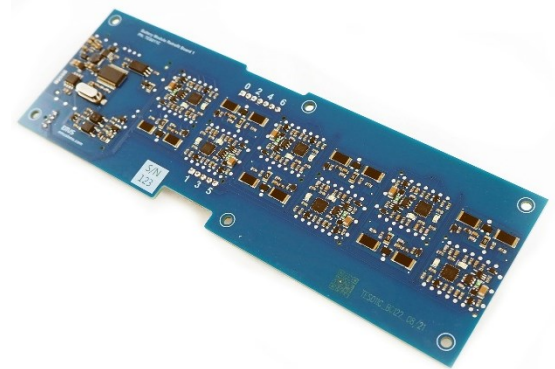


# Tesla Module (TES011C) retrofit BMS

## INTRODUCTION

The 24Vdc packs from the Tesla Model S have a rated capacity of 5.3kWh and consist of six modules. The key is that the cells in each module may end up with different performance characteristics which is why they are no longer used in a vehicle. EMUS Tesla Module retrofit BMS module supports cell voltages from 2V to 4.55V with a balancing current of 0.5A and a maximum cell power (Pmax) of 2W. This is ten times the power supported by Tesla's original BMS board.

EMUS Tesla Module retrofit BMS board is the device that once mounted on a battery pack measures cells voltages, temperatures, its own temperature, and broadcasts all measured values to the main unit. Also, using previously mentioned values it regulates the balancing current to keep the cell's voltage lower than the balancing threshold, while at the same time keeping its own temperature lower than a certain maximum value to protect itself from overheating.



