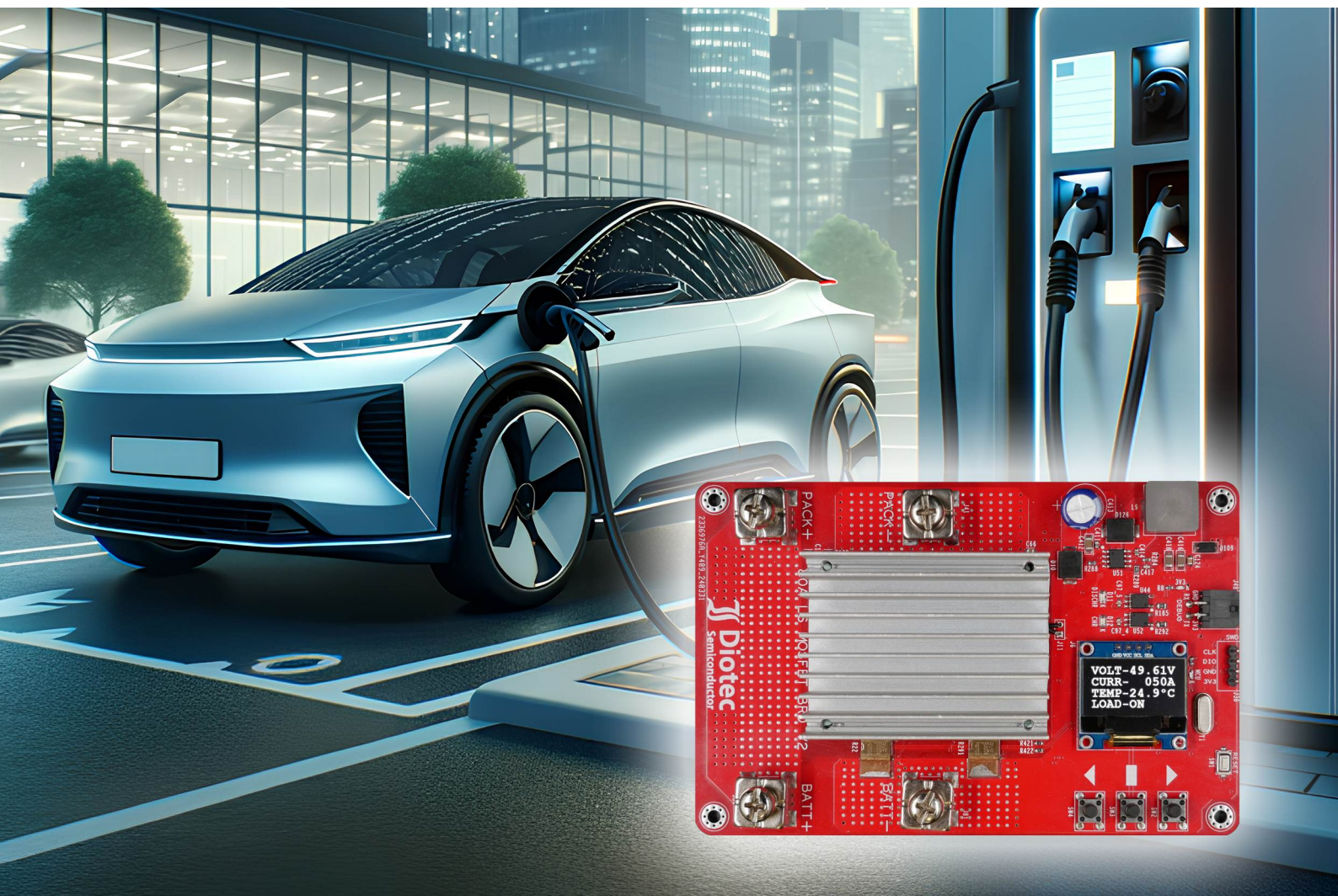




DEMO BOARD 3991.31.2

MOSFET POWER DELIVERY UNIT

DI280N10TL

1. Overview

The Diotech Power MOSFETs (DI280N10TL) used in the Diotech PDU are arranged back-to-back to cut current in both directions.

A parallel arrangement is utilized to boost current capability. The gates are controlled by a TLP152 gate driver. A shunt current sensor BVE-M-R0002 is used to measure the current.

The intended nominal current at room temperature is 80 A. An aluminum heatsink is used for cooling. A new generation of electronic relays, is Diotech's solid state relay (PDU). Its goal is to provide current monitoring in a compact, lightweight, and durable protection system.

