NEO P36 Hardware Specification and Manual

References

NEO_Platform36 REV_D Schematic.

Revision Information

Created:	Revision	Name	Comments
2026/4/13	0.1	Seven Liu	Initial revision

Modified

FCC ID: 2AVNE-P36

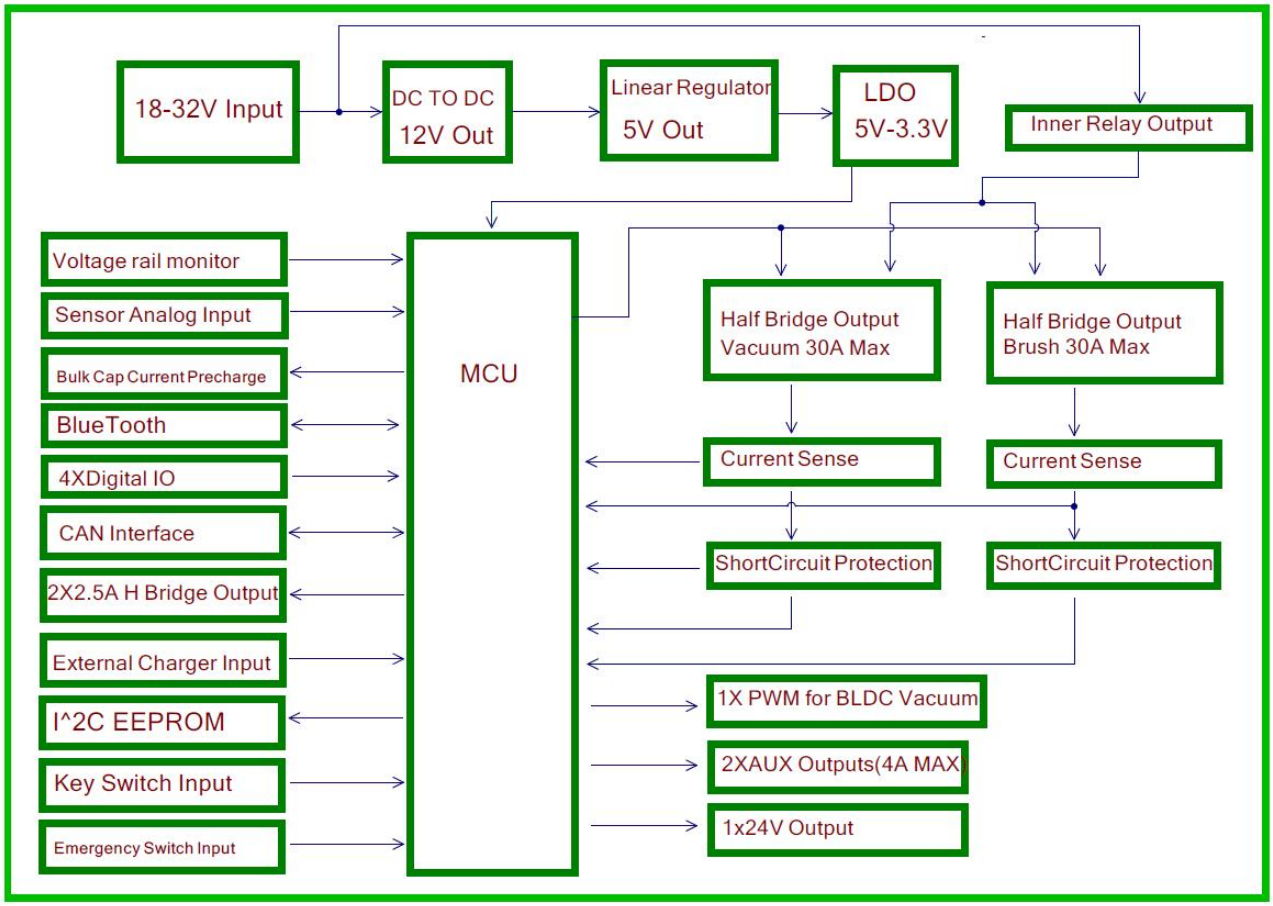
Table of Contents

1 Introduction

This document specifies the hardware specifications for the P36.

