PULSE SYSTECH

PULSESYSTECH

HAVEN
USER MANUAL

Revision	Date	Description
000	2025-03-21	First Release

Contents

Table List

1. INTRODUCTION

The Pulsesystech Haven platform features an smart battery power module architecture. It can be easily charged using a standard laptop adapter. During the charging process, your system continues to operate uninterrupted through the power adapter. When the charger is disconnected, the system automatically switches to battery power.

The battery pack is continuously monitored through precise measurement mechanisms. The remaining usable capacity and the balance between the cells are analyzed to optimize the system's energy consumption and extend the battery lifespan.

By utilizing advanced fault detection algorithms, the battery pack protects against risks such as high temperature, over-discharge, short circuit, and low voltage, ensuring maximum system integrity and operational continuity.

All status information for your battery pack is sent on the circuit via RS485 or CAN. Depending on the user's choice, the communication link must be selected so that only one or both interface connections are available.

2. HAVEN TECHNICAL SPECIFICATIONS

Table 1. Haven Features

Feature	Description
Charging Voltage	15.5V-28V (3S Minimum 15.5V, 4S Minimum 19.5V, 5S Minimum 24V)
Reverse Voltage Protection	Reverse Voltage Protection at Charging Adapter Input
System Output Voltage	9V-27.5V - 2.5A (In Charging Process) / 10A (In Battery Discharge Process)
Battery Voltage	9V-21V
Series Connected Battery	3S/4S/5S Lithium Ion Connection
Battery Discharge Current	10A
Maximum Charge Current	2A at Continuous Current (Automatically Decreases up to 0.5A according to Load Demand from System Output)
Battery Package	• 18650 • 21700
System Voltage Control	Automatic Switching Between Charging Voltage and Battery Voltage
System Protection Structures	• Battery Cell Voltage Low-High Voltage Protection • Battery Short Circuit Protection • Battery Overcurrent Protection • Circuit Charge Voltage Low-High Voltage Protection

	• Battery Over Temperature Protection
System Voltage, Current and Temperature Monitor	• Battery Cell Voltage Reading • Battery Charge and Discharge Current Reading • System Voltage and Current Reading • Circuit Charge Voltage and Current Reading • On-Circuit Charging Structure Temperature Reading • Charge and Discharge Open-Close Structure Temperature Reading • Battery Pack Temperature Reading
Battery Capacity Measurement	Battery Load Counting (Coulomb Counting)
Battery Balance	Passive Compensation (50mA at 4.2V Cell Voltage)
Circuit External Regulator Output	• 12V/1A • 5V/1A
Digital Display	Can be added 7- Segment
Circuit Communication	• RS485 Full Duplex • CAN-BUS
Circuit Operating Temperature	-40 °C…70 °C
Circuit Dimensions	89.45mm x 86.50mm x 21.40mm

