

Appendix E

GLM Results for the 85/85 and Thermal Shock Test Environments

Table E.1 Significant Coefficients for the GLM Analyses by Test Time

Electrical Response: HCLV PTH	85/85				Thermal Shock	
	Pre-Test*	Delta 1	Delta 2	Post-Delta	100 Cycles	200 Cycles
Constant	6.963	0.026	-0.019	0.010	-0.003	0.009
Benzimidazole Immersion Ag Immersion Au/Pd						
Parylene Silicone Urethane	0.160					
Flux		-0.086				
Benzi*Parylene Imm Ag*Parylene Imm Au/Pd*Parylene				0.278		
Benzi*Silicone Imm Ag*Silicone Imm Au/Pd*Silicone			-0.205			-0.137
Benzi*Urethane Imm Ag* Urethane Imm Au/Pd* Urethane						
Benzi*Flux Imm Ag*Flux Imm Au/Pd*Flux						
Parylene*Flux Silicone*Flux Urethane*Flux						
Benzi*Parylene*Flux Imm Ag*Parylene*Flux Imm Au/Pd*Parylene*Flux				-0.320		
Benzi*Silicone*Flux Imm Ag*Silicone*Flux Imm Au/Pd*Silicone*Flux						
Benzi*Urethane*Flux Imm Ag*Urethane*Flux Imm Au/Pd*Urethane*Flux			-0.237		-0.213	
Model R ²	15.1%	3.2%	7.9%	5.0%	2.9%	2.5%
Standard Deviation	0.165	0.240	0.217	0.217	0.218	0.210

*The Pre-Test column contains estimated coefficients for the raw Pre-Test measurements. The remaining columns contain the estimated coefficients for the deltas defined in Section 4.3.

Table E.2 Significant Coefficients for the GLM Analyses by Test Time

Electrical Response: HCLV SMT	85/85				Thermal Shock	
	Pre-Test*	Delta 1	Delta 2	Post-Delta	100 Cycles	200 Cycles
Constant	7.242	-0.028	0.002	-0.031	-0.049	-0.040
Benzimidazole						
Immersion Ag						
Immersion Au/Pd	-0.217	0.075	0.026	0.218	0.193	0.139
Parylene						
Silicone						
Urethane				0.086	0.075	
Flux				-0.094		
Benzi*Parylene						
Imm Ag*Parylene						
Imm Au/Pd*Parylene	0.195			-0.205	-0.128	
Benzi*Silicone						
Imm Ag*Silicone						
Imm Au/Pd*Silicone	0.140			-0.168	-0.132	
Benzi*Urethane						
Imm Ag* Urethane						
Imm Au/Pd* Urethane	0.224			-0.222	-0.236	
Benzi*Flux	-0.138			0.293		0.080
Imm Ag*Flux				0.121		
Imm Au/Pd*Flux	0.088					-0.109
Parylene*Flux	-0.110			0.178		
Silicone*Flux						
Urethane*Flux		-0.085				
Benzi*Parylene*Flux	0.198			-0.330		
Imm Ag*Parylene*Flux	0.189			-0.326		
Imm Au/Pd*Parylene*Flux						
Benzi*Silicone*Flux	0.192			-0.272		
Imm Ag*Silicone*Flux						
Imm Au/Pd*Silicone*Flux						
Benzi*Urethane*Flux	0.144			-0.310		
Imm Ag*Urethane*Flux				-0.170		
Imm Au/Pd*Urethane*Flux						
Model R ²	25.9%	7.5%	0.6%	27.3%	13.1%	10.7%
Standard Deviation	0.106	0.152	0.143	0.130	0.136	0.140

*The Pre-Test column contains estimated coefficients for the raw Pre-Test measurements. The remaining columns contain the estimated coefficients for the deltas defined in Section 4.3.

Table E.3 Significant Coefficients for the GLM Analyses by Test Time

Electrical Response: HVLC PTH	85/85				Thermal Shock	
	Pre-Test	Delta 1	Delta 2	Post-Delta	100 Cycles	200 Cycles
Constant	5.047	5.016	5.011	5.010	5.000	4.999
Benzimidazole Immersion Ag Immersion Au/Pd						
Parylene		0.027	0.014			
Silicone		0.014	0.011		0.004	
Urethane	-0.029			-0.033		
Flux		0.019	0.013			
Benzi*Parylene Imm Ag*Parylene Imm Au/Pd*Parylene				-0.035		
Benzi*Silicone Imm Ag*Silicone Imm Au/Pd*Silicone						
Benzi*Urethane Imm Ag* Urethane Imm Au/Pd* Urethane				0.031 0.038 0.030		
Benzi*Flux Imm Ag*Flux Imm Au/Pd*Flux						
Parylene*Flux Silicone*Flux Urethane*Flux			-0.064			
		-0.025	-0.020			
Benzi*Parylene*Flux Imm Ag*Parylene*Flux Imm Au/Pd*Parylene*Flux			0.036 0.030	0.028		
		0.091				
Benzi*Silicone*Flux Imm Ag*Silicone*Flux Imm Au/Pd*Silicone*Flux				-0.038		0.008
Benzi*Urethane*Flux Imm Ag*Urethane*Flux Imm Au/Pd*Urethane*Flux						
Model R ²	20.1%	52.0%	31.0%	26.6%	0.6%	0.5%
Standard Deviation	0.025	0.026	0.022	0.020	0.022	0.019