2 System description

The P36 consists of the following functional blocks, and the block diagram shown as below:



- 2 x 2.5A H Bridget output
- 4 x Digital I/O
- 2 x Aux output 4A(max)
- 2 x DC Motor/pump output 30A (max) with current sense
- 1 x Power key switch for user button input
- 1 x 24V output for Traction controller KSI signal.
- 1 x PWM signal for BLDC Vacuum.
- 1 x Detergent sensor input.
- Battery voltage measurement.
- Battery communication interface(COMBAT-2) and Lead-acide battery interface.
- 32 Bit Microprocessor
- Power supplies: 5Vdc, 12Vdc, and 3.3Vdc
- 1K Bytes EEPROM
- Bulk cap current pre-charge function.
- TC-1 Interface (CAN)
- Programming interface(ST SWD)
- R&D Interface(USART). Test point output mode.
- Bluetooth transceiver

2.1 Embedded functions and peripherals

2.1.1 Leakage current during power off

To satisfy the biggest possible battery configurations, a low leakage input current is mandatory.The aim is to get below 500uA with 30V on across the main power input terminals. This demand necessitates the use of a pass transistor that can effectively block power to the embedded DC/DC converters.

2.1.2 Local power rails

The P36 is powered by a Nilfisk Combat 2 battery pack or Lead-acid battery stack.
The nominal operating input voltage range is 20 – 30Vdc. Maximum input is 32Vdc.
The local power supplies will provide 3.3V for MCU and other logic functions, 5V for CAN and sensors, and 12V for gate drive circuits.

2.1.2.1 3.3 Volt

The 3.3V output is provided by Diodes LDO AP2121AK.The max nominal output current is limit to about 0.2A. Input voltage is DC 5V. It supplies power to MCU, EEPROM.BT circuit.
If the 3.3V output is short circuited, the MCU will power down, then the supply hold signal to PMOS (CPH3351 or FDN5618P) will off, and this then cuts power to the hole board and to any externally controlled contactors, and thus the whole system powers off.

2.1.2.2 5 Volt

The 5V output is provided by a ST 78M05. Max current output is 0.5A.
When the 5V output is short circuited, the MCU will power down and then the system will do as in chapter 2.1.2.1.

2.1.2.3 12 Volt

The 12V output is provided by DC/DC converter XL7005A The max nominal output current is 0.4A. Input voltage is DC 18-30V. It provides power for the half bridge gate drive IC FAN73932
When the 12V output is short circuited, PTC 0.5A fuse will be tripped. Cut off the output.

2.1.3 EEPROM

Purpose:

The EEPROM will contain saved parameters, PCBA ID and calibration data, etc.

Although the MCU has an embedded EEPROM, the external EEPROM is faster to implement due to the software layer from previous design has been tested and verified, and thus is begging to be reused.

At a later time, a switch to the internal EEPROM of the MCU may be effectuated, and the external EEPROM can be phased out, saving cost and sourcing efforts.

Description:

Target I2C clock speed is 400kHz

The usual 1 kΩ - 2.2 kΩ is used for pull-up on data and clock lines. The exact value will depend on what other resistor values will be in the design. Reuse is the key.

The type is M24C08, SOIC8,1K bytes.

2.2 Output functions

2.2.1 AUX Low side switch output.

Purpose:

Used for external solenoid, solution pump, detergent pum etc.

Description:

There are 2 AUX Low side switch outputs.
Fully protected MOSFET from ST model VND7N04. The protected MOSFET has internal current limit of 6A. 4A continues output has been verified.

The AUX outputs PWM frequency should be less than 4K HZ. If higher PWM frequency is required, then need to do more verification. PWM 1K HZ /1A output has been verified.

Connector:

5557 4.2mm pitch.

2.2.2 Half bridge output

Purpose:

Use for brush motor and vacuum motor output.

Description:

There are 2 half bridge outputs. Each output can provide continuous operation with a maximum 30A current limit

To keep the high ampacity pulsed current draw of the half bridges inside the PCB a large bulk capacitance is installed. 2x 680µF 35V long life (3000Hrs @ 105°C) is allotted.

Connector: TM54111092-1250

2.2.3 H bridge output

Purpose:

There are 2 H bridge outputs. Use for brush deck actuator or squeegee actuator.

Description:

The bridge drive IC is DRV8874. Max 6A output. With Integrated Current Sense and Regulation

The DRV8874 is an integrated motor driver with N channel H-bridge, charge pump, current sensing and proportional output, current regulation, and protection circuitry.

Connector: 5557 4.2mm pitch.

