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**EV14G15A Evaluation Board User Guide**

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## Introduction

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The EV14G15A evaluation board is developed based on Microchip's PD39208 and PD39210 chipset.

Microchip's PD39208 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 PD39208 PoE manager is an 8-port, mixed-signal and high-voltage PoE driver. Together with the PD39210 PoE controller, it performs as a PSE system. Microchip's PD39210 PoE controller is a cost-effective and pre-programmed MCU designed to implement enhanced mode PoE system.

The PD39208 and PD39210 chipset supports PoE Powered Device (PD) detection, power-up, and protection according to IEEE<sup>®</sup> 802.3af/at 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 802.3at standards, including PD detection (AF and AT).

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 PD39208 is the most integrated PSE IC including internal MOSFET and sense resistor to achieve a low-power dissipation.

The PD39210 features an eSPI bus for each PD39208. It is based on the Microchip D21 family. The PD39210 utilizes an I<sup>2</sup>C 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 EV14G15A demonstrates the operation of eight 2-pair ports, and is based on a PD39210 PSE controller and a single PD39208 PSE manager. The power is delivered over alt B (Pins 4 and 5 are positive, pins 7 and 8 are negative), and the port can be set to IEEE.

The evaluation board includes a green, uni-color LED stream generated by the PD39210 and an LED stream circuit. The LED stream provides visual status of each port by a dedicated LED per port. A bi-color application is also available, which provides visual status of the port by two colors.

The evaluation system has the following features.

- Two RJ45 gangs (each contains four RJ45 connectors)
- 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 all ports (LED stream)
- Requires single power source only
- 0 °C to 40 °C operating temperature
- RoHS compliant