Table E.4 Significant Coefficients for the GLM Analyses by Test Time

Electrical Response: HVLC SMT	85/85				Thermal Shock	
	Pre-Test	Delta 1	Delta 2	Post-Delta	100 Cycles	200 Cycles
Constant	4.950	4.949	4.949	4.966	4.952	4.952
Benzimidazole		0.157				
Immersion Ag						
Immersion Au/Pd				0.106		
Parylene				0.040		
Silicone						
Urethane	0.051	0.059	0.047		0.046	0.048
Flux						
Benzi*Parylene		-0.156				
Imm Ag*Parylene				-0.045		
Imm Au/Pd*Parylene				-0.139		
Benzi*Silicone		-0.152				
Imm Ag*Silicone						
Imm Au/Pd*Silicone				-0.117		
Benzi*Urethane		-0.167				
Imm Ag* Urethane	0.034		0.033		0.033	0.031
Imm Au/Pd* Urethane				-0.136		
Benzi*Flux		-0.153				
Imm Ag*Flux						
Imm Au/Pd*Flux				-0.093		
Parylene*Flux		0.148		-0.032		
Silicone*Flux						
Urethane*Flux						
Benzi*Parylene*Flux						
Imm Ag*Parylene*Flux		-0.151				
Imm Au/Pd*Parylene*Flux				0.103		
Benzi*Silicone*Flux		0.155		0.093		
Imm Ag*Silicone*Flux						
Imm Au/Pd*Silicone*Flux				0.094		
Benzi*Urethane*Flux	0.034	0.186	0.033		0.033	0.029
Imm Ag*Urethane*Flux						
Imm Au/Pd*Urethane*Flux				0.115		
Model R ²	61.9%	21.1%	58.7%	40.8%	58.7%	58.5%
Standard Deviation	0.023	0.094	0.023	0.036	0.023	0.023

Table E.5 Significant Coefficients for the GLM Analyses by Test Time

Electrical Response: HSD PTH	85/85				Thermal Shock	
	Pre-Test*	Delta 1	Delta 2	Post-Delta	100 Cycles	200 Cycles
Constant	13.10	1.24	1.27	0.53	1.17	0.34
Benzimidazole Immersion Ag Immersion Au/Pd						
Parylene Silicone Urethane	0.08 3.88	0.72		1.35	0.87	0.76
Flux						
Benzi*Parylene Imm Ag*Parylene Imm Au/Pd*Parylene			-0.49			
Benzi*Silicone Imm Ag*Silicone Imm Au/Pd*Silicone						
Benzi*Urethane Imm Ag* Urethane Imm Au/Pd* Urethane						
Benzi*Flux Imm Ag*Flux Imm Au/Pd*Flux				-0.88		-0.67
Parylene*Flux Silicone*Flux Urethane*Flux						
Benzi*Parylene*Flux Imm Ag*Parylene*Flux Imm Au/Pd*Parylene*Flux						
Benzi*Silicone*Flux Imm Ag*Silicone*Flux Imm Au/Pd*Silicone*Flux		3.31				
Benzi*Urethane*Flux Imm Ag*Urethane*Flux Imm Au/Pd*Urethane*Flux					-1.92	
Model R ²	99.1%	13.6%	1.1%	14.5%	10.9%	11.2%
Standard Deviation	0.16	1.60	1.14	1.58	1.17	1.11

*The Pre-Test column contains estimated coefficients for the raw Pre-Test measurements. The remaining columns contain the estimated coefficients for the deltas defined in Section 4.3.

Table E.6 Significant Coefficients for the GLM Analyses by Test Time

Electrical Response: HSD SMT	85/85				Thermal Shock	
	Pre-Test	Delta 1	Delta 2	Post-Delta	100 Cycles	200 Cycles
Constant	5.04	3.60	3.64	2.22	4.77	2.20
Benzimidazole			-1.20			
Immersion Ag						
Immersion Au/Pd					-1.36	
Parylene			1.41			
Silicone						
Urethane	4.17					
Flux						
Benzi*Parylene						
Imm Ag*Parylene						
Imm Au/Pd*Parylene						
Benzi*Silicone			2.68			
Imm Ag*Silicone						
Imm Au/Pd*Silicone						
Benzi*Urethane						
Imm Ag* Urethane						
Imm Au/Pd* Urethane						
Benzi*Flux		-1.83			-2.85	-1.35
Imm Ag*Flux						
Imm Au/Pd*Flux				0.92		
Parylene*Flux						
Silicone*Flux						
Urethane*Flux						
Benzi*Parylene*Flux						
Imm Ag*Parylene*Flux	-0.21					
Imm Au/Pd*Parylene*Flux						
Benzi*Silicone*Flux		3.60			4.20	
Imm Ag*Silicone*Flux						
Imm Au/Pd*Silicone*Flux						
Benzi*Urethane*Flux						
Imm Ag*Urethane*Flux	-0.18					
Imm Au/Pd*Urethane*Flux						
Model R ²	99.4%	5.1%	9.3%	0.8%	12.6%	3.4%
Standard Deviation	0.14	2.72	2.54	3.48	2.59	2.34

*The Pre-Test column contains estimated coefficients for the raw Pre-Test measurements. The remaining columns contain the estimated coefficients for the deltas defined in Section 4.3.

