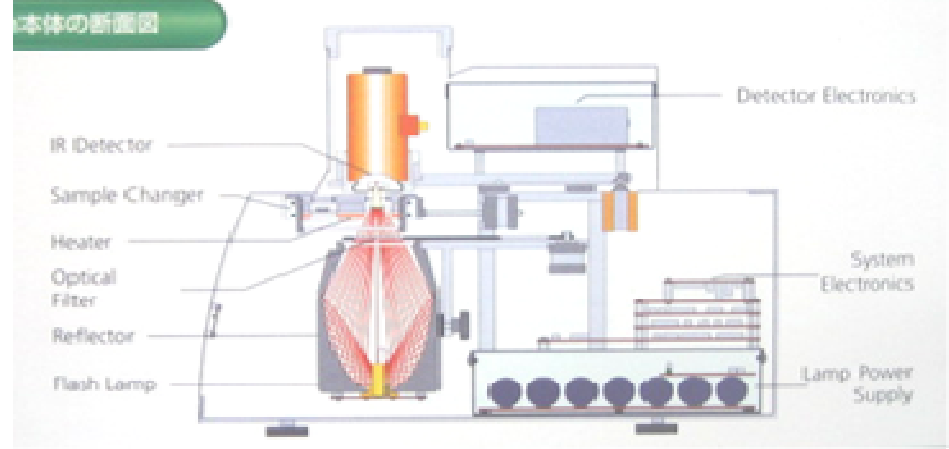
Item		Spec.	#1	#2	#3	判定
2W	绝缘体 50 μ m	1.0kgf/cm 以上	2.02	2.02	2.01	OK
	绝缘体 90 μ m		2.00	1.99	2.00	OK
5W	绝缘体 80 μ m		1.85	1.84	1.86	OK

[Unit=Kgf/cm]

Test Method



❖ Measuring instrument : LFA457



Test Result

Thermal Diffusivity - I <绝缘体 Single Layer >

General information

Database :	hsm-130307.mdb	Operator :	LEH
Instrument :	LFA 457	Customer :	HSM
Identity :	20130307-2	Remark (mmment) :	---
Date :	2013-03-07	Cp table :	#20
Material :	#20	Expansion table :	dL_const
Ref. density (25.0 °C) /(g/cm³) :	2.330	Temp. recalib. file :	Tcalzero.tcx
Sample :	#20	Purge gas :	used
Type :	Single layer	Furnace :	LFA 457 Medium Rg
Coating :	C	Sample holder :	unknown
Thickness (RT) mm :	0.1130	Laser :	LFA 457 Laser
Diameter mm :	10.000	Centering cone :	Std SiC 10mm ²
Sensor :	InSb	Center cone ratio :	0.70
Beam enlargement : /mm :	12.7	Furnace TC :	S
Laser filter : % :	10.0	Sample TC :	S
Atmosphere :	N2	Sample Xp / Tn :	3.00 / 0.52
Gas flow : /(ml/min) :	100.00	Furnace Xp / Tn :	3.20 / 0.52
Laboratory :	Ajou CMCM		

Results

hot number	temperature °C	Model	Diffusivity mm ² /s	Conductivity W/(m·K)	Cp J/g·K	laser voltage V	pulse width ms
1	25.2	Cowan + pc	0.614	1.514	1.059	1538.0	0.50
2	25.1	Cowan + pc	0.617	1.521	1.059	1538.0	0.50
3	25.1	Cowan + pc	0.624	1.539	1.059	1538.0	0.50
4	24.9	Cowan + pc	0.616	1.518	1.058	1538.0	0.50
5	25.0	Cowan + pc	0.617	1.523	1.059	1538.0	0.50
Mean:	25.1		0.617	1.523	1.059		
Std. Dev.:	0.1		0.004	0.009	0.000		

