Report # 29668EGS

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
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 and Z-CTE (TMA), Time to Delamination, Dimensional Stability, Solderability, Chemical Resistance, Metal Surface Cleanability, Pressure Cooker Test
SAMPLE:	CCL
TEST MATERIAL:	85H0100CTTXWPRG, 85H0590CTTXWPRG
SPECIFICATION:	IPC-4101E/43
TEST RESULTS:	The specimens were tested by the indicated test methods within this report. The actual detailed test results are enclosed.
DATE OF REPORT:	11 MAY 2021
REPORT No.:	29668E

MICROTEK (CHANGZHOU) PRODUCT SERVICES CO., LTD. 美可罗泰克（常州）产品服务有限公司 2021.05.11 16:44:40 +08'00' 检测专用章

"INTEGRITY, HONESTY AND KNOWLEDGE"

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SUMMARIZED TEST RESULTS:

Test Item	85H0100CTTXWPRG (Thin)	85H0590CTTXWPRG (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 and Z-CTE (TMA)	--	Pass
Time to Delamination (T260,T288,T300)	--	Pass
Dimensional Stability	Pass	Pass
Solderability	Pass	Pass
Chemical Resistance	Report Only	Report Only
Metal Surfaces Cleanability	Report Only	Report Only
Pressure Cooker Test	--	Report Only

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Peel Strength

REFERENCE

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

RESULTS

Table 1 Peel Strength Thin (After Thermal Stress)

Sample Designation	CCL	Sample Identification	85H0100CTTXWPRG	
Test Date	2021-05-03	Ambient	24℃, 49%RH	
Sample No.	Peel Strength (N/mm)			
	Top Lengthwise	Bottom Crosswise	Top Lengthwise	Bottom Crosswise
29668-4-5-1	0.92			
29668-4-5-2	0.95			
29668-4-6-1		0.90		
29668-4-6-2		0.95		
29668-4-7-1			0.98	
29668-4-7-2			0.98	
29668-4-8-1				0.96
29668-4-8-2				0.95
Average	0.94	0.93	0.98	0.95
Requirement	≥0.90			

Table 2 Peel Strength Thick (After Thermal Stress)

Sample Designation	CCL	Sample Identification	85H0590CTTXWPRG	
Test Date	2021-05-03	Ambient	24℃, 49%RH	
Sample No.	Peel Strength (N/mm)			
	Top Lengthwise	Bottom Crosswise	Top Lengthwise	Bottom Crosswise
29668-17-5-1	1.11			
29668-17-5-2	1.11			
29668-17-6-1		1.04		
29668-17-6-2		1.03		
29668-17-7-1			1.05	
29668-17-7-2			1.05	
29668-17-8-1				1.02
29668-17-8-2				1.03
Average	1.11	1.04	1.05	1.02
Requirement	≥0.90			

Table 3 Peel Strength Thin (At Elevated Temperature)

Sample Designation	CCL	Sample Identification	85H0100CTTXWPRG	
Test Date	2021-05-06	Ambient	24℃, 49%RH	
Sample No.	Peel Strength (N/mm)			
	Top Lengthwise	Bottom Crosswise	Top Lengthwise	Bottom Crosswise
29668-5-5-1	0.76			
29668-5-5-2	0.77			
29668-5-6-1		0.72		
29668-5-6-2		0.74		
29668-5-7-1			0.81	
29668-5-7-2			0.82	
29668-5-8-1				0.78
29668-5-8-2				0.80
Average	0.76	0.73	0.81	0.79
Requirement	⩾0.70			

Table 4 Peel Strength Thick (At Elevated Temperature)

