Report # 35942ES

TEST REPORT SUMMARY

(Short Report)

CLIENT:	IPC INTERNATIONAL INC 3000 Lakeside Drive Suite 105N Bannockburn, IL 60015 Attention: Mr. Randy Cherry Phone: 1-847-597-2806
REFERENCE:	IPC-4101E-WAM1/40, IPC-TM-650 2.4.8C, 2.4.8.3A, 2.5.17.1A, 2.6.2.1A, 2.5.6B, 2.5.5.9, 2.4.4B, 2.4.4.1A, 2.5.1B, 2.4.13.1, 2.5.6.2A, 2.4.24C, 2.3.4.2A, 2.4.39A, 2.3.1.1, 2.6.16, IPC J-STD-003C, UL94
TEST ITEM:	Peel Strength, Volume Resistivity and Surface Resistivity, Moisture Absorption, Dielectric Breakdown , Permittivity and Loss Tangent at 1 MHz, Flexural Strength, Arc Resistance, Thermal Stress, Electric Strength, Horizontal Burning Test, Glass Transition Temperature (TMA), Dimensional Stability, Solderability, Chemical Resistance , Metal Surface Cleanability, Pressure Cooker Test
SAMPLE:	CCL
TEST MATERIAL:	VT-90H
SPECIFICATION:	IPC-4101E-WAM1/41
TEST RESULTS:	The specimens were tested by the indicated test methods within this report. The actual detailed test results are enclosed.
DATE OF REPORT:	21 November 2022
REPORT No.:	35942E

MICROTEK (CHANGZHOU) PRODUCT SERVICES CO., LTD. 麦可罗泰克（常州）产品服务有限公司 2022.11.22 17:05:07 +08'00' 检测专用章

"INTEGRITY, HONESTY AND KNOWLEDGE"

MICROTEK（CHANGZHOU）PRODUCT SERVICES CO., LTD

NO.19 XINKE ROAD • ELECTRONIC-TECHNOLOGY • CHANGZHOU, JIANGSU, CHINA 213031 •

Tel: 86 519 85487809 •Fax: 86 519 85487810 • WWW.THETESTLAB.CN

SUMMARIZED TEST RESULTS:

Test Item	Thin	Thick
Peel Strength	Pass	Pass
Volume Resistivity	Pass	Pass
Surface Resistivity	Pass	Pass
Moisture Absorption	/	Pass
Dielectric Breakdown	/	Pass
Permittivity at 1 MHz	Pass	Pass
Loss Tangent at 1 MHz	Pass	Pass
Flexural Strength	/	Pass
Arc Resistance	Pass	Pass
Thermal Stress	Pass	Pass
Electric Strength	Pass	/
Horizontal Burning Test	Pass	Pass
Glass Transition Temperature (TMA)	/	Pass
Dimensional Stability	Pass	Pass
Solderability	Pass	Pass
Metal Surface Cleanability	/	See test page
Pressure Cooker Test	/	See test page
Chemical Resistance	See test page	See test page

Report # 35942ES

Peel Strength

REFERENCE

IPC-4101E-WAM1 Specification for Base Materials for Rigid and Multilayer Printed Boards
IPC-TM-650 Method 2.4.8C Peel Strength of Matallic Clad Laminates
IPC-TM-650 Method 2.4.8.3A Peel Strength of Matallic Clad Laminates at Elevated

RESULTS

Table 1 Peel Strength After Thermal Stress Thin

Sample Designation	CCL	Sample Identification	VT-90H	
Test Date	2022-11-08	Ambient	25 ℃, 48% RH	
Sample No.	Peel Strength (N/mm)			
	Top Crosswise	Top Lengthwise	Bottom Crosswise	Bottom Lengthwise
35941-1-9	1.34			
35941-1-10	1.36			
35941-1-11		1.36		
35941-1-12		1.40		
35941-1-13			1.21	
35941-1-14			1.30	
35941-1-15				1.38
35941-1-16				1.35
Average	1.35	1.38	1.26	1.37
Requirement	⩾0.70			

