NUV100-SC
Nuvation BMS™ Stack Controller
Datasheet
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System Overview

Nuvation BMS™ is generally comprised of the following modules:

- 1 Stack Controller
- 1 Power Interface
- 1 or more Cell Interfaces

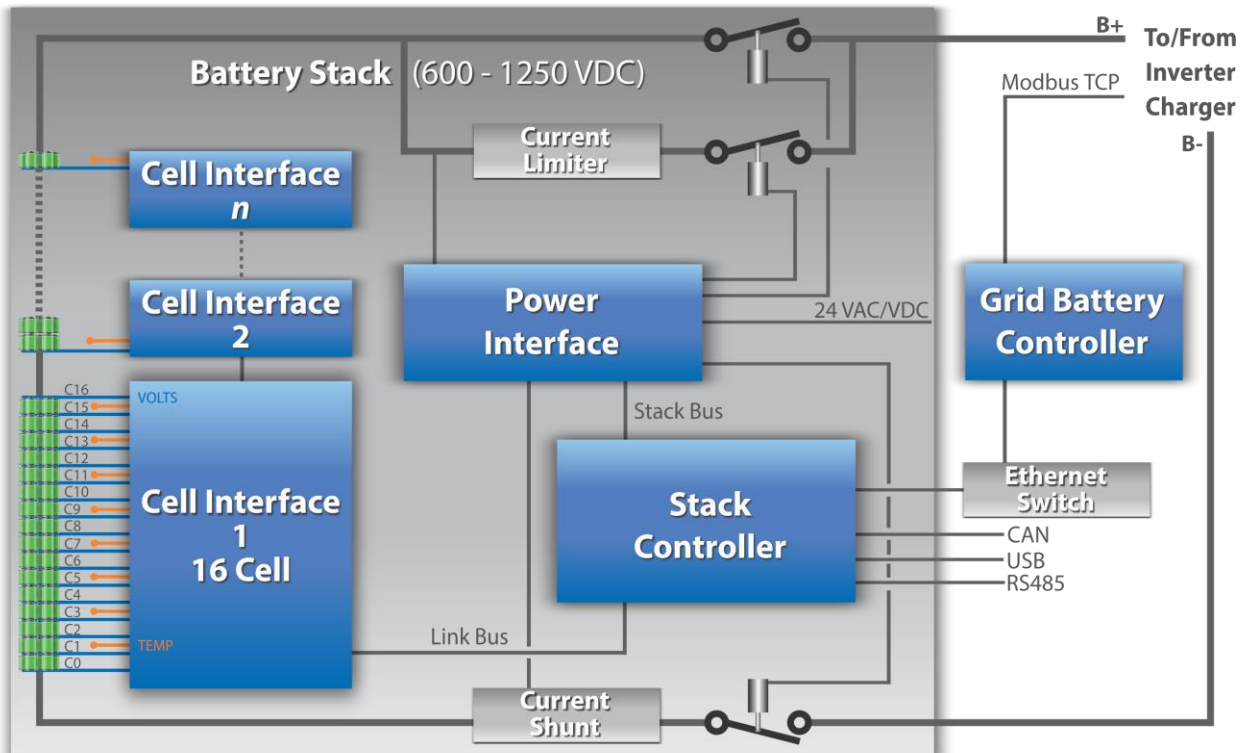An example configuration is shown in Figure 1.

Figure 1: Nuvation BMS™ Example System Diagram

This datasheet addresses the Stack Controller. Refer to the Power Interface or Cell Interface datasheets for information about the other modules in Nuvation BMS™.

Hardware Overview

The Stack Controller (SC) module contains the central MCU which handles all the processes and decision making required by Nuvation BMS™. The external interfaces to this module are:

- 10/100 Base-T Ethernet RJ45 jack
- USB 2.0 Host A connector
- Isolated CAN 2.0 port
- RS-485 (Modbus) connector
- Four (4) opto-isolated digital outputs
- Four (4) opto-isolated digital inputs
- Link Bus connector
- Stack Bus connector
- Three (3) Indicator LEDs

The SC does not have high-voltage connectors and does not connect to any battery stack-referenced signals, making it safe to handle and connect to external equipment.

The following subsections describe the external interfaces in more detail. For wiring/pin-out information, please refer to the *Nuvation BMS Implementation Guidebook*.

Ethernet

The Ethernet jack is a standard RJ45 Cat5e rated jack. This interface is used as the primary means of connecting an external system to the BMS to configure the operating parameters and observe the status. It is also used as a means of controlling an external battery charger/inverter and communicating with the vehicle central controller, grid-attached site controller, etc. The two LEDs on the Ethernet jack indicate link status (green LED) and network activity (yellow LED).

