Amphenol Aerospace

CF-020400-62

Thermal Analysis

Dec 15, 2021

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Electronic Cooling Solutions Inc.

Objectives

1. To determine that the critical components on the CF-020400-62 board are within their thermal limits for the following cases:

   a) -20°C at sea level

   b) 23°C at sea level

   c) 60°C at sea level

   d) 85°C at sea level

   e) -40°C at 31000 ft

   f) 32°C at 31000 ft

   At 2 different power levels:

   a) Worst Case – Total Power of 118.046 W

   b) Predicted Case – Total Power of 71.215 W

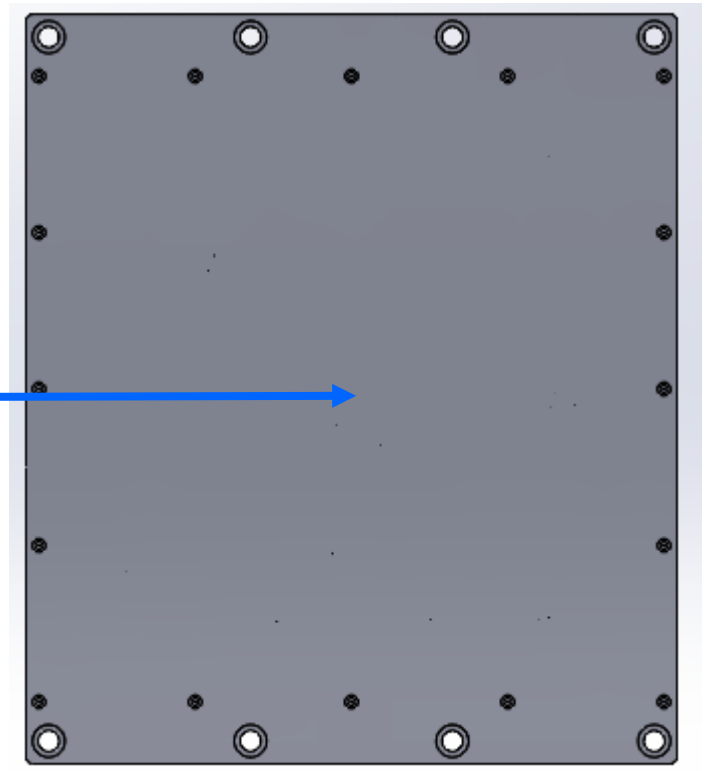
Approach

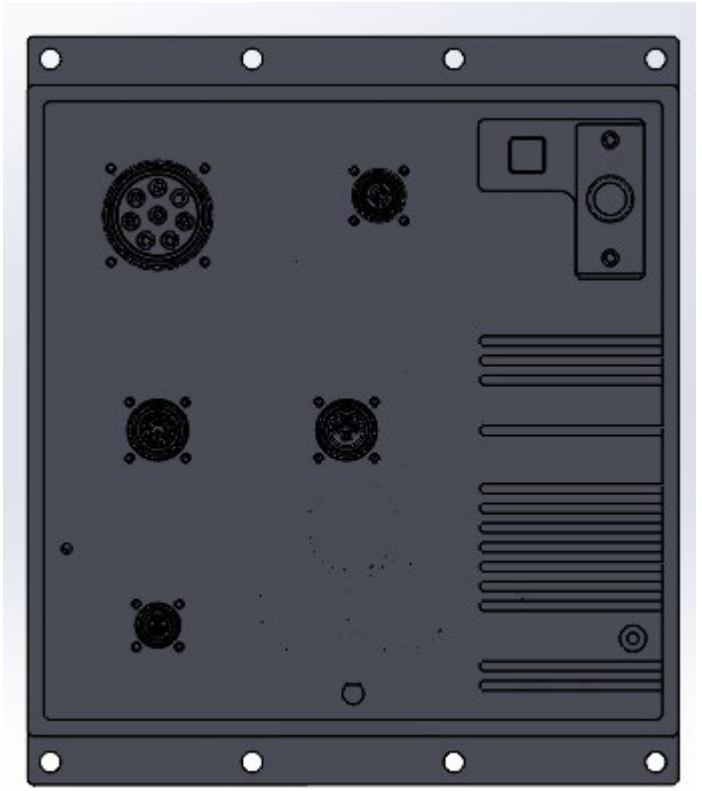
1. This analysis was done using FloTHERM XT V2021.1 CFD software.
2. The thermal model was created from the cf-020400-062m_asm file provided for thermal analysis.
3. It was assumed that no neighboring devices were producing or sinking heat.
4. Thermal gap pad used for the components: Thermal conductivity of 17.8 W/m-K.
5. The critical components were modeled as 2-resistor networks with thermal resistance values found on the “Parts Thermal Characteristics.doc”.

Thermal Model Setup

Thermal Model Setup – Overview

Cooling Surface





Gravity

Enclosure Material – Al6061 T6

Thermal Data

CF-020400-62	Worst Case			Predicted			Thermal Resistance (°C/W)/Model	
Component	Qty	Per Component	Total	Qty	Per Component	Total	R_{JC}	R_{JB}
Aldrin	1	46.864	46.864	1	21.089	21.089	0.2	1.7
Marvel 88X3340 Quad PHY	1	13.582	13.582	1	13.175	13.175	0.3	2.6
Marvel 88X3340 Quad PHY	1	13.582	13.582	1	13.175	13.175	0.3	2.6
DCM3414	1	10.499	10.499	1	6.242	6.242	2.03	1.79
LEAP	1	7.9	7.9	1	3.95	3.95	N/A	N/A
LEAP	1	7.9	7.9	1	3.95	3.95	N/A	N/A
CPU	1	7.771	7.771	1	3.885	3.885	2.57	6.89
LTM4650 ALD_CORE_1V0	1	3.7	3.7	1	1.665	1.665	3.7	1.5
LTM4650 1V0_PHY_CORE_0V88	1	1.871	1.871	1	1.421	1.421	3.7	1.5
MFM1714 28V Filter	1	1.272	1.272	1	0.756	0.756	14	4.7
ISL8201M 3V3	1	0.8	0.8	1	0.395	0.395	2	0.8
MAXM17515 CPU_CORE_1V08	1	0.716	0.716	1	0.358	0.358	6	1.5
ISL8201M ALD_PHY_INPHI_1V8	1	0.4	0.4	1	0.302	0.302	2	0.8
ISL8201M PHY_AVDD_1V5	1	0.3	0.3	1	0.293	0.293	2	0.8
ISL8201M CPU Supplies	1	0.494	0.494	1	0.244	0.244	2	0.8
ISL8201M PHY_AVDD_2V3	1	0.2	0.2	1	0.22	0.22	2	0.8
MAXM17515 CPU_VDDM1V5	1	0.102	0.102	1	0.051	0.051	6	1.5
MAXM17515 CPU_ALD_3V3	1	0.093	0.093	1	0.044	0.044	6	1.5
		Total	**118.046**		**Total**	**71.215**		

Note: Thermal resistances from junction to case (R_{JC}) and from junction to board (R_{JB}) and thermal limits were taken from “Parts Thermal Characteristics”.

Note: For this set of simulations, the worst case power values were used.

Thermal Analysis

Worst Case Power Results

Sim 1
23 C Ambient, Vertical, Sea Level
Al 6061 T6 Enclosure
Worst Case Power

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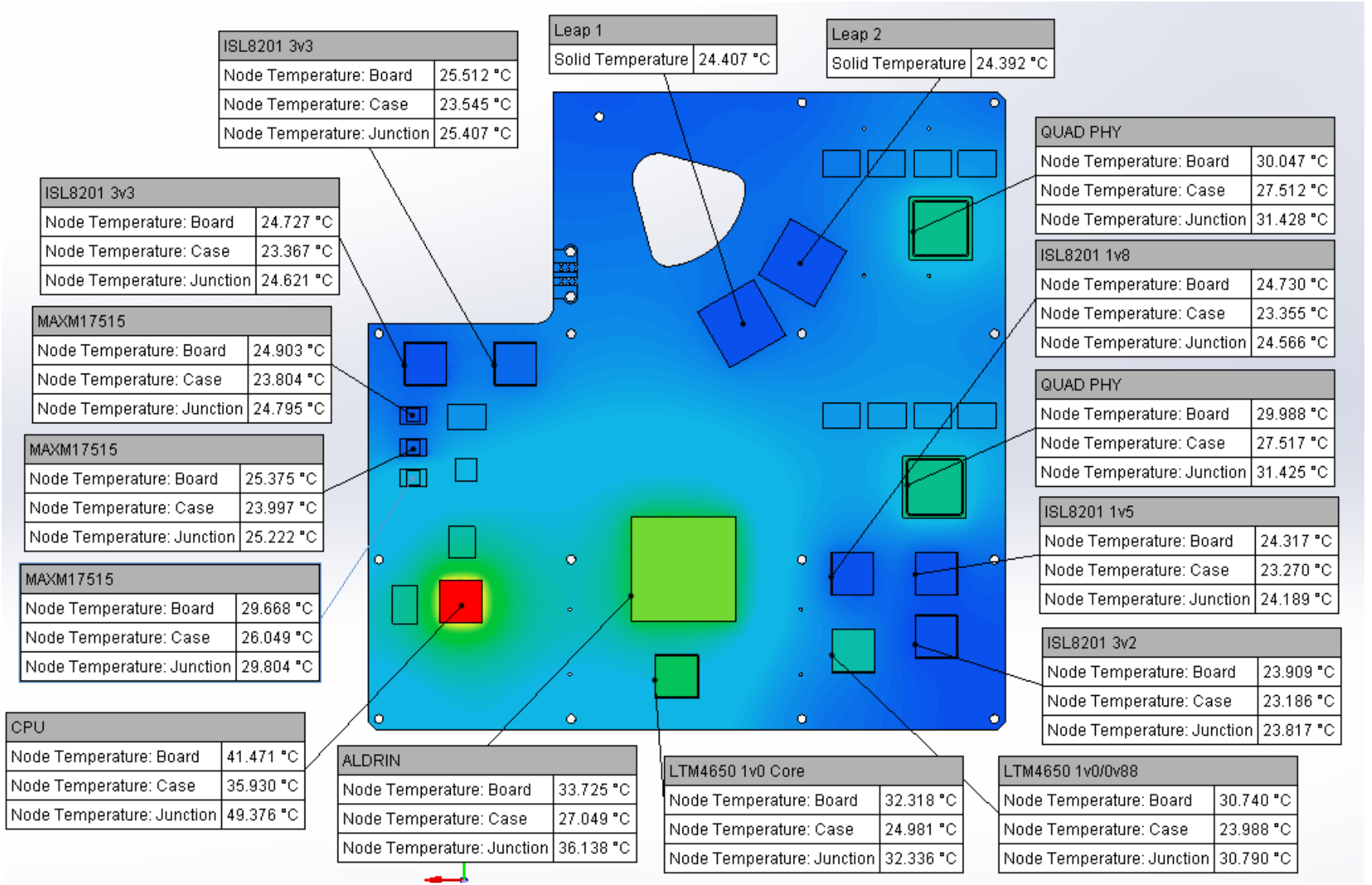
Results Summary –Temperature Cases

Al 6061 T6 Enclosure						
Parameters				Sim 1		
Power Scenario				**Worst Case**		
Cooling Rail Temperature °C				23		
Ambient Temp., °C				23		
Elevation, ft				0		
RESULTS						
Component	**Min. Limit, °C**	**Max. Limit, °C**	**Limit Type**	**Power, W**	**Result, °C**	**Margin, °C**
Aldrin	-40	110	junction	46.864	36.1	73.9
Marvel 88X3340 Quad PHY	-40	105	Junction	13.582	31.4	73.6
Marvel 88X3340 Quad PHY	-40	105	Junction	13.582	31.4	73.6
DCM3414	-40	125	Junction	10.499	42.6	82.4
LEAP	0	70	Case	7.9	24.4	45.6
LEAP	0	70	Case	7.9	24.3	45.7
CPU	-40	115	junction	7.771	49.3	65.7
LTM4650 ALD_CORE_1V0	-40	125	junction	3.7	32.3	92.7
LTM4650 1V0_PHY_CORE_0V88	-40	125	junction	1.871	30.7	94.3
MFM1714 28V Filter	-55	125	junction	1.272	35.0	90
ISL8201M 3V3	-55	125	Junction	0.8	25.4	99.6
MAXM17515 CPU_CORE_1V08	-40	125	Junction	0.716	24.7	100.3
ISL8201M ALD_PHY_INPHI_1V8	-55	125	junction	0.4	24.5	100.5
ISL8201M PHY_AVDD_1V5	-55	125	junction	0.3	24.1	100.9
ISL8201M CPU Supplies	-55	125	junction	0.494	24.6	100.4
ISL8201M PHY_AVDD_2V3	-55	125	junction	0.2	23.8	101.2
MAXM17515 CPU_VDDM1V5	-40	125	junction	0.102	25.2	99.8
MAXM17515 CPU_ALD_3V3	-40	125	Junction	0.093	29.8	95.2

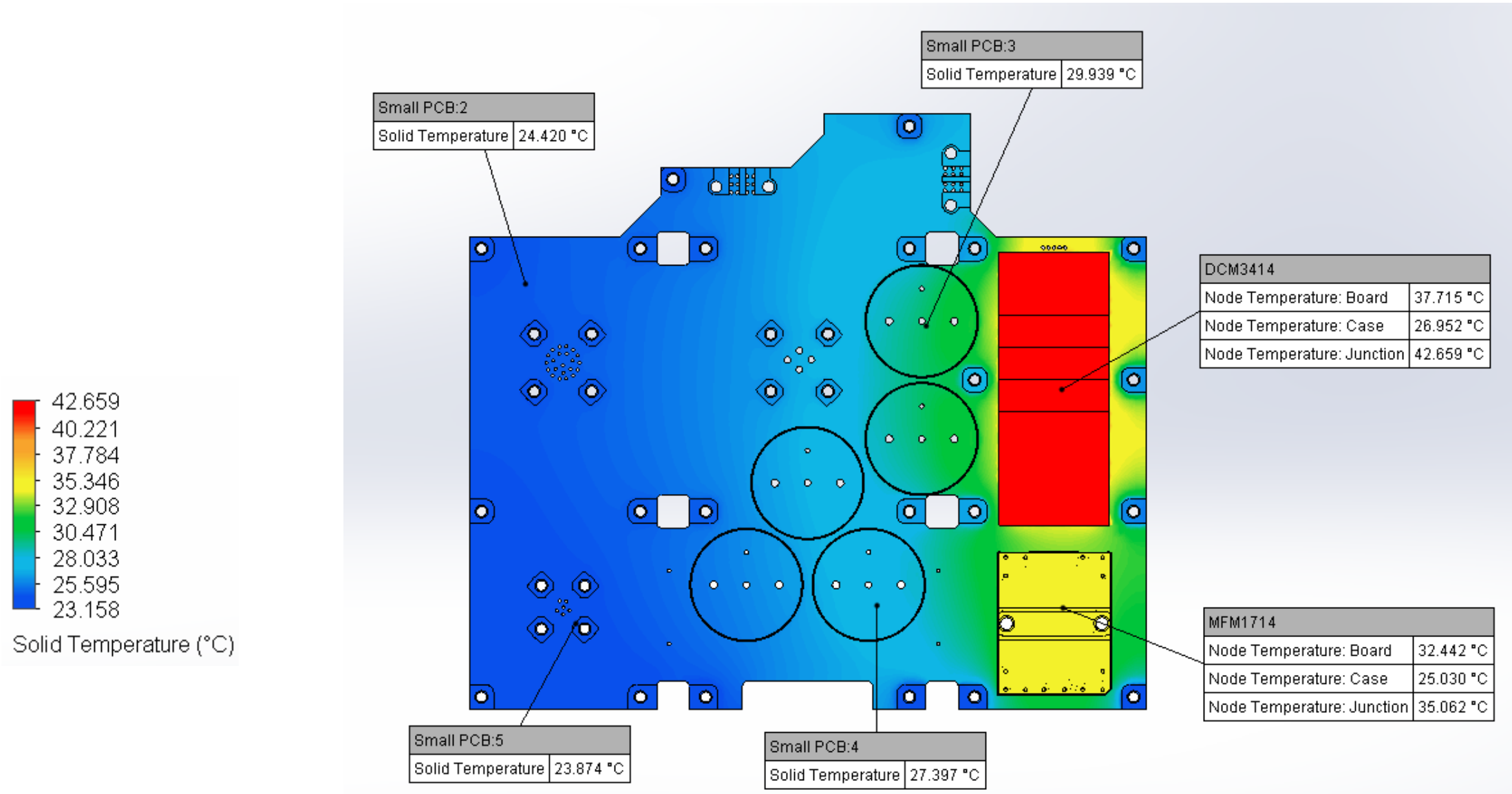
Large PCB Components Temperature Plot

23°C , sea level



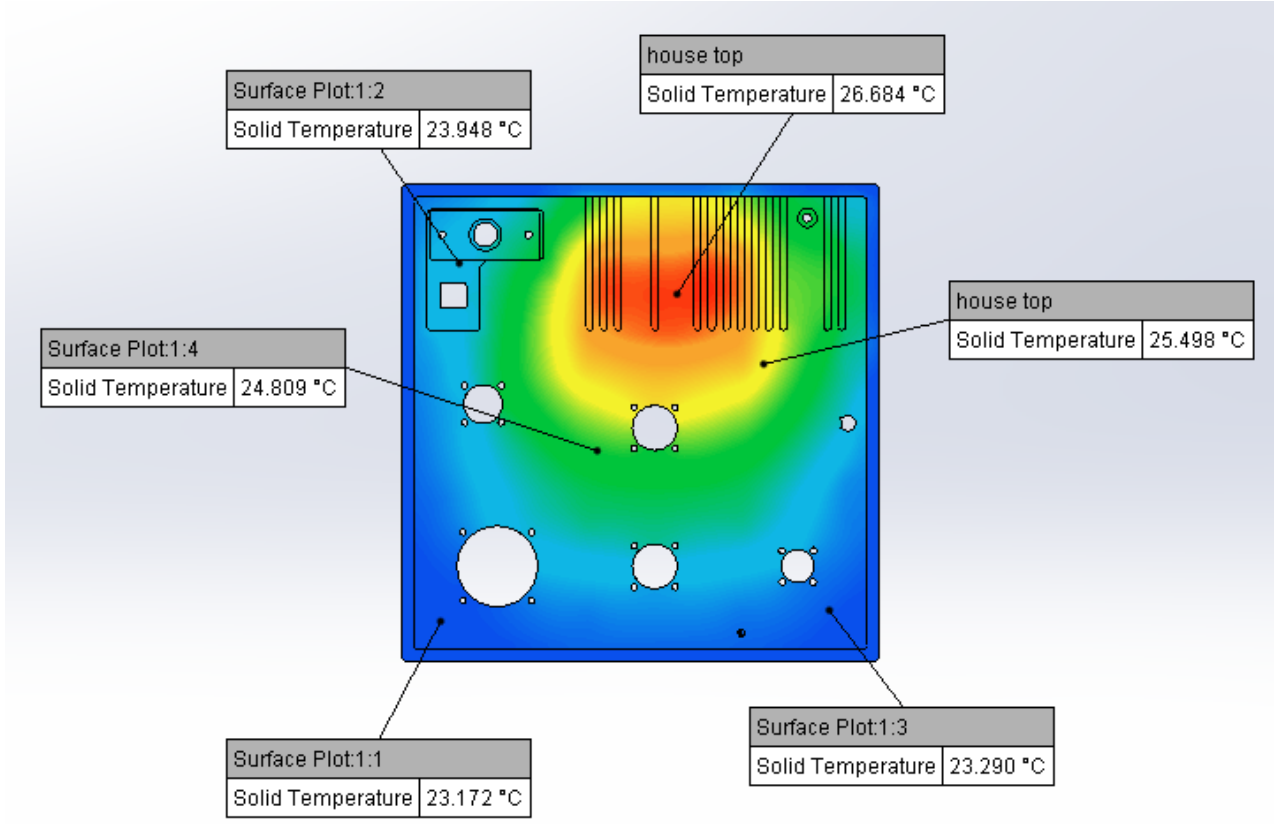
Small PCB Components Temperature Plot

23°C , sea level

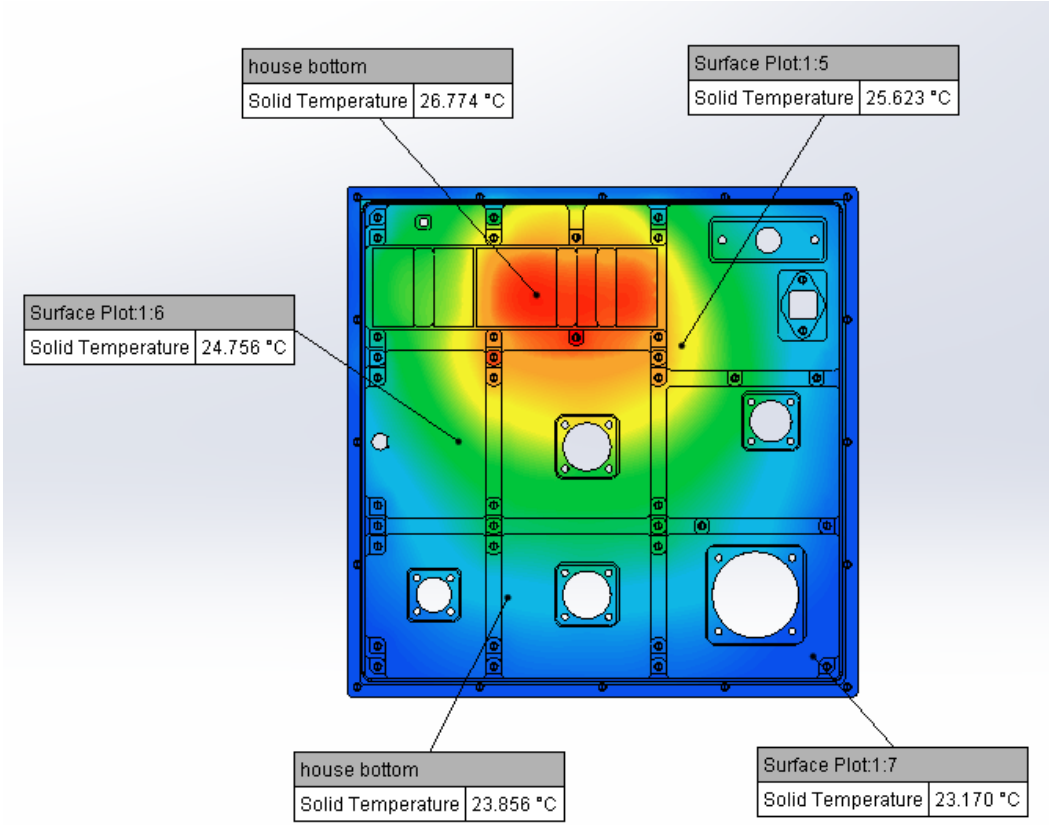


Housing Surface Temperature Plot

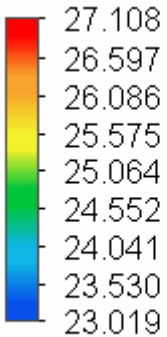
23°C , sea level



Top Side

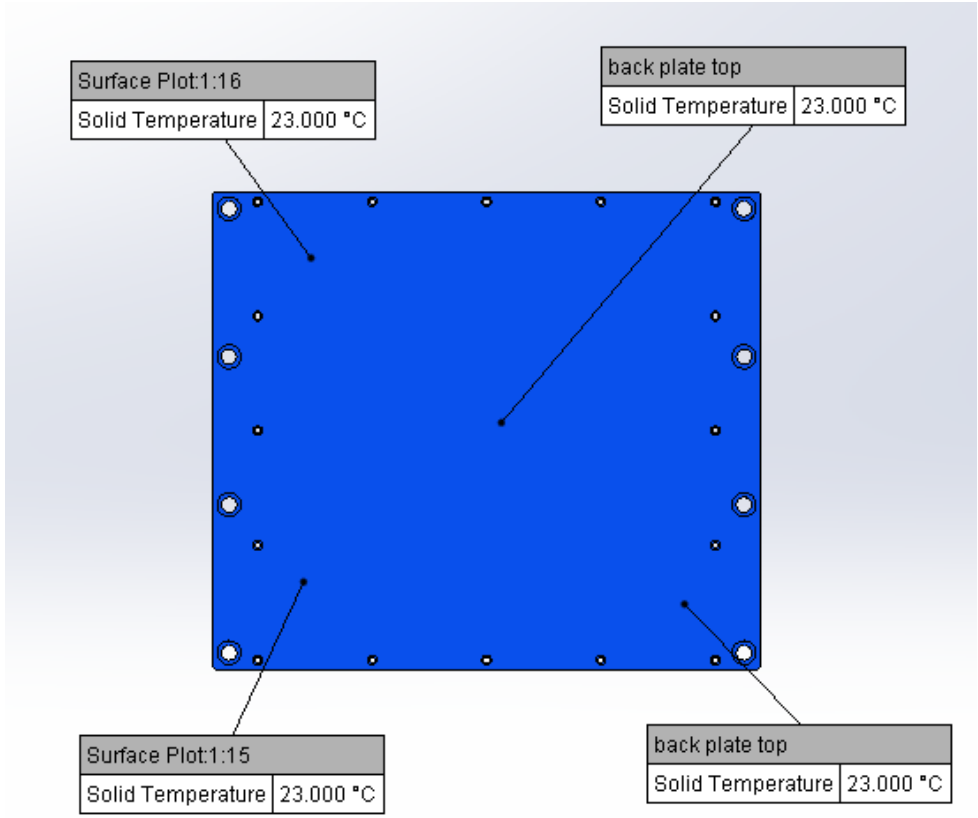


Bottom Side

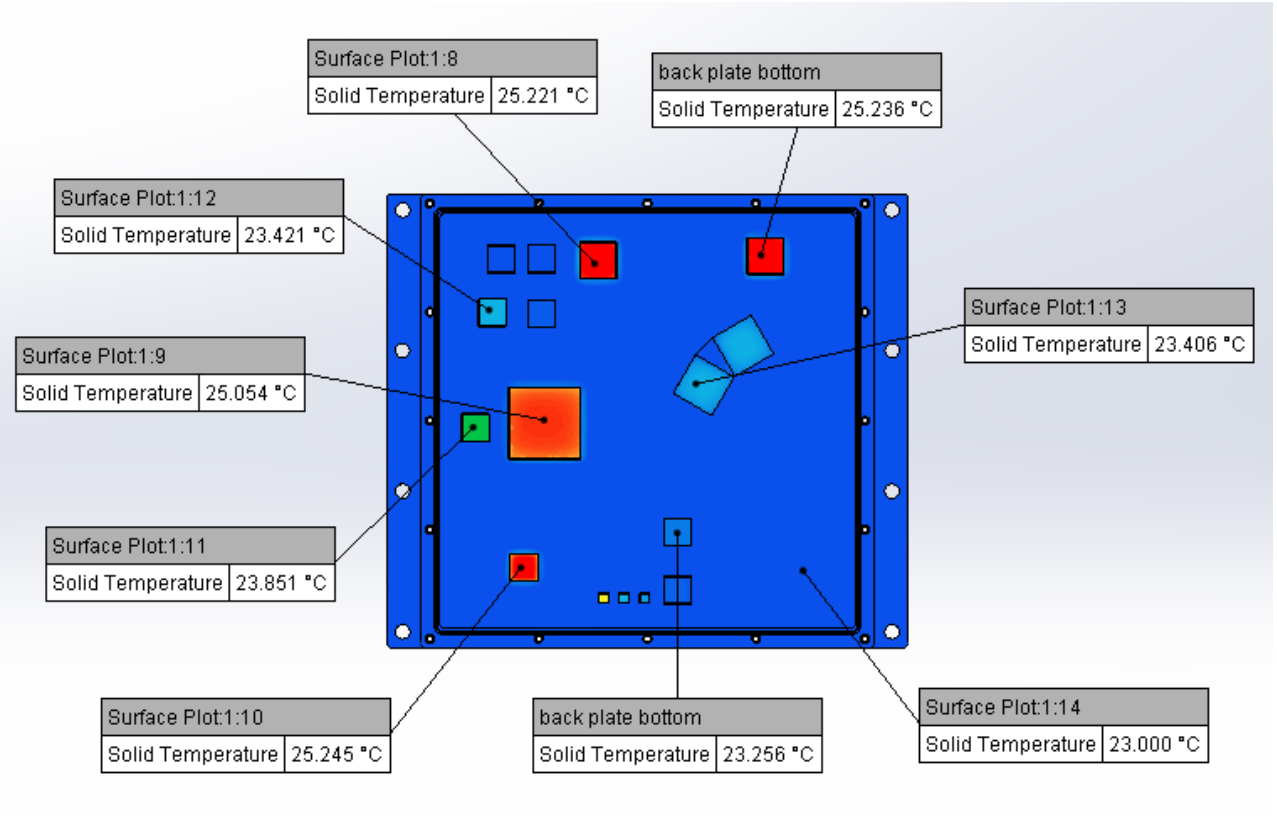


Rear Cover Temperature Plot

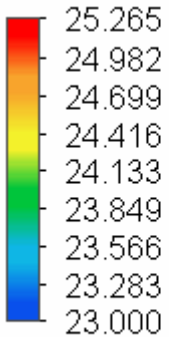
23°C , sea level



Top Side



Bottom Side



Sim 7
85 C Ambient, Vertical, Sea Level
Al 6061 T6 Enclosure
Worst Case Power

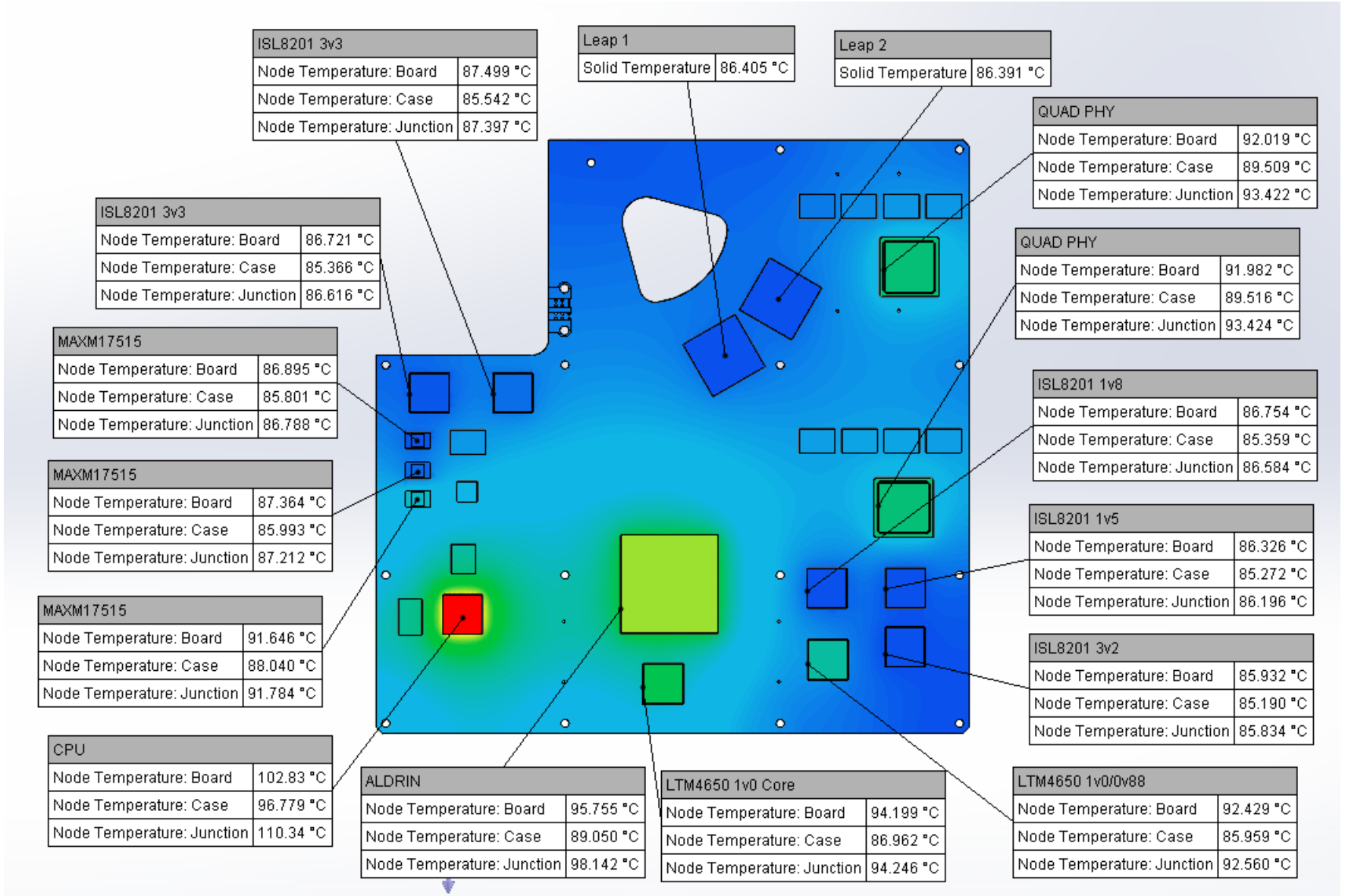
ElectronicCooling Solutions inc

Results Summary –Temperature Cases

Al 6061 T6 Enclosure						
Parameters				Sim 7		
Power Scenario				**Worst Case**		
Cooling Rail Temperature °C				85		
Ambient Temp., °C				85		
Elevation, ft				0		
RESULTS						
Component	**Min. Limit, °C**	**Max. Limit, °C**	**Limit Type**	**Power, W**	**Result, °C**	**Margin, °C**
Aldrin	-40	110	junction	46.864	98.1	11.9
Marvel 88X3340 Quad PHY	-40	105	Junction	13.582	93.4	11.6
Marvel 88X3340 Quad PHY	-40	105	Junction	13.582	93.4	11.6
DCM3414	-40	125	Junction	10.499	104.7	20.3
LEAP	0	70	Case	7.9	86.4	-16.4
LEAP	0	70	Case	7.9	86.4	-16.4
CPU	-40	115	junction	7.771	110.3	4.7
LTM4650 ALD_CORE_1V0	-40	125	junction	3.7	94.2	30.8
LTM4650 1V0_PHY_CORE_0V88	-40	125	junction	1.871	92.5	32.5
MFM1714 28V Filter	-55	125	junction	1.272	97.1	27.9
ISL8201M 3V3	-55	125	Junction	0.8	87.4	37.6
MAXM17515 CPU_CORE_1V08	-40	125	Junction	0.716	91.8	33.2
ISL8201M ALD_PHY_INPHI_1V8	-55	125	junction	0.4	86.6	38.4
ISL8201M PHY_AVDD_1V5	-55	125	junction	0.3	86.2	38.8
ISL8201M CPU Supplies	-55	125	junction	0.494	86.6	38.4
ISL8201M PHY_AVDD_2V3	-55	125	junction	0.2	85.8	39.2
MAXM17515 CPU_VDDM1V5	-40	125	junction	0.102	87.2	37.8
MAXM17515 CPU_ALD_3V3	-40	125	Junction	0.093	86.8	38.2