Table 2 Peel Strength After Thermal Stress Thick

Sample Designation	CCL	Sample Identification	VT-90H	
Test Date	2022-11-08	Ambient	25 ℃, 48% RH	
Sample No.	Peel Strength (N/mm)			
	Top Crosswise	Top Lengthwise	Bottom Crosswise	Bottom Lengthwise
35941-11-9	1.35			
35941-11-10	1.37			
35941-11-11		1.40		
35941-11-12		1.40		
35941-11-13			1.40	
35941-11-14			1.37	
35941-11-15				1.40
35941-11-16				1.43
Average	1.36	1.40	1.38	1.41
Requirement	⩾0.80			

Table 3 Peel Strength At Elevated Temperature Thin

Sample Designation	CCL	Sample Identification	VT-90H	
Test Date	2022-11-10	Ambient	25 ℃, 49% RH	
Sample No.	Peel Strength (N/mm)			
	Top Crosswise	Top Lengthwise	Bottom Crosswise	Bottom Lengthwise
35941-1-1	1.21			
35941-1-2	1.21			
35941-1-3		1.22		
35941-1-4		1.25		
35941-1-5			1.10	
35941-1-6			1.16	
35941-1-7				1.19
35941-1-8				1.14
Average	1.21	1.24	1.13	1.17
Requirement	⩾0.60			

Table 4 Peel Strength At Elevated Temperature Thick

Sample Designation	CCL	Sample Identification	VT-90H	
Test Date	2022-11-10	Ambient	25 ℃, 49% RH	
Sample No.	Peel Strength (N/mm)			
	Top Crosswise	Top Lengthwise	Bottom Crosswise	Bottom Lengthwise
35941-11-1	1.22			
35941-11-2	1.20			
35941-11-3		1.21		
35941-11-4		1.22		
35941-11-5			1.20	
35941-11-6			1.20	
35941-11-7				1.18
35941-11-8				1.18
Average	1.21	1.22	1.20	1.18
Requirement	⩾0.70			

Table 5 Peel Strength After Process Solutions Thin

Sample Designation	CCL	Sample Identification	VT-90H	
Test Date	2022-11-10	Ambient	24 ℃,48% RH	
Sample No.	Peel Strength (N/mm)			
	Top Crosswise	Top Lengthwise	Bottom Crosswise	Bottom Lengthwise
35941-2-1	1.39			
35941-2-2	1.37			
35941-2-3		1.35		
35941-2-4		1.39		
35941-2-5			1.39	
35941-2-6			1.39	
35941-2-7				1.34
35941-2-8				1.33
Average	1.38	1.37	1.39	1.33
Requirement	⩾0.60			

Table 6 Peel Strength After Process Solutions Thick

Sample Designation	CCL	Sample Identification	VT-90H	
Test Date	2022-11-10	Ambient	24 ℃,48% RH	
Sample No.	Peel Strength (N/mm)			
	Top Crosswise	Top Lengthwise	Bottom Crosswise	Bottom Lengthwise
35941-12-1	1.42			
35941-12-2	1.41			
35941-12-3		1.40		
35941-12-4		1.37		
35941-12-5			1.42	
35941-12-6			1.41	
35941-12-7				1.38
35941-12-8				1.46
Average	1.42	1.38	1.42	1.42
Requirement	⩾0.70			

Table 7 Peel Strength Thin (Low Profile Copper Foil)

Sample Designation	/	Sample Identification	/	
Test Date	/	Ambient	/	
Sample No.	Peel Strength (N/mm)			
	Top Crosswise	Top Lengthwise	Bottom Crosswise	Bottom Lengthwise
No Requirement for IPC-4101E-WAM1/41				

Table 8 Peel Strength Thick (Low Profile Copper Foil)

Sample Designation	/	Sample Identification	/	
Test Date	/	Ambient	/	
Sample No.	Peel Strength (N/mm)			
	Top Crosswise	Top Lengthwise	Bottom Crosswise	Bottom Lengthwise
No Requirement for IPC-4101E-WAM1/41				

Report # 35942ES

Volume and Surface Resistivity

REFERENCE

IPC-4101E-WAM1 Specification for Base Materials for Rigid and Multilayer Printed Boards
IPC-TM-650 2.5.17.1A Volume and Surface Resistivity of Dielectric Materials

