**System Features:**

**1. BMS:**

* + Robust and small design.
  + Single cell voltage measurement (0.1 – 5.0 V, resolution 1 mv).
  + Single cell - under/over voltage protection.
  + Single cell internal resistance measurement.
  + SOC and SOH calculation.
  + Over temperature protection (up to 8 temperature sensors).
  + Under temperature charging protection.
  + Passive cell balancing up to 1.3 A per cell.
  + Shunt current measurement.
  + Galvanically isolated user defined multi-purpose digital input/output.
  + Programmable relay (normally open).
  + Galvanically isolated rs-485 communication protocol.
  + CAN communication.
  + PC user interface for changing the settings and data-logging.
  + Hibernate switch.

**2. SOLAR PANELS:**

* + Panasonic Module HIT - VBHN325SA16
  + Efficiency – 19.7%
  + Temperature Independent.
  + Having Water Drainage.

**3. SOLAR CHARGE CONTROLLER:**

* + NavSemi Energy IMAX40 (48v) MPPT Solar Charge Controller.
  + Maximization of Solar Energy Harvest.
  + Higher Power Conversion Efficiency.
  + Remote Monitoring.
  + Dual Voltage Operation (12/24V).
  + Integrated LCD Display.
  + LED Visual Indications.
  + High Voltage Protection.
  + Panel reversal Protection.
  + Battery reversal Protection.
  + Short Circuit Protection.
  + Open Fuse Protection.

**Project h/w specifications:**

1. **BMS:**
   * Balance start voltage 3.5 V.
   * balance end voltage 3.6 V.
   * Maximum diverted current per cell up to 1.3 (3.9 Ohm) A.
   * Cell over voltage switch-off 3.8 V.
   * Cell over voltage switch-off hysteresis per cell 0.015 V.
   * Charger end of charge switch-off pack 3.6 V.
   * Cell under voltage protection switch-off 2.2 V.
   * Cell under voltage protection alarm 2.6 V.
   * Cell under voltage protection switch-off timer 4 s.
   * Cells max difference 0.2 V.
   * BMS maximum pack voltage 62.5 V.
   * BMS over temperature switch-off 50 °C.
   * Cell over temperature switch-off 60 °.
   * Under temperature charging disable -15 °C.

**2. SOLAR PANEL:**

* + Rated Power (Pmax)¹ : 325W
  + Maximum Power Voltage (Vpm) : 57.6V
  + Maximum Power Current (lpm) : 5.65A
  + Open Circuit Voltage (Voc) : 69.6V
  + Short Circuit Current (lsc) : 6.03A
  + Temperature Coefficient (Pmax): -0. 30%/°C
  + Temperature Coefficient (Voc) : -0. 174V/°C
  + Temperature Coefficient (lsc) : 1.82mA/°C
  + CEC PTS Rating : 301.7W
  + Cell Efficiency : 21.76%
  + Module Efficiency : 19.4%
  + Watts per Ft.² : 18.0W
  + Maximum System Voltage : 600V
* Weight 40.81 Lbs. (18.5kg)
* Dimensions LxWxH 62.6x41.5x1.4 in. (1590x1053x35 mm)
* Cable Length +Male/-Female 40.2/40.2 in. (1020/1020 mm)
* Cable Size / Type No. 12 AWG / PV Cable
* Connector Type2 Multi-Contact® Type IV (MC4™)
* Operating Temperature -40°F to 185°F (-40°C to 85°C)

**3. SOLAR CHARGE CONTROLLER:**

* Maximum Power Handling (Wp): 2000
* Maximum Voltage Open Circuit (V): 150
* Operating Voltage Range(V): 60-120
* Max Short Circuit Current (Isc): 20 A
* Typical Battery Voltage (V): 48
* Battery Low (V) [Red LED]: 43.2
* Battery Low Alarm (V) [Yellow LED]: 45.6
* Boost cut-off (V): 58.8
* Float charge voltage (V): 54.4
* Maximum charging current (A): 40
* Self-consumption: <1.3 W OTHER

**DS18B20 Sensor Technical specs:**

* Usable temperature range: -55 to 125°C (-67°F to +257°F)
* 9 to 12 bit selectable resolution
* Uses 1-Wire interface- requires only one digital pin for communication
* Unique 64 bit ID burned into chip
* Multiple sensors can share one pin
* ±0.5°C Accuracy from -10°C to +85°C
* Temperature-limit alarm system
* Query time is less than 750ms
* Usable with 3.0V to 5.5V power/data