APPENDIX A: SENSITIVITY STUDY RESULTS

Table 5 shows the ANOVA p-value for all physics parameters/thermocouple temperature pairs. Columns correspond to thermocouple responses, and rows correspond to material model parameters. The numerical entries are the p-values for a given parameter–response pair. Red entries identify parameters for which the p-value is <0.001, those marked in green have a p-value <0.01, and those in blue have a p-value <0.05. Thus, those in red are most likely to influence the variance in the thermocouple responses, followed by those in green and then those in blue. Those with no colour code have insignificant influence on the variance in the thermocouple responses.

Table 5a: *p*-values for global L_2 and L_∞ and L_2 and L_∞ for TCs 1 and 2.

	L_2	L_{inf}	TC1_L_2	TC1_L_{inf}	TC2_L_2	TC2_L_{inf}
18_8_ss_cp	0.000404	0.642399	0.454907	0.445016	0.54524	0.644345
18_8_ss_e	0.058408	0.987042	0.072508	0.961748	0.0617	0.420155
18_8_ss_k	0.154696	0.036568	0.989608	0.578926	0.6603	0.497507
AL_6061_T6_cp	< 2e-16	0.427063	< 2e-16	< 2e-16	< 2e-16	< 2e-16
AL_6061_T6_e	0.730961	0.180992	0.557246	0.541344	0.42543	0.581014
AL_6061_T6_k	5.36E-05	0.441099	< 2e-16	< 2e-16	6.13E-14	6.83E-14
AL_7075_T6_cp	< 2e-16	0.151986	<2e-16	<2e-16	<2e-16	<2e-16
AL_7075_T6_e	0.004193	0.617289	0.688439	0.363442	0.48476	0.647712
AL_7075_T6_k	4.84E-09	0.635069	0.525841	0.065707	0.0000295	0.059275
battery_cp	<2e-16	0.894434	<2e-16	<2e-16	<2e-16	<2e-16
battery_e	1.98E-06	0.717964	0.129313	0.006153	0.04885	0.006235
battery_k	1.82E-07	0.184464	0.004422	0.001372	0.00156	0.000825
battery_timing	<2e-16	0.082986	<2e-16	<2e-16	<2e-16	<2e-16
block_108	5.24E-08	0.000228	2.83E-13	1.38E-09	<2e-16	3.87E-11
block_109	6.09E-09	5.77E-10	1.02E-12	4.02E-10	<2e-16	4.96E-14
block_112	0.296301	0.452528	0.170561	0.073237	0.08176	0.080095
block_113	0.952616	0.566572	0.671499	0.772919	0.99577	0.865106
block_115	0.263884	0.077434	0.057711	0.26877	0.0468	0.185175
circuit_board_cp	4.86E-16	0.455038	0.0000165	0.0000132	4.02E-07	9.51E-08
circuit_board_e	0.560704	0.102249	0.205145	0.083687	0.15058	0.140512
circuit_board_kxy	0.040098	0.127029	0.016231	0.007494	0.00651	0.001297
circuit_board_kz	0.243183	0.801651	0.072868	0.144767	0.03693	0.116029
diode_18	0.107985	0.045313	0.535887	0.793059	0.74754	0.572943
ep_long	<2e-16	0.944156	<2e-16	<2e-16	<2e-16	<2e-16
ep_short	0.405256	0.8618	0.832909	0.283879	0.68323	0.0000345
filtered_connector_cp	0.405822	0.22078	0.364073	0.388425	0.31375	0.207786
filtered_connector_e	0.590375	0.105837	0.487313	0.661892	0.52543	0.580172

