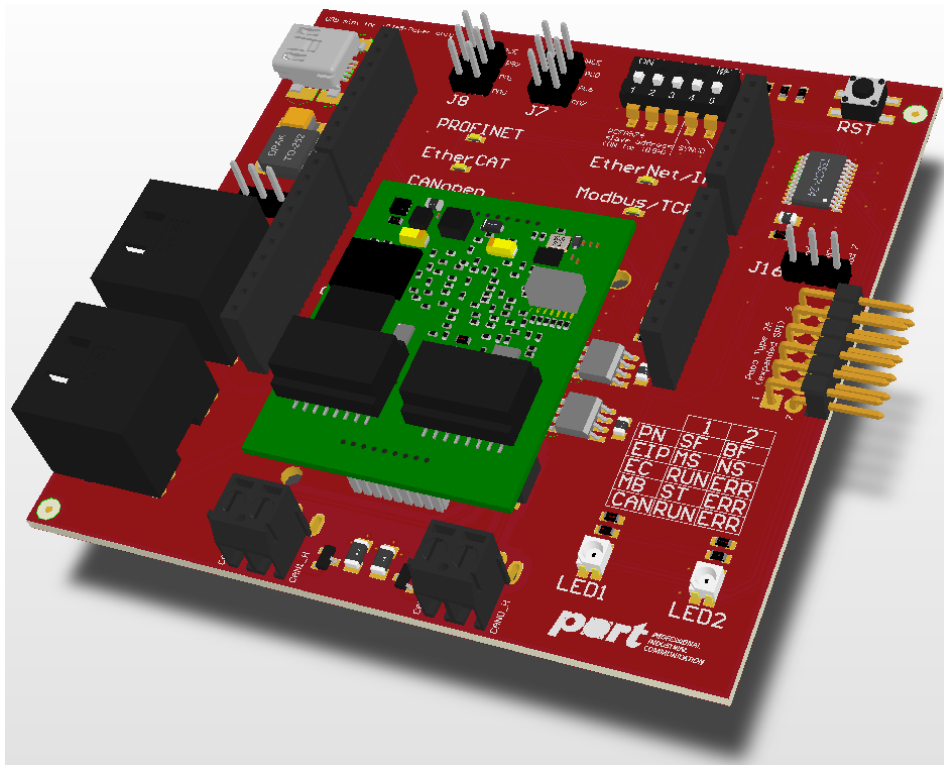


Adapter ARDUINO/PMOD pin assignment for PCB version 1V6 and higher

Version: 0.1



valid for 1 port, 2 port and SoM version

please note:

We reserve the right to make changes.

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Revision History

Version	Date	Status	Author	Updates
1.0	22.02.2018		STS	Initial document for PCB 1V5
1.1	21.03.2018		STS	Update to PCB 1V6
1.2	27.03.2018		DRF	Update Content

1. Scope

This document describes the pin assignment for the printed circuit board "Adapter_ARDUINO/PMOD_x_1V6". Letter **x** mean **port** or **OEM** versions.

2. Definitions

With the Adapter_ARDUINO/PMOD and assembled iRJ45 module is the range of functions for development applications with the iRJ45 realized. Therefor are two interfaces on Adapter_ARDUINO/PMOD board integrated. This interfaces are described in section 3 of this document.

Additional are 7 LEDs for visualization on the PCB integrated. If the connection with PMOD interface is used, keep the external supply voltage on pin 6 and 12 lower than 3.6V DC.

The 7 LEDs (2 LED are dual types) for the industrial network protocols are tethered with an I²C 16bit port extender (PCA9552PW). Both I²C signals can optional connected via mini DIP switch S1 at the SYNC0 and SYNC1 signals of iRJ45 module and in this case with PMOD interface too. This connection is visualised in Figure 1 with blue markings. The default 8bit device slave address of the PCA9552PW on this board is 0xC0 in write mode. For more details show PCA9552PW datasheet. All 16 outputs are **low active**. Switch S1 positions ON drive the inputs A0...2 at high level and connect the signals SDA with SYNC0. Same is equal to signals SCL with SYNC1.

Optional is a supply voltage source for the iRJ45 module via mini USB connector cable possible. Therefor the jumper J13 is to connect on VCC33_iRJ45 and VCC33_USB in common with Figure 1 (red arrow and rectangle).