Large PCB Components Temperature Plot

85°C , sea level



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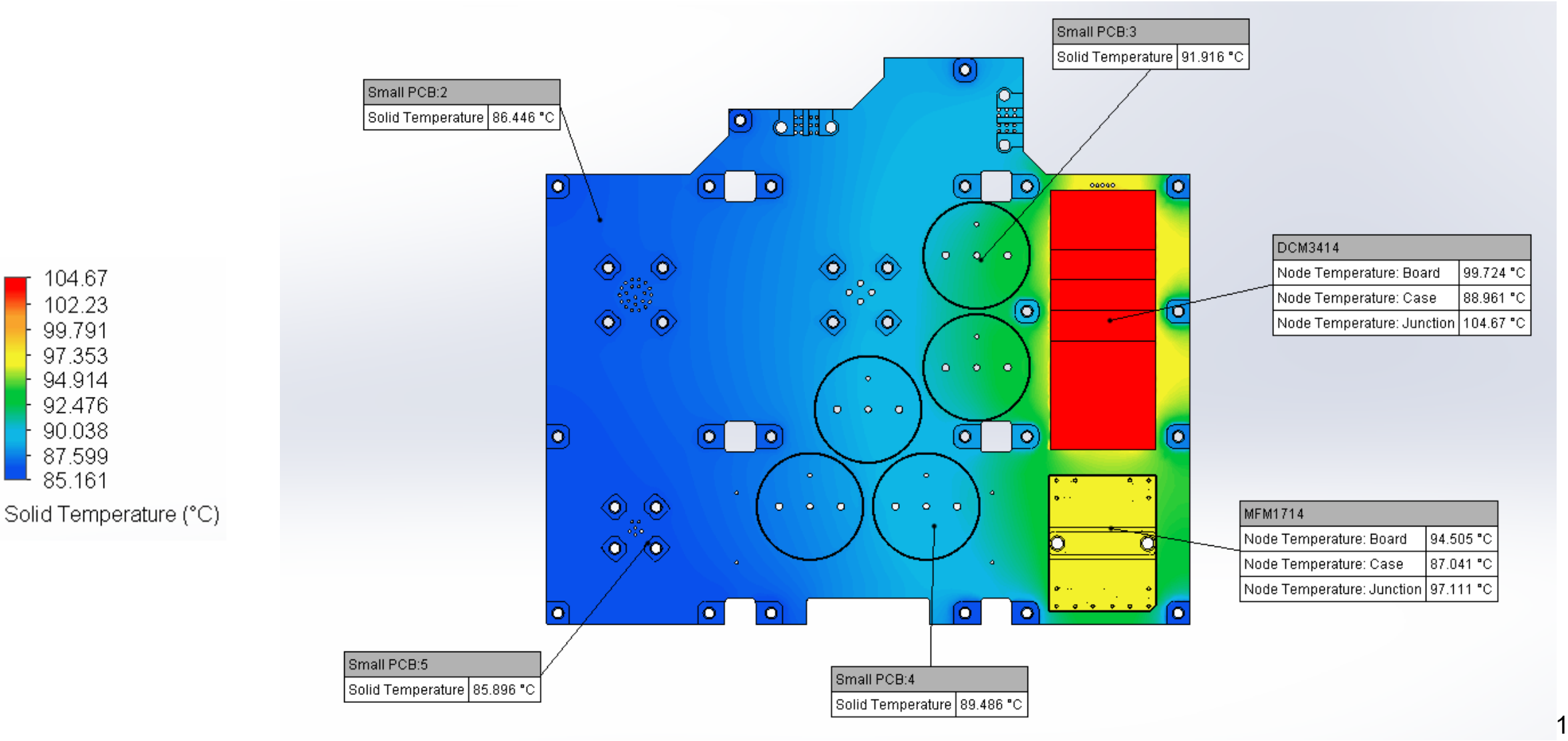
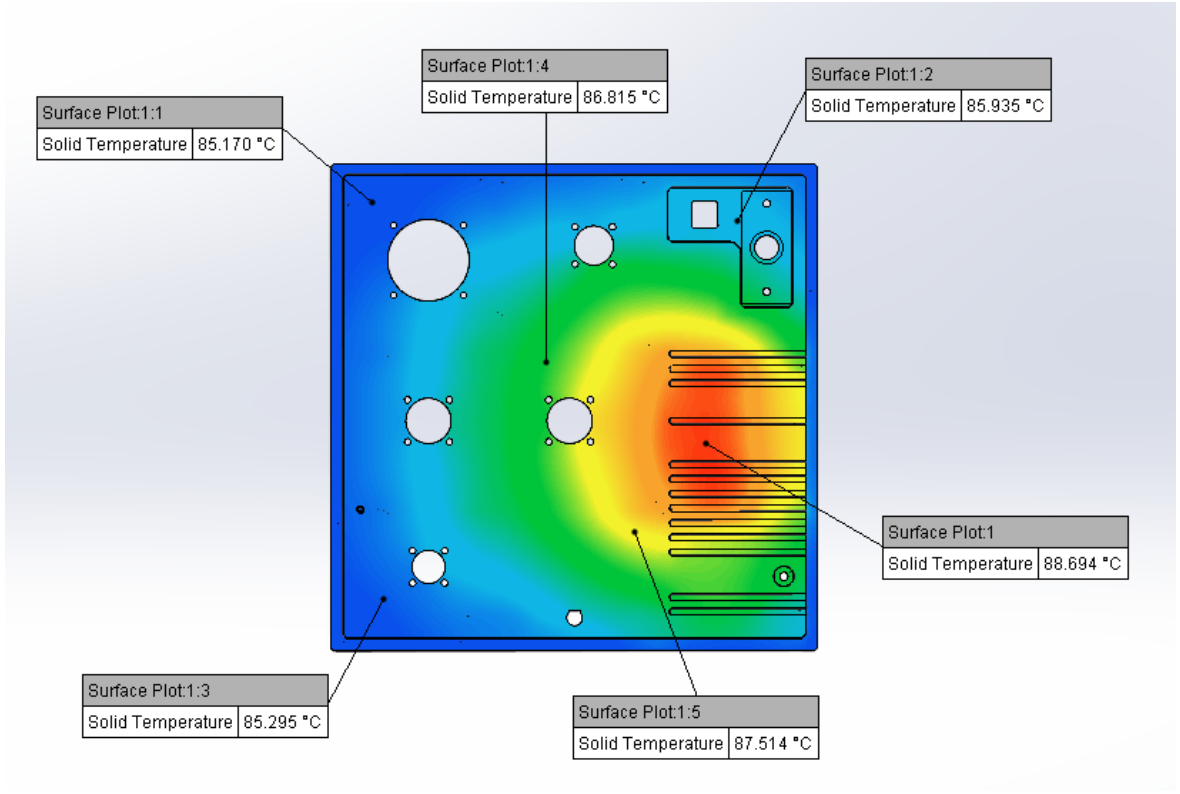
Small PCB Components Temperature Plot

85°C , sea level

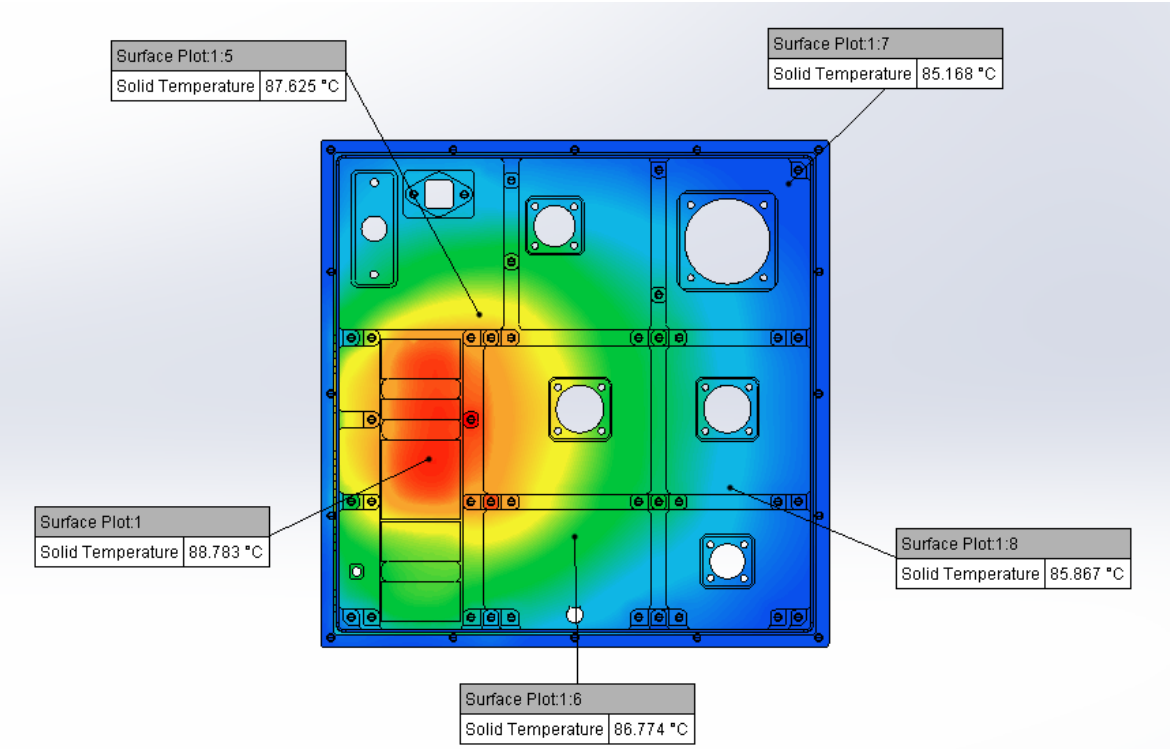


Housing Surface Temperature Plot

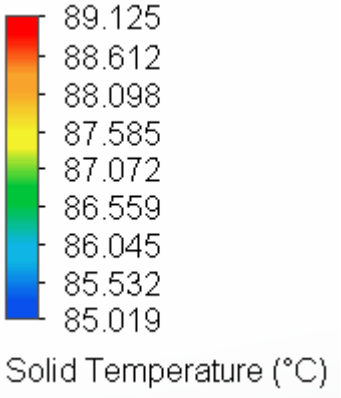
85°C , sea level



Top Side

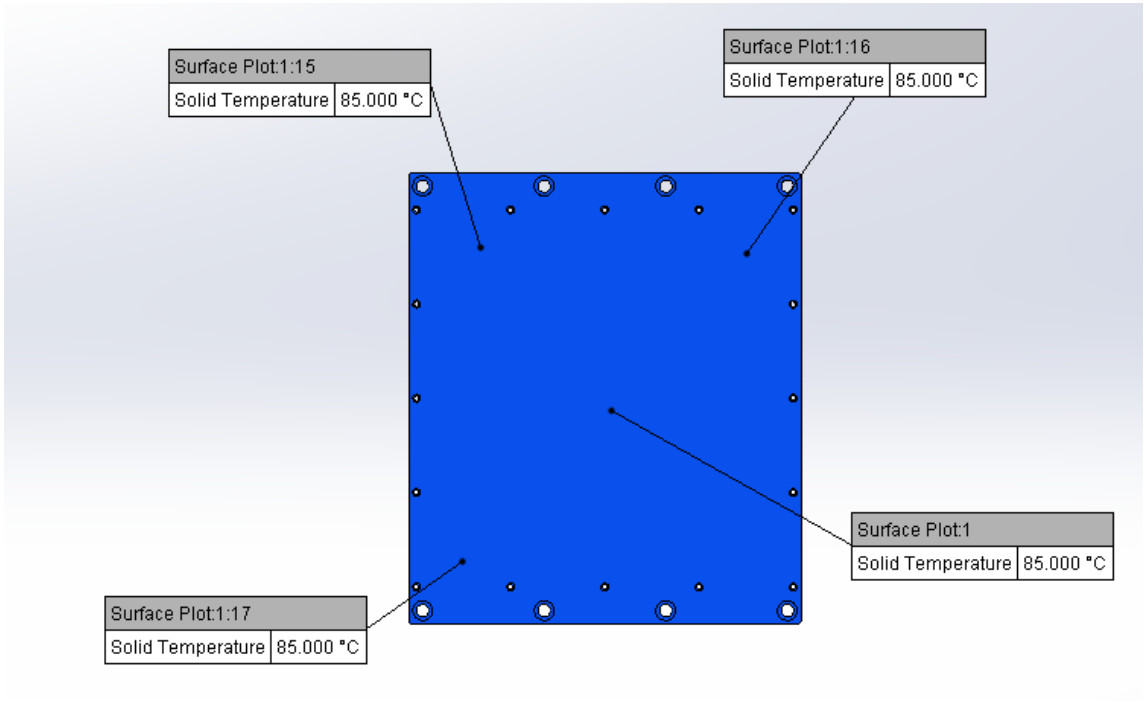


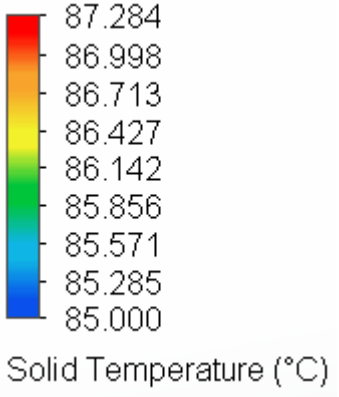
Bottom Side



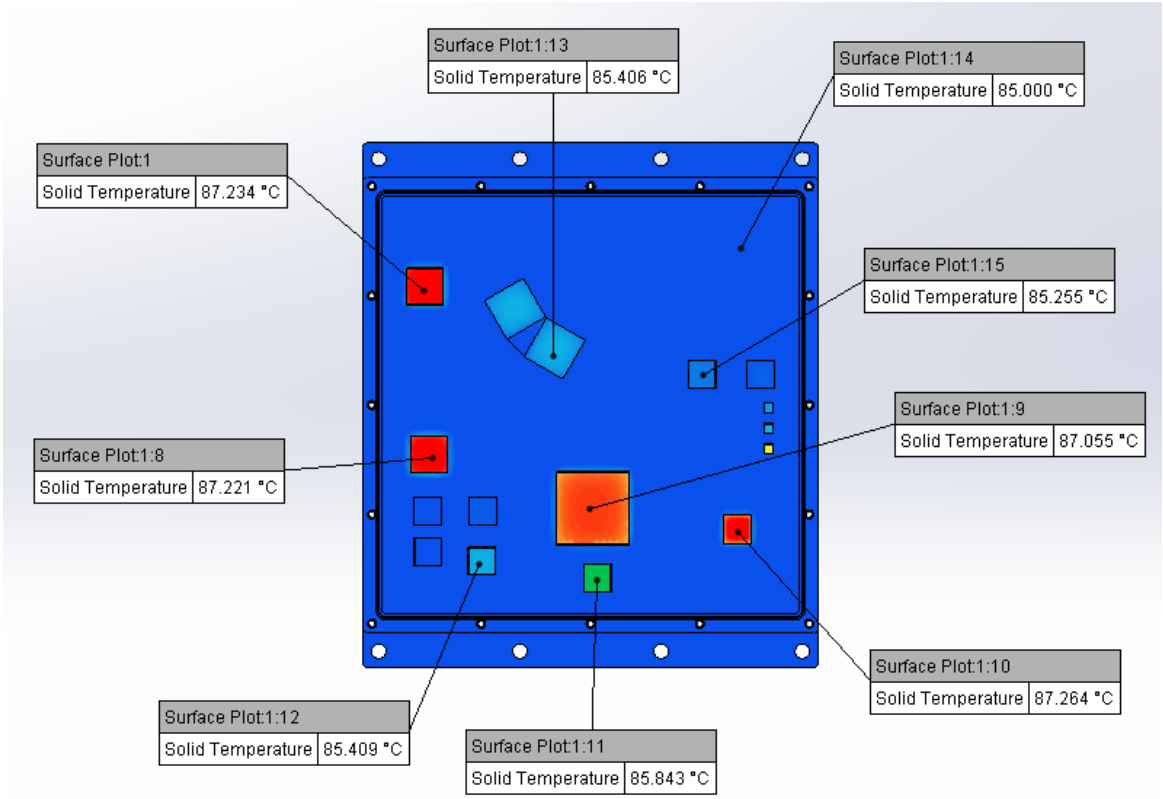
Rear Cover Temperature Plot

85°C , sea level





Top Side



Bottom Side

Sim 5
60 C Ambient, Vertical, Sea Level
Al 6061 T6 Enclosure
Worst Case Power

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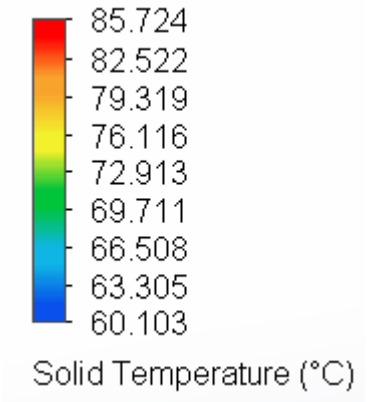
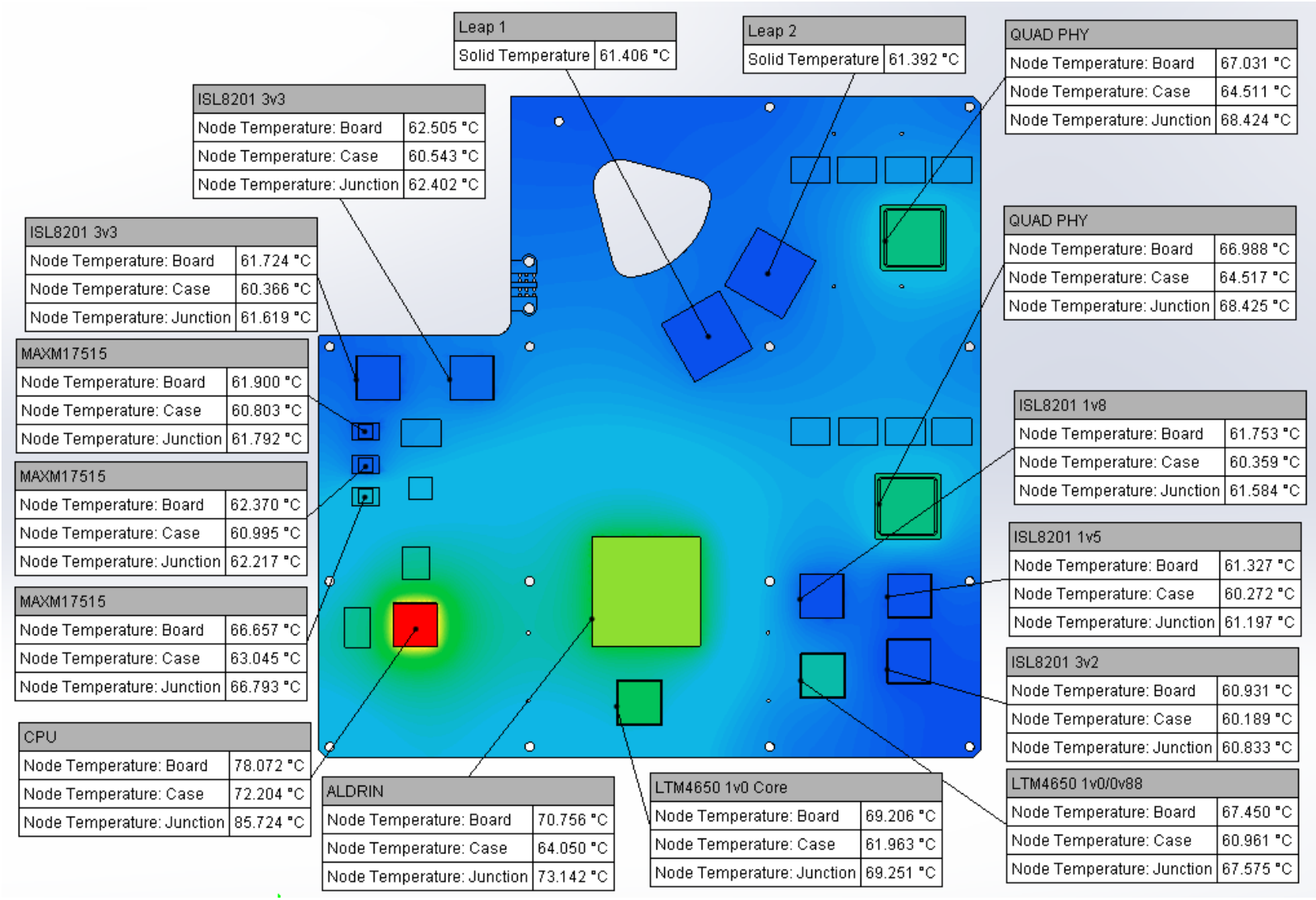
Results Summary –Temperature Cases

Al 6061 T6 Enclosure						
Parameters				Sim 5		
Power Scenario				**Worst Case**		
Cooling Rail Temperature °C				60		
Ambient Temp., °C				60		
Elevation, ft				0		
RESULTS						
Component	**Min. Limit, °C**	**Max. Limit, °C**	**Limit Type**	**Power, W**	**Result, °C**	**Margin, °C**
Aldrin	-40	110	junction	46.864	73.1	36.9
Marvel 88X3340 Quad PHY	-40	105	Junction	13.582	68.4	36.6
Marvel 88X3340 Quad PHY	-40	105	Junction	13.582	68.4	36.6
DCM3414	-40	125	Junction	10.499	79.7	45.3
LEAP	0	70	Case	7.9	61.4	8.6
LEAP	0	70	Case	7.9	61.4	8.6
CPU	-40	115	junction	7.771	85.7	29.3
LTM4650 ALD_CORE_1V0	-40	125	junction	3.7	69.2	55.8
LTM4650 1V0_PHY_CORE_0V88	-40	125	junction	1.871	67.6	57.4
MFM1714 28V Filter	-55	125	junction	1.272	72.1	52.9
ISL8201M 3V3	-55	125	Junction	0.8	61.6	63.4
MAXM17515 CPU_CORE_1V08	-40	125	Junction	0.716	66.8	58.2
ISL8201M ALD_PHY_INPHI_1V8	-55	125	junction	0.4	61.6	63.4
ISL8201M PHY_AVDD_1V5	-55	125	junction	0.3	61.2	63.8
ISL8201M CPU Supplies	-55	125	junction	0.494	61.6	63.4
ISL8201M PHY_AVDD_2V3	-55	125	junction	0.2	60.8	64.2
MAXM17515 CPU_VDDM1V5	-40	125	junction	0.102	62.2	62.8
MAXM17515 CPU_ALD_3V3	-40	125	Junction	0.093	61.8	63.2