filtered_connector_k	0.001782	0.805536	0.019807	0.000197	0.00505	0.0000497
gap_pad_cp	0.787781	0.988152	0.262191	0.509639	0.29568	0.977002
gap_pad_e	0.670491	0.100359	0.247661	0.914846	0.30108	0.695787
gap_pad_k	0.756279	0.006836	0.035711	0.012146	0.09008	0.013822
glenair_connector_cp	0.689287	0.199272	0.076736	0.244792	0.09041	0.158463
glenair_connector_e	8.56E-06	0.949708	0.002574	0.002707	0.00786	0.002693
glenair_connector_k	0.015364	0.617245	0.908441	0.377402	0.86352	0.339139
h_inside	<2e-16	0.990258	<2e-16	<2e-16	<2e-16	<2e-16
h_outside	<2e-16	0.641528	<2e-16	<2e-16	<2e-16	<2e-16
mdm_connector_cp	0.921163	0.210461	0.881999	0.053855	0.9931	0.087859
mdm_connector_e	0.31987	0.152558	0.984999	0.910772	0.74113	0.804121
mdm_connector_k	3.48E-06	0.873313	0.002322	0.000163	0.00276	0.000189
parrafin_cp	<2e-16	0.004507	0.00000018	0.000000137	2.06E-10	2.61E-08
parrafin_e	0.042484	0.959832	0.484868	0.36572	0.26445	0.47945
parrafin_flh	0.350082	0.655611	0.090774	0.030298	0.12142	0.070498
parrafin_k	0.003408	0.424548	2.08E-11	1.38E-09	1.93E-11	3.17E-08
parrafin_tl	0.693978	0.611301	0.625014	0.178385	0.56131	0.150676
parrafin_ts	0.45038	0.03168	0.648983	0.670602	0.65883	0.222974
polycarbonate_cp	<2e-16	0.963015	<2e-16	<2e-16	<2e-16	<2e-16
polycarbonate_e	1.01E-06	0.445723	0.014669	0.00115	0.00298	0.000107
polycarbonate_k	1.19E-08	0.396752	0.000000563	0.003531	1.37E-07	0.000749
resistor_cp	2.16E-06	0.802993	0.015052	0.117514	0.00913	0.036233
resistor_e	0.100752	0.00406	0.716685	0.373521	0.93588	0.982758
resistor_k	0.004615	<2e-16	0.000699	0.007865	0.00152	0.002042
resistor2_cp	<2e-16	0.6994	<2e-16	<2e-16	<2e-16	<2e-16
resistor2_e	0.023749	0.040377	0.643454	0.509345	0.24647	0.11594
resistor2_k	0.155405	0.99216	0.024576	0.224602	0.03832	0.166352
silicone_rtv_cp	0.076978	0.97764	0.053707	0.116127	0.01998	0.05437
silicone_rtv_e	6.54E-05	0.485919	0.014452	0.106784	0.01713	0.09389
silicone_rtv_k	<2e-16	0.483703	<2e-16	<2e-16	<2e-16	<2e-16

Table 5b: p-values for L_2 and L_∞ for TCs 3, 4, and 5.

	TC3_L_2	TC3_L_{inf}	TC4_L_2	TC4_L_{inf}	TC5_L_2	TC5_L_{inf}
18_8_ss_cp	0.655109	0.252526	0.669933	0.979262	0.538387	0.874593
18_8_ss_e	0.49587	0.391224	0.217468	0.168145	0.079097	0.733283
18_8_ss_k	0.861503	0.832355	0.969808	0.690907	0.894023	0.294146
AL_6061_T6_cp	<2e-16	<2e-16	<2e-16	<2e-16	<2e-16	<2e-16
AL_6061_T6_e	0.818126	0.171471	0.514985	0.351567	0.426512	0.455737
AL_6061_T6_k	<2e-16	3.83E-10	0.00811	9.52E-09	1.05E-15	6.84E-08
AL_7075_T6_cp	<2e-16	<2e-16	<2e-16	<2e-16	<2e-16	<2e-16
AL_7075_T6_e	0.484335	0.188415	0.731411	0.624849	0.550624	0.039122
AL_7075_T6_k	<2e-16	<2e-16	1.69E-08	<2e-16	1.67E-14	3.4E-15
battery_cp	<2e-16	<2e-16	<2e-16	<2e-16	<2e-16	<2e-16
battery_e	0.001284	0.203953	0.012854	0.000514	0.145826	0.000668
battery_k	0.032868	0.07715	0.014778	0.015019	0.001753	0.002744
battery_timing	<2e-16	<2e-16	<2e-16	<2e-16	<2e-16	<2e-16
block_108	0.0000369	0.001409	1.82E-08	1.29E-08	<2e-16	<2e-16
block_109	0.0000367	0.1231	0.00000102	0.00000115	<2e-16	<2e-16
block_112	0.021729	0.272671	0.013217	0.102457	0.103919	0.318884
block_113	0.749018	0.739682	0.99729	0.461807	0.70829	0.875213
block_115	0.348886	0.391634	0.139489	0.806993	0.011174	0.96029
circuit_board_cp	0.00000702	0.666108	0.0000289	0.00000137	0.000000421	0.000000522
circuit_board_e	0.359156	0.280785	0.145705	0.178988	0.155008	0.177322
circuit_board_kxy	0.998117	0.285069	0.09245	0.156957	0.002386	0.378773
circuit_board_kz	0.079395	0.422513	0.089127	0.046216	0.02346	0.244131
diode_18	0.859296	0.867916	0.693359	0.943042	0.899091	0.012069
ep_long	<2e-16	<2e-16	<2e-16	<2e-16	<2e-16	<2e-16
ep_short	0.856997	0.075931	0.008235	<2e-16	0.948254	0.005632
filtered_connector_cp	0.657283	0.352311	0.519682	0.123857	0.39358	0.819203
filtered_connector_e	0.64908	0.954244	0.611583	0.50497	0.502338	0.527045