USB 2.0 Host

The USB 2.0 Host connector is a standard Type-A connector. This interface is used as a service port for the service technician to connect to.

CAN 485

The CAN 485 connector is a 12-pin Micro-Fit 3.0™ Molex connector. This interface provides an isolated CAN 2.0 port as well as a non-isolated RS-485 (Modbus) port. This interface can be used to control an external battery charger/inverter and communicating with the external system (vehicle central controller, grid-attached controller, etc).

GPIO-Out

The GPIO-Out connector is a 10-pin Micro-Fit 3.0™ Molex connector. This interface provides four (4) isolated outputs (output of a solid-state relay) to allow an external system to receive digital input from the SC. The functionality of this interface is configured by the end-user to match their needs.

GPIO-In

The GPIO-In connector is an 8-pin Micro-Fit 3.0™ Molex connector. This interface provides four (4) isolated inputs (cathode on an optocoupler) to allow an external system to send digital output to the SC. The functionality of this interface is configured by the end-user to match their needs.

Link Out

The Link Out connector is a 4-pin Micro-Fit 3.0™ Molex connector. This interface is used to connect the Cell Interface string to the SC. The Link In connector on the Cell Interface module monitoring the lowest-potential cell in the series battery stack is connected to this connector via a Link Bus cable. The SC also provides power out this connector to power the Cell Interface modules.

Stack Bus

The Stack Bus connector is a 6-pin Mini-Fit® Jr. Molex connector. This interface is used to connect the Power Interface to the SC. The SC is powered from the Stack Bus.

Indicator LEDs

The three (3) LEDs are used by the SC to indicate health and functional status to the user. All LEDs are controlled by the central MCU. The Power LED indicates the MCU is operational, the Activity LED indicates the MCU is processing data and the Fault LED indicates a fault has occurred in Nuvation BMS™.

Operating Limits

This section states the operating limits of the Stack Controller module.
WARNING: Exceeding the maximum ratings will damage the module.

Electrical Characteristics

Table 1: Electrical Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Units
Stack Bus Specifications						
+VSYS	Input Voltage		5.6	24	34	Vdc
	Input Current	+VSYS = 24Vdc	0.042	-	1.3	Adc
Rterm	Termination resistance tolerance		118.8	120	121.2	Ω
	Power rating		-	-	0.125	W
StackbusP	Dominant Output		2.45	-	3.3	Vdc
	Recessive Output		-	2.3	-	Vdc
	Output Current		10	-	50	mAdc
	Output Signal Rise Time		35	-	135	ns
	Output Signal Fall Time		35	-	135	ns
StackbusN	Dominant Output		0.5	-	1.25	Vdc
	Recessive Output		-	2.3	-	Vdc
	Output Current		10	-	50	mAdc
	Output Signal Rise Time		35	-	135	ns
	Output Signal Fall Time		35	-	135	ns
Link Bus Specifications						
+VBUS	Output Voltage		-	+VSYS	-	Vdc
	Output Current	+VBUS = 24Vdc	-	-	1.26	Adc
IP_LINK	Output Current		-	-	20	mAdc
IN_LINK	Output Current		-	-	20	mAdc
USB Specifications						
+5V_USB	USB Current		-	-	500	mAdc
USB_Data	USB supported datarates		1.0	-	2.0	
Ethernet Specifications						
ETH_Protocol	Ethernet data speeds		10	-	100	Base-T
ETH_Connector	Ethernet jack rating		-	Cat5e	-	
GPIO-Out						
Vmax	Open Blocking Voltage	Between *_A and *_B, or between *_B and *_A	-	-	60	Vdc
Imax	Closed Maximum Curent	Between *_A and *_B, or between *_B	-	-	400	mAdc