Table E.7 Significant Coefficients for the GLM Analyses by Test Time

Electrical Response: HF PTH 50 MHz	85/85				Thermal Shock	
	Pre-Test*	Delta 1	Delta 2	Post-Delta	100 Cycles	200 Cycles
Constant	-0.238	0.009	-0.007	0.002	-0.004	0.023
Benzimidazole			0.019	0.017		
Immersion Ag	0.038		0.044	0.034	0.020	0.024
Immersion Au/Pd			0.028			
Parylene						
Silicone				-0.018		-0.012
Urethane	-0.050	-0.032				
Flux						
Benzi*Parylene						0.019
Imm Ag*Parylene						
Imm Au/Pd*Parylene						
Benzi*Silicone						
Imm Ag*Silicone				0.033		0.032
Imm Au/Pd*Silicone				0.029		
Benzi*Urethane				-0.027		
Imm Ag* Urethane			-0.0307	-0.028		
Imm Au/Pd* Urethane		0.043		0.038	0.043	0.041
Benzi*Flux						
Imm Ag*Flux						
Imm Au/Pd*Flux						
Parylene*Flux						-0.022
Silicone*Flux						
Urethane*Flux						
Benzi*Parylene*Flux		-0.172				
Imm Ag*Parylene*Flux						
Imm Au/Pd*Parylene*Flux						0.033
Benzi*Silicone*Flux						
Imm Ag*Silicone*Flux				-0.036		-0.037
Imm Au/Pd*Silicone*Flux						
Benzi*Urethane*Flux				0.047	0.038	0.032
Imm Ag*Urethane*Flux						
Imm Au/Pd*Urethane*Flux						
Model R ²	10.9%	26.3%	27.9%	29.1%	16.7%	32.4%
Standard Deviation	0.079	0.054	0.024	0.0286	0.030	0.026

*The Pre-Test column contains estimated coefficients for the raw Pre-Test measurements. The remaining columns contain the estimated coefficients for the deltas defined in Section 4.3.

Table E.8 Significant Coefficients for the GLM Analyses by Test Time

Electrical Response: HF PTH f(-3dB)	85/85				Thermal Shock	
	Pre-Test*	Delta 1	Delta 2	Post-Delta	100 Cycles	200 Cycles
Constant	251.6	-2.5	-3.2	-0.2	-1.4	-1.4
Benzimidazole	-4.4	-3.7			-6.8	-4.8
Immersion Ag			4.2			
Immersion Au/Pd	-3.7			-3.10	-3.0	-2.6
Parylene						
Silicone	-4.1	-5.6	-4.6	-3.1	-6.3	-6.1
Urethane						
Flux						
Benzi*Parylene	6.3	5.4			8.5	6.8
Imm Ag*Parylene			-5.6		-7.9	
Imm Au/Pd*Parylene			-4.4			
Benzi*Silicone	8.1	9.1	4.4		11.1	9.4
Imm Ag*Silicone	6.1	4.8		4.2	4.6	4.9
Imm Au/Pd*Silicone						
Benzi*Urethane			-5.0	-6.5		
Imm Ag* Urethane						
Imm Au/Pd* Urethane						
Benzi*Flux						
Imm Ag*Flux						
Imm Au/Pd*Flux						
Parylene*Flux		-4.6			-3.9	-3.3
Silicone*Flux						
Urethane*Flux						
Benzi*Parylene*Flux						
Imm Ag*Parylene*Flux					8.3	
Imm Au/Pd*Parylene*Flux						
Benzi*Silicone*Flux						
Imm Ag*Silicone*Flux						
Imm Au/Pd*Silicone*Flux						
Benzi*Urethane*Flux	6.7	7.0	9.7	10.2	9.8	7.9
Imm Ag*Urethane*Flux						
Imm Au/Pd*Urethane*Flux						
Model R ²	20.8%	15.6%	23.1%	17.0%	27.5%	22.5%
Standard Deviation	5.5	5.7	5.2	5.2	5.4	5.4

*The Pre-Test column contains estimated coefficients for the raw Pre-Test measurements. The remaining columns contain the estimated coefficients for the deltas defined in Section 4.3.

Table E.9 Significant Coefficients for the GLM Analyses by Test Time

Electrical Response: HF PTH f(-40dB)	85/85				Thermal Shock	
	Pre-Test*	Delta 1	Delta 2	Post-Delta	100 Cycles	200 Cycles
Constant	442.9	-2.0	-1.6	-2.8	-1.5	-1.6
Benzimidazole						
Immersion Ag						
Immersion Au/Pd	-4.4	-3.8	-4.0	-4.2	-4.4	-3.9
Parylene						
Silicone			-2.7	-3.5	-2.8	-2.9
Urethane						
Flux						
Benzi*Parylene						
Imm Ag*Parylene						
Imm Au/Pd*Parylene						
Benzi*Silicone						
Imm Ag*Silicone			5.5	5.8	6.4	5.6
Imm Au/Pd*Silicone						
Benzi*Urethane	-13.6	-12.7	-13.2	-14.1	-13.4	-8.6
Imm Ag* Urethane						
Imm Au/Pd* Urethane						
Benzi*Flux				-5.5		
Imm Ag*Flux						
Imm Au/Pd*Flux						
Parylene*Flux	-5.3	-4.2	-4.1	-5.9	-4.0	-5.7
Silicone*Flux						
Urethane*Flux						
Benzi*Parylene*Flux	6.5			11.2		6.3
Imm Ag*Parylene*Flux						
Imm Au/Pd*Parylene*Flux						
Benzi*Silicone*Flux				8.2		
Imm Ag*Silicone*Flux						
Imm Au/Pd*Silicone*Flux						
Benzi*Urethane*Flux	15.6	15.1	15.2	20.8	15.2	10.8
Imm Ag*Urethane*Flux						
Imm Au/Pd*Urethane*Flux						
Model R ²	23.8%	19.2%	24.0%	29.4%	25.8%	23.4%
Standard Deviation	6.1	6.2	6.0	5.9	6.1	5.8

*The Pre-Test column contains estimated coefficients for the raw Pre-Test measurements. The remaining columns contain the estimated coefficients for the deltas defined in Section 4.3.