Large PCB Components Temperature Plot

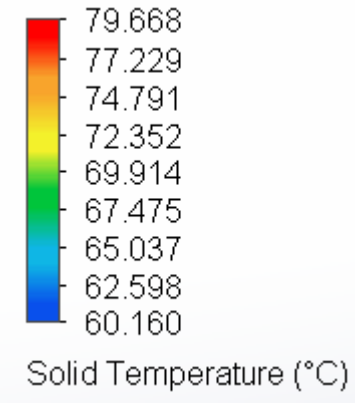
60°C , sea level

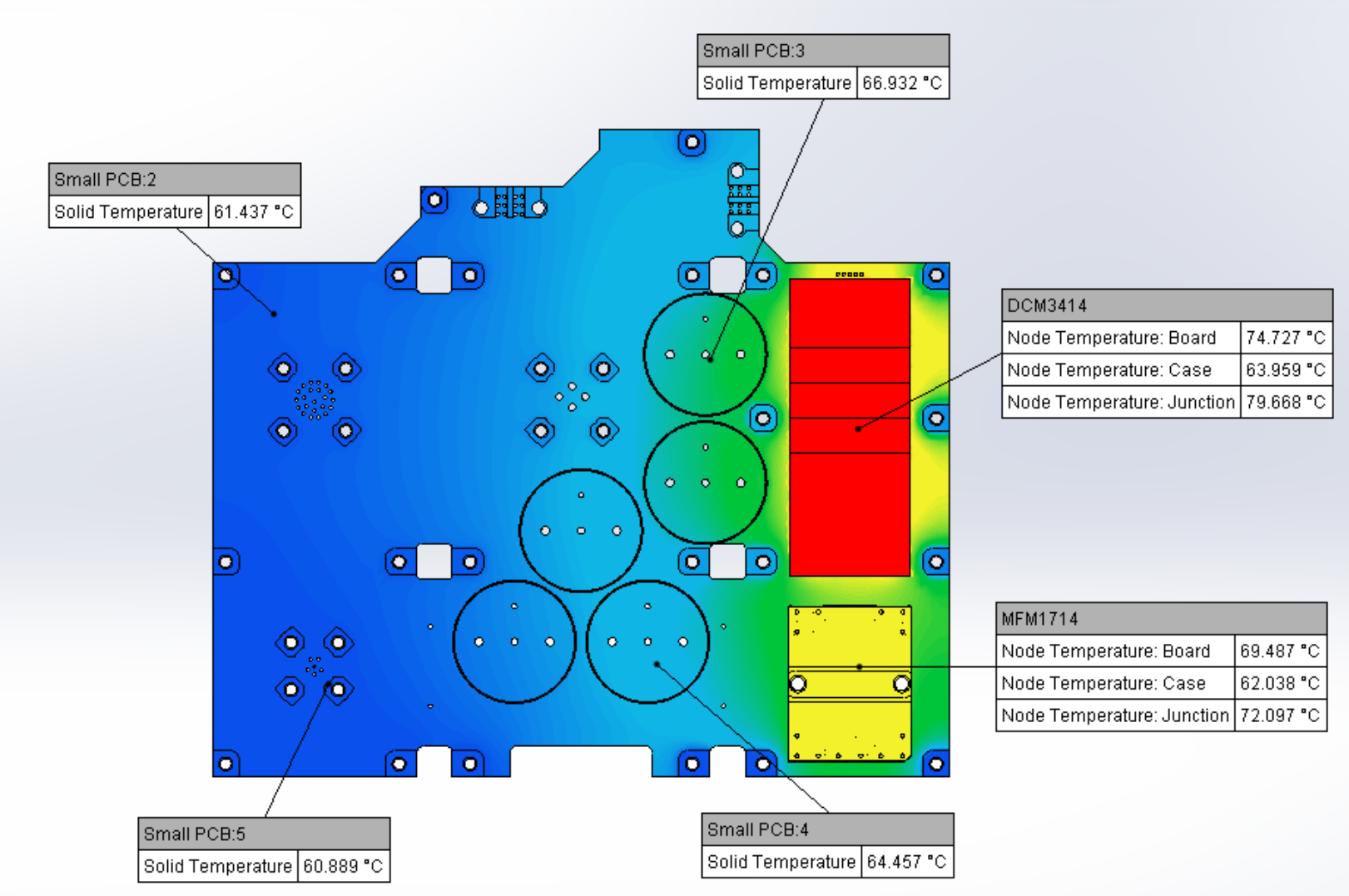




Small PCB Components Temperature Plot

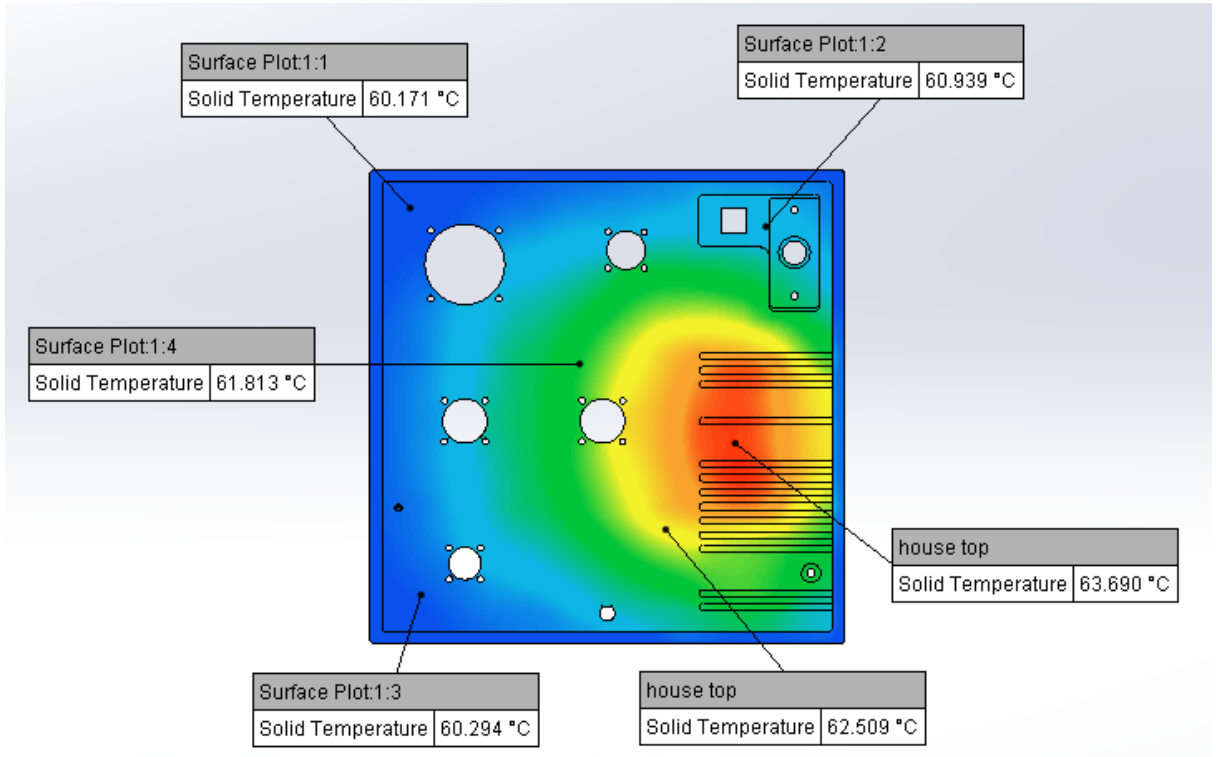
60°C , sea level



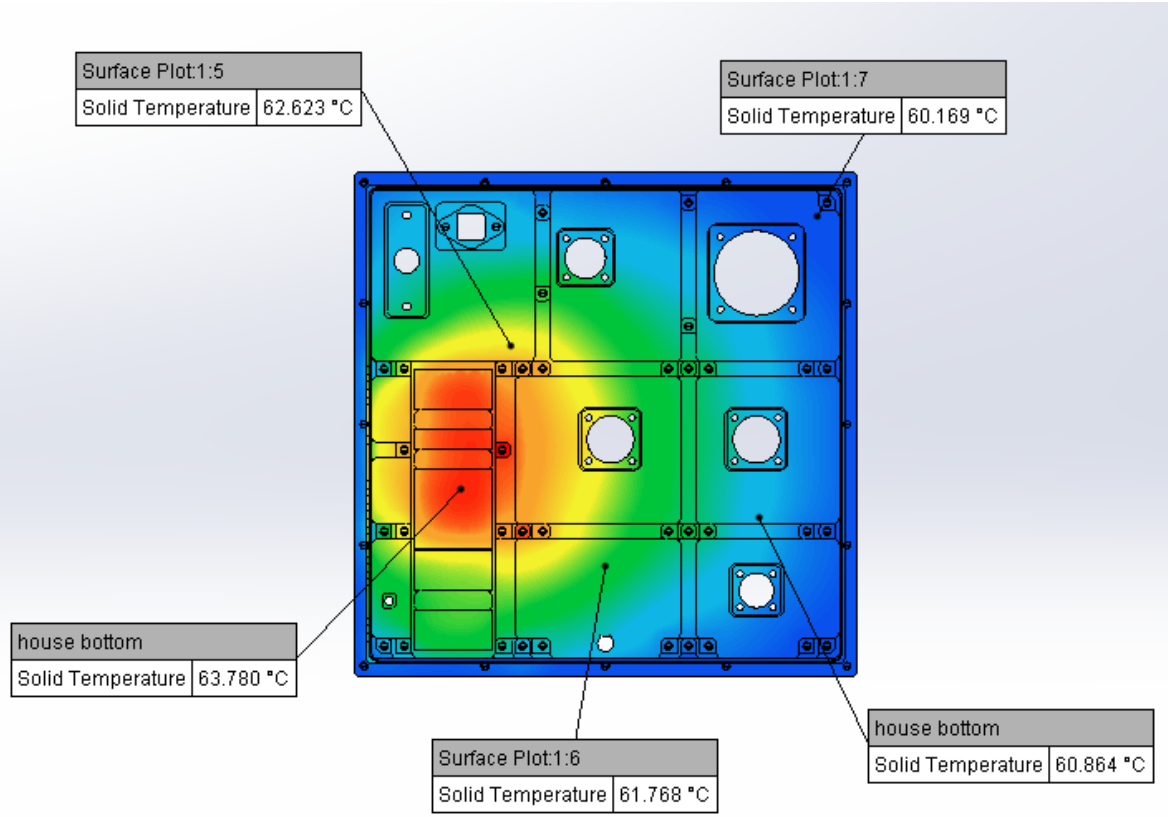


Housing Surface Temperature Plot

60°C , sea level



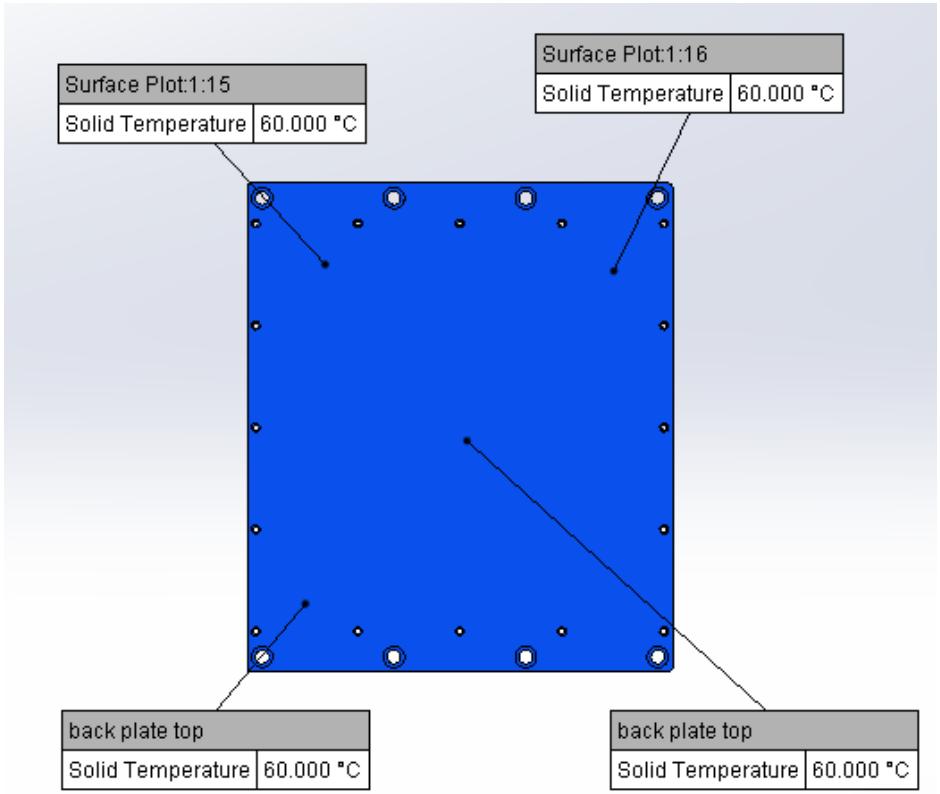
Top Side



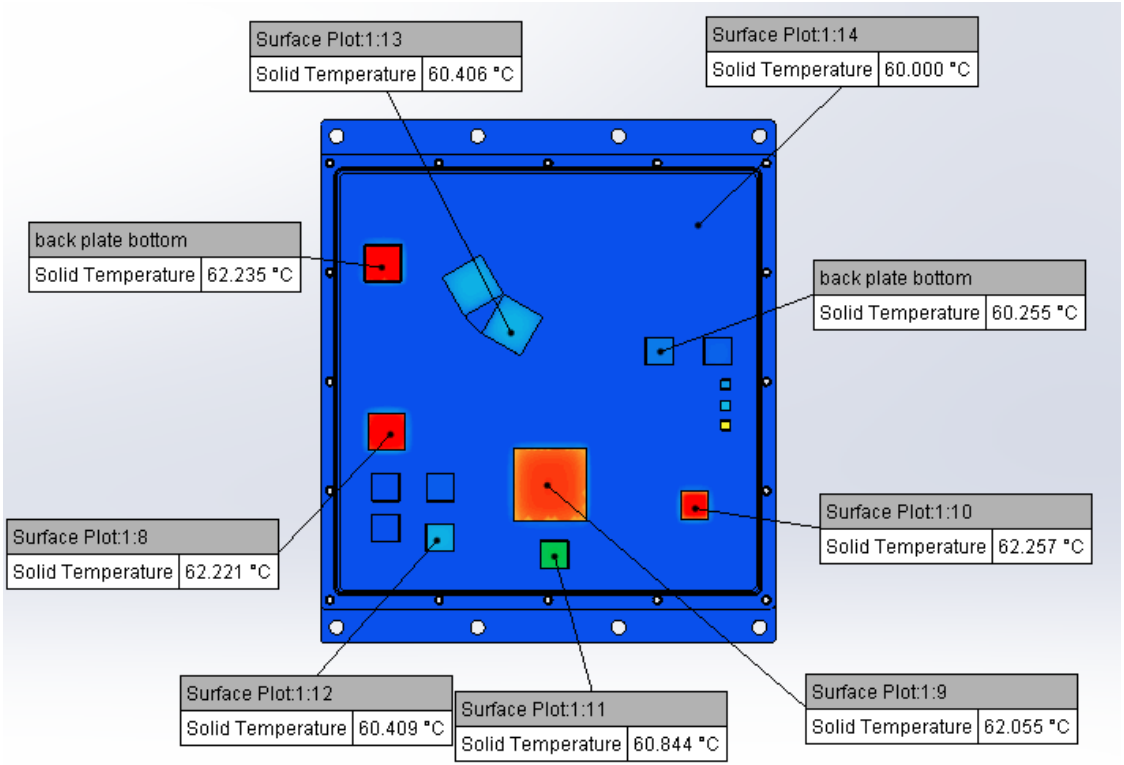
Bottom Side

Rear Cover Temperature Plot

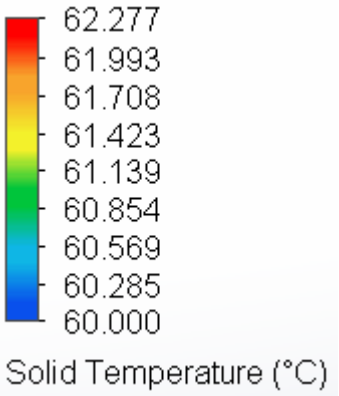
60°C , sea level



Top Side



Bottom Side



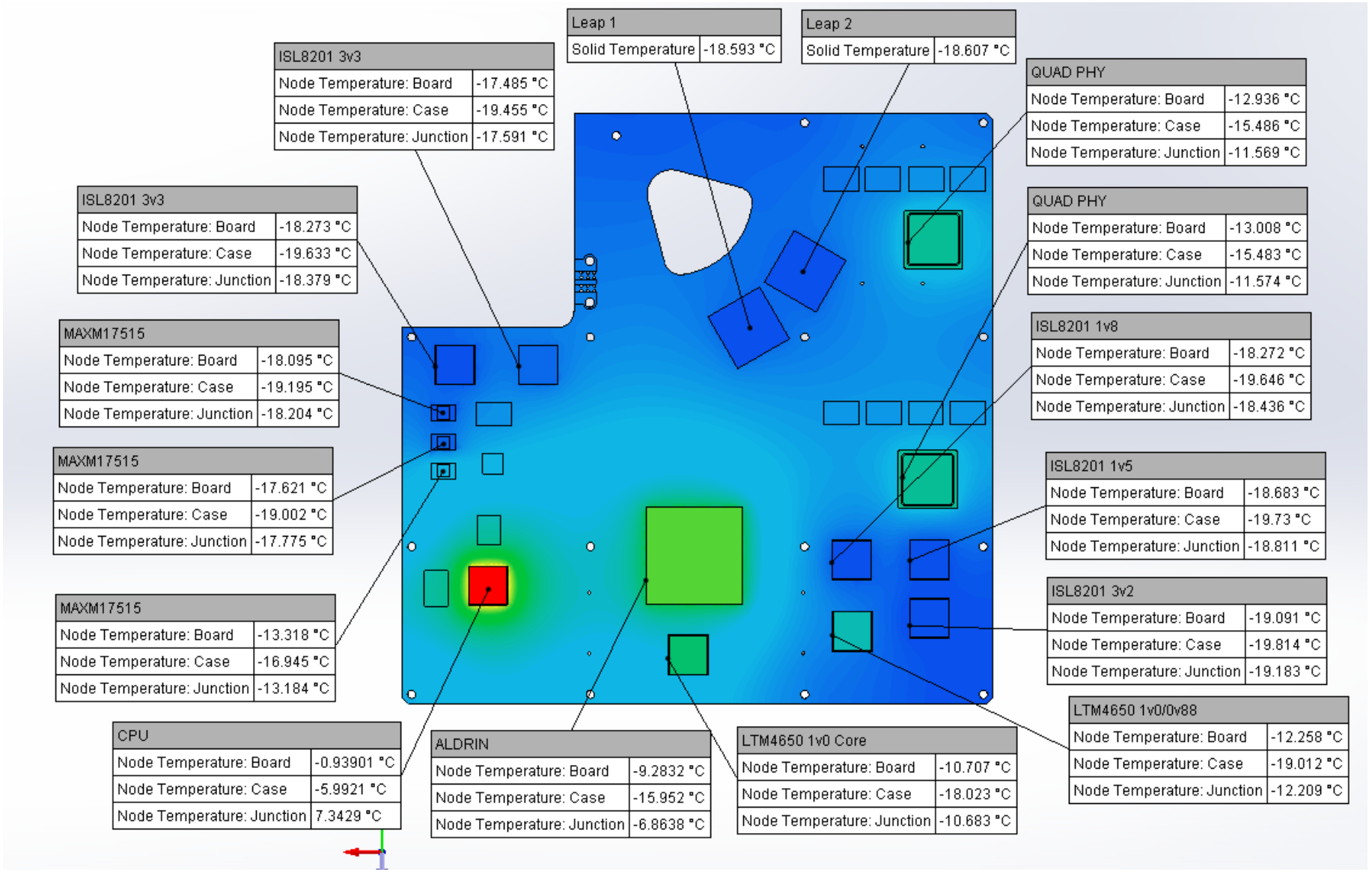
Sim 3
-20 C Ambient, Vertical, Sea Level
Al 6061 T6 Enclosure
Worst Case Power

Results Summary –Temperature Cases

Al 6061 T6 Enclosure						
Parameters				Sim 3		
Power Scenario				**Worst Case**		
Cooling Rail Temperature °C				-20		
Ambient Temp., °C				-20		
Elevation, ft				0		
RESULTS						
Component	**Min. Limit, °C**	**Max. Limit, °C**	**Limit Type**	**Power, W**	**Result, °C**	**Margin from Minimum, °C**
Aldrin	-40	110	junction	46.864	-6.8	33.2
Marvel 88X3340 Quad PHY	-40	105	Junction	13.582	-11.5	28.5
Marvel 88X3340 Quad PHY	-40	105	Junction	13.582	-11.5	28.5
DCM3414	-40	125	Junction	10.499	-0.3	39.7
LEAP	0	70	Case	7.9	-18.6	7.9
LEAP	0	70	Case	7.9	-18.6	7.9
CPU	-40	115	junction	7.771	7.3	47.3
LTM4650 ALD_CORE_1V0	-40	125	junction	3.7	-10.6	29.4
LTM4650 1V0_PHY_CORE_0V88	-40	125	junction	1.871	-12.2	27.8
MFM1714 28V Filter	-55	125	junction	1.272	-8.0	47.0
ISL8201M 3V3	-55	125	Junction	0.8	-17.5	37.5
MAXM17515 CPU_CORE_1V08	-40	125	Junction	0.716	-13.1	26.9
ISL8201M ALD_PHY_INPHI_1V8	-55	125	junction	0.4	-18.4	36.6
ISL8201M PHY_AVDD_1V5	-55	125	junction	0.3	-18.8	36.2
ISL8201M CPU Supplies	-55	125	junction	0.494	-18.3	36.7
ISL8201M PHY_AVDD_2V3	-55	125	junction	0.2	-19.1	35.9
MAXM17515 CPU_VDDM1V5	-40	125	junction	0.102	-17.7	22.3
MAXM17515 CPU_ALD_3V3	-40	125	Junction	0.093	-18.2	21.8

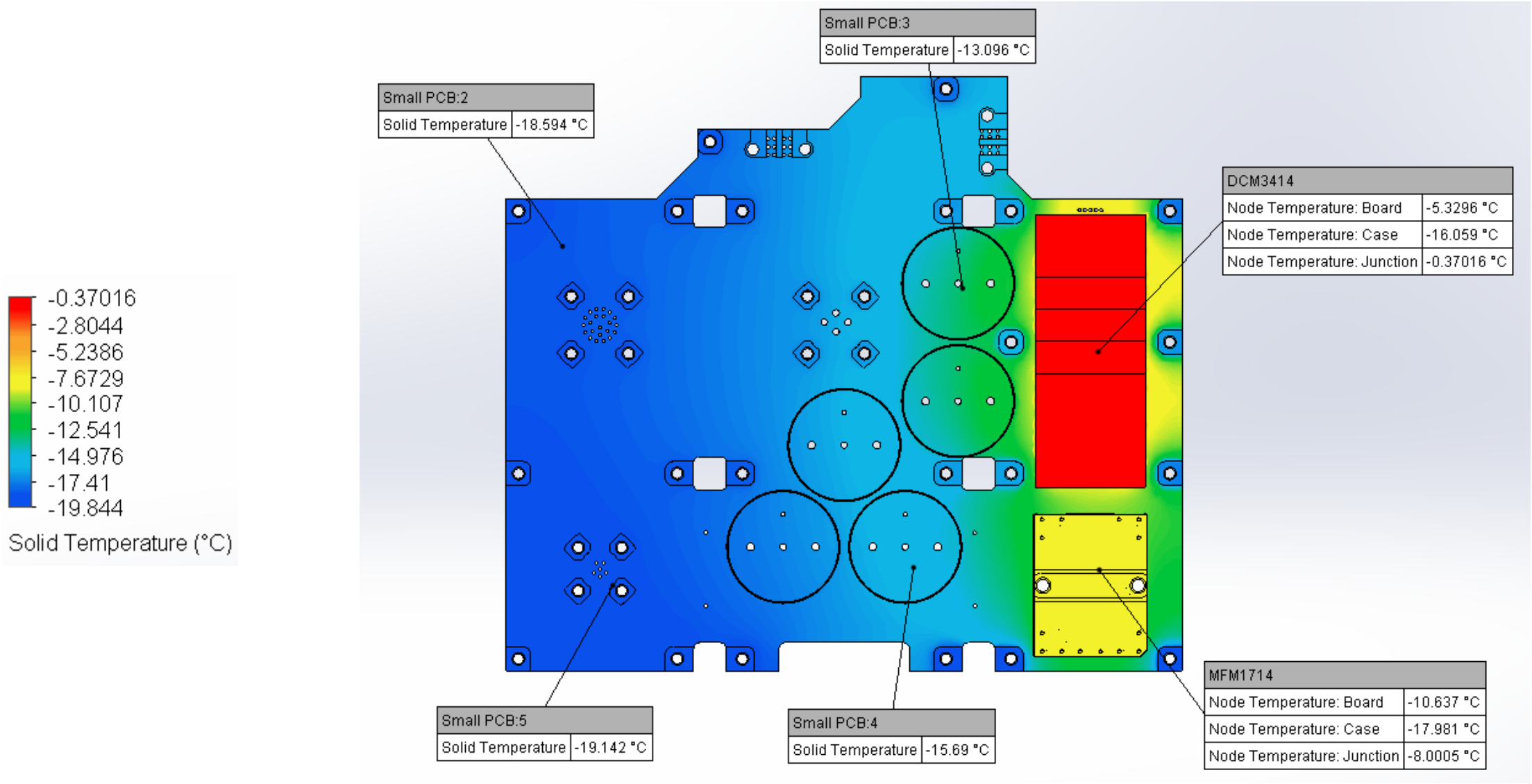
Large PCB Components Temperature Plot

-20°C , sea level



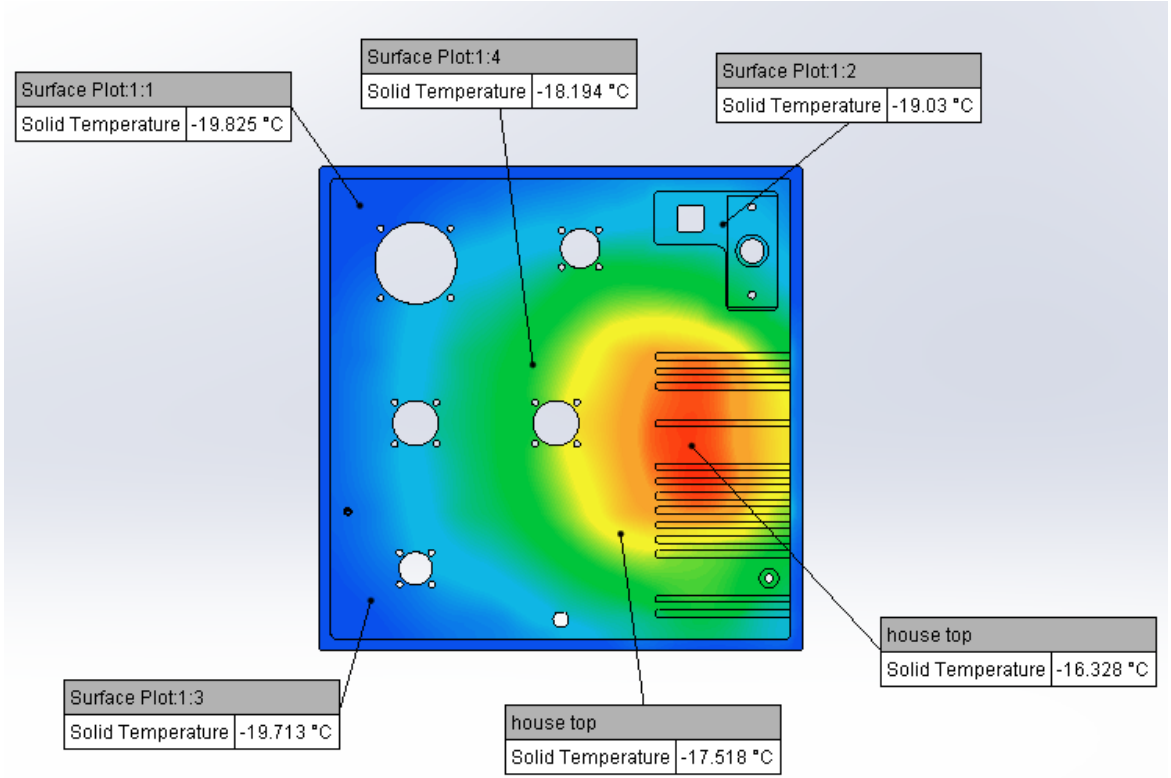
Small PCB Components Temperature Plot

-20°C , sea level

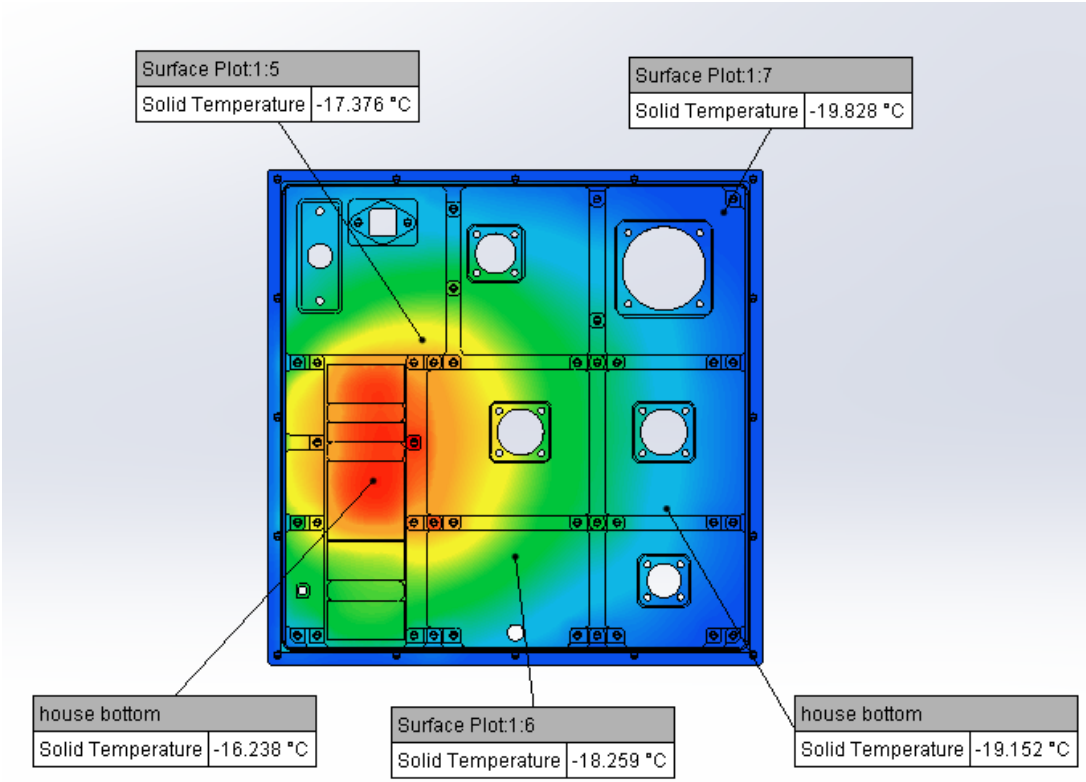


Housing Surface Temperature Plot

-20°C , sea level



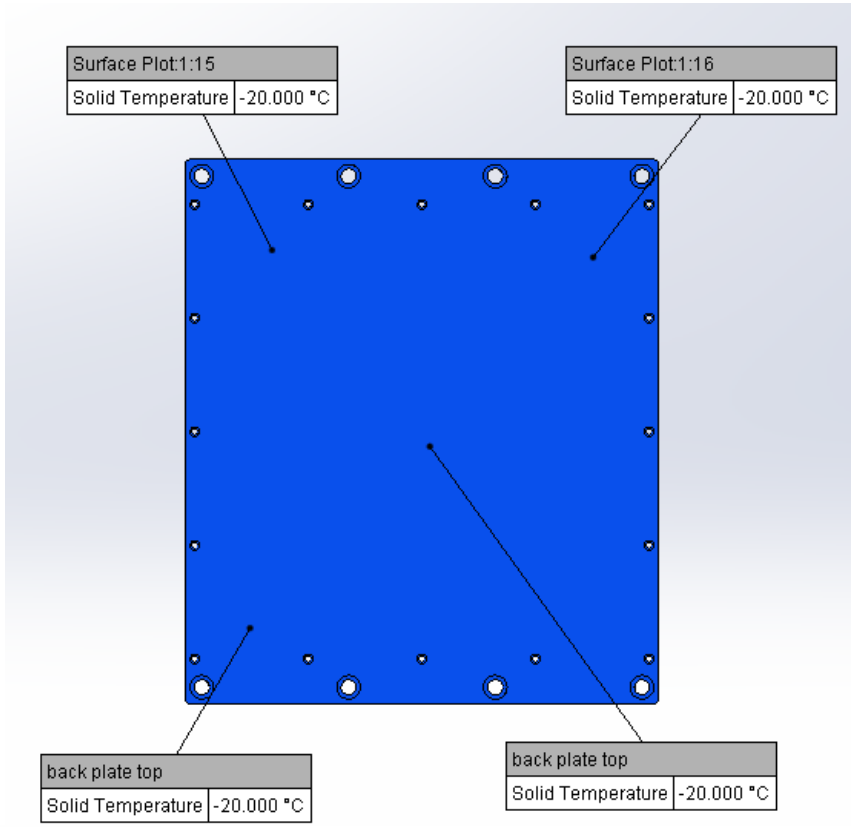
Top Side



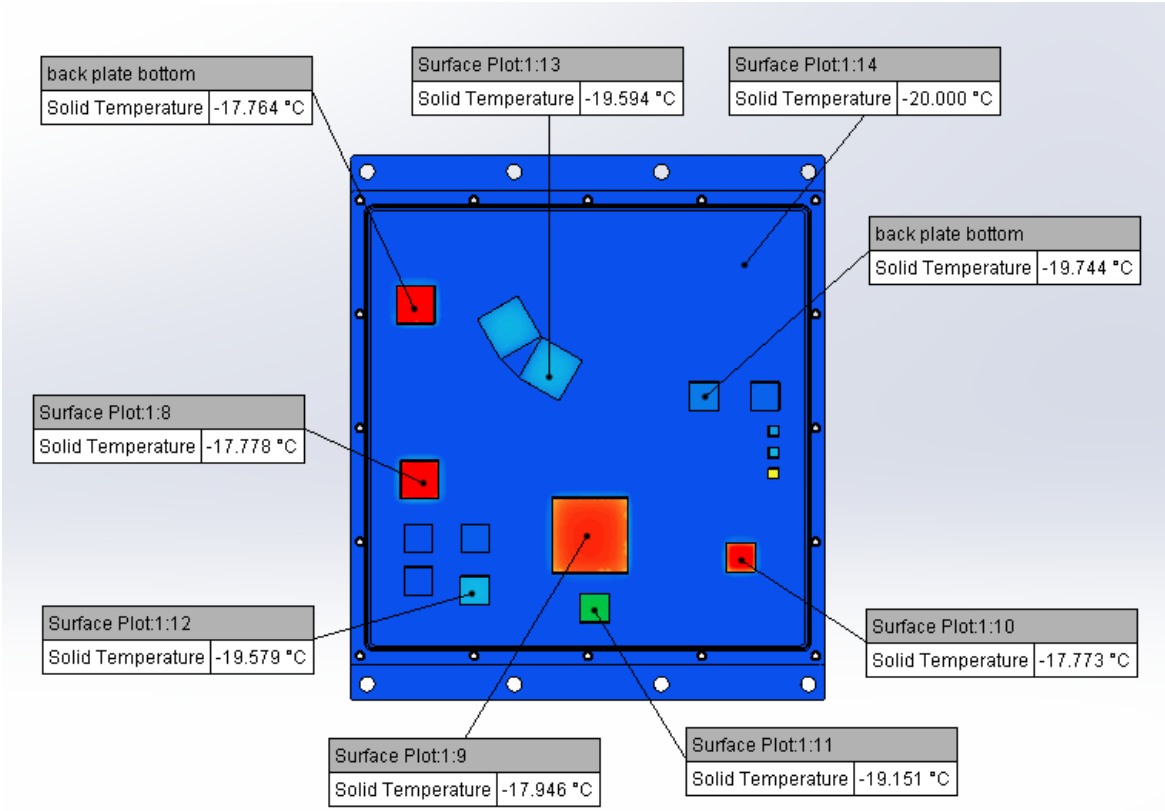
Bottom Side

Rear Cover Temperature Plot

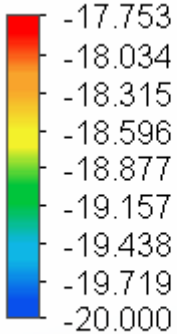
-20°C , sea level



Top Side



Bottom Side



Sim 9
-40 C Ambient, Vertical, 31000 ft
Al 6061 T6 Enclosure
Worst Case Power

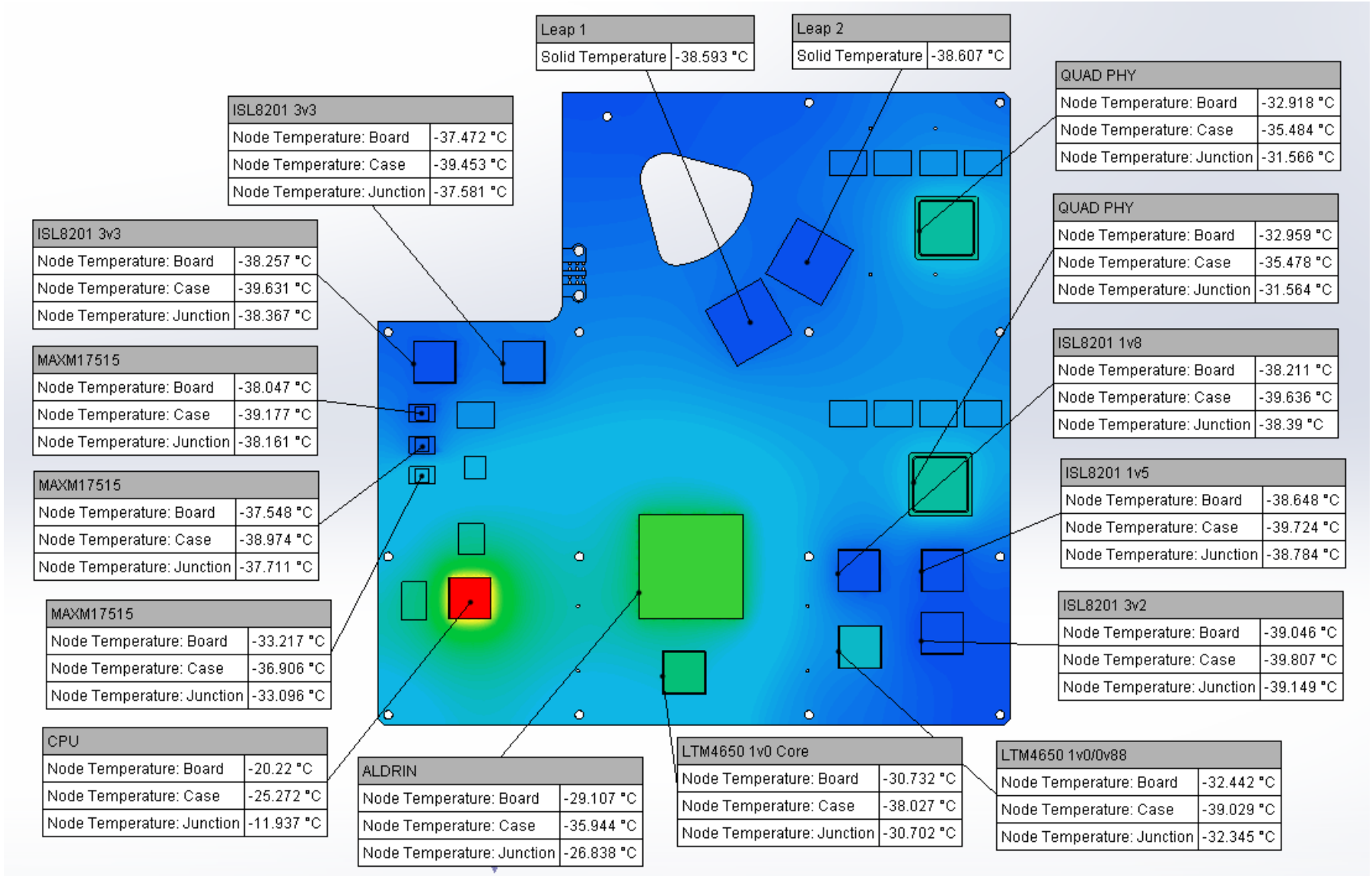
ElectronicCooling Solutions inc

Results Summary –Temperature Cases

Al 6061 T6 Enclosure						
Parameters				Sim 9		
Power Scenario				**Worst Case**		
Cooling Rail Temperature °C				-40		
Ambient Temp., °C				-40		
Elevation, ft				31000		
RESULTS						
Component	**Min. Limit, °C**	**Max. Limit, °C**	**Limit Type**	**Power, W**	**Result, °C**	**Margin from Minimum, °C**
Aldrin	-40	110	junction	46.864	-26.8	13.2
Marvel 88X3340 Quad PHY	-40	105	Junction	13.582	-31.5	8.5
Marvel 88X3340 Quad PHY	-40	105	Junction	13.582	-31.5	8.5
DCM3414	-40	125	Junction	10.499	-20.2	19.8
LEAP	0	70	Case	7.9	-38.5	-38.5
LEAP	0	70	Case	7.9	-38.6	-38.6
CPU	-40	115	junction	7.771	-11.9	28.1
LTM4650 ALD_CORE_1V0	-40	125	junction	3.7	-30.7	9.3
LTM4650 1V0_PHY_CORE_0V88	-40	125	junction	1.871	-32.3	7.7
MFM1714 28V Filter	-55	125	junction	1.272	-27.6	27.4
ISL8201M 3V3	-55	125	Junction	0.8	-37.5	17.5
MAXM17515 CPU_CORE_1V08	-40	125	Junction	0.716	-33.0	7.0
ISL8201M ALD_PHY_INPHI_1V8	-55	125	junction	0.4	-38.3	16.7
ISL8201M PHY_AVDD_1V5	-55	125	junction	0.3	-38.7	16.3
ISL8201M CPU Supplies	-55	125	junction	0.494	-38.3	16.7
ISL8201M PHY_AVDD_2V3	-55	125	junction	0.2	-39.1	15.9
MAXM17515 CPU_VDDM1V5	-40	125	junction	0.102	-37.7	2.3
MAXM17515 CPU_ALD_3V3	-40	125	Junction	0.093	-38.1	1.9

