



Product Code: MNC313E

Introduction

The EMUS **Mini 3 BMS** is a compact, all-in-one Battery Management System designed to autonomously manage and execute all the core and utility functions of battery management.

It features built-in contactors for charging and discharging circuits, monitors cell voltage, adjusts charging and balancing, and interfaces with system components via versatile inputs, outputs, and communication interfaces.

Capable of managing battery packs with 6 to 16 series-connected cells, it ensures safe, efficient, and reliable operation, making it ideal for a wide range of applications.

NOTE: The values on the datasheet are predicted based on the components and circuits and will be confirmed in the next datasheet release.



Applications

The EMUS Mini 3 BMS supports series-connected battery packs, including those with parallel strings, from 6 to 16 cells, across various lithium chemistries. Its versatility makes it suitable for transportation, robotics, and portable energy solutions. The EMUS Mini 3 BMS is ideal for:

- Autonomous Ground Vehicles (AGVs) and Unmanned Ground Vehicles (UGVs)
- Scooters And Bikes
- Two-Wheelers and Three-Wheelers
- Electric motorcycles
- Mobile Energy Storage Systems

Features

- **USB Interface:** Easy, fast and simple connection to a host device, such as a computer, tablet, or smartphone, for configuration, diagnostics, and maintenance
- **CAN Data Interface:** Facilitates smooth communication with CAN-enabled EMUS devices and third-party systems, allowing for integration into various configurations.
- **Bluetooth Interface:** Allows wireless real-time data transmission to the EMUS EVGUI app, providing instant access to key information.
- **Flexible CAN Baud Rates:** Supports a range of CAN Baud rates, including 50, 125, 250, 500, 800 kbit/s, and 1 Mbit/s, with a default of 250 kbit/s, ensuring adaptability to different systems.
- **SD Card Logging:** Stores all log data, allowing recovery and analysis of unexpected events to support diagnostics and performance tracking
- **Comprehensive Monitoring:** Monitors 6 to 16 cells per BMS unit, ensuring precise control and safety of the battery pack.
- **State of Charge (SOC) and State of Health (SOH) Algorithms:** Advanced algorithms track cell degradation and calculate SOC based on real capacity and internal cell parameters, enhancing the accuracy and longevity of the battery system.
- **Sleep Mode:** Minimizes power consumption during idle periods, conserving energy and extending the battery pack's operational life.