Table E.10 Significant Coefficients for the GLM Analyses by Test Time

Electrical Response: HF SMT 50 MHz	85/85				Thermal Shock	
	Pre-Test*	Delta 1	Delta 2	Post-Delta	100 Cycles	200 Cycles
Constant	-0.219	0.000	0.008	-0.003	0.002	0.017
Benzimidazole						
Immersion Ag		0.022	0.016	0.013	0.011	0.021
Immersion Au/Pd		0.028	0.022	0.018	0.062	0.029
Parylene						-0.011
Silicone			-0.009		-0.013	-0.009
Urethane	-0.045					
Flux						
Benzi*Parylene						0.030
Imm Ag*Parylene						
Imm Au/Pd*Parylene			-0.023		-0.069	
Benzi*Silicone						0.017
Imm Ag*Silicone						
Imm Au/Pd*Silicone					-0.039	
Benzi*Urethane						
Imm Ag* Urethane			-0.022			-0.016
Imm Au/Pd* Urethane						
Benzi*Flux						0.024
Imm Ag*Flux						
Imm Au/Pd*Flux					-0.047	
Parylene*Flux						
Silicone*Flux						
Urethane*Flux		-0.031				
Benzi*Parylene*Flux						-0.045
Imm Ag*Parylene*Flux						
Imm Au/Pd*Parylene*Flux					0.067	
Benzi*Silicone*Flux						-0.039
Imm Ag*Silicone*Flux						
Imm Au/Pd*Silicone*Flux					0.052	
Benzi*Urethane*Flux		0.052				
Imm Ag*Urethane*Flux						
Imm Au/Pd*Urethane*Flux						
Model R ²	5.9%	18.3%	20.3%	10.8%	28.3%	38.0%
Standard Deviation	0.078	0.032	0.020	0.023	0.027	0.017

*The Pre-Test column contains estimated coefficients for the raw Pre-Test measurements. The remaining columns contain the estimated coefficients for the deltas defined in Section 4.3.

Table E.11 Significant Coefficients for the GLM Analyses by Test Time

Electrical Response: HF SMT f(-3dB)	85/85				Thermal Shock	
	Pre-Test*	Delta 1	Delta 2	Post-Delta	100 Cycles	200 Cycles
Constant	278.0	-0.3	0.4	0.6	-0.1	0.6
Benzimidazole						
Immersion Ag						
Immersion Au/Pd	6.2				6.0	
Parylene			-0.7			-0.6
Silicone		-0.97	-1.6	-1.0	-1.3	-1.7
Urethane						
Flux						
Benzi*Parylene						
Imm Ag*Parylene						
Imm Au/Pd*Parylene	-6.5				-6.9	
Benzi*Silicone						
Imm Ag*Silicone						
Imm Au/Pd*Silicone	-7.6				-6.1	
Benzi*Urethane			-1.0			-1.0
Imm Ag* Urethane						
Imm Au/Pd* Urethane	-8.6	-1.8	-2.2	-0.9	-7.4	-1.7
Benzi*Flux						
Imm Ag*Flux						
Imm Au/Pd*Flux	-5.6				-6.4	
Parylene*Flux						
Silicone*Flux						
Urethane*Flux						
Benzi*Parylene*Flux						
Imm Ag*Parylene*Flux						
Imm Au/Pd*Parylene*Flux	5.8				6.5	
Benzi*Silicone*Flux						
Imm Ag*Silicone*Flux						
Imm Au/Pd*Silicone*Flux	9.6				11.3	
Benzi*Urethane*Flux						
Imm Ag*Urethane*Flux						
Imm Au/Pd*Urethane*Flux	6.0				6.8	
Model R ²	19.3%	16.5%	25.4%	14.1%	21.5%	21.1%
Standard Deviation	2.6	1.3	1.3	1.2	2.6	1.4

*The Pre-Test column contains estimated coefficients for the raw Pre-Test measurements. The remaining columns contain the estimated coefficients for the deltas defined in Section 4.3.

Table E.12 Significant Coefficients for the GLM Analyses by Test Time

Electrical Response: HF SMT f(-40dB)	85/85				Thermal Shock	
	Pre-Test*	Delta 1	Delta 2	Post-Delta	100 Cycles	200 Cycles
Constant	662.7	-4.4	-1.9	-4.8	-5.8	-1.7
Benzimidazole			-6.6			
Immersion Ag	-4.7	-6.7	-9.4	-9.1	-5.6	-8.6
Immersion Au/Pd		-9.7	-9.2			-12.1
Parylene						
Silicone				7.8		
Urethane						
Flux				6.7		
Benzi*Parylene						-8.5
Imm Ag*Parylene				11.0		
Imm Au/Pd*Parylene						
Benzi*Silicone				-10.2		-6.8
Imm Ag*Silicone						
Imm Au/Pd*Silicone	-9.3			-15.2	-8.7	
Benzi*Urethane	-7.0					-11.1
Imm Ag* Urethane		12.7	10.0	12.4	8.6	10.9
Imm Au/Pd* Urethane	-11.8		-9.4	-12.4	-8.6	
Benzi*Flux				-6.8		-10.1
Imm Ag*Flux						
Imm Au/Pd*Flux	-7.1		-6.3	-14.3	-7.7	
Parylene*Flux						
Silicone*Flux				-13.0		-4.6
Urethane*Flux		-11.3	-4.3	-6.1		-5.6
Benzi*Parylene*Flux						12.7
Imm Ag*Parylene*Flux				-17.9		
Imm Au/Pd*Parylene*Flux						
Benzi*Silicone*Flux				19.1		18.2
Imm Ag*Silicone*Flux						
Imm Au/Pd*Silicone*Flux	14.5			15.5	14.1	
Benzi*Urethane*Flux						19.2
Imm Ag*Urethane*Flux						
Imm Au/Pd*Urethane*Flux			12.2	14.7		
Model R ²	20.1%	32.4%	40.7%	40.0%	18.4%	38.6%
Standard Deviation	8.8	8.1	6.8	7.1	9.0	6.9

*The Pre-Test column contains estimated coefficients for the raw Pre-Test measurements. The remaining columns contain the estimated coefficients for the deltas defined in Section 4.3.