1.523W/mK

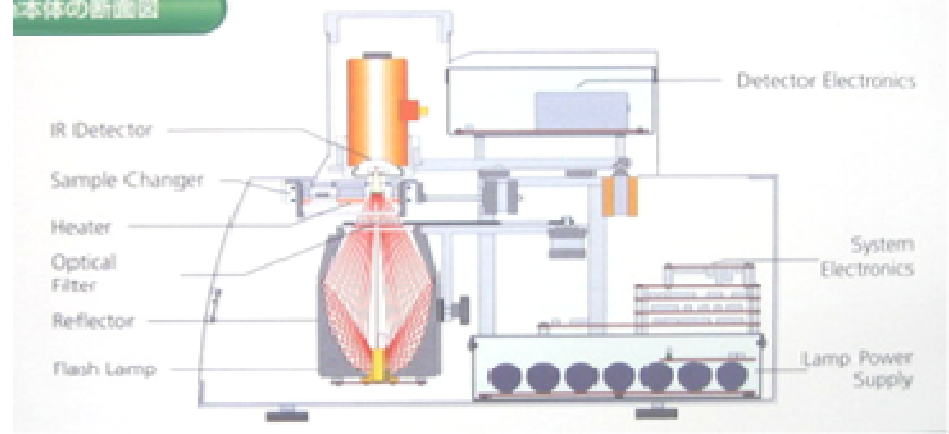
Test Method



❖ Measuring instrument : LFA457



本体的断面図



Test Result

<绝缘体:50 μ m, Al:0.6T, Cu:1oz, 3Layer >

General information

Database :	hsm-121220.mdk	Operator :	LEH
Instrument :	LFA 457	Customer :	HSM
Identity :	201212	Remark (mmnt) :	---
Date :	2012-12-20	Cp table :	HS
Material :	Sample	Expansion table :	dL_const
Ref. density (25.0 °C) / (g/cm ³) :	2.831	Temp. recalib. file :	Totalzero.tcx
Sample :	Sample	Purge gas :	used
Type :	Single layer	Furnace :	LFA 457 Medium R _g
Coating :	C	Sample holder :	unknown
Thickness (RT) /mm :	0.7300	Laser :	LFA 457 Laser
Diameter /mm :	10.000	Centering cone :	Std SiC 10mm ²
Sensor :	InSb	Center cone ratio :	0.70
Beam enlargement : /mm :	12.7	Furnace TC :	S
Laser filter : /% :	100.0	Sample TC :	S
Atmosphere :	N ₂	Sample Xp / Tn :	3.00 / 0.52
Gas flow : / (ml/min) :	100.00	Furnace Xp / Tn :	3.20 / 0.52
Laboratory :	Ajou CMCM		

Results

shot number	temperature °C	Model	Diffusivity mm ² /s	Conductivity W/(m ² K)	Cp J/g/K	Laser voltage V	Pulse width ms
1	25.0	Cowan + pc	8.459	21.005	0.877	1538.0	0.50
2	25.0	Cowan + pc	8.299	20.608	0.877	1538.0	0.50
3	24.9	Cowan + pc	8.432	20.935	0.877	1538.0	0.50
4	24.7	Cowan + pc	8.289	20.578	0.877	1538.0	0.50
5	24.7	Cowan + pc	8.225	20.417	0.877	1538.0	0.50
Mean:	24.9		8.341	20.708	0.877		
Std. Dev.:	0.2		0.100	0.251	0.000		

→ 20.7W/mK

Thermal Diffusivity <绝缘体:90 μ m, Al:0.6T, Cu:1oz, 3Layer >

General information

Database :	hsm\gb-120619.mdk	Operator :	LEH
Instrument :	LFA 457	Customer :	HSM LG-B
Identity :	20120620-1	Remark (mmnt) :	---
Date :	2012-06-20	Cp table :	#1 W1
Material :	#1 W-1	Expansion table :	dL_const
Ref. density (25.0 °C) / (g/cm ³) :	2.615	Temp. recalib. file :	Totalzero.tcx
Sample :	#1 W-1	Purge gas :	used
Type :	Single layer	Furnace :	LFA 457 Medium R _g
Coating :	C	Sample holder :	unknown
Thickness (RT) /mm :	0.6960	Laser :	LFA 457 Laser
Diameter /mm :	10.000	Centering cone :	Std SiC 10mm ²
Sensor :	InSb	Center cone ratio :	0.70
Beam enlargement : /mm :	12.7	Furnace TC :	S
Laser filter : /% :	100.0	Sample TC :	S
Atmosphere :	N ₂	Sample Xp / Tn :	3.00 / 0.52
Gas flow : / (ml/min) :	100.00	Furnace Xp / Tn :	3.20 / 0.52
Laboratory :	Ajou CMCM		

