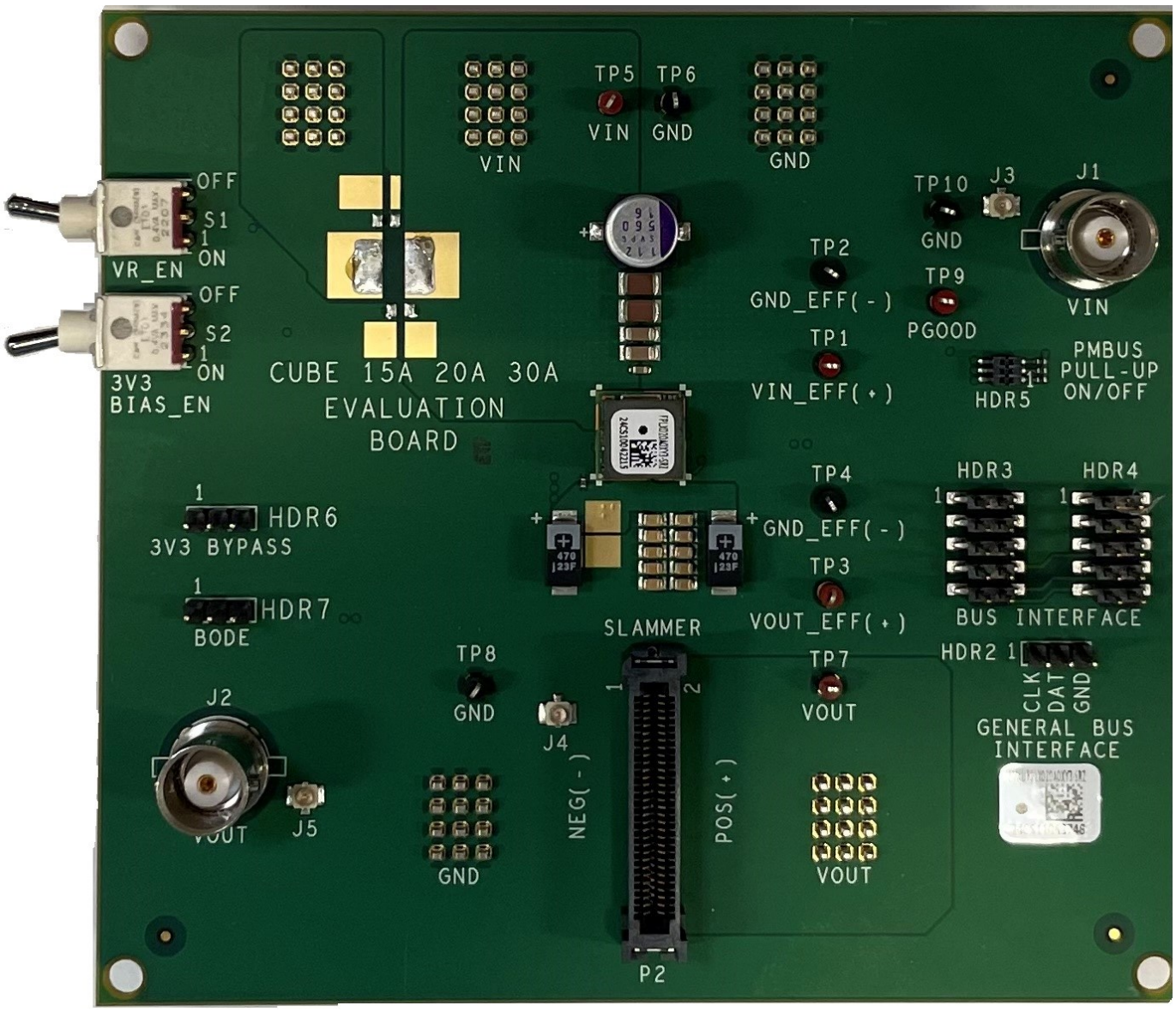
# FPLX015/20/30 Evaluation Board Guide

## Evaluation Board populated with FPLX015 / FPLX020 or FPLX030 modules



# Table of Contents

## 1. Description

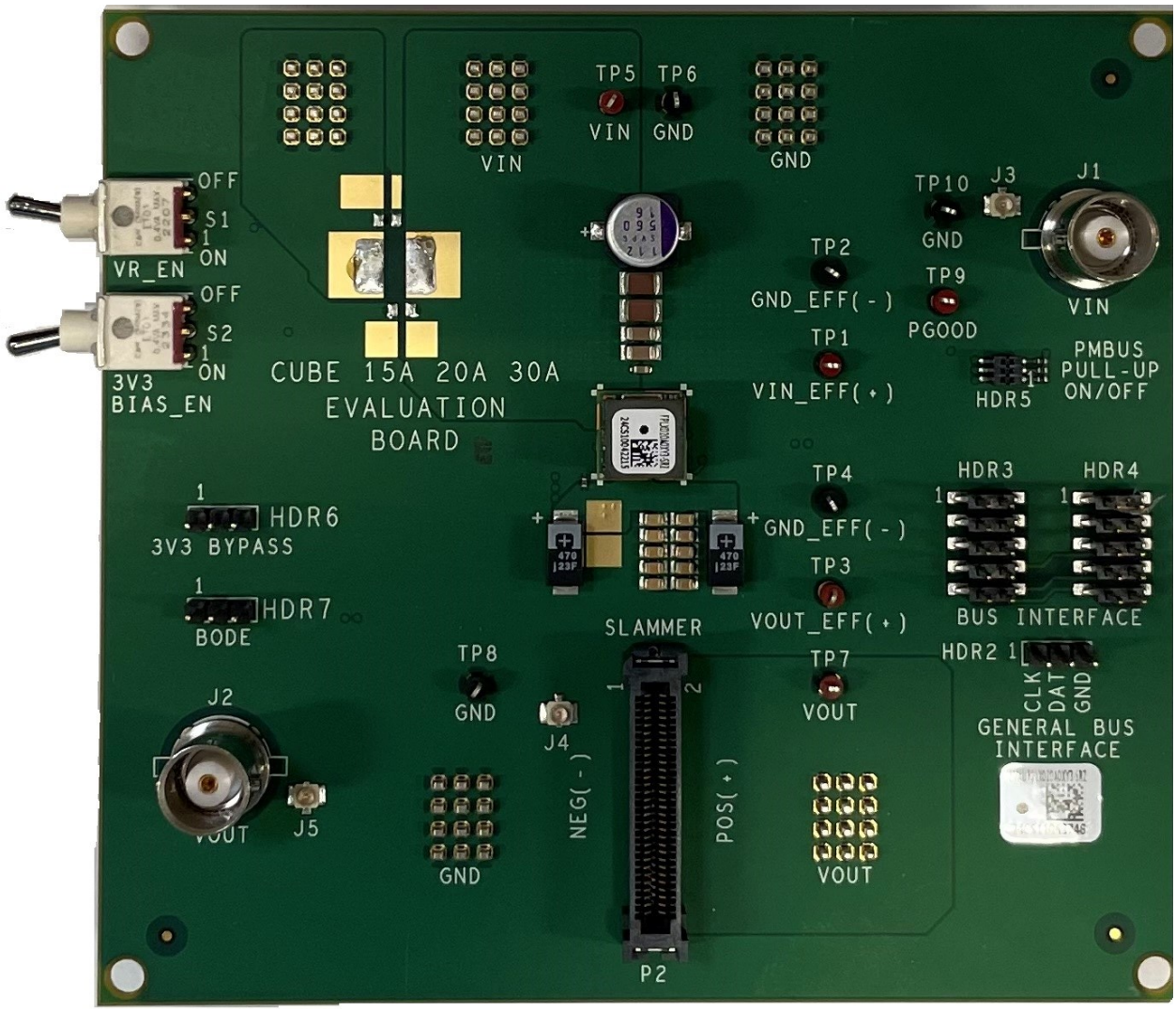
The OmniOn Power™ FPLX series are the next generation of POL modules that can deliver 15/20/30A in a fully configured mode. It operates over a wide input range from 6V to 14Vdc and provides precisely regulated output voltage from 0.45 to 2..0V(FPLX030) or 3.6(FPLX015/020).

The module's features include digital PMBus™ interface, remote ON/OFF, output voltage sequencing, pre-biased start up, cycle-by-cycle output overcurrent protection, input and output under-voltage and over-voltage protections and over-temperature protections and more. The module has an extensive set of PMBus™ commands for both control and monitoring of the system parameters.

The evaluation board is shown on the picture below. It comes pre-populated with required minimum of input and output capacitors. Numerous empty component place holders allow the board to be reconfigured to match a specific customer's application. Various test points facilitate the easy setup and monitoring of the module operation.

The board shown below is common to the FPLX030, FPLX020 and FPLX015 modules. This evaluation board guide can be used to understand, connect and configure evaluation boards with any of these modules.

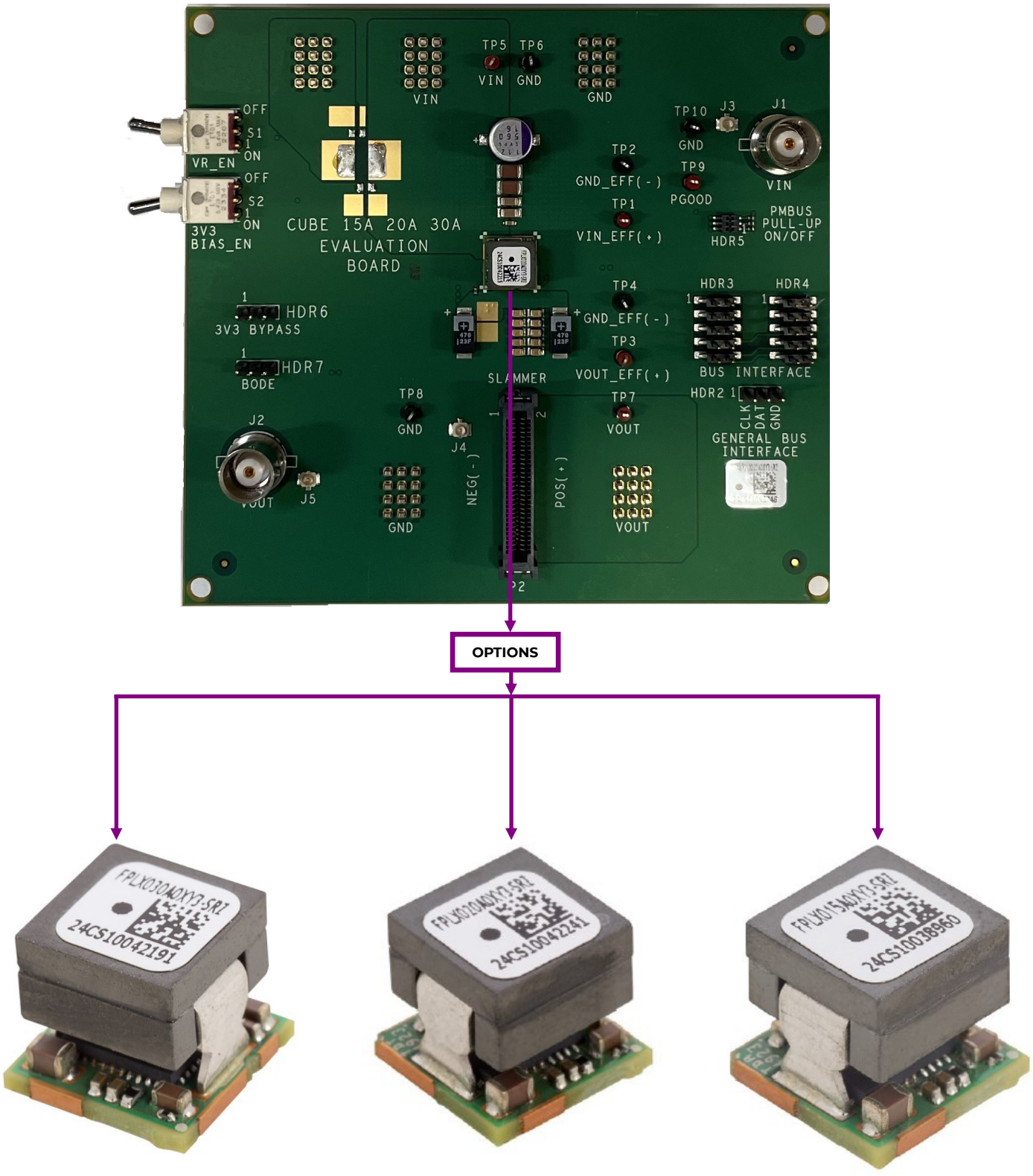
**Top View of Evaluation Board with FPLX015 moule**



## 1. Description (Continued)

The evaluation board can come pre-installed with any of the FPLX Modules.