Figure 1. EV14G15A

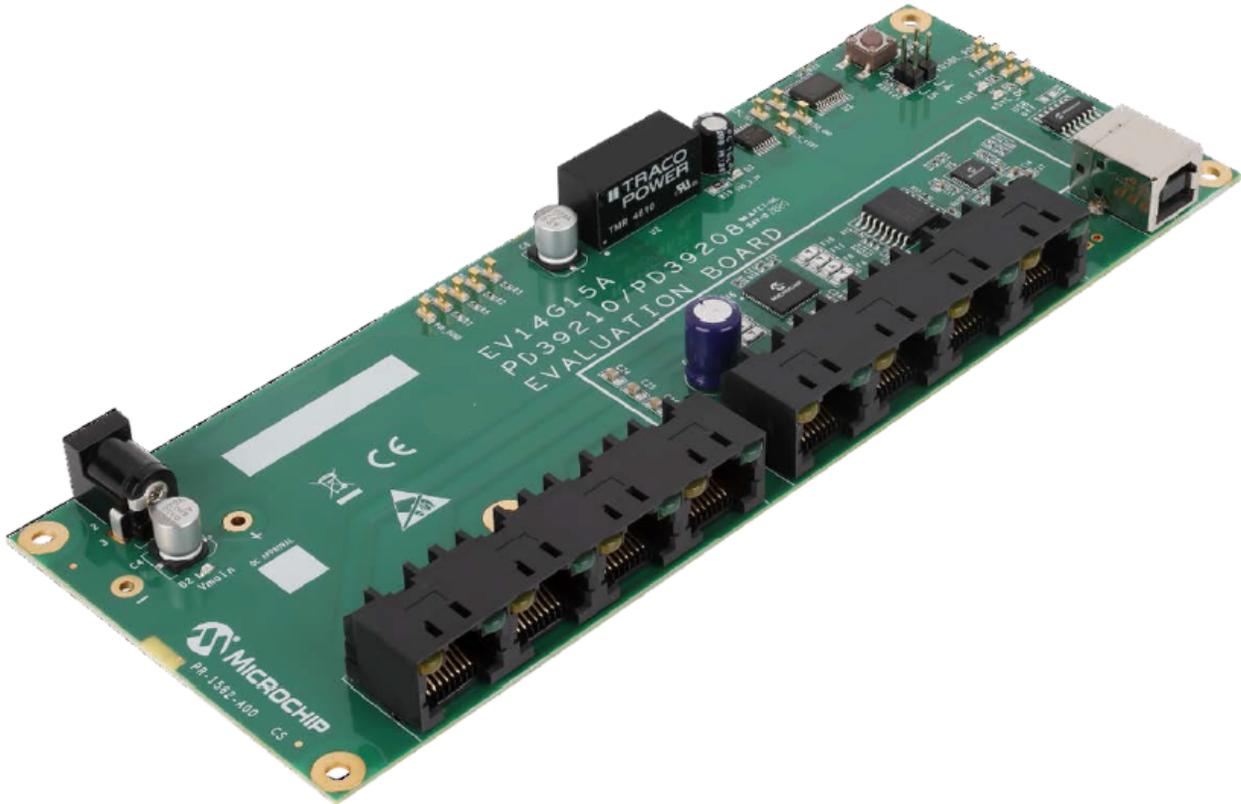


Figure 2. EV14G15A Evaluation System Block Diagram

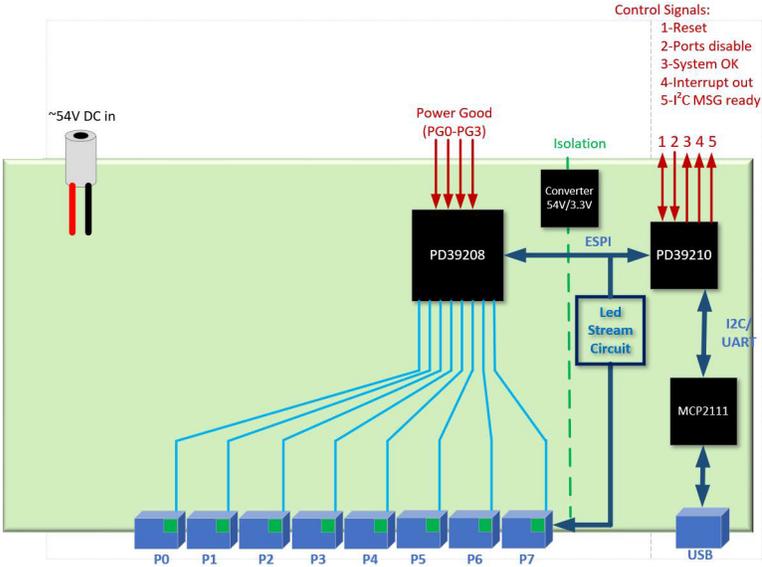


Figure 3. EV14G15A Top View



Note: Actual board size is 3.6" × 0.87" with 4 layers.

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## 1. Overview

This section provides the basic overview of the EV14G15A evaluation board.

### 1.1 Power

The Evaluation Board (EVB) is powered by a single source via the DC connector J2. The input voltage level can be selected according to the IEEE 802.3 PoE standards:

- IEEE 802.3af: 44 V<sub>DC</sub> to 57 V<sub>DC</sub>.
- IEEE 802.3at: 50 V<sub>DC</sub> to 57 V<sub>DC</sub>.

The recommended voltage level is 53 V<sub>DC</sub> to 55 V<sub>DC</sub>, 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<sub>DC</sub>, which feeds the PD39210, LED stream, and serial communication peripherals.
  - The isolated 3.3 V<sub>DC</sub> 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 PD39210.

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

**Figure 1-1. DC Connector J2 Polarity**



**Important:** DC connector J2 is limited to current level up to 4 A. If higher current is needed, the 2 via holes next to J2 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 PD39210 by UART and I<sup>2</sup>C. The serial communication is converted to USB by the Microchip MCP2221A (U10) 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](http://www.microchip.com/wwwproducts/en/MCP2221A)

If R66 is installed as 0  $\Omega$ , the USB converter (U10) is disabled, which allows the user to connect directly to the I<sup>2</sup>C bus via the two test points and control the EVB via I<sup>2</sup>C. The ISO\_GND test-point is the GND for the I<sup>2</sup>C bus. For the test points location, see figure [I<sup>2</sup>C Bus Test Point and Control Signals](#).

UART or I<sup>2</sup>C can be select by jumper J4:

