
PD-IM-7601/SP Evaluation Board User Guide

Introduction

The PD-IM-7601/SP evaluation board is developed based on Microchip's PD69201 1-Port PSE PoE Manager and demonstrates the operation of one 2-pair port. The part number for this EVB is PD-IM-7601.

Microchip's PD69201 device is an IEEE[®] 802.3af and IEEE[®] 802.3at compliant single-port Power over Ethernet (PoE) Manager, used in Ethernet switches and midspans/injectors to allow network devices to share power and data over the same cable. With minimal external components, the PD69201 supports both IEEE 802.3af/at and Legacy Power Devices (PDs). Integrating power, analog, and state-of-the-art logic, the PD69201 is available in a 10-pin, 3 mm x 4 mm DFN package.

PD69201 supports supply voltages between 32 V and 57 V without additional power sources. Ongoing monitoring of system parameters for the host software is available through I²C communication. For higher reliability, internal thermal protection is implemented in the chip. PD69201 is the most integrated PSE IC including internal MOSFET and sense resistor to achieve a low power dissipation.

The evaluation system has the following features.

- Two RJ45 connectors (one for Data in and one for Power and Data out).
- 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.
- LED status indication for system power, Port power, and Port disabled.
- Requires only a single power source.
- 0 °C to 40 °C working temperature.
- RoHS compliant.