**Evaluation Board with different module variants**



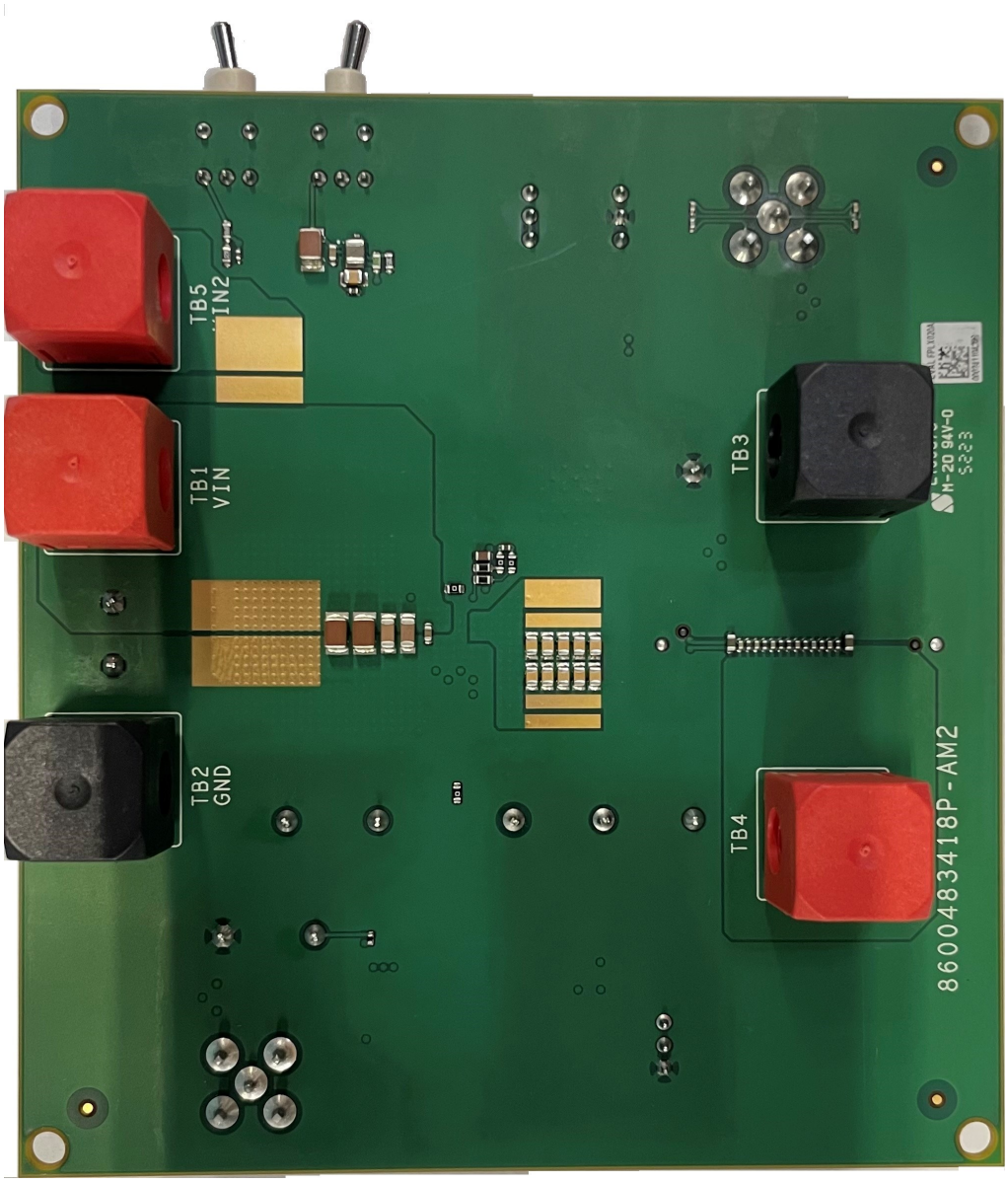

**FPLX030** **FPLX020** **FPLX015**

## 1. Description (Continued)

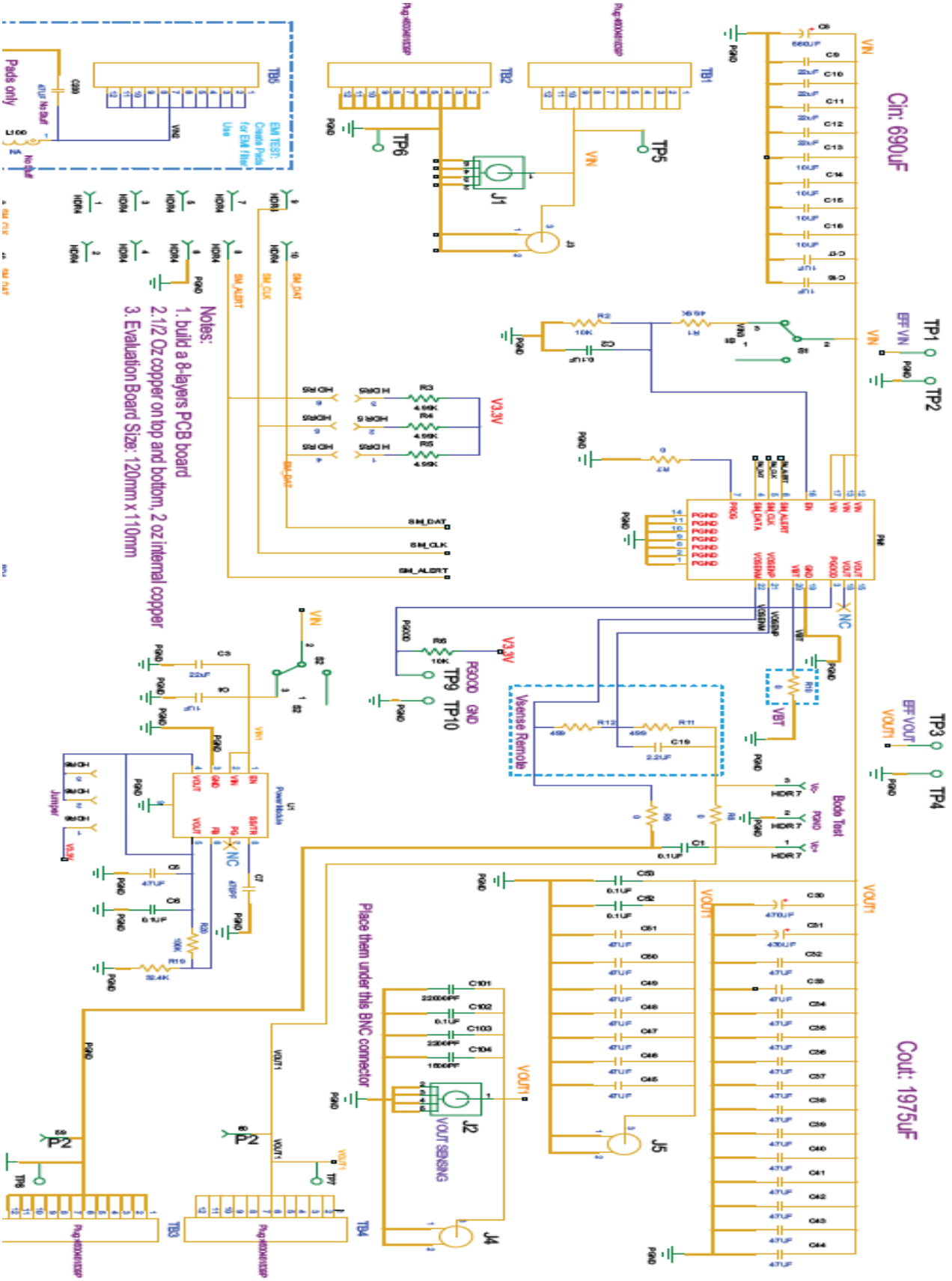
The Installed components are as follows. The schematic on the following page shows maximum capability and includes expansion capability:

- Ceramic caps for input.
- Ceramic and  Surface electrolytic on output.
- Input, Output Connectors, Test Points and Probe Sockets.
- Male Connectors that  plug into input and output sockets can be ordered from Digi-key, Mouser, etc. The connectors  are made by Wurth Electronik,.Part No is 74640016.

**Bottom View of Evaluation Board**

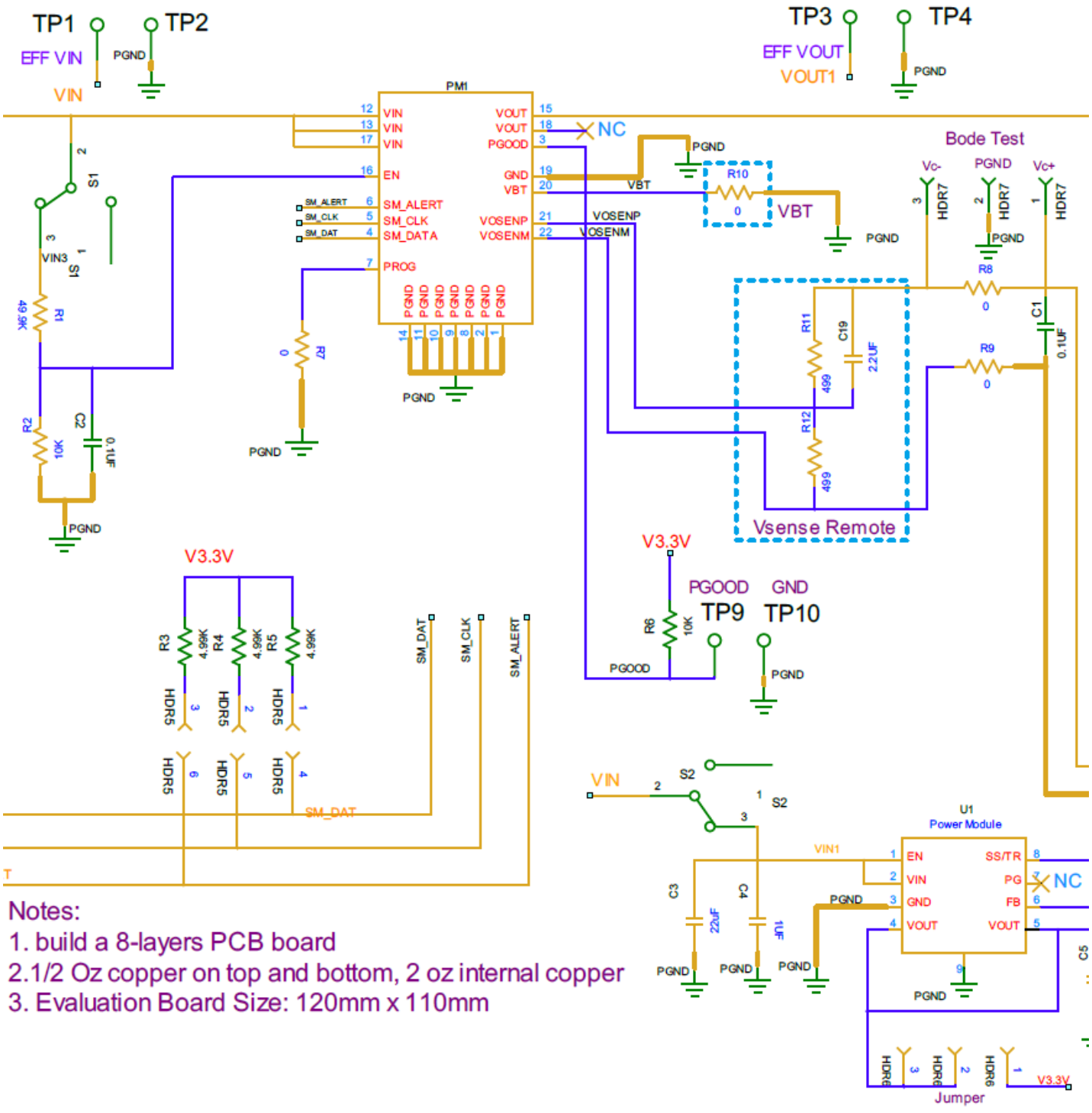


## 2. Schematic



## 2. Schematic (Continued)

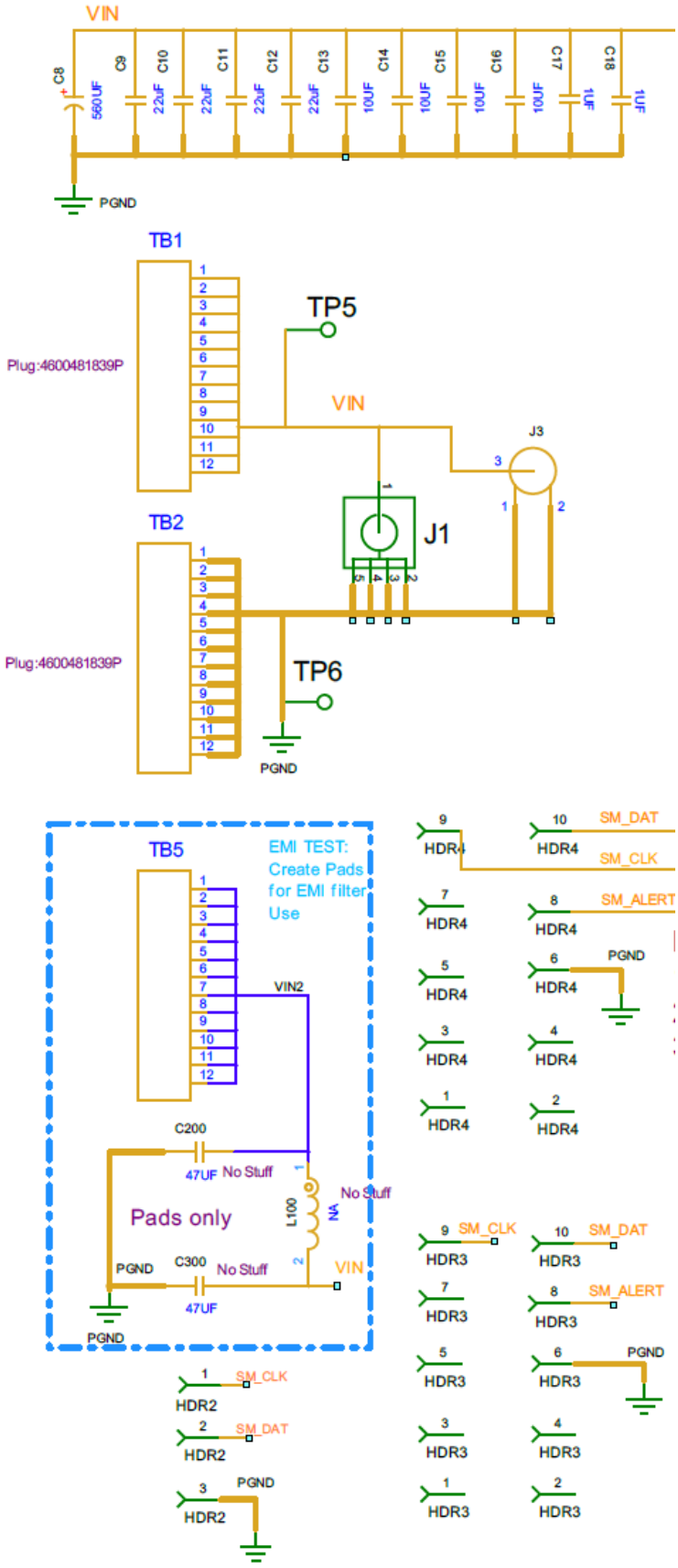
The complete schematic diagram of the FPLX Series evaluation board is shown in the previous pages. Components on schematic show max capability and may not be actually used on the board.