2.2.4 1x24V output

Purpose:

Use for power on the traction controller KSI(KEY SWITCH INPUT) signal if necessary.

Description:

24V output max current is 0.5A.

Connector: 5557 4.2mm pitch.

2.2.5 UI output

Purpose:

Use for power on the UI controller

Description:

24V output max current is 0.5A.

Connector: 5557 4.2mm pitch.

2.2.6 1x PWM output

Purpose:

Use for the BLDC VACUUM motor.

Description:

Output voltage max is 5V. Frequency is 1KHZ.

Connector: CJT A2502WV-3P

2.3 Input functions

2.3.1 On/OFF input

Purpose:

Power up and down the board.

Description:

Can use push button or key switch connect to the input.

Connector:

5557 4.2mm pitch.

2.3.2 Switch input

Purpose:

General purpose input detect, use as rotary switch input , brush output enable input, solution level input etc.

Description:

There are 2 switch inputs, they are general digital I/O input. Max input voltage DC 3.3V.

Connector:

5557 4.2mm pitch.

2.3.3 Digital input

Purpose:

Sample analog signal.

Description:

There are 2 digital inputs. Max input voltage is 24V.
General purpose input detect, use as rotary switch input , brush output enable input, solution level input etc.

Connector:

5557 4.2mm pitch.

2.4 Communication functions

2.4.1 CAN

Purpose:

Connects to the Combat2,TC1 module. P36 accept commands, transfer data, report error message etc.

Description:

The MCU has an integrated CAN controller. The transceiver isTJA1050T.

The CAN bus interface will comply with CAN B active from 100Kbps to 500Kbps communication rate.

Connector:

CJT A2502WV-6P

2.4.2 Programming interface

Purpose:

To allow development work and programming of target.

Description:

SWD interface to MCU, no trace data available

Connector: PZ254V-11-04P

2.4.3 Debug interface

Purpose:

To enable the STI command and response interface.

Description:

UART debug interface is use PCB PAD, TP46 and TP47.

Connector: PAD

2.4.4 Bluetooth interface

Purpose:

1. Enable the STI command and response interface.
2. Get error states.
3. Combat2 battery message
4. MCU SUOTA function.

Description:

STI command, Error states. Combat2 battery message, MCU SUOTA can be implemented via Bluetooth.

Connector:

1. BT chip programming interface. PZ254V-11-05P

2.5 Other features

2.5.1 Bulk cap current pre-charge

Purpose:

While power up, the Bulk cap charge current should be limited.

Description:

The max charge current is 24V/100R=0.24A.

2.5.2 Voltage rail monitoring

Purpose:

Monitoring the incoming battery voltage, the bulk capacitor voltage.

Description:
While the battery voltage or bulk cap voltage is low, P36 will report the errors and will disable appropriate functions.

2.5.3 Voltage reference

MCU has an embedded voltage reference for use with the ADC. But P36 use LDO 3.3V output as ADC reference. if in Combat2 battery system. LDO 3.3V output as ADC reference is enouth. But in lead-acid battery system, should use MCU inner voltage reference. refer to bellow figure.

Calculating the actual V_{REF+} voltage using the internal reference voltage

The power supply voltage applied to the device may be subject to variations or not precisely known. When V_{DDA} is connected to V_{REF+}, it is possible to compute the actual V_{DDA} voltage using the embedded internal reference voltage (V_{REFINT}). V_{REFINT} and its calibration data, acquired by the ADC during the manufacturing process at V_{DDA_Charac}, can be used to evaluate the actual V_{DDA} voltage level.

The following formula gives the actual V_{REF+} voltage supplying the device:

$$V_{REF+} = V_{REF+\_Charac} \times VREFINT\_CAL / VREFINT\_DATA$$

Where:

- V_{REF+_Charac} is the value of V_{REF+} voltage characterized at V_{REFINT} during the manufacturing process. It is specified in the device datasheet.
- VREFINT_CAL is the V_{REFINT} calibration value
- VREFINT_DATA is the actual V_{REFINT} output value converted by ADC

2.5.4 Soft start

All half-bridge outputs must feature soft start function (ramp up and down of PWM values)

2.5.5 Current sense circuit

The offset voltage value must be calibrated during MCU power up. No need to be calibrated during production.