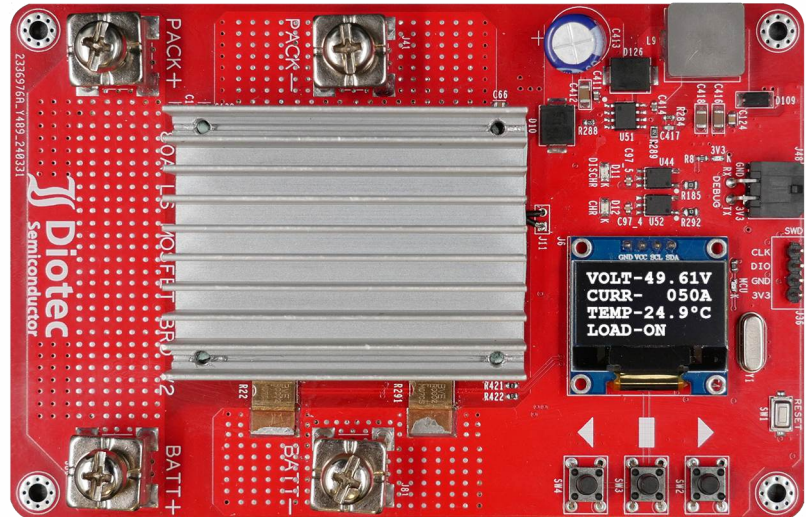


Fig. 1

Connecting to live batteries and load/chargers, is simple and secure. Shunt current sensor BVE-M-R0002 with (MCP3425) a 16-Bit Analog-to-Digital Converter is used to measure the current. A high current power distribution switch (HC-PDU) on one single heavy copper printed circuit board (PCB). This reference board demonstrates an implementation of high current protection, switching up to 80 A for automotive 48 V batteries.

Features

- Suitable for use in 9 V to 100 V applications
- Forward/reverse current up to 80 A
- Embedded shunt based current sensor
- Adjustable analog overcurrent protection
- 0.9 inch OLED display to monitor voltage, current, temperature and MOSFET status
- Low side MOSFET switching configuration
- PCB dimension - L 140 mm x W 90 mm
- Serial/bluetooth interface for remote monitoring and logging

Applications

- Mobile and stationary electrical storage equipment
- Industrial and home storage
- Electric and hybrid electric vehicles
- Backup battery systems
- Drones, robots, street lighting
- Solar systems
- Any DC power distribution system requiring monitoring, protection and switching

2. Test - Supply and load connection

Requirements:

- DC power supply that can deliver 48 V DC @ 80 A
- DC load, capable of 80 A continues
- connection cables capable of 80 A

The 48 V supply has to be connected to the M6 screw terminals marked "BAT+" and "BATT-". The BATT-terminal is the ground reference of the board. The load is connected to the screw terminals marked "PACK+" and "PACK-".