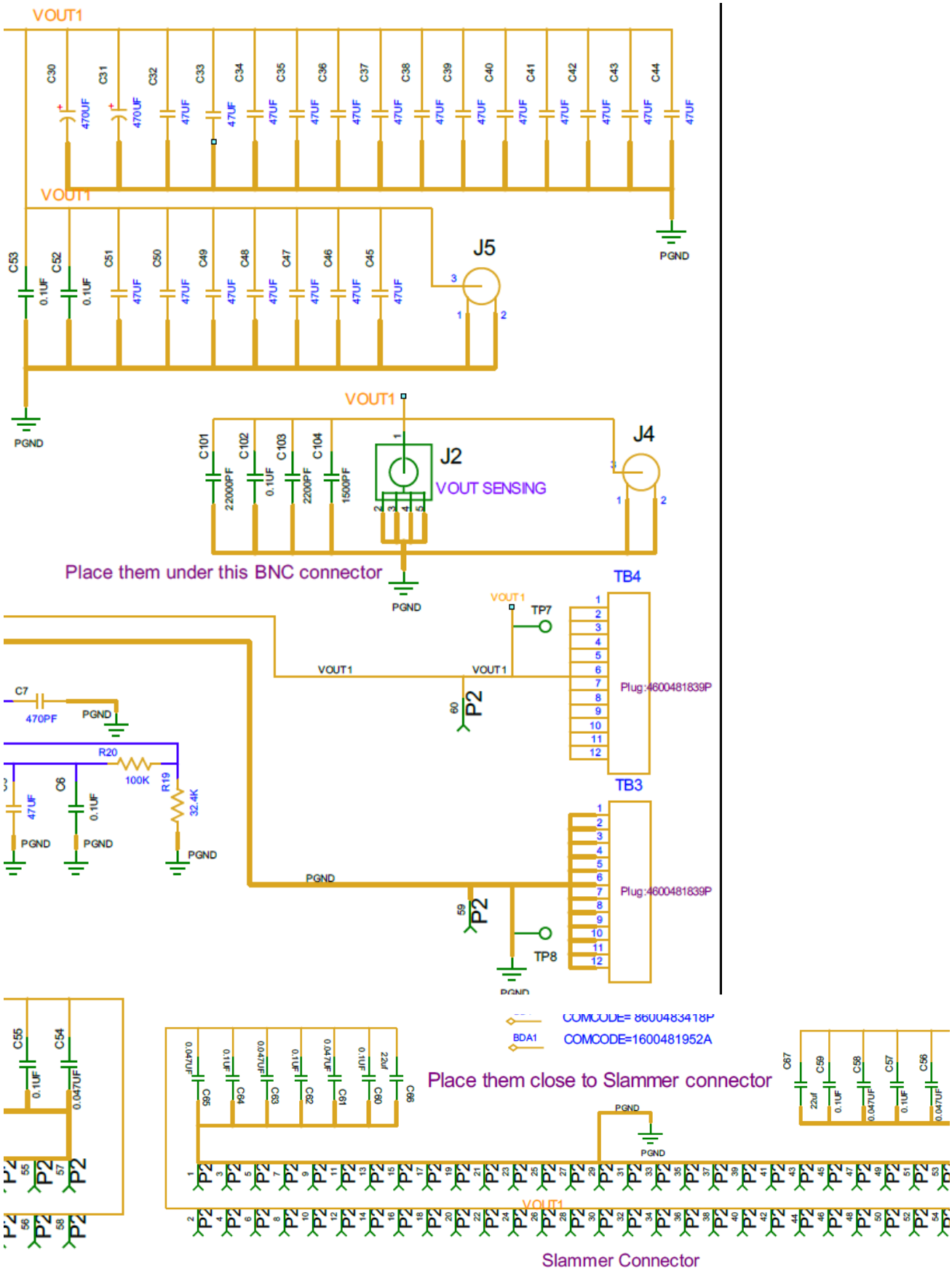

Notes:

1. build a 8-layers PCB board
2. 1/2 Oz copper on top and bottom, 2 oz internal copper
3. Evaluation Board Size: 120mm x 110mm

## 2. **Schematic** (Continued)



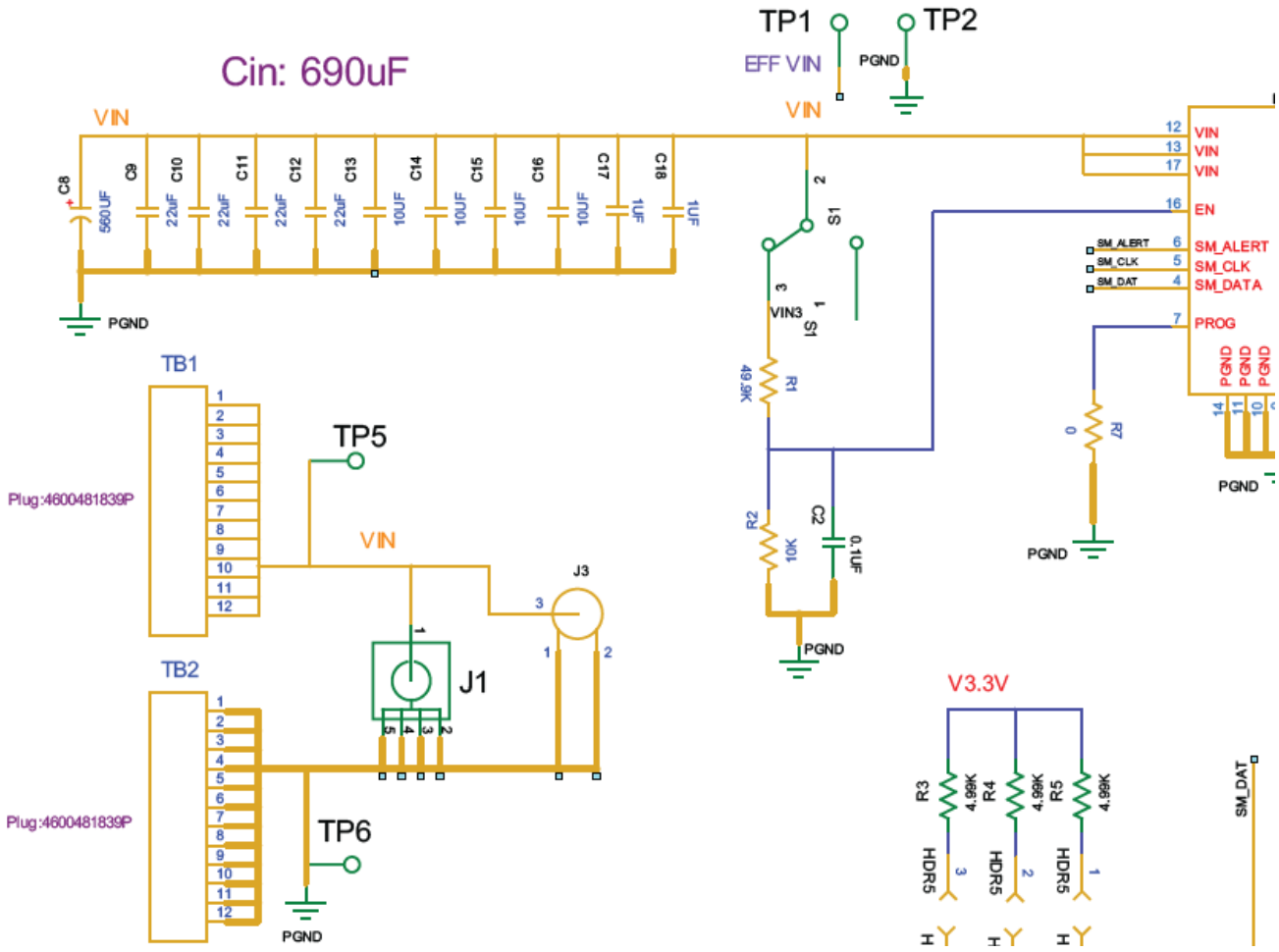
## 2. Schematic (Continued)

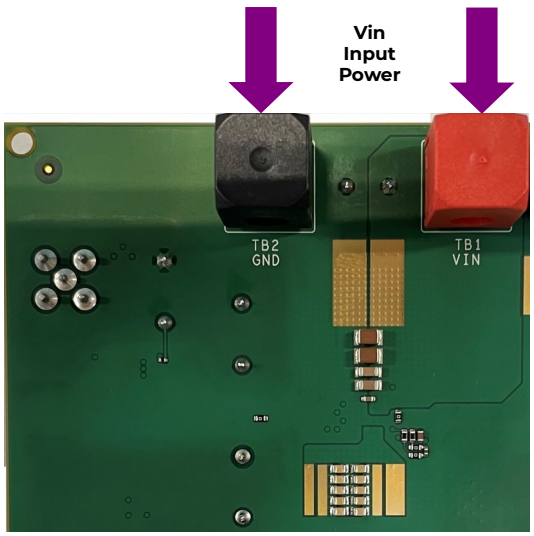


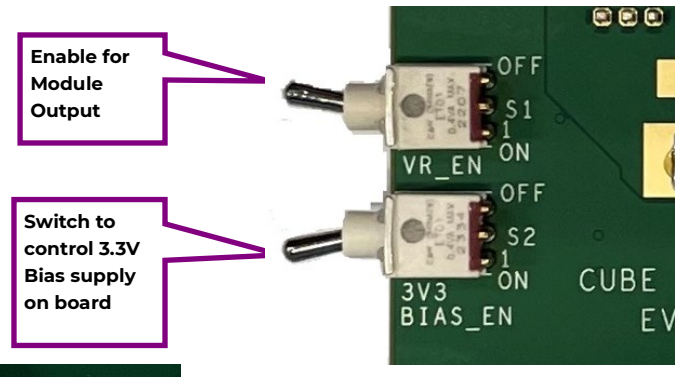
## 2.1. Eval Board Sections

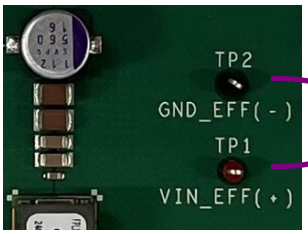
The following pictures show the input connections and components external to the module.