filtered_connector_k	0.559596	0.948166	0.150459	0.000993	0.007956	0.000134
gap_pad_cp	0.538759	0.216495	0.443555	0.656	0.21985	0.814608
gap_pad_e	0.82539	0.195118	0.315483	0.902995	0.292241	0.464086
gap_pad_k	0.002568	0.388901	0.019753	0.009107	0.172773	0.883017
glenair_connector_cp	0.88467	0.966311	0.277035	0.308007	0.050429	0.248326
glenair_connector_e	0.006995	0.02133	0.003819	0.000642	0.007018	0.008192
glenair_connector_k	0.021518	0.442412	0.835393	0.382837	0.892479	0.803439
h_inside	<2e-16	<2e-16	<2e-16	<2e-16	<2e-16	<2e-16
h_outside	<2e-16	6.01E-08	<2e-16	<2e-16	<2e-16	<2e-16
mdm_connector_cp	0.666413	0.747329	0.86265	0.021116	0.658584	0.012654
mdm_connector_e	0.725265	0.700575	0.869475	0.857085	0.978502	0.802014
mdm_connector_k	0.00000517	0.000162	0.000143	0.000144	0.006813	0.001034
parrafin_cp	0.000905	0.009396	0.00000332	0.00000323	5.89E-08	0.000000608
parrafin_e	0.803719	0.834732	0.731879	0.452952	0.416428	0.761557
parrafin_flh	0.015199	0.011831	0.089015	0.003593	0.170812	0.084758
parrafin_k	0.00031	0.023659	0.001958	0.027456	0.000113	0.003091
parrafin_tl	0.639365	0.169183	0.955443	0.093286	0.456155	0.097455
parrafin_ts	0.379764	0.845548	0.623057	0.71333	0.953497	0.245676
polycarbonate_cp	<2e-16	<2e-16	<2e-16	<2e-16	<2e-16	<2e-16
polycarbonate_e	0.000359	0.001143	0.004588	0.001705	0.010522	0.000562
polycarbonate_k	0.00000714	0.085398	1.58E-07	0.002815	0.00000069	0.040747
resistor_cp	0.013105	0.014925	0.01138	0.007741	0.002725	0.002316
resistor_e	0.646724	0.593816	0.486264	0.360147	0.986196	0.305786
resistor_k	0.015226	0.156859	0.001178	0.004347	0.000553	0.01308
resistor2_cp	<2e-16	<2e-16	<2e-16	<2e-16	<2e-16	<2e-16
resistor2_e	0.129097	0.255364	0.496109	0.315447	0.548953	0.404975
resistor2_k	0.001239	0.000000316	0.054209	0.000453	0.028518	0.477044
silicone_rtv_cp	0.086889	0.010055	0.018233	0.011078	0.067444	0.145444
silicone_rtv_e	0.013014	0.321625	0.008233	0.14423	0.01828	0.075132
silicone_rtv_k	<2e-16	<2e-16	<2e-16	<2e-16	<2e-16	<2e-16

Table 5c: p-values for L_2 and L_∞ for TCs 6, 7, and 8.

	TC6_L_2	TC6_L_{inf}	TC7_L_2	TC7_L_{inf}	TC8_L_2	TC8_L_{inf}
18_8_ss_cp	0.490867	0.671466	0.005813	0.01157	0.000316	0.010131
18_8_ss_e	0.214991	0.663677	0.626775	0.45537	0.411593	0.408501
18_8_ss_k	0.998717	0.56963	0.726626	0.67294	0.710398	0.795804
AL_6061_T6_cp	<2e-16	<2e-16	0.094335	0.12538	0.001056	0.152423
AL_6061_T6_e	0.500943	0.203793	0.644146	0.44866	0.652156	0.74033
AL_6061_T6_k	2.46E-13	5.03E-08	0.99232	0.51326	0.51495	0.07841
AL_7075_T6_cp	<2e-16	<2e-16	0.031227	0.06756	0.007278	0.000041
AL_7075_T6_e	0.697674	0.017743	0.90955	0.73847	0.033428	0.054469
AL_7075_T6_k	3.27E-08	9.7E-12	0.278681	0.18381	0.000193	8.85E-05
battery_cp	<2e-16	<2e-16	0.111593	0.08789	0.0000186	0.084357
battery_e	0.022584	0.000229	0.481417	0.39554	0.110969	0.819363
battery_k	0.006114	0.000416	0.010852	0.02264	0.281849	0.355211
battery_timing	<2e-16	<2e-16	5.35E-11	0.0000004	<2e-16	2.75E-14
block_108	3.56E-10	5E-07	0.026899	0.06726	<2e-16	<2e-16
block_109	1.04E-09	3.86E-09	0.011998	0.01605	<2e-16	<2e-16
block_112	0.021195	0.20842	0.706087	0.49048	0.400901	0.284966
block_113	0.935701	0.995886	0.557906	0.31245	0.178746	0.055292
block_115	0.114502	0.807751	0.163583	0.23834	0.079592	0.00263
circuit_board_cp	0.0000143	1.26E-05	0.000935	0.04303	1.78E-08	<2e-16
circuit_board_e	0.182757	0.161363	0.042603	0.05282	0.308224	0.268022
circuit_board_kxy	0.065471	0.420049	0.001742	0.01101	0.0000727	<2e-16
circuit_board_kz	0.132636	0.282918	0.466519	0.69303	0.112749	<2e-16
diode_18	0.687849	0.380106	0.163901	0.27848	0.00786	4.9E-07
ep_long	<2e-16	<2e-16	0.028994	0.1306	7.78E-08	0.689446
ep_short	0.566824	2.19E-08	0.870576	0.72726	0.040505	0.51443
filtered_connector_cp	0.441003	0.648366	0.674582	0.88307	0.69854	0.70421
filtered_connector_e	0.527514	0.622996	0.734898	0.8684	0.788971	0.266809