2.1 Block Diagram

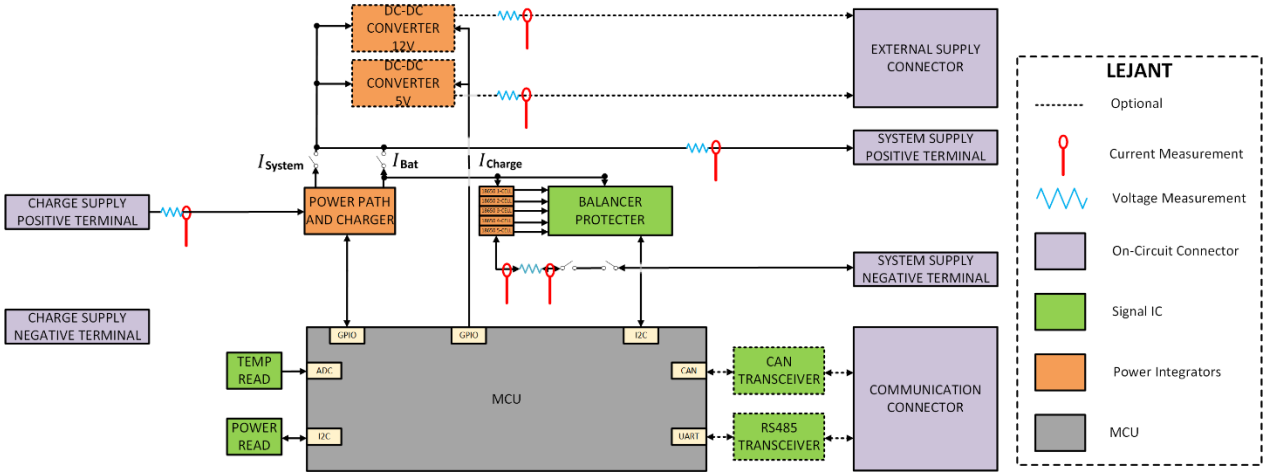


Figure 1. Haven Power and Signal Block Diagram

2.2 On-Circuit Connector Placement

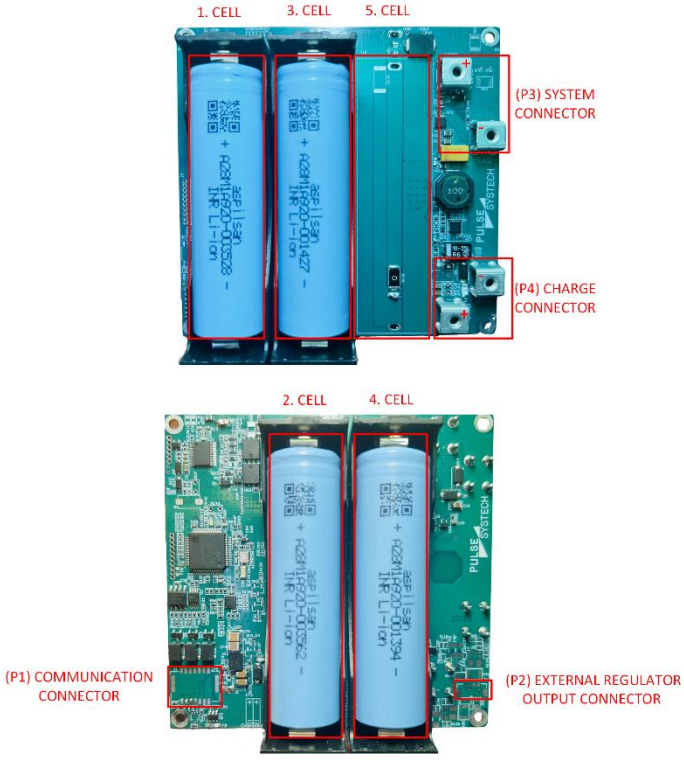


Figure 2. Haven On-Circuit Connectors

2.3 Connector Information

Descriptive	Connector	Description
P1	**2077601471**	Communication Connector
P2	**5055680471**	External Regulator Output Connector
P3	**7770**	System Connector
P4	**7770**	Charging Connector

3. HAVEN DETAILED TECHNICAL EXPLANATIONS

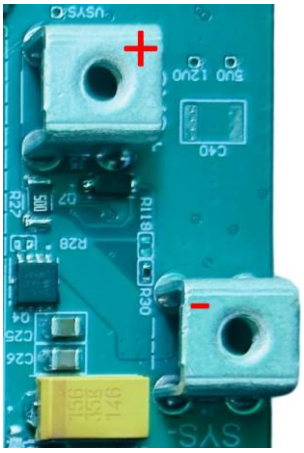
3.1 Charge Connector

There is a built-in battery charging structure on the circuit. This structure eliminates the need for an external battery charger. For the built-in charging structure to work, it is sufficient to connect a DC adapter between 15.5V-28V voltage levels. The minimum voltage levels of the adapter depend on the configuration of the batteries connected in series:

- 3S Configuration 15.5V,
- 4S Configuration 19.5V,
- 5S Configuration 24V

must be. The system continues to be supplied with power during the charging process. During charging, the system voltage is automatically at the same level as the DC adapter. The input current is limited to protect your adapter during charging. The charge current and system current depend on the sum: $Iadaptor = I_{charge} + I_{system}$. During the charging process, when the system supply is demanded and the current limit is exceeded, the battery charging current is automatically reduced.