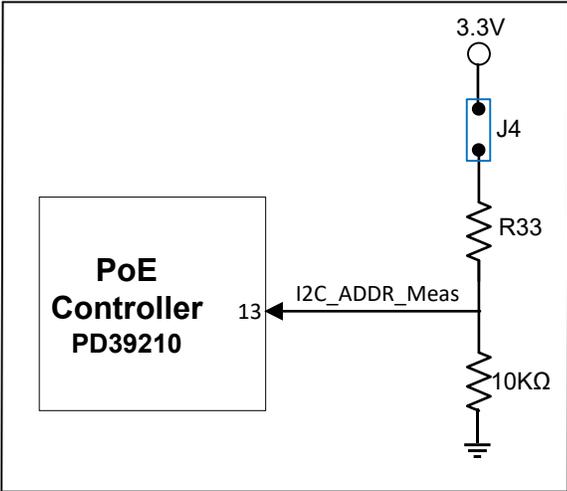
- When jumper J4 is not installed, the PD39210 is set to UART mode.
- When jumper J4 is installed, the PD39210 is set to I<sup>2</sup>C mode.
  - In order to select I<sup>2</sup>C address, R33 should be installed according to the following table [I<sup>2</sup>C Address Setting](#).
  - R33 is located on the PCB bottom side, below the PD39210.

The EVB is set to I<sup>2</sup>C address 0x2C (R33= 11K).

**Table 1-1. I<sup>2</sup>C Address Setting**

I <sup>2</sup> C Address	Address (Hex)	R33 (k $\Omega$ )
#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

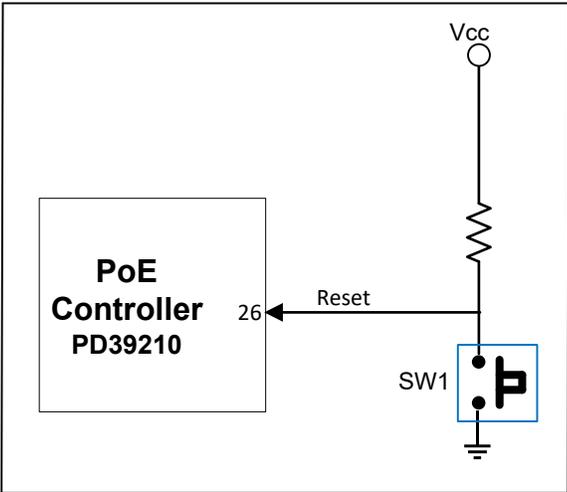
Figure 1-3. I<sup>2</sup>C Address Setting Diagram



1.2.2 Reset Pushbutton

The pushbutton is connected to the Reset pin of the PD39210 (pin 26). Pressing on SW1 will connect the Reset pin to GND.

Figure 1-4. Reset Control Diagram



1.2.3 PoE Ports Disable

J5 is connected to the Disable pin of the PD39210 (pin 4). When jumper J5 is installed, the Disable pin is connected to GND.

Figure 1-5. Ports Disable Control Jumper Diagram

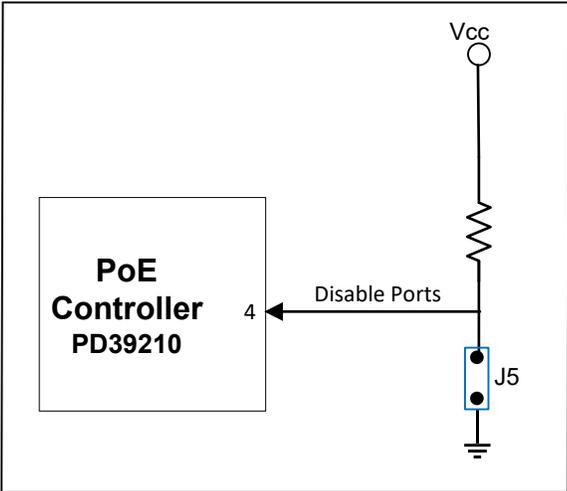
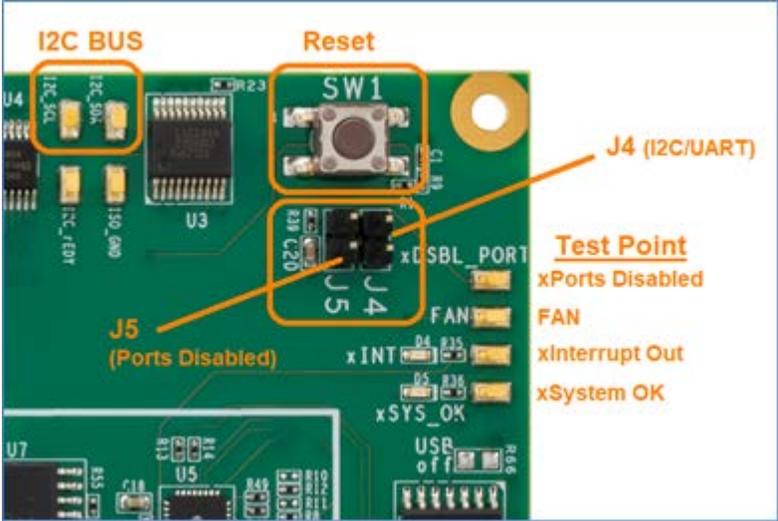


Figure 1-6. I<sup>2</sup>C Bus Test Point and Control Signals



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 (3.3 V<sub>DC</sub>), which indicates the power supply is active. That signal should be connected to one of the PGD pins of the PD39208 (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 related to the PoE domain and can be used with the test point named **POE\_DGND**, next to it.