RESULTS

Table 9 Volume and Surface Resistivity Thin (Humidity Conditioning)

Sample Designation	CCL		Sample Identification	VT-90H	
Test Date	2022-11-04～2022-11-11		Ambient	23 ℃, 50% RH	
Sample No.	Average Thickness T	Surface Resistance R'	Surface Resistivity $r'=R'P/D_4$	Volume Resistance R	Volume Resistivity r=RA/T
	(cm)	(MΩ)	(MΩ)	(MΩ)	(MΩ·cm)
35941-3-1	0.0104	3.0E+04	9.7E+06	6.0E+04	3.0E+07
35941-3-2	0.0104	2.5E+04	8.1E+06	9.0E+04	4.5E+07
35941-3-3	0.0106	1.8E+04	5.8E+06	7.0E+04	3.4E+07
Average		/	7.8E+06	/	3.6E+07
Requirement		/	$\geqslant 10^4$	/	$\geqslant 6.0\times 10^4$

Table 10 Volume and Surface Resistivity Thin (At Elevated Temperature)

Sample Designation	CCL		Sample Identification	VT-90H	
Test Date	2022-11-15～2022-11-16		Ambient	23 ℃, 53% RH	
Sample No.	Average Thickness T	Surface Resistance R'	Surface Resistivity $r'=R'P/D_4$	Volume Resistance R	Volume Resistivity r=RA/T
	(cm)	(MΩ)	(MΩ)	(MΩ)	(MΩ·cm)
35941-4-1	0.0102	5.2E+04	1.7E+07	1.6E+05	8.1E+07
35941-4-2	0.0102	3.8E+04	1.2E+07	2.6E+05	1.3E+08
35941-4-3	0.0103	4.4E+04	1.4E+07	1.4E+05	7.0E+07
Average		/	1.4E+07	/	9.4E+07
Requirement		/	$\geqslant 10^4$	/	$\geqslant 6.0\times 10^4$

Table 11 Volume and Surface resistivity Thick (Humidity Conditioning)

Sample Designation	CCL		Sample Identification	VT-90H	
Test Date	2022-11-04～2022-11-11		Ambient	23 ℃, 50% RH	
Sample No.	Average Thickness T	Surface Resistance R'	Surface Resistivity r'=R'P/D_4	Volume Resistance R	Volume Resistivity r=RA/T
	(cm)	（MΩ）	（MΩ）	（MΩ）	（MΩ-cm）
35941-13-1	0.1505	2.0E+05	5.7E+06	2.7E+05	4.6E+07
35941-13-2	0.1512	1.8E+05	5.1E+06	2.0E+05	3.4E+07
35941-13-3	0.1504	1.6E+05	4.5E+06	2.5E+05	4.3E+07
Average		/	5.1E+06	/	4.1E+07
Requirement		/	⩾10^6	/	⩾10^6

Table 12 Volume and Surface resistivity Thick (At Elevated Temperature)

Sample Designation	CCL		Sample Identification	VT-90H	
Test Date	2022-11-15～2022-11-16		Ambient	23 ℃, 53% RH	
Sample No.	Average Thickness T	Surface Resistance R'	Surface Resistivity r'=R'P/D_4	Volume Resistance R	Volume Resistivity r=RA/T
	(cm)	（MΩ）	（MΩ）	（MΩ）	（MΩ-cm）
35941-14-1	0.1518	4.6E+05	1.3E+07	1.2E+06	2.0E+08
35941-14-2	0.1523	4.4E+05	1.2E+07	8.0E+05	1.3E+08
35941-14-3	0.1522	3.6E+05	1.0E+07	9.0E+05	1.5E+08
Average		/	1.2E+07	/	1.6E+08
Requirement		/	⩾10^6	/	⩾10^6

Report # 35942ES

Moisture Absorption

REFERENCE

IPC-4101E-WAM1 Specification for Base Materials for Rigid and Multilayer Printed Boards
IPC-TM-650 Method 2.6.2.1A Water Absorption, Metal Clad Plastic Laminates