### 2.1.1. Input Connections



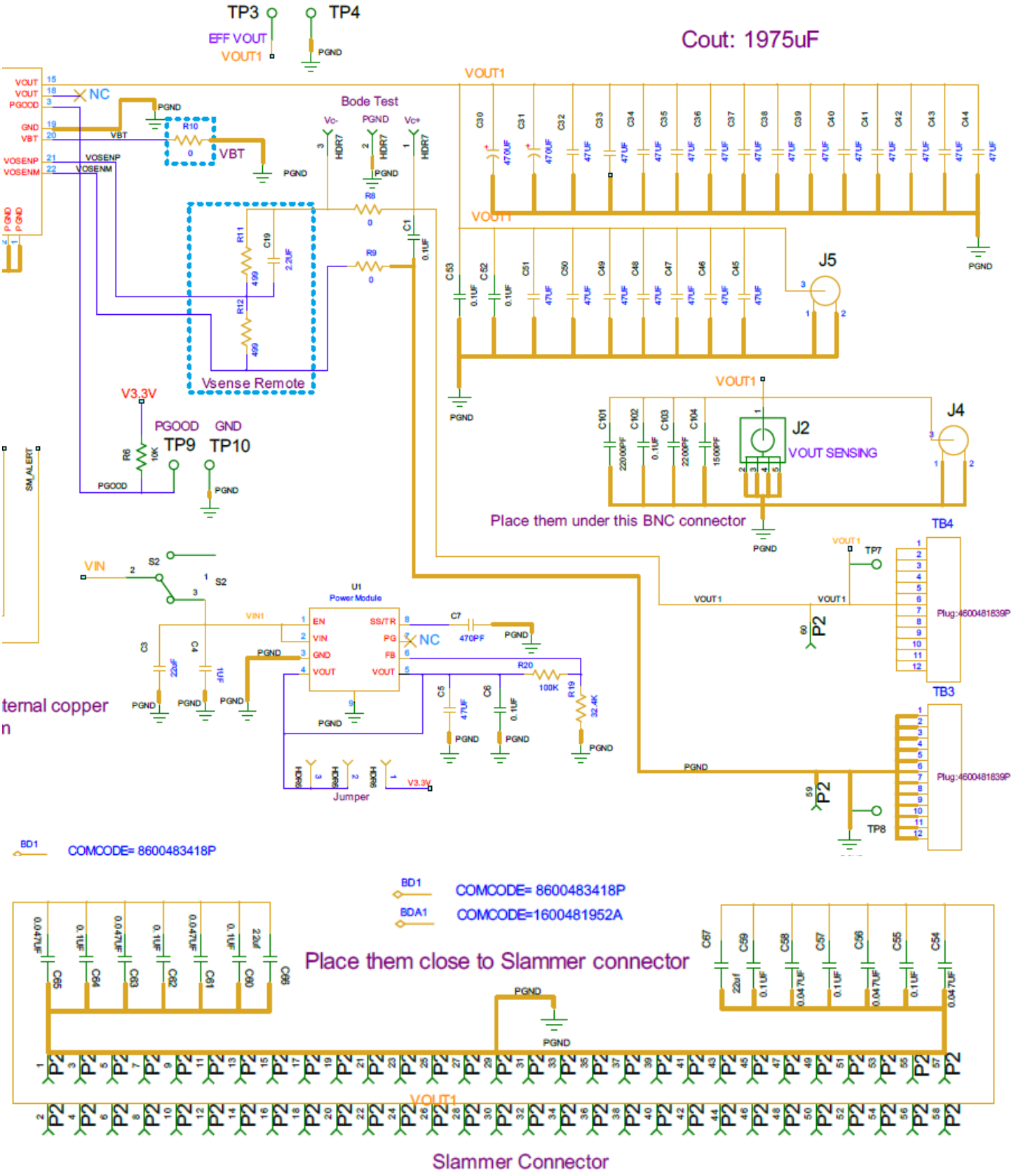



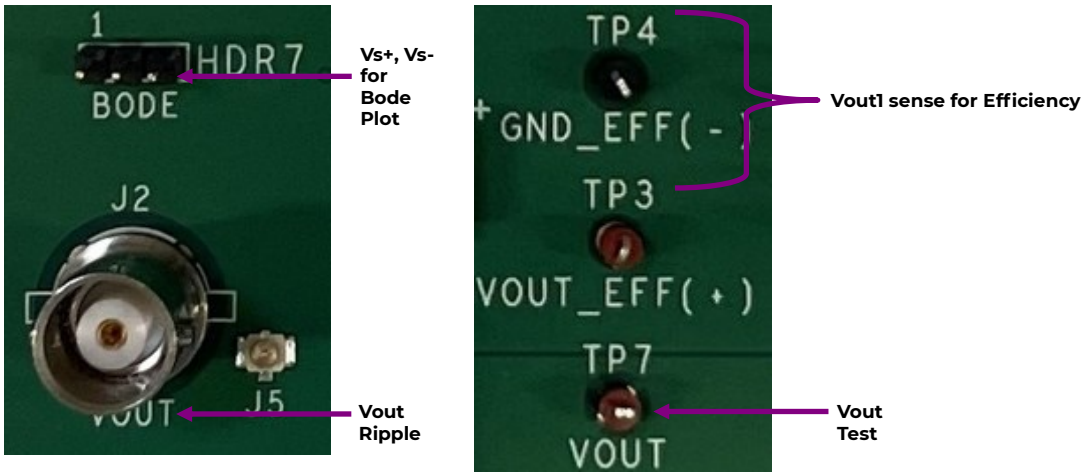



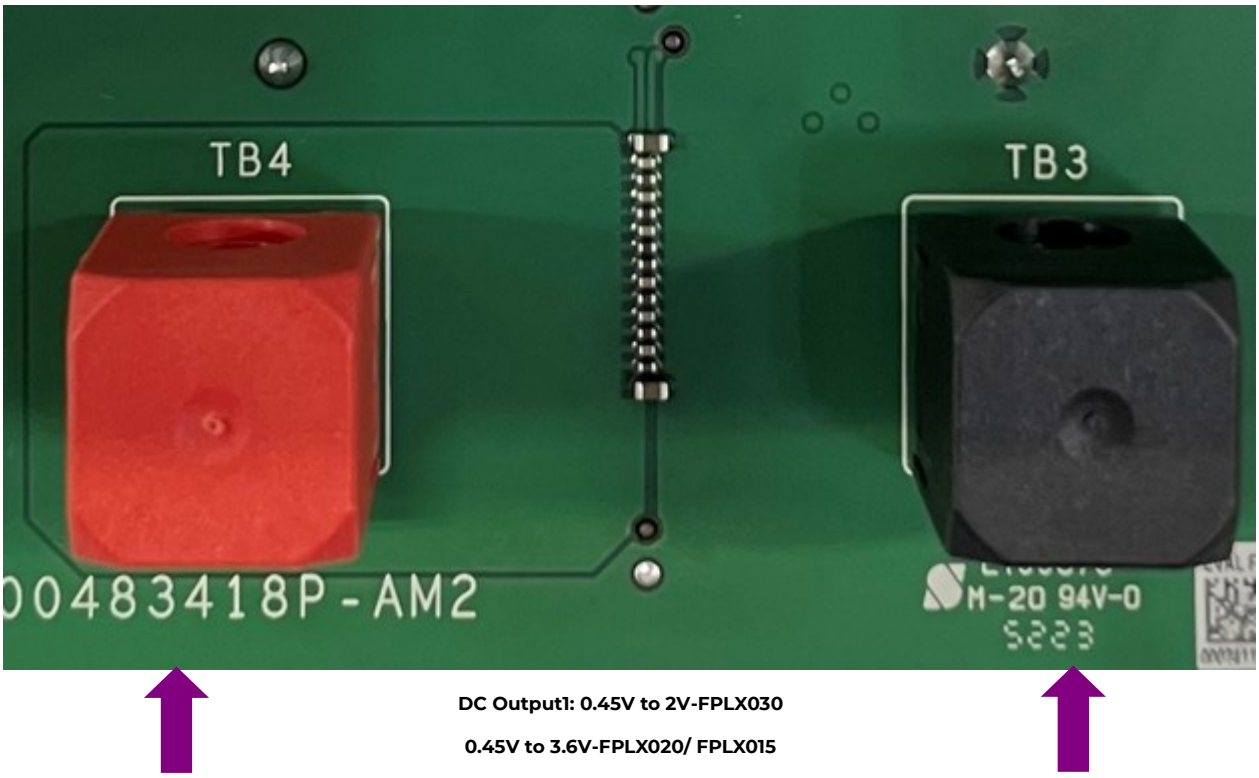



### 2.1.2. Output Connections

Schematic shows max capability. Board will not be populated with all components.



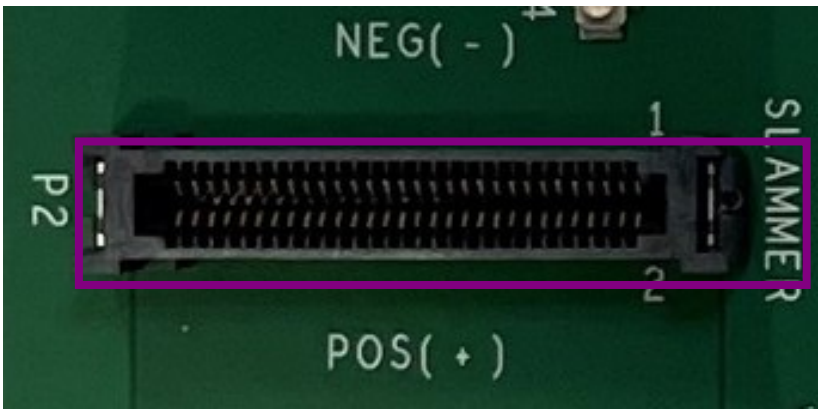



DC Output1: 0.45V to 2V-FPLX030

0.45V to 3.6V-FPLX020/ FPLX015

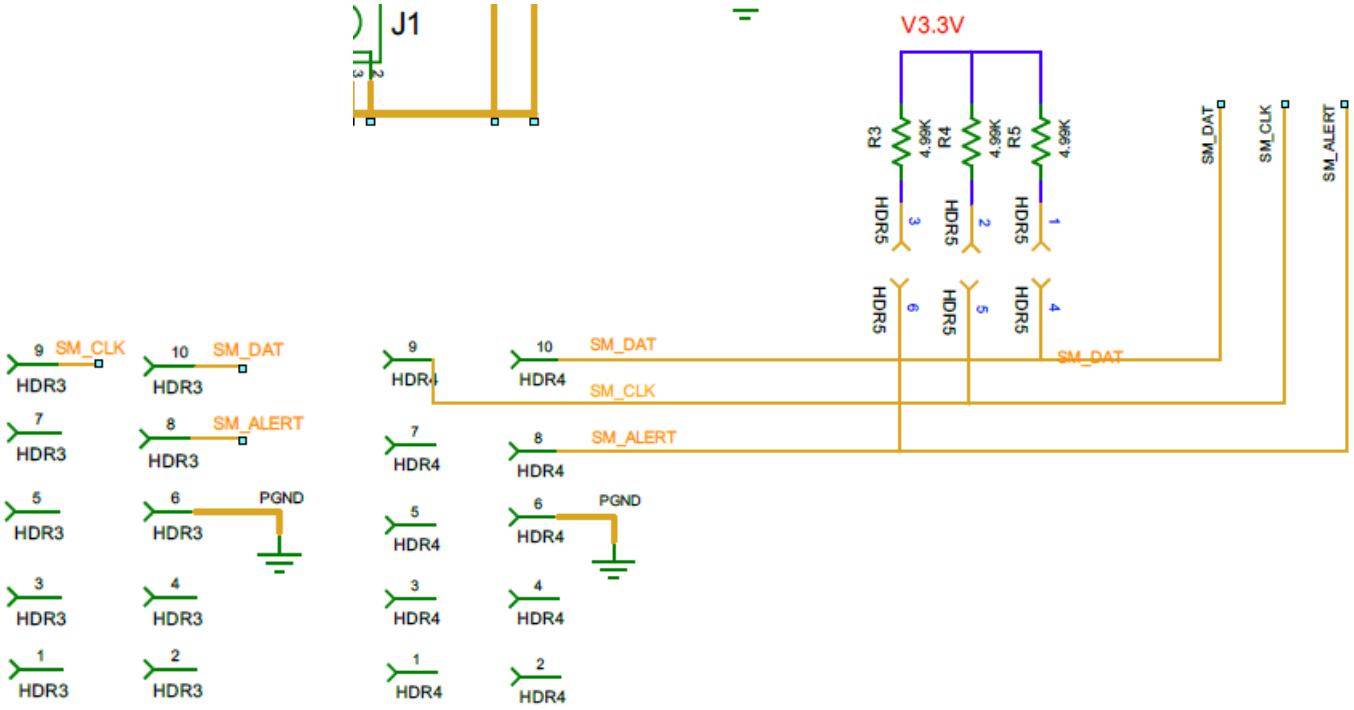
### 2.1.3. Load Transient Connection

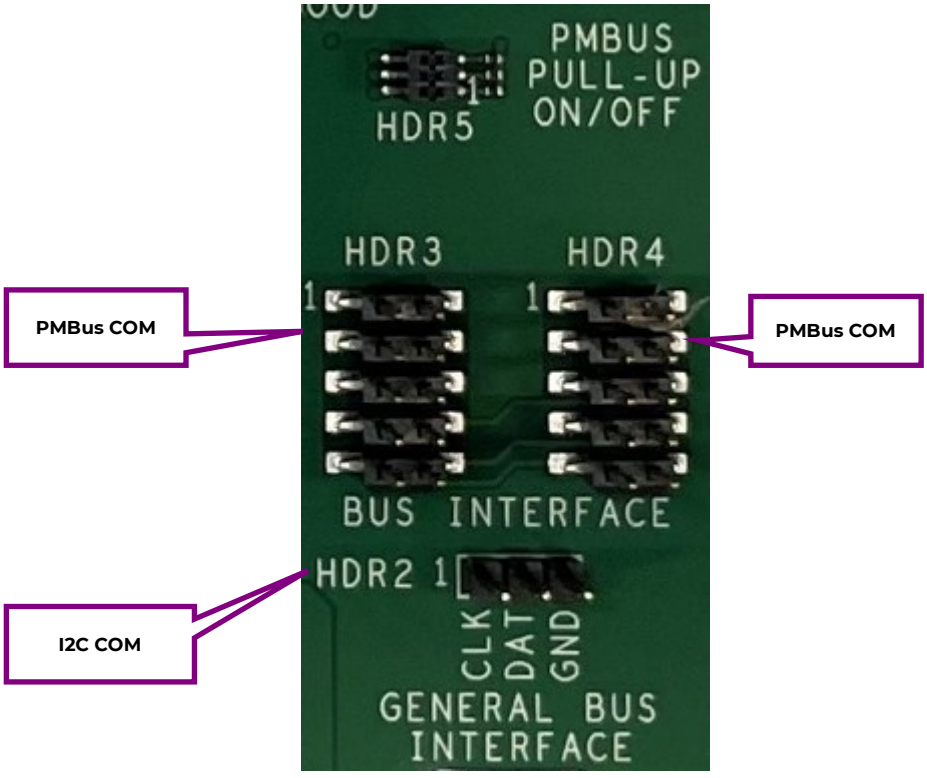



Load Slammer Connector-Output

## 2.1.4. PMBus Connection

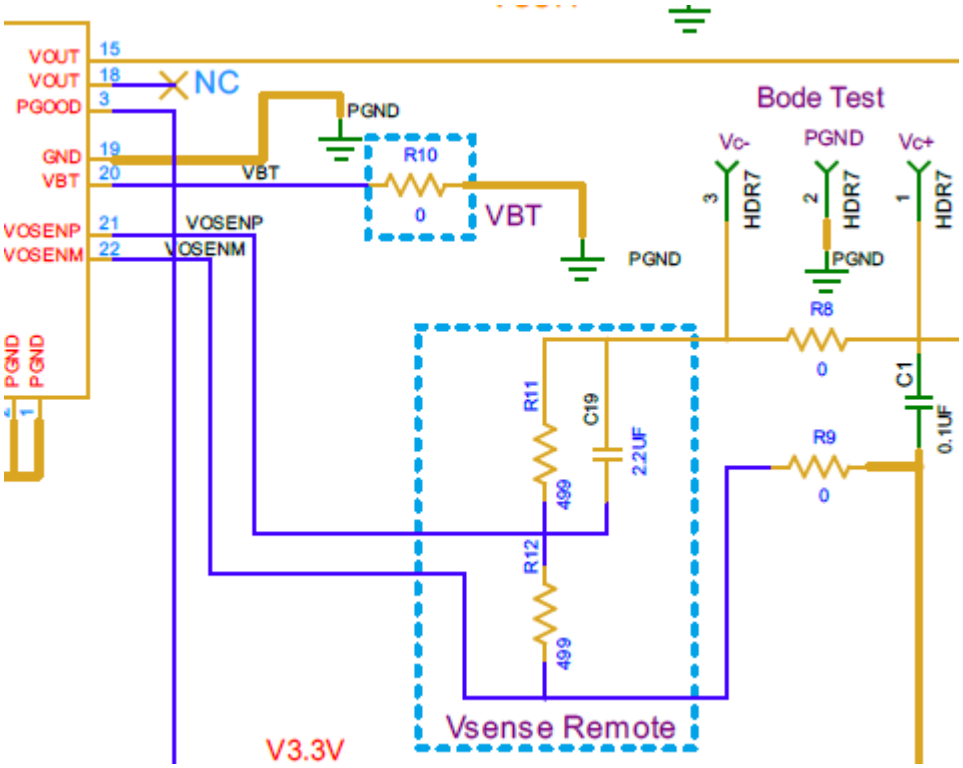
Evaluation Board is provided with a pair of 10 pin connectors and 3 pin header for PMBus connectivity.