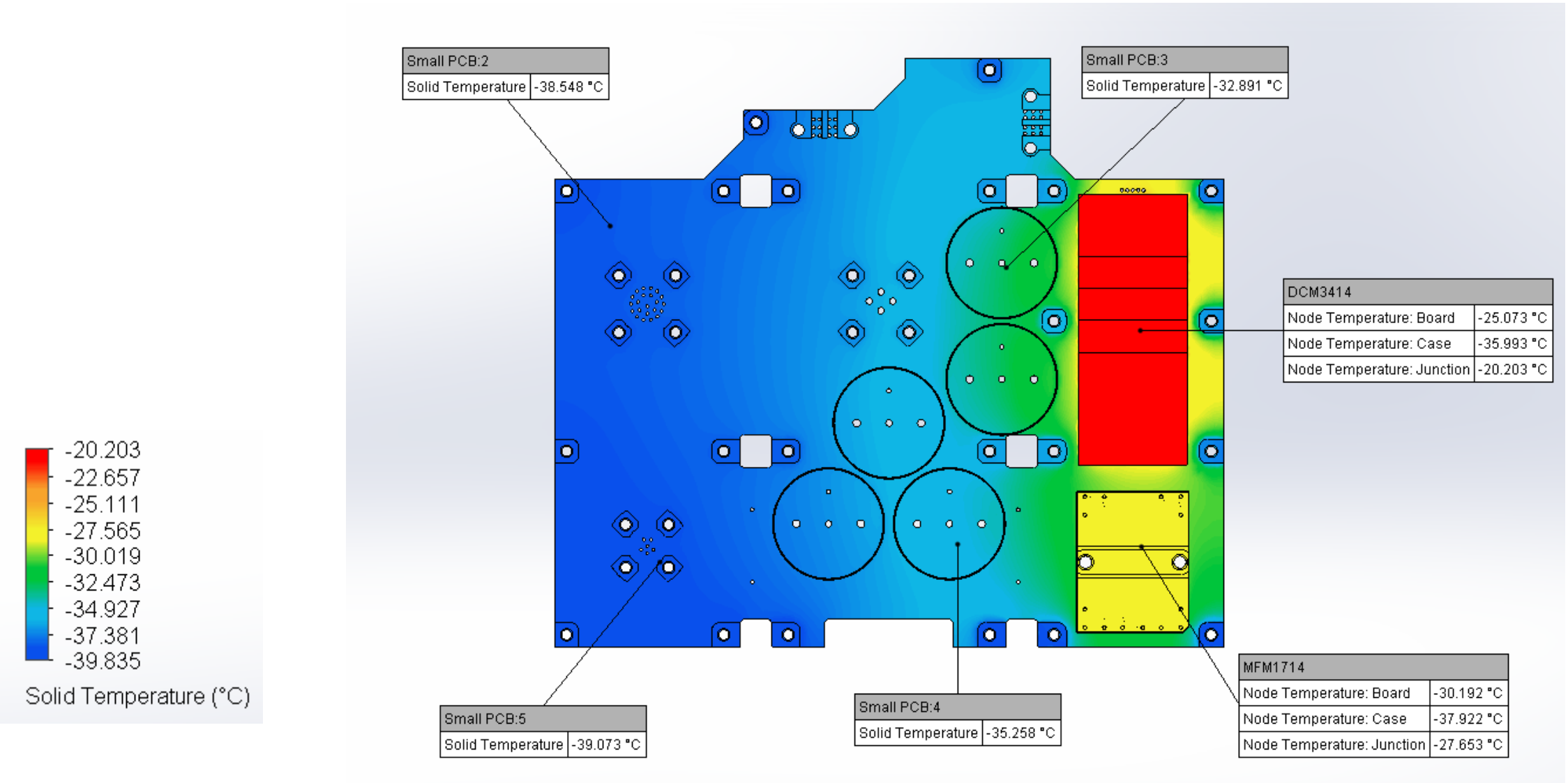
Large PCB Components Temperature Plot

-40°C , sea level



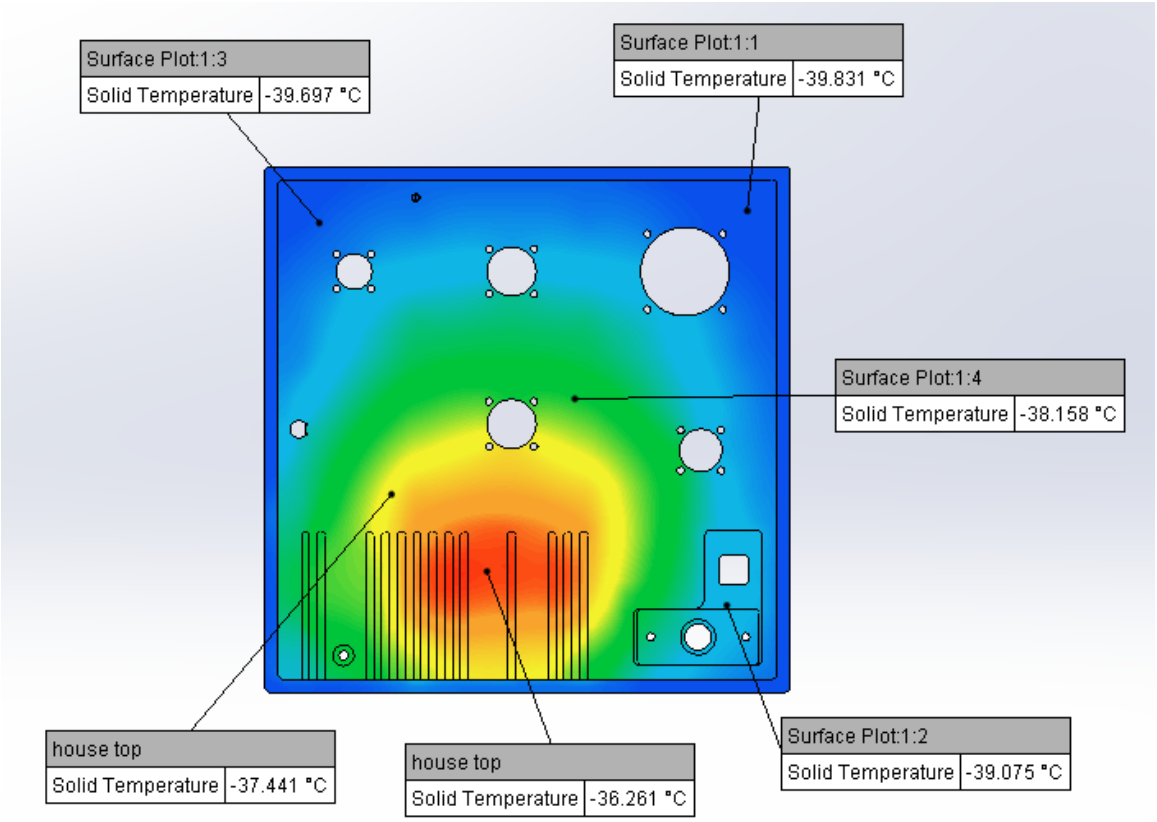
Small PCB Components Temperature Plot

-40°C , sea level

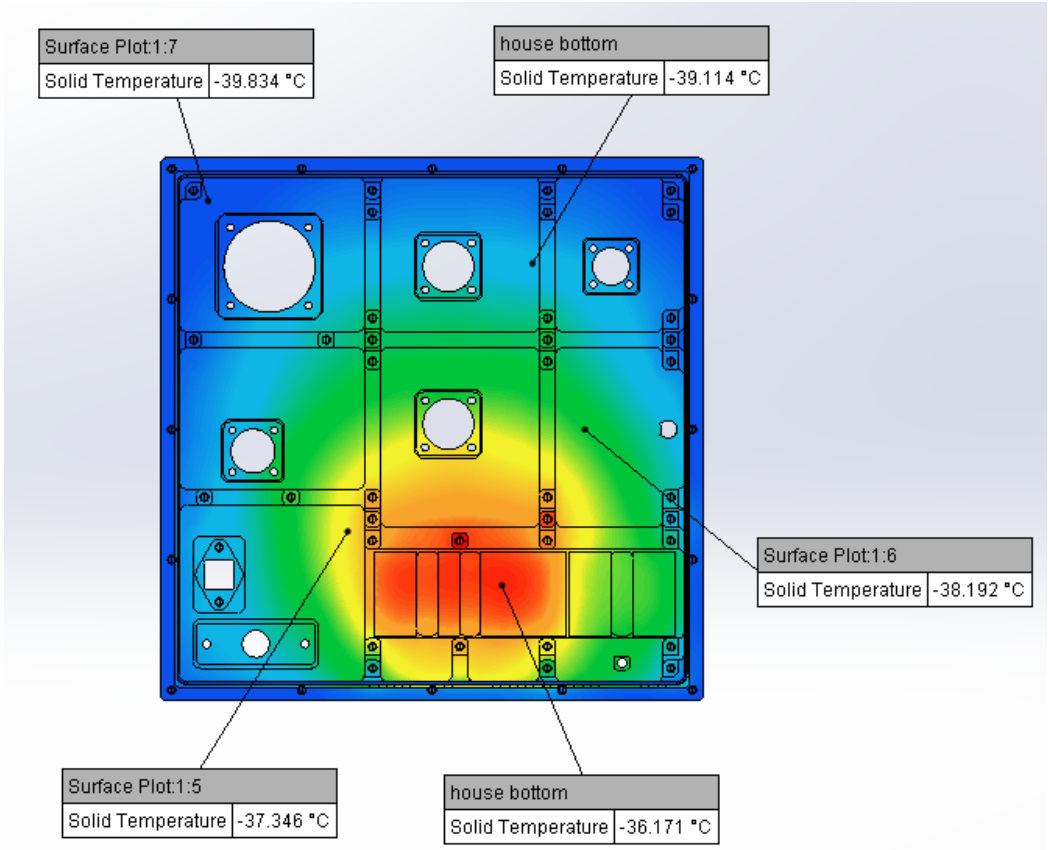


Housing Surface Temperature Plot

-40°C , sea level



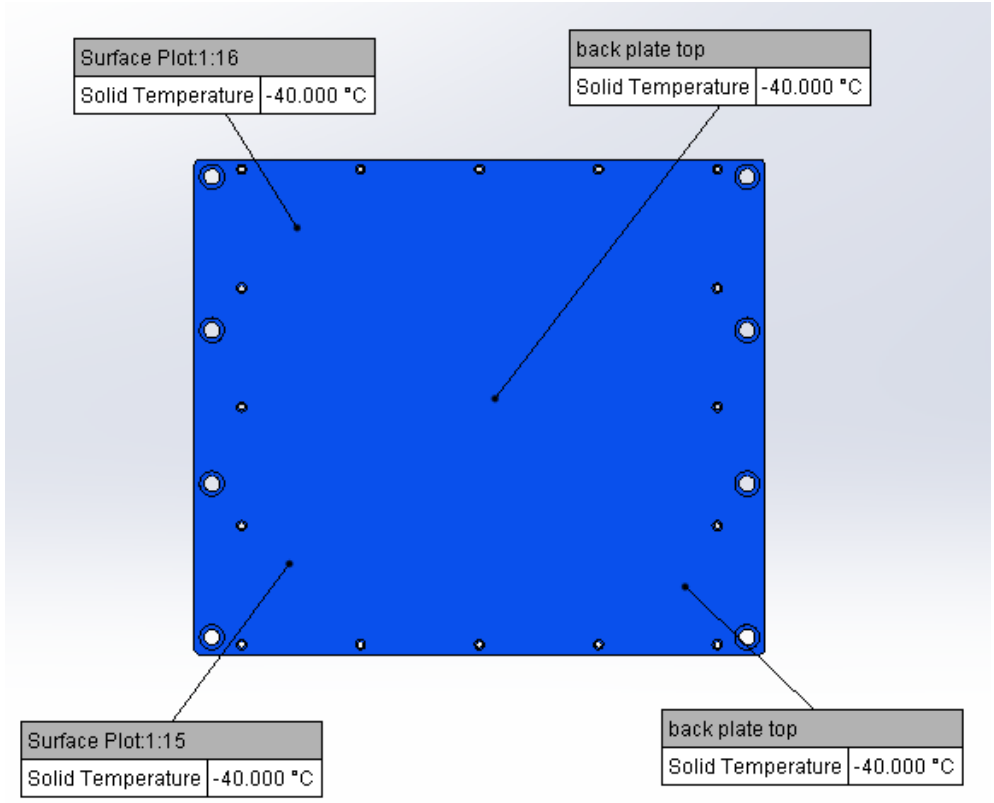
Top Side



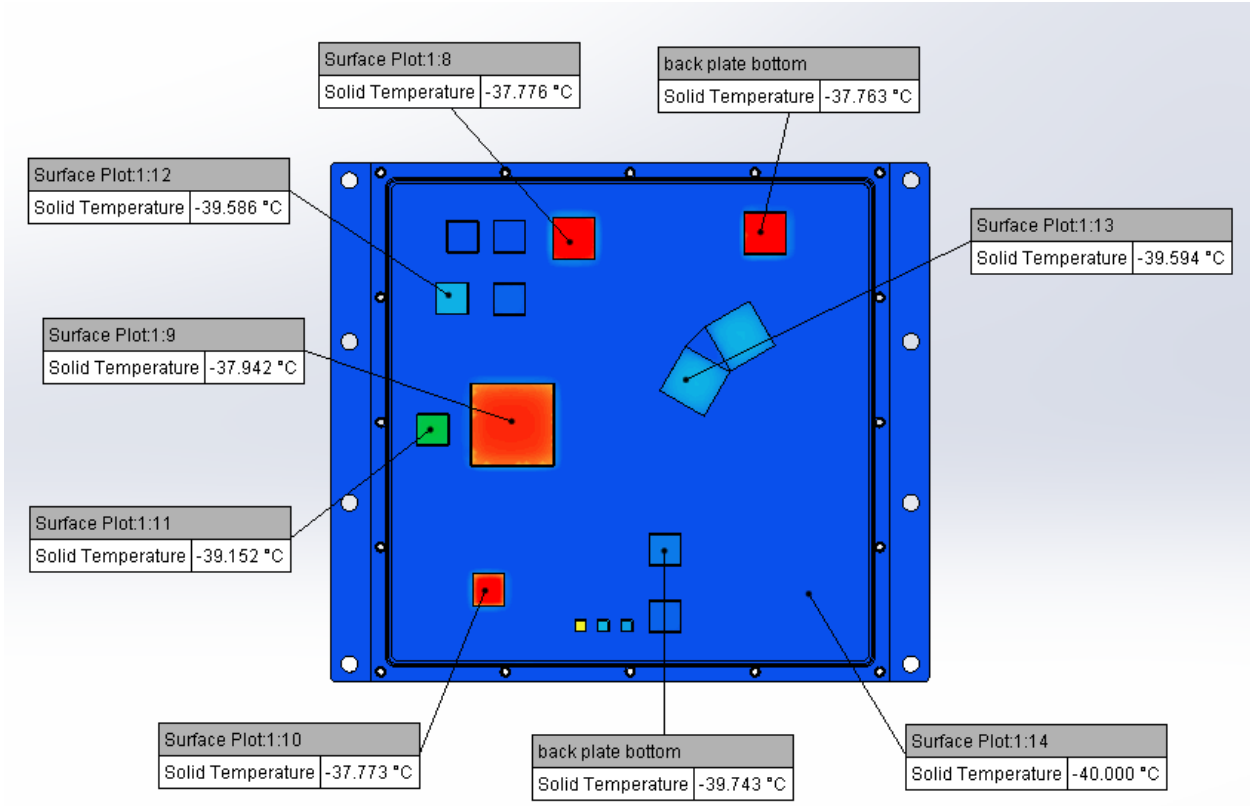
Bottom Side

Rear Cover Temperature Plot

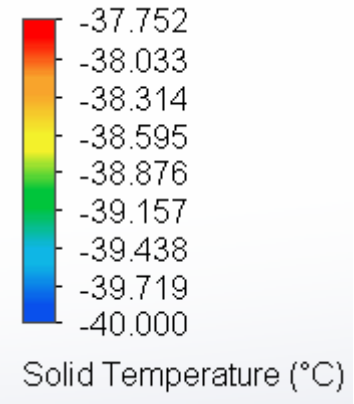
-40°C , sea level



Top Side



Bottom Side



Sim 11
32 C Ambient, Vertical, 31000 ft
Al 6061 T6 Enclosure
Worst Case Power

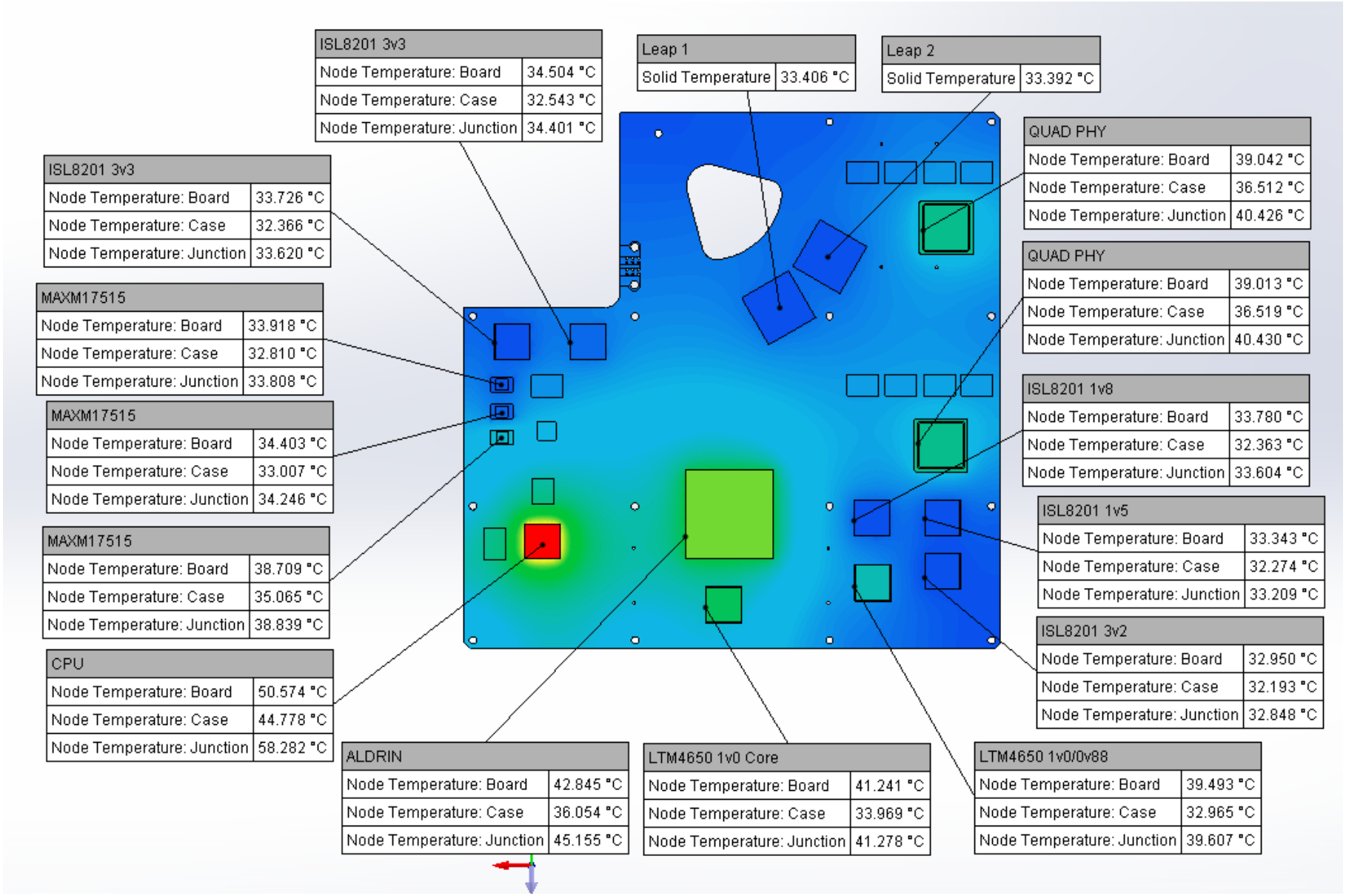
ElectronicCooling Solutions inc

Results Summary –Temperature Cases

Al 6061 T6 Enclosure						
Parameters				Sim 11		
Power Scenario				**Worst Case**		
Cooling Rail Temperature °C				32		
Ambient Temp., °C				32		
Elevation, ft				31000		
RESULTS						
Component	**Min. Limit, °C**	**Max. Limit, °C**	**Limit Type**	**Power, W**	**Result, °C**	**Margin, °C**
Aldrin	-40	110	junction	46.864	45.1	64.9
Marvel 88X3340 Quad PHY	-40	105	Junction	13.582	40.4	64.6
Marvel 88X3340 Quad PHY	-40	105	Junction	13.582	40.4	64.6
DCM3414	-40	125	Junction	10.499	51.7	73.3
LEAP	0	70	Case	7.9	33.4	36.6
LEAP	0	70	Case	7.9	33.3	36.7
CPU	-40	115	junction	7.771	58.3	56.7
LTM4650 ALD_CORE_1V0	-40	125	junction	3.7	41.3	83.7
LTM4650 1V0_PHY_CORE_0V88	-40	125	junction	1.871	39.6	85.4
MFM1714 28V Filter	-55	125	junction	1.272	44.3	80.7
ISL8201M 3V3	-55	125	Junction	0.8	34.4	90.6
MAXM17515 CPU_CORE_1V08	-40	125	Junction	0.716	38.8	86.2
ISL8201M ALD_PHY_INPHI_1V8	-55	125	junction	0.4	33.6	91.4
ISL8201M PHY_AVDD_1V5	-55	125	junction	0.3	33.2	91.8
ISL8201M CPU Supplies	-55	125	junction	0.494	33.6	91.4
ISL8201M PHY_AVDD_2V3	-55	125	junction	0.2	32.8	92.2
MAXM17515 CPU_VDDM1V5	-40	125	junction	0.102	34.2	90.8
MAXM17515 CPU_ALD_3V3	-40	125	Junction	0.093	33.8	91.2

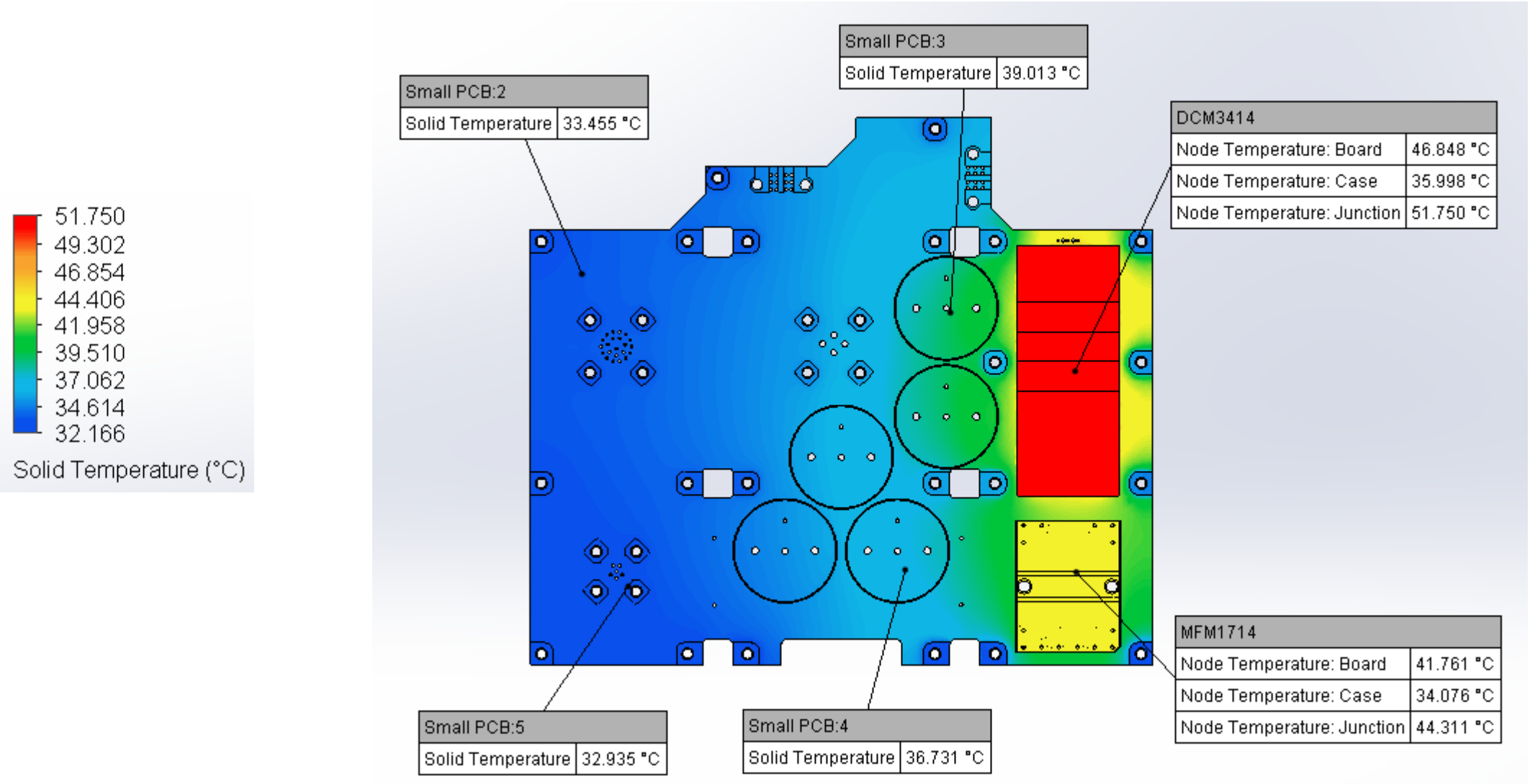
Large PCB Components Temperature Plot

32°C , sea level



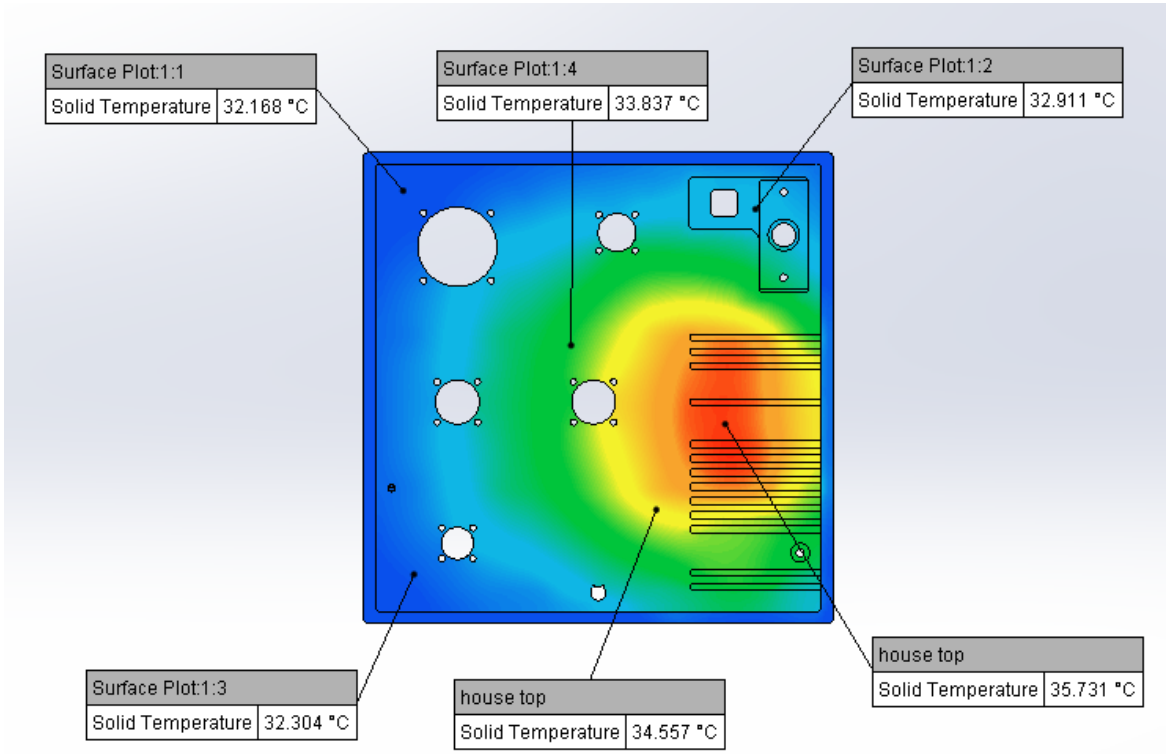
Small PCB Components Temperature Plot

32°C , sea level

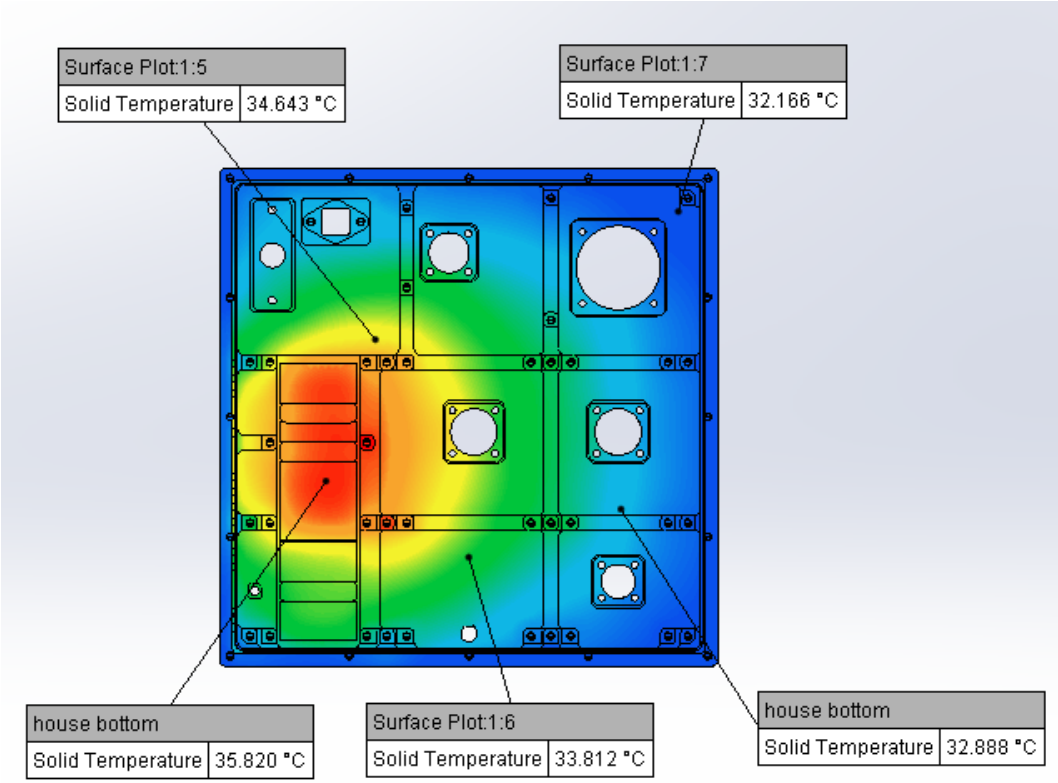


Housing Surface Temperature Plot

32°C , sea level



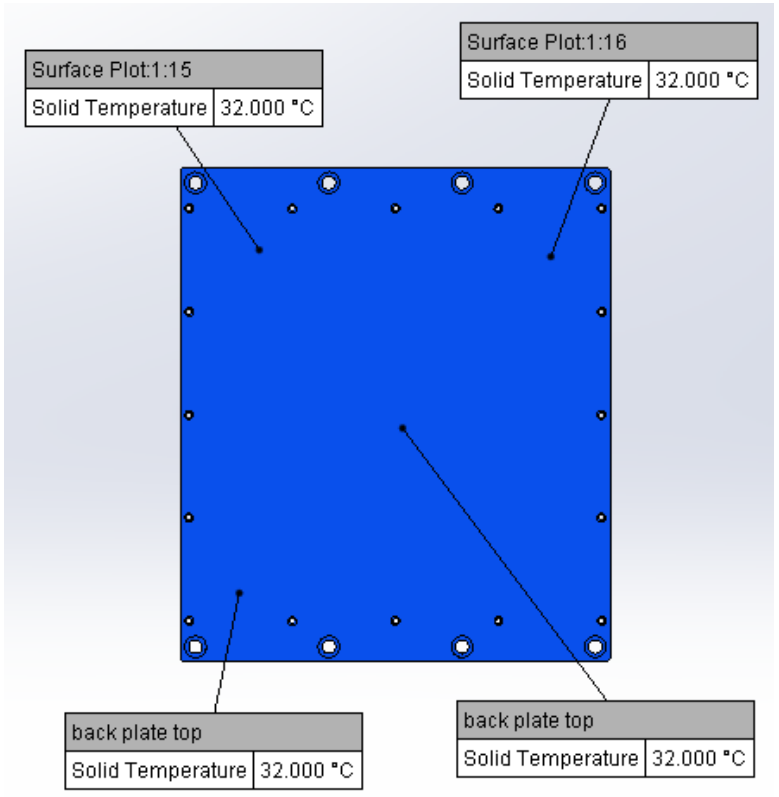
Top Side



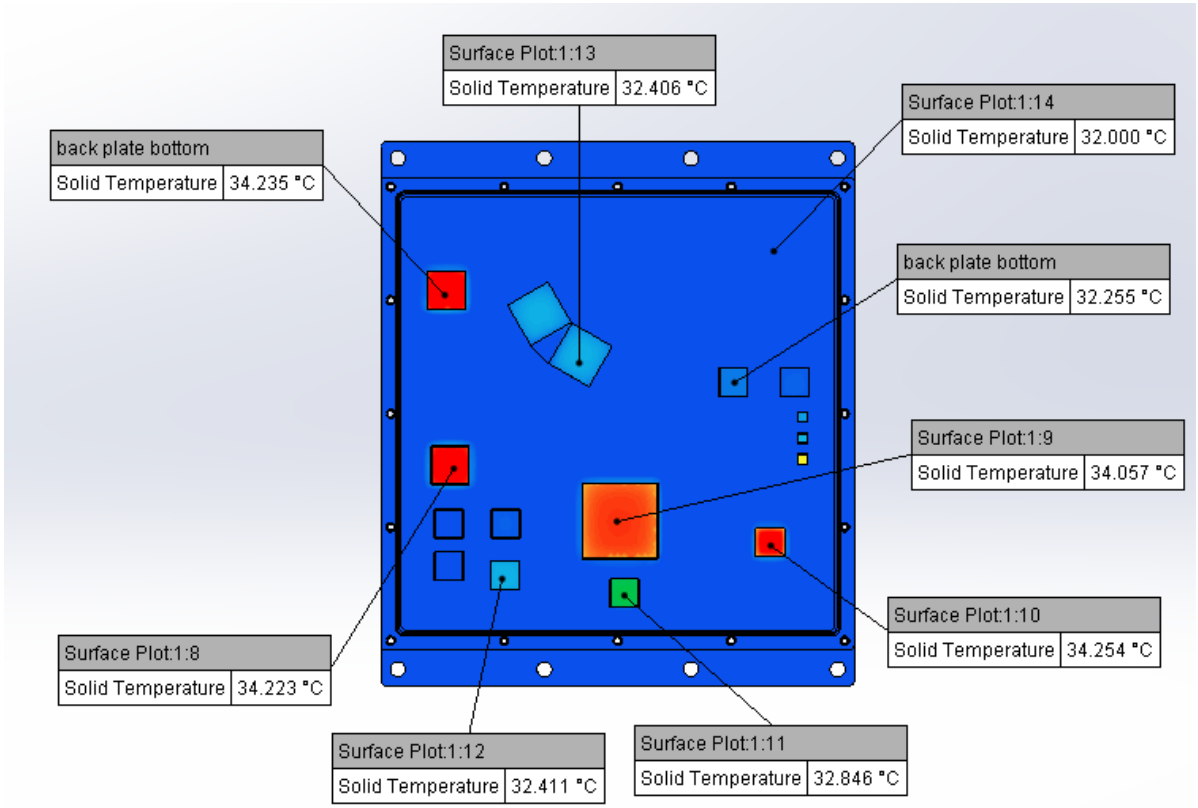
Bottom Side

Rear Cover Temperature Plot

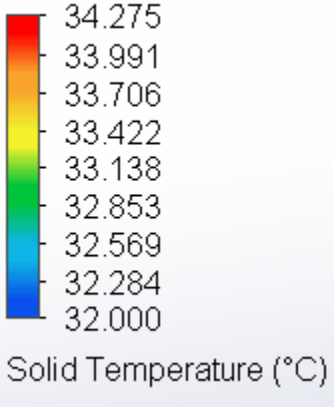
32°C , sea level



Top Side



Bottom Side



Predicted Power Results

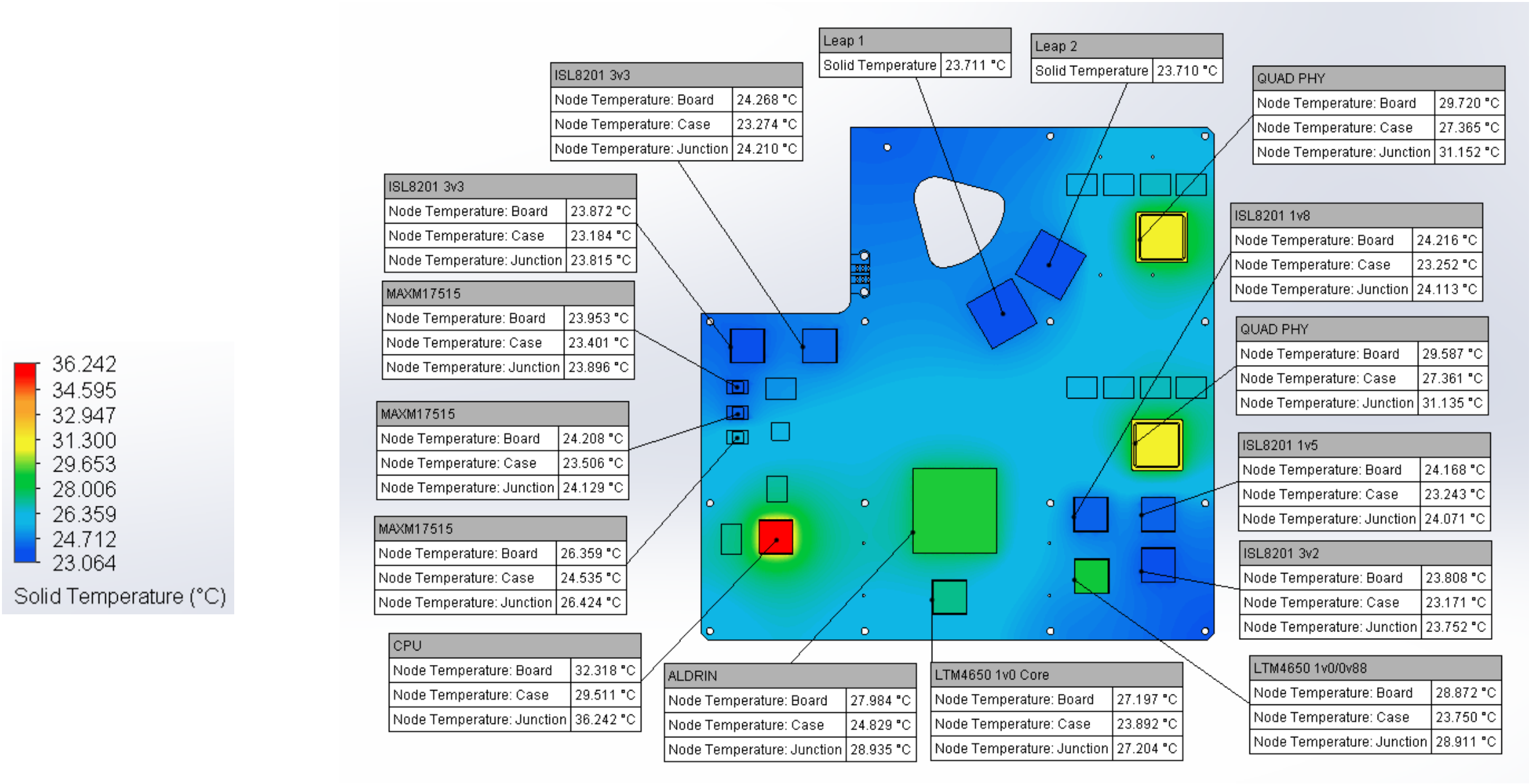
Sim 2
23 C Ambient, Vertical, Sea Level
Al 6061 T6 Enclosure
Predicted Power