Results

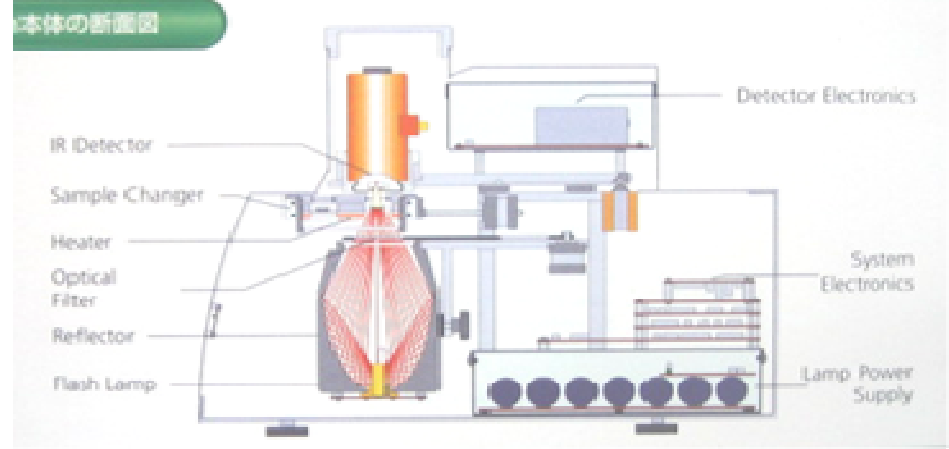
shot number	temperature °C	Model	Diffusivity mm ² /s	Conductivity W/(m ² K)	Cp J/g/K	Laser voltage V	Pulse width ms
1	25.2	Cowan + pc	7.302	17.122	0.897	1538.0	0.50
2	25.2	Cowan + pc	7.341	17.208	0.896	1538.0	0.50
3	25.0	Cowan + pc	7.217	16.915	0.896	1538.0	0.50
4	25.0	Cowan + pc	7.309	17.129	0.896	1538.0	0.50
5	25.0	Cowan + pc	7.318	17.149	0.896	1538.0	0.50
Mean:	25.1		7.297	17.105	0.896		
Std. Dev.:	0.1		0.047	0.111	0.000		

→ 17.1W/mk

Test Method



❖ Measuring instrument : LFA457



Test Result

Thermal Diffusivity - NETZSC <绝缘体 Single Layer >

General information

Database :	hsm-120831.mdb	Operator :	LEH
Instrument :	LFA 457	Customer :	HSM
Identity :	20120831-5	Remark (mmenf) :	
Date :	2012-08-31	Cp table :	#9 WB5
Material :	#9 WB5	Expansion table :	dL_const
Ref. density (25.0 °C) / (g/cm ³) :	2.670	Temp. recalib. file :	Tcalzero.tcx
Sample :	#9 WB5	Purge gas :	used
Type :	Single layer	Furnace :	LFA 457 Medium Rg
Coating :	C	Sample holder :	unknown
Thickness (RT) /mm :	0.1220	Laser :	LFA 457 Laser
Diameter /mm :	10.000	Centering cone :	Std SiC 10mm ²
Sensor :	InSb	Center cone ratio :	0.70
Beam enlargement : /mm :	12.7	Furnace TC :	S
Laser filter : /% :	100.0	Sample TC :	S
Atmosphere :	N2	Sample Xp / Tn :	3.00 / 0.52
Gas flow : / (ml/min) :	100.00	Furnace Xp / Tn :	3.20 / 0.52
Laboratory :	Ajou CMCM		

Results

shot number	temperature °C	Model	Diffusivity mm ² /s	Conductivity W/(m·K)	Cp J/g·K	Laser voltage V	Pulse width ms
1	24.9	Cowan + pc	1.658	5.186	1.171	1538.0	0.50
2	25.1	Cowan + pc	1.678	5.248	1.171	1538.0	0.50
3	25.1	Cowan + pc	1.685	5.270	1.171	1538.0	0.50
4	25.1	Cowan + pc	1.678	5.247	1.171	1538.0	0.50
5	25.1	Cowan + pc	1.708	5.342	1.171	1538.0	0.50
Mean:	25.1		1.681	5.259	1.171		
Std. Dev.:	0.1		0.018	0.056	0.000		