Figure 1. PD-IM-7601/SP Evaluation Board

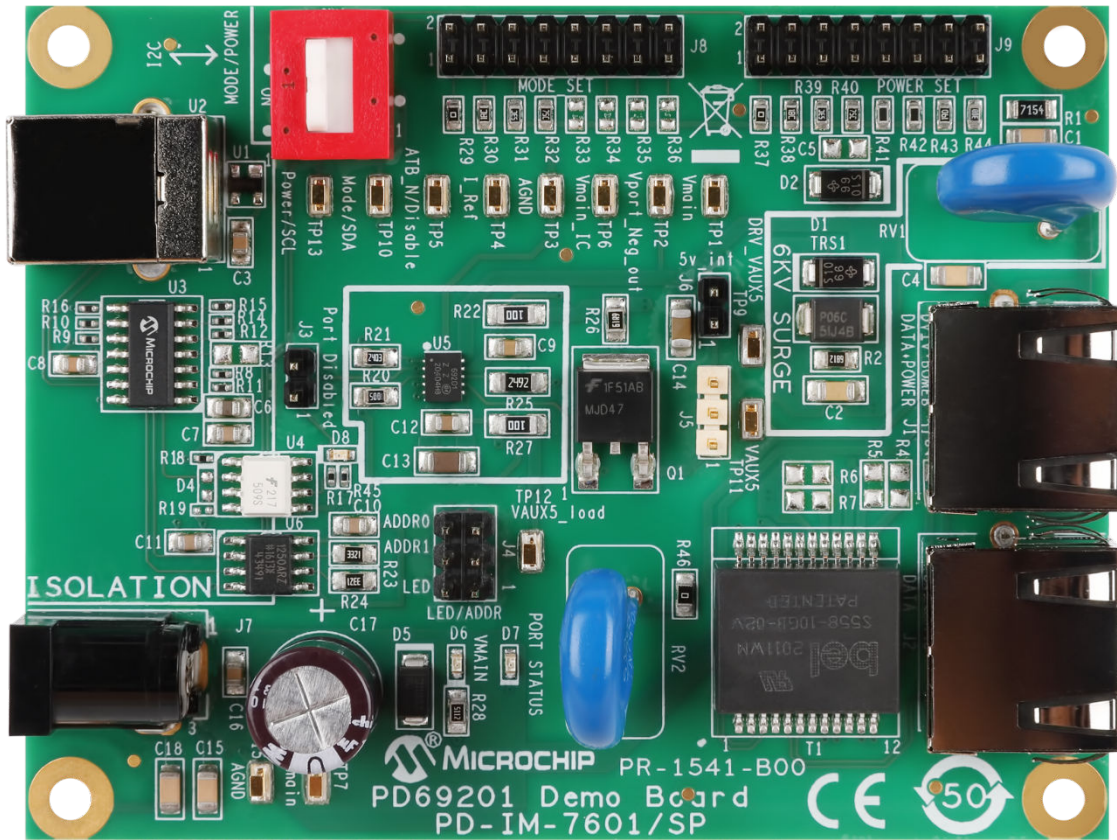


Figure 2. PD-IM-7601/SP System Block Diagram

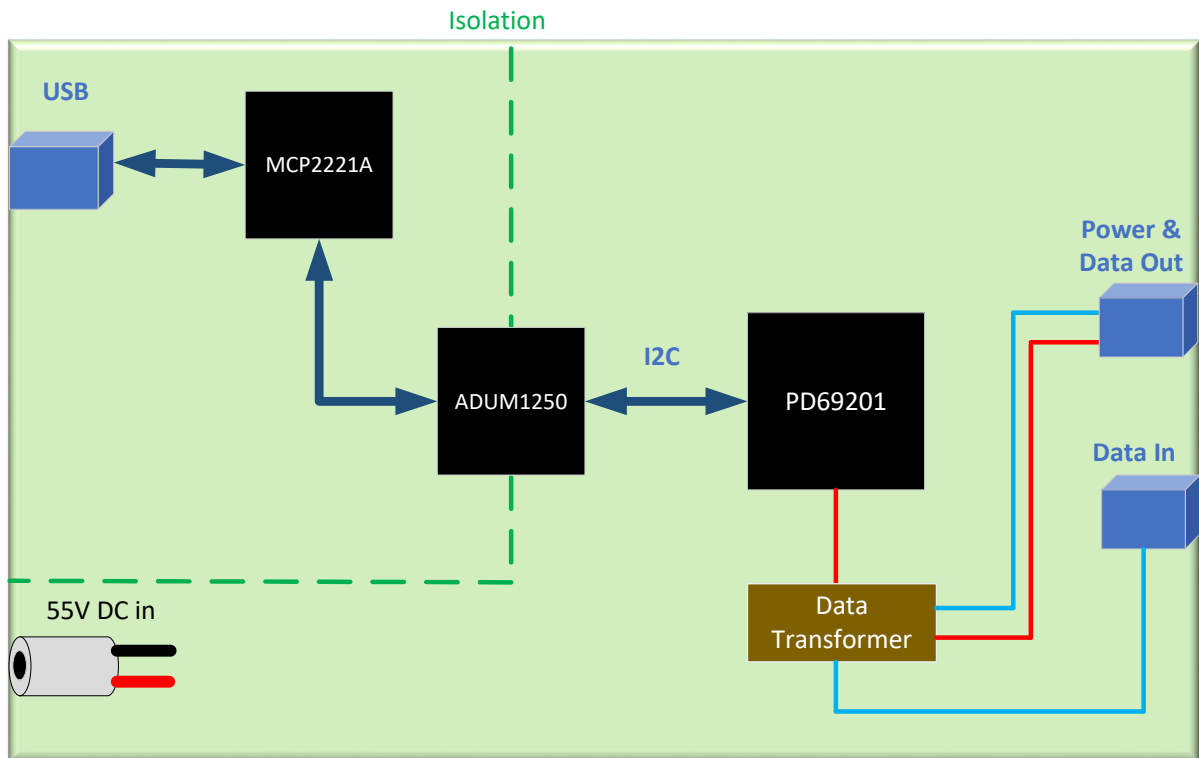


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1. Product Overview

1.1 Power

The EVB is powered by a single source via the DC connector J7. The input voltage level can be selected according to the IEEE 802.3 PoE standards:

- IEEE 802.3af: 44 VDC to 57 VDC
- IEEE 802.3at: 50 VDC to 57 VDC

The recommended voltage level is 55 VDC, which covers all PoE standards.