Sample Designation	CCL	Sample Identification	85H0590CTTXWPRG	
Test Date	2021-05-06	Ambient	24℃, 49%RH	
Sample No.	Peel Strength (N/mm)			
	Top Lengthwise	Bottom Crosswise	Top Lengthwise	Bottom Crosswise
29668-18-5-1	0.91			
29668-18-5-2	0.92			
29668-18-6-1		0.90		
29668-18-6-2		0.90		
29668-18-7-1			0.93	
29668-18-7-2			0.93	
29668-18-8-1				0.92
29668-18-8-2				0.92
Average	0.92	0.90	0.93	0.92
Requirement	⩾0.70			

Table 5 Peel Strength Thin (After Process Solutions)

Sample Designation	CCL	Sample Identification	85H0100CTTXWPRG	
Test Date	2021-05-07	Ambient	24℃, 48%RH	
Sample No.	Peel Strength (N/mm)			
	Top Lengthwise	Bottom Crosswise	Top Lengthwise	Bottom Crosswise
29668-6-5-1	0.95			
29668-6-5-2	0.91			
29668-6-6-1		0.86		
29668-6-6-2		0.89		
29668-6-7-1			0.97	
29668-6-7-2			0.94	
29668-6-8-1				0.87
29668-6-8-2				0.89
Average	0.93	0.87	0.96	0.88
Requirement	⩾0.80			

Table 6 Peel Strength Thick (After Process Solutions)

Sample Designation	CCL	Sample Identification	85H0590CTTXWPRG	
Test Date	2021-05-07	Ambient	24℃, 48%RH	
Sample No.	Peel Strength (N/mm)			
	Top Lengthwise	Bottom Crosswise	Top Lengthwise	Bottom Crosswise
29668-19-5-1	0.92			
29668-19-5-2	0.94			
29668-19-6-1		0.90		
29668-19-6-2		0.93		
29668-19-7-1			0.94	
29668-19-7-2			0.86	
29668-19-8-1				0.88
29668-19-8-2				0.90
Average	0.93	0.91	0.90	0.89
Requirement	⩾0.80			

Table 7 Peel Strength Thin (Low Profile Copper Foil)

Sample Designation	/	Sample Identification	/	
Test Date	/	Ambient	/	
Sample No.	Peel Strength (N/mm)			
	Top Lengthwise	Bottom Crosswise	Top Lengthwise	Bottom Crosswise
No Requirement for IPC-4101E/43				

Table 8 Peel Strength Thick (Low Profile Copper Foil)

Sample Designation	/	Sample Identification	/	
Test Date	/	Ambient	/	
Sample No.	Peel Strength (N/mm)			
	Top Lengthwise	Bottom Crosswise	Top Lengthwise	Bottom Crosswise
No Requirement for IPC-4101E/43				

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Volume and Surface Resistivity

REFERENCE

IPC-4101E 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 Surface Resistivity Thin (Humidity Conditioning: 96 h)

Sample Designation	CCL		Sample Identification	85H0100CTTXWPRG	
Test Date	2021-05-02~2021-05-06		Ambient	(23~24) ℃, (48~51)% 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)
29668-4-1	0.0264	5.6E+05	1.8E+08	/	/
29668-4-2	0.0267	6.0E+05	1.9E+08	/	/
29668-4-3	0.0265	4.8E+05	1.5E+08	/	/
Average		/	1.8E+08	/	/
Requirement		/	$\geqslant 10^4$	/	/

Table 10 Volume Resistivity Thin (Humidity Conditioning: 160 h)

Sample Designation	CCL		Sample Identification	85H0100CTTXWPRG	
Test Date	2021-04-29~2021-05-06		Ambient	(23~24) ℃, (48~51)% 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)
29668-5-1	0.0262	/	/	4.8E+05	9.5E+07
29668-5-2	0.0263	/	/	4.2E+05	8.3E+07
29668-5-3	0.0262	/	/	3.2E+05	6.3E+07
Average		/	/	/	8.0E+07
Requirement		/	/	/	≥6E+04

Table 11 Volume and Surface Resistivity Thin (At Elevated Temperature)