RESULTS

Table 13 Moisture Absorption

Sample Designation	CCL		Sample Identification	VT-90H
Test Date	2022-11-01~2022-11-02		Ambient	25 °C, (50~60)% RH
Sample No.	mass(g)		increasing weight percent of mass(%)	
	m_1	m_2		
35941-21	6.7928	6.8061	0.20	
35941-22	6.7811	6.7954	0.21	
35941-23	6.7648	6.7788	0.21	
Average			0.21	
Requirement			≤1.0	

Report # 35942ES

Dielectric Breakdown

REFERENCE

IPC-4101E-WAM1 Specification for Base Materials for Rigid and Multilayer Printed Boards
IPC-TM-650 Method 2.5.6B Dielectric Breakdown of Rigid Printed Wiring Material

RESULTS

Table 14 Dielectric Breakdown Thick

Sample Designation		CCL	Sample Identification	VT-90H
Test Date		2022-11-14~2022-11-16	Ambient	22 °C, 49% RH
Sample No.		Thickness (mm)	Breakdown Voltage (kV)	Minimum Voltage (kV)
35941-19-1	Machine direction	1.523	44.1+N.B	44+N.B
35941-19-2		1.521	43.7+N.B	
35941-19-3	Transverse direction	1.521	44.3+N.B	
35941-19-4		1.522	43.9+N.B	
Requirement				⩾40

Report # 35942ES

Permittivity and Loss Tangent

REFERENCE

IPC-4101E-WAM1 Specification for Base Materials for Rigid and Multilayer Printed Boards
IPC-TM-650 2.5.5.9 Permittivity and Loss Tangent, Parallel Plate, 1MHz to 1.5 GHz

RESULTS

Table 15 Permittivity and Loss Tangent

Sample Designation	CCL		Sample Identification	VT-90H
Test Date	2022-11-01~2022-11-02		Ambient	22 °C,50% RH
Sample No.	test frequency	thickness(mm)	permittivity	loss tangent
35941-27	1 MHz	0.106	3.6	0.013
35941-28		0.103	3.6	0.012
35941-29		0.102	3.5	0.011
Average			3.6	0.012
Requirement			≤5.4	≤0.035
35941-30	1 MHz	1.412	4.7	0.007
35941-31		1.396	4.7	0.007
35941-32		1.405	4.7	0.007
Average			4.7	0.007
Requirement			≤5.4	≤0.035

Report # 35942ES

Flexural Strength

REFERENCE

IPC-4101E-WAM1 Specification for Base Materials for Rigid and Multilayer Printed Boards
IPC-TM-650 2.4.4B Flexural Strength of Laminates (at Ambient Temperature)
IPC-TM-650 2.4.4.1A Flexural Strength of Laminates (at Elevated Temperature)

RESULTS

Table 16 Flexural Strength (At Ambient Temperature)

Sample Designation	CCL		Sample Identification		VT-90H		
Test Date	2022-11-15		Ambient		22 ℃，47% RH		
Sample No.	Span	Thickness	Width	Load	Flexural Strength S	Average	Requirement
	L	d	b	P			
	(mm)	(mm)	(mm)	(N)	(N/mm^2)	(N/mm^2)	(N/mm^2)
35941-18-1 (Cross direction)	25.40	1.535	26.40	703.898	431	434	⩾325
35941-18-2 (Cross direction)		1.532	25.45	684.392	437		
35941-18-3 (Length direction)		1.536	26.45	936.041	571	570	⩾415
35941-18-4 (Length direction)		1.536	26.15	921.923	569		

Table 17 Flexural Strength (At Elevated Temperature)

Sample Designation	CCL		Sample Identification		VT-90H		
Test Date	2022-11-15		Ambient		22 ℃，48% RH		
Sample No.	Span	Thickness	Width	Load	Flexural Strength	Average	Requirement
	L	d	b	P	S		
	(mm)	(mm)	(mm)	(N)	(N/mm^2)	(N/mm^2)	(N/mm^2)
35941-18-5 (Length direction)	25.40	1.535	25.63	753.512	475	471	⩾311
35941-18-6 (Length direction)		1.533	26.20	754.501	467		
35941-18-7 (Length direction)		1.535	25.47	742.579	471		
35941-18-8 (Length direction)		1.533	26.46	770.712	472		

Report # 35942ES

Arc Resistance

REFERENCE

IPC-4101E-WAM1 Specification for Base Materials for Rigid and Multilayer Printed Boards
IPC-TM-650 2.5.1B Arc Resistance of Printed Wiring Material

RESULTS

The samples were tested by the methods given above, the test results meet the requirement of IPC-4101E/40 standards. See attached test data sheet for actual test result.