The EVB has two power domains:

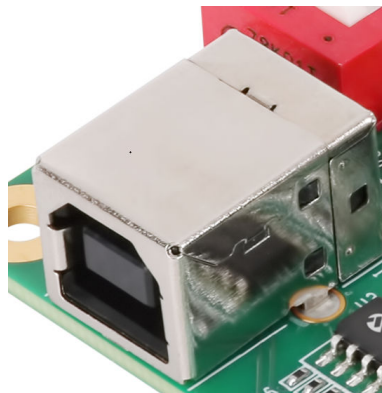
- PoE domain, which is fed directly by the main supply, and it is the power domain provided by the RJ45. The EVB DC input is polarity sensitive.

Figure 1-1. DC Connector J7 Polarity



- Isolated 5 VDC, which feeds the serial communication peripherals. The isolated 5 VDC is derived from U2 (USB connector).

Figure 1-2. USB Connector U2



Auxiliary 5 VDC power options:

- The PD69201 has an internal 5 VDC regulator, which eliminates the need for an external DC/DC converter.
- In case it is required to use the 5 VDC for external periphery, the 5 VDC regulator can be boosted by an external NPN transistor.
- 5 VDC can be supplied by an external source. Connect positive to TP12 Vaux5_load and negative to TP3 AGND.

The following table lists the options that are set by jumpers J5 and J6.

Table 1-1. Auxiliary 5 VDC Options

| Auxiliary 5 VDC Option | J5 Jumper | J6 Jumper |
|---|-----------|-----------|
| Internal | Pin 2-3 | NC |
| NPN Transistor (recommended for managed mode) | Pin 1-2 | Pin 1-2 |
| External | NC | Pin 1-2 |

Figure 1-3. Auxiliary 5 VDC Select Jumpers J5 and J6



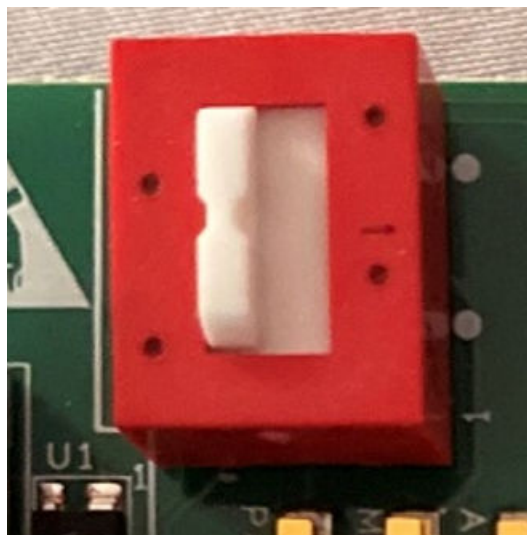
1.2 Interface and Control

The EVB supports Managed and Unmanaged mode of operation. In the Managed application, Host CPU issues commands utilizing I²C Communication Protocol to the PD69201 PoE manager.

The I²C communication is converted to USB, to allow the user-friendly experience using Microchip GUI.

The following figure shows switch, SW1, that selects I²C mode.

Figure 1-4. Managed/Unmanaged Mode Selection Switch SW1

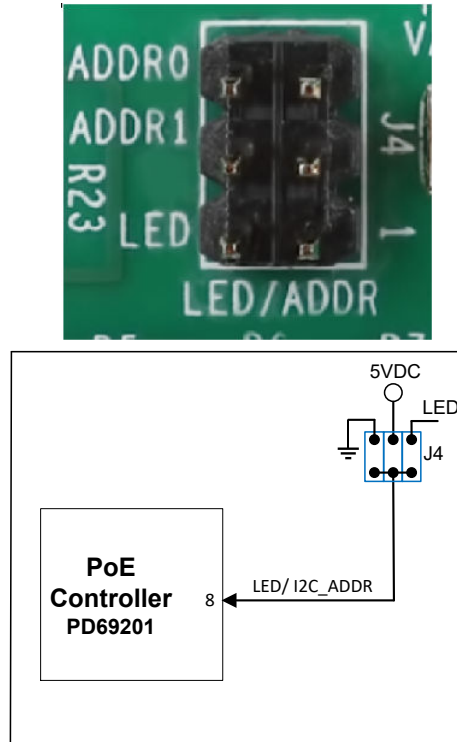


The following table lists the two I²C addresses that are selected by jumper J4.