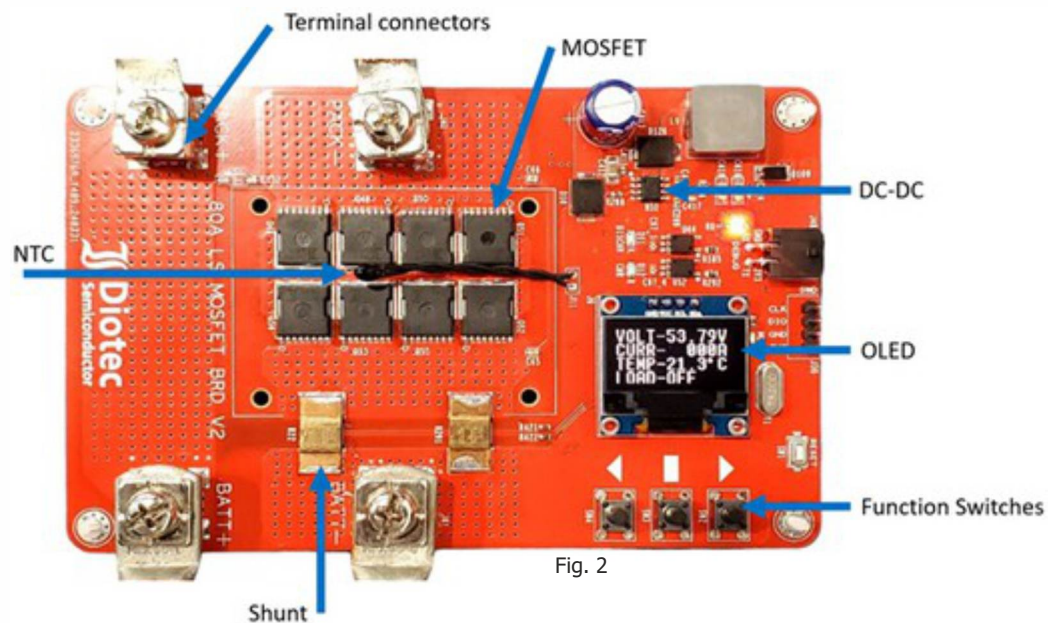


Fig. 2

For driving high currents use properly sized cables and cable lugs. Use a maximum of 9 Nm mounting torque for tightening the nuts on the terminal screws.

Note: Ensure the right supply polarity as no reverse polarity protection is implemented.

Connecting supply and load

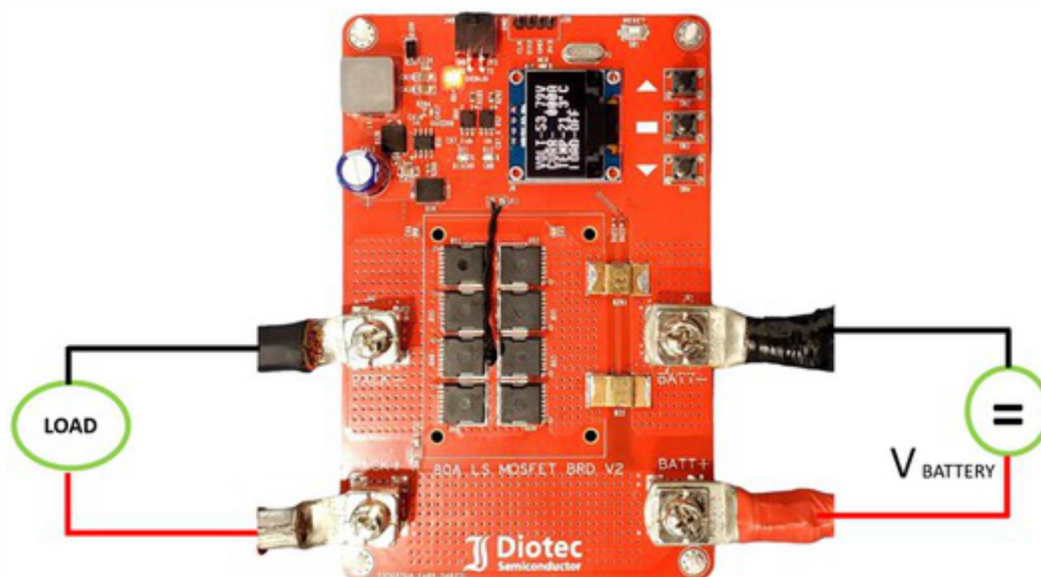


Fig. 3

3. Heat sink



Example

The heat sink will cool down the MOSFETs, making them operate safely, reducing the risk of hardware failure.

It uses a size of 40 x 40 x 11 mm (L x W x H) which is applicable for installing a 40 x 40 mm cooling fan.

4. Thermal performance of the MOSFET

This test is intended to analyze the PCB's thermal performance. The heat sink is mounted onto the Diotec PDU during testing.

Extra isolation between the Diotec PDU and the heat sink is not necessary because of the thermal prepreg layer that sits between the middle and bottom layers. The performance is adequate even without a thermal pad.

A 12 V PC fan, set at a low speed and 20 cm from the Diotec PDU provides moderate air flow, allowing the maximum board temperature to settle at 80 °C after 30 minutes at an ambient temperature of 25 °C.

At the conclusion of the test, the temperature distribution is displayed in the images down below.