Results Summary –Temperature Cases

Al 6061 T6 Enclosure						
Parameters				Sim 2		
Power Scenario				**Predicted**		
Cooling Rail Temperature °C				23		
Ambient Temp., °C				23		
Elevation, ft				0		
RESULTS						
Component	**Min. Limit, °C**	**Max. Limit, °C**	**Limit Type**	**Power, W**	**Result, °C**	**Margin, °C**
Aldrin	-40	110	junction	21.089	28.9	81.1
Marvel 88X3340 Quad PHY	-40	105	Junction	13.175	31.1	73.9
Marvel 88X3340 Quad PHY	-40	105	Junction	13.175	31.1	73.9
DCM3414	-40	125	Junction	6.242	34.7	90.3
LEAP	0	70	Case	3.95	23.7	46.3
LEAP	0	70	Case	3.95	23.7	46.3
CPU	-40	115	junction	3.885	36.2	78.8
LTM4650 ALD_CORE_1V0	-40	125	junction	1.665	27.2	97.8
LTM4650 1V0_PHY_CORE_0V88	-40	125	junction	1.421	28.9	96.1
MFM1714 28V Filter	-55	125	junction	0.756	30.2	94.8
ISL8201M 3V3	-55	125	Junction	0.395	23.8	101.2
MAXM17515 CPU_CORE_1V08	-40	125	Junction	0.358	26.4	98.6
ISL8201M ALD_PHY_INPHI_1V8	-55	125	junction	0.302	24.1	100.9
ISL8201M PHY_AVDD_1V5	-55	125	junction	0.293	24.1	100.9
ISL8201M CPU Supplies	-55	125	junction	0.244	24.2	100.8
ISL8201M PHY_AVDD_2V3	-55	125	junction	0.22	23.7	101.3
MAXM17515 CPU_VDDM1V5	-40	125	junction	0.051	24.1	100.9
MAXM17515 CPU_ALD_3V3	-40	125	Junction	0.044	23.9	101.1

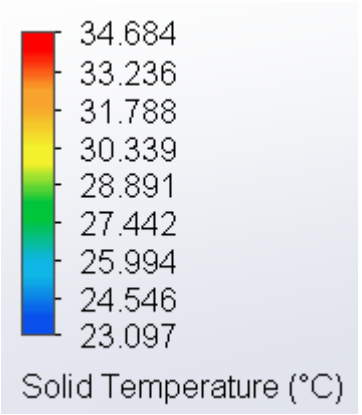
Large PCB Components Temperature Plot

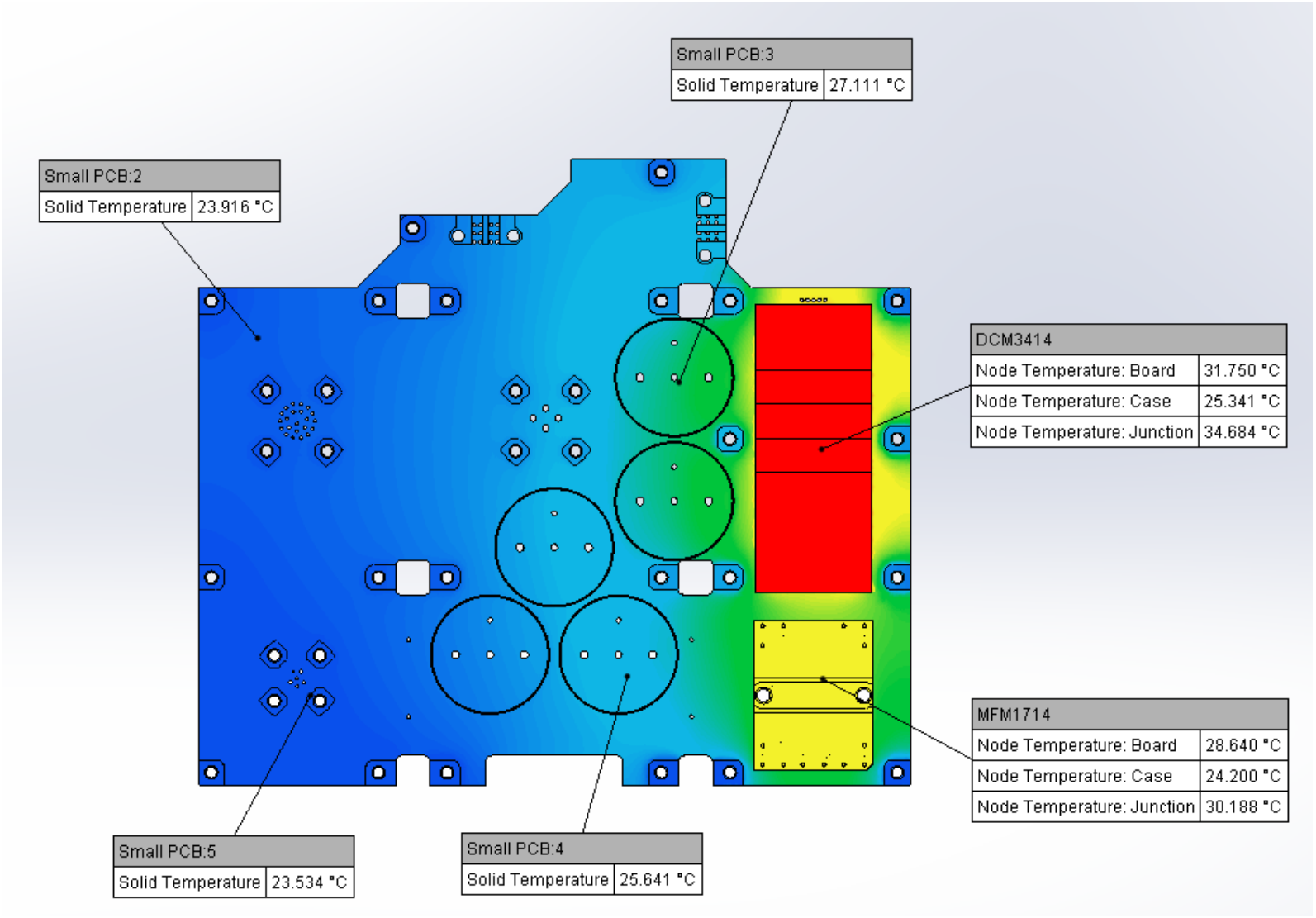
23°C , sea level



Small PCB Components Temperature Plot

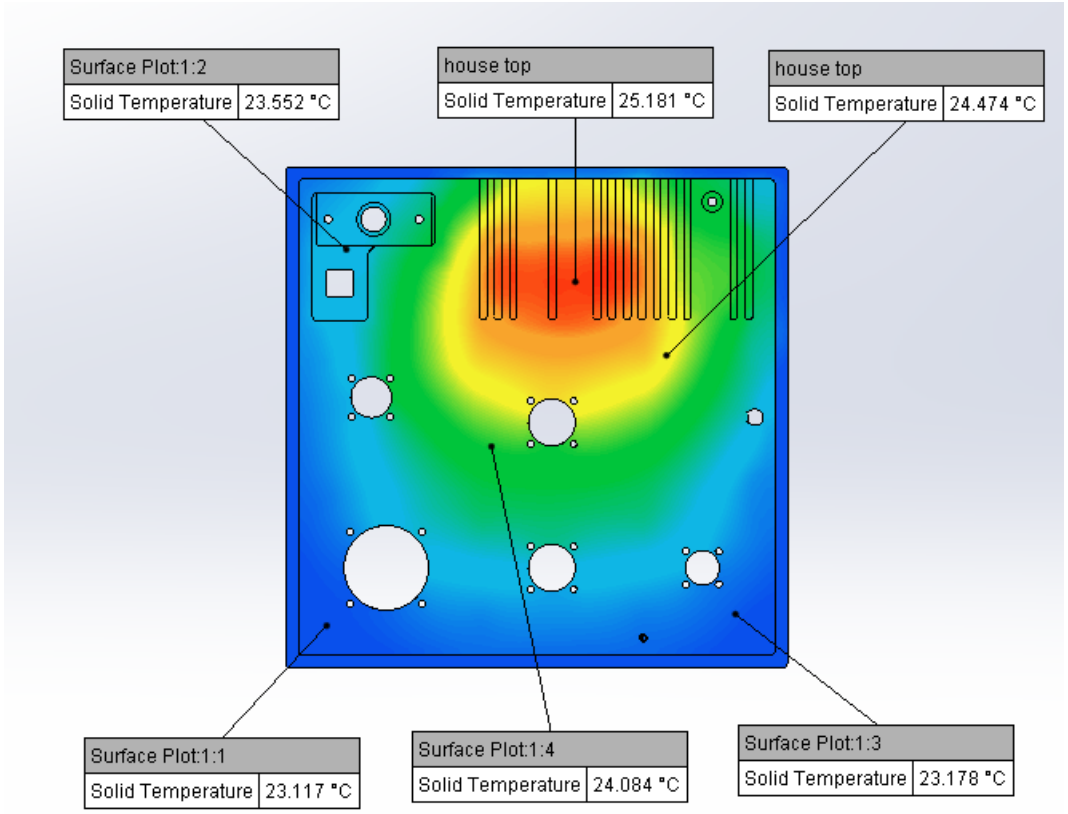
23°C , sea level



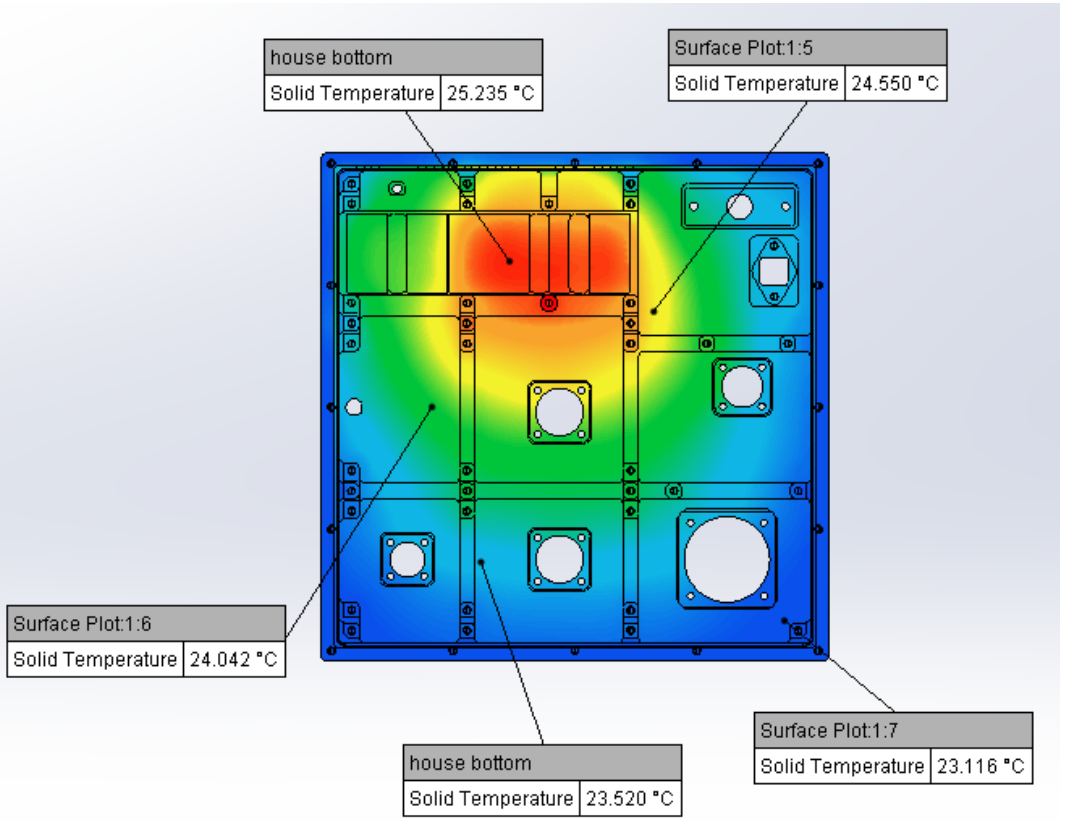


Housing Surface Temperature Plot

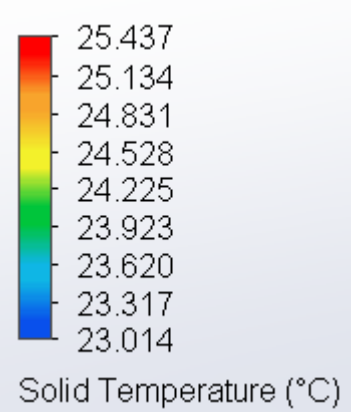
23°C , sea level



Top Side

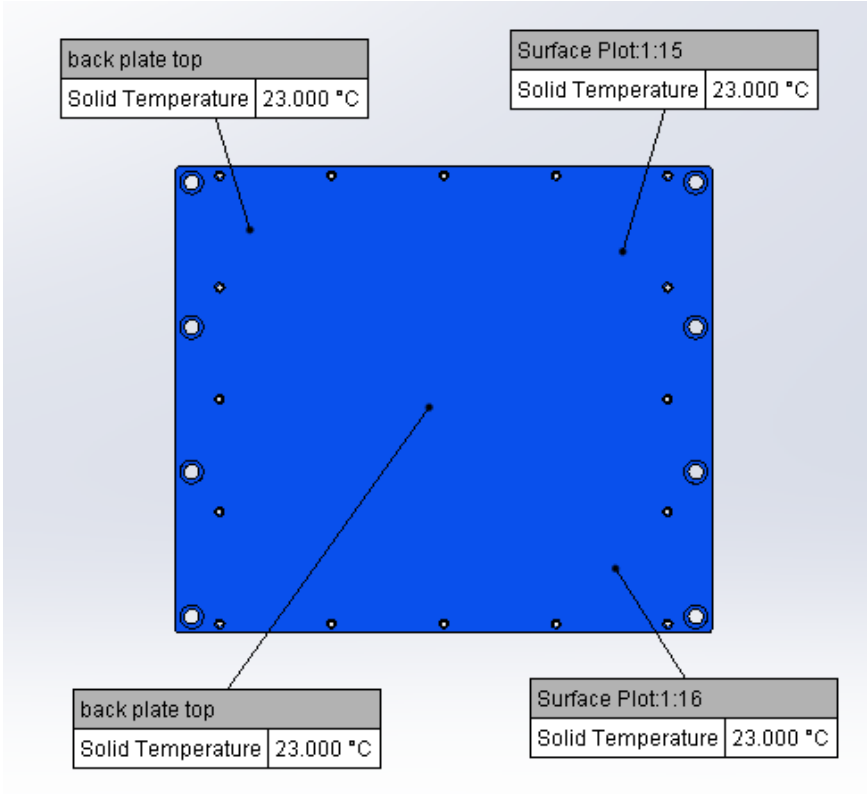


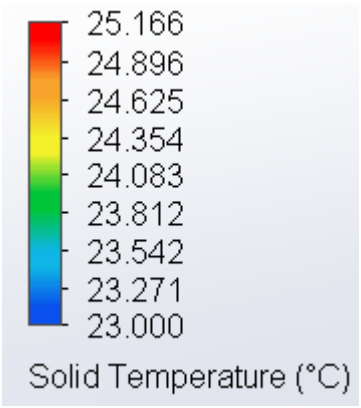
Bottom Side



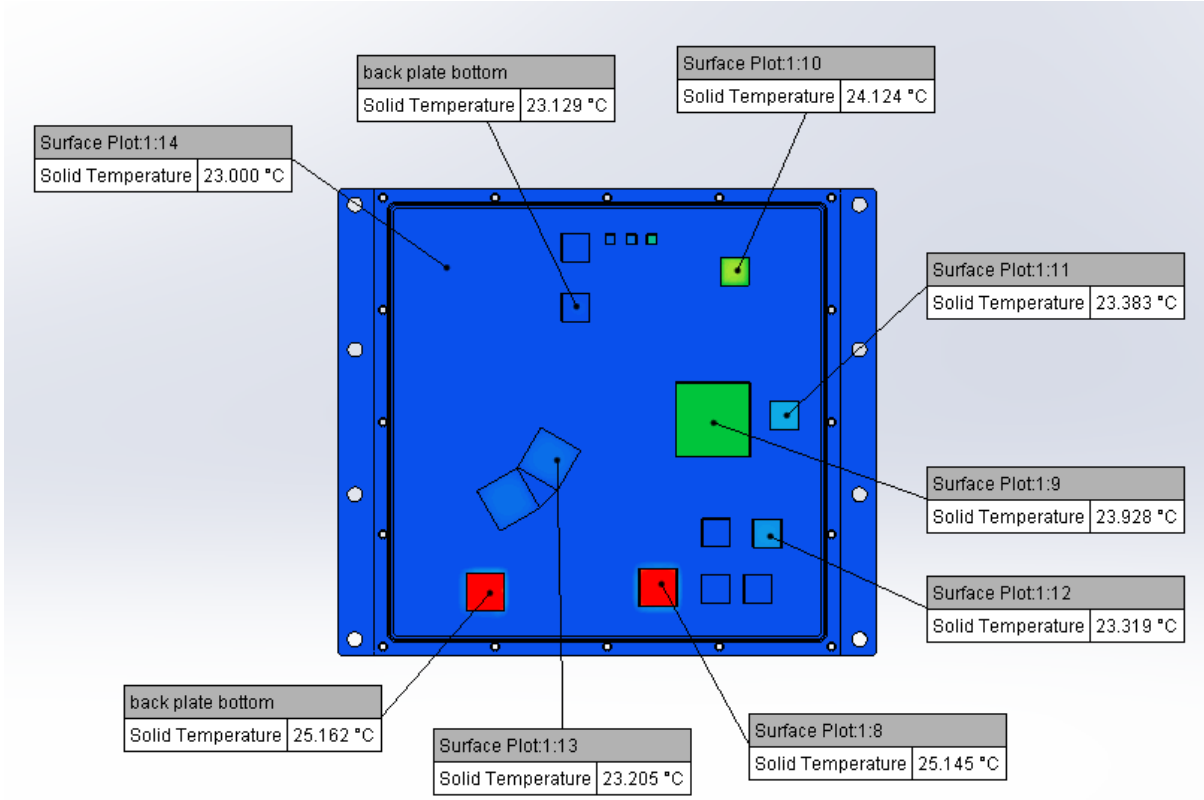
Rear Cover Temperature Plot

23°C , sea level





Top Side



Bottom Side

Sim 4
-20 C Ambient, Vertical, Sea Level
Al 6061 T6 Enclosure
Predicted Power

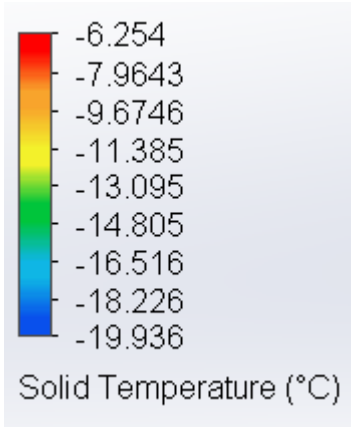
ElectronicCooling Solutions inc

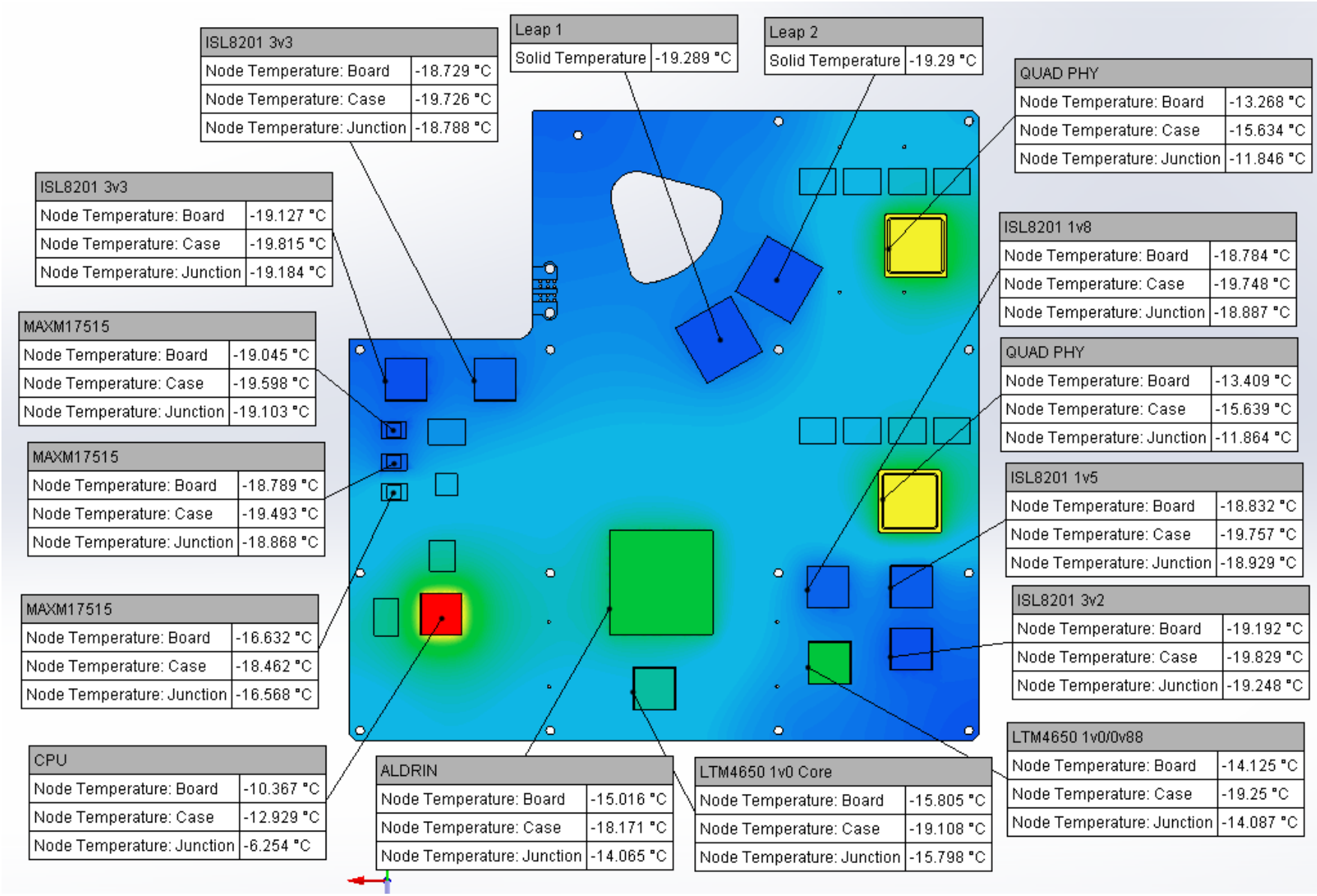
Results Summary –Temperature Cases

Al 6061 T6 Enclosure						
Parameters				Sim 4		
Power Scenario				**Predicted**		
Cooling Rail Temperature °C				-20		
Ambient Temp., °C				-20		
Elevation, ft				0		
RESULTS						
Component	**Min. Limit, °C**	**Max. Limit, °C**	**Limit Type**	**Power, W**	**Result, °C**	**Margin from Min Limit, °C**
Aldrin	-40	110	junction	21.089	-14.0	26.0
Marvel 88X3340 Quad PHY	-40	105	Junction	13.175	-11.8	28.2
Marvel 88X3340 Quad PHY	-40	105	Junction	13.175	-11.8	28.2
DCM3414	-40	125	Junction	6.242	-8.3	31.7
LEAP	0	70	Case	3.95	-19.2	-19.2
LEAP	0	70	Case	3.95	-19.2	-19.2
CPU	-40	115	junction	3.885	-6.2	33.8
LTM4650 ALD_CORE_1V0	-40	125	junction	1.665	-15.7	24.3
LTM4650 1V0_PHY_CORE_0V88	-40	125	junction	1.421	-14.1	25.9
MFM1714 28V Filter	-55	125	junction	0.756	-12.8	42.2
ISL8201M 3V3	-55	125	Junction	0.395	-19.2	35.8
MAXM17515 CPU_CORE_1V08	-40	125	Junction	0.358	-16.5	23.5
ISL8201M ALD_PHY_INPHI_1V8	-55	125	junction	0.302	-18.8	36.2
ISL8201M PHY_AVDD_1V5	-55	125	junction	0.293	-18.9	36.1
ISL8201M CPU Supplies	-55	125	junction	0.244	-18.7	36.3
ISL8201M PHY_AVDD_2V3	-55	125	junction	0.22	-19.2	35.8
MAXM17515 CPU_VDDM1V5	-40	125	junction	0.051	-18.8	21.2
MAXM17515 CPU_ALD_3V3	-40	125	Junction	0.044	-19.1	20.9