Table 1-2. I²C Address Setting

| I ² C Address | J4 Jumper Setting | PCB Marking |
|--------------------------|-------------------|-------------|
| 0x20 | GND | ADDR0 |
| 0x21 | 5VDC | ADDR1 |
| 0x21 | LED | LED |

Figure 1-5. LED/Address Select Jumper J4

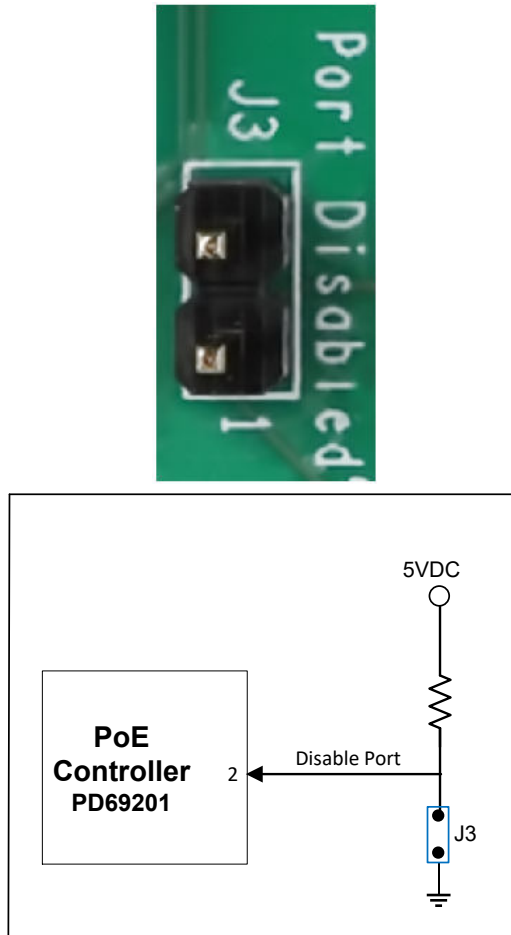


PoE disabled port settings are:

- J3 is connected to the disable pin of the PD69201 (Pin 2).
- When the jumper J3 is installed, the disable pin is connected to GND and PoE functionality is disabled.

The following figure shows the J3 jumper settings.

Figure 1-6. Port Disabled Jumper J3



1.3 RJ45 Connector Polarity

The following table lists the RJ45 connector polarity settings.

Table 1-3. RJ45 Connector 2-pair Port

| Pin Number | Polarity |
|------------|----------------|
| 1,2 | N.A |
| 3,6 | N.A |
| 4,5 | Positive Alt B |
| 7,8 | Negative Alt B |

1.4 Power Select Settings

In the Unmanaged application, the power limit of the port is set by the jumpers on J9, as listed in the following table.

Table 1-4. Power Select Settings

| J9 Pins | Resistor Value | Function | | |
|---------|----------------|------------------------|------------------------|-------|
| | | I _{cut} (OVL) | I _{lim} (Typ) | Class |
| 1,2 | 0 Ω | 375 mA | 430 mA | No |
| 3,4 | 15 kΩ | Disabled | 111 mA | No |
| 5,6 | 34.8 kΩ | Disabled | 197 mA | No |
| 7,8 | 59 kΩ | Disabled | 283 mA | No |
| 9,10 | 86.6 kΩ | Disabled | 490 mA | No |
| 11,12 | 118 kΩ | Disabled | 614 mA | No |
| 13,14 | 154 kΩ | Disabled | 981 mA | Yes |
| 15,16 | 200 kΩ | 642 mA | 759 mA | Yes |

Figure 1-7. Power Set Jumper J9



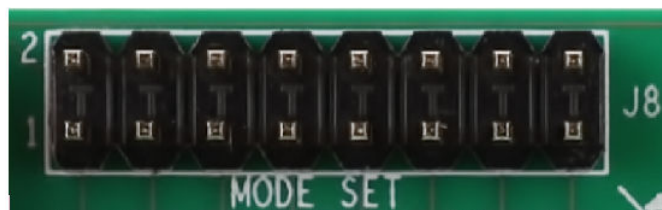
1.5 Mode Settings

In the Unmanaged application, the mode of the port is set by the jumpers on J8, as listed in the following table.