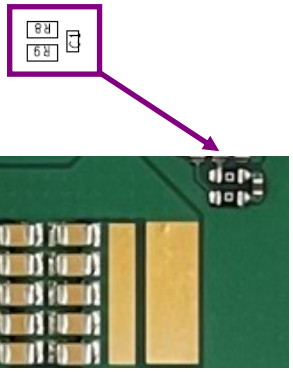


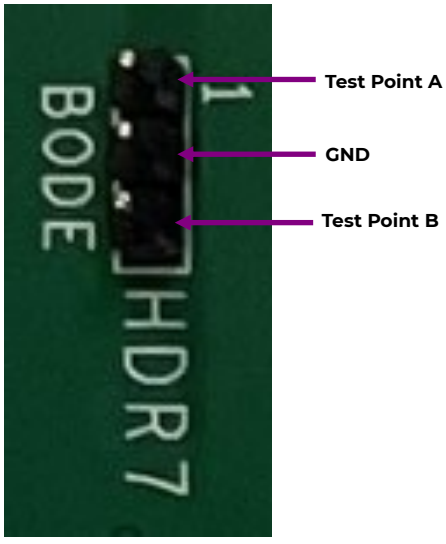
## 2.1.5. Bode Plot Connection

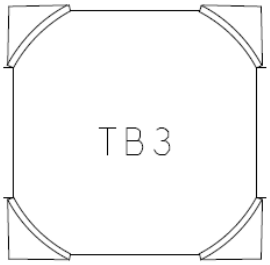
Evaluation Board is  provided with test points for Bode Plot connections. Populate a 10-50 ohm resistor between test points A&B by replacing the 0 ohm resistor on R8 and R9, and inject a small signal across Point A and Point B by using a transformer. Measure voltage of Ch1( A and GND) and Ch2(B and GND); Gain=Ch1/Ch2.



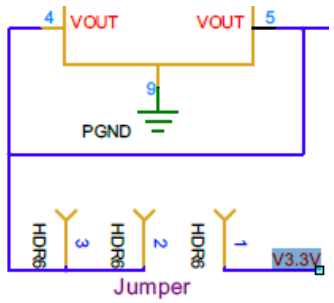
**Bode Measurement**



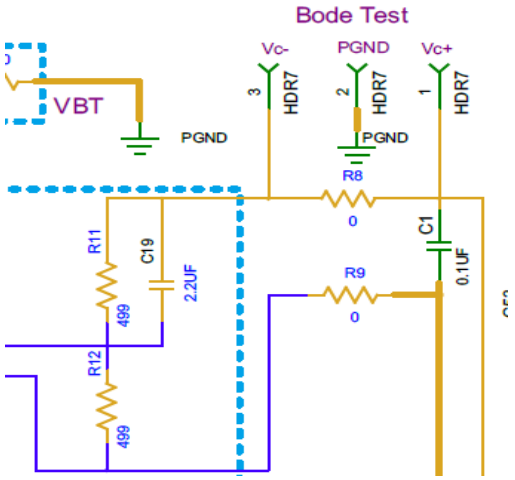



## 2.1.6. Summary of all Test Connections

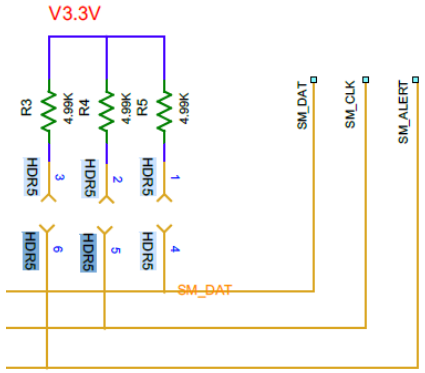
**Bias Rails**

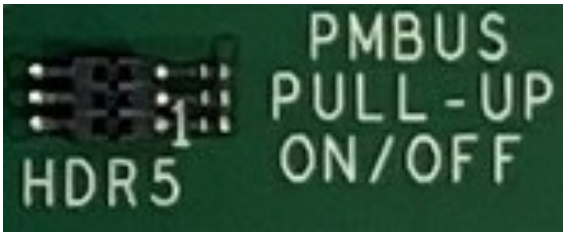


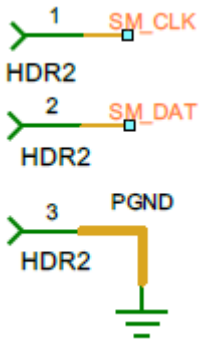




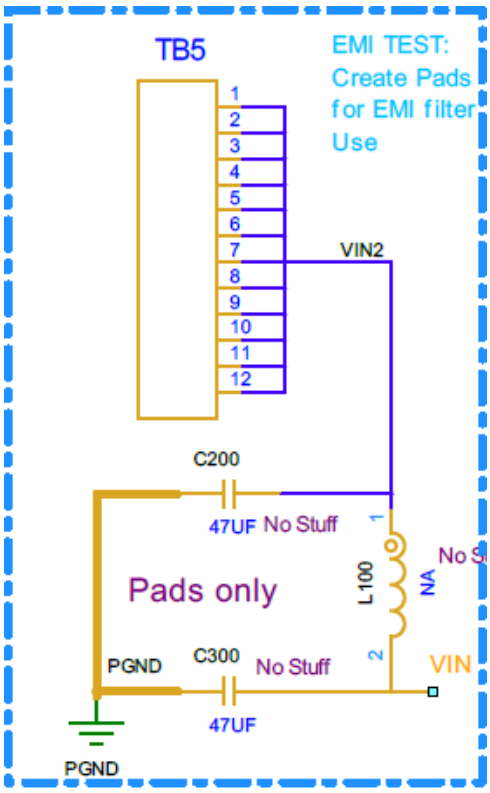




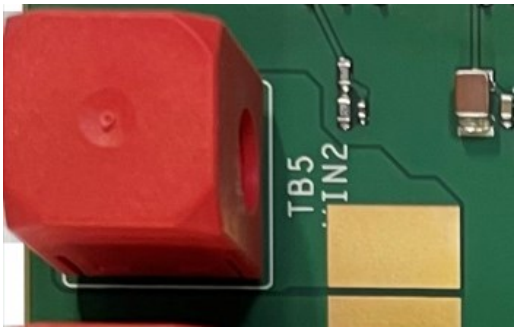




## Optional EMI Filter Components

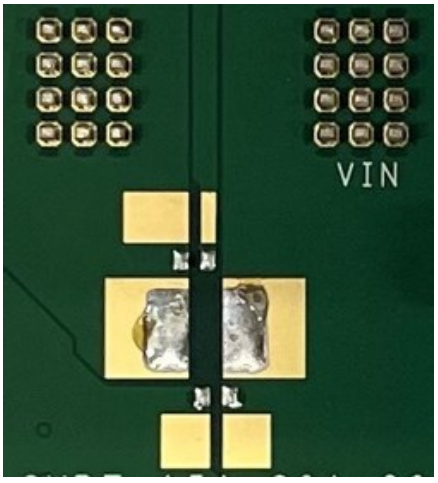



**BOTTOM SIDE**

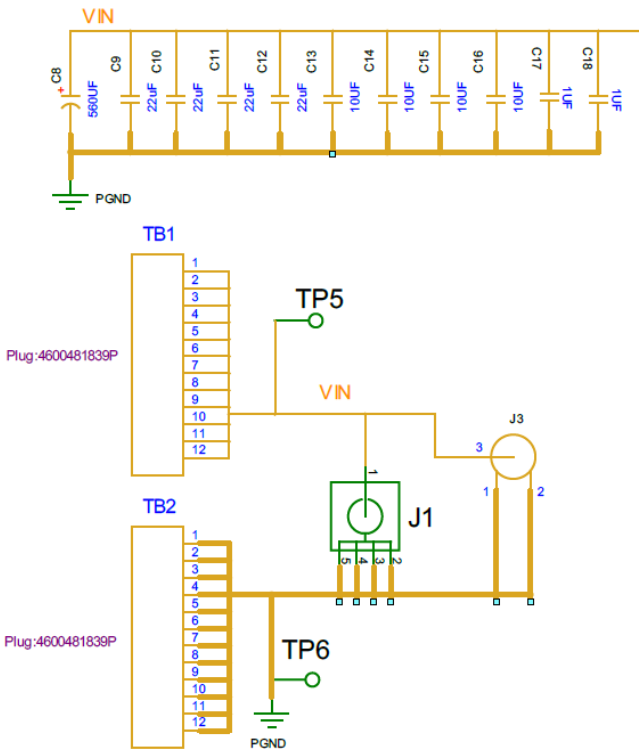



Male Connectors that plug into these sockets can be ordered from Digi-key, Mouser, etc. The connectors are made by Wurth Electronik,.Part No is 74640016

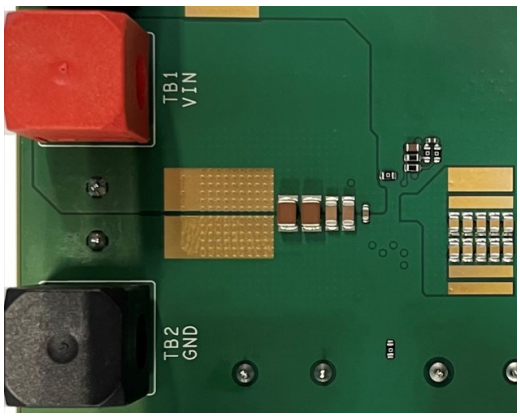
**TOP SIDE**



## Input Section




**BOTTOM SIDE**

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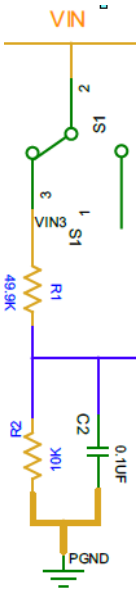
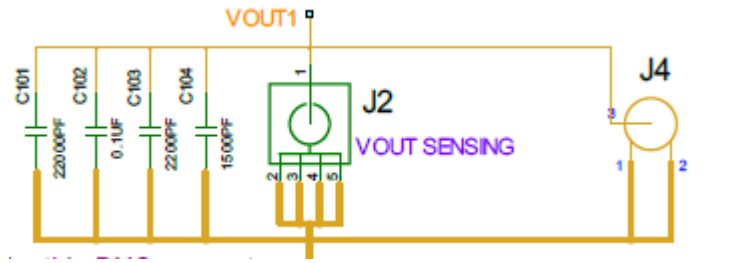
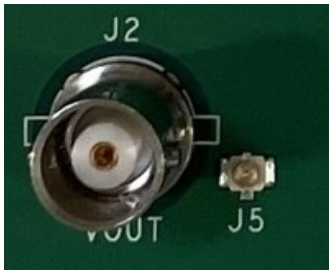
**TOP SIDE**