Table E.13 Significant Coefficients for the GLM Analyses by Test Time

Electrical Response: HF TLC 50 MHz Forward	85/85				Thermal Shock	
	Pre-Test*	Delta 1	Delta 2	Post-Delta	100 Cycles	200 Cycles
Constant	-39.01	-0.17	-0.18	-0.28	-0.33	-0.30
Benzimidazole	2.34					0.10
Immersion Ag	2.39					
Immersion Au/Pd						
Parylene	-1.84		-0.21	-0.50		
Silicone	-5.92					-0.25
Urethane	-3.08		0.26	0.20	0.60	0.26
Flux						
Benzi*Parylene		1.09		0.38		
Imm Ag*Parylene				0.41		
Imm Au/Pd*Parylene				0.30		
Benzi*Silicone				0.90		
Imm Ag*Silicone	1.74					0.31
Imm Au/Pd*Silicone	4.37					0.29
Benzi*Urethane						
Imm Ag* Urethane		-0.99			-1.13	
Imm Au/Pd* Urethane	3.74					
Benzi*Flux						
Imm Ag*Flux						
Imm Au/Pd*Flux	1.80					
Parylene*Flux						
Silicone*Flux						
Urethane*Flux						
Benzi*Parylene*Flux		-1.93				
Imm Ag*Parylene*Flux						
Imm Au/Pd*Parylene*Flux						
Benzi*Silicone*Flux				-0.87		
Imm Ag*Silicone*Flux						
Imm Au/Pd*Silicone*Flux	-4.49					
Benzi*Urethane*Flux					-1.16	
Imm Ag*Urethane*Flux	-2.12	1.14			1.14	
Imm Au/Pd*Urethane*Flux	-1.97	1.45				
Model R ²	76.1%	21.6%	25.6%	36.2%	17.2%	24.5%
Standard Deviation	1.30	0.77	0.28	0.29	0.62	0.26

*The Pre-Test column contains estimated coefficients for the raw Pre-Test measurements. The remaining columns contain the estimated coefficients for the deltas defined in Section 4.3.

Table E.14 Significant Coefficients for the GLM Analyses by Test Time

Electrical Response: HF TLC 500 MHz Forward	85/85				Thermal Shock	
	Pre-Test*	Delta 1	Delta 2	Post-Delta	100 Cycles	200 Cycles
Constant	-17.83	0.28	0.13	0.32	-0.55	-0.62
Benzimidazole	-0.62					
Immersion Ag	-0.73			-0.18		
Immersion Au/Pd	-0.53					
Parylene	-1.10		0.21	0.18		
Silicone	-2.53		0.22		-0.17	-0.22
Urethane	-1.92	0.71	0.51		0.25	
Flux						
Benzi*Parylene						
Imm Ag*Parylene						
Imm Au/Pd*Parylene						
Benzi*Silicone				0.72		
Imm Ag*Silicone				0.41		
Imm Au/Pd*Silicone						
Benzi*Urethane						0.56
Imm Ag* Urethane	0.67	-0.62			-0.26	0.65
Imm Au/Pd* Urethane	-0.73			0.78		
Benzi*Flux						
Imm Ag*Flux						
Imm Au/Pd*Flux						
Parylene*Flux						
Silicone*Flux						
Urethane*Flux			-0.25	0.23		
Benzi*Parylene*Flux						
Imm Ag*Parylene*Flux						
Imm Au/Pd*Parylene*Flux						
Benzi*Silicone*Flux				-0.59		
Imm Ag*Silicone*Flux						
Imm Au/Pd*Silicone*Flux						
Benzi*Urethane*Flux						
Imm Ag*Urethane*Flux					0.40	
Imm Au/Pd*Urethane*Flux	0.50			-1.05	-0.27	
Model R ²	87.4%	14.3%	15.9%	22.1%	29.7%	20.6%
Standard Deviation	0.39	0.684	0.3%	0.40	0.23	0.48

*The Pre-Test column contains estimated coefficients for the raw Pre-Test measurements. The remaining columns contain the estimated coefficients for the deltas defined in Section 4.3.