Table 1-5. Mode Select Settings

| J8 Pins | Resistor Value | Function | |
|---------|----------------|----------|-----------|
| | | ALT A/B | Detection |
| 1,2 | 0 Ω | Alt B | Res |
| 3,4 | 15 kΩ | Alt B | Res+Cap |
| 5,6 | 34.8 kΩ | Alt A | Res |
| 7,8 | 59 kΩ | Alt A | Res+Cap |

Figure 1-8. Mode Set Jumper J8



1.6 LED Indication

The following table lists the evaluation board status indication LEDs.

Table 1-6. LED List

| Designation | Function |
|------------------|--|
| D6 | Vmain ON |
| D4 | Port Disabled |
| D7 (Port Status) | Led off→ Port is OFF Led on→ Port is ON Led blink 1 Hz→Port OVL/short/dvdt error/res fail/class error LED blink 4 Hz→Vmain is out of range or OVT LED Pulse of 30 ms every 2 s→ Port is Idle |

1.7 Test Points

The following table lists the test points in the evaluation board.

Table 1-7. Test Points

| Designation | Description |
|-------------|--|
| TP1, TP7 | Positive input Vmain |
| TP2 | Negative output Vport_Neg_out |
| TP3, TP15 | Ground AGND |
| TP4 | Connected to IREF pin #1 |
| TP5 | Connected to Disable Port pin #2 |
| TP6 | Connected to Vmain pin #9 |
| TP9 | Connected to output of internal regulator DRV_VAUX5 pin #7 |
| TP10 | I ² C bus serial data (SDA)/Mode pin #4 |
| TP11 | Regulated 5 V input Vaux5 pin #6 |
| TP12 | 5 V Supply Vaux5_load |
| TP13 | I ² C bus serial clock (SCL)/Power_set pin #5 |

1.8 Surge Requirements

The following table lists the PoE surge standards that the EVB is designed to meet. Protection is implemented by use of varistors (RV1, RV2) and Sidactor (TRS1). Refer to *AN3580 Designing 1-port PoE System Using PD69201, DS00003580* for additional information.

Table 1-8. Surge Standards

| Standard | Test Circuit Waveform | Level [\pm] | Tested Channel Condition | Coupling Mode |
|-------------------------------|--|-----------------|--------------------------|---------------|
| ITU-T K21 2018 Test 2.1.11 | 1.2/50-8/20 us R1=10 Ω R2=10 Ω | 6 kV | Channel OFF | Differential |
| ITU-T K21 2018 Test 2.1.8 | 1.2/50-8/20 us R=10 Ω | 6 kV | Channel OFF | Common |
| ITU-T K21 2018 Test 2.1.4a | 10/700 us R=25 Ω | 6 kV | Channel OFF and ON | Common |

2. Installation and Settings

This section describes the steps required for installing and operating the PD-IM-7601/SP.

2.1 Prerequisites

Take the following precautions before starting the installation:

- Ensure that the power supply is turned-off before plugging in the DC connector.
- Ensure the auxiliary 5 VDC supply is configured correctly.
- After the DC connector is plugged-in, turn the main supply ON.
- Ensure the correct polarity of the power supply cable. The polarity of the power supply cable is as shown in [Figure 2-1](#).