2.5.6 Peak overcurrent (short circuit) protection

Going with the same peak overcurrent protection circuit, as to P26 has some limitations – As di/dt during a short circuit is very high, it is compulsory to grab hold of the current shunt voltage signal from the shunt resistor differentially, and not like it has been done on the P26.

Ground bounces can have a quite significant amplitude, which will overlay the actual signal of interest, and furthermore most likely will not be identically for the three circuits - such that the same component values yields vastly different trip points.

2.5.7 Reverse polarity protection

The P36 shall not be damaged if the battery is connected with reverse polarity.

2.5.8 Charger Input detect

While charger plug in, charger inner relay NO switch will close if AC input is normal, then will wake up the P37 power system. and can disable all outputs if necessary.

2.6 P36 PCBA Connector

Refer to bellow table.

J3 5557 4.2mm Connector		
PIN	**Description**	**in/out**
1	GND	Out
2	GND	Out
3	Onboard charger normal open input	In
4	Power Key	In
5	EXT_24V for Traction controller input	Out
6	BAT+ 24V connect to battery positive directly	Out
7	SWITCH 2 INPUT	In
8	SWITCH 1 INPUT	In
9	CAN L	IN/OUT
10	CAN H	IN/OUT
11	Emergency switch input	In
12	UI power output	Out

J10 5557 4.2mm Connector		
PIN	**Description**	**in/out**
1	H Bridge 1 Output +	Out
2	H Bridge 1 Output -	Out
3	VBAT	Out
4	VBAT	Out
5	AUX1 Output	Out
6	AUX2 Output	Out
7	Digital 2 Input	In
8	Digital 1 Input	In

J4 5557 4.2mm Connector		
PIN	**Description**	**in/out**
1	H Bridge 2 Output +	Out
2	H Bridge 2 Output -	Out

J8 CJT A2502WV-3PConnector		
PIN	**Description**	**in/out**
1	5V	Out
2	PWM OUT	Out
3	GND	Out

J7 CJT A2502WV-4P Connector		
PIN	**Description**	**in/out**
1	GND	Out
2	CAN L	In/Out
3	CAN H	In/Out
4	BATTERY ON/OFF	In

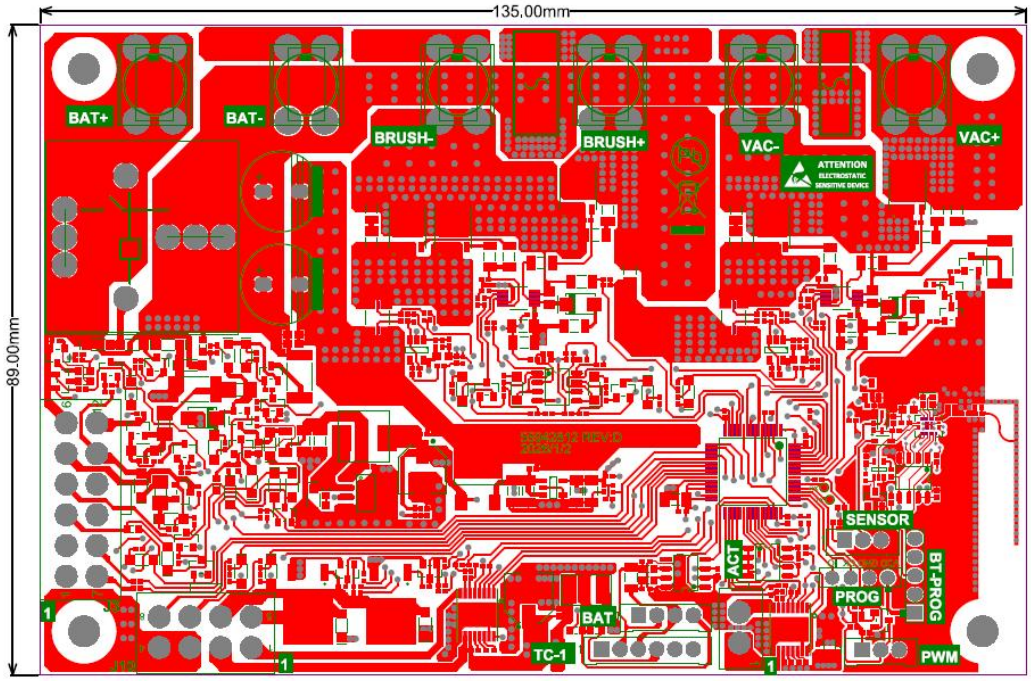
J5 CJT A2502WV-6P Connector		
PIN	**Description**	**in/out**
1	GND	Out
2	CAN L	In/Out
3	CAN H	In/Out
4	BATTERY ON/OFF	In
5	TC1 Key Switch	Out
6	VIOT	Out