filtered_connector_k	0.075317	0.000782	0.76595	0.42201	0.554042	0.196206
gap_pad_cp	0.426414	0.635416	0.441868	0.6378	0.397769	0.211754
gap_pad_e	0.379977	0.899302	0.284518	0.52484	0.243803	0.724872
gap_pad_k	0.03059	0.344387	0.52338	0.46147	0.248542	4.39E-10
glenair_connector_cp	0.21624	0.675933	0.388934	0.44465	0.621146	0.071759
glenair_connector_e	0.002461	0.000281	0.955795	0.77398	0.050363	0.315768
glenair_connector_k	0.75985	0.95315	0.601958	0.63005	0.513795	0.062457
h_inside	<2e-16	<2e-16	1.71E-08	0.00588	<2e-16	1.81E-11
h_outside	<2e-16	<2e-16	0.890059	0.72402	0.006142	0.915391
mdm_connector_cp	0.8153	0.003274	0.82615	0.96179	0.262001	0.69985
mdm_connector_e	0.927614	0.82887	0.81817	0.76626	0.487373	0.157501
mdm_connector_k	0.000336	0.000018	0.269024	0.26495	0.575743	0.745708
parrafin_cp	1.07E-06	1.67E-08	0.132092	0.43402	0.021008	0.000356
parrafin_e	0.678792	0.70219	0.727471	0.46448	0.351146	0.436083
parrafin_flh	0.07744	0.000752	0.968861	0.88621	0.154184	0.575831
parrafin_k	0.0000135	0.00065	0.453684	0.46351	0.315072	0.461927
parrafin_tl	0.605104	0.073198	0.850577	0.96117	0.916045	0.300129
parrafin_ts	0.560465	0.586208	0.339476	0.14436	0.193838	0.107366
polycarbonate_cp	<2e-16	<2e-16	0.002996	0.03071	1.81E-12	5.14E-07
polycarbonate_e	0.0029	0.000221	0.691349	0.50279	0.171839	0.421968
polycarbonate_k	3.74E-07	0.021668	0.044991	0.01936	0.366767	0.529377
resistor_cp	0.008542	0.019779	0.537094	0.78021	0.24842	<2e-16
resistor_e	0.690786	0.864266	0.087455	0.51406	0.989723	0.006974
resistor_k	0.001208	0.003721	0.338984	0.40991	0.01312	1.78E-05
resistor2_cp	<2e-16	<2e-16	0.08524	0.0907	0.000716	0.680645
resistor2_e	0.373466	0.328858	0.877338	0.56025	0.235346	0.136699
resistor2_k	0.007918	0.21551	0.029964	0.1485	0.487642	0.15618
silicone_rtv_cp	0.028587	0.021853	0.78788	0.85143	0.632802	0.196654
silicone_rtv_e	0.031701	0.078415	0.714061	0.91694	0.867569	0.097445
silicone_rtv_k	<2e-16	<2e-16	0.122022	0.21058	0.000978	4.27E-05

Table 5d: p-values for L_2 and L_∞ for TCs 9, 10, and 11.

	TC9_L_2	TC9_L_{inf}	TC10_L_2	TC10_L_{inf}	TC11_L_2	TC11_L_{inf}
18_8_ss_cp	0.036757	0.007757	0.04408	0.011934	0.578988	0.501049
18_8_ss_e	0.631474	0.504077	0.49578	0.421135	0.592161	0.772382
18_8_ss_k	0.842565	0.473958	0.79114	0.486467	0.917236	0.550917
AL_6061_T6_cp	0.613688	0.407157	0.53153	0.615464	<2e-16	<2e-16
AL_6061_T6_e	0.47214	0.053689	0.70178	0.798434	0.0000158	0.0000567
AL_6061_T6_k	0.257427	0.098448	0.43527	0.161664	<2e-16	<2e-16
AL_7075_T6_cp	0.545479	0.890789	0.10739	0.243865	<2e-16	<2e-16
AL_7075_T6_e	0.350561	0.361934	0.34239	0.523205	0.257171	0.01283
AL_7075_T6_k	0.186701	0.079768	0.1261	0.071012	1.43E-08	2.07E-07
battery_cp	0.965172	0.293796	0.18763	0.892009	<2e-16	<2e-16
battery_e	0.422217	0.335886	0.39143	0.413458	0.000373	0.000789
battery_k	0.105465	0.067912	0.12633	0.089156	0.005536	0.001275
battery_timing	0.001438	0.000753	3.7E-13	<2e-16	<2e-16	<2e-16
block_108	0.00638	0.020383	0.00884	0.020894	0.00000168	0.0000113
block_109	0.555297	0.451875	0.70759	0.570738	5.14E-09	0.0000146
block_112	0.874437	0.620976	0.73312	0.47011	0.003956	0.220663
block_113	0.721768	0.518687	0.75929	0.600471	0.951141	0.761713
block_115	0.090638	0.089033	0.10142	0.129005	0.394397	0.505833
circuit_board_cp	0.104363	5.06E-06	0.00272	0.736529	5.13E-15	0.00000154
circuit_board_e	0.720363	0.061937	0.0664	0.481203	0.791262	0.442319
circuit_board_kxy	0.374874	0.012418	0.53986	0.767861	0.617746	0.891609
circuit_board_kz	0.015403	0.003296	0.05979	0.019693	0.123151	0.318455
diode_18	0.710809	0.636922	0.623	0.635028	0.79935	0.73545
ep_long	0.588785	0.241133	0.05136	0.075321	<2e-16	<2e-16
ep_short	0.017146	0.011091	0.01085	0.006655	0.576642	1.51E-07
filtered_connector_cp	0.601719	0.03389	0.78719	0.376443	0.196708	0.620284
filtered_connector_e	0.402531	0.848736	0.39518	0.595366	0.856697	0.778501