Table E.15 Significant Coefficients for the GLM Analyses by Test Time

Electrical Response: HF TLC 1 GHz Forward	85/85				Thermal Shock	
	Pre-Test*	Delta 1	Delta 2	Post-Delta	100 Cycles	200 Cycles
Constant	-12.51	0.20	0.18	0.16	-0.37	-0.41
Benzimidazole Immersion Ag Immersion Au/Pd						
Parylene Silicone Urethane	-1.26 -2.53 -1.54	0.50				
Flux						
Benzi*Parylene Imm Ag*Parylene Imm Au/Pd*Parylene						
Benzi*Silicone Imm Ag*Silicone Imm Au/Pd*Silicone						
Benzi*Urethane Imm Ag* Urethane Imm Au/Pd* Urethane		-0.77				0.98 1.04
Benzi*Flux Imm Ag*Flux Imm Au/Pd*Flux						
Parylene*Flux Silicone*Flux Urethane*Flux	0.89	-0.43				
Benzi*Parylene*Flux Imm Ag*Parylene*Flux Imm Au/Pd*Parylene*Flux	-1.46 -0.99 -0.69		0.56	0.83	0.67	
Benzi*Silicone*Flux Imm Ag*Silicone*Flux Imm Au/Pd*Silicone*Flux						
Benzi*Urethane*Flux Imm Ag*Urethane*Flux Imm Au/Pd*Urethane*Flux		0.93				
Model R ²	76.1%	7.9%	3.8%	5.5%	3.7%	12.0%
Standard Deviation	0.54	0.56	0.49	0.60	0.60	0.92

*The Pre-Test column contains estimated coefficients for the raw Pre-Test measurements. The remaining columns contain the estimated coefficients for the deltas defined in Section 4.3.

Table E.16 Significant Coefficients for the GLM Analyses by Test Time

Electrical Response: HF TLC Rev Null Freq	85/85				Thermal Shock	
	Pre-Test*	Delta 1	Delta 2	Post-Delta	100 Cycles	200 Cycles
Constant	652.2	-6.1	-6.2	-9.5	5.7	6.3
Benzimidazole	-7.9					
Immersion Ag	-7.3				0.8	
Immersion Au/Pd					0.7	
Parylene	-5.1	-2.1	-1.8			
Silicone	-18.6		0.8	2.3	1.4	1.5
Urethane	-18.5	-1.0	2.1	2.0	3.4	2.1
Flux						
Benzi*Parylene						
Imm Ag*Parylene					-1.0	
Imm Au/Pd*Parylene					-1.2	
Benzi*Silicone	3.7			2.4		
Imm Ag*Silicone	5.0					
Imm Au/Pd*Silicone						
Benzi*Urethane	12.8		-1.3		-1.5	
Imm Ag* Urethane	8.7	1.6			-1.4	
Imm Au/Pd* Urethane						
Benzi*Flux					1.1	
Imm Ag*Flux						
Imm Au/Pd*Flux						1.4
Parylene*Flux						
Silicone*Flux						
Urethane*Flux						
Benzi*Parylene*Flux					-1.8	
Imm Ag*Parylene*Flux						
Imm Au/Pd*Parylene*Flux						-2.4
Benzi*Silicone*Flux						
Imm Ag*Silicone*Flux						
Imm Au/Pd*Silicone*Flux						-1.6
Benzi*Urethane*Flux						
Imm Ag*Urethane*Flux						
Imm Au/Pd*Urethane*Flux						
Model R ²	81.7%	24.9%	52.6%	17.5%	62.6%	40.2%
Standard Deviation	3.5	1.6	1.3	2.9	1.1	1.3

*The Pre-Test column contains estimated coefficients for the raw Pre-Test measurements. The remaining columns contain the estimated coefficients for the deltas defined in Section 4.3.

Table E.17 Significant Coefficients for the GLM Analyses by Test Time

Electrical Response: HF TLC Rev Null Resp	85/85				Thermal Shock	
	Pre-Test*	Delta 1	Delta 2	Post-Delta	100 Cycles	200 Cycles
Constant	-45.39	1.51	1.29	1.01	-0.95	-1.46
Benzimidazole Immersion Ag Immersion Au/Pd						
Parylene Silicone Urethane	-5.90		1.01	0.81		
Flux						
Benzi*Parylene Imm Ag*Parylene Imm Au/Pd*Parylene	-4.30					
Benzi*Silicone Imm Ag*Silicone Imm Au/Pd*Silicone		1.50			-3.20	
Benzi*Urethane Imm Ag* Urethane Imm Au/Pd* Urethane	-6.80				6.60	13.00
Benzi*Flux Imm Ag*Flux Imm Au/Pd*Flux						
Parylene*Flux Silicone*Flux Urethane*Flux	5.80					
Benzi*Parylene*Flux Imm Ag*Parylene*Flux Imm Au/Pd*Parylene*Flux						
Benzi*Silicone*Flux Imm Ag*Silicone*Flux Imm Au/Pd*Silicone*Flux						
Benzi*Urethane*Flux Imm Ag*Urethane*Flux Imm Au/Pd*Urethane*Flux					-5.40	-8.90 3.90
Model R ²	17.7%	1.3%	3.1%	1.4%	10.8%	27.5%
Standard Deviation	5.51	3.24	2.44	2.97	4.2%	4.0%

*The Pre-Test column contains estimated coefficients for the raw Pre-Test measurements. The remaining columns contain the estimated coefficients for the deltas defined in Section 4.3.