Symbol	Parameter	Conditions	Min	Typ	Max	Units
		and *_A				
Ron	Closed-State Resistance	Between *_A and *_B, or between *_B and *_A	-	-	2	Ω
GPIO-In						
Turn-On	Turn On Threshold Voltage		0	-	1.4	Vdc
	Turn-On Threshold Current		1.6	-	-	mAdc
Turn-Off	Turn-Off Threshold Voltage		3	-	5	Vdc
	Turn-Off Threshold Current		-	1	-	mAdc
Vmax	Off Voltage	Iin = 0mA	-	-	5	Vdc
Imax	On Current	Vin = 0V	-	-	12	mAdc
CAN Specifications						
+VCAN	Input Voltage		5.5	-	12	Vdc
	Input Current	+VCAN = 12Vdc	-	52	73	mAdc
Rterm	Termination resistance tolerance		118.8	120	121.2	Ω
	Power rating		-	-	0.125	W
CAN_P	Dominant Output		2.9	3.5	4.5	Vdc
	Recessive Output		2	2.3	3	Vdc
	Output Current		10	-	70	mAdc
	Output Signal Rise Time		-	20	50	ns
	Output Signal Fall Time		-	20	50	ns
CAN_N	Dominant Output		0.8	1.2	1.5	Vdc
	Recessive Output		2	2.3	3	Vdc
	Output Current		10	-	70	mAdc
	Output Signal Rise Time			20	50	ns
	Output Signal Fall Time			20	50	ns
Isolation	Rated Isolation		-	-	2500	Vrms
Modbus Specifications						
+VMOD	Output Voltage		-	+VSYS	-	Vdc
	Output Current	+VMOD = 24Vdc	-	-	1	Adc
Rterm	Termination resistance tolerance		148.5	150	151.5	Ω
	Power rating		-	-	0.125	W
|Vod|	Driver differential output		1.5	2	-	V
Io	Output current		-60	-	60	mA
tr	Output Signal Rise Time		0.3	0.7	1.2	us
tf	Output Signal Fall Time		0.3	0.7	1.2	us

Environmental Conditions

Table 2: Environmental Conditions

Symbol	Parameter	Conditions	Min	Typ	Max	Units
Thermal Specifications						
Ta	Operating Temperature		-10	25	60	°C
	Storage Temperature		-10	25	60	°C
Humidity Specifications						
RH	Operational RH		5	-	85	%
	Storage RH		5	-	85	%
Shock and Vibration Specifications						
Vertical	Vertical shock/vibration		-	-	1	m/s^2
Longitudinal	Longitudinal shock/vibration		-	-	1	m/s^2
Transverse	Transverse shock/vibration		-	-	1	m/s^2

The SC has also met industry standards CISPR 22 Class A and IEC/EN 61000-4-2 for EMC/EMI and ESD respectively. All components are EU RoHS/China RoHS compliant.

Mechanical Overview

The overall dimensions of the SC are 104.4mm X 121.58mm X 40.6mm. It comes standard with DIN clips that enable it to be securely mounted to EN50022-compliant DIN rails. The clips add an extra 19.6mm to the overall width of the SC module, bringing it from 104.4mm to 124mm. Extra space should be provided around the module to allow for easy installation/maintenance.
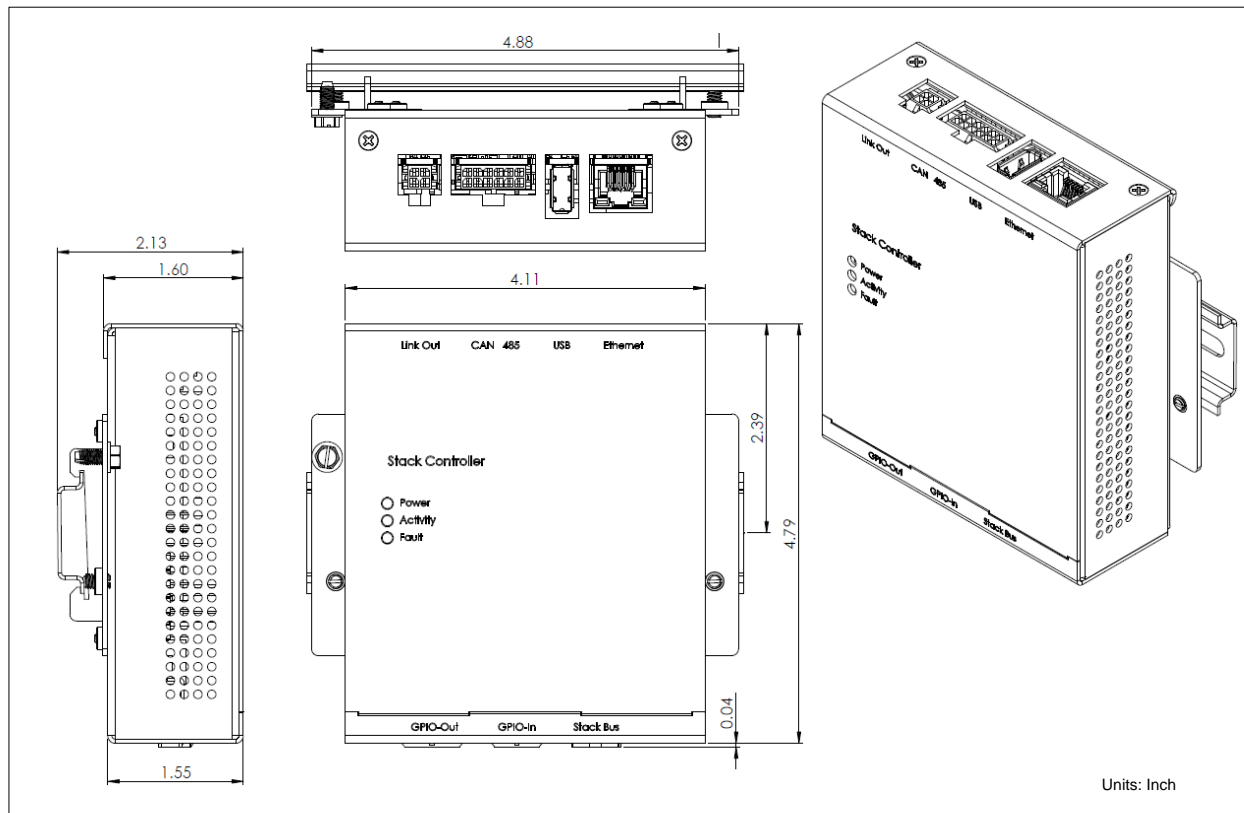
The SC weighs approximately 536g.