filtered_connector_k	0.019558	0.00196	0.17566	0.108306	0.09579	0.008431
gap_pad_cp	0.891085	0.715979	0.85152	0.739387	0.874989	0.648807
gap_pad_e	0.033203	0.089065	0.03554	0.096107	0.685895	0.960346
gap_pad_k	0.885743	0.501336	0.86377	0.962535	0.61205	0.058386
glenair_connector_cp	0.203477	0.513907	0.20609	0.380846	0.842766	0.807172
glenair_connector_e	0.398028	0.359812	0.48089	0.362805	0.000303	0.001011
glenair_connector_k	0.196265	0.221283	0.16622	0.285156	0.101605	0.788014
h_inside	0.000364	2.6E-08	4.5E-06	2.5E-14	<2e-16	<2e-16
h_outside	0.150213	0.016558	0.09049	0.000856	<2e-16	<2e-16
mdm_connector_cp	0.45823	0.222115	0.45867	0.476503	0.229051	0.000627
mdm_connector_e	0.673445	0.712932	0.65579	0.462961	0.878206	0.947244
mdm_connector_k	0.459274	0.099661	0.7265	0.349691	0.00000456	0.001166
parrafin_cp	0.141777	0.079474	0.06263	0.057471	0.00000014	1.54E-07
parrafin_e	0.502229	0.270055	0.39093	0.246164	0.782775	0.783908
parrafin_flh	0.307897	0.160608	0.36147	0.376373	0.217367	0.011646
parrafin_k	0.926379	0.580976	0.97092	0.467895	0.0000295	0.036837
parrafin_tl	0.680486	0.797417	0.62557	0.768914	0.357809	0.361571
parrafin_ts	0.959321	0.593953	0.91461	0.546892	0.205102	0.346631
polycarbonate_cp	0.289754	0.520469	0.01117	0.024948	<2e-16	<2e-16
polycarbonate_e	0.53726	0.359141	0.35416	0.394016	0.0000381	0.000249
polycarbonate_k	0.615453	0.709335	0.74466	0.47793	0.00000578	0.261417
resistor_cp	0.601865	0.542186	0.50288	0.32385	0.096605	0.141782
resistor_e	0.149721	0.261546	0.13484	0.175291	0.90089	0.219584
resistor_k	0.258095	0.655082	0.31192	0.376431	0.003865	0.016707
resistor2_cp	0.764247	0.307363	0.04697	0.124399	<2e-16	<2e-16
resistor2_e	0.416033	0.252347	0.28547	0.085454	0.041934	0.371165
resistor2_k	0.18007	0.210715	0.22935	0.160424	0.001446	0.093484
silicone_rtv_cp	0.705462	0.85501	0.72106	0.989181	0.025987	0.073713
silicone_rtv_e	0.466057	0.430564	0.37203	0.434553	0.003095	0.143978
silicone_rtv_k	0.036554	0.118775	0.00533	0.050047	<2e-16	<2e-16

Table 5e: p-values for L_2 and L_∞ for TCs 12, 13, and 14.