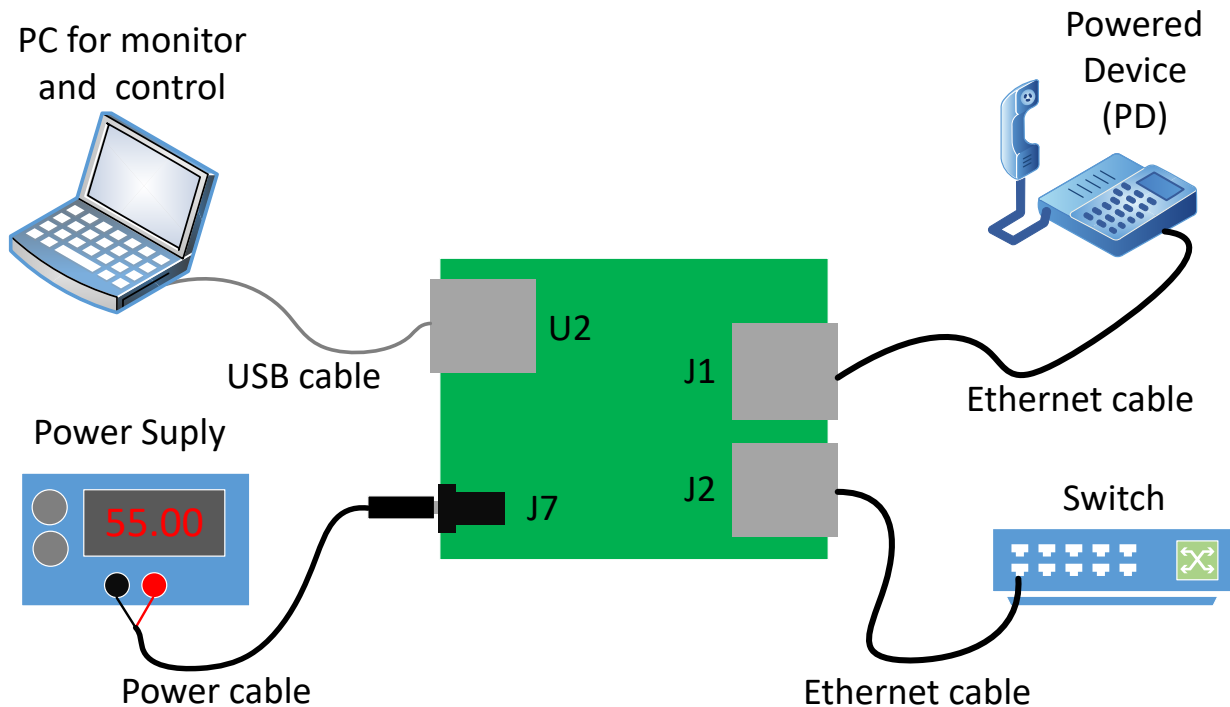
Download and install MCP2221A USB to I2C windows driver from [MCP2221A](#), under Documents tab. Extract all files and run the Driver Installation Tool that is appropriate for your system (x64 or x86).

2.2 Initial Configuration

Note: It is important to verify that the Evaluation Board is setup as shown in [Figure 2-1](#) prior to starting any operation.

- Set the DIP switch SW1 to the correct position (Managed or Unmanaged mode of operation).
- If managed mode is selected, make sure the 5V is boosted by the NPN Transistor.
- If using Unmanaged mode of operation, set the Mode and Power_set jumpers accordingly.
- If using Managed mode of operation, connect the computer with Microchip GUI installed to USB connector U2.
- Connect a power cable from the power supply to the Evaluation Board (J7) and turn the main supply ON.
- Verify Vmain LED is ON.

Figure 2-1. Test Setup



2.3 PD69201 Evaluation Board Schematics

The full schematics of the EVB are available on the [Microchip website](#).

3. Reference Documents

The following is the list of reference documents.

- *IEEE 802.3af-2003 standard, DTE Power via MDI*
- *IEEE802.3at-2009 standard, DTE Power via MDI*
- *PD69201 Data Sheet, DS00003454*
- *AN3580 Designing 1-port PoE System Using PD69201, DS00003580*

4. Revision History

| Revision | Date | Description |
|----------|---------|---|
| B | 02/2021 | Updated Table 1-1 . Updated PD-IM-7601/SP System Block Diagram . |
| A | 01/2021 | Initial Revision. |

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ISBN: 978-1-5224-7724-2

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