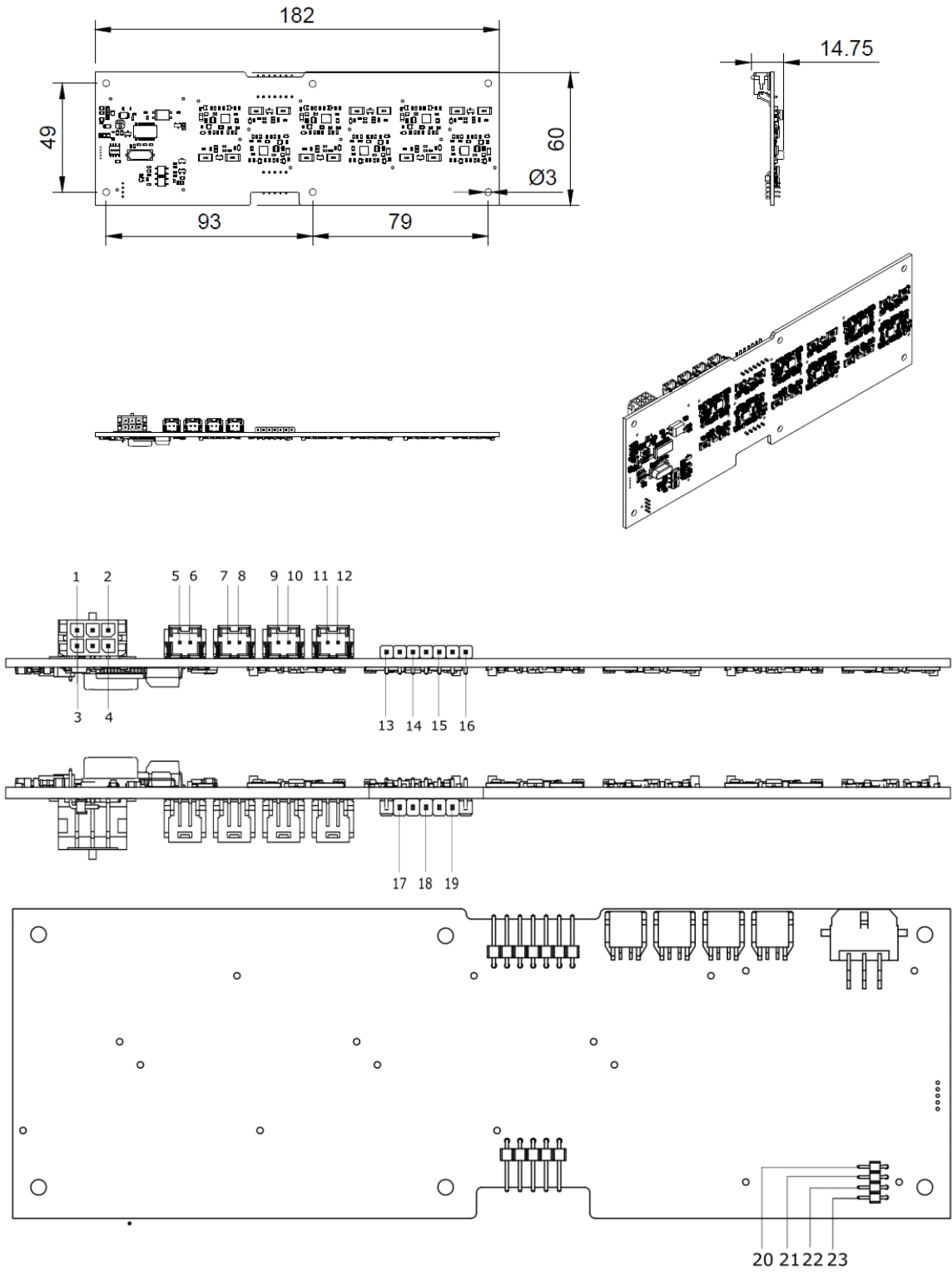
## APPLICATIONS

- Board's form factor designed for Tesla Model S, battery module (24V, ~5.3kWh)

## FEATURES

- Connects to 2 original Tesla temperature sensors
- 4 additional external temperature measurement sensors, 10k (sold separately by code ETS06)
- Wide scalability via CAN bus - up to 25 Tesla battery modules can be connected in series/parallel per one system
- Serial data interface for continuous cell monitoring
- Communication indicating green LED
- Balancing level indicating red LED
- Maximum balancing current up to 500mA (@4.2)
- Supports 50, 125, 250, 500, 800 kbit/s and 1 Mbit/s CAN baud rates (default 250kbit/s)

**MECHANICAL INFORMATION**





Pin No.	Assignment	Mating housing	Terminal crimp
1	PWR	Microfit 43025-0600	43030-0003 (recommended crimp tool Molex Hand Crimp Tool P/N: 638190000)
2	CAN H		
3	GND		
4	CAN L		
5,6	External temperature sensor 3		
7,8	External temperature sensor 4		
9, 10	External temperature sensor 5		
11, 12	External temperature sensor 6		
13	Cell 1-		
14	Cell 2+		
15	Cell 4+		
16	Cell 6+		
17	Cell 1+		
18	Cell 3+		
19	Cell 5+		
20, 22	External temperature sensor 1		
21, 23	External temperature sensor 2		

**ELECTRICAL CHARACTERISTICS**

**Battery cells monitoring circuitry specification**

Item	Value
Operating Voltage	2.0 VDC to 4.55 VDC
Voltage measuring range	2.0 VDC to 4.55 VDC
Voltage measurement resolution	10mV
Internal temperature measuring range	-40°C to 85°C
Internal temperature measurement resolution	1°C
Internal temperature measurement accuracy	±5°C
External temperature measuring range	-99°C to 154°C
External temperature measurement resolution	1°C
External temperature measurement accuracy	±5°C
Balancing current	500mA@4.2V
Current consumption in active mode, when communication LED is on, cell voltage = 3.60V	3.2 mA
Current consumption in sleep mode, cell voltage = 3.60V	35µA
Balancing resistor resistance	8 Ω
Balancing resistor rated power	2W



**CAN communication circuitry specification**

Item	Conditions	Value
Supply voltage		9.0 VDC to 32.0 VDC (24 VDC Typical)
Power supply reverse protection		Yes
Current consumption of fully integrated system (CU021A+TES011)	In active mode, supply voltage = 12VDC	6.3 mA
	In active mode, supply voltage = 24VDC	3.6 mA
	In sleep mode, supply voltage = 12VDC	1.0 mA
	In sleep mode, supply voltage = 24VDC	0.16 mA
Isolation voltage		1.0 kV
CAN Speed		50kbps, 125kbps, 250kbps, 500kbps, 800kbps, 1Mbps
Transient/overvoltage protection between CAN H/CAN L and GND (and vice versa)		24 VDC



**OTHER SPECIFICATIONS**

Item	Value
Reserved CAN IDs	0x1FFFFEE5, 0x1FFFFEE6, 0x1FFFE5E5, and 0x1FFFE5E6
Operating temperature	-40°C to +85°C
IP Rating	IP21
Weight	43g
Dimensions	182x60x15 mm
External temperature sensor type	NTCM-10K-B4150
Sleep mode timeout when not balancing	60 ms
Sleep mode timeout when balancing	10 s
Wakeup source	Cell communication signal edge, watchdog timer timeout (8 s period)