Table E.18 Significant Coefficients for the GLM Analyses by Test Time

Electrical Response: 10-Mil Pads	85/85				Thermal Shock	
	Pre-Test	Delta 1	Delta 2	Post-Delta	100 Cycles	200 Cycles
Constant	11.06	12.29	12.95	12.35	14.03	13.76
Benzimidazole	1.08					
Immersion Ag	0.72					
Immersion Au/Pd			-0.69			
Parylene	3.11	0.63				
Silicone	0.63		-0.47		-1.50	-1.08
Urethane	1.61	-0.63	-0.27	-0.72	-1.26	-1.63
Flux	1.91	-0.58	-0.35	-1.06	-0.47	
Benzi*Parylene	-1.39					
Imm Ag*Parylene	-1.27	-0.45				
Imm Au/Pd*Parylene			0.76			
Benzi*Silicone	-0.98					
Imm Ag*Silicone	-0.77					
Imm Au/Pd*Silicone			0.67			
Benzi*Urethane	-1.08					
Imm Ag* Urethane	-0.75					
Imm Au/Pd* Urethane			0.78			
Benzi*Flux	-1.60	0.52		0.64		
Imm Ag*Flux		0.90		0.78		-0.46
Imm Au/Pd*Flux						-0.62
Parylene*Flux	-2.12	-1.35	-1.53	-1.24		-0.93
Silicone*Flux	-2.41	-0.52	-0.59			
Urethane*Flux	-2.11	0.50	0.36	1.16	0.54	0.79
Benzi*Parylene*Flux	1.68		0.70			1.02
Imm Ag*Parylene*Flux			1.11	-1.45	-1.09	
Imm Au/Pd*Parylene*Flux		-0.62				1.64
Benzi*Silicone*Flux	1.98		0.53		0.88	
Imm Ag*Silicone*Flux		-0.94		-0.99		
Imm Au/Pd*Silicone*Flux						
Benzi*Urethane*Flux	1.74			-0.62		
Imm Ag*Urethane*Flux		-0.80		-1.20		
Imm Au/Pd*Urethane*Flux						
Model R ²	80.7%	58.8%	69.1%	72.1%	49.6%	38.3%
Standard Deviation	0.51	0.51	0.38	0.49	0.68	0.85

Table E.19 Significant Coefficients for the GLM Analyses by Test Time

Electrical Response: PGA A	85/85				Thermal Shock	
	Pre-Test	Delta 1	Delta 2	Post-Delta	100 Cycles	200 Cycles
Experimental Variables						
Constant	10.95	11.74	11.96	11.82	13.31	13.22
Benzimidazole						-0.80
Immersion Ag						
Immersion Au/Pd						
Parylene	1.23			-0.75		
Silicone	0.62			-1.75	-0.41	
Urethane	0.67	-1.00	-0.491	-1.03	-1.71	-2.35
Flux	2.07			-1.40	-1.31	-1.06
Benzi*Parylene		-0.48				1.16
Imm Ag*Parylene						
Imm Au/Pd*Parylene						
Benzi*Silicone				1.26		0.83
Imm Ag*Silicone				1.64		
Imm Au/Pd*Silicone				1.81		
Benzi*Urethane						1.12
Imm Ag* Urethane			-0.26			
Imm Au/Pd* Urethane						
Benzi*Flux						
Imm Ag*Flux						
Imm Au/Pd*Flux		-0.62	-0.40			
Parylene*Flux	-2.28	-1.52	-1.19		1.42	1.23
Silicone*Flux	-2.74	-1.10	-1.027	1.57		
Urethane*Flux	-2.03			1.33	1.31	1.63
Benzi*Parylene*Flux	0.83	1.06	0.56			
Imm Ag*Parylene*Flux			0.40			
Imm Au/Pd*Parylene*Flux						
Benzi*Silicone*Flux	0.93	0.86	0.82			
Imm Ag*Silicone*Flux				-1.40		
Imm Au/Pd*Silicone*Flux				-1.87		
Benzi*Urethane*Flux						
Imm Ag*Urethane*Flux						
Imm Au/Pd*Urethane*Flux		0.83	0.50			
Model R ²	41.9%	61.7%	66.4%	43.7%	49.4%	50.5%
Standard Deviation	0.79	0.50	0.34	0.79	0.82	0.91

Table E.20 Significant Coefficients for the GLM Analyses by Test Time

Electrical Response: PGA B	85/85				Thermal Shock	
	Pre-Test	Delta 1	Delta 2	Post-Delta	100 Cycles	200 Cycles
Experimental Variables						
Constant	10.62	11.71	12.16	11.03	13.38	13.08
Benzimidazole			-0.266			
Immersion Ag				0.65		
Immersion Au/Pd				0.59		
Parylene	1.37	-0.53	-0.368	-1.03		0.32
Silicone	0.60		-0.457	-0.47	-1.10	-0.62
Urethane	0.79	-1.02	-0.691	-0.72	-1.95	-1.77
Flux	2.45					
Benzi*Parylene						
Imm Ag*Parylene						
Imm Au/Pd*Parylene						
Benzi*Silicone						
Imm Ag*Silicone						
Imm Au/Pd*Silicone						
Benzi*Urethane						
Imm Ag* Urethane			-0.36	-2.26		
Imm Au/Pd* Urethane						
Benzi*Flux				0.48		
Imm Ag*Flux						
Imm Au/Pd*Flux						
Parylene*Flux	-2.71		-0.47			
Silicone*Flux	-2.68	-0.77	-0.75		-1.14	-0.91
Urethane*Flux	-2.51					
Benzi*Parylene*Flux			0.45			
Imm Ag*Parylene*Flux			0.63			
Imm Au/Pd*Parylene*Flux		-1.26				
Benzi*Silicone*Flux			0.67		1.28	
Imm Ag*Silicone*Flux						
Imm Au/Pd*Silicone*Flux						
Benzi*Urethane*Flux						
Imm Ag*Urethane*Flux				1.69		
Imm Au/Pd*Urethane*Flux						
Model R ²	41.3%	37.3%	58.0%	32.4%	76.4%	70.9%
Standard Deviation	0.85	0.62	0.34	0.90	0.52	0.56

