

**Purpose**

This test was conducted to determine if the NSSPCM’s passive heating method has the ability to circulate heat to conduct to the system battery. The NSSPCM’s PCB serves as a heat sink to conduct heat away from components and to the battery to ensure proper operating temperature. This test investigated the system’s operation in a convection present environment.

**Equipment Used:**

- Fully assembled and operating NSSPCM
- Infrared Thermometer
- Decade Resistor Box
- Fluke 179 True RMS Digital Multimeter with 80BK Temperature Probe

**Procedure:**

- 1) Assemble NSSPCM completely and power on system.
- 2) Place the DMM thermocouple inside the module above the PCB for an ambient temperature reading.
- 3) At room temperature, measure temperatures at the designated locations of the NSSPCM PCB noted on page 2.
- 4) Measure the temperature of the PCB locations every 15 minutes for 2 hours.
- 5) Record all data for analysis.

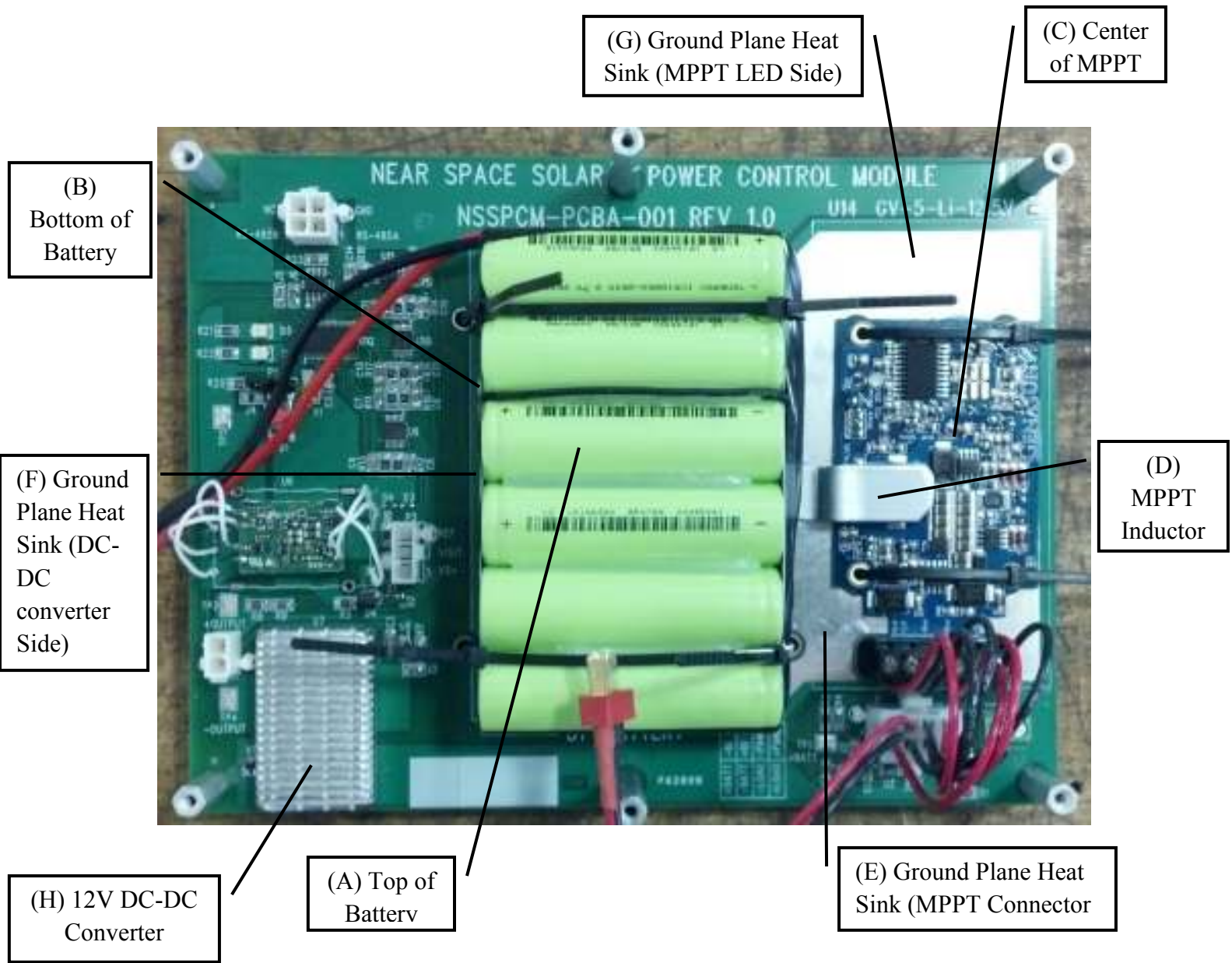
**Collected Data:**

\*Temperature Units: Degrees Celsius

Time	A	B	C	D	E	F	G	H	I
2:00 PM	27.4	28.0	29.6	26.8	27.2	27.4	27.4	32.4	28.5
2:15 PM	28.2	28.6	32.2	27.0	28.2	28.4	27.2	37.4	29.4
2:30 PM	29.4	29.2	34.6	27.6	27.8	30.1	27.4	39.2	30.1
2:45 PM	30.2	30.0	33.8	29.6	30.6	30.8	29.4	39.6	31.4
3:00 PM	30.8	31.6	36.6	29.4	30.1	31.4	30.0	41.2	32.7
3:15 PM	31.6	32.6	37.6	30.6	30.6	32.4	30.6	42.8	33.4
3:30 PM	32.4	32.6	37.8	30.7	31.2	32.4	30.0	43.9	33.8
3:45 PM	33.0	33.6	38.2	31.8	31.8	33.6	30.2	43.8	34.4
4:00 PM	33.4	33.6	36.0	30.6	31.6	33.6	30.4	43.6	34.4