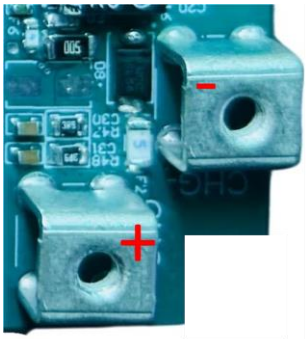
Function	Description
Location	P3
Type	M3 Screw
Connector Part Number	7770
Mate Connector Part Number	0193240002
Pin Diagram	See Image.



3.2 Systems Connector

Power is transferred to the circuit via the system connector. The system output voltage varies between battery and charger voltage levels. The output voltage and current values of the system connector are 9V-27.5V and 2.5A when charging and 10A when discharging the battery. During the charging process the system voltage is automatically equalised to the voltage level of the charging adaptor. When the charger is removed, the system continues to be powered by the battery voltage without interruption.

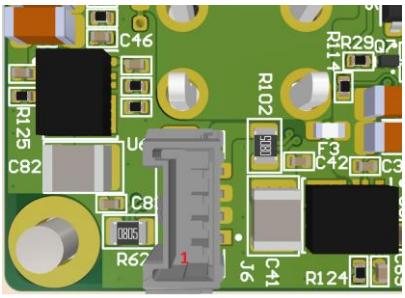
Function	Description
Location	P4
Type	M3 Screw
Connector Part Number	7770
Mate Connector Part Number	0193240002
Pin Diagram	See Image.



3.3 External Regulator Connector

On the circuit there are regulators for the external loads of the users. The output values of these regulators are 12V/1A and 5V/1A. These power outputs can be adapted to the user's needs and the output values of the regulators can be changed.

Function	Description
Location	P2
Type	Board to Cable
Connector Part Number	5055680471
Mate Connector Part Number	5055650401
Pin Diagram	
Pin 1	5V0
Pin 2	GND
Pin 3	GND
Pin 4	12V0



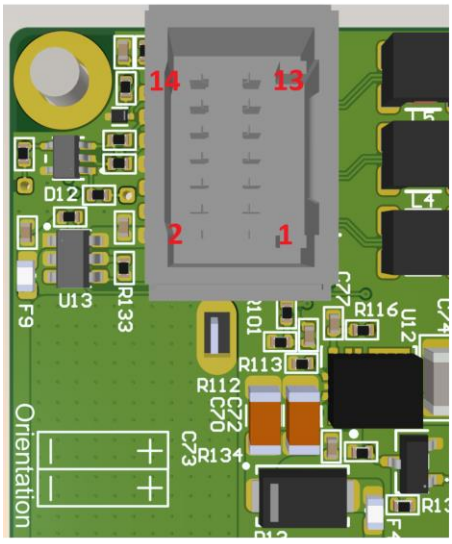
3.4 Communication Connector

On the circuit, communication packages such as battery cell voltages, total battery voltage, battery protection status, remaining battery capacity indication in mAh, battery charge and discharge current, battery pack temperature status, charger and system supply power levels, circuit temperature measurement, charge fault status and charge end status are carried via CAN and RS485. CAN or RS485 communication can be selected according to the user's requirements.

Function	Description
Location	P1
Type	Board to Cable
Connector Part Number	2077601471
Mate Connector Part Number	2045231401

Pin Diagram

Pin 1	RS485_RX_+	**Pin 8**	GND
Pin 2	N.C	**Pin 9**	GND
Pin 3	RS485_RX_-	**Pin 10**	N.C
Pin 4	N.C	**Pin 11**	CAN+
Pin 5	RS485_TX_-	**Pin 12**	N.C
Pin 6	N.C	**Pin 13**	CAN-
Pin 7	RS485_TX_+	**Pin 14**	N.C



4. INSTALLATION

Pulsesystech's Haven platform has four basic connections: system voltage, charge voltage, CAN-RS485 communication and external regulator connection. Diagrams of these connections are shown in Figure 3 and Figure 4

The Haven can be used with either series or parallel battery connections. Figure 3 shows the basic power and signalling connection diagram for series connected batteries. The charger adapter can remain permanently connected to the circuit, in which case the output voltage is equal to the voltage of the charger adapter. If there is a power failure during the charging process, the current flow through the battery will automatically continue without interruption. If the circuit is to be used as a mobile circuit, the charger adapter can be disconnected and the circuit can be used.