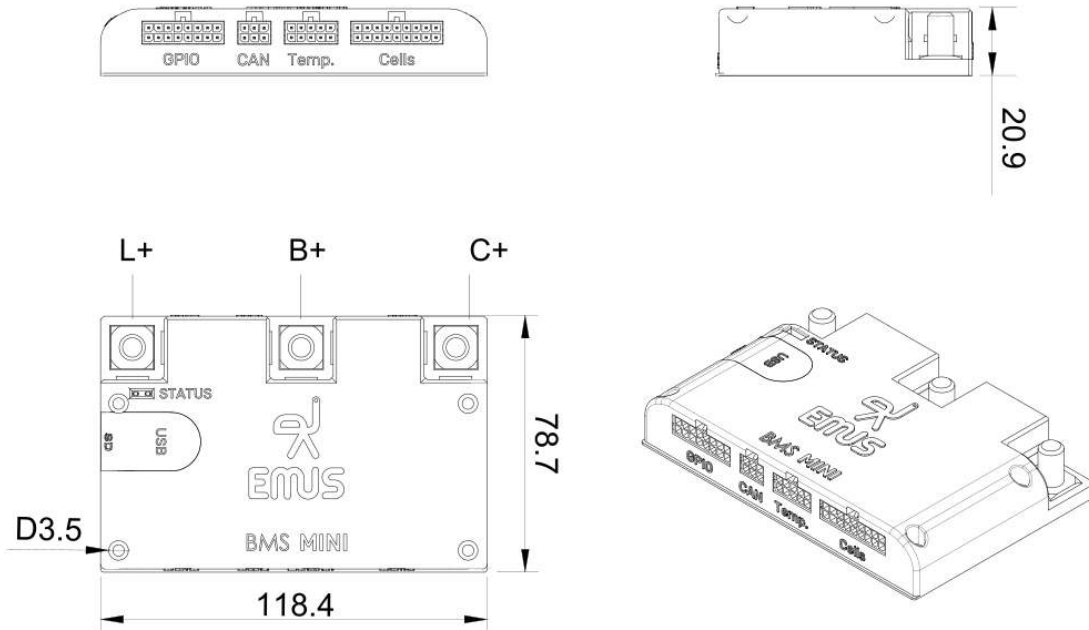


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- **Short-Circuit Protection:** Ensures system safety by detecting and mitigating short-circuit events, preventing damage to the battery pack and connected components.

Mechanical Information



Connection pinout

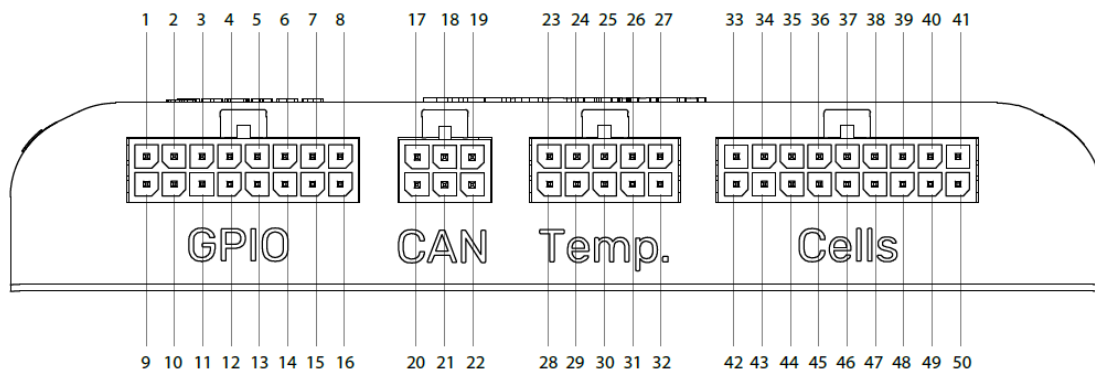


Figure 1. MINI 3 BMS (MNC313E) pinouts

Table 1. MNC313E pin assignment

Pin No.	Assignment	Mating Housing	Terminal
1	5V/12V	Micro-Fit 3.0 Receptacle Housing 43025-1600	Molex Micro-Fit 43045-1600 (Recommended crimp tool Molex Hand Crimp Tool P/N: 638190000)
2	GPAI2		
3	GPO1		



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Pin No.	Assignment	Mating Housing	Terminal
4	GPO2		
5	GPO3		
6	GPO4		
7	RS232_TX		
8	RS485_A		
9	GND		
10	GPAI1		
11	GPI1		
12	GPI2		
13	GPI3/GPAI3		
14	GPI4/GPAI4		
15	RS232_RX		
16	RS485_B		
17	5V/12V		
18	GPO5		
19	CAN_H		
20	GND		
21	GPI5	Micro-Fit 3.0 Receptacle Housing 43025-1000	Molex Micro-Fit 43045-1000 (Recommended crimp tool Molex Hand Crimp Tool P/N: 638190000)
22	CAN_L		
23	TEMP1		
24	TEMP2		
25	TEMP3		
26	TEMP4		
27	TEMP5		
28	GND		
29			
30			
31			
32			
33	(-)*	Micro-Fit 3.0 Receptacle Housing 43025-1800	Molex Micro-Fit 43045-1800 (Recommended crimp tool Molex Hand Crimp Tool P/N: 638190000)
34	CELL15+		
35	CELL13+		
36	CELL11+		
37	CELL9+		
38	CELL7+		
39	CELL5+		
40	CELL3+		
41	CELL1+		
42	CELL16+		
43	CELL14+		



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Pin No.	Assignment	Mating Housing	Terminal
44	CELL12+		
45	CELL10+		
46	CELL8+		
47	CELL6+		
48	CELL4+		
49	CELL2+		
50	CELL1-		