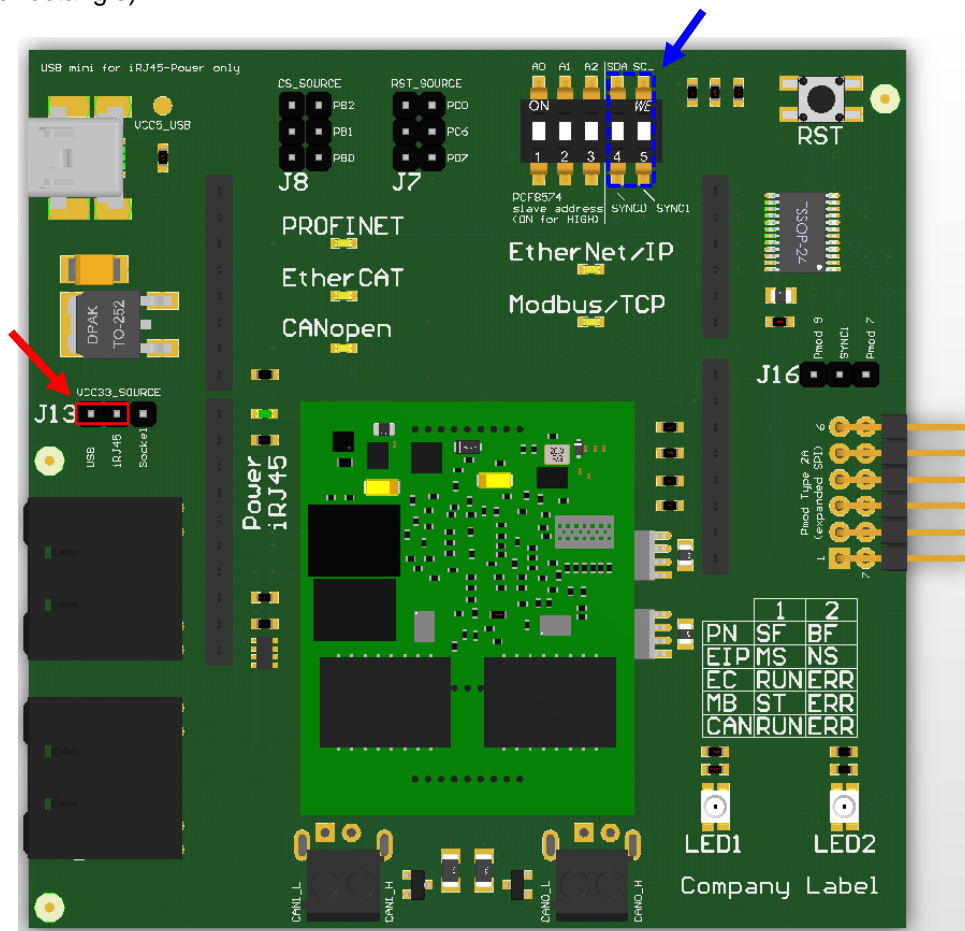






Figure 1: Top view of Adapter_ARDUINO/PMOD

3. Pin assignment

Following Figure 2 shows the default jumper connection on the Adapter_ARDUINO/PMOD board, marked with red rectangles. In Table 1 is the configurable jumper position represented.

Table 1: VCC33/SYNC1 selection matrix

	Position 1	Position 2
VCC33 via J13	VCC33_SOURCE J13  USB iRJ45 SOCKET	VCC33_SOURCE J13  USB iRJ45 SOCKET
SYNC1 via J16	SYNC1_VAR J16  Pmod 9 SYNC1 Pmod 7	SYNC1_VAR J16  Pmod 9 SYNC1 Pmod 7

With the blue rectangles are displayed the ARDUINO connectors. The green dashed line shows the PMOD connector. The five mini DIP switch contacts are by default in lower position, also OFF.

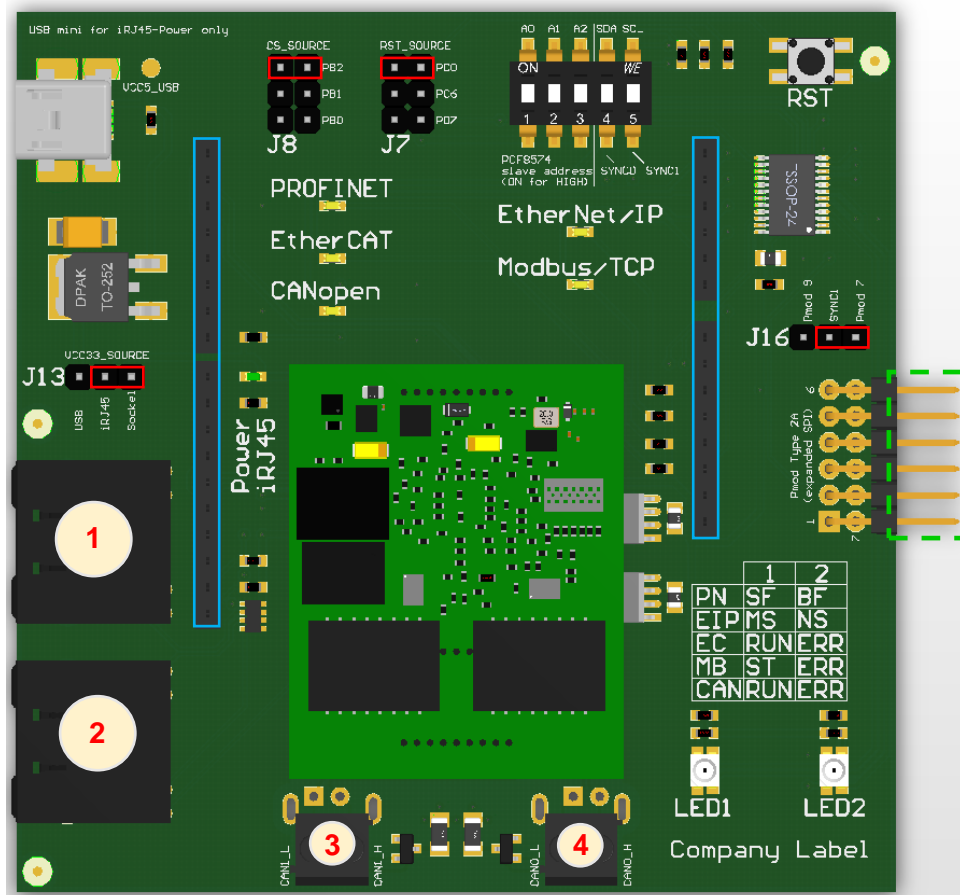


Figure 2: Default jumper connection

Red numeral 1 and 2 point the optional available RJ45 jacks in board assemble variant with SoM_iRJ45. In this variant are also two CAN connectors provided, marked with red numerals 3 and 4 in Figure 2. A listing with available Adapterboard variants is specified in section 3.3 of this document.

The Mini DIP switch 4 and 5 (PCB version 1V5 or later) enables a I²C connection with 16bit port extender (PCA9552PW) on PMOD interface in switching mode ON. The connection of I²C signal SCL with PMOD interface pin 7 or 9 (depends on jumper selection of J16, show section 3.1 of this document) is realized with switch part 5. And the I²C signal SDA can be connected with switch part 4 to PMOD interface pin 10.

With mini DIP switch 1, 2 and 3 it is possible to modify the device slave address of PCA9552PW. This three switch parts are directly connected with PCA9552 pin 1 (A0), 2 (A1) and 3 (A2). Switch mode ON is equal to HIGH level at the address inputs.

3.1. PMOD Type 2A connector

Figure 3 gives an overview about PMOD interface Type 2A (expanded SPI) pinning. Source for this interface represent the Digilent Pmod™ Interface Specification with revision of November 20, 2011. The pin assignment is declared in Table 1.

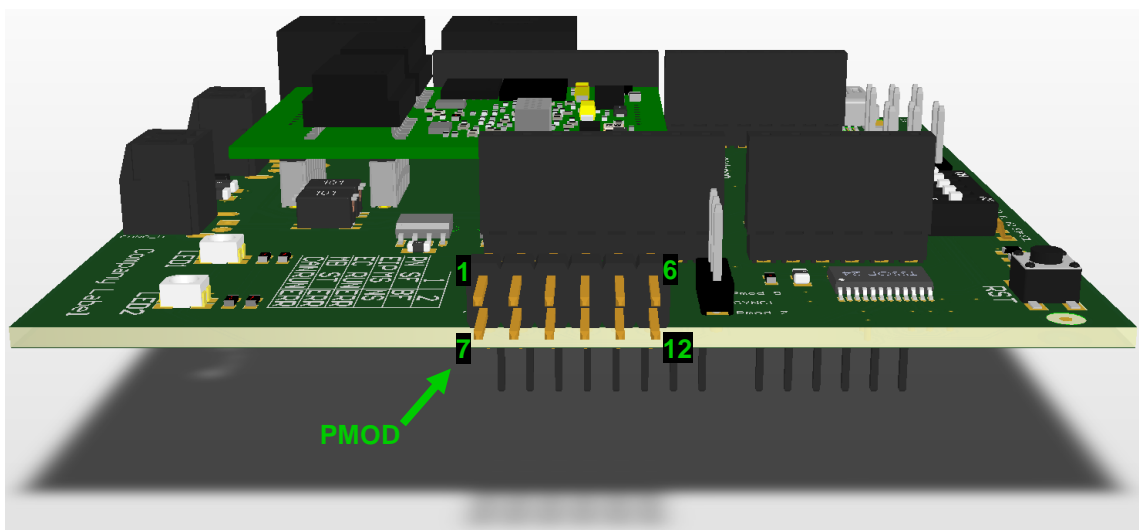


Figure 3: PMOD interface connector

Table 2: Pin assignment PMOD connector

Pin	Signal	Pin	Signal
1	CS	7	NC or INT
2	MOSI	8	RESET
3	MISO	9	NC or SYNC1
4	SCK	10	SYNC0
5	GND	11	GND
6	VCC3.3	12	VCC3.3

With jumper J7, SYNC1 signal of the iRJ45 can be connect with PMOD pin 7 or 9. One of both pins is unconnected. The yellow marked pins 6 and 12 are only to use with **3.3V DC** supply voltage. **Higher voltage (above 3.6V DC) on this pins may cause damage the iRJ45 module.** The iRJ45 module is directly connected with PMOD interface pin 6 and 12.

3.2. ARDUINO socket

The red markings on Figure 4 and Table 2 display the connected signals on ARDUINO interface socket. The numbering only relates the pins with signal names in Table 2.

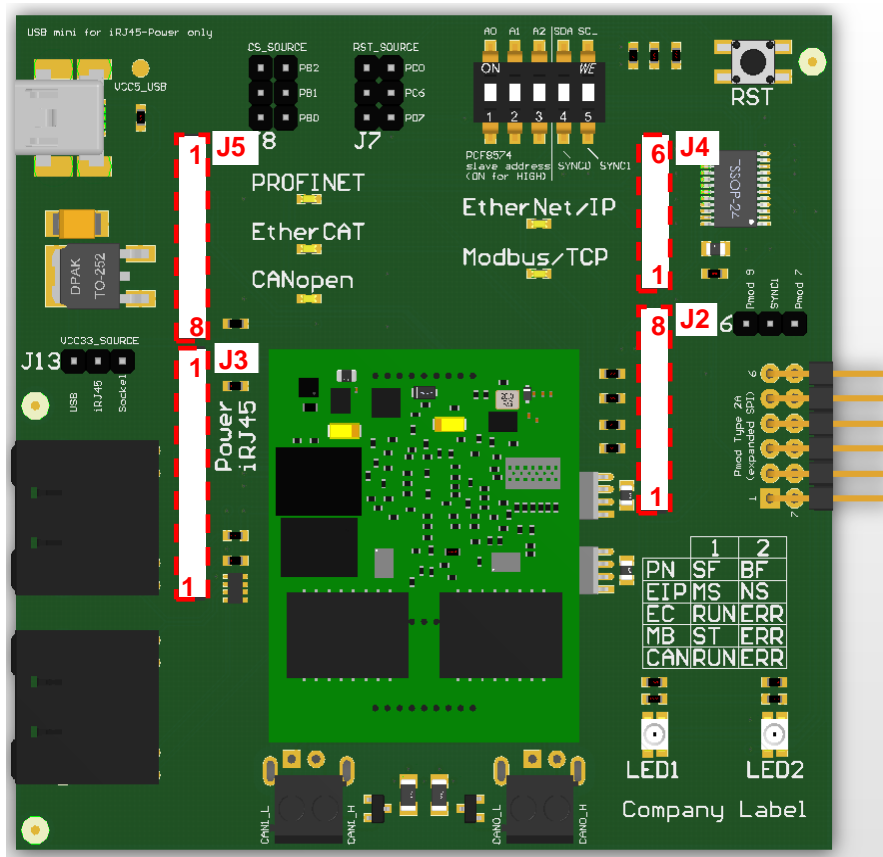


Figure 4: ARDUINO interface socket

Table 3: Pin assignment ARDUINO interface socket

J5 pin	Signal	J4 pin	Signal
1	SYNC0	1	PC0 (RST)
2	SYNC1	2	NC
3	NC	3	NC
4	NC	4	NC
5	NC	5	NC
6	NC	6	NC
7	NC		
8	PD7 (RST)		

J3 pin	Signal	J2 pin	Signal
1	CS_PB0	1	NC
2	CS_PB1	2	NC
3	CS (PB2)	3	PC6 (RST)
4	MOSI	4	3.3V
5	MISO	5	5V
6	SCK	6	GND
7	GND	7	GND
8	NC	8	NC
9	I ² C_SDA		
10	I ² C_SCL		

The CS signal at ARDUINO connector J3 pin 1 to 3 is able to connect with iRJ45 CS. Therefore is jumper J8 implemented, shown in Figure 5.

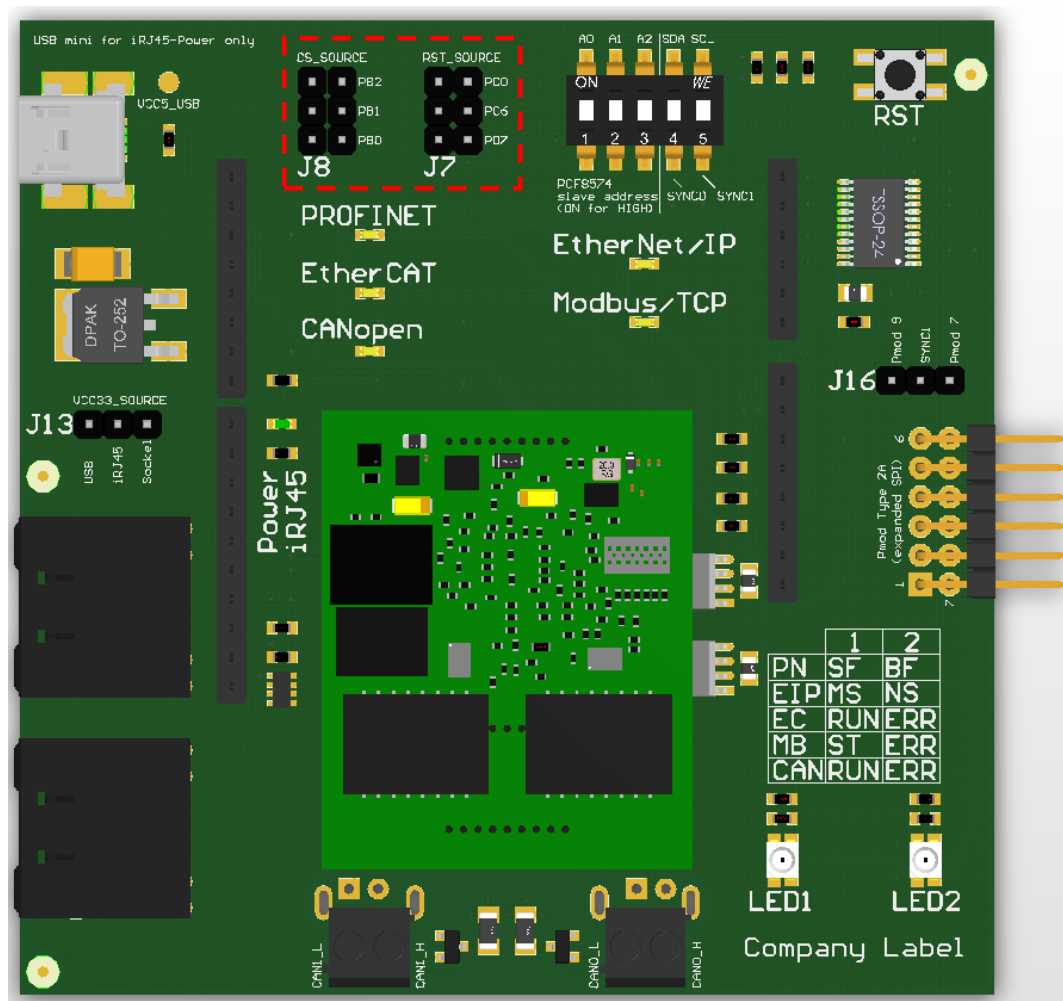


Figure 5: Jumper for CS/RST selection

Jumper J8 is prepared to vary the CS signal for iRJ45 module on the ARDUINO socket. In this case, 3 different signal sources (show Table 4) are available and allow a connection of three of this boards as stack structure. This is pictured in Figure 6 schematically.

With jumper J7 you can select one of three different RESET sources (show Table 4). Another possibility for pull down the iRJ45 RESET pin, is to use the pushbutton (RST) at the upper right end of the Adapter_ARDUINO/PMOD top side. This RESET signal gives the possibility to reboot the iRJ45 module. The three RESET and CS source pins are shown in Table 2 (PD7, PC6, PC0, PB2, PB1 and PB0). A horizontal jumper position permits this signal selection. Note, only connect one jumper to select a RESET/ CS source! This jumper pins are represented in Figure 5 as red dashed line rectangle.

Table 4: CS/RESET source matrix

	Position 1	Position 2	Position 3
CS via J8	<p>CS_SOURCE</p> <p><input checked="" type="checkbox"/> PB2</p> <p><input type="checkbox"/> PB1</p> <p><input type="checkbox"/> PB0</p> <p>J8</p>	<p>CS_SOURCE</p> <p><input type="checkbox"/> PB2</p> <p><input checked="" type="checkbox"/> PB1</p> <p><input type="checkbox"/> PB0</p> <p>J8</p>	<p>CS_SOURCE</p> <p><input type="checkbox"/> PB2</p> <p><input type="checkbox"/> PB1</p> <p><input checked="" type="checkbox"/> PB0</p> <p>J8</p>
RESET via J7	<p>RST_SOURCE</p> <p><input checked="" type="checkbox"/> PC0</p> <p><input type="checkbox"/> PC6</p> <p><input type="checkbox"/> PD7</p> <p>J7</p>	<p>RST_SOURCE</p> <p><input type="checkbox"/> PC0</p> <p><input checked="" type="checkbox"/> PC6</p> <p><input type="checkbox"/> PD7</p> <p>J7</p>	<p>RST_SOURCE</p> <p><input type="checkbox"/> PC0</p> <p><input type="checkbox"/> PC6</p> <p><input checked="" type="checkbox"/> PD7</p> <p>J7</p>

If the stack structure is used, the power supply with the ARDUINO connectors is recommended. Please note the correct position of jumper J13 who should in default setting.

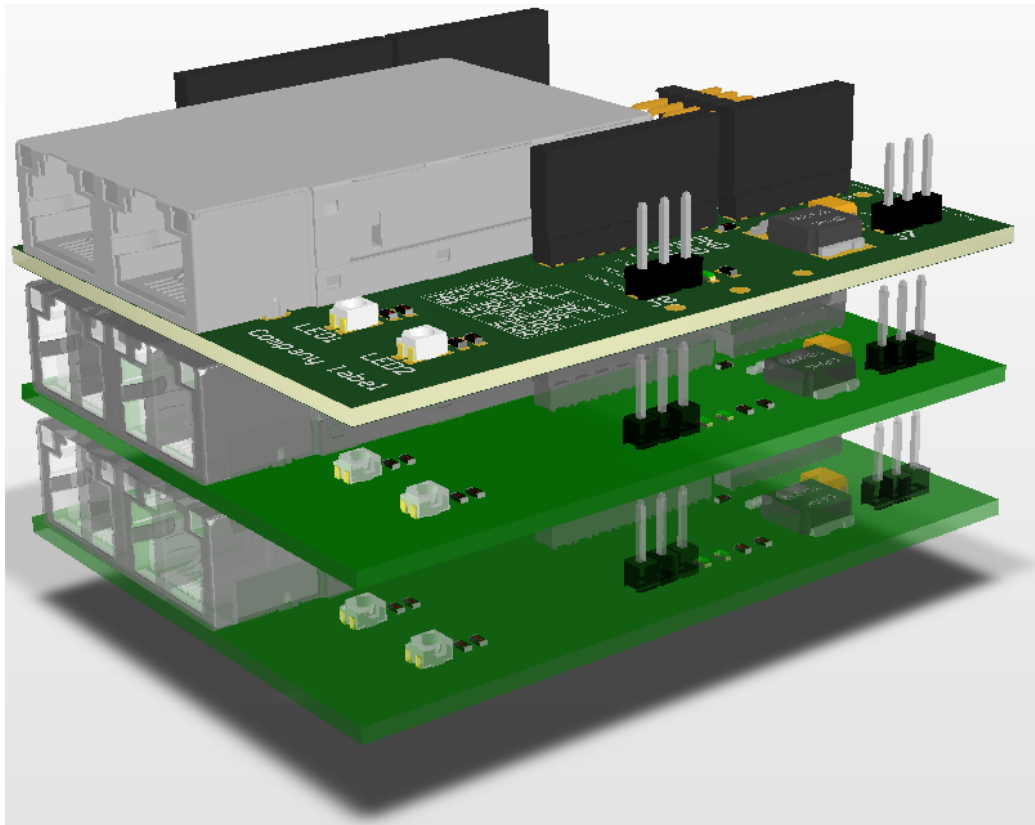


Figure 6: Stack structure with three boards

3.3. Board Assemble Variants

The Adapter_ARDUINO/PMOD is available in different assemble variants. This section give an overview about the physical appearance and the attached technical features. Based on common bottom layer design, the bottom side of the PCB is in all variants identical. In this case, compare with Figure 7.

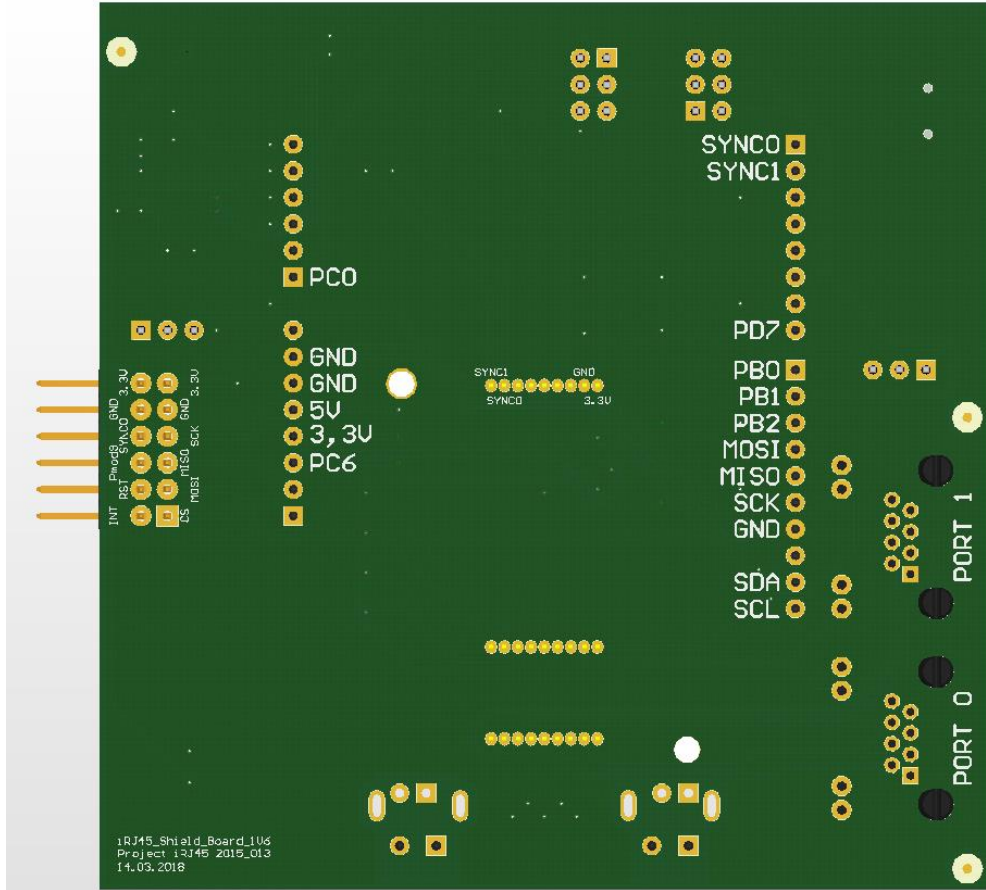


Figure 7: Bottom view Adapter_ARDUINO/PMOD

Note: the PCB colour can differ from shown figures.

3.3.1. ARDUINO / PMOD Communication Board single RJ45

Figure 8 shows the board with assembled iRJ45_1Port-Module. This configuration offers 1 port for ethernet communication by using PROFINET, EtherNet/IP, EtherCAT or Modbus/TCP. Additionally, the both connection interfaces from section 3.1 and 3.2 are present. Also a mini USB connector for power supply is placed.

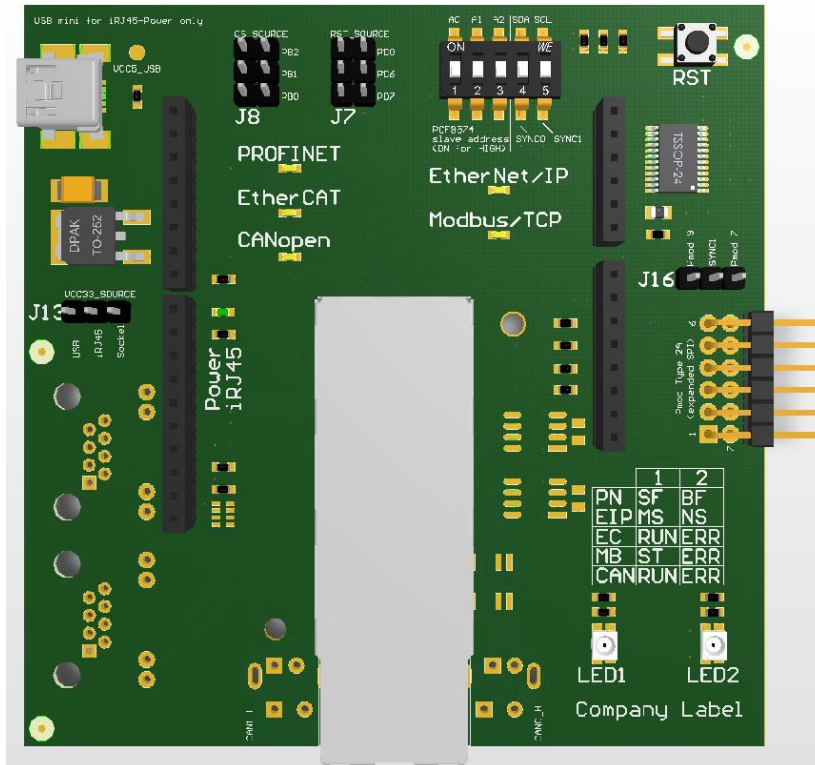


Figure 8: Top view single RJ45 variant

3.3.2. ARDUINO / PMOD Communication Board dual RJ45

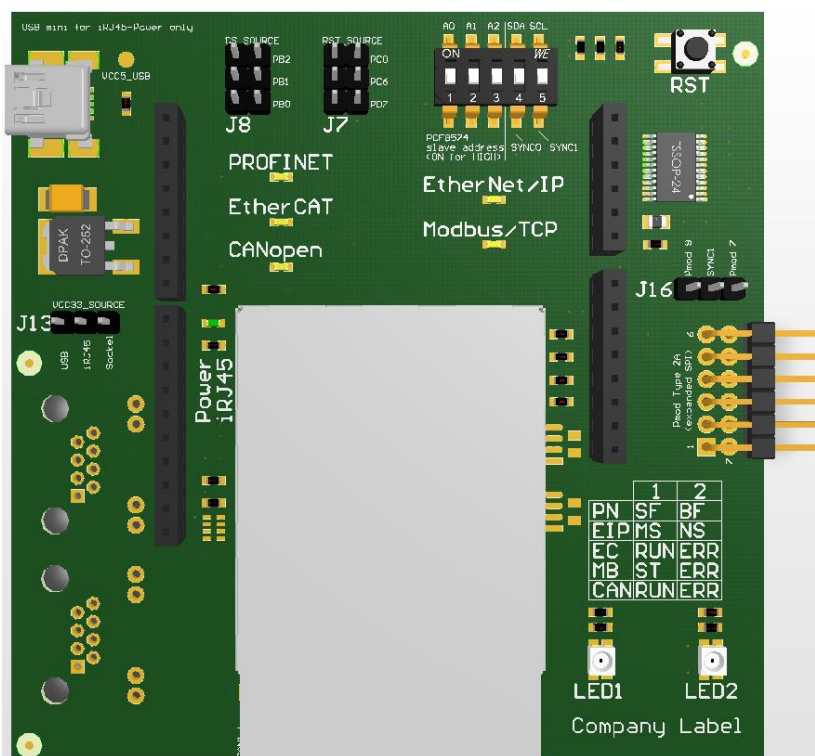


Figure 9: Top view dual RJ45 variant

The range of functions is equal to ARDUINO / PMOD Communication Board single RJ45, except the quantity of ports is increased to 2 ports (Figure 9) for ethernet communication.

3.3.3. ARDUINO / PMOD Communication Board SoM

Distinctive for this board variant are the two available CANopen ports with corresponding transceiver and ESD protection components. Figure 10 shows the board with assembled iRJ45_SoM-Module. This configuration offer 2 ports for ethernet communication by using PROFINET, EtherNet/IP, EtherCAT or Modbus/TCP via RJ45 jacks on adapter board.

Additional, the both connection interfaces from section 3.1 and 3.2 are also present. The mini USB connector for power supply is also placed.

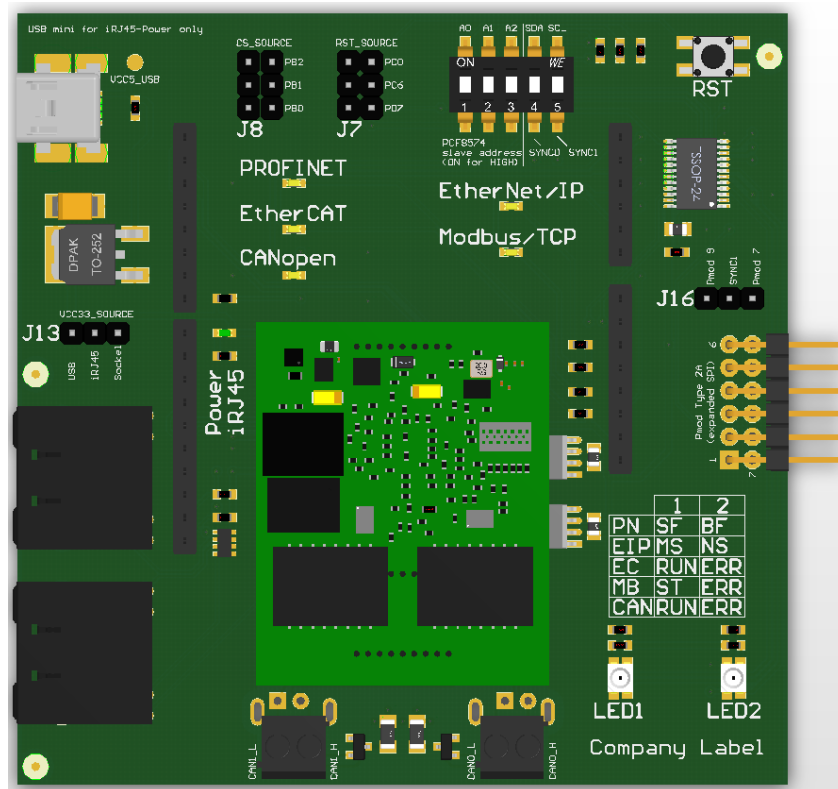


Figure 10: Top view SoM variant

4. Application Notes

4.1. Connection with STM32 Nucleo-144 boards

In consequence to our development process, a questionability emerged several times with the STM32 Nucleo-144 evaluation board. The prepared connection on ARDUINO compatible sockets isn't trivial. Following Figure 7 (page 8) display the correct Arduino compatible socket pins marked with purple color.

Table 3 listed the correct connection of Adapter_ARDUINO/PMOD with STM32 Nucleo-144 board.

Table 5: Connection Adapter_ARDUINO/PMOD with STM32 Nucleo-144

ARDUINO/PMOD J5	STM32 Nucleo-144 CN10	ARDUINO/PMOD J4	STM32 Nucleo-144 CN9
1	16	1	1
2	14	2	3
3	12	3	5
4	10	4	7
5	8	5	9
6	6	6	11
7	4		
8	2		

ARDUINO/PMOD J3	STM32 Nucleo-144 CN7	ARDUINO/PMOD J2	STM32 Nucleo-144 CN8
1	20	1	1
2	18	2	3
3	16	3	5
4	14	4	7
5	12	5	9
6	10	6	11
7	8	7	13
8	6	8	15
9	4		
10	2		

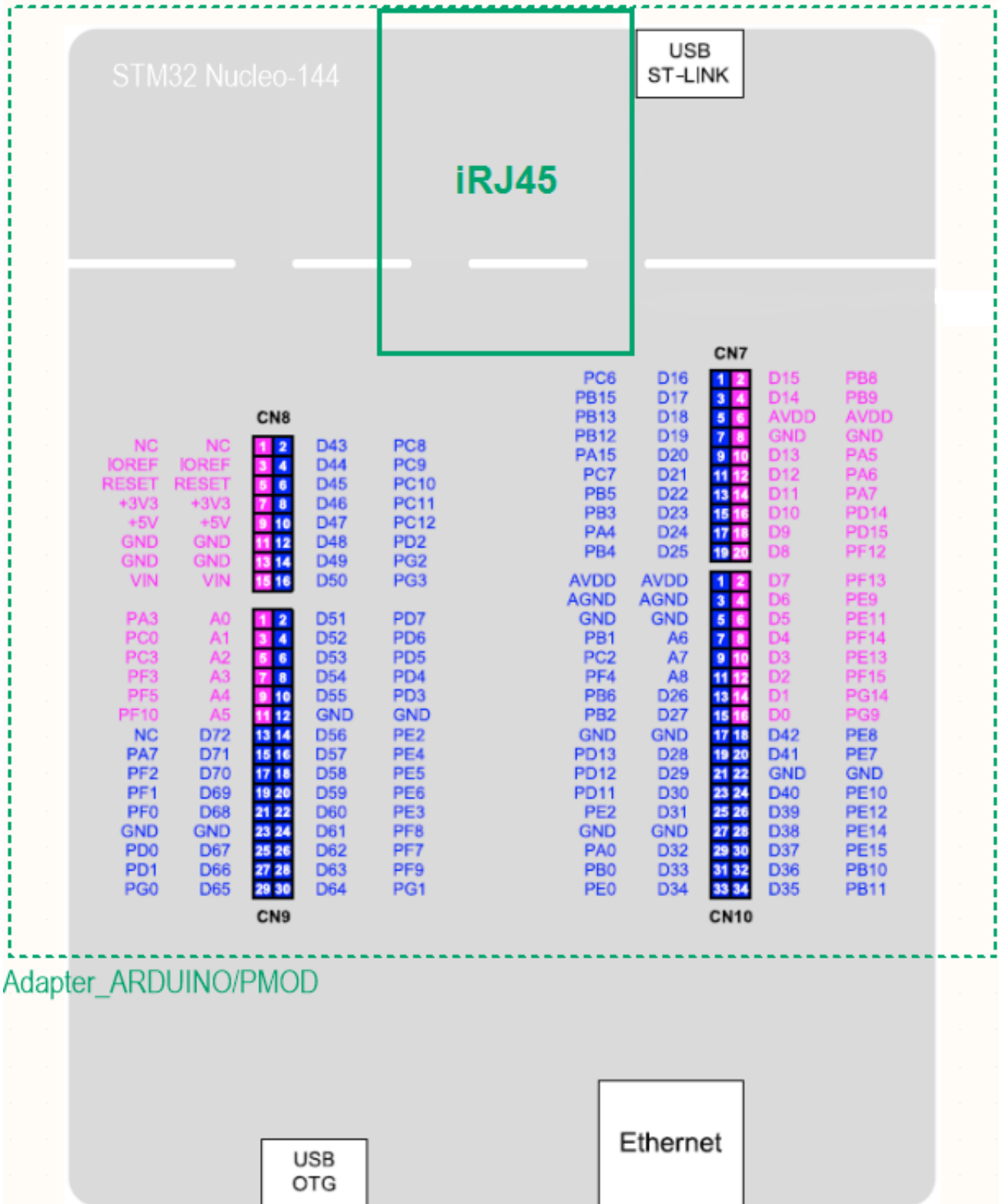
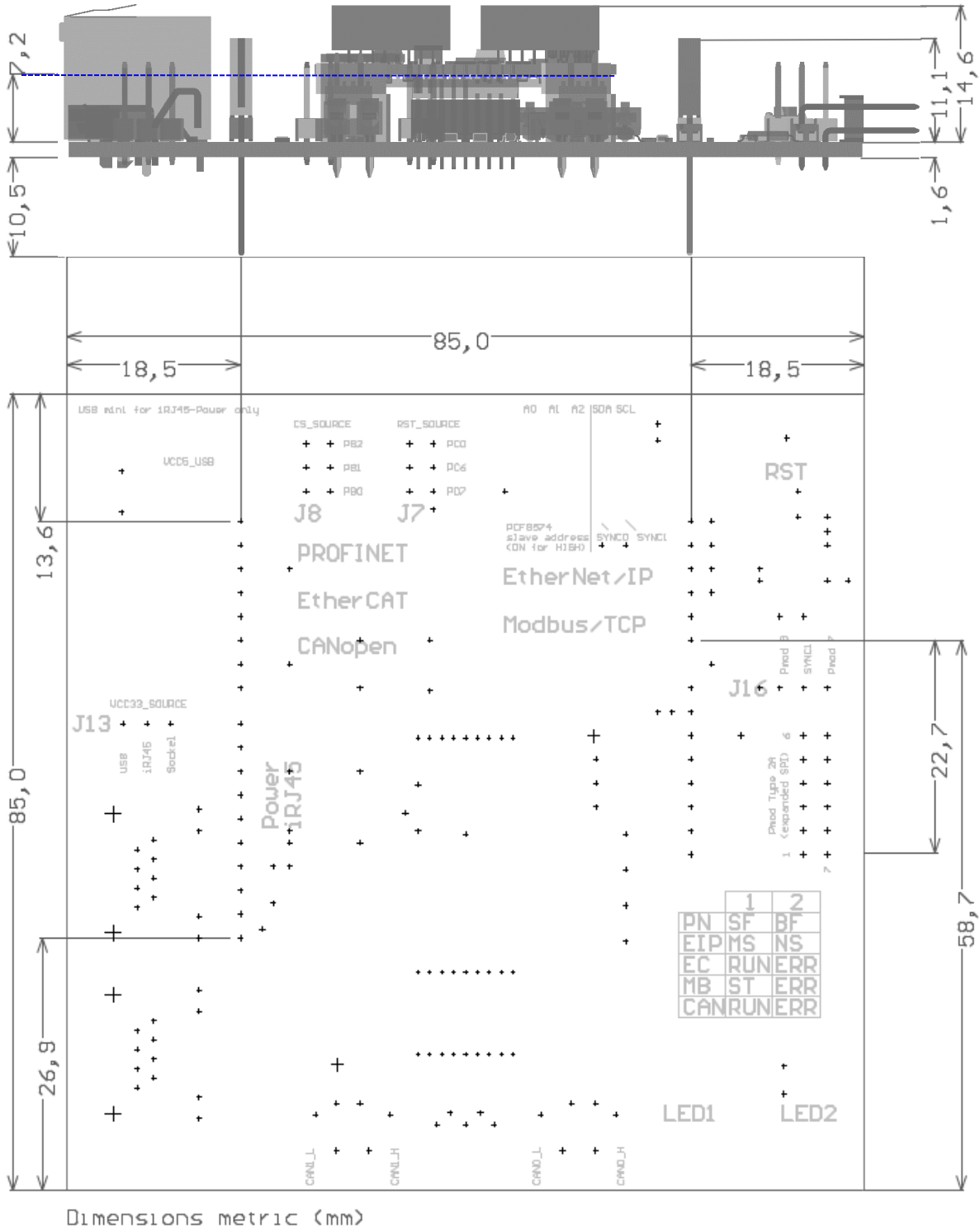


Figure 11: STM32 Nucleo-144 board ARDUINO socket (top view)

5. Board dimensions

All dimensions are metric (mm). The dashed blue line marked the distance between SoM PCB and Adapter_ARDUINO/PMOD surface.



6. Where to Buy

6.1. Arduino / PMOD Boards



The Arduino/PMOD boards can be purchased from PORT GmbH (www.port-automation.de)

Art.No.	Description	Note
2070/82 (with 1 PORT iRJ45 Modul)	<p>Multiprotocol Board for ARDUINO and PMOD systems. The board offer the follow Fieldbussystems (all on Board) Version: 1.V.x on board</p> <ul style="list-style-type: none"> ○ PROFINET ○ Ethernet IP ○ MODBUS TCP** ○ single Port solution <p>**on Request</p> <p>incl. USB cable</p> <p>The communication between the Host Board and the communication board will be via SPI. Some samples on board available. The board offers various switches and LEDs for status displays</p> <p>more information: http://www.port-automation.com/en/products/arduino-pmod-boards.html</p>	
2070/83 (with 2 PORT iRJ45 Modul)	<p>Multiprotocol Board for ARDUINO and PMOD systems. The board offer the follow Fieldbussystems (all on Board) Version: 1.V.x on board</p> <ul style="list-style-type: none"> ○ PROFINET ○ Ethernet IP ○ DLR** ○ EtherCAT ○ MODBUS TCP** ○ Dual Port solution <p>** on Request</p> <p>incl. USB cable</p> <p>The communication between the Host Board and the communication board will be via SPI. Some samples on board available. The board offers various switches and LEDs for status displays</p> <p>more information: http://www.port-automation.com/en/products/arduino-pmod-boards.html</p>	
2070/84 (with SoM – Modul)	<p>Multiprotocol Board for ARDUINO and PMOD systems. The board offer the follow Fieldbussystems (all on Board) Version: 1.V.x on board</p> <ul style="list-style-type: none"> ○ PROFINET ○ Ethernet IP ○ DLR** ○ EtherCAT ○ MODBUS TCP** ○ CANopen Master/Slave ○ Dual Port solution <p>** on Request</p>	available 10/2018

	<p>incl. USB cable</p> <p>The communication between the Host Board and the communication board will be via SPI. Some samples on board available. The board offers various switches and LEDs for status displays</p> <p>more information: http://www.port-automation.com/en/products/arduino-pmod-boards.html</p>	
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6.2. iRJ45 Module

The iRJ45 module can be purchased from RENESAS and the RENESAS distribution partners (Glyn, Avnet, Arrow)

Art.No.	Description	Note
<p>R19DS0100ED0000</p> 	<p>The Intelligent RJ45-2 (I-RJ45-2) is a ready to use, pre-certified dual port Ethernet module solution currently available for PROFINET RT, EtherNet/IP and EtherCAT real-time protocols, including an embedded 2-port Ethernet switch with a 3rd internal port for bus and ring network topologies. A single port Ethernet module version is also available as I-RJ45-1.</p>	
<p>R19DS0099ED0000</p> 	<p>The Intelligent RJ45-1 (I-RJ45-1) is a ready to use, pre-certified single port Ethernet module solution currently available for PROFINET RT and EtherNet/IP real-time protocols. A dual-Ethernet-port module version including an embedded 3-port Ethernet switch for bus and ring network topologies is also available as I-RJ45-2.</p>	

6.3. SoM Module

The SoM module can be purchased from PORT GmbH (www.port-automation.de).

Art.No.	Description	Note
<p>On Request</p> 	<p>The Intelligent SoM Module is a ready to use, pre-certified dual port Ethernet/CANopen module solution currently available for:</p> <ul style="list-style-type: none"> ○ PROFINET RT ○ EtherNet/IP ○ DLR** ○ EtherCAT ○ MODBUS TCP** ○ CANopen Master/Slave <p>**on Request</p> <p>real-time protocols, including an embedded 2-port Ethernet switch with a 3rd internal port for bus and ring network topologies.</p>	<p>available 10/2018</p>