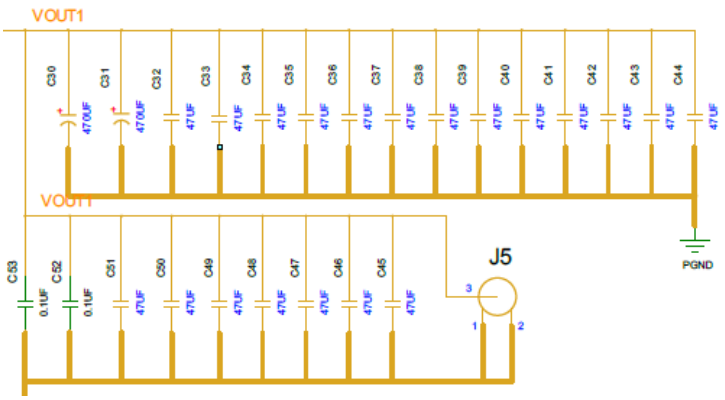




## Output Section

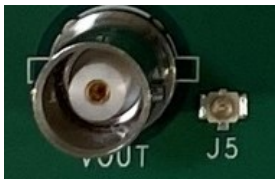


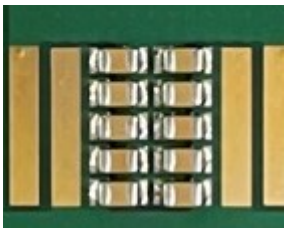


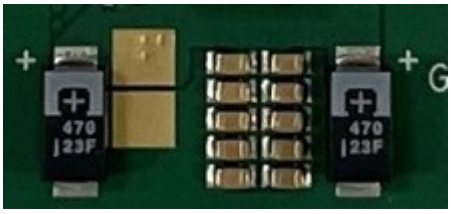


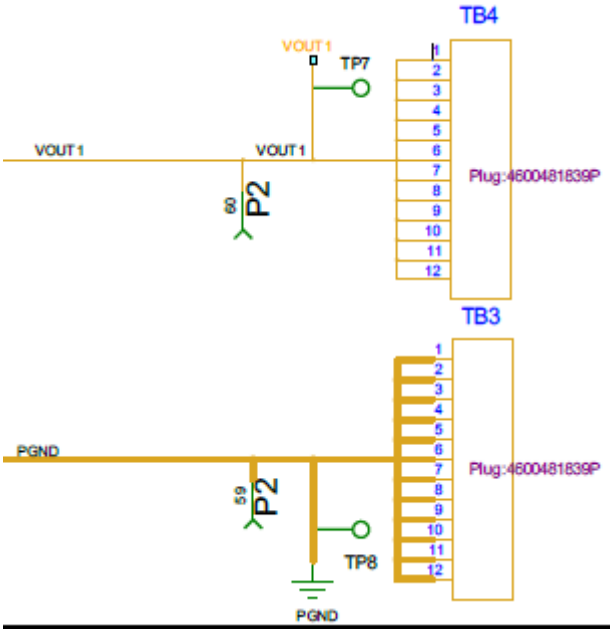

TOP SIDE



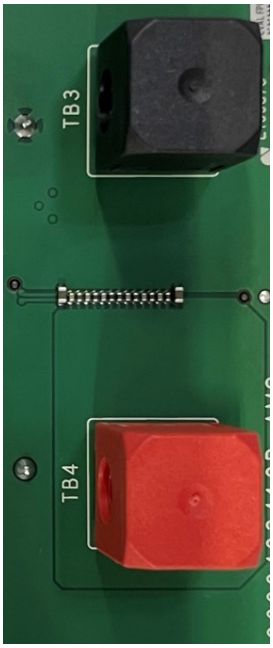

BOTTOM SIDE





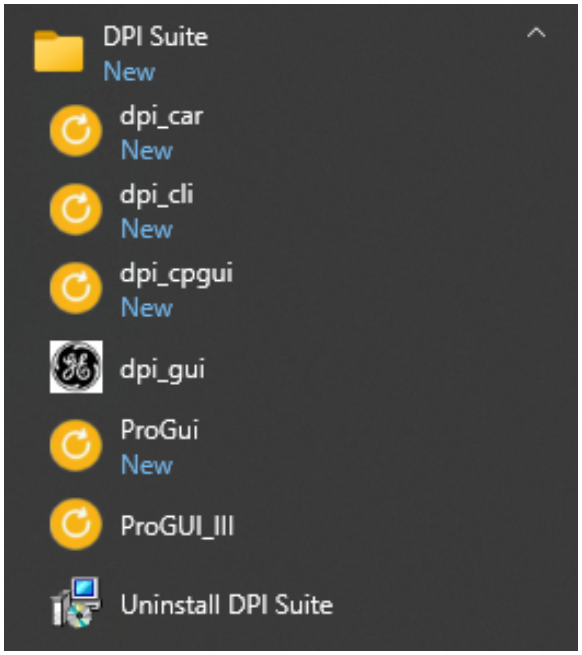

BOTTOM SIDE

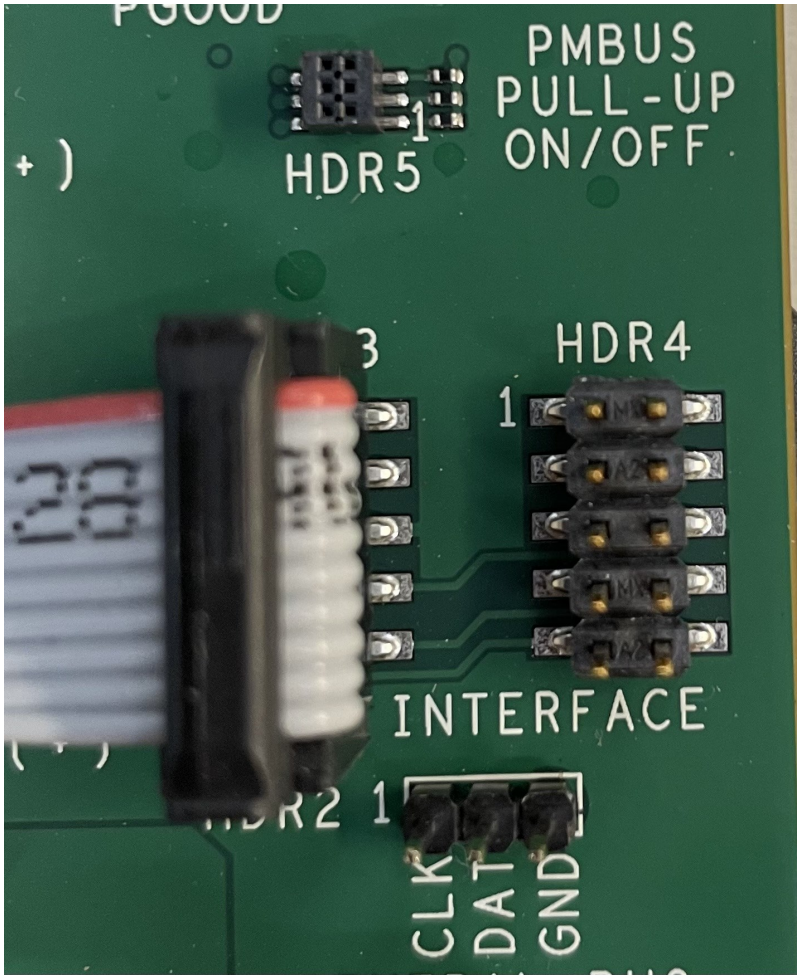



Male Connectors that plug into above sockets can be ordered from Digi-key, Mouser, etc. The connectors are made by Wurth Electronik. Part No is 74640016.

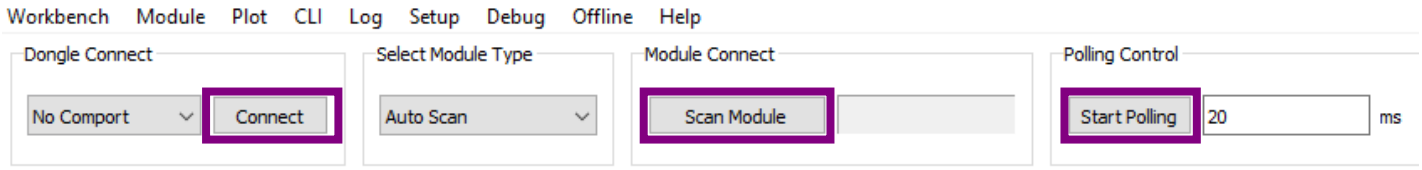
## 2.2 ProGUI Connection and Setup

Click on ProGUI_III option after clicking  on your Windows Start Icon. Make sure the dongle is connected to the board and the computer. Ensure ribbon cable is connected with the pin alignment shown below.



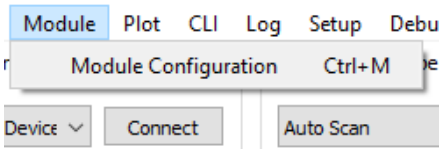




Click on Connect and then Scan Module to find the FPLX module and then click on Start Polling.

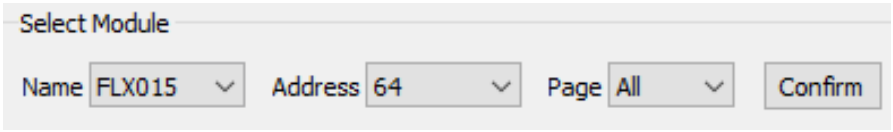


## 2.2.1. ProGUI Connection and Setup - Initialization

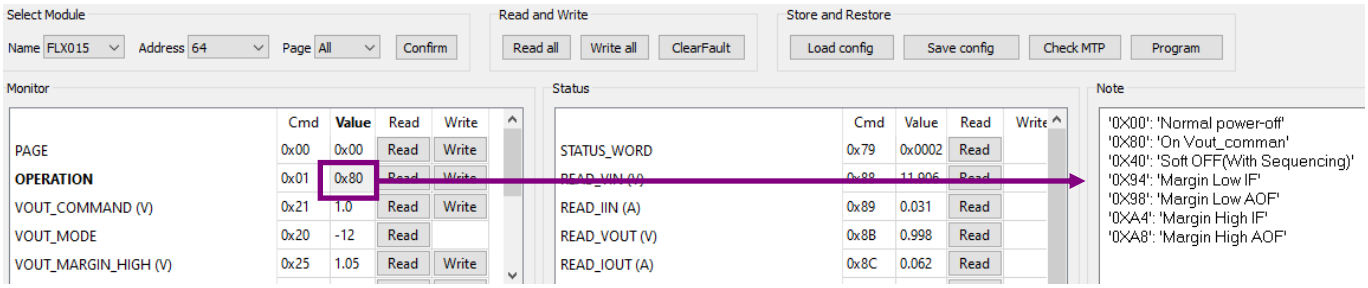
- Click on “Module” in the top left corner and then click on Module Configuration.



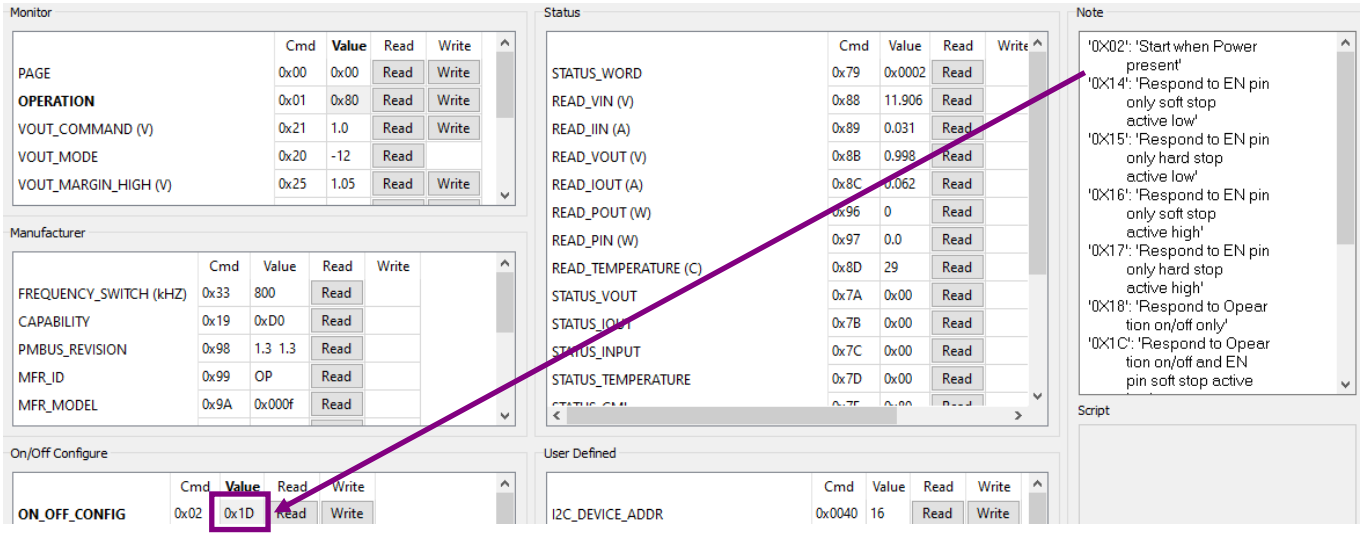

- A new window will open up. Click on the Confirm button to allow access to the module.