* GND1 and (-) are the same electrical point

Electrical Characteristics

Table 2. MNC313E electrical characteristics

Item	Conditions	Value	
Operating Voltage		12 to 72.8 VDC	
Active mode current consumption	At typical supply voltage, with nothing else connected	12 VDC typical 30 mA	72.8 VDC typical 11 mA
Sleep mode current consumption	At typical supply voltage, with nothing else connected	12 VDC typical 0.9 mA	72.8 VDC typical 1.1 mA
General purpose output GPO1-GPO5 max sinking current (resettable fuse trip current)		1.25A	
General purpose output max voltage		32 VDC	
General purpose input ON voltage		5 to 72.8 VDC	
General purpose input OFF voltage		0 VDC	
USB interface controller		F232R	
USB power supply data line transient/overvoltage protection	VS protection (Pd - 85W)	6V	
CAN interface	TVS protection (Pd - 350W)	-24V to 24V	
USB interface duplexity	USB connected	Full duplex (send and receive)	
USB interface baud rate		57.6kbps	
USB interface data bits		8 bits	
USB interface parity		None	
USB interface stop bits		1 bit	
Number of external temperature sensors		5	
Number of internal temperature sensors		2	
Individual cell voltage limits		2.01V to 4.55V*	
Individual cell voltage measurement accuracy		12mV	
Individual cell voltage measurement resolution		10mV	
CAN speeds		50, 125, 250, 500, 800 kbit/s and 1 Mbit/s	



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Item	Conditions	Value	
Load current	Continuous	Standalone	90A
		With heatsink**	150A
	Peak	Standalone, 10s	220A
		With heatsink, 10s	300A
Charge current	Continuous	Standalone	45A
		With heatsink	70A
	Peak	Standalone, 10s	75A
		With heatsink, 10s	90A
Balancing	Resistor	8.2 Ohm	
	Current at 4.2V cell voltage	500mA***	
Pre-charge resistor		250 Ohm	
5V/12V	Hold current	1A	

*Maximum voltage per cell is limited by full pack voltage depending on number of cells used.

** Used Heatsink with at least 0.7 K/W thermal resistance.

*** Depending on thermal conditions.

Other Specifications

Table 3. MNC313E other specifications

Item	Condition	Value
Number of cells limits		6 to 16 cells*
Operating temperature		-40°C to +85°C
Maximum number of external temperature sensors		5
External temperature sensor measurement accuracy		±5°C
External temperature sensors measurement resolution		1°C
IP rating		IP40
Weight		0.154kg
Terminal tightening torque on M8 L+, C+, B+ terminals	Maximum	15Nm
	Destruction	18Nm

*Minimum cells count depends on full battery pack voltage. Minimum full battery pack voltage must be above 12V.



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Installation

To set less than 16 cells please refer to the figure below.