Figure 4 shows the parallel battery connection. There are two different types of parallel connection, master and slave. There are three basic connections that must be shared between master and slave circuits: system voltage, charge voltage and slave-master communication connections.

The communication packages of the series and parallel battery circuits can communicate via CAN-BUS at 500 Kbit/s and RS485 at 115200 baud rate.

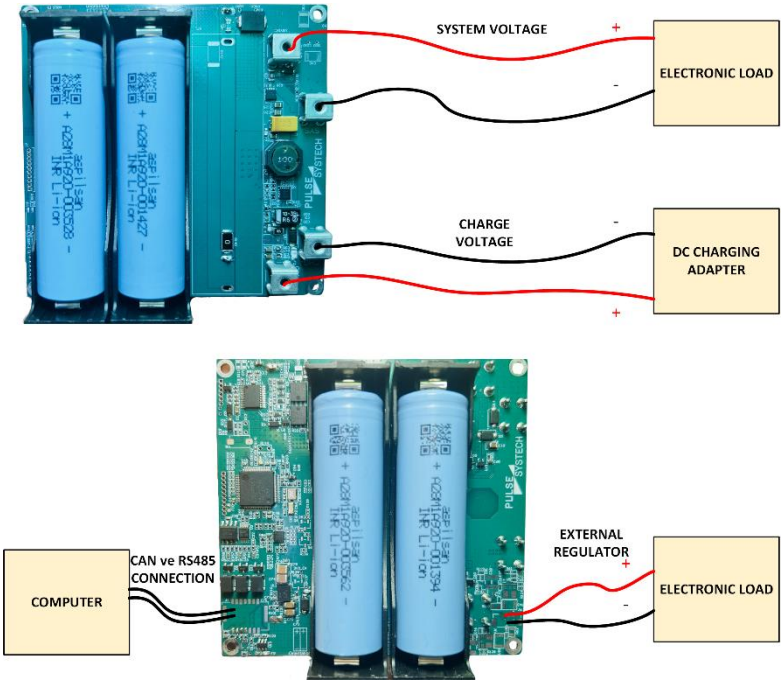


Figure 3. Diagram of Series Connected Battery Power and Signal Connections

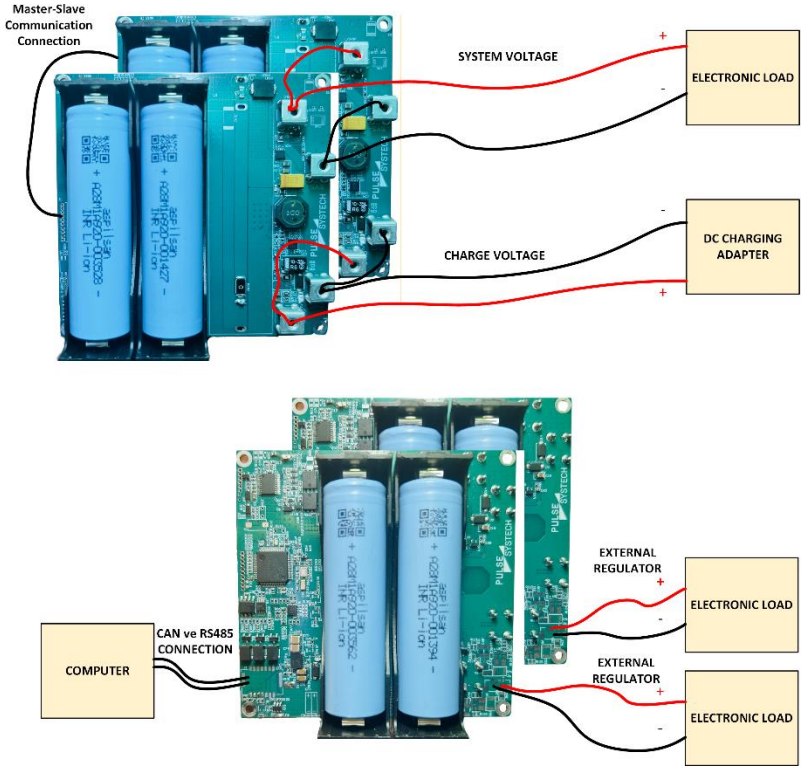


Figure 4. Diagram of Parallel Battery Power and Signal Connections

4.1 Interface and Communication Packages

The communication packet structure and interface can be customized to meet user requirements. With the packet structure, data related to status information in the circuit is transmitted to the interface. The user interface is at the preliminary design stage. The data in the demo interface is shown in Figure 5.