	TC12_L_2	TC12_L_{inf}	TC13_L_2	TC13_L_{inf}	TC14_L_2	TC14_L_{inf}
18_8_ss_cp	0.469421	0.543336	0.310341	0.771821	0.31614	0.811825
18_8_ss_e	0.103214	0.200407	0.034715	0.358716	0.04809	0.556075
18_8_ss_k	0.446342	0.17597	0.813256	0.403479	0.76257	0.506221
AL_6061_T6_cp	<2e-16	<2e-16	<2e-16	<2e-16	<2e-16	<2e-16
AL_6061_T6_e	0.691863	0.653741	0.695659	0.415027	0.69878	0.453568
AL_6061_T6_k	<2e-16	<2e-16	5.01E-09	0.000817	1.61E-09	0.000107
AL_7075_T6_cp	<2e-16	3.03E-09	<2e-16	<2e-16	<2e-16	<2e-16
AL_7075_T6_e	0.030382	0.201527	0.315921	0.05068	0.3118	0.077656
AL_7075_T6_k	0.298345	0.909339	<2e-16	<2e-16	<2e-16	<2e-16
battery_cp	<2e-16	<2e-16	<2e-16	<2e-16	<2e-16	<2e-16
battery_e	0.023114	0.208139	0.065955	0.001552	0.04295	0.002571
battery_k	0.006344	0.012085	0.00104	0.000092	0.00123	0.00014
battery_timing	<2e-16	<2e-16	<2e-16	<2e-16	<2e-16	<2e-16
block_108	0.000898	0.000422	3.58E-10	0.000000179	2.65E-07	0.0000357
block_109	0.00000315	0.002221	2.08E-12	3.41E-09	2.77E-08	0.00000578
block_112	0.312682	0.390442	0.200751	0.054598	0.14285	0.059699
block_113	0.721362	0.681511	0.695775	0.984665	0.60175	0.750132
block_115	0.319312	0.977636	0.159943	0.860362	0.21093	0.467467
circuit_board_cp	<2e-16	3.34E-12	0.0000417	0.00113	0.0000637	0.000696
circuit_board_e	0.582974	0.526355	0.301616	0.093766	0.36658	0.096976
circuit_board_kxy	0.006146	0.074832	0.033556	0.365246	0.05246	0.053503
circuit_board_kz	0.741249	0.878477	0.059182	0.466169	0.06214	0.262012
diode_18	0.318678	0.250202	0.936424	0.354369	0.93059	0.859667
ep_long	<2e-16	<2e-16	<2e-16	<2e-16	<2e-16	<2e-16
ep_short	0.886413	0.431049	0.870903	0.037026	0.97075	0.026248
filtered_connector_cp	0.456362	0.735811	0.217148	0.925214	0.26882	0.649332
filtered_connector_e	0.900967	0.828994	0.595012	0.710197	0.5902	0.676692

filtered_connector_k	0.027591	0.191288	0.006681	0.001816	0.00803	0.000707
gap_pad_cp	0.996928	0.924039	0.23996	0.227877	0.32773	0.436048
gap_pad_e	0.167853	0.373866	0.413191	0.861826	0.45683	0.850878
gap_pad_k	0.42569	0.610532	0.119982	0.174936	0.11384	0.061692
glenair_connector_cp	0.712909	0.569982	0.097603	0.945606	0.14348	0.632161
glenair_connector_e	0.014713	0.070123	0.016481	0.010869	0.02433	0.010198
glenair_connector_k	0.608848	0.101173	0.532171	0.538816	0.649	0.205876
h_inside	<2e-16	<2e-16	<2e-16	<2e-16	<2e-16	<2e-16
h_outside	8.17E-12	1.01E-09	<2e-16	<2e-16	<2e-16	<2e-16
mdm_connector_cp	0.016657	0.009992	0.772478	0.002929	0.70803	0.006444
mdm_connector_e	0.747749	0.821468	0.675599	0.814673	0.56433	0.80767
mdm_connector_k	0.031713	0.186824	0.008174	0.000194	0.00664	0.000159
parrafin_cp	0.0000031	5.17E-06	6.8E-09	3.21E-09	1.1E-08	2.58E-08
parrafin_e	0.857554	0.576644	0.144627	0.252858	0.13231	0.217312
parrafin_flh	0.694435	0.999997	0.10829	0.008376	0.11403	0.008365
parrafin_k	0.141053	0.710054	9E-15	6.92E-10	2.4E-15	1.49E-10
parrafin_tl	0.807873	0.850026	0.928626	0.32608	0.96832	0.55304
parrafin_ts	0.916426	0.369084	0.564325	0.778992	0.55484	0.42836
polycarbonate_cp	<2e-16	<2e-16	<2e-16	<2e-16	<2e-16	<2e-16
polycarbonate_e	0.005065	0.016293	0.004118	0.000184	0.00316	0.000466
polycarbonate_k	0.779176	0.758808	0.0000111	0.128922	0.0000127	0.112927
resistor_cp	0.467209	0.669537	0.025998	0.207022	0.03184	0.302687
resistor_e	0.615857	0.620883	0.934229	0.37337	0.98546	0.325234
resistor_k	0.648636	0.751525	0.000828	0.050856	0.00177	0.016476
resistor2_cp	<2e-16	3.29E-11	<2e-16	<2e-16	<2e-16	<2e-16
resistor2_e	0.007391	0.36842	0.210545	0.58985	0.12913	0.294261
resistor2_k	0.709578	0.302577	0.031374	0.989642	0.03268	0.634614
silicone_rtv_cp	0.06888	0.334	0.021561	0.031537	0.0146	0.038583
silicone_rtv_e	0.04446	0.728463	0.011977	0.042735	0.01528	0.05058
silicone_rtv_k	<2e-16	6.27E-12	<2e-16	<2e-16	<2e-16	<2e-16

Table 5f: *p*-values for L_2 and L_∞ for TC15.