5.259W/mK

<绝缘体:80μm, Al:0.6T, Cu:1oz, 3Layer >

Thermal Diffusivity - NETZSCH LFA Analys

General information

Database :	hsm-120925.mdb	Operator :	LEH
Instrument :	LFA 457	Customer :	HSM
Identity :	20120925-7	Remark (mmenf) :	
Date :	2012-09-25	Cp table :	SS
Material :	#6 S5	Expansion table :	dL_const
Ref. density (25.0 °C) / (g/cm ³) :	3.012	Temp. recalib. file :	Tcalzero.tcx
Sample :	#6 S5	Purge gas :	used
Type :	Single layer	Furnace :	LFA 457 Medium Rg
Coating :	C	Sample holder :	unknown
Thickness (RT) /mm :	0.7100	Laser :	LFA 457 Laser
Diameter /mm :	10.000	Centering cone :	Std SiC 10mm ²
Sensor :	InSb	Center cone ratio :	0.70
Beam enlargement : /mm :	12.7	Furnace TC :	S
Laser filter : /% :	100.0	Sample TC :	S
Atmosphere :	N2	Sample Xp / Tn :	3.00 / 0.52
Gas flow : / (ml/min) :	100.00	Furnace Xp / Tn :	3.20 / 0.52
Laboratory :	Ajou CMCM		

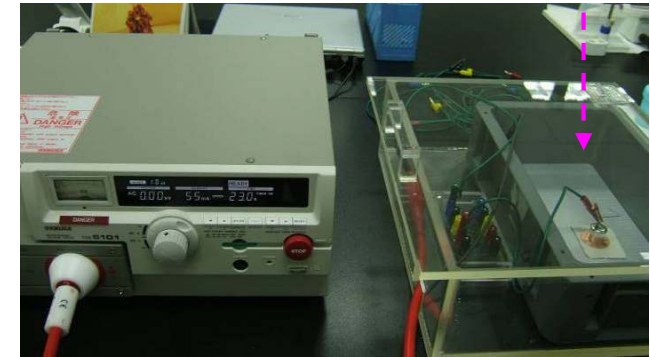
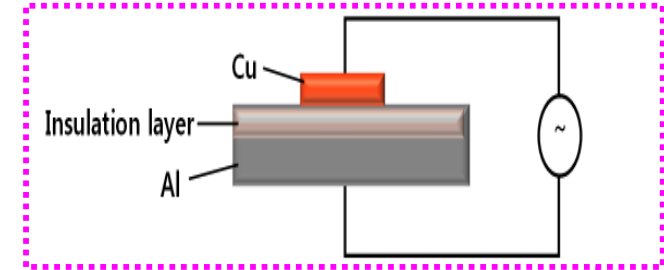
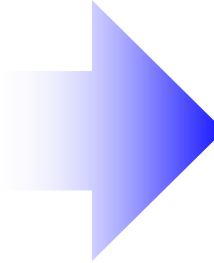
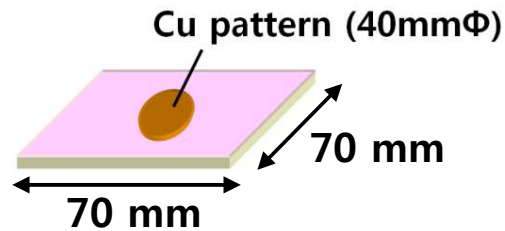
Results

shot number	temperature °C	Model	Diffusivity mm ² /s	Conductivity W/(m·K)	Cp J/g·K	Laser voltage V	Pulse width ms
1	24.9	Cowan + pc	13.585	34.657	0.847	1538.0	0.50
2	24.8	Cowan + pc	13.639	34.796	0.847	1538.0	0.50
3	24.8	Cowan + pc	13.548	34.558	0.847	1538.0	0.50
4	24.8	Cowan + pc	13.436	34.274	0.847	1538.0	0.50
5	24.7	Cowan + pc	13.549	34.562	0.847	1538.0	0.50
Mean:	24.8		13.551	34.569	0.847		
Std. Dev.:	0.0		0.074	0.191	0.000		

34.569W/mK

Test Method

- ❖ JIS C 2110
- ❖ Measuring instrument : TOS 5101(KIKUSUI)



Test condition

AC 5kV or less	0.2kV increment
AC Over 5kV	0.5kV increment
Leakage Current	10mA以下