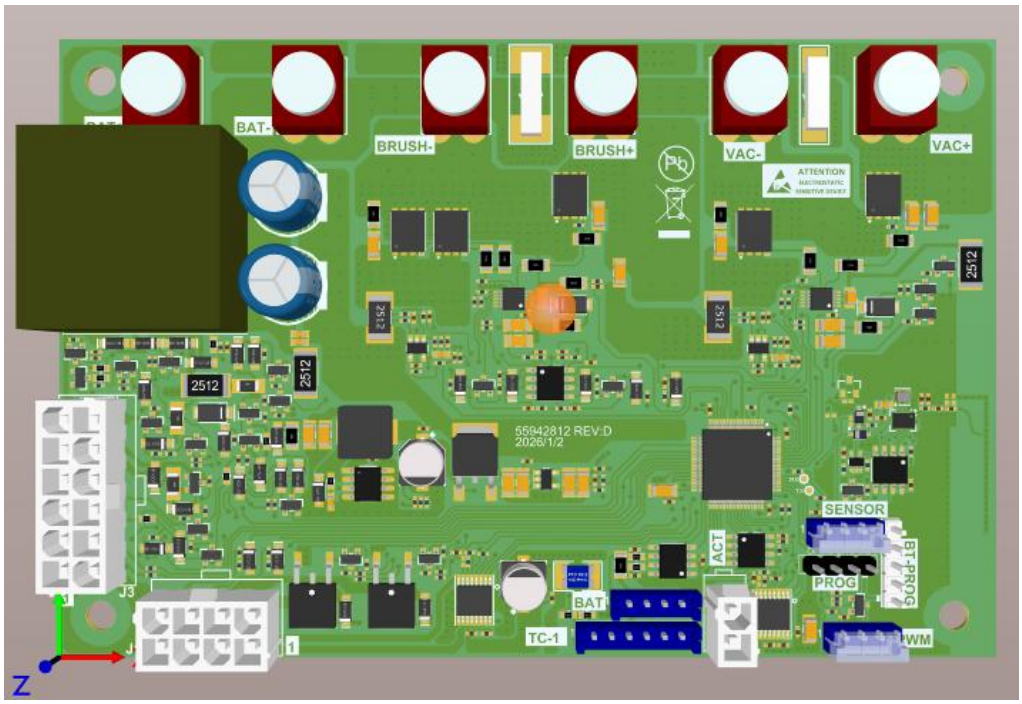
J16 CJT A2502WV-3PConnector		
PIN	**Description**	**in/out**
1	3.3V	Out
2	Sensor Analog Input	In
3	GND	Out

3 General Specifications

3.1 Dimenion

L=135mm, W=89mm, H=28mm max. Refer to bellow 2D and 3D figures.





3.2 Others

- PCB shows its P/N and lot or production date information on laser code or QR code.
- PCB is UL recognized, flammability rated UL-V0 and marked accordingly.
- PCBA is protected from moisture effects by coating.

Declaration Letter

Nilfisk A/S

Company:Nilfisk A/S

Address:Marmorvej 8, DK-2100 Copenhagen OE, Denmark

Product Name: Main machine controller

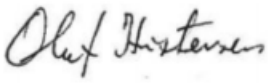
Model Number: P36 PCBA

FCCID:2AVNE-P36

Regarding the issue with our product labeling, due to our own product design reasons(Because terminal customer demand), we need to place the product label on the outer packaging and user manual to reflect more product information. Therefore, we would like to provide an explanation for this situation.The labels on the packaging are currently fixed with strong ultra-high molecular weight polyethylene transparent tape to prevent them from being removed or worn. Please be informed!

Name: Oluf Kristensen Date: May 22, 2026

Title: manager

Signature of applicant: 

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:
(1) This device may not cause harmful interference, and
(2) this device must accept any interference received, including interference that may cause undesired operation.

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
-Reorient or relocate the receiving antenna.
-Increase the separation between the equipment and receiver.
-Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
-Consult the dealer or an experienced radio/TV technician for help.

The device has been evaluated to meet general RF exposure requirement. The device can be used in portable exposure condition without restriction.