Sample Designation	CCL		Sample Identification	85H0100CTTXWPRG	
Test Date	2021-04-27~2021-04-28		Ambient	(24~25) ℃, 49% 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)
29668-6-1	0.0266	2.0E+05	6.4E+07	3.0E+05	5.8E+07
29668-6-2	0.0263	1.8E+05	5.8E+07	3.2E+05	6.3E+07
29668-6-3	0.0265	2.6E+05	8.4E+07	2.9E+05	5.7E+07
Average		/	6.9E+07	/	5.9E+07
Requirement		/	$\geqslant 10^4$	/	≥6E+04

Table 12 Surface Resistivity Thick (Humidity Conditioning: 96 h)

Sample Designation	CCL		Sample Identification	85H0590CTTXWPRG	
Test Date	2021-05-02~2021-05-06		Ambient	(23~24) ℃, (48~51)% 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)
29668-17-1	0.1521	1.0E+05	2.8E+06	/	/
29668-17-2	0.1519	1.2E+05	3.4E+06	/	/
29668-17-3	0.1524	1.4E+05	4.0E+06	/	/
Average		/	3.4E+06	/	/
Requirement		/	$\geqslant 10^6$	/	/

Table 13 Volume Resistivity Thick (Humidity Conditioning: 160 h)

Sample Designation	CCL		Sample Identification	85H0590CTTXWPRG	
Test Date	2021-04-29~2021-05-06		Ambient	(23~24) ℃, (48~51)% 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)
29668-18-1	0.1522	/	/	9.0E+05	1.5E+08
29668-18-2	0.1519	/	/	1.0E+06	1.7E+08
29668-18-3	0.1520	/	/	7.5E+05	1.3E+08
Average		/	/	/	1.5E+08
Requirement		/	/	/	$\geqslant 10^6$

Table 14 Volume and Surface Resistivity Thick (At Elevated Temperature)

Sample Designation	CCL		Sample Identification	85H0590CTTXWPRG	
Test Date	2021-04-27~2021-04-28		Ambient	(24~25) ℃, 49% 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)
29668-19-1	0.1518	2.7E+05	7.6E+06	3.4E+05	5.7E+07
29668-19-2	0.1516	3.0E+05	8.5E+06	3.6E+05	6.1E+07
29668-19-3	0.1519	2.0E+06	5.7E+07	3.2E+05	5.4E+07
Average		/	2.4E+07	/	5.7E+07
Requirement		/	$\geqslant 10^6$	/	$\geqslant 10^6$

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Moisture Absorption

REFERENCE

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

RESULTS

Table 15 Moisture Absorption Thick

Sample Designation	CCL		Sample Identification	85H0590CTTXWPRG
Test Date	2021-04-28~2021-04-29		Ambient	(23~24)℃, (49~57)% RH
Sample No.	mass(g)		increasing weight percent of mass(%)	
	m_1	m_2		
29668-23-1	7.6043	7.6180	0.18	
29668-23-2	7.6057	7.6203	0.19	
29668-23-3	7.6240	7.6382	0.19	
Average			0.19	
Requirement			⩽0.5	

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Dielectric Breakdown

REFERENCE

IPC-4101E 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 16 Dielectric Breakdown Thick

Sample Designation		CCL	Sample Identification	85H0590CTTXWPRG
Test Date		2021-04-27~2021-04-29	Ambient	24 ℃, 60% RH
Sample No.		Thickness (mm)	Voltage (kV)	Minimum Voltage (kV)
29668-20-1	Machine direction	1.518	43.5+N.B	43+N.B
29668-20-2		1.517	42.9+N.B	
29668-20-3	Transverse direction	1.515	43.2+N.B	
29668-20-4		1.518	43.1+N.B	
Requirement				≥40

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Permittivity and Loss Tangent