Table 18 Arc Resistance

Sample Designation	CCL	Sample Identification	VT-90H	
Test Date	2022-11-14～2022-11-16	Ambient	22 °C, 47% RH	
Sample No.	Thickness (mm)	Times (s)	Average (s)	Requirement (s)
35941-33-1	0.107	123	122	⩾120
35941-34-1	0.106	122		
35941-35-1	0.104	122		
35941-37-1	1.525	134	134	
35941-38-1	1.521	140		
35941-39-1	1.520	129		

Thermal Stress

REFERENCE

IPC-4101E-WAM1 Specification for Base Materials for Rigid and Multilayer Printed Boards
IPC-TM-650 Method 2.4.13.1 Thermal Stress of Laminates

RESULTS

Table 19 Thermal Stress

Sample Designation	CCL			Sample Identification	VT-90H
Test Date	2022-11-15			Ambient	22°C, 52% RH
Sample No.				Test result	
35941-8-4	Etched	Top	Thin	No obvious blister, delamination, wrinkling or cracking.	
35941-8-5				No obvious blister, delamination, wrinkling or cracking.	
35941-8-6				No obvious blister, delamination, wrinkling or cracking.	
35941-8-7		Bottom		No obvious blister, delamination, wrinkling or cracking.	
35941-8-8				No obvious blister, delamination, wrinkling or cracking.	
35941-8-9				No obvious blister, delamination, wrinkling or cracking.	
35941-10-1	Unetched	Top		No obvious blister, delamination, wrinkling or cracking.	
35941-10-2				No obvious blister, delamination, wrinkling or cracking.	
35941-10-3				No obvious blister, delamination, wrinkling or cracking.	
35941-10-4		Bottom		No obvious blister, delamination, wrinkling or cracking.	
35941-10-5				No obvious blister, delamination, wrinkling or cracking.	
35941-10-6				No obvious blister, delamination, wrinkling or cracking.	
35941-19-5	Etched	Top	Thick	No obvious blister, delamination, wrinkling or cracking.	
35941-19-6				No obvious blister, delamination, wrinkling or cracking.	
35941-19-7				No obvious blister, delamination, wrinkling or cracking.	
35941-19-8		Bottom		No obvious blister, delamination, wrinkling or cracking.	
35941-19-9				No obvious blister, delamination, wrinkling or cracking.	
35941-19-10				No obvious blister, delamination, wrinkling or cracking.	
35941-20-1	Unetched	Top		No obvious blister, delamination, wrinkling or cracking.	
35941-20-2				No obvious blister, delamination, wrinkling or cracking.	
35941-20-3				No obvious blister, delamination, wrinkling or cracking.	
35941-20-4		Bottom		No obvious blister, delamination, wrinkling or cracking.	
35941-20-5				No obvious blister, delamination, wrinkling or cracking.	
35941-20-6				No obvious blister, delamination, wrinkling or cracking.	

Electric Strength

REFERENCE

IPC-4101E-WAM1 Specification for Base Materials for Rigid and Multilayer Printed Boards

IPC-TM-650 Method 2.5.6.2A Electric Strength of Printed Wiring Material

RESULTS

Table 20 Electric Strength Thin

Sample Designation	CCL	Sample Identification	VT-90H
Test Date	2022-11-14~2012-11-16	Ambient	22 ℃, 49% RH
Sample No.	Average Thickness (mm)	Voltage (kV)	Electric Strength (kV/mm)
35941-41	0.108	7.7	71.30
35941-42	0.107	7.3	68.22
35941-43	0.108	7.6	70.37
Average			70
Requirement			⩾30

Report # 35942ES

Horizontal Burning Test

REFERENCE

IPC-4101E-WAM1 Specification for Base Materials for Rigid and Multilayer Printed Boards