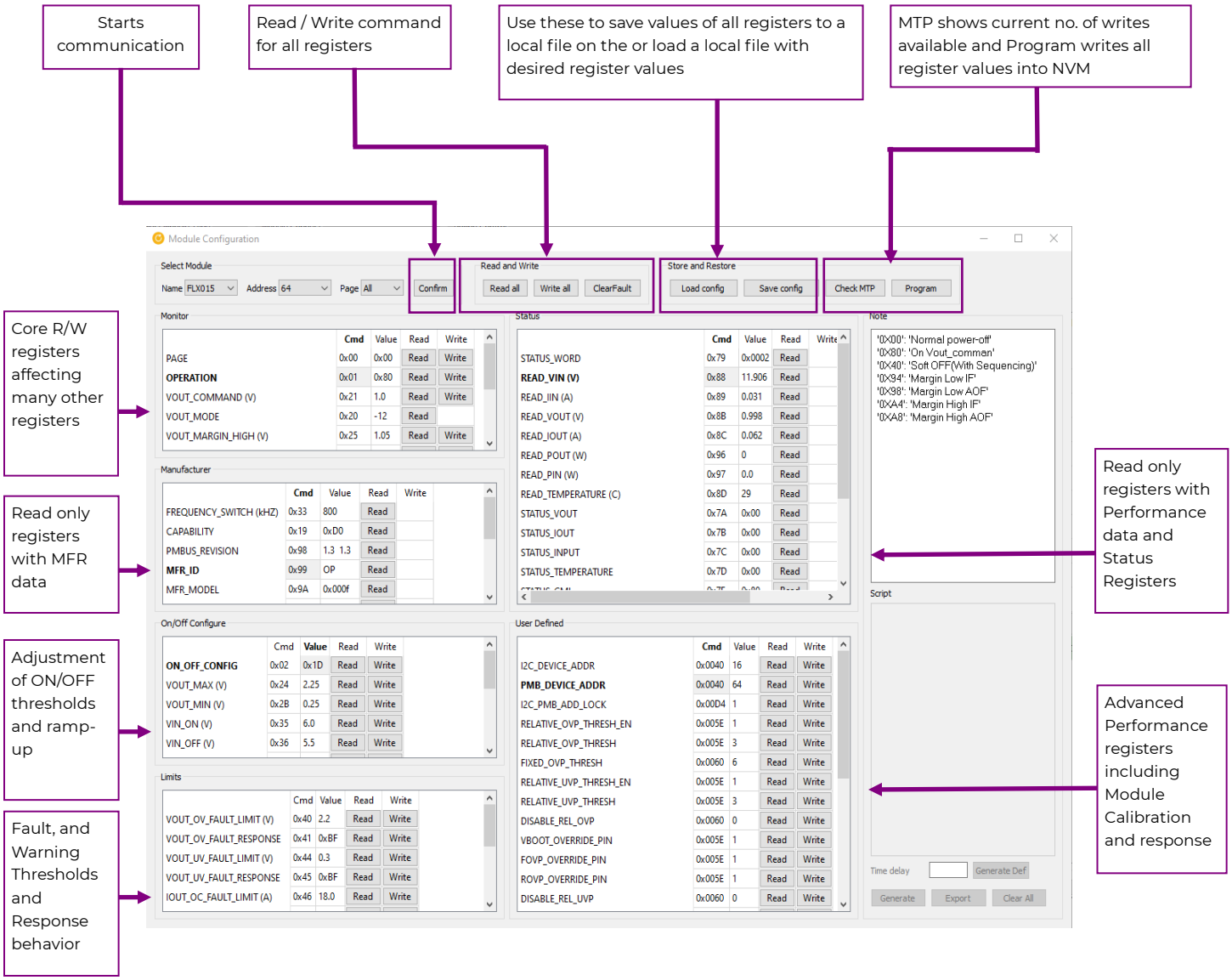

- Clicking on the Hex Command or the Value field for the configurable registers populates the Notes filed on the Right Upper corner which provides the user with information on the available options for that command/register. See example of 0x80 for OPERATION command. Remember to click on the Write button after entering the value in the Value register. Click on PROGRAM only once all changes have been made due to limited number of writes available. Another way to conserve number of writes is to use the SAVE CONFIG option by clicking on it. It stores a config file locally which can be retrieved to restore Module Setpoints.



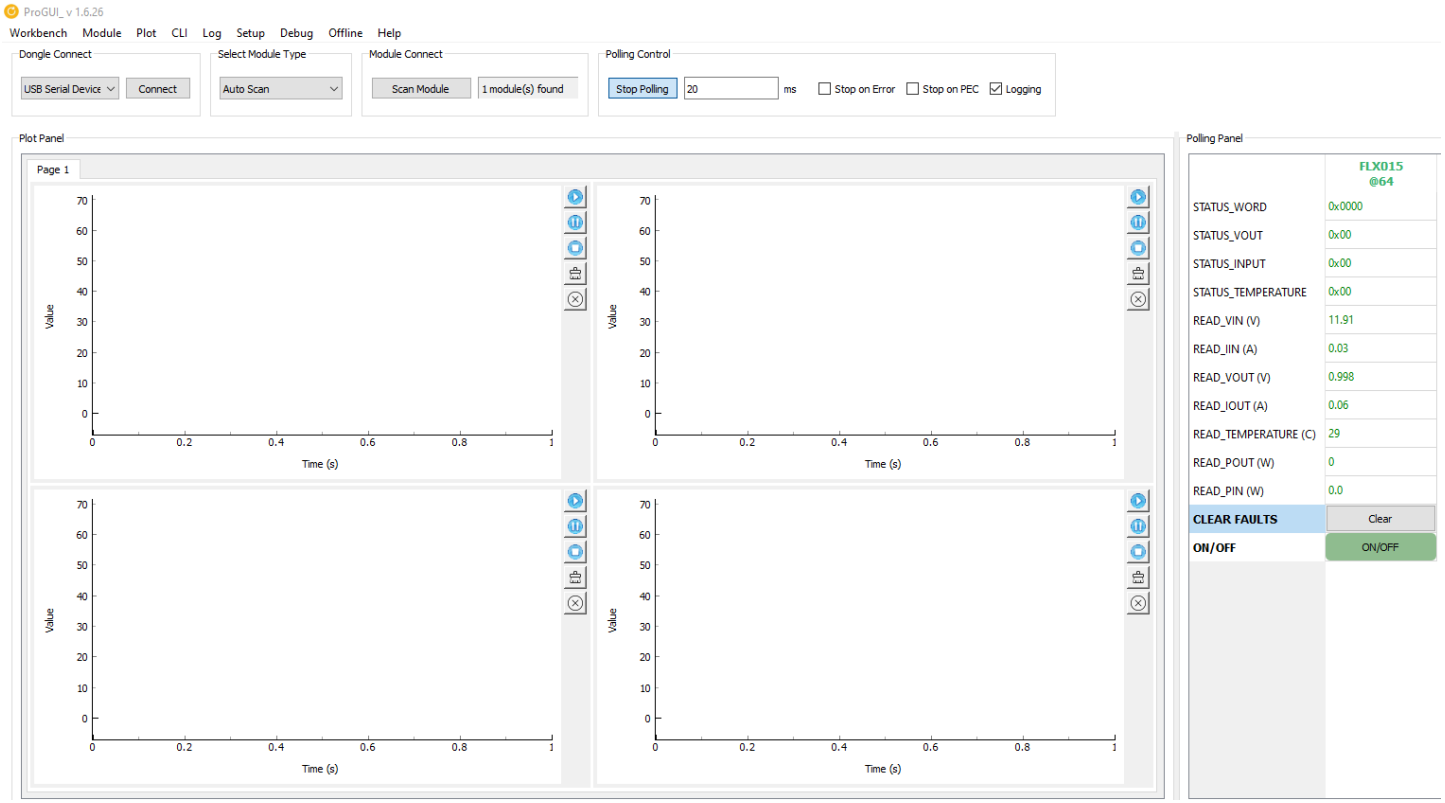

- Similarly clicking on ON_OFF_CONFIG Value 0x1D data field below brings up all the options available to the user in the Note Section. For example, enter 0x02 if you want module to powerup as soon as input is applied.



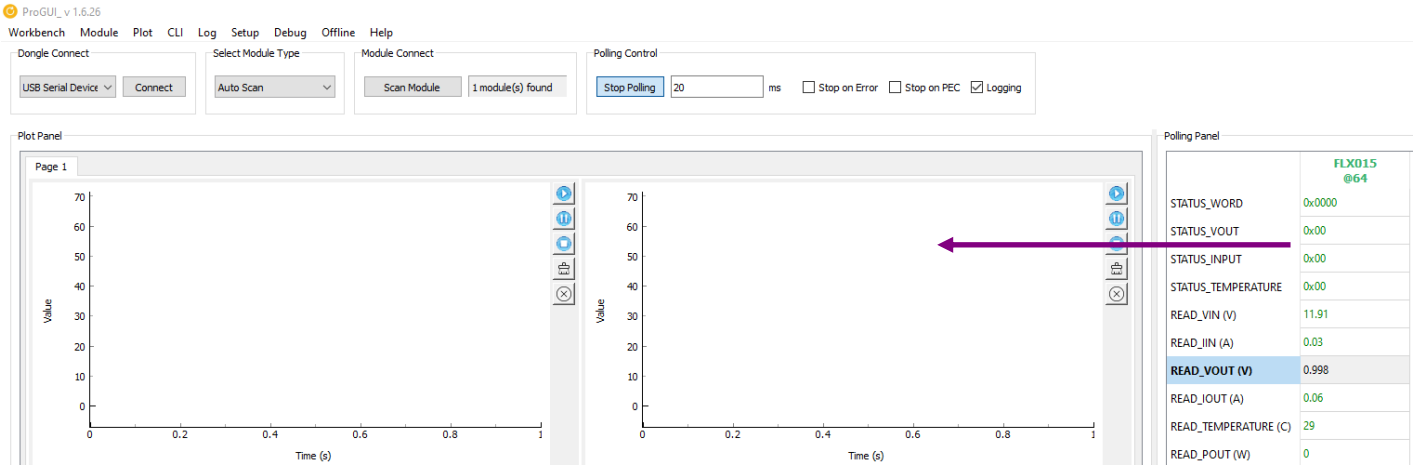
## 2.2.2. ProGUI Connection and Setup - Module Configuration



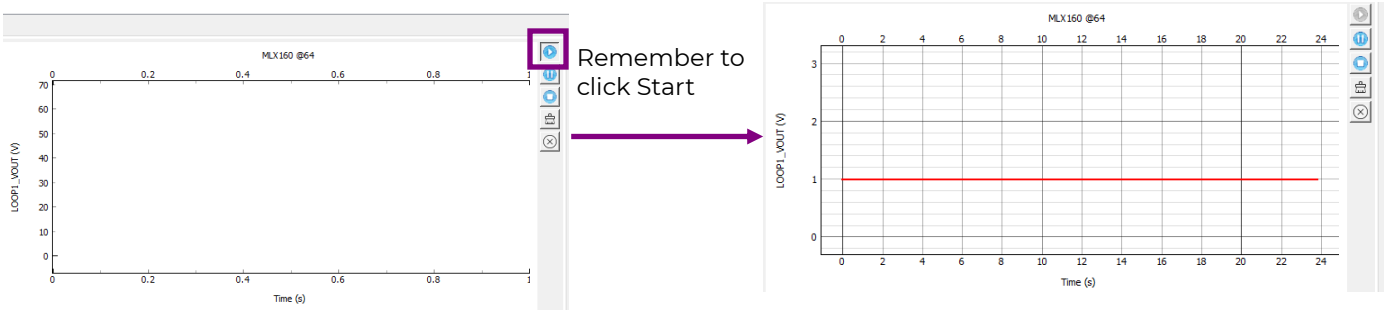
## 2.2.3. ProGUI Connection and Setup - Polling




Main Display Screen once Module is On (with output).

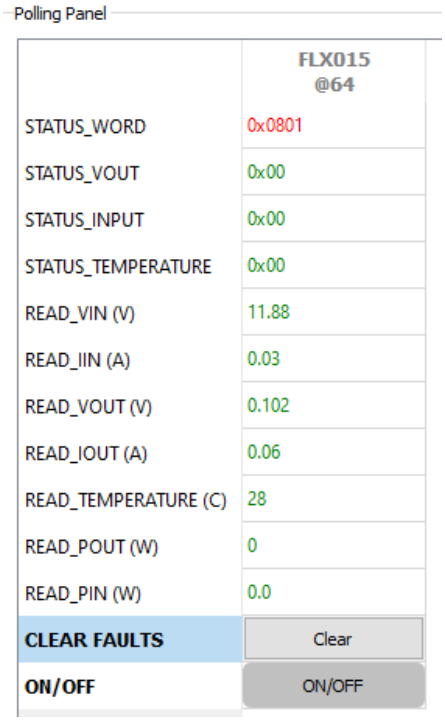



Drag desired parameters to screen for polling and drop into graph area.

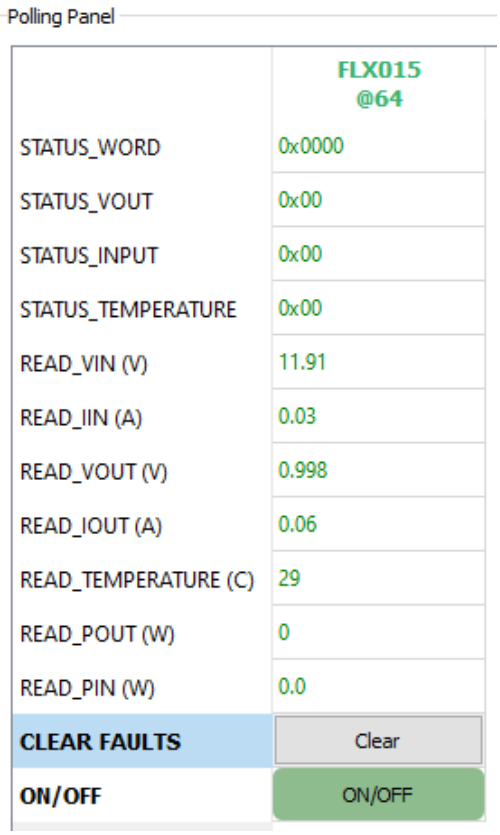


## 2.2.4. ProGUI Connection and Setup - ON/OFF Settings

Once module is Turned On the main screen displays the key input-output measurements.