REFERENCE

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

RESULTS

Table17 Permittivity and Loss Tangent Thin

Sample Designation	CCL		Sample Identification	85H0100CTTXWPRG
Test Date	2021-04-28~2021-04-29		Ambient	25 ℃, 50% RH
Sample No.	Test Frequency	Thickness(mm)	Permittivity	Loss Tangent
29668-10-1	1MHz	0.253	4.2	0.009
29668-10-2		0.252	4.2	0.009
29668-10-3		0.267	4.2	0.009
Average			4.2	0.009
Requirement			⩽5.4	⩽0.01

Table18 Permittivity and Loss Tangent Thick

Sample Designation	CCL		Sample Identification	85H0590CTTXWPRG
Test Date	2021-04-28~2021-04-29		Ambient	25 ℃, 50% RH
Sample No.	Test Frequency	Thickness(mm)	Permittivity	Loss Tangent
29668-23-4	1MHz	1.520	4.9	0.006
29668-23-5		1.517	4.9	0.006
29668-23-6		1.511	4.9	0.006
Average			4.9	0.006
Requirement			⩽5.4	⩽0.01

Flexural Strength

REFERENCE

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

RESULTS

Table 19 Flexural Strength Test (At Ambient Temperature)

Sample Designation	CCL		Sample Identification		85H0590CTTXWPRG		
Test Date	2021-04-29		Ambient		23℃, 48%RH		
Sample No.	Span	Thickness	Width	Load	Flexural Strength $S=3PL/2bd^2$	Average	Requirement
	L	d	b	P			
	(mm)	(mm)	(mm)	(N)	(N/mm^2)	(N/mm^2)	(N/mm^2)
29668-16-1 (Cross direction)	25.40	1.516	25.77	685.272	441	440	⩾325
29668-16-2 (Cross direction)		1.524	24.95	669.066	440		
29668-16-7 (Length direction)		1.512	25.75	754.612	488	484	⩾415
29668-16-8 (Length direction)		1.510	25.25	725.384	480		

Table 20 Flexural Strength (At Elevated Temperature)

Sample Designation	CCL		Sample Identification		85H0590CTTXWPRG		
Test Date	2021-04-29		Ambient		23℃, 48%RH		
Sample No.	Span	Thickness	Width	Load	Flexural Strength $S=3PL/2bd^2$	Average	Requirement
	L	d	b	P			
	(mm)	(mm)	(mm)	(N)	(N/mm^2)	(N/mm^2)	(N/mm^2)
29668-16-9 (Length direction)	25.40	1.515	24.77	607.964	407	420	⩾311
29668-16-10 (Length direction)		1.516	25.56	642.359	417		
29668-16-11 (Length direction)		1.514	25.41	659.614	431		
29668-16-12 (Length direction)		1.507	25.51	644.116	424		

Arc Resistance

REFERENCE

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

RESULTS

Table 21 Arc Resistance Thin

Sample Designation	CCL	Sample Identification	85H0100CTTXWPRG	
Test Date	2021-04-27~2021-04-29	Ambient	23 ℃, 48% RH	
Sample No.	Thickness	Times	Average	Requirement
	(mm)	(s)	(s)	(s)
29668-7-1	0.259	181	182	⩾120
29668-7-2	0.260	182		
29668-7-3	0.257	182		

Table 22 Arc Resistance Thick

Sample Designation	CCL	Sample Identification	85H0590CTTXWPRG	
Test Date	2021-04-27~2021-04-29	Ambient	23 ℃, 48% RH	
Sample No.	Thickness	Times	Average	Requirement
	(mm)	(s)	(s)	(s)
29668-20-5	1.524	182	182	⩾120
29668-20-6	1.518	181		
29668-20-7	1.519	182		