Large PCB Components Temperature Plot

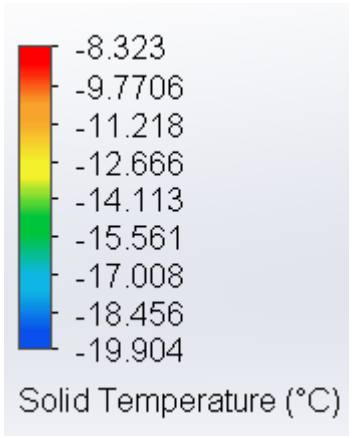
-20°C , sea level

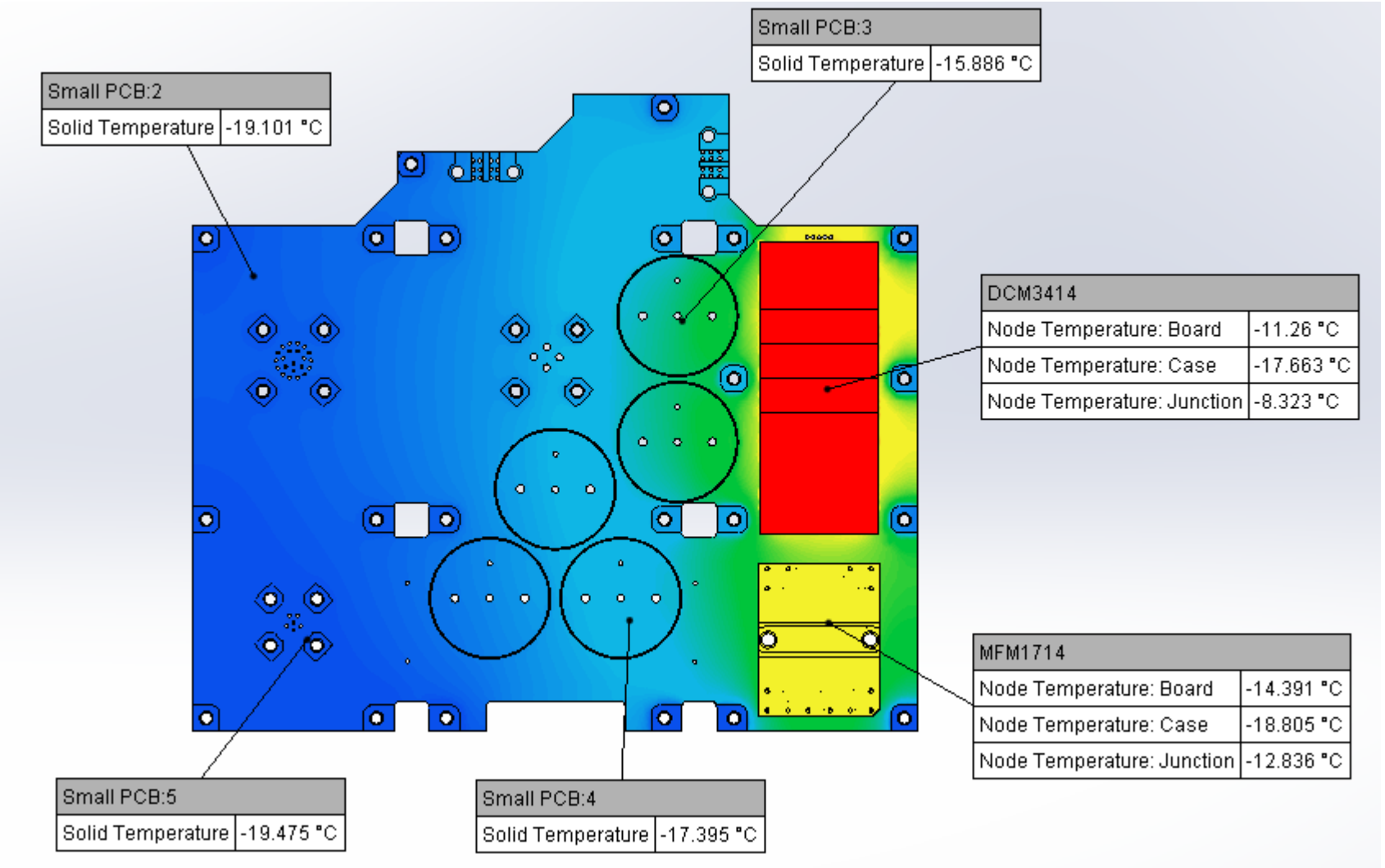




Small PCB Components Temperature Plot

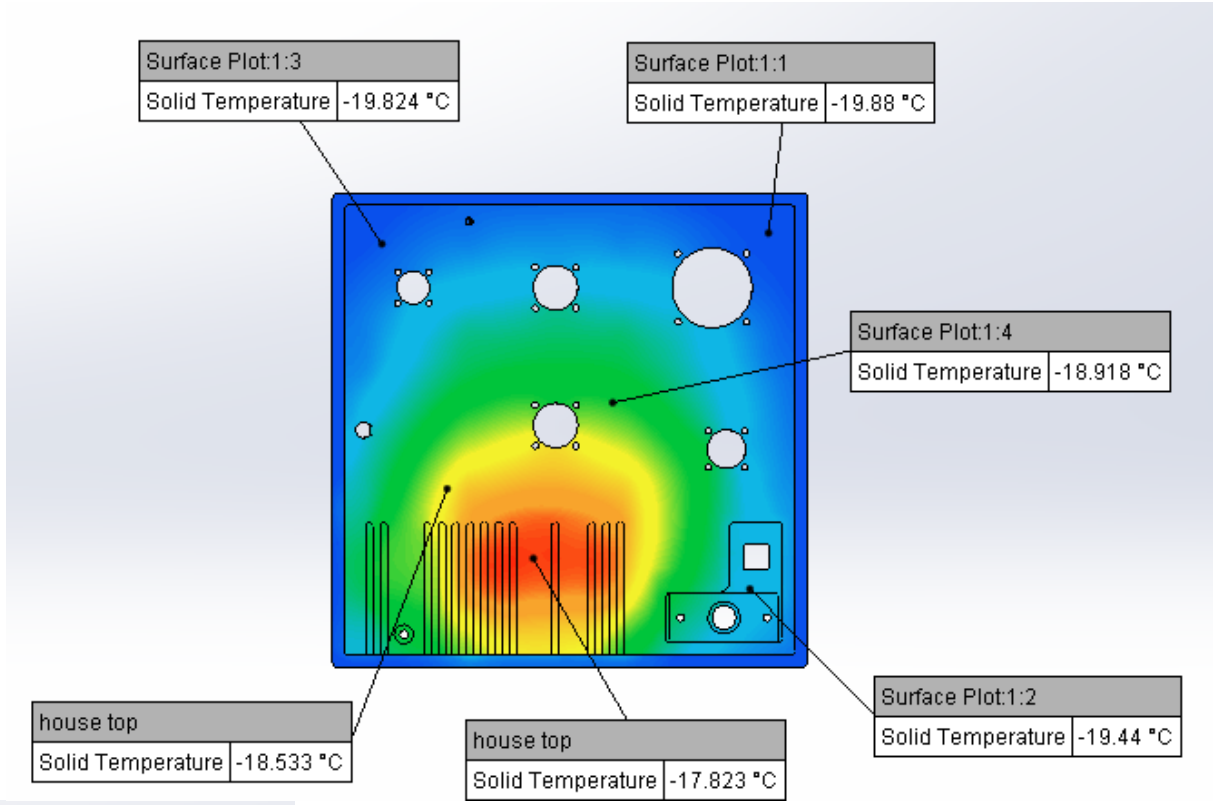
-20°C , sea level



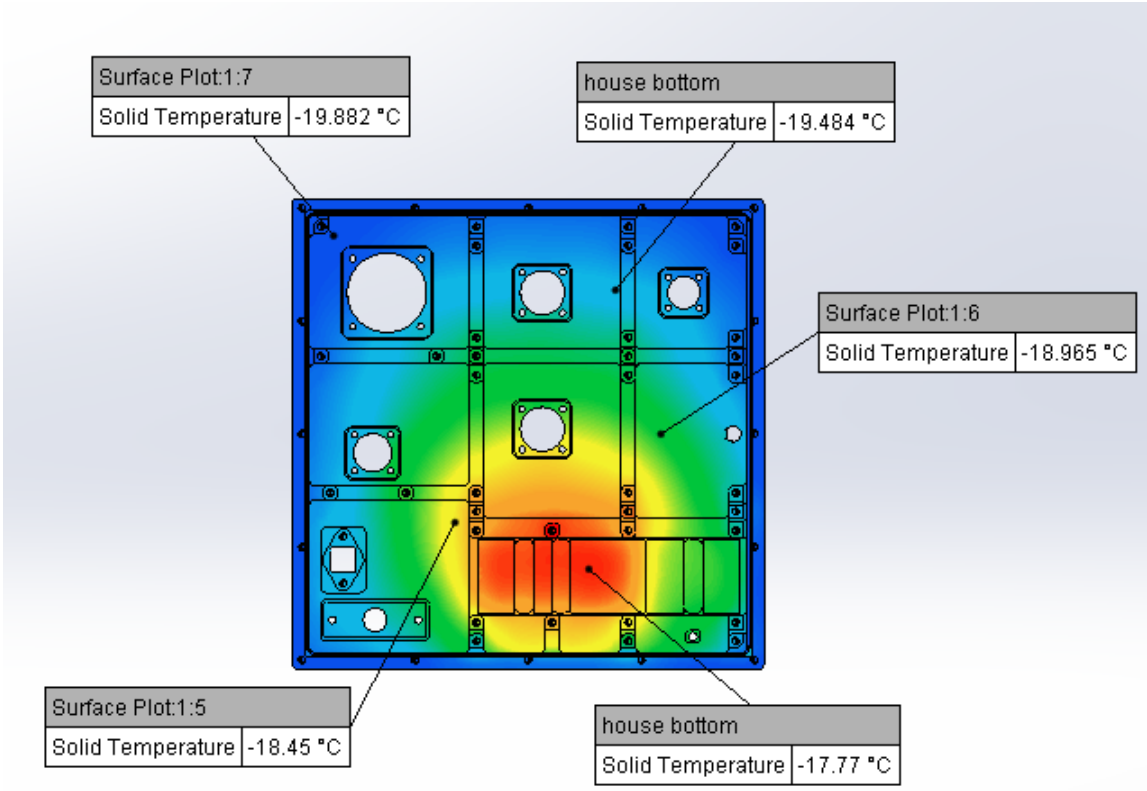


Housing Surface Temperature Plot

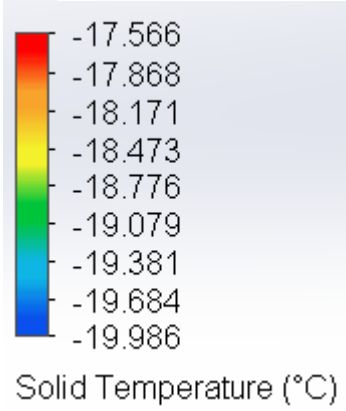
-20°C , sea level



Top Side

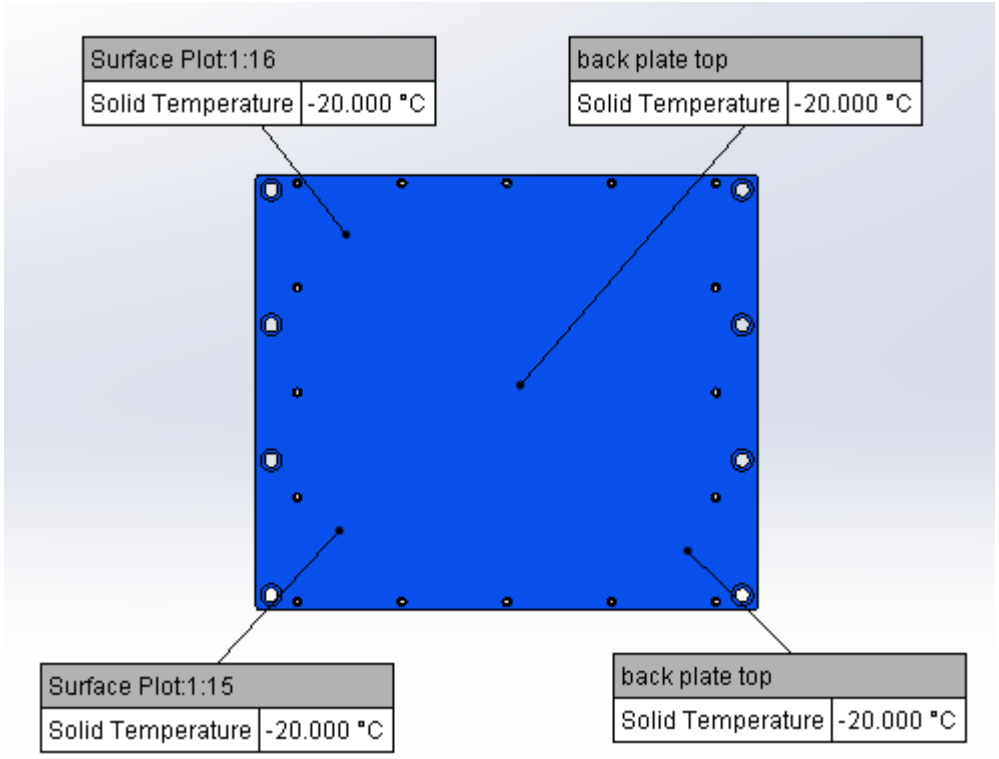


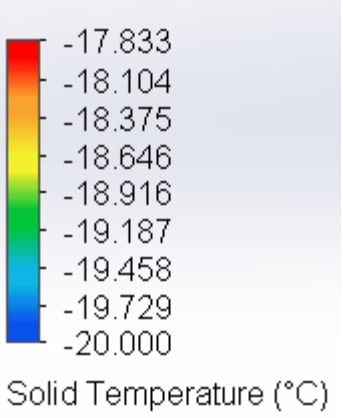
Bottom Side



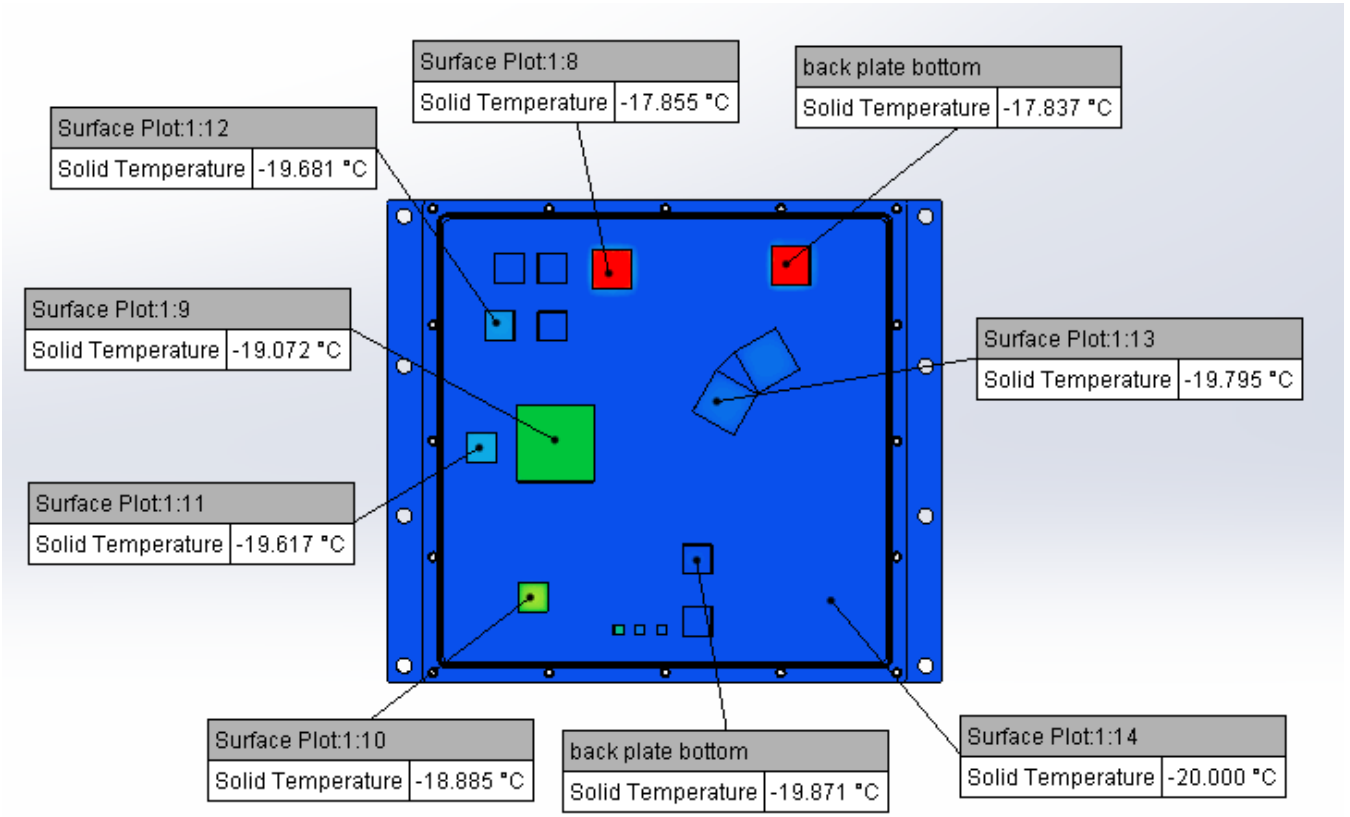
Rear Cover Temperature Plot

-20°C , sea level





Top Side



Bottom Side

Sim 6
60 C Ambient, Vertical, Sea Level
Al 6061 T6 Enclosure
Predicted Power

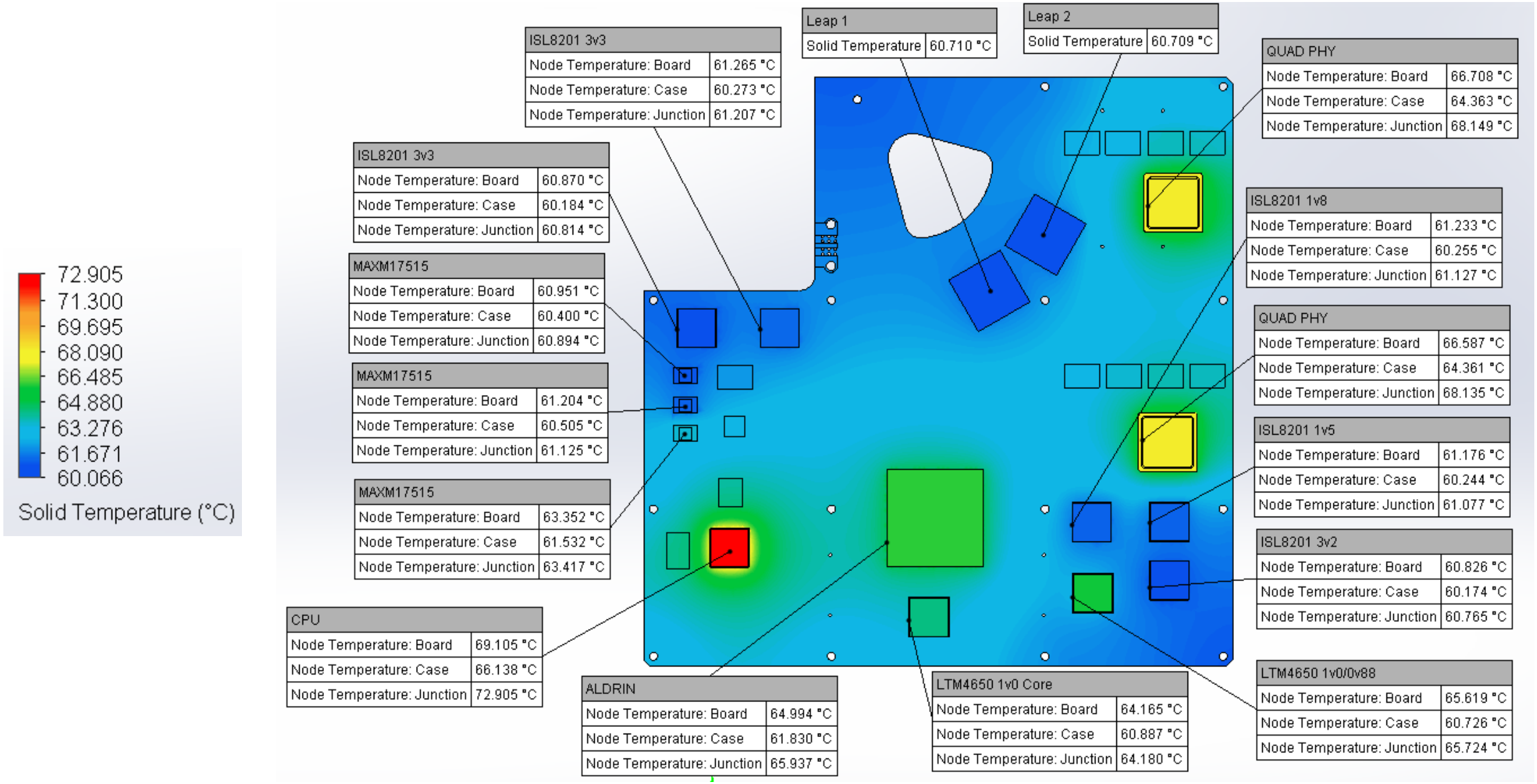
ElectronicCooling Solutions inc

Results Summary –Temperature Cases

Al 6061 T6 Enclosure						
Parameters				Sim 6		
Power Scenario				**Predicted**		
Cooling Rail Temperature °C				60		
Ambient Temp., °C				60		
Elevation, ft				0		
RESULTS						
Component	**Min. Limit, °C**	**Max. Limit, °C**	**Limit Type**	**Power, W**	**Result, °C**	**Margin, °C**
Aldrin	-40	110	junction	21.089	65.9	44.1
Marvel 88X3340 Quad PHY	-40	105	Junction	13.175	68.1	36.9
Marvel 88X3340 Quad PHY	-40	105	Junction	13.175	68.1	36.9
DCM3414	-40	125	Junction	6.242	71.6	53.4
LEAP	0	70	Case	3.95	60.7	9.3
LEAP	0	70	Case	3.95	60.7	9.3
CPU	-40	115	junction	3.885	72.9	42.1
LTM4650 ALD_CORE_1V0	-40	125	junction	1.665	64.1	60.9
LTM4650 1V0_PHY_CORE_0V88	-40	125	junction	1.421	65.7	59.3
MFM1714 28V Filter	-55	125	junction	0.756	67.1	57.9
ISL8201M 3V3	-55	125	Junction	0.395	61.2	63.8
MAXM17515 CPU_CORE_1V08	-40	125	Junction	0.358	60.8	64.2
ISL8201M ALD_PHY_INPHI_1V8	-55	125	junction	0.302	61.1	63.9
ISL8201M PHY_AVDD_1V5	-55	125	junction	0.293	61.0	64.0
ISL8201M CPU Supplies	-55	125	junction	0.244	60.8	64.2
ISL8201M PHY_AVDD_2V3	-55	125	junction	0.22	60.7	64.3
MAXM17515 CPU_VDDM1V5	-40	125	junction	0.051	61.1	63.9
MAXM17515 CPU_ALD_3V3	-40	125	Junction	0.044	63.4	61.6