UL94 STANDARD FOR SAFETY Tests for Flammability of Plastic Materials for Parts in Devices and Appliances Section 7 Horizontal Burning Test; HB

RESULTS

Table 21 Horizontal Burning Test Thin

Sample Designation	CCL		Sample Identification	VT-90H		
Test Date	2022-11-10~2022-11-16		Ambient	22 ℃, 48% RH		
Sample No.	Sample Thk	Flame time Te	Burning time Tb	Combustion length L	Burning rate v	Note
	(mm)	(s)	(s)	(mm)	(mm/min)	
35941-45	0.104	30	0	0	/	1
35941-46	0.104	30	0	0	/	1
35941-47	0.103	30	0	0	/	1
Avg:	0.104	Flammability classification				HB
Requirement						HB
Note:	1.The test specimen did not burn more than 25mm mark line.					
	2.The sample was burned more than 25mm mark line, and no more than 100mm mark line.					
	3.Sample burning more than 100mm mark line.					
	4.Samples have any burning particles drop.					

Table 22 Horizontal Burning Test Thick

Sample Designation	CCL		Sample Identification	VT-90H		
Test Date	2022-11-10~2022-11-16		Ambient	22 ℃, 48% RH		
Sample No.	Sample Thk	Flame time Te	Burning time Tb	Combustion length L	Burning rate v	Note
	(mm)	(s)	(s)	(mm)	(mm/min)	
35941-48	1.471	30	0	0	/	1
35941-49	1.460	30	0	0	/	1
35941-50	1.467	30	0	0	/	1
Avg:	1.466	Flammability classification				HB
Requirement						HB
Note:	1.The test specimen did not burn more than 25mm mark line.					
	2.The sample was burned more than 25mm mark line, and no more than 100mm mark line.					
	3.Sample burning more than 100mm mark line.					
	4.Samples have any burning particles drop.					

Report # 35942ES

Glass Transition Temperature (TMA)

REFERENCE

IPC-4101E-WAM1 Specification for Base Materials for Rigid and Multilayer Printed Boards

IPC-TM-650 2.4.24C Glass Transition Temperature and Z-Axis Thermal Expansion by TMA

RESULTS

Table 23 Glass Transition Temperature （TMA）

Sample Designation	CCL	**Sample Identification**	VT-90H
Test Date	2022-11-02	**Ambient**	25 °C, 50% RH
Sample No.	**Tg(℃)**		
35941-62	252.36		
35941-63	252.70		
Requirement	≥250		

Dimensional Stability

REFERENCE

IPC-4101E-WAM1 Specification for Base Materials for Rigid and Multilayer Printed Boards

IPC-TM-650 2.4.39A Dimensional Stability, Glass Reinforced Thin Laminates

RESULTS

Table 24 Dimensional Stability Thin

Sample Designation	CCL		Sample Identification		VT-90H			
Test Date	2022-11-01~2022-11-10		Ambient		（21~22）℃，（47~49）% RH			
Sample No.	After Bake Process (ppm)				After Thermal Stress Process (ppm)			
	MD		TD		MD		TD	
35941-5	101	137	189	182	233	278	284	264
35941-6	141	170	114	158	278	283	279	281
35941-7	133	137	174	154	282	290	292	280
Requirement	-300~300							

Table 25 Dimensional Stability Thick

Sample Designation	CCL		Sample Identification		VT-90H			
Test Date	2022-11-01~2022-11-10		Ambient		（21~22）℃，（47~49）% RH			
Sample No.	After Bake Process (ppm)				After Thermal Stress Process (ppm)			
	MD		TD		MD		TD	
35941-15	157	-40	31	28	161	65	51	20
35941-16	121	44	-32	107	32	-16	126	24
35941-17	117	20	59	28	52	226	20	20
Requirement	-300~300							

Report # 35942ES

Solderability（Edge Dip Test）

REFERENCE

IPC-4101E-WAM1 Specification for Base Materials for Rigid and Multilayer Printed Boards
IPC J-STD-003C Solderability Tests for Printed Boards 4.2.1 Edge Dip Test

RESULTS

The samples were tested by the methods given above, the test results meet the requirement of IPC J-STD-003C. See attached test data sheet and test pictures for actual test result.