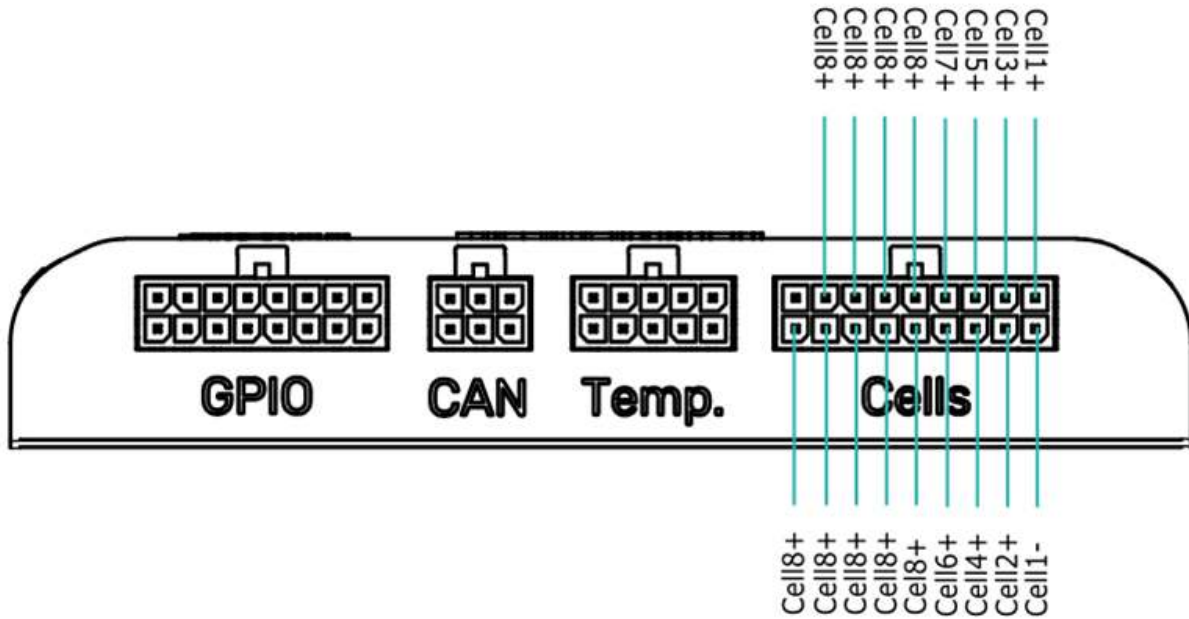


Figure 2. Less than 16 cells installation

To set up 16 cells please refer to the figure below.

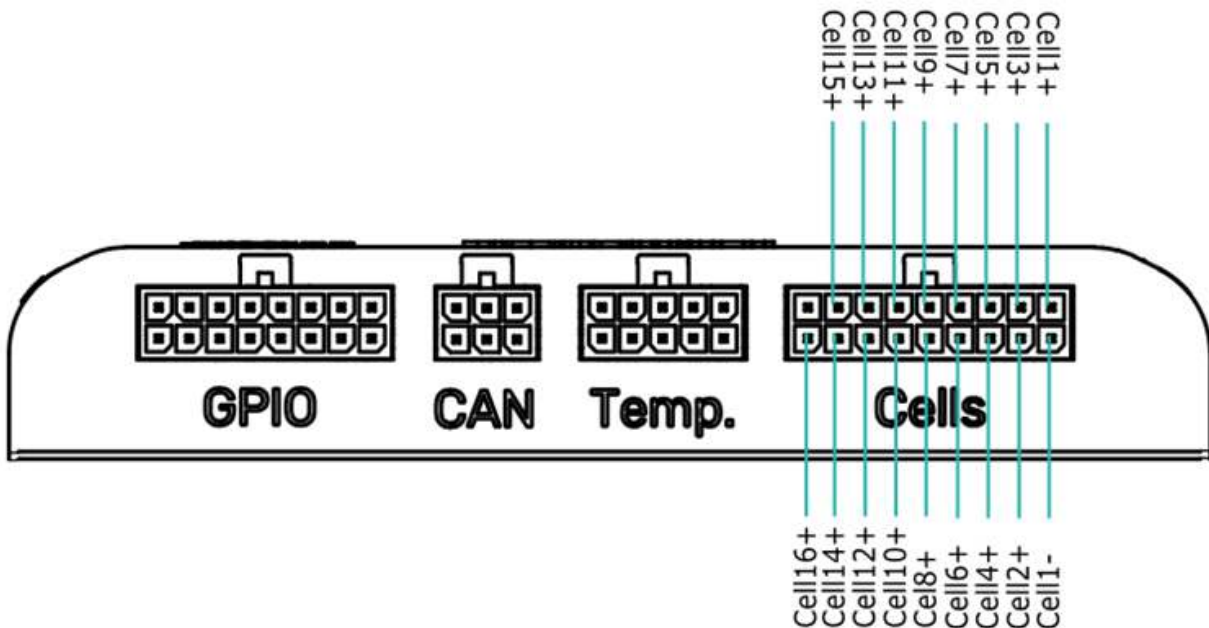


Figure 3. 16 cells installation example