Table E.21 Significant Coefficients for the GLM Analyses by Test Time

Electrical Response: Gull Wing	85/85				Thermal Shock	
	Pre-Test	Delta 1	Delta 2	Post-Delta	100 Cycles	200 Cycles
Constant	11.67	11.83	12.12	11.81	13.10	13.12
Benzimidazole						
Immersion Ag	0.63		-1.55			
Immersion Au/Pd			-1.24	-0.72	-1.97	-0.80
Parylene	1.45			-0.74		
Silicone						
Urethane					-0.76	-1.29
Flux		-1.06		-2.08	-3.03	-2.07
Benzi*Parylene						
Imm Ag*Parylene	-0.76		1.91			
Imm Au/Pd*Parylene			1.13		2.17	
Benzi*Silicone						
Imm Ag*Silicone		0.61	1.53			
Imm Au/Pd*Silicone			1.12		1.41	
Benzi*Urethane						
Imm Ag* Urethane			1.56			
Imm Au/Pd* Urethane			1.61		2.33	
Benzi*Flux					0.76	
Imm Ag*Flux		-0.56			0.81	
Imm Au/Pd*Flux				2.41	4.04	1.33
Parylene*Flux			-0.57	1.63	2.70	2.27
Silicone*Flux		0.88		1.84	1.71	1.19
Urethane*Flux		1.03		1.81	2.31	2.15
Benzi*Parylene*Flux		0.85				
Imm Ag*Parylene*Flux		1.51				
Imm Au/Pd*Parylene*Flux				-1.80	-3.4	
Benzi*Silicone*Flux						
Imm Ag*Silicone*Flux						
Imm Au/Pd*Silicone*Flux				-1.79	-3.0	
Benzi*Urethane*Flux						
Imm Ag*Urethane*Flux	-1.64					
Imm Au/Pd*Urethane*Flux				-1.75	-3.9	
Model R ²	45.4%	28.6%	28.5%	32.8%	41.8%	30.3%
Standard Deviation	0.72	0.77	0.82	0.9%	1.04	1.20

Table E.22 Significant Coefficients for the GLM Analyses by Test Time

Electrical Response: Stranded Wire 1	85/85				Thermal Shock	
	Pre-Test*	Delta 1	Delta 2	Post-Delta	100 Cycles	200 Cycles
Constant	12.66	0.0024	0.0021	0.0008	0.0012	0.0012
Benzimidazole						
Immersion Ag						
Immersion Au/Pd				0.0015	0.0016	0.0009
Parylene						
Silicone						
Urethane		-0.0035	-0.0030	-0.0021		-0.0020
Flux						
Benzi*Parylene						
Imm Ag*Parylene						
Imm Au/Pd*Parylene					-0.0028	
Benzi*Silicone						
Imm Ag*Silicone						
Imm Au/Pd*Silicone						
Benzi*Urethane						
Imm Ag* Urethane	2.80					
Imm Au/Pd* Urethane	2.50				-0.0032	
Benzi*Flux						
Imm Ag*Flux						
Imm Au/Pd*Flux				-0.0018	-0.0021	
Parylene*Flux						
Silicone*Flux						
Urethane*Flux					-0.0022	
Benzi*Parylene*Flux						
Imm Ag*Parylene*Flux						
Imm Au/Pd*Parylene*Flux					0.0039	
Benzi*Silicone*Flux						
Imm Ag*Silicone*Flux						
Imm Au/Pd*Silicone*Flux						
Benzi*Urethane*Flux						
Imm Ag*Urethane*Flux						
Imm Au/Pd*Urethane*Flux					0.0035	
Model R ²	7.3%	17.8%	17.5%	13.8%	19.5%	19.6%
Standard Deviation	3.21	0.0033	0.0028	0.0026	0.0020	0.0020

*The Pre-Test column contains estimated coefficients for the raw Pre-Test measurements. The remaining columns contain the estimated coefficients for the deltas defined in Section 4.3.

Table E.23 Significant Coefficients for the GLM Analyses by Test Time

Electrical Response: Stranded Wire 2	85/85				Thermal Shock	
	Pre-Test*	Delta 1	Delta 2	Post-Delta	100 Cycles	200 Cycles
Constant	22.61	-0.0007	0.0003	-0.0009	-0.0007	-0.0007
Benzimidazole	1.64					
Immersion Ag	1.83					
Immersion Au/Pd	1.23					
Parylene						
Silicone						
Urethane	-2.82	0.0023	0.0012	0.0018	0.0014	0.0014
Flux						
Benzi*Parylene	1.66					
Imm Ag*Parylene						
Imm Au/Pd*Parylene						
Benzi*Silicone						
Imm Ag*Silicone						
Imm Au/Pd*Silicone					-0.0020	
Benzi*Urethane						
Imm Ag* Urethane	3.19					
Imm Au/Pd* Urethane	4.00			0.0033		
Benzi*Flux						
Imm Ag*Flux						
Imm Au/Pd*Flux						
Parylene*Flux						
Silicone*Flux						
Urethane*Flux						
Benzi*Parylene*Flux						
Imm Ag*Parylene*Flux						
Imm Au/Pd*Parylene*Flux						
Benzi*Silicone*Flux						
Imm Ag*Silicone*Flux						
Imm Au/Pd*Silicone*Flux						
Benzi*Urethane*Flux						
Imm Ag*Urethane*Flux						
Imm Au/Pd*Urethane*Flux	-3.80			-0.0042		
Model R ²	35.3%	8.0%	1.6%	12.0%	9.5%	6.1%
Standard Deviation	2.09	0.0034	0.0040	0.0030	0.0026	0.0024

*The Pre-Test column contains estimated coefficients for the raw Pre-Test measurements. The remaining columns contain the estimated coefficients for the deltas defined in Section 4.3.