Figure 2: Mechanical Drawing

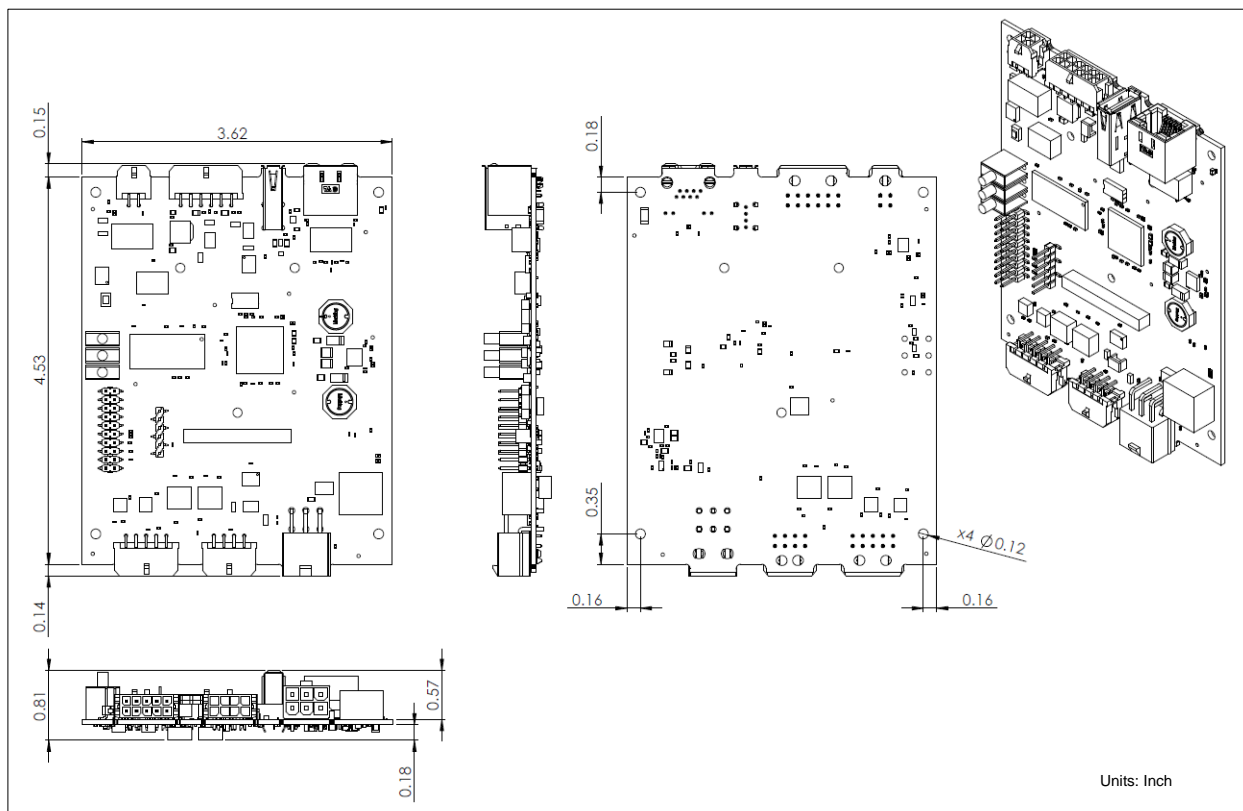The SC without the enclosure weighs approximately 71g.

Figure 3: Mechanical Drawing of PCB

Ordering Info

Model Number	Description
NUV100-SC	Stack Controller with Enclosure
NUV100-SC-U	Stack Controller PCB (no enclosure)

Notes: