PD69220/PD69208M

EV82F61A Evaluation Board User Guide

Introduction

The EV82F61A evaluation board is developed based on Microchip's PD69220 PoE controller and two PD69208M PoE managers.

Microchip's PD69208M Power over Ethernet (PoE) manager IC integrates power, analog, and state-of-the-art logic into a single 56-pin, plastic QFN package. The device is used in Ethernet switches and midspans/injectors to allow network devices to share power and data over the same Ethernet cable.

The PD69208M PoE manager is an 8-port, mixed-signal, and high-voltage PoE driver. Together with the PD69220 PoE controller, it performs as a PSE system. Microchip's PD69220 PoE controller is a pre-programmed MCU designed to implement enhanced mode PoE system.

The PD69208M and PD69220 chipset supports PoE Powered Device (PD) detection, power-up, and protection according to IEEE® 802.3af/at/bt standards as well as legacy/pre-standard PD detection. It provides real-time PD protection through the following mechanisms: overload, under-load, over-voltage, over-temperature, and short-circuit, and enables operation in a Standalone mode. It also executes all real-time functions as specified in IEEE 802.3af/at/bt standards.

The chipset supports supply voltages between 44 V and 57 V without additional power sources. Ongoing monitoring of system parameters for the host software is available through communication. For higher reliability, internal thermal protection is implemented in the chip. The PD69208M is the most integrated PSE IC including internal MOSFET and sense resistor to achieve a low power dissipation.

The PD69220 features an eSPI bus for each PD69208M. It is based on the Microchip D21 family. The PD69220 utilizes an I2C or UART interface to the host CPU. It is designed to support software field-upgradable through the communication interface. The evaluation system provides designers with the required environment to evaluate the performance.

The EV82F61A demonstrates the operation of four 4-pair ports and four 2-pair ports, and is based on a PD69220 PSE controller and two PD69208M PSE manager.

The EVB includes green and yellow bi-color LED-stream, which is generated by the PD69220 and an LED stream circuit.

The LED stream provides visual status of each port by two dedicated LEDs per each port.

A uni-color application is also available, which provides visual status of the port by one color.

The evaluation system has the following features.

- Two RJ45 gangs (each contains four RJ45 connectors)
- Four 4-pair ports and four 2-pair ports structured by two PD69208Ms
- Switch domain isolated from PoE domain
- Switch domain USB interface to be connected to a PC with Microchip GUI
- PoE controller manual Reset and serial communication setting
- Green and yellow bi-color LED status indication for all 8 ports (LED stream)
- Requires a single power source only
- 0 °C to 40 °C operating temperature
- RoHS compliant

Figure 1. EV82F61A

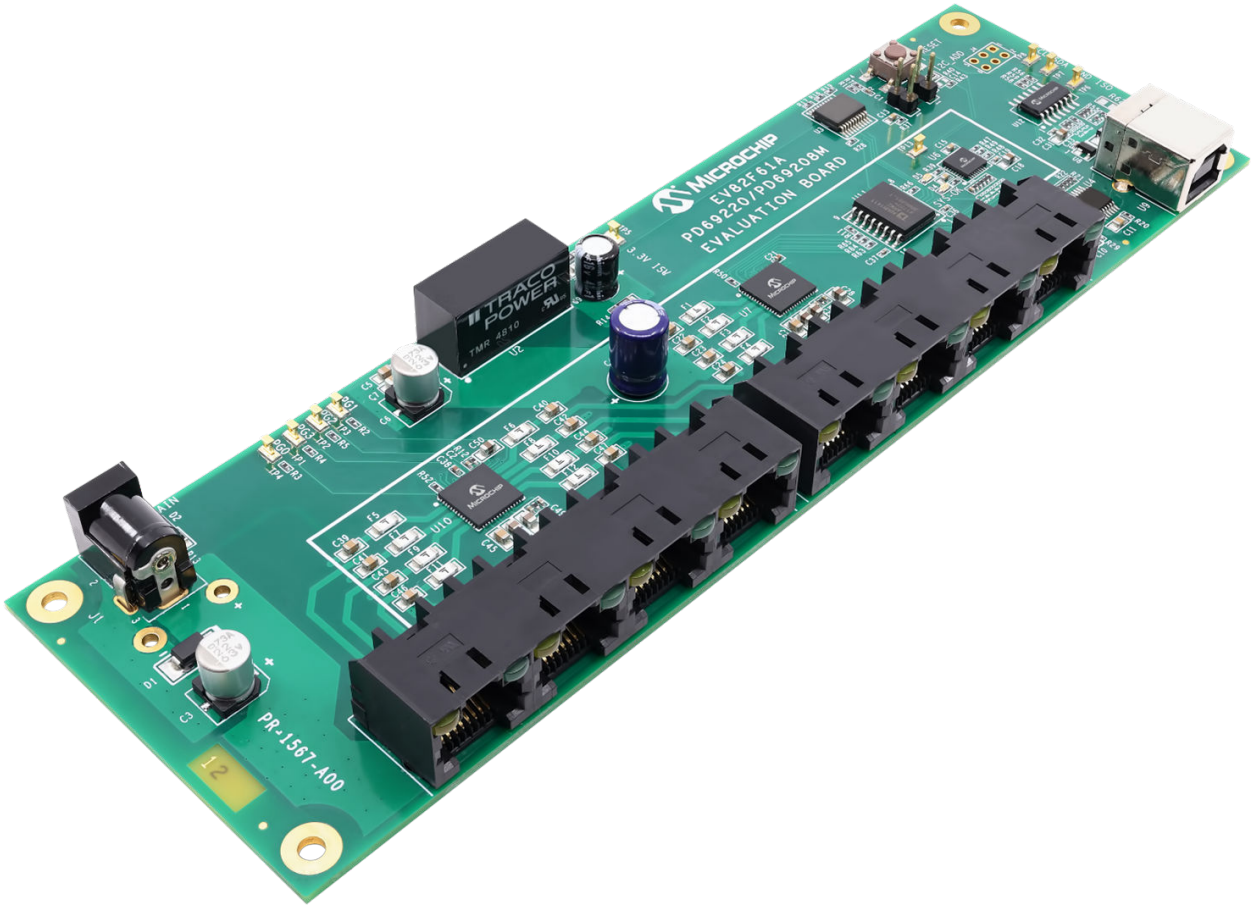

Figure 2. EV82F61A Evaluation System Block Diagram

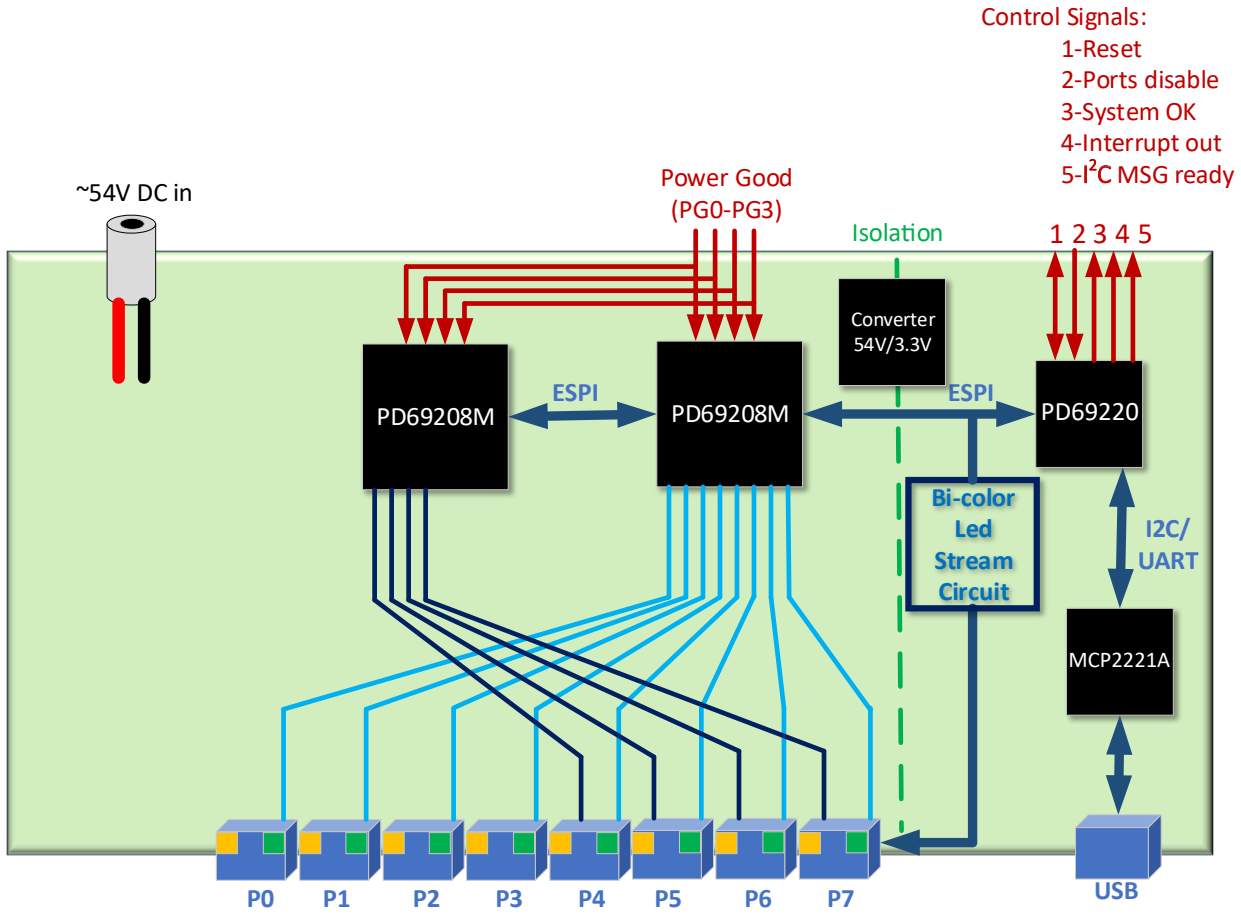

Figure 3. EV82F61A Top View

Note: Actual PoE size is 2.2 cm × 13.5 cm.

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1. Overview

This section provides the basic overview of the EV82F61A evaluation board.

1.1 Power

The Evaluation Board (EVB) is powered by a single source via the DC connector J1. The input voltage level can be selected according to the IEEE 802.3 PoE standards:

- IEEE 802.3af: 44 V_{DC} to 57 V_{DC}.
- IEEE 802.3at: 50 V_{DC} to 57 V_{DC}.

The recommended voltage level is 53 V_{DC} to 55 V_{DC}, which covers all PoE standards.

The EVB has two power domains:

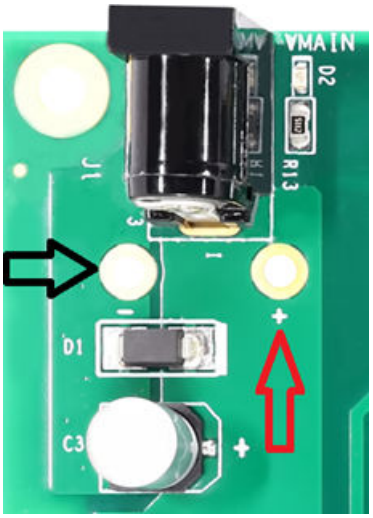
- PoE domain, which is fed directly by the main supply and is the power domain provided by the RJ45.
- Isolated 3.3 V_{DC}, which feeds the PD69220, LED stream, and serial communication peripherals.
  - The isolated 3.3 V_{DC} is generated by U2 (a DC/DC module).
  - Test points **3.3V_iso** and **GND_ISO** can be used for connecting external signals to control the PD69220.

Note: The EVB is polarity sensitive. The correct polarity is shown in the following figure.

Figure 1-1. DC Connector J1 Polarity

Important: DC input connector J1 is limited to current level up to 4 A. If higher current is needed, the 2 via holes next to J1 can be used, by soldering a cable to it. The two via holes support up to 10 A to feed the whole EVB.

Figure 1-2. Power via Holes



1.2 Interface and Control

This section describes the serial communication, reset pushbutton, PoE ports disable, and power good input (PGD0-PGD3).

1.2.1 Serial Communication

The EVB supports serial communication with the PD69220 by UART and I²C. The serial communication is converted to USB by the Microchip MCP2221A (U12) to allow a user-friendly experience using the Microchip dedicated GUI. To use the USB port, install the MCP2221A driver on your PC. The driver can be downloaded from the Microchip website at www.microchip.com/wwwproducts/en/MCP2221A

If R62 is installed as 0 Ω, the USB converter (U12) is disabled, which allows the user to connect directly to the I²C bus via the two test points and control the EVB via I²C. The ISO_GND test-point is the GND for the I²C bus. For the test points location, see figure I²C Bus Test Point and Control Signals.

UART or I²C can be select by jumper J3:

- When jumper J3 is not installed, the PD69220 is set to UART mode.
- When jumper J3 is installed, the PD69220 is set to I²C mode.
  - In order to select I²C address, R40 should be installed according to the following table I²C Address Setting.
  - R40 is located next to J3.

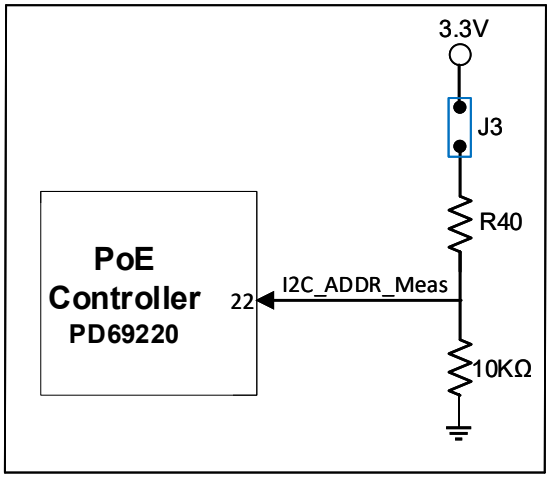
The EVB is set to I²C address 0x2C (R40= 11K).

J3 should be installed or removed before the EVB is powered up, so during the EVB initialization, the PD69220 identifies the communication method.

Table 1-1. I²C Address Setting

I²C Address Setting	Address (Hex)	R40 (kΩ)
#0	UART	N.C.
#1	0x4	147
#2	0x8	86.6
#3	0xC	57.6
#4	0x10	43.2
#5	0x14	34
#6	0x18	26.7
#7	0x1C	22.1
#8	0x20	18.2
#9	0x24	15.4
#10	0x28	13
#11	0x2C	11
#12	0x30	9.31
#13	0x34	7.87
#14	0x38	6.49
#15	0x3C	5.49

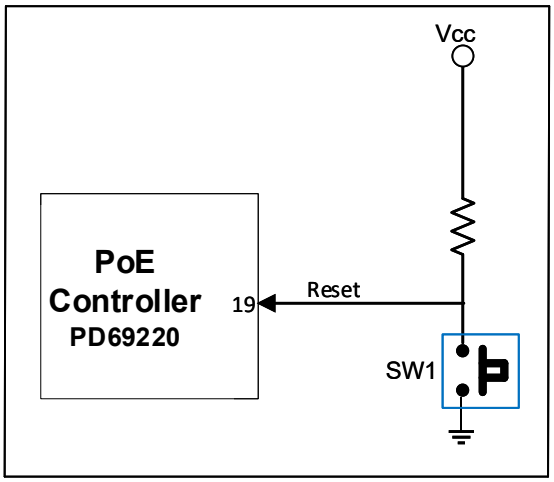
Figure 1-3. I²C Address Setting Diagram



1.2.2 Reset Pushbutton

The pushbutton is connected to the Reset pin of the PD69220 (pin 19). Pressing on SW1 will connect the Reset pin to GND, and the PoE system will reset.

Figure 1-4. Reset Control Diagram



1.2.3 PoE Ports Disable

J2 is connected to the Disable pin of the PD69220 (pin 31). When jumper J2 is installed, the Disable pin is connected to GND, and all ports are disabled.

Figure 1-5. Ports Disable Control Jumper Diagram

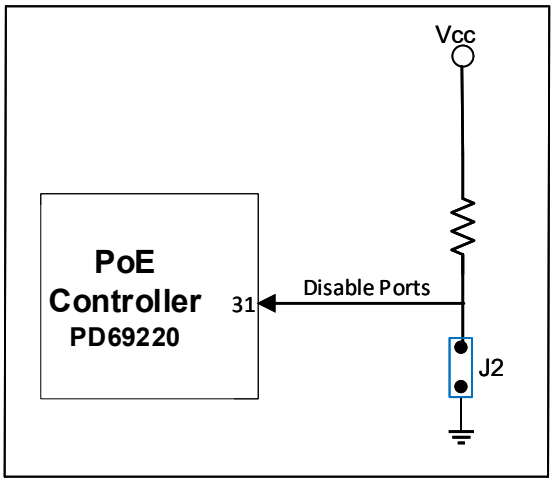
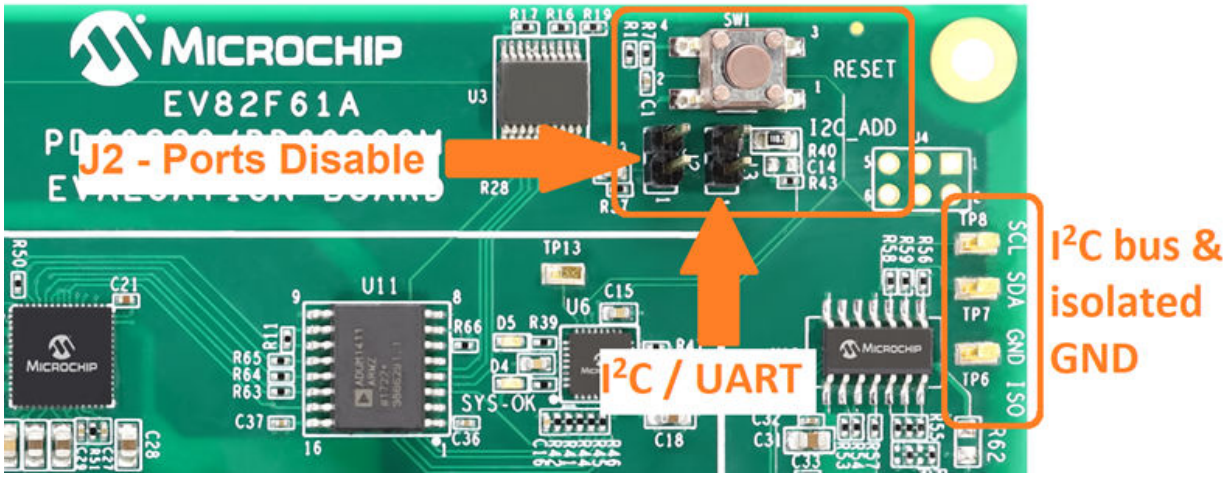


Figure 1-6. I²C Bus Test Point and Control Signals



1.2.4 Power Good Input (PGD0-PGD3)

The EVB supports feeding from up to four power supplies, which means 16 power banks (bank0 to bank15). Each power supply should generate a digital signal (0 V_{DC} or 3.3 V_{DC}), which indicates the power supply is active. That signal should be connected to one of the PGD pins of the PD69208M (pins 41, 46, 47, 56). On the EVB, the four PGD pins are pulled down with a 10K resistor to DGND, which set the default power bank to 0x00.

In order to set a bank different than 0x00, the user can use the PG0-PG3 tests points located next to U2. The four PGD signals are referenced to the AGND of the PoE domain and can be used with the AGND via hole seen in figure Power via Holes.

Figure 1-7. PGD0-PGD3 Test Points Diagram

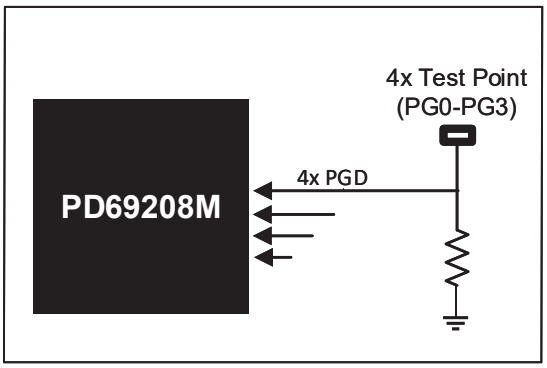
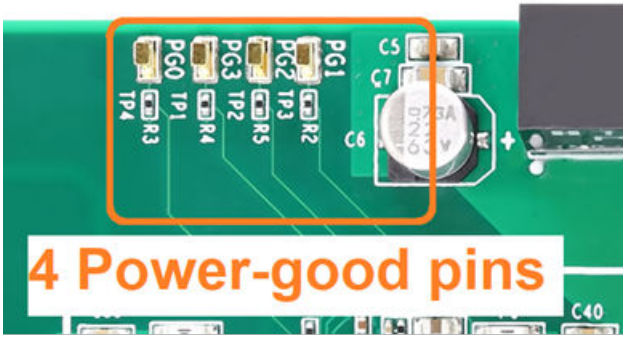


Figure 1-8. PGD0-PGD3 Test Points



1.3 LED Indication

The evaluation board contains status indication LEDs, listed in the following table.

Table 1-2. LED List

Designation	Function
D2	V_{MAIN} ON
D3	Isolated 3.3 V_{DC} ON (powers the PD69220, LED stream, USB comm)
D4	System OK (active low) Driven by PD69220 pin 32.
D5	Interrupt out (active low) Driven by PD69220 pin 25.
Port (0–7)	Green and yellow LED per port: • LED off= Port is off • Green LED on= 4-pair port is on • Yellow LED on= 2-pair port is on • Green LED blinking= Port is off due to error/under load/power management

1.4 RJ45 Connectors Polarity

The four ports of J5 are 2-pair up to 32 W each, and the four ports of J6 are 4-pair up to 64 W each. The polarity of the port is listed in the following tables.

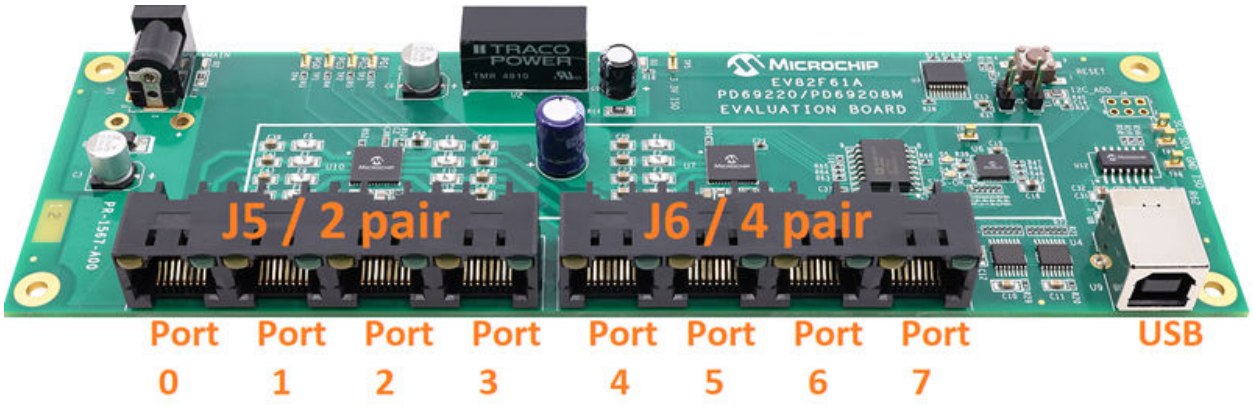
Table 1-3. J5/RJ45 Connector 2-Pair Port (Ports 0–3)