Thermal Stress

REFERENCE

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

RESULTS

Table 23 Thermal Stress Thin

Sample Designation	CCL	Sample Identification	85H0100CTTXWPRG
Test Date	2021-04-28	Ambient	25 ℃, 49% RH
Sample No.	Sample Description	Test result	
29668-7-11	Top etched	No evidence of blistering, delamination, wrinkling and cracking.	
29668-7-12		No evidence of blistering, delamination, wrinkling and cracking.	
29668-7-13		No evidence of blistering, delamination, wrinkling and cracking.	
29668-7-14	Bottom etched	No evidence of blistering, delamination, wrinkling and cracking.	
29668-7-15		No evidence of blistering, delamination, wrinkling and cracking.	
29668-7-16		No evidence of blistering, delamination, wrinkling and cracking.	
29668-9-1	Top unetched	No evidence of blistering, delamination, wrinkling and cracking.	
29668-9-2		No evidence of blistering, delamination, wrinkling and cracking.	
29668-9-3		No evidence of blistering, delamination, wrinkling and cracking.	
29668-9-4	Bottom unetched	No evidence of blistering, delamination, wrinkling and cracking.	
29668-9-5		No evidence of blistering, delamination, wrinkling and cracking.	
29668-9-6		No evidence of blistering, delamination, wrinkling and cracking.	
Requirement		No evidence of blistering, delamination, wrinkling and cracking.	

Table 24 Thermal Stress Thick

Sample Designation	CCL	Sample Identification	85H0590CTTXWPRG
Test Date	2021-04-28	Ambient	25 ℃, 49% RH
Sample No.	Sample Description	Test result	
29668-20-11	Top etched	No evidence of blistering, delamination, wrinkling and cracking.	
29668-20-12		No evidence of blistering, delamination, wrinkling and cracking.	
29668-20-13		No evidence of blistering, delamination, wrinkling and cracking.	
29668-20-14	Bottom etched	No evidence of blistering, delamination, wrinkling and cracking.	
29668-20-15		No evidence of blistering, delamination, wrinkling and cracking.	
29668-20-16		No evidence of blistering, delamination, wrinkling and cracking.	
29668-22-1	Top unetched	No evidence of blistering, delamination, wrinkling and cracking.	
29668-22-2		No evidence of blistering, delamination, wrinkling and cracking.	
29668-22-3		No evidence of blistering, delamination, wrinkling and cracking.	
29668-22-4	Bottom unetched	No evidence of blistering, delamination, wrinkling and cracking.	
29668-22-5		No evidence of blistering, delamination, wrinkling and cracking.	
29668-22-6		No evidence of blistering, delamination, wrinkling and cracking.	
Requirement		No evidence of blistering, delamination, wrinkling and cracking.	

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Electric Strength

REFERENCE

IPC-4101E 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 25 Electric Strength

Sample Designation	CCL	Sample Identification	85H0100CTTXWPRG
Test Date	2021-04-27~2021-04-29	Ambient	24 ℃, 60% RH
Sample No.	Average Thickness (mm)	Voltage (kV)	Electric Strength (kV/mm)
29668-8-1	0.267	12.5	46.82
29668-8-2	0.264	12.8	48.48
29668-8-3	0.266	12.6	47.37
Average			48
Requirement			⩾30

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Horizontal Burning Test

REFERENCE

IPC-4101E Specification for Base Materials for Rigid and Multilayer Printed Boards
UL94, Section 8 Horizontal Burning Test; HB

RESULTS

Table 26 Horizontal Burning Test Thin

Sample Designation	CCL		Sample Identification	85H0100CTTXWPRG		
Test Date	2021-04-27~2021-05-06		Ambient	23 ℃, 51% RH		
Sample No.	Sample Thk	Flame time Te	Burning time Tb	Combustion length L	Burning rate v	Note
	(mm)	(s)	(s)	(mm)	(mm/min)	
29668-7-21	0.264	30	0	0	/	1
29668-7-22	0.263	30	0	0	/	1
29668-7-23	0.265	30	0	0	/	1
Avg:	0.264	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 27 Horizontal Burning Test Thick

Sample Designation	CCL		Sample Identification	85H0590CTTXWPRG		
Test Date	2021-04-27~2021-05-06		Ambient	23 ℃, 51% RH		
Sample No.	Sample Thk	Flame time Te	Burning time Tb	Combustion length L	Burning rate v	Note
	(mm)	(s)	(s)	(mm)	(mm/min)	
29668-20-21	1.513	30	0	0	/	1
29668-20-22	1.512	30	0	0	/	1
29668-20-23	1.514	30	0	0	/	1
Avg:	1.513	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.