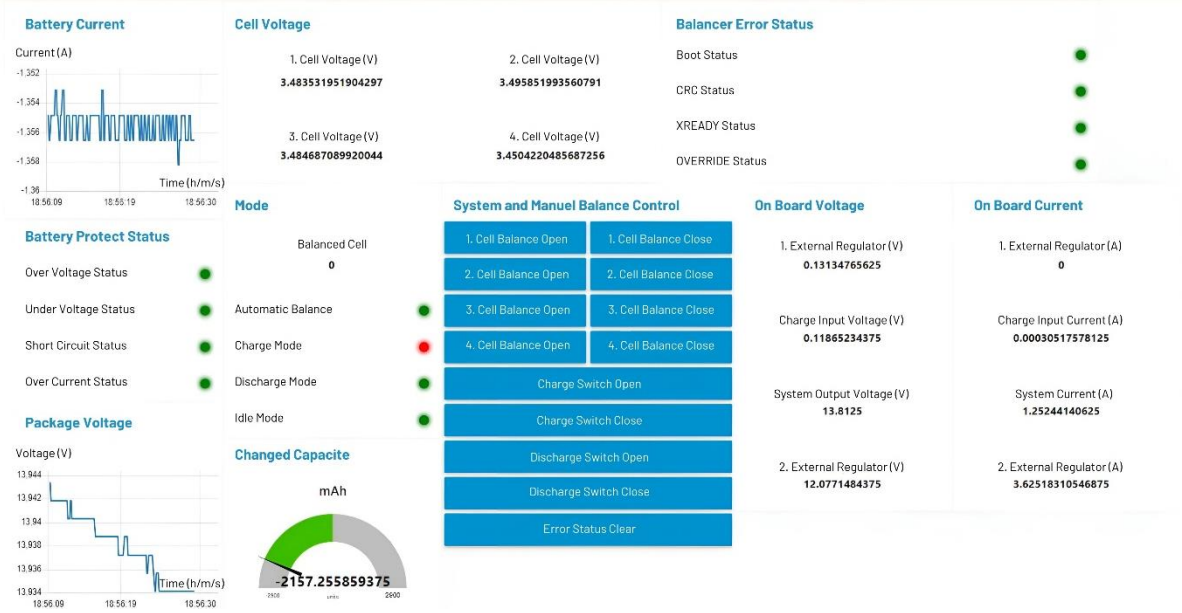


Figure 5. Haven Demo Interface

5. CUSTOMIZE

- The following technical features can be customized to meet the needs of users by creating a new design:
- Charging current in steady state (>1A)
- System current with charging adapter connected (>2.5A)
- Number of battery series connected connections (>5S)
- Battery balancing current (>50mA)
- Battery balancing method (active balancing)
- Circuit communication connection (WI-FI, Bluetooth, etc.)
- External battery pack connection (external battery connector and cell voltage measurement connector)
- Battery discharge current (>10A)
- Communication package structure (Mavlink etc.)
- User interface (logging, high visual graphics, etc.)
- External regulator power output requirements (>12V/1A, >5V/1A)
- Battery connector size change (>21700)

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