51.0 °C @ 60 A without heat sink

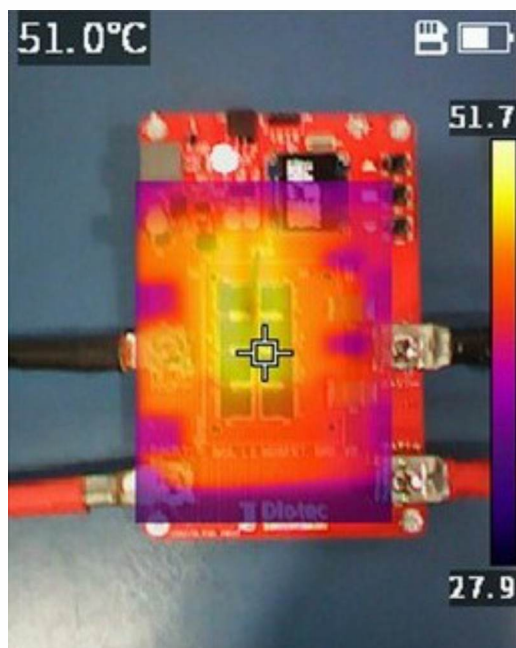


Fig. 4

32.6 °C @ 60 A with heat sink

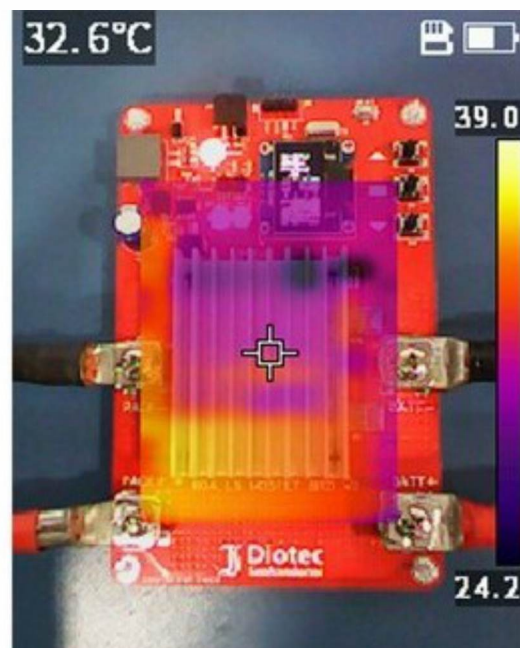


Fig. 5

5. Thermal image from Fluke VT08 Visual IR Thermocamera

The below images show the thermal image of the Diotec PDU with a constant current of 60 A after 60 minutes at room temperature. Test point 1 (PCB_1) is the hotspot.