Pin Number (Each RJ45 Port)	Polarity
1, 2	N.A.
3, 6	N.A.
4, 5	Positive Alt B
7, 8	Negative Alt B

Table 1-4. J6/RJ45 Connector 4-Pair Port (Ports 4–7)

Pin Number (Each RJ45 Port)	Polarity
1, 2	Negative Alt A
3, 6	Positive Alt A
4, 5	Positive Alt B
7, 8	Negative Alt B

Figure 1-9. Port Numbering



2. Installation and Setting

This section describes the steps required for installing and operating the EVB.

Take the following precautions before starting the installation:

- Ensure that the power supply of the board is turned off before plugging in the DC connecter.
- Only after the DC connector is plugged in, turn the main supply ON.
- If using the DC connector J1, ensure that the power banks are set to 250 W.
- Ensure the correct polarity of the power supply cable. The polarity of the power supply cable is as shown in figure DC Connector J1 Polarity.

2.1 Ports Matrix

Ensure the ports matrix is configured according to the following table.

Ports that do not exist on the EVB (ports 8–47) should be configured as 255, 255.

Table 2-1. Ports Matrix

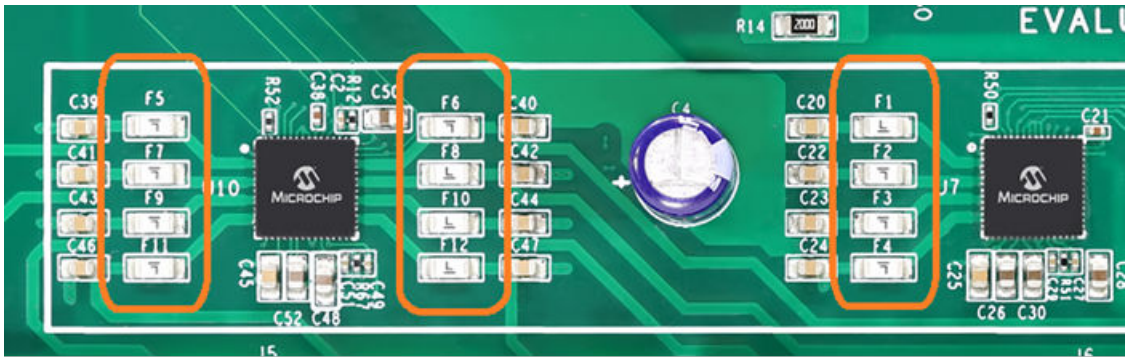
Logical Port	Physical Port A	Physical Port B
0	255 (0xFF)	8
1	255	9
2	255	10
3	255	11
4	0	12
5	1	13
6	2	14
7	3	15
8	255	255
9... 47	255	255

2.2 Fuses

On the main board, there are 12 fuses for the two PD69208M, located on the top side next to the PD69208M (U7 and U10). The fuse is connected on the Vport_Neg pin of each port, and marked F1… F12.

IEC62368-1 Ed2 (released in October 2018 and effective December 2020) requires per-port fuses for a system power supply greater than 250 W.

Figure 2-1. Fuses



2.3 Schematics

The full schematics are available on the Microchip website at www.microchip.com/DevelopmentTools/ProductDetails/PartNO/EV82F61A.

3. Revision History

Revision	Date	Description
A	06/2021	Initial Revision

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