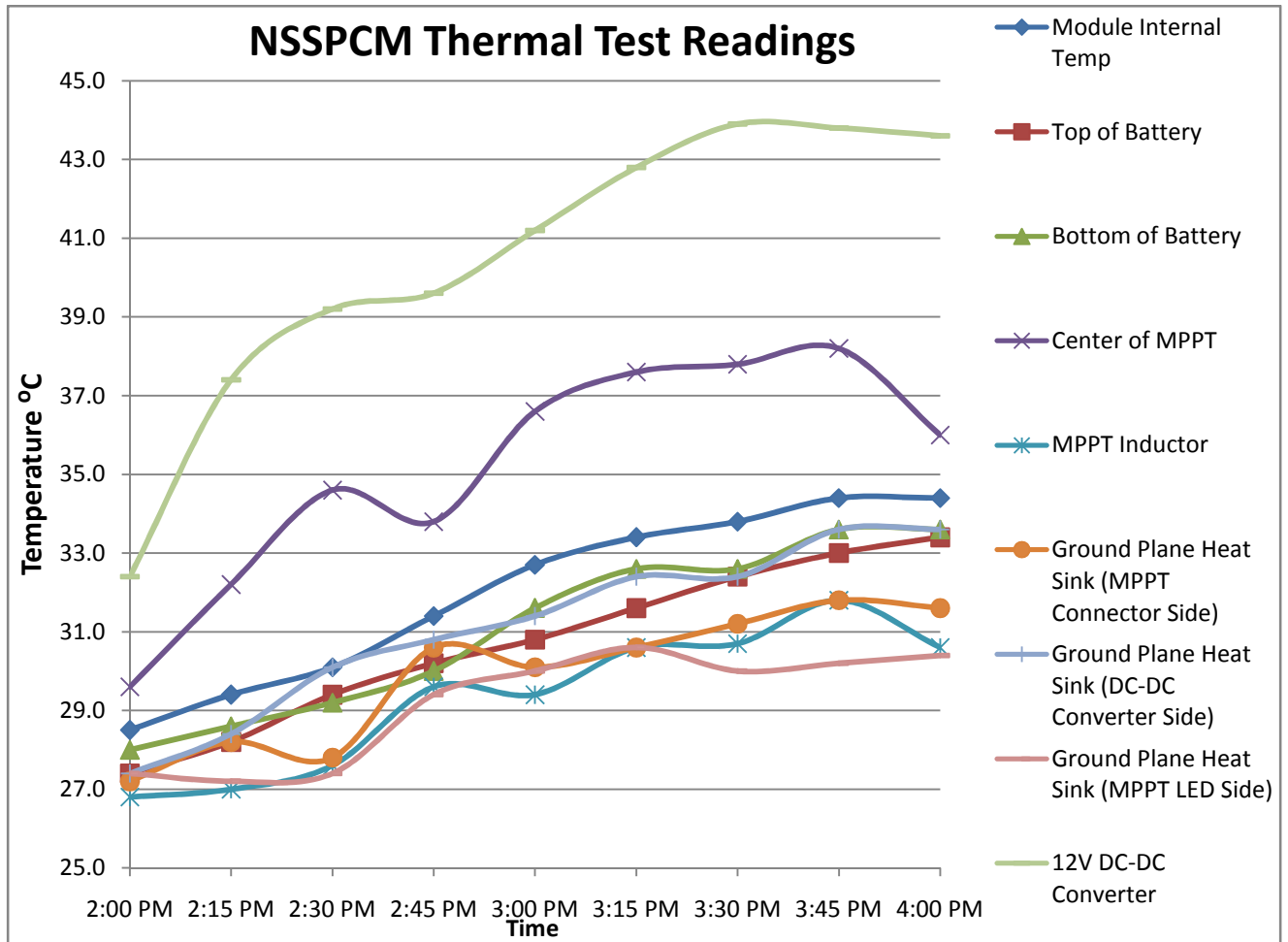
Measurement locations on page 2

**Measurement Locations**



(I) Module Internal Temperature

**Graphed Results**



**Conclusion**

At the anticipated altitudes, convection will not exist. Therefore, nearly all heat transfer will take place due to conduction. These test results indicated that the passive heating method is working according to design in a convection present environment. The most important observation was that the bottom of the battery yielded the highest temperatures. This result is critical because the battery is the most temperature sensitive device in the module and requires a strict operating range. To better test and investigate the NSSPCM passive heating method, a vacuum chamber needs to be used to eliminate the effect of convection. A vacuum chamber with an adjustable temperature setting will be ideal because near space environment presents harsh temperature conditions.