Glass Transition Temperature and Cure Factor by DSC

REFERENCE

IPC-TM-650 Method 2.4.25D Glass Transition Temperature and Cure Factor by DSC
IPC-4101E Specification for Base Materials for Rigid and Multilayer Printed Boards

RESULTS

Table 28 Glass Transition Temperature And Cure Factor by DSC

Sample Designation	/	Sample Identification	/
Test Date	/	Ambient	/
Sample No.	/		
Element	Measurement (℃)		Requirement
Tg1	No Requirement for IPC-4101E/43		
Tg2			
Cure Factor △Tg			

Decomposition Temperature (T_d)

REFERENCE

IPC-TM-650 method 2.4.24.6 Decomposition Temperature (Td) of Laminate Material Using TGA
IPC-4101E Specification for Base Materials for Rigid and Multilayer Printed Boards

RESULTS

Table 29 Decomposition Temperature Test

Sample Designation:	/	Sample Identification	/
Test Date:	/	Ambient:	/
Sample No.	Decomposition temperature (℃)		
	mass loss at 2%	mass loss at 5%	
/	No Requirement for IPC-4101E/43		
Requirement			

Glass Transition Temperature and Z-CTE (TMA)

REFERENCE

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

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

RESULTS

Table 30 Glass Transition Temperature and Z-CTE (TMA)

Sample Designation	CCL		Sample Identification	85H0590CTTXWPRG
Test Date	2021-04-25~2021-04-26		Ambient	24 ℃, 49% RH
Sample No.	Z-CTE (ppm/℃)		PTE（%）	Tg(℃)
	(100~150)℃	(290~340)℃	(50~260)℃	
29668-23-7	38.70	152.5	1.0	256.28
29668-23-8	38.91	155.1	1.0	256.42
Requirement	≤40	≤175	≤1.0	≥250

Time to Delamination

REFERENCE

IPC-TM-650 Method 2.4.24.1 Time to Delamination (TMA Method)
IPC-4101E Specification for Base Materials for Rigid and Multilayer Printed Boards
Customer Technical Requirement

RESULTS

Table 31 Time to Delamination

Sample Designation	CCL	Sample Identification	85H0590CTTXWPRG	
Test Date	2021-04-25~2021-04-27	Ambient	24 ℃,(49~51)% RH	
Sample No.	Test Item	Time of Reversible Event (min)	Time of Delaminate (min)	Requirement
29668-23-9	T260	/	＞60	≥60
29668-23-10		/	＞60	
29668-23-11	T288	/	＞15	≥15
29668-23-12		/	＞15	
29668-23-13	T300	/	＞5	≥5
29668-23-14		/	＞5	

Dimensional Stability

REFERENCES

IPC-TM-650 Method 2.4.39A Dimensional Stability, Glass Reinforced Thin Laminates
IPC-4101E Specification for Base Materials for Rigid and Multilayer Printed Boards

RESULTS

Table 32 Dimensional Stability Thin

Sample Designation	CCL		Sample Identification		85H0100CTTXWPRG			
Test Date	2021-04-22~2021-04-30		Ambient		（22~23）℃, (48~49)% RH			
Sample No.	After Bake Process (ppm)				After Thermal Stress Process (ppm)			
	MD		TD		MD		TD	
29668-1	-56	-93	-149	-130	77	109	-8	28
29668-2	-105	-141	-114	-158	85	36	8	-47
29668-3	-173	-121	-110	-83	28	4	-47	32
Requirement	-300~300							