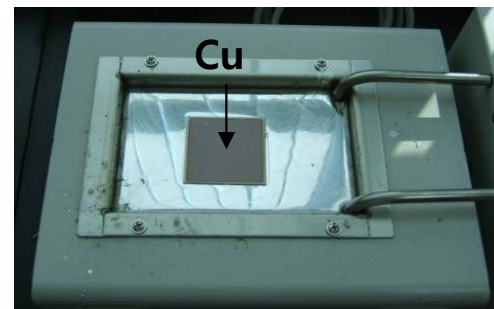
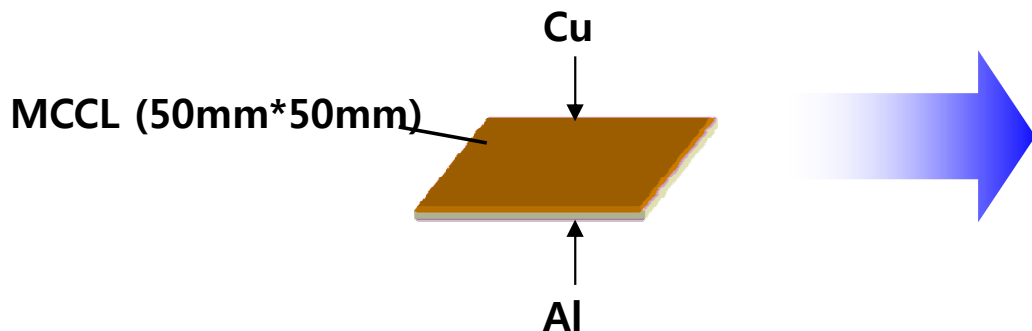
Test Result

Item		Spec.	#1	#2	#3	判定
2W	绝缘体 50 μ m	AC 3.0Kv 以上, 10mA	4.0	4.0	4.2	PASS
	绝缘体 90 μ m	AC 3.0Kv 以上, 10mA	6.5	6.0	6.0	PASS
5W	绝缘体 80 μ m	AC 3.0Kv 以上, 10mA	5.5	5.5	5.5	PASS

[Unit=Kv]

Test Method

- Measuring instrument : Solder pot



Test condition

Temperature	288°C
time	10minute 以上

Test Result

Item	Spec.	#1	#2	#3	判定
2W	绝缘体 50μm	10 以上	10 以上	10 以上	PASS
	绝缘体 90μm	10 以上	10 以上	10 以上	PASS
5W	绝缘体 80μm	10 以上	10 以上	10 以上	PASS

[Unit=min]

Test Method ■ Measuring instrument : Zig

90° Bending

180° Bending

Test condition	
Bending angle	90°, 180°
Spec.	No crack, No delamination

Test result						
Item	Spec.	#1	#2	#3	判定	
2W	绝缘体 50μm	No crack, No delamination	无	无	无	PASS
	绝缘体 90μm		无	无	无	PASS
5W	绝缘体 80μm		无	无	无	PASS

Test Method

- Measuring instrument : Optical Microscope

Test condition	
Condition	288 °C/ 10Sec/ 10Cycle/ Dipping
Spec.	No crack, No delamination



Cross Section

Test Result

Item		Spec.	#1	#2	#3	判定
2W	50 μ m	No crack, No delamination				OK
	90 μ m					OK
5W	80 μ m					OK



Test Report No. F690101/LF-CTSAYAA12-32782

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Sample No. : AYAA12-32782.001
 Sample Description : M-2
 Item No./Part No. : M-2 Insulator
 Materials : NA

Heavy Metals

Test Items	Unit	Test Method	MDL	Results
Cadmium (Cd)	mg/kg	With reference to IEC 62321:2008, ICP	0.5	N.D.
Lead (Pb)	mg/kg	With reference to IEC 62321:2008, ICP	5	N.D.
Mercury (Hg)	mg/kg	With reference to IEC 62321:2008, ICP	2	N.D.
Hexavalent Chromium (Cr VI) By boiling water extraction*	**	With reference to IEC 62321:2008	-	Negative

Flame Retardants-PBBs/PBDEs

Test Items	Unit	Test Method	MDL	Results
Mono bromobiphenyl	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Dibromobiphenyl	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Tribromobiphenyl	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Tetrabromobiphenyl	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Pentabromobiphenyl	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Hexabromobiphenyl	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Heptabromobiphenyl	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Octabromobiphenyl	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Nonabromobiphenyl	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Decabromobiphenyl	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Mono bromodiphenyl ether	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Dibromodiphenyl ether	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Tribromodiphenyl ether	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Tetrabromodiphenyl ether	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Pentabromodiphenyl ether	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Hexabromodiphenyl ether	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Heptabromodiphenyl ether	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Octabromodiphenyl ether	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.

NOTE: (1) N.D. = Not detected. (<MDL)
 (2) mg/kg = ppm
 (3) MDL = Method Detection Limit
 (4) - = No regulation
 (5) Negative = Undetectable / Positive = Detectable
 (6) ** = Qualitative analysis (No Unit)
 (7) * = Boiling-water-extraction:

Negative = Absence of CrVI coating
 Positive = Presence of CrVI coating; the detected concentration in boiling-water-extraction solution is equal or greater than 0.02 mg/kg with 50 cm2 sample surface area.