Start @ 60 A with heat sink

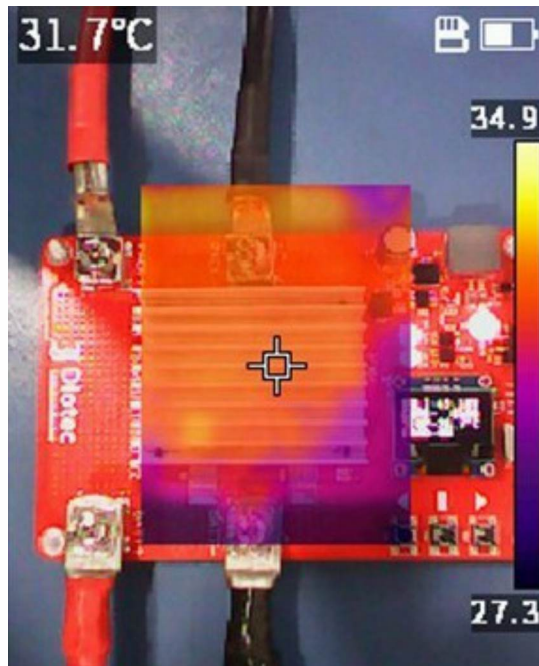


Fig. 6

End @ 60 A with heat sink after 60 min

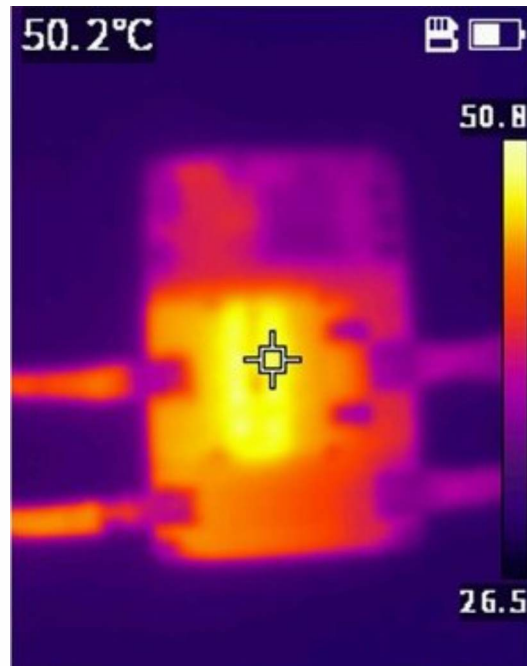


Fig. 7

Start @ 60 A without heat sink

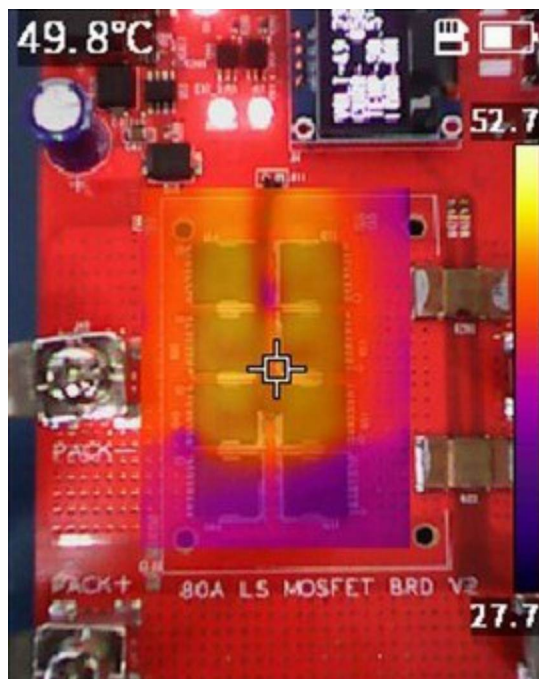


Fig. 8

End @ 60 A without heat sink after 60 min

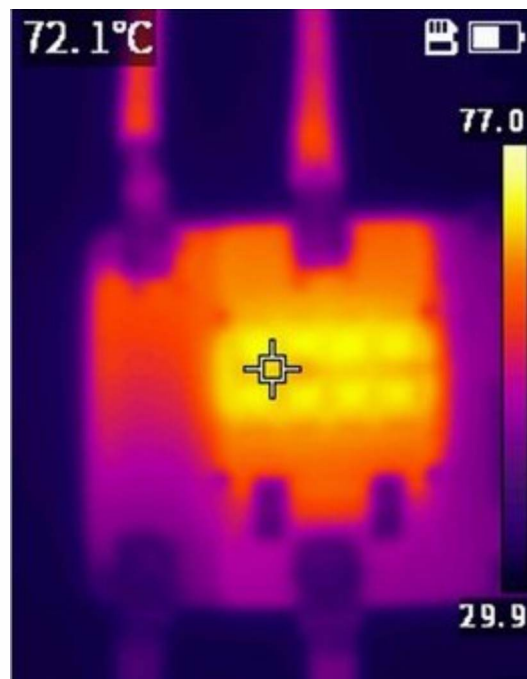


Fig. 9

6. Parts list

Part No.	Quantity
DI280N10TL	8
MMFTP3401	1
LDI1117-3.3H	1
BAT46W	1
SK420	2
S1M	3
SK315	1
BZT52C2V4	4
SKL310	1
BZT52C5V1	1
ESDB24C-AQ	1