Table 26 Solderability (Edge Dip Test)

Sample Designation	CCL	Sample Identification	VT-90H
Test Date	2022-11-16	Ambient	23 °C, 53% RH

Sample No.	Test result
35941-10-7 (Thin)	Sample surface exhibit good wetting
35941-20-7 (Thick)	Sample surface exhibit good wetting

Report # 35942ES

Chemical Resistance

REFERENCE

IPC-4101E-WAM1 Specification for Base Materials for Rigid and Multilayer Printed Boards

IPC-TM-650 2.3.4.2A Chemical Resistance of Laminates, Prepreg, and Coated Foil Products, by Solvent Exposure

RESULTS

Table 27 Chemical Resistance

Sample Designation	CCL			Sample Identification	VT-90H	
Test Date	2022-11-06			Ambient	24 °C, 50% RH	
Sample No.	Thickness（mm）	Weight (mg)		Increase Weight (mg)	Appearance Inspection	
		W_1	W_2	W_2-W_1	After Bake	After Immerse in the Solvent
35941-8-1	0.105	442.1	443.3	1.2	no any change	no any change
35941-8-2	0.106	447.8	449.3	1.5	no any change	no any change
35941-8-3	0.105	445.2	446.1	0.9	no any change	no any change
Average				1.2	/	
35941-24	1.418	6716.5	6718.3	1.8	no any change	no any change
35941-25	1.424	6571.0	6572.6	1.6	no any change	no any change
35941-26	1.414	6729.7	6731.4	1.7	no any change	no any change
Average				1.7	/	

Report # 35942ES

Metal Surface Cleanablility

REFERENCE

IPC-4101E-WAM1 Specification for Base Materials for Rigid and Multilayer Printed Boards
IPC-TM-650 2.3.1.1 Chemical Cleaning of Metal-Clad Laminate

RESULTS

Table 28 Metal Surface Cleanablility

Sample Designation	CCL	**Sample Identification**	VT-90H
Test Date	2022-11-06	**Ambient**	24 °C, 50% RH
Sample No.	**Test Result**		
35941-56	A uniform matte finish formed on the metal cladding of the test specimen. No bead or puddles formed on the metal surface after pouring deionized water on it		
35941-57	A uniform matte finish formed on the metal cladding of the test specimen. No bead or puddles formed on the metal surface after pouring deionized water on it		
35941-58	A uniform matte finish formed on the metal cladding of the test specimen. No bead or puddles formed on the metal surface after pouring deionized water on it		
35941-59	A uniform matte finish formed on the metal cladding of the test specimen. No bead or puddles formed on the metal surface after pouring deionized water on it		
35941-60	A uniform matte finish formed on the metal cladding of the test specimen. No bead or puddles formed on the metal surface after pouring deionized water on it		
35941-61	A uniform matte finish formed on the metal cladding of the test specimen. No bead or puddles formed on the metal surface after pouring deionized water on it		
Requirements	The metal cladding on the test specimen shall be cleaned to a uniform matte finish. Deionized or distilled water poured on the metal surface does not bead or form puddles.		

Report # 35942ES

CERTIFICATE OF CONFORMANCE

Microtek (Changzhou) Laboratories certifies that the test equipment used complies with the calibration requirements of correlation criterion and that the data contained in this report is accurate within the tolerance limitation of this equipment.

The test report is invalid without the signature of the approver and the stamp of "Special Seal for Test Report". This report has been CA certified, and will be invalid if altered or tampered with. The partial replication of it is invalid, too.

The authenticity of report should be subject to its authorized electronic report that has been CA certified. The test results in this report are only responsible for the tested samples.

The report shall not be reproduced, except in full, without the written approval of Microtek (Changzhou) Laboratories.

Thank you for selecting Microtek (Changzhou) Laboratories for your testing requirements.

Edited by:	Reviewed by:	Approved by:
Liu Dengping	Celina Gu	Gestar
Liu Dengping	Celina Gu	Gestar
Project Engineer	Project Manager	Deputy Technical Manager
Date:2022-11-21	Date:2022-11-21	Date: 2022-11-22