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Test Report No. F690101/LF-CTSAYAA12-32782

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Sample No. : AYAA12-32782.001
 Sample Description : M-2
 Item No./Part No. : M-2 Insulator
 Materials : NA

Flame Retardants-PBBs/PBDEs

Test Items	Unit	Test Method	MDL	Results
Nonabromodiphenyl ether	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Decabromodiphenyl ether	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.

Halogen Contents

Test Items	Unit	Test Method	MDL	Results
Bromine (Br)	mg/kg	With reference to ASTM D 7359-03, IC	30	N.D.
Chlorine (Cl)	mg/kg	With reference to ASTM D 7359-03, IC	30	N.D.
Fluorine (F)	mg/kg	With reference to ASTM D 7359-03, IC	30	N.D.
Iodine (I)	mg/kg	With reference to ASTM D 7359-03, IC	50	N.D.

NOTE: (1) N.D. = Not detected. (<MDL)
 (2) mg/kg = ppm
 (3) MDL = Method Detection Limit
 (4) - = No regulation
 (5) Negative = Undetectable / Positive = Detectable
 (6) ** = Qualitative analysis (No Unit)
 (7) * = Boiling-water-extraction:
 Negative = Absence of CrVI coating
 Positive = Presence of CrVI coating; the detected concentration in boiling water extraction solution is equal or greater than 0.02 mg/kg with 50 cm2 sample surface area.

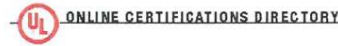
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QMTS2.E346145 - Polymeric Materials - Filament-wound Tubing, Industrial Lamin... 페이지 1 / 2



QMTS2.E346145

Polymeric Materials - Filament-wound Tubing, Industrial Laminates, Vulcanized Fiber, and Materials for Use in Fabricating Recognized Printed Wiring Boards - Component

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Polymeric Materials - Filament-wound Tubing, Industrial Laminates, Vulcanized Fiber, and Materials for Use in Fabricating Recognized Printed Wiring Boards - Component

See General Information for Polymeric Materials - Filament-wound Tubing, Industrial Laminates, Vulcanized Fiber, and Materials for Use in Fabricating Recognized Printed Wiring Boards - Component

HEESUNG MATERIAL LTD E346145
 620 BON-RI
 IRYU-MYEON
 CHUNGJU-SI, CHUNGCHEONGBUK-DO 380-871 REPUBLIC OF KOREA

Metal base industrial laminates:

MTI Dsg	Color	Metal		Dielectric		R.T.I.			H			Meets 746E DSR	
		Min Thk (mm)	Max Thk (mm)	Min Thk (mic)	Max Thk (mic)	Flame Class	Elec (°C)	Mech (°C)	H W I	H A I	V T R		C T I
Aluminum base with Epoxy (EP) dielectric, industrial laminates, "HEESUNG THERMAL PLATE", furnished as sheets.													
M-2	GY	0.30	-	30	-	V-0	-	-	-	-	-	-	-
		0.30	-	180	-	V-0	-	-	-	-	-	-	-
		0.50	-	80	-	V-0	155	155	0	3	-	-	Yes
		0.50	-	180	-	V-0	155	155	0	2	-	0	Yes
Aluminum base with Epoxy (EP) dielectric, industrial laminates, furnished as sheets.													
HSTP-2	NC	0.5	-	60	-	V-0	140	180	5	0	-	-	-
		0.5	-	120	-	V-0	140	180	4	0	-	0	Yes

Metal clad metal base industrial laminates:

Metal Clad Dsg	Lam-inate Dsg	Pre-preg Dsg	Metal		Dielectric		Clad Cond Thk			Max Area Dia (mm)	Flame Class	Max Oper Temp (°C)	Max Solder Lts Temp (°C)	Solder Lts Time (sec)
			Min Thk (mm)	Max Thk (mm)	Min Thk (mic)	Max Thk (mic)	Min Ext (mic)	Max Ext (mic)	Max Int (mic)					
Aluminum base with Epoxy (EP) dielectric, Metal clad industrial laminates with copper on one side only, furnished as sheets.														
HSTP-2														
	HSTP-2	-	0.5	60	120	34	102	-	50.8	V-0	140	280	60	

Marking: Company name or tradename "HEESUNG THERMAL PLATE" and material designation on container or wrapper.
 Last Updated on 2013-04-25

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谢谢。