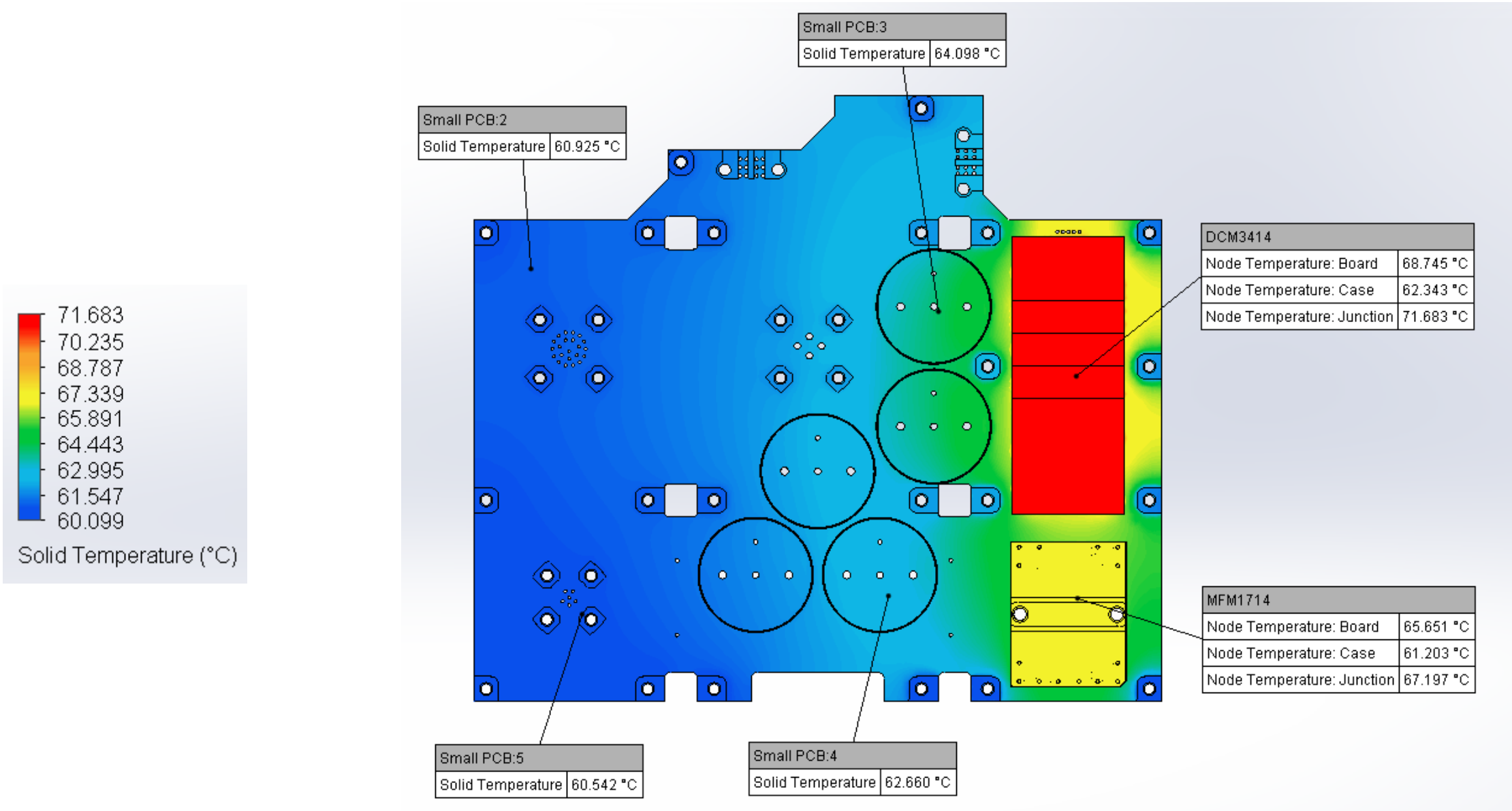
Large PCB Components Temperature Plot

60°C , sea level



Small PCB Components Temperature Plot

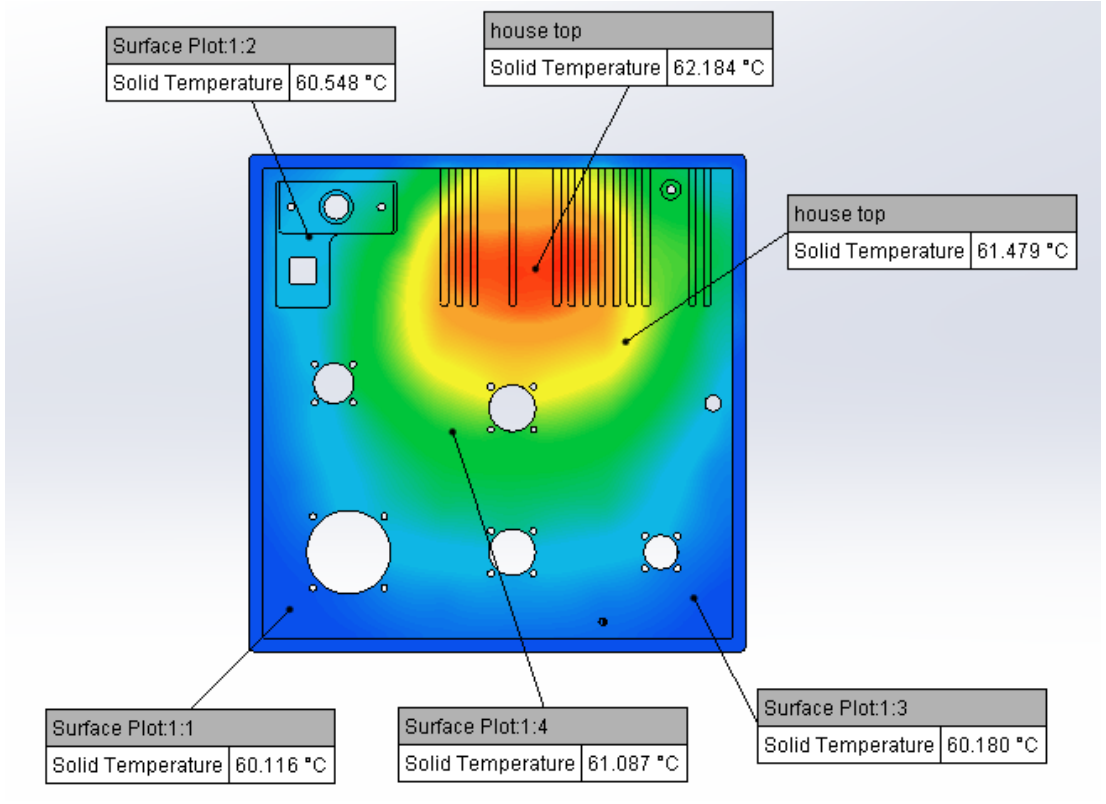
60°C , sea level



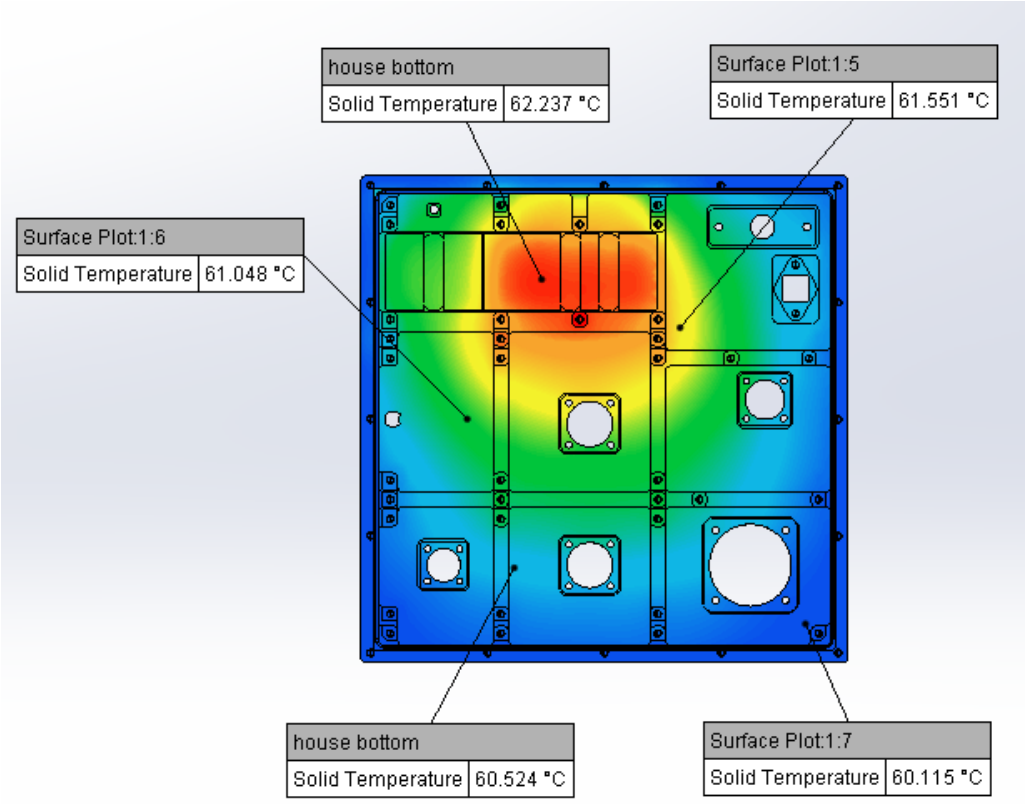
ElectronicCooling Solutions inc

Housing Surface Temperature Plot

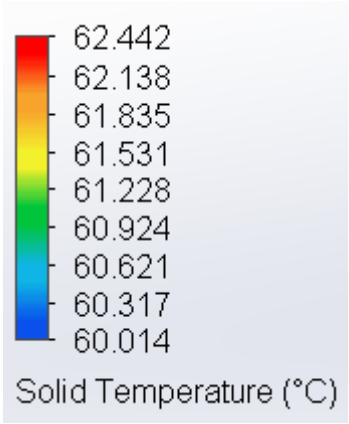
60°C , sea level



Top Side

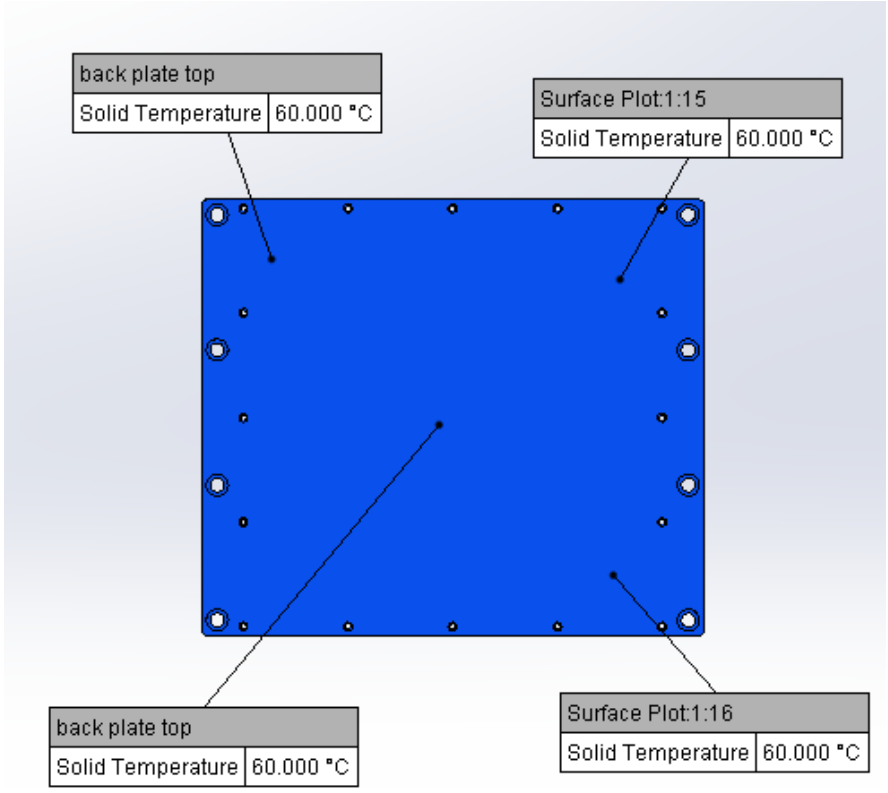


Bottom Side

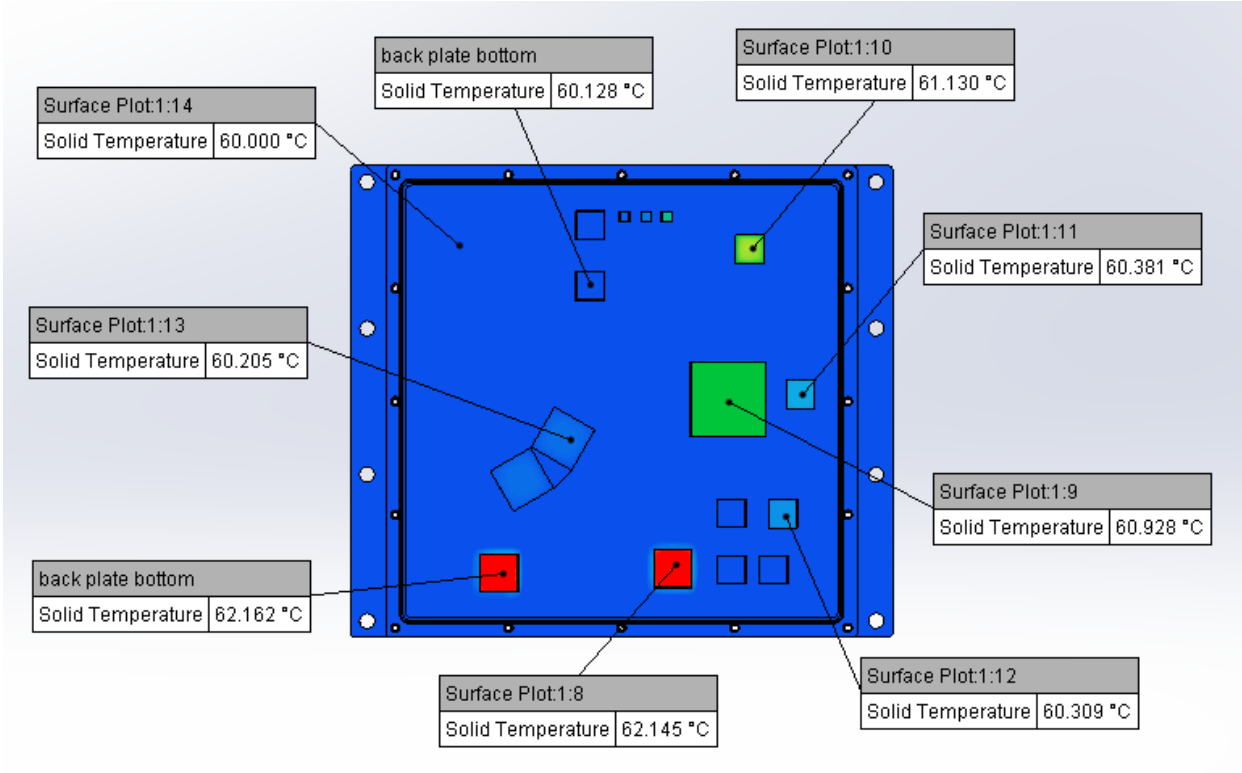


Rear Cover Temperature Plot

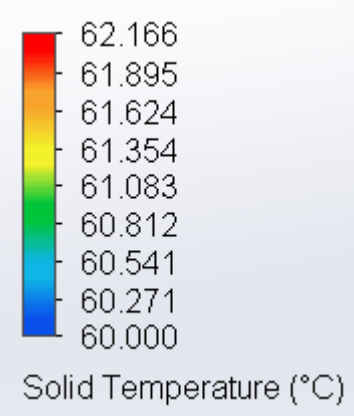
60°C , sea level



Top Side



Bottom Side



Sim 8
85 C Ambient, Vertical, Sea Level
Al 6061 T6 Enclosure
Predicted Power

ElectronicCooling Solutions inc

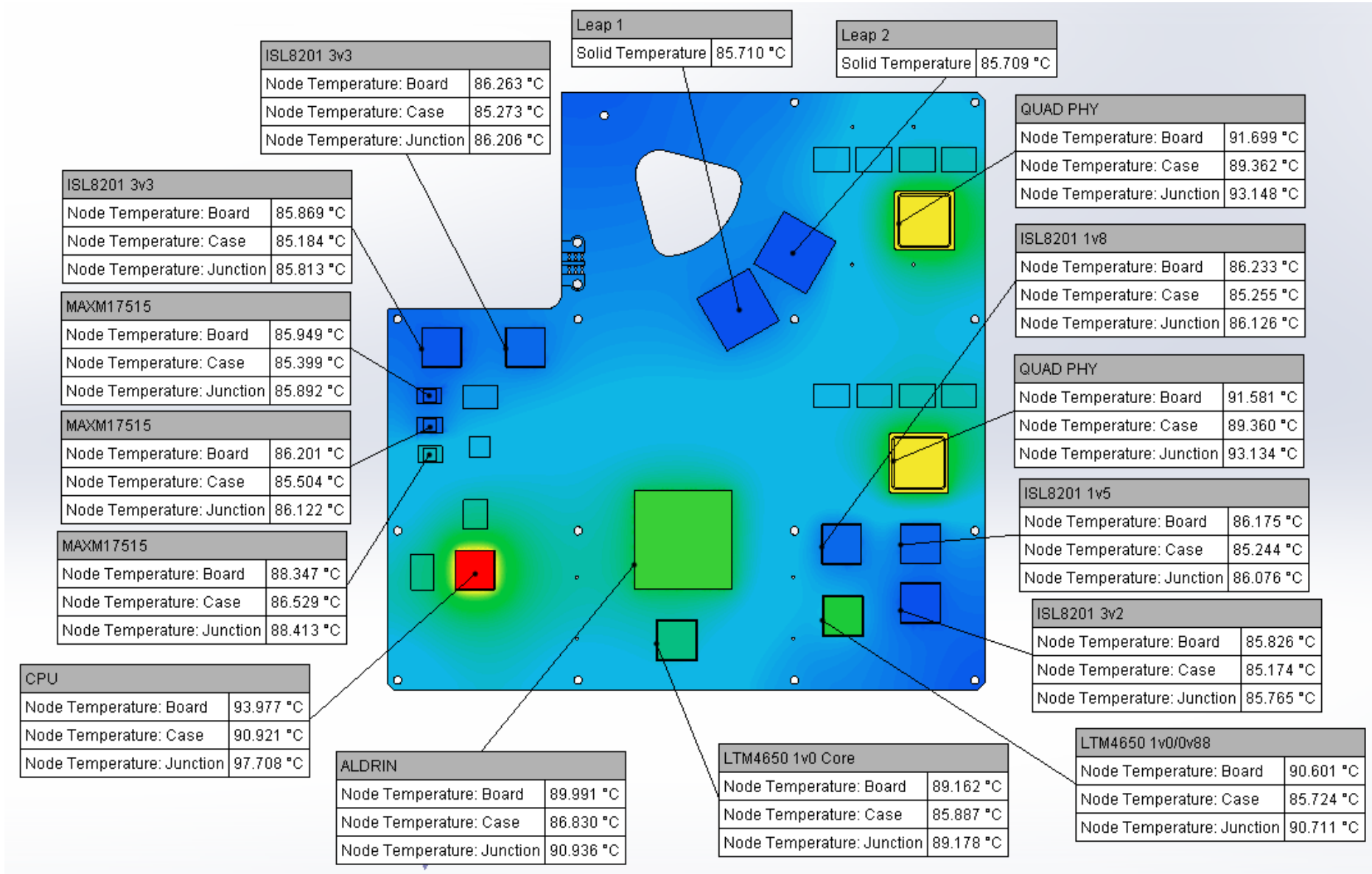
Results Summary –Temperature Cases

Al 6061 T6 Enclosure						
Parameters				Sim 8		
Power Scenario				**Predicted**		
Cooling Rail Temperature °C				85		
Ambient Temp., °C				85		
Elevation, ft				0		
RESULTS						
Component	**Min. Limit, °C**	**Max. Limit, °C**	**Limit Type**	**Power, W**	**Result, °C**	**Margin, °C**
Aldrin	-40	110	junction	21.089	90.9	19.1
Marvel 88X3340 Quad PHY	-40	105	Junction	13.175	93.1	11.9
Marvel 88X3340 Quad PHY	-40	105	Junction	13.175	93.1	11.9
DCM3414	-40	125	Junction	6.242	96.6	28.4
LEAP	0	70	Case	3.95	85.7	-15.7
LEAP	0	70	Case	3.95	85.7	-15.7
CPU	-40	115	junction	3.885	97.7	17.3
LTM4650 ALD_CORE_1V0	-40	125	junction	1.665	89.1	35.9
LTM4650 1V0_PHY_CORE_0V88	-40	125	junction	1.421	90.7	34.3
MFM1714 28V Filter	-55	125	junction	0.756	92.1	32.9
ISL8201M 3V3	-55	125	Junction	0.395	86.2	38.8
MAXM17515 CPU_CORE_1V08	-40	125	Junction	0.358	85.8	39.2
ISL8201M ALD_PHY_INPHI_1V8	-55	125	junction	0.302	86.1	38.9
ISL8201M PHY_AVDD_1V5	-55	125	junction	0.293	86.0	39
ISL8201M CPU Supplies	-55	125	junction	0.244	85.8	39.2
ISL8201M PHY_AVDD_2V3	-55	125	junction	0.22	85.7	39.3
MAXM17515 CPU_VDDM1V5	-40	125	junction	0.051	86.1	38.9
MAXM17515 CPU_ALD_3V3	-40	125	Junction	0.044	88.4	36.6

ElectronicCooling Solutions inc

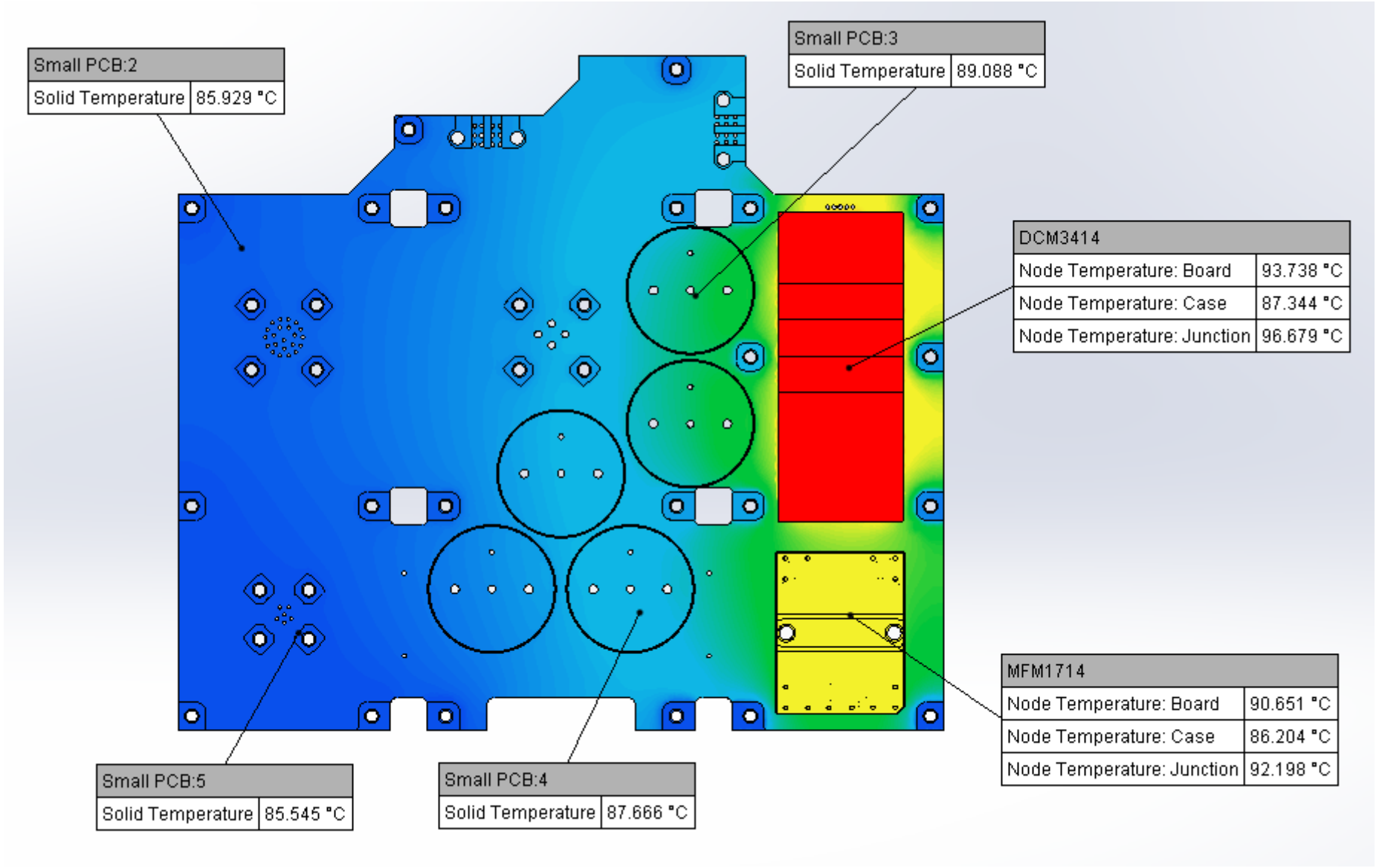
Large PCB Components Temperature Plot

85°C , sea level



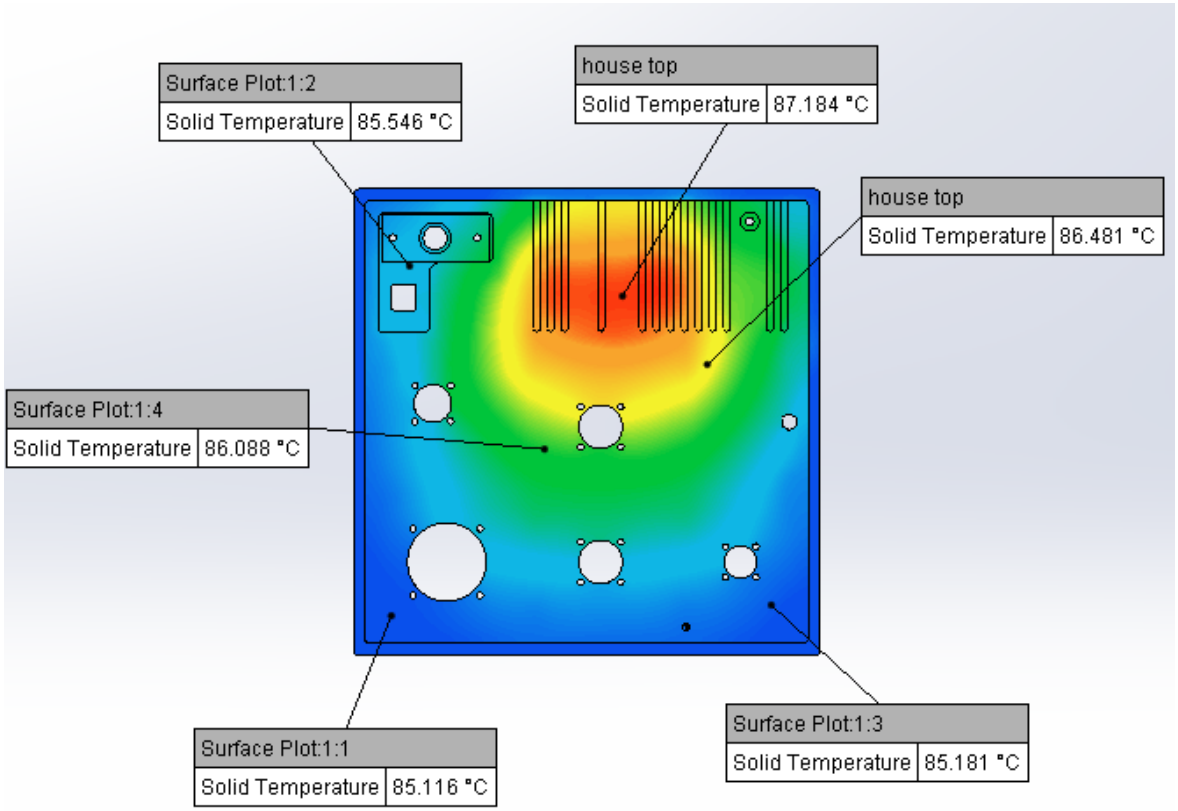
Small PCB Components Temperature Plot

85°C , sea level

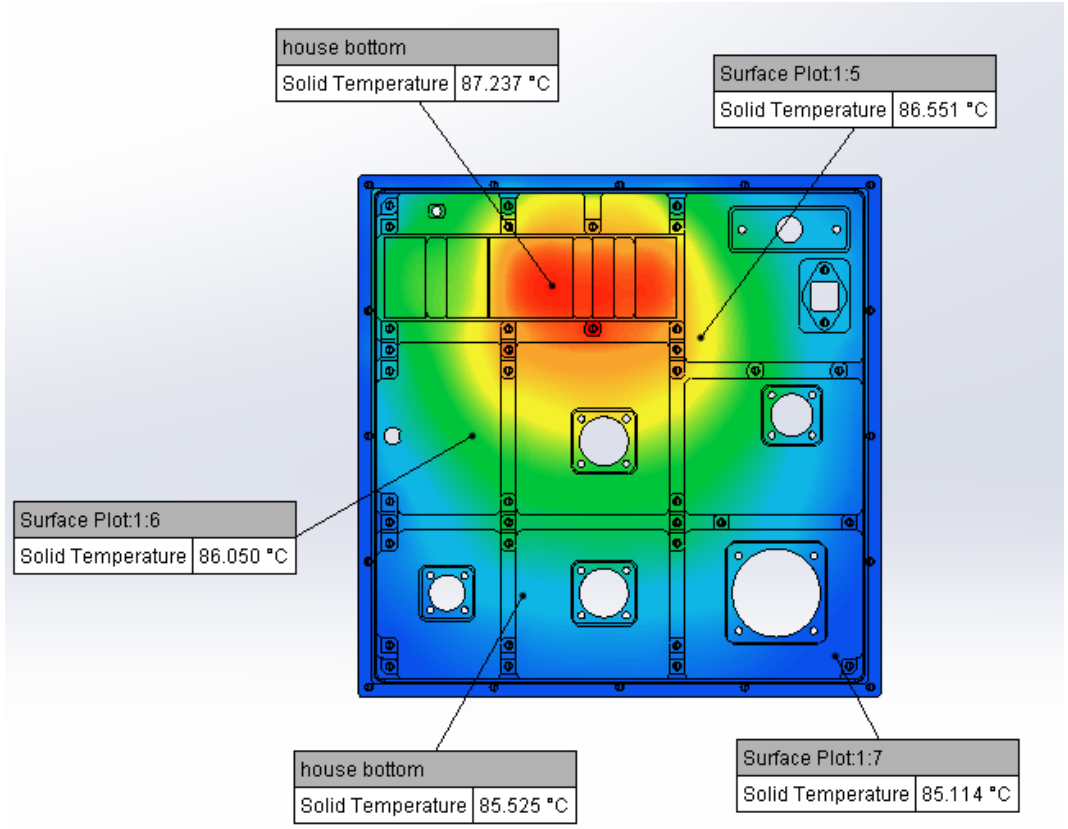


Housing Surface Temperature Plot

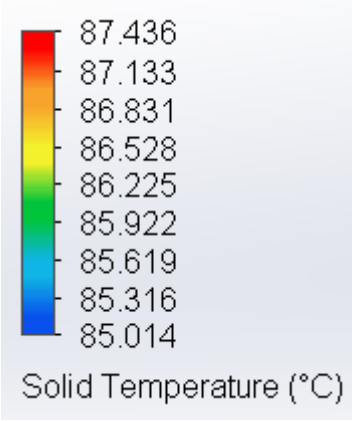
85°C , sea level



Top Side

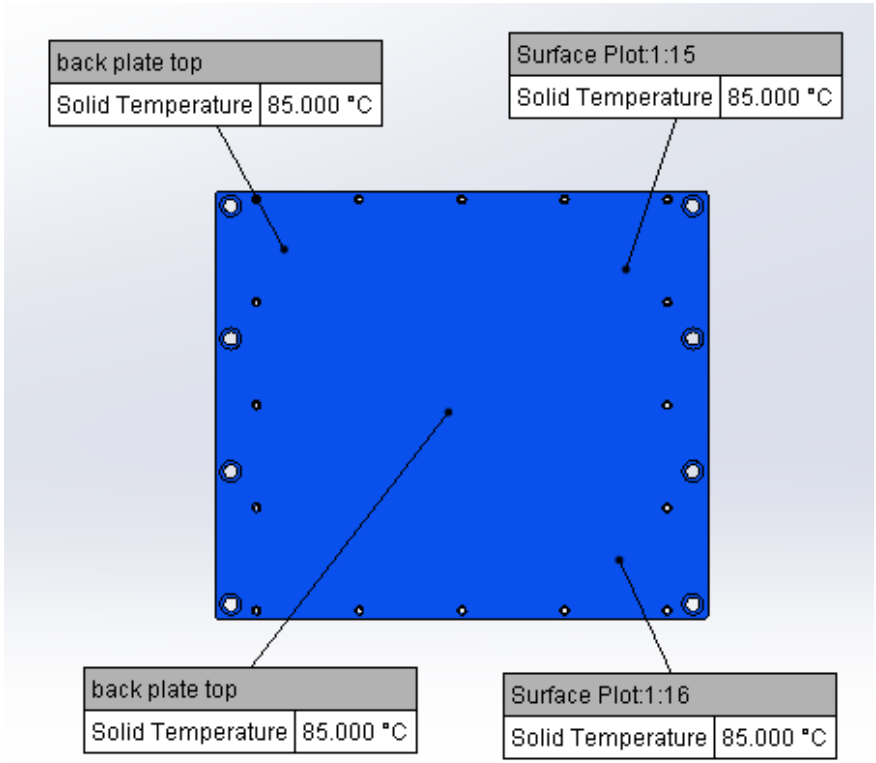


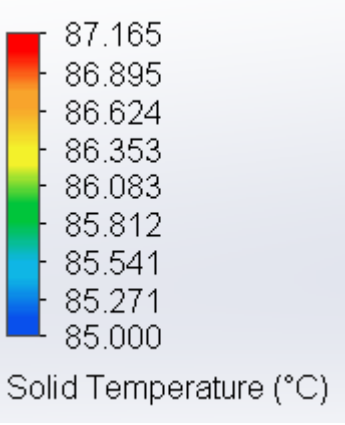
Bottom Side



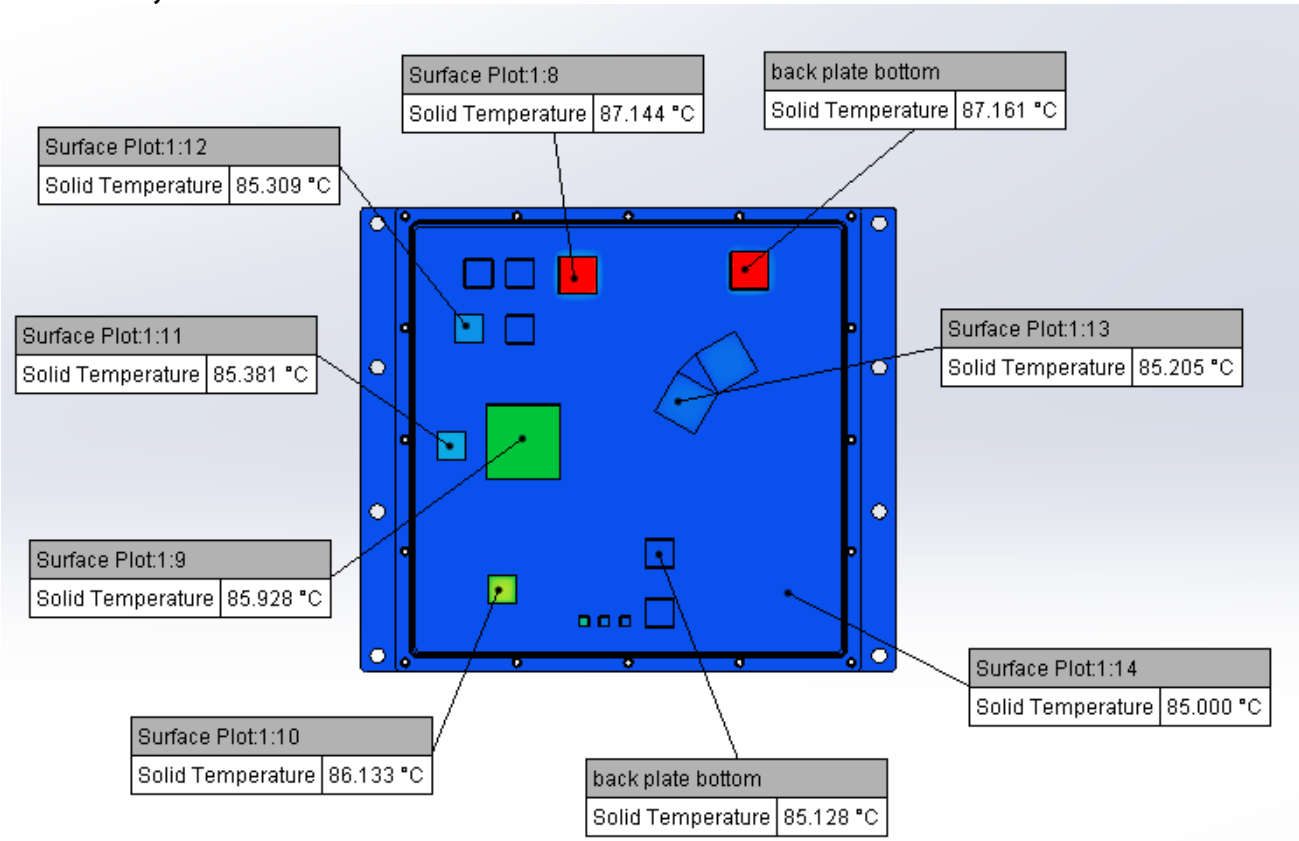
Rear Cover Temperature Plot

85°C , sea level





Top Side



Bottom Side

Sim 10
-40 C Ambient, Vertical, 31000 ft
Al 6061 T6 Enclosure
Predicted Power

ElectronicCooling Solutions inc

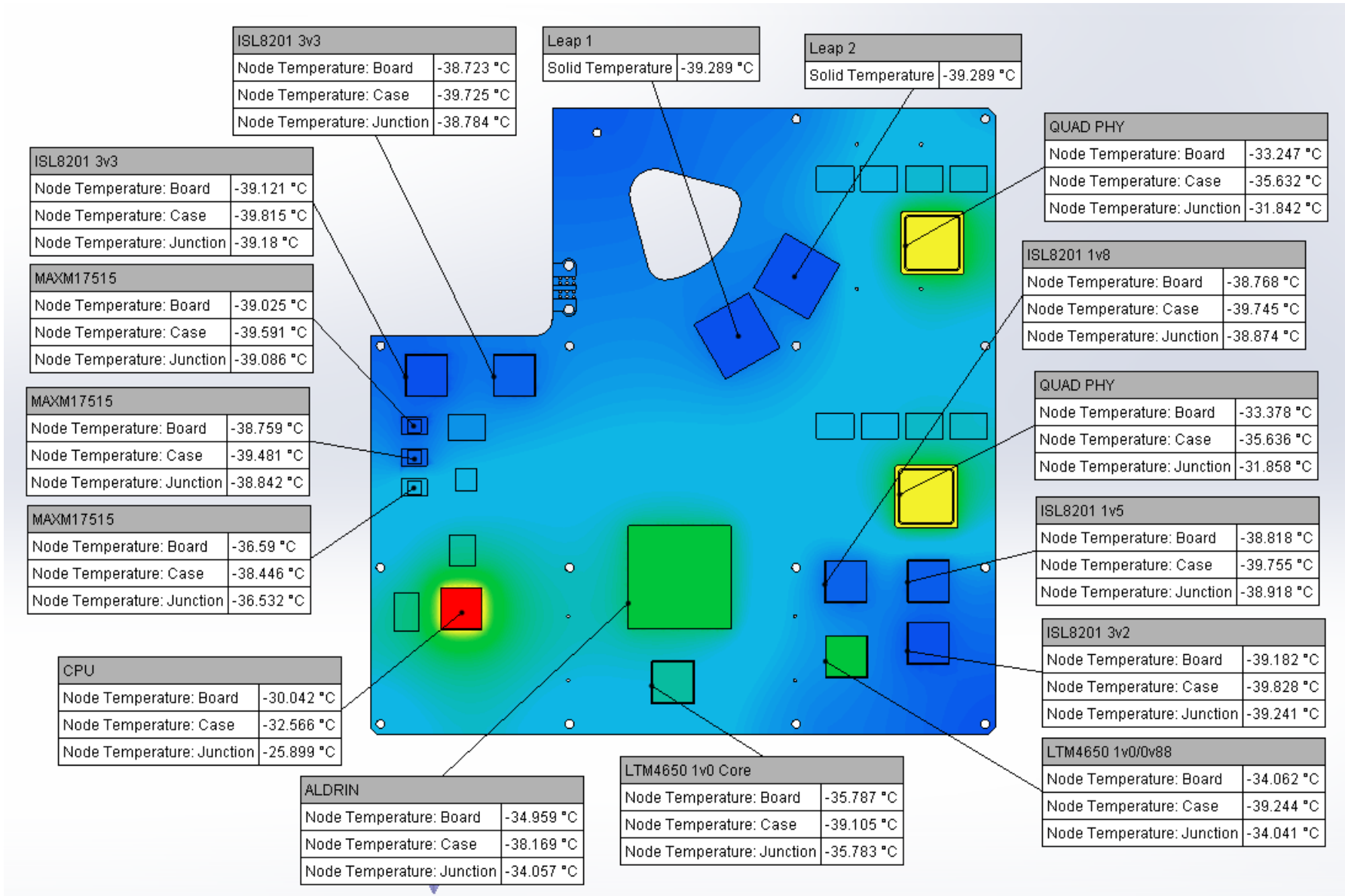
Results Summary –Temperature Cases

Al 6061 T6 Enclosure						
Parameters				Sim 10		
Power Scenario				**Predicted**		
Cooling Rail Temperature °C				-40		
Ambient Temp., °C				-40		
Elevation, ft				**31000 ft**		
RESULTS						
Component	**Min. Limit, °C**	**Max. Limit, °C**	**Limit Type**	**Power, W**	**Result, °C**	**Margin from Negative Limit, °C**
Aldrin	-40	110	junction	21.089	-34.0	6
Marvel 88X3340 Quad PHY	-40	105	Junction	13.175	-31.8	8.2
Marvel 88X3340 Quad PHY	-40	105	Junction	13.175	-31.8	8.2
DCM3414	-40	125	Junction	6.242	-28.2	11.8
LEAP	0	70	Case	3.95	-39.2	-39.2
LEAP	0	70	Case	3.95	-39.2	-39.2
CPU	-40	115	junction	3.885	-25.8	14.2
LTM4650 ALD_CORE_1V0	-40	125	junction	1.665	-35.7	4.3
LTM4650 1V0_PHY_CORE_0V88	-40	125	junction	1.421	-34.0	6.0
MFM1714 28V Filter	-55	125	junction	0.756	-32.6	22.4
ISL8201M 3V3	-55	125	Junction	0.395	-38.7	16.3
MAXM17515 CPU_CORE_1V08	-40	125	Junction	0.358	-36.5	3.5
ISL8201M ALD_PHY_INPHI_1V8	-55	125	junction	0.302	-38.8	16.2
ISL8201M PHY_AVDD_1V5	-55	125	junction	0.293	-38.9	16.1
ISL8201M CPU Supplies	-55	125	junction	0.244	-39.1	15.9
ISL8201M PHY_AVDD_2V3	-55	125	junction	0.22	-39.2	15.8
MAXM17515 CPU_VDDM1V5	-40	125	junction	0.051	-38.8	1.2
MAXM17515 CPU_ALD_3V3	-40	125	Junction	0.044	-39.0	1.0