Figure 1-7. PGD0-PGD3 Test Points Diagram

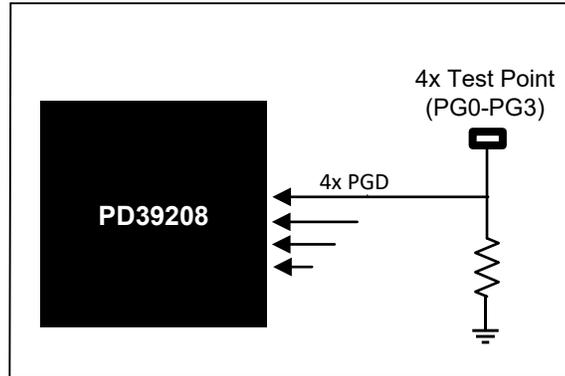
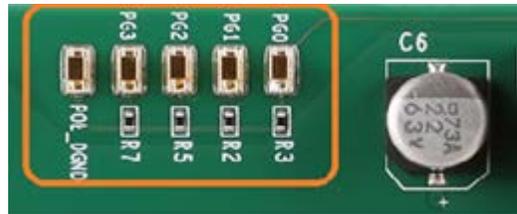


Figure 1-8. PGD0-PGD3 Test Points



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 <sub>MAIN</sub> ON
D3	Isolated 3.3 V <sub>DC</sub> ON (powers the PD39210, LED stream, USB comm)
D4	Interrupt out (active low)
D5	System OK (active low)
Port (0–7)	Green LED per port: <ul style="list-style-type: none"> <li>• LED off= Port is off</li> <li>• LED on= Port is on</li> <li>• LED blinking= Port is off due to error/under load/power management</li> </ul>

### 1.4 RJ45 Connectors Polarity

The eight ports of J6 and J7 are 2-pair. The polarity of the port is listed in the following table.

Table 1-3. RJ45 Connectors 2-Pair Port

Pin Number (Each RJ45 Port)	Polarity
1, 2	N.A.
3, 6	N.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 connector.
- Only after the DC connector is plugged in, turn the main supply ON.
- If using the DC connector J2, 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 J2 Polarity](#).

### 2.1 Ports Matrix

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

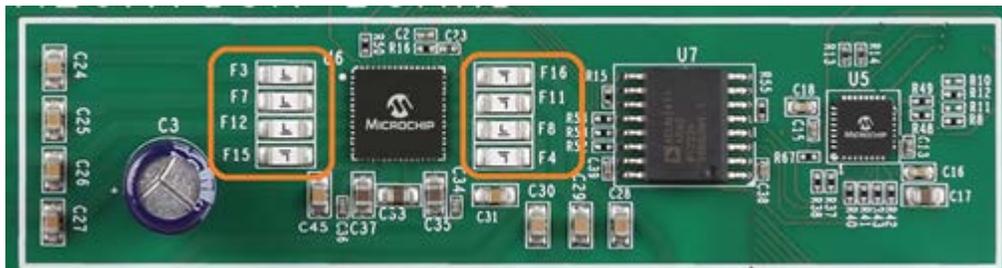
Logical Port	Physical Port A
0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7

### 2.2 Fuses

On the main board, there are 8 fuses for the PD39208, located on the top side next to the PD39208 (U6). The fuse is connected on the Vport\_Neg pin of each port.

Fuses per port are not required for use in circuits with a total power level of up to 3 kW, as the PD39208 is designed to fulfill Limited Power Source (LPS) requirements per the latest editions of IEC60950-1 and EN60950-1. However, 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/EV14G15A](http://www.microchip.com/DevelopmentTools/ProductDetails/PartNO/EV14G15A).

### 3. **Revision History**

Revision	Date	Description
A	02/2021	Initial Revision

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