7. Layout

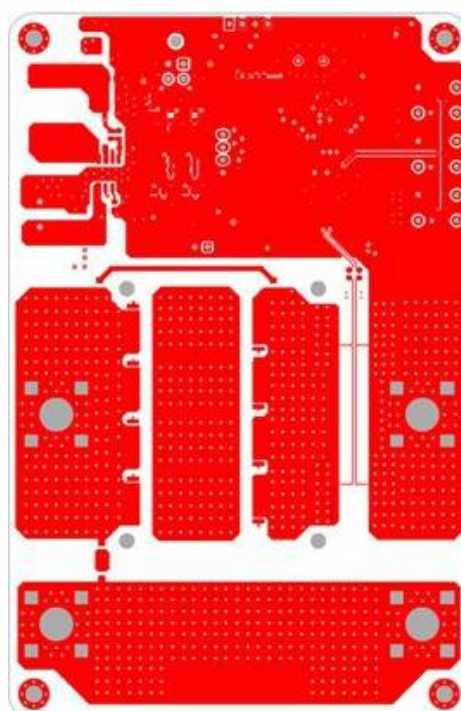


Fig. 10 TOP LAYER - L1

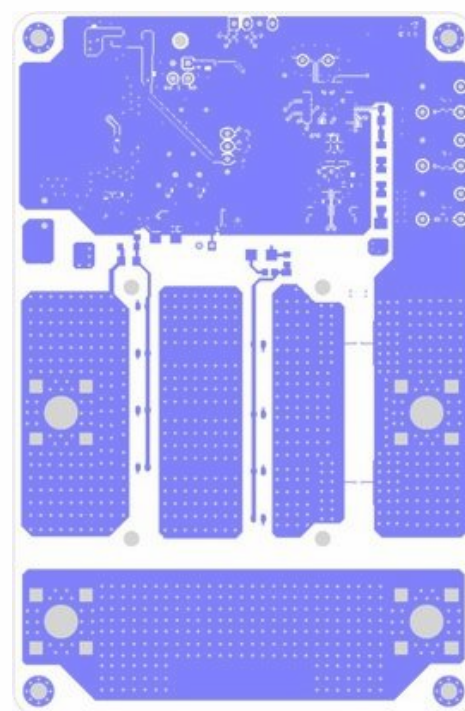
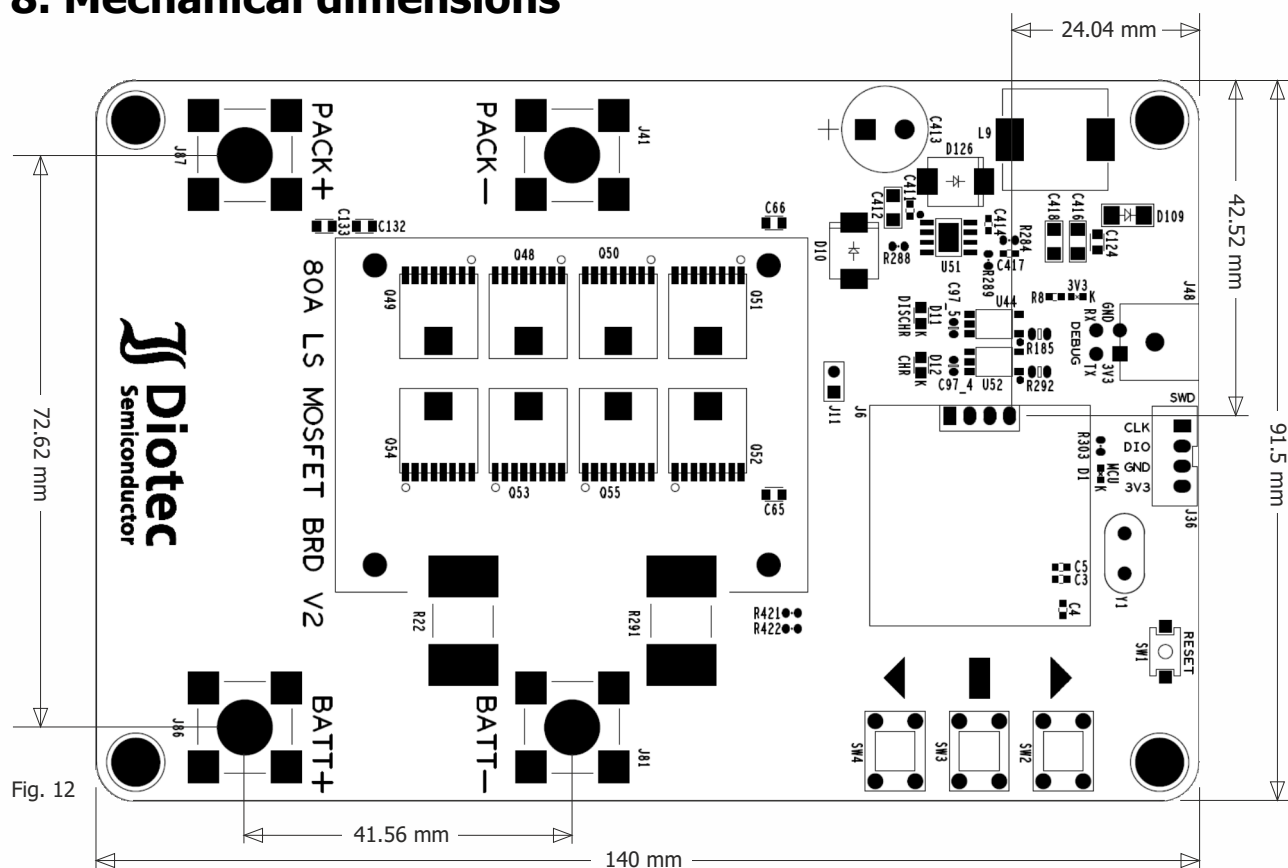


Fig. 11 BOTTOM LAYER - L4

8. Mechanical dimensions



Datasheets of all mentioned products can be found at www.diotech.com

Do not hesitate to contact us for further questions and schematics:

technicalsupport@diotech.com