	TC15_L_2	TC15_L_{inf}
18_8_ss_cp	0.872918	0.70337
18_8_ss_e	0.831183	0.03417
18_8_ss_k	0.713025	0.38518
AL_6061_T6_cp	<2e-16	<2e-16
AL_6061_T6_e	0.000893	0.00556
AL_6061_T6_k	<2e-16	<2e-16
AL_7075_T6_cp	<2e-16	<2e-16
AL_7075_T6_e	0.393845	0.3983
AL_7075_T6_k	<2e-16	<2e-16
battery_cp	<2e-16	<2e-16
battery_e	0.013037	0.00636
battery_k	0.002158	0.00415
battery_timing	<2e-16	<2e-16
block_108	0.00033	0.00105
block_109	0.0000108	0.03492
block_112	0.25714	0.21885
block_113	0.940584	0.7849
block_115	0.61954	0.75102
circuit_board_cp	0.000099	0.02293
circuit_board_e	0.57868	0.12818
circuit_board_kxy	0.194974	0.55379
circuit_board_kz	0.186598	0.66582
diode_18	0.839402	0.88784
ep_long	<2e-16	<2e-16
ep_short	0.408463	0.04987
filtered_connector_cp	0.393879	0.83058
filtered_connector_e	0.216402	0.34943
filtered_connector_k	0.421962	0.38419
gap_pad_cp	0.332164	0.77018
gap_pad_e	0.966213	0.8688
gap_pad_k	0.17059	0.2469
glenair_connector_cp	0.676817	0.50558
glenair_connector_e	0.243083	0.20678
glenair_connector_k	0.808624	0.38159
h_inside	<2e-16	<2e-16
h_outside	<2e-16	<2e-16
mdm_connector_cp	0.184016	0.001
mdm_connector_e	0.844263	0.54578
mdm_connector_k	0.010615	0.01772
parrafin_cp	2.9E-08	0.00000164

(*Continued*)

Table 5f: *p*-Values for L_2 and L_∞ for TC15 (*Continued*).

	TC15_L_2	TC15_L_{inf}
parrafin_e	0.196038	0.20832
parrafin_flh	0.616545	0.12542
parrafin_k	1.75E-08	0.00079
parrafin_tl	0.563855	0.49712
parrafin_ts	0.587207	0.49556
polycarbonate_cp	<2e-16	<2e-16
polycarbonate_e	0.0157	0.01565
polycarbonate_k	0.003283	0.4555
resistor_cp	0.179982	0.98061
resistor_e	0.342476	0.71705
resistor_k	0.102633	0.67685
resistor2_cp	<2e-16	<2e-16
resistor2_e	0.00822	0.32848
resistor2_k	0.093325	0.99867
silicone_rtv_cp	0.00889	0.09314
silicone_rtv_e	0.084283	0.15335
silicone_rtv_k	<2e-16	2.03E-13

APPENDIX B: MATERIAL PROPERTIES AND UNCERTAINTIES

Table 6: Physical parameters in the model and their sampling bounds.

Parameter	Lower limit	Upper limit
Al 6061-T6 specific heat*	0.5	1.5
Al 6061-T6 conductivity*	0.5	1.5
Al 6061-T6 emissivity	0.1	0.6
Al 7075-T6 specific heat	500	1500
Al 7075-T6 conductivity	65	185
Al 7075-T6 emissivity	0.4	1
Battery specific heat	400	1500
Battery conductivity	10	1000
Battery emissivity	0.2	0.8
Circuit board specific heat	600	1700
Circuit board parallel conductivity	8	24
Circuit board normal conductivity	0.1	1
Connector (3 connectors independently varied) specific heat	600	1700
Connector (3 connectors independently varied) conductivity	0.1	1
Connector (3 connectors independently varied) emissivity	0.4	1
Padding specific heat	650	1850
Padding conductivity	0.5	2
Padding emissivity	0.4	1
Parrafin specific heat	1000	3000
Parrafin conductivity	0.1	0.3
Parrafin emissivity	0.4	1
Parrafin latent heat of fusion	0.1	0.3
Parrafin solidus temperature	309	329
Parrafin liquidus temperature	331	351
Polycarbonate specific heat	800	2400
Polycarbonate conductivity	0.09	0.27
Polycarbonate emissivity	0.4	1
Resistor (2 resistors independently varied) specific heat	800	2400
Resistor (2 resistors independently varied) conductivity	0.09	0.27
Resistor (2 resistors independently varied) emissivity	0.4	1
Silicone RTV specific heat	1000	2000
Silicone RTV conductivity	0.45	1.35

(*Continued*)

Table 6: Physical parameters in the model and their sampling bounds (*Continued*).