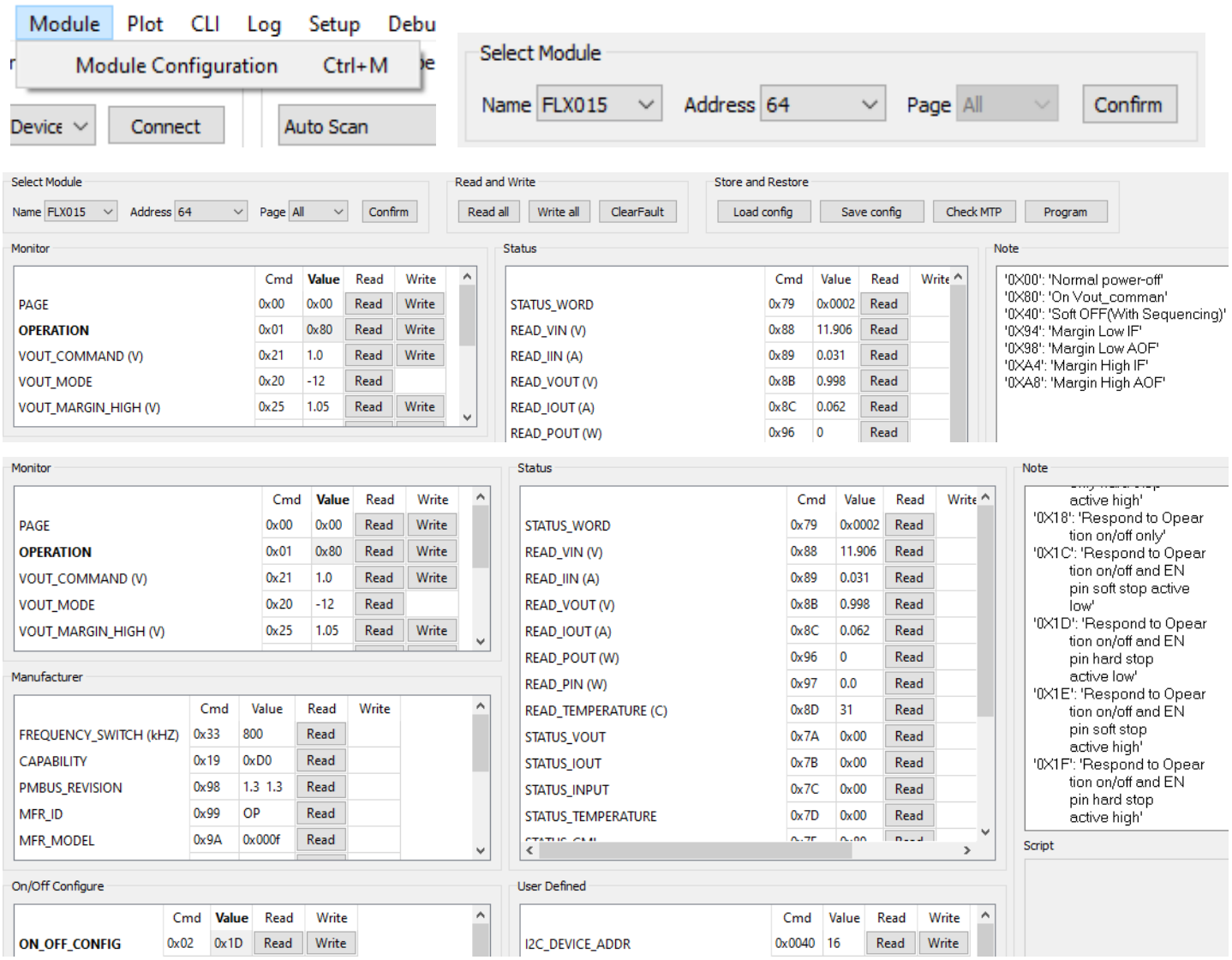



Use Enable Toggle Switch to turn on output or change configuration to always On mode when Input is present.

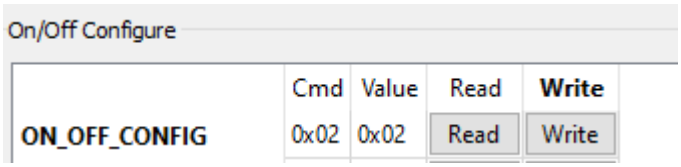


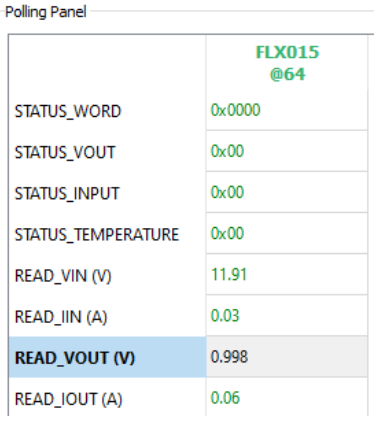
## 2.2.4. ProGUI Connection and Setup - On/Off Settings (Continued)

Change Module Setting to turn on when Input Power is Present.




Change ON_OFF_CONFIG to 0x02 and then module turns ON.



## 2.3 PMBus Summary

| PMBUS CMD | CMD CODE | DATA BYTES | DATA FORMAT | UNIT | TRANSFER TYPE | DEFAULT VALUE | MIN/MAX VALUES or RANGE |
|---|---|---|---|---|---|---|---|
| PAGE | 0x00 | 1 | bit field | | R/W | 0x00 | 0x00 |
| OPERATION | 0x01 | 1 | bit field | | R/W | 0x80 | 0x00/40/80/94/98/A4/A8 |
| ON_OFF_CONFIG | 0x02 | 1 | bit field | | R/W | 0x1D | 0x02/14/15/16/17/18/1C/1D/1E/1F |
| CLEAR_FAULTS | 0x03 | 1 | | | W | | |
| WRITE_PROTECT | 0x10 | 1 | bit field | | R/W | 0x00 | 0x80/40/20/03/02/00 |
| STORE_USER_ALL | 0x15 | 1 | | | W | | |
| RESTORE_USER_ALL | 0x16 | 1 | | | W | | |
| CAPABILITY | 0x19 | 1 | bit field | | R | 0xD0 | |
| SMBALERT_MASK | 0x1B | 5 | bit field | | R/W | 0x0000000000 | |
| VOUT_MODE | 0x20 | 1 | mode+exp | | R/W | 0x14 (-12) | 0x14/15/16/17/18 |
| VOUT_COMMAND | 0x21 | 2 | 16-bit linear | V | R/W | 0x1000 (1.0 V) | 0.4 to 2.0/(0.5 to3.6 with FB divider) |
| VOUT_MAX | 0x24 | 2 | 16-bit linear | V | R/W | 0x2400 (2.25 V) | 0.4 to 2.25/(0.5 to3.7 with FB divider) |
| VOUT_MARGIN_HIGH | 0x25 | 2 | 16-bit linear | V | R/W | 0x4301 (1.05 V) | 0.45 to 2.2/(0.5 to 3.6 with FB divider) |
| VOUT_MARGIN_LOW | 0x26 | 2 | 16-bit linear | V | R/W | 0x3891 (0.95 V) | 0.45 to 2.2/(0.5 to 3.6 with FB divider) |
| VOUT_TRANSITION_RATE | 0x27 | 2 | 11-bit linear | mV/us | R/W | 0xE808 (1 mV/us) | 0 to 127.875 |
| VOUT_DROOP | 0x28 | 2 | 11-bit linear | mΩ | R/W | 0x0000 (0 mΩ) | 0 to 9.98/(0 to 49.9) |
| VOUT_SCALE_LOOP | 0x29 | 2 | 11-bit linear | | R/W | 0x808 (1:1 ratio) | 0xE808/0xE804 |
| VOUT_MIN | 0x2B | 2 | 16-bit linear | V | R/W | 0x0400 (0.25 V) | 0 to 3.7 |
| FREQUENCY_SWITCH | 0x33 | 2 | 11-bit linear | kHz | R/W | 0x0320(800 Khz) | 600/800/1000 |
| VIN_ON | 0x35 | 2 | 11-bit linear | V | R/W | 0xF80C (6.0 V) | 6 to 14 |
| VIN_OFF | 0x36 | 2 | 11-bit linear | V | R/W | 0xF80B(5.5 V) | 5.5 to 14 |
| VOUT_OV_FAULT_LIMIT | 0x40 | 2 | 16-bit linear | V | R/W | 0x2333(2.2 V) | 0.4 to 2.2 |
| VOUT_OV_FAULT_RESPONSE | 0x41 | 1 | bit field | | R/W | 0xBF (Shutdown/retry) | 0x00/(0x80 - 0xBF) |
| VOUT_UV_FAULT_LIMIT | 0x44 | 2 | 16-bit linear | V | R/W | 0x0666(0.4 V) | 0.4 to 2.2 |
| VOUT_UV_FAULT_RESPONSE | 0x45 | 1 | bit field | | R/W | 0xBF (Shutdown/retry) | 0x00/(0x80 -0xBF) |

## 2.3 PMBus Summary (Continued)

| PMBUS CMD | CMD CODE | DATA BYTES | DATA FORMAT | UNIT | TRANSFER TYPE | DEFAULT VALUE | MIN/MAX VALUES or RANGE |
|---|---|---|---|---|---|---|---|
| VOUT_UV_FAULT_LIMIT | 0x44 | 2 | 16-bit linear | V | R/W | 0x0666 (0.4 V) | 0.4 to 2.2 |
| VOUT_UV_FAULT_RESPONSE | 0x45 | 1 | bit field | | R/W | 0xBF (Shutdown/retry) | 0x00/(0x80 -0xBF) |
| IOUT_OC_FAULT_LIMIT | 0x46 | 2 | 11-bit linear | A | R/W | 0xE190 (25 A) | 0 to 25 |
| IOUT_OC_FAULT_RESPONSE | 0x47 | 1 | bit field | | R/W | 0xFF (Shutdown/retry) | 0xC0 to 0xFF |
| OT_FAULT_LIMIT | 0x4F | 2 | 11-bit linear | °C | R/W | 0x007D (125°C) | 0 to 125 |
| OT_FAULT_RESPONSE | 0x50 | 1 | bit field | | R/W | 0xF8 (Restart) | 0x00/(0xC0 -0xBF) |
| OT_WARN_LIMIT | 0x51 | 2 | 11-bit linear | °C | R/W | 0x006E (110°C) | 0 to 124 |
| VIN_OV_FAULT_LIMIT | 0x55 | 2 | 11-bit linear | V | R/W | 0xE0E8 (14.5 V) | 6 to14.5 |
| VIN_OV_FAULT_RESPONSE | 0x56 | 1 | bit field | | R/W | 0x80 (Shutdown) | 0x00/(0x80 - 0xBF) |
| POWER_GOOD_ON | 0x5E | 2 | 16-bit linear | V | R/W | 0x0666 (0.399 V) | 0.3 to 2.0/(0.3 to3.6 with FB divider) |
| POWER_GOOD_OFF | 0x5F | 2 | 16-bit linear | V | R/W | 0x0666 (0.399 V) | 0.3 to 2.0/(0.3 to3.6 with FB divider) |
| TON_DELAY | 0x60 | 2 | 11-bit linear | ms | R/W | 0x0000 (0 ms) | 0 - 127.5 |
| TON_RISE | 0x61 | 2 | 11-bit linear | ms | R/W | 0xF81E (15 ms) | 0 - 127.5 |
| TOFF_DELAY | 0x64 | 2 | 11-bit linear | ms | R/W | 0x0000 (0 ms) | 0 - 127.5 |
| TOFF_FALL | 0x65 | 2 | 11-bit linear | ms | R/W | 0xF81E (15 ms) | 0 - 127.5 |
| STATUS_BYTE | 0x78 | 1 | bit field | | R/W | 0x00 | |
| STATUS_WORD | 0x79 | 2 | bit field | | R/W | 0x0000 | |
| STATUS_VOUT | 0x7A | 1 | bit field | | R/W | 0x00 | |
| STATUS_IOUT | 0x7B | 1 | bit field | | R/W | 0x00 | |
| STATUS_INPUT | 0x7C | 1 | bit field | | R/W | 0x00 | |
| STATUS_TEMPERATURE | 0x7D | 1 | bit field | | R/W | 0x00 | |
| STATUS_CML | 0x7e | 1 | bit field | | R/W | 0x00 | |
| READ_VIN | 0x88 | 2 | 11-bit linear | V | R | Vary | |
| READ_IIN | 0x89 | 2 | 11-bit linear | A | R | Vary | |
| READ_VOUT | 0x8B | 2 | 11-bit linear | V | R | Vary | |
| READ_IOUT | 0x8C | 2 | 11-bit linear | A | R | Vary | |
| READ_TEMPERATURE_1 | 0x8D | 2 | 11-bit linear | °C | R | Vary | |
| READ_POUT | 0x96 | 2 | 11-bit linear | W | R | Vary | |
| READ_PIN | 0x97 | 2 | 11-bit linear | W | R | Vary | |
| PMBUS_REVISION | 0x98 | 1 | bit field | | R | 0x33 | |
| MFR_ID | 0x99 | 2 | bit field | | R | 0x4F50 ("OP") | OmniOn Power |
| MFR_MODEL | 0x9A | 2 | bit field | | R | 0x14 | |
| MFR_REVISION | 0x9B | 2 | bit field | | R | 0x2025 | |
| MFR_VENDOR_INFO_2 | 0xC2 | 2 | bit field | | R | Vary | |
| MFR_REG_ACCESS | 0xD0 | 7 | bit field | | R/W | Vary | Allows users to access I2C register map based advanced commands. Supported I2C register map accessible commands are shown in Advanced Commands table. |

## 3. Ordering Information

**Orderable OmniOn Power™ Accessories**

| Manufacturer Part Number | Ordering Code | Description |
|---|---|---|
| EVAL FPLX030A0XY3-SRZ | 1600481952A | Evaluation Board with FPLX030 module |
| EVAL FPLX020A0XY3-SRZ | 1600481944A | Evaluation Board with FPLX020 module |
| EVAL FPLX015A0XY3-SRZ | 1600482259A | Evaluation Board with FPLX015 module |
| I2C_USB_DONGLE_2.X_ WITH_CABLES | 150036482 | USB Dongle and cables required for use with Digital Power Insight software by OmniOn Power™. This kit can be used with other OmniOn Power™ Evaluation Boards. |

**Orderable Third Party Accessories**

| Manufacturer Part Number | Manufacturer | Description |
|---|---|---|
| 74640016 | Wurth Electronik | Orderable from third party websites like Digi_Key, Mouser, etc.  |

## 4. Revision History

| Revision | Date | Description of the change |
|---|---|---|
| 1.1 | 07/01/2024 | Initial Release |
| 1.2 | 08/02/2024 | Formatting changes |

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