ElectronicCooling Solutions inc

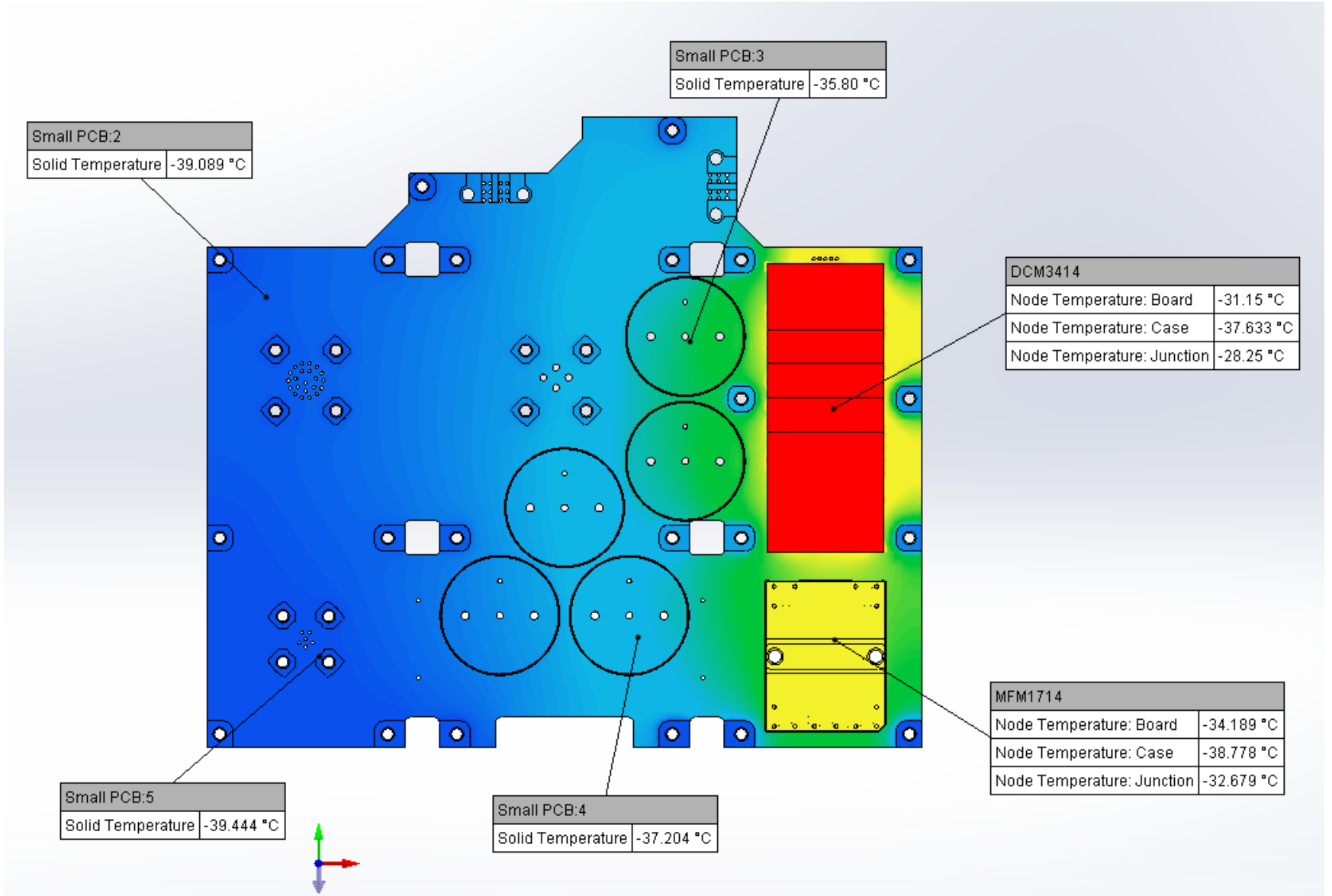
Large PCB Components Temperature Plot

-40°C , 31000 ft



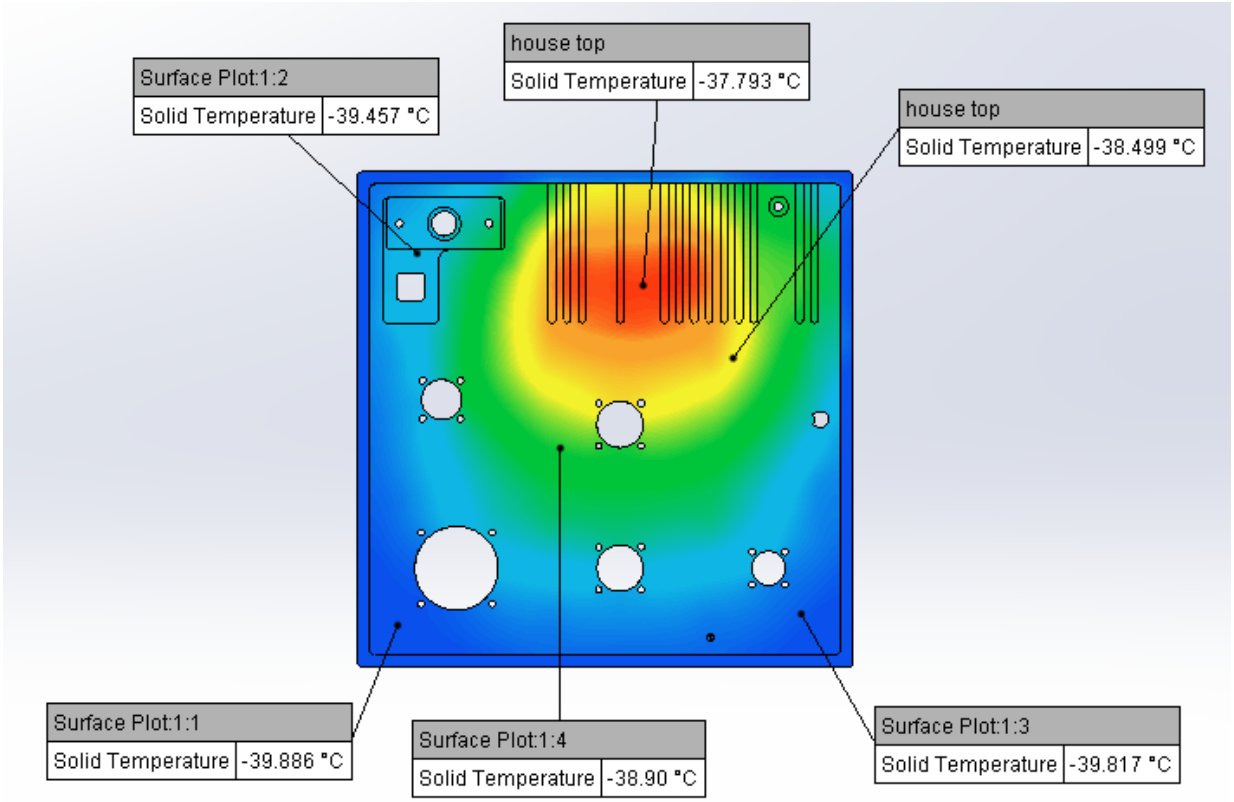
Small PCB Components Temperature Plot

-40°C , 31000 ft

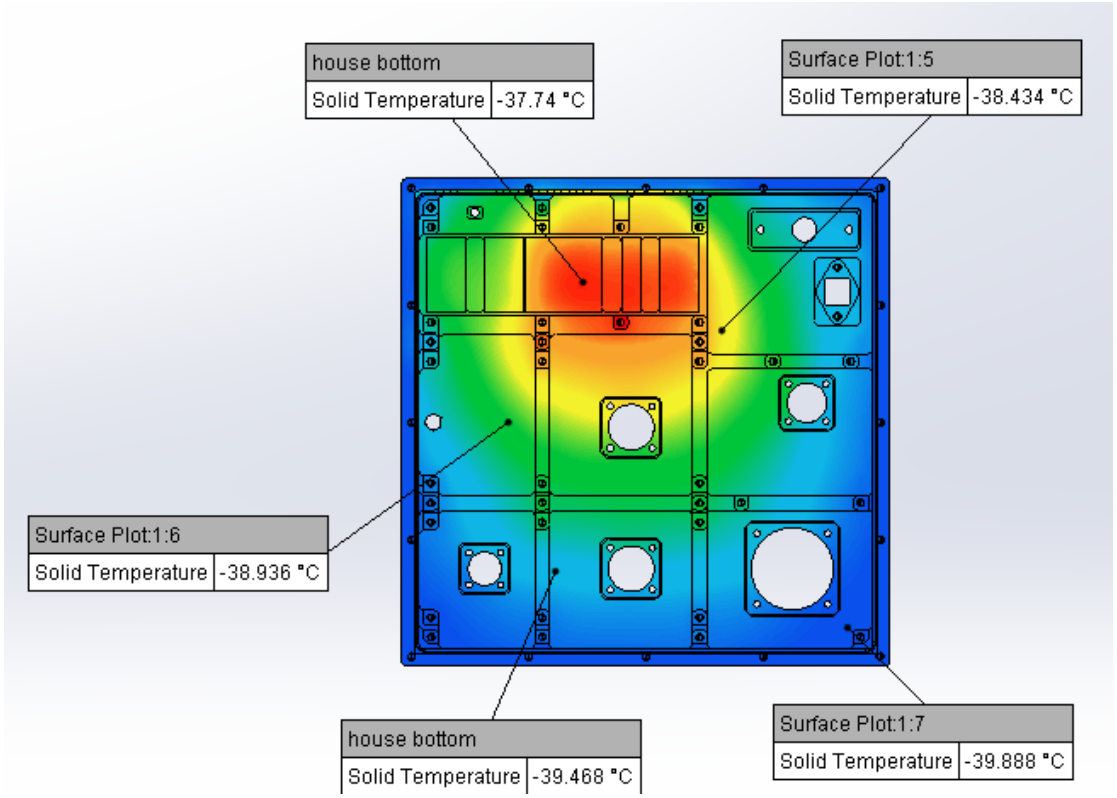


Housing Surface Temperature Plot

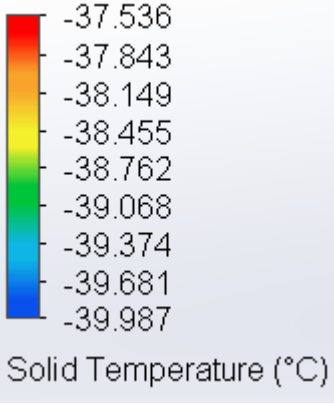
-40°C , 31000 ft



Top Side

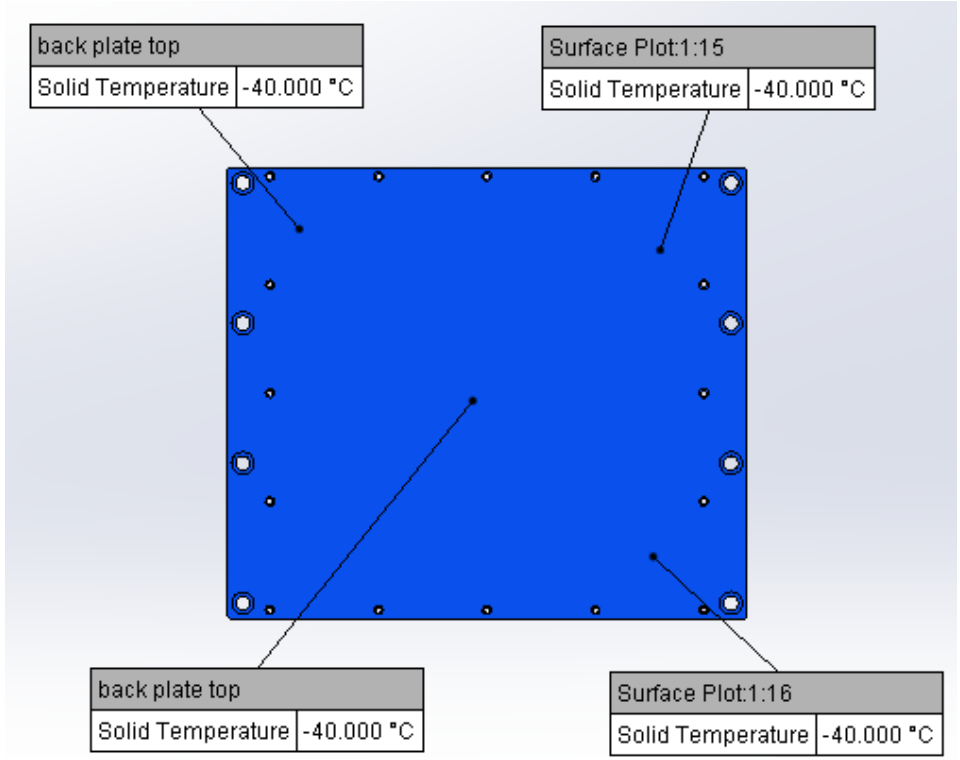


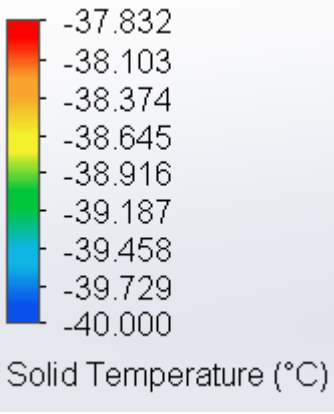
Bottom Side



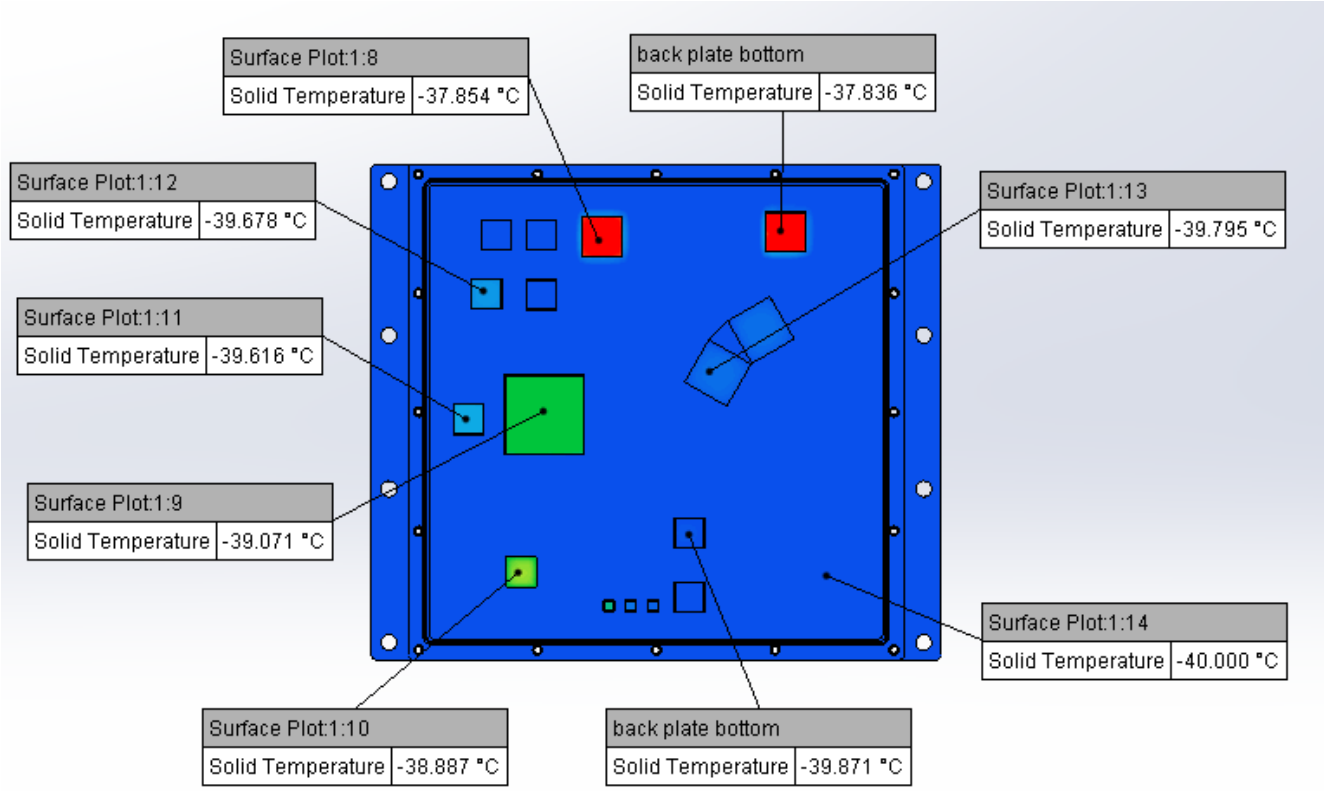
Rear Cover Temperature Plot

-40°C , 31000 ft





Top Side



Bottom Side

Sim 12
32 C Ambient, Vertical, 31000 ft
Al 6061 T6 Enclosure
Predicted Power

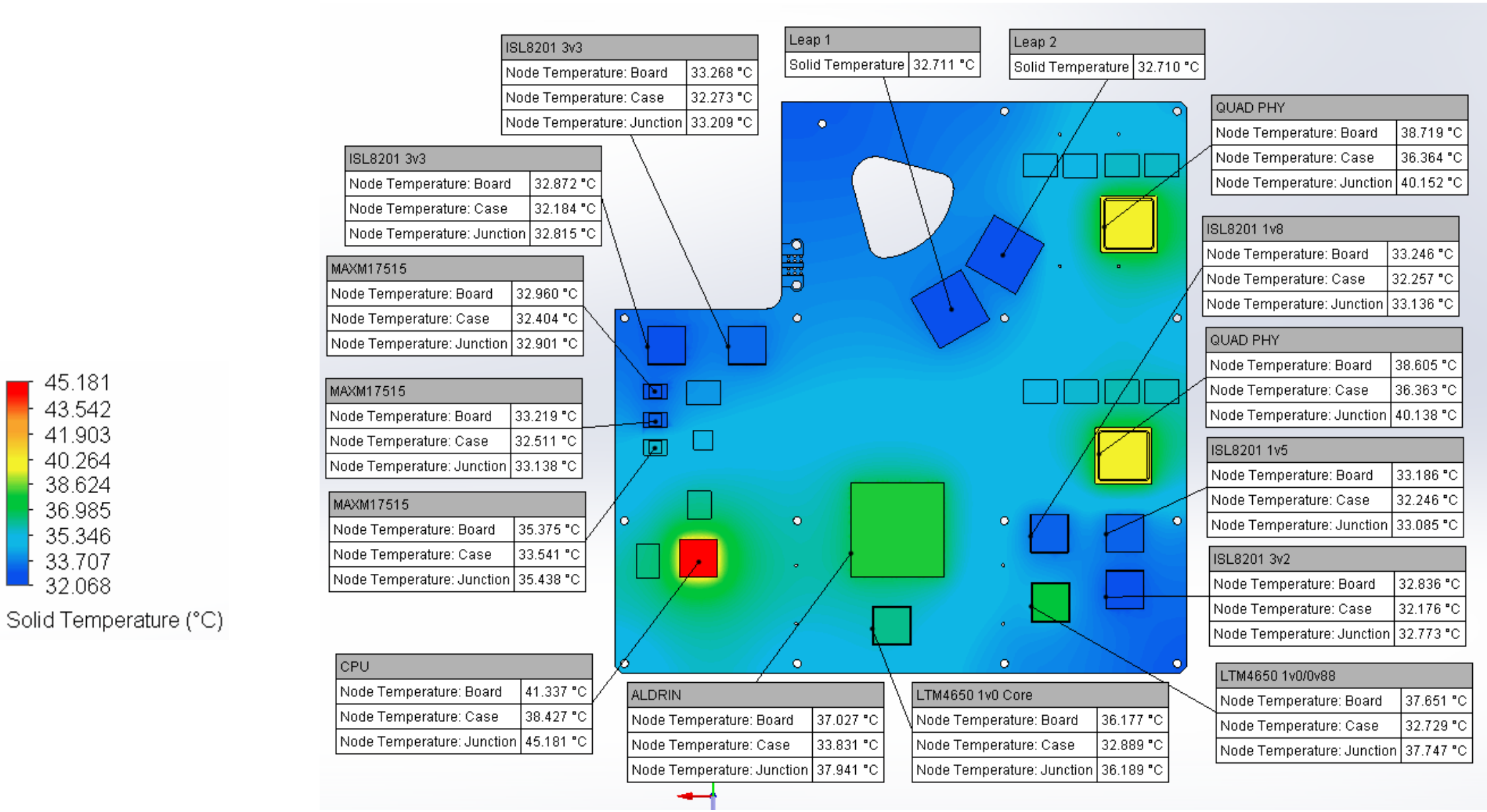
ElectronicCooling Solutions inc

Results Summary –Temperature Cases

Al 6061 T6 Enclosure						
Parameters				Sim 12		
Power Scenario				**Predicted**		
Cooling Rail Temperature °C				32		
Ambient Temp., °C				32		
Elevation, ft				**31000 ft**		
RESULTS						
Component	**Min. Limit, °C**	**Max. Limit, °C**	**Limit Type**	**Power, W**	**Result, °C**	**Margin, °C**
Aldrin	-40	110	junction	21.089	37.9	72.1
Marvel 88X3340 Quad PHY	-40	105	Junction	13.175	40.1	64.9
Marvel 88X3340 Quad PHY	-40	105	Junction	13.175	40.1	64.9
DCM3414	-40	125	Junction	6.242	43.7	81.3
LEAP	0	70	Case	3.95	32.7	37.3
LEAP	0	70	Case	3.95	32.7	37.3
CPU	-40	115	junction	3.885	45.1	69.9
LTM4650 ALD_CORE_1V0	-40	125	junction	1.665	36.1	88.9
LTM4650 1V0_PHY_CORE_0V88	-40	125	junction	1.421	37.7	87.3
MFM1714 28V Filter	-55	125	junction	0.756	39.2	85.8
ISL8201M 3V3	-55	125	Junction	0.395	33.2	91.8
MAXM17515 CPU_CORE_1V08	-40	125	Junction	0.358	35.4	89.6
ISL8201M ALD_PHY_INPHI_1V8	-55	125	junction	0.302	33.1	91.9
ISL8201M PHY_AVDD_1V5	-55	125	junction	0.293	33.0	92
ISL8201M CPU Supplies	-55	125	junction	0.244	32.8	92.2
ISL8201M PHY_AVDD_2V3	-55	125	junction	0.22	32.7	92.3
MAXM17515 CPU_VDDM1V5	-40	125	junction	0.051	33.1	91.9
MAXM17515 CPU_ALD_3V3	-40	125	Junction	0.044	32.9	92.1

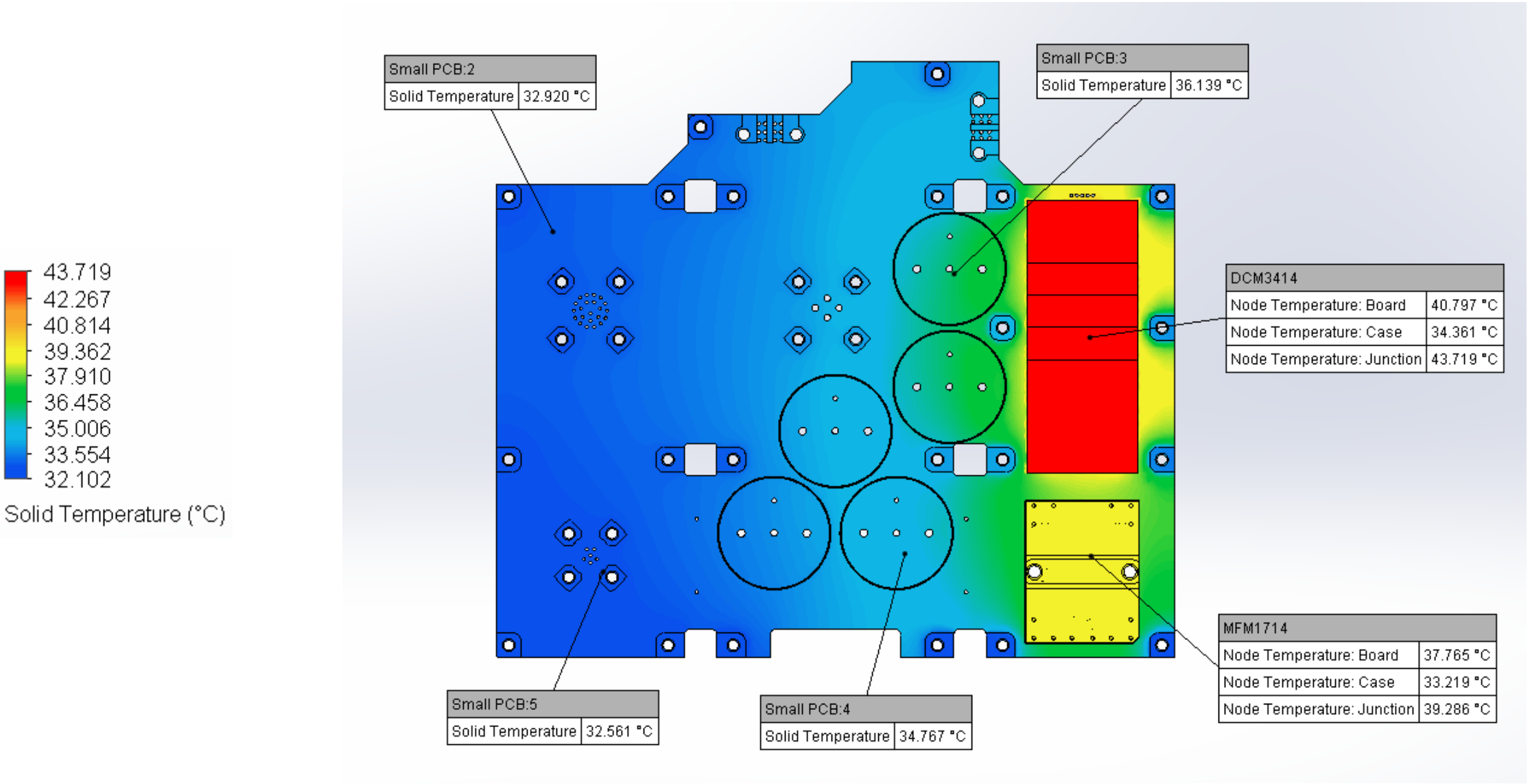
Large PCB Components Temperature Plot

32°C , 31000 ft



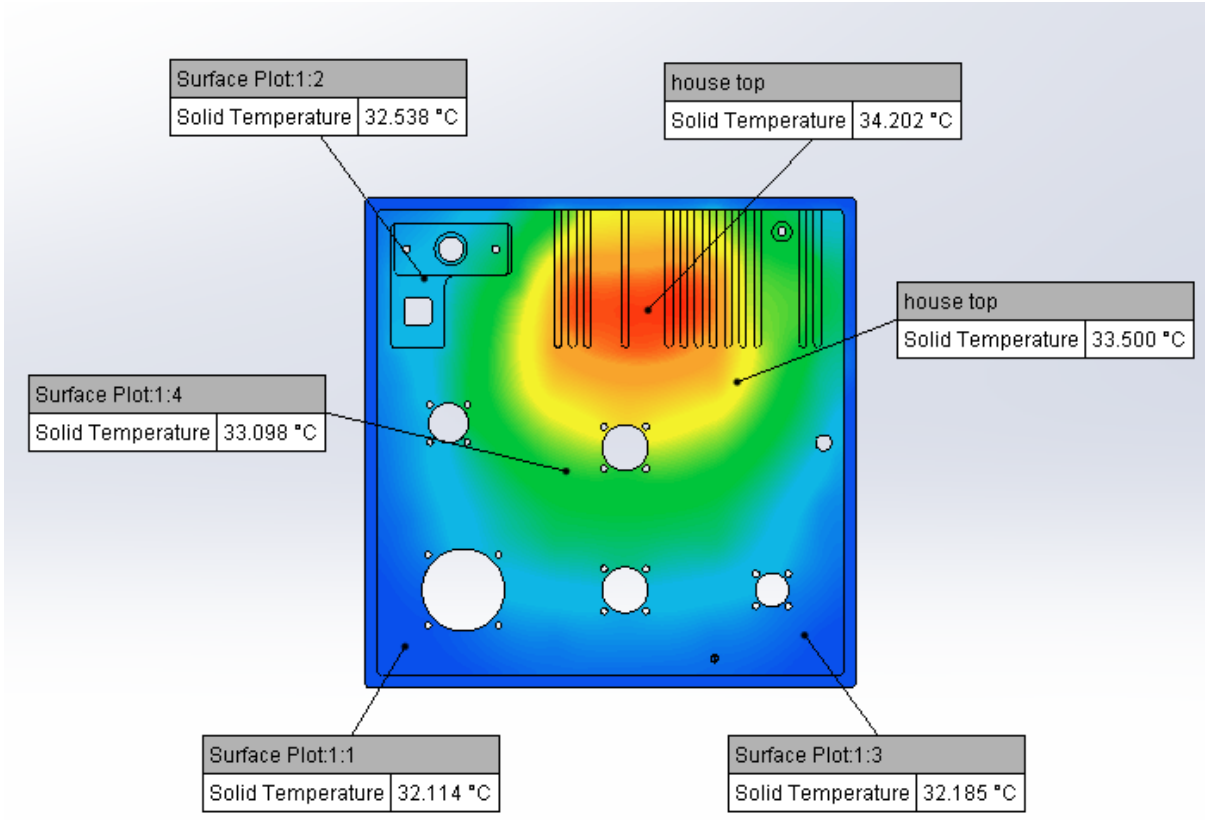
Small PCB Components Temperature Plot

32°C , 31000 ft

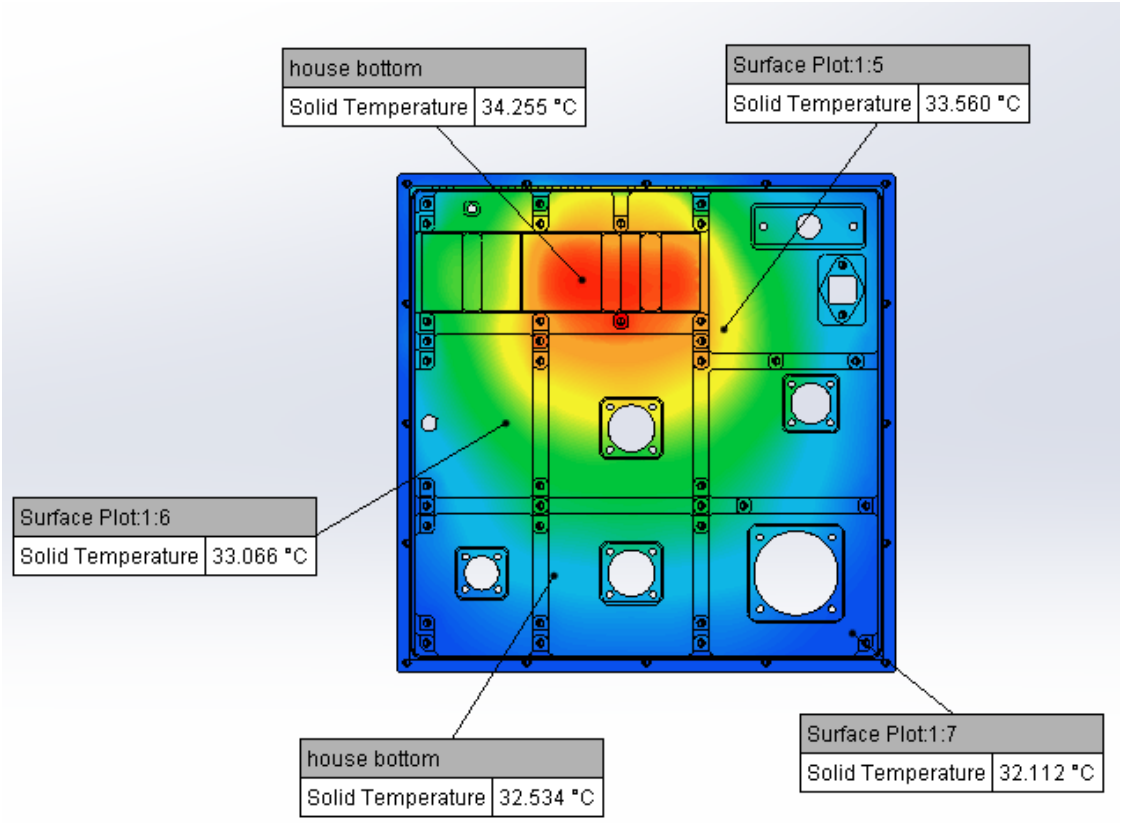


Housing Surface Temperature Plot

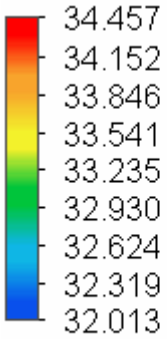
32°C , 31000 ft



Top Side

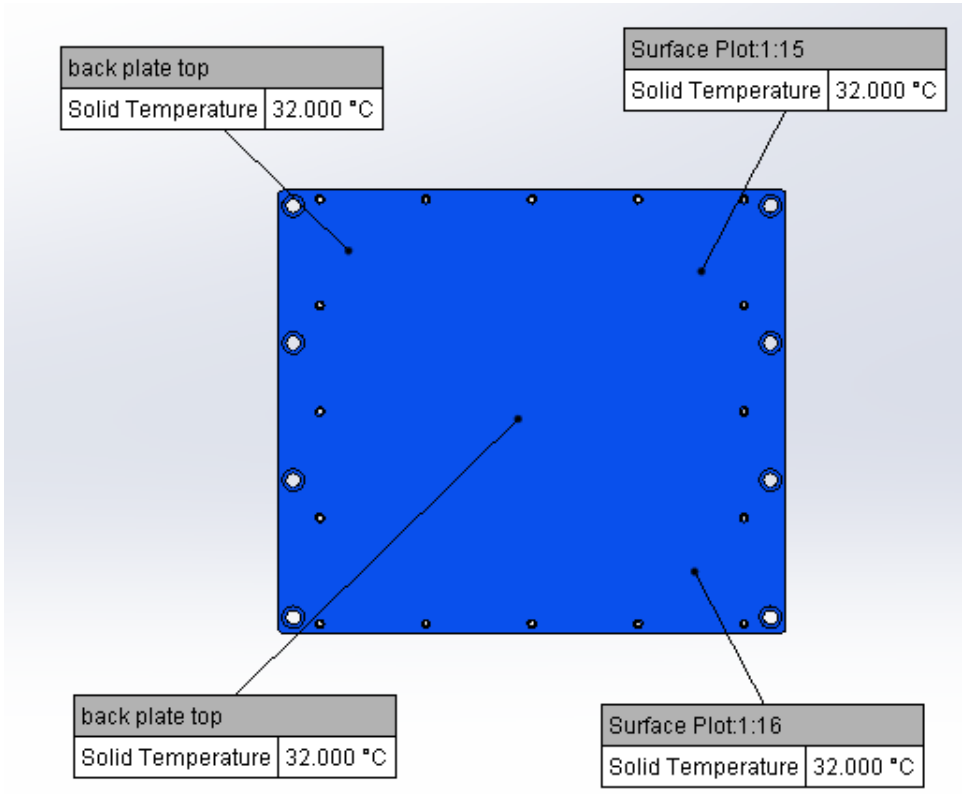


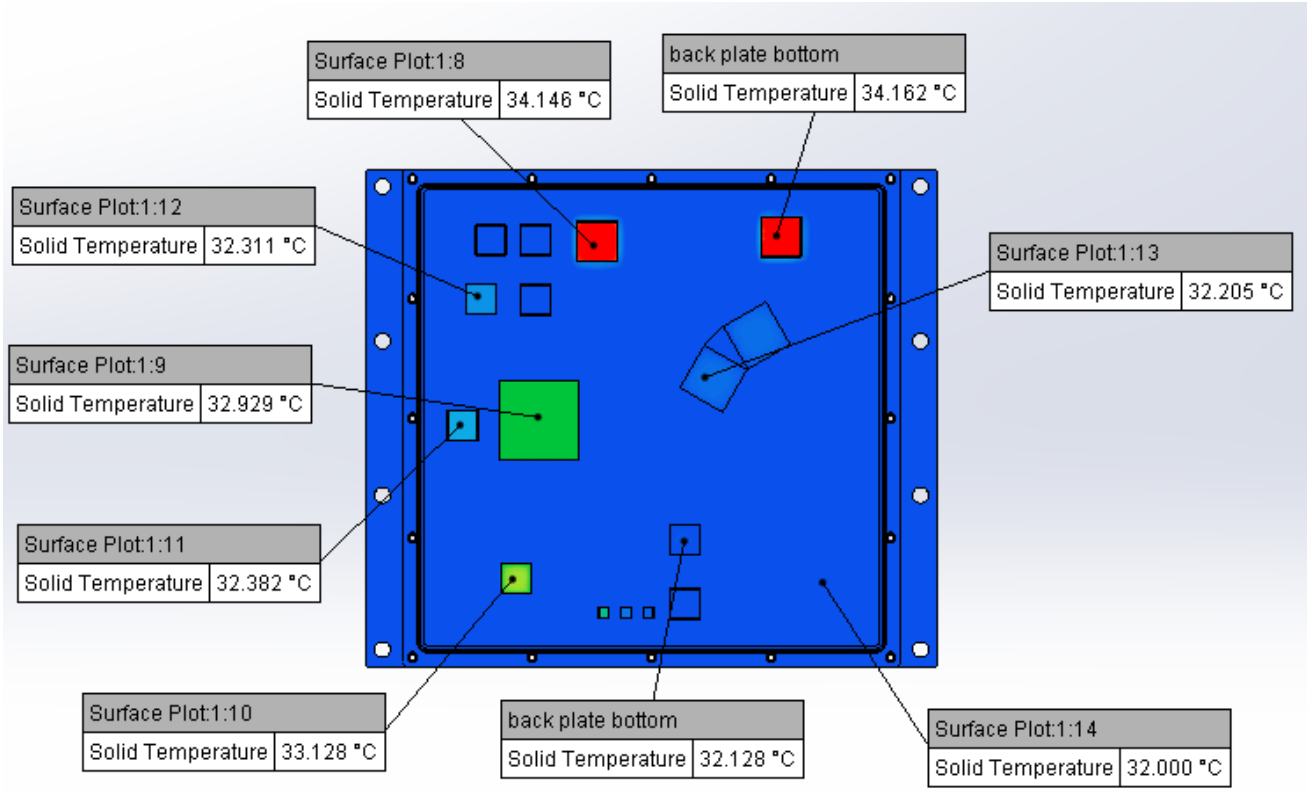
Bottom Side

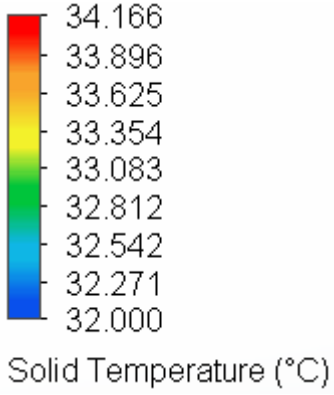


Rear Cover Temperature Plot

32°C , 31000 ft







Top Side

Bottom Side