Parameter	Lower limit	Upper limit
Silicone RTV emissivity	0.4	1
Stainless Steel 18-8 specific heat	250	750
Stainless Steel 18-8 conductivity	8	24
Stainless Steel 18-8 emissivity	0.1	0.5
Battery timing*	0.5	1.5
Diode*	0.5	1.5
EP long time*	0.5	1.5
EP short time*	0.5	1.5
External convection coefficient	0.2	2
Internal convection coefficient	0.2	2
Battery 1 heat generation	2e-7	2e-8
Battery 2 heat generation	5e-5	7e-6
Battery 3 heat generation	5e-5	4e-6
Battery 4 heat generation	2e-7	2e-8
Battery 5 heat generation	2e-7	2e-8

* Indicates that the values are scaling factors of a temperature-dependent quantity and are dimensionless. All other quantities are in appropriate SI units.

Table 7: Temperature-dependent specific heat capacity of Al 6061-T6.

Temperature (K)	Specific heat (J/K)
300	900
400	942

Linear interpolation is used to estimate the specific heat between values.

Table 8: Temperature-dependent conductivity of Al 6061-T6.

Temperature (K)	Conductivity (W/mK)
300	155
350	162
400	166

Linear interpolation is used to estimate the conductivity between values.

Table 9: Time-dependent battery heat generation.

Time (s)	Heat generation (W/m^3)
0	9.41e4
59	9.41e4
60	2.55e5
3659	2.55e5
3660	4.17e5
4561	4.17e5

Linear interpolation is used to estimate the heat generation between values.

Table 10: Time-dependent diode heat generation.

Time (s)	Heat generation (W/m^3)
0	0
59	0
60	1.74e8
3659	1.74e8
3660	3.48e8
4561	3.38e8

Linear interpolation is used to estimate the heat generation between values.

Table 11: Time-dependent long-time EP heat generation.

Time (s)	Heat generation (W/m^3)
0	0
59	0
60	7.34E+05
4561	7.34E+05

Linear interpolation is used to estimate the heat generation between values.

Table 12: Time-dependent short-time EP heat generation.

Time (s)	Heat generation (W/m^3)
0	0
3659	0
3660	7.34E+05
4561	7.34E+05

Linear interpolation is used to estimate the heat generation between values.

Table 13: Time-dependent external convective heat transfer coefficient, estimated from air temperature measurements during the experiments.

Time (s)	Convection coefficient (W/m^{2}K)
0	1.499555166
100	2.094760961
200	2.24476693
300	2.408483807
400	2.562995932
500	2.703378881
600	2.821441819
700	2.921076026
800	3.021231917
900	3.10699235
1000	3.182301593
1100	3.253570441
1200	3.322634965
1300	3.381564063
1400	3.440524086
1500	3.496884626
1600	3.542286208
1700	3.589525505
1800	3.630879768
1900	3.674144622
2000	3.709291367
2100	3.742770599
2200	3.772901333
2300	3.798939081
2400	3.825898856
2500	3.849191953

(*Continued*)

Table 13: Time-dependent external convective heat transfer coefficient, estimated from air temperature measurements during the experiments (*Continued*).

Time (s)	Convection coefficient (W/m^{2}K)
2600	3.870247521
2700	3.891443271
2800	3.911971324
2900	3.931595298
3000	3.949507062
3100	3.967555364
3200	3.98287045
3300	4.000142908
3400	4.016722368
3500	4.034617946
3600	4.051935226
3700	4.06985136
3800	4.096777307
3900	4.130863408
4000	4.16891471
4100	4.206814772
4200	4.246750495
4300	4.284042513
4400	4.32268806
4500	4.361006413
4561	4.372

Linear interpolation is used to estimate the convection coefficient between values.

Table 14: Time-dependent internal convective heat transfer coefficient estimated from experimental air temperature measurements.

Time (s)	Convection coefficient (W/m^{2}K)
0	1.63073095
100	1.528677106
200	1.822929925
300	2.067220594
400	2.205107805
500	2.291642275
600	2.349519027
700	2.391963676
800	2.425128201

(*Continued*)

Table 14: Time-dependent internal convective heat transfer coefficient estimated from experimental air temperature measurements (*Continued*).

Time (s)	Convection coefficient (W/m^{2}K)
900	2.451786304
1000	2.47375939
1100	2.492865742
1200	2.508668417
1300	2.523083311
1400	2.536196335
1500	2.546144555
1600	2.557207841
1700	2.565933717
1800	2.575489081
1900	2.583715675
2000	2.591593316
2100	2.599724946
2200	2.606922243
2300	2.615817864
2400	2.625500531
2500	2.633934094
2600	2.643121004
2700	2.651393687
2800	2.659300196
2900	2.666591383
3000	2.673286272
3100	2.679121346
3200	2.684130389
3300	2.689618119
3400	2.693497861
3500	2.698114106
3600	2.702427294
3700	2.706443288
3800	2.75845897
3900	2.821396194
4000	2.8683685
4100	2.902760048
4200	2.930501018
4300	2.952608882
4400	2.971917359
4500	2.98735299
4561	2.9973

Linear interpolation is used to estimate the convection coefficient between values.