Table 33 Dimensional Stability Thick

Sample Designation	CCL		Sample Identification		85H0590CTTXWPRG			
Test Date	2021-04-22~2021-04-30		Ambient		（22~23）℃, (48~49)% RH			
Sample No.	After Bake Process (ppm)				After Thermal Stress Process (ppm)			
	MD		TD		MD		TD	
29668-13	48	-44	90	16	81	69	126	75
29668-14	-44	97	118	91	77	77	130	91
29668-15	109	36	43	99	173	60	86	87
Requirement	-300~300							

Solderability（Edge Dip Test）

REFERENCE

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

RESULTS

Table 34 Solderability（Edge Dip Test）

Sample Designation	CCL	Sample Identification	See the table below
Test Date	2021-04-29	Ambient	25 ℃, 47% RH
Sample No.	Sample Identification	Test result	
29668-9-11	85H0100CTTXWPRG (Thin)	Sample surface exhibits good wetting	
29668-9-12		Sample surface exhibits good wetting	
29668-9-13		Sample surface exhibits good wetting	
29668-22-11	85H0590CTTXWPRG (Thick)	Sample surface exhibits good wetting	
29668-22-12		Sample surface exhibits good wetting	
29668-22-13		Sample surface exhibits good wetting	

Chemical Resistance

REFERENCE

IPC-TM-650 Method 2.3.4.2 Chemical Resistance of Laminates, Prepreg, and Coated Foil Products, by Solvent Exposure
IPC-4101E Specification for Base Materials for Rigid and Multilayer Printed Boards

RESULTS

Table 35 Chemical Resistance Thin

Sample Designation	CCL			Sample Identification	85H0100CTTXWPRG	
Test Date	2021-05-06			Ambient	23 ℃, 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
29668-10-4	0.256	1127.5	1129.0	1.5	no any change	no any change
29668-10-5	0.259	1136.5	1138.0	1.5	no any change	no any change
29668-10-6	0.262	1179.4	1180.7	1.3	no any change	no any change
Average				1.4	/	

Table 36 Chemical Resistance Thick

Sample Designation	CCL			Sample Identification	85H0590CTTXWPRG	
Test Date	2021-05-06			Ambient	23 ℃, 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
29668-23-15	1.512	7494.9	7497.3	2.4	no any change	no any change
29668-23-16	1.512	7500.9	7503.4	2.5	no any change	no any change
29668-23-17	1.518	7486.2	7488.6	2.4	no any change	no any change
Average				2.4	/	

Metal Surface Cleanablility

REFERENCE

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

RESULTS

Table 37 Metal Surface Cleanablility Thin

Sample Designation	CCL	Sample Identification	85H0100CTTXWPRG
Test Date	2021-05-07	Ambient	26 ℃, 51% RH
Sanple Nunber	Test Result		
29668-11-1	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.		
29668-11-2	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.		
29668-11-3	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.		

Table 38 Metal Surface Cleanablility Thick

Sample Designation	CCL	Sample Identification	85H0590CTTXWPRG
Test Date	2021-05-07	Ambient	26 ℃, 51% RH
Sanple Nunber	Test Result		
29668-24-1	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.		
29668-24-2	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.		
29668-24-3	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.		

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Pressure Cooker Test

REFERENCE

IPC-4101E Specification for Base Materials for Rigid and Multilayer Printed Boards
IPC-TM 650 2.6.16 Pressure Vessel Method for Glass Epoxy Laminate Integrity

RESULTS

Table 39 Pressure Cooker Test

Sample Designation	CCL	Sample Identification	85H0590CTTXWPRG
Test Date	2021-04-30	Ambient	24 ℃, 49% RH
Sample No.	Test result		
29668-21-1	Grade 5: The sample have no measles, blisters, or surface erosion.		
29668-21-2	Grade 5: The sample have no measles, blisters, or surface erosion.		
29668-21-3	Grade 5: The sample have no measles, blisters, or surface erosion.		
29668-21-4	Grade 5: The sample have no measles, blisters, or surface erosion.		
29668-21-5	Grade 5: The sample have no measles, blisters, or surface erosion.		

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