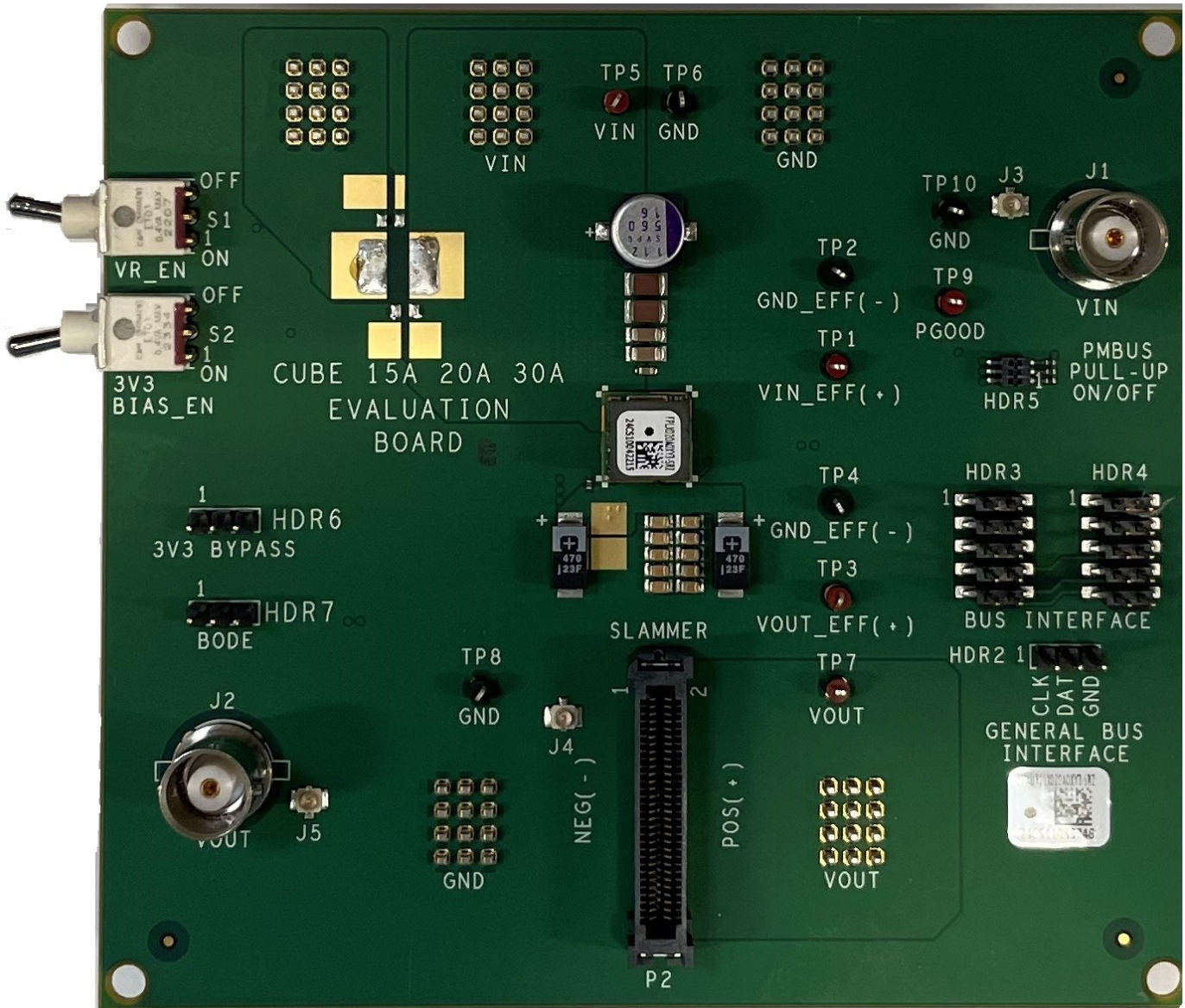


# FPLX015/20/30 Evaluation Board Guide

Evaluation Board populated with FPLX015 / FPLX020 or FPLX030 modules



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## 1. Description

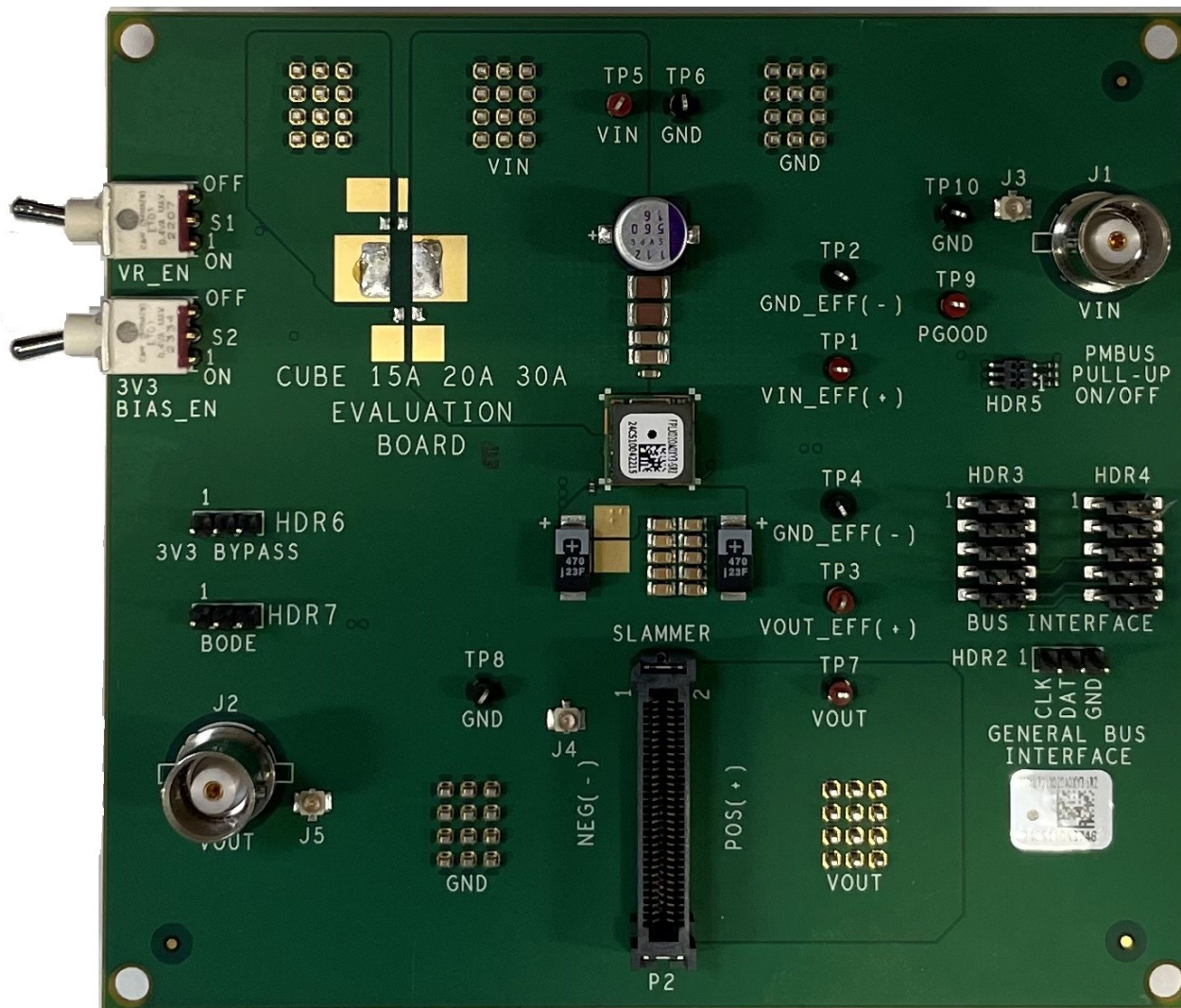
The OmniOn Power™ FPLX series are the next generation of POL modules that can deliver 15/20/30A in a fully configured mode. It operates over a wide input range from 6V to 14Vdc and provides precisely regulated output voltage from 0.45 to 2.0V(FPLX030) or 3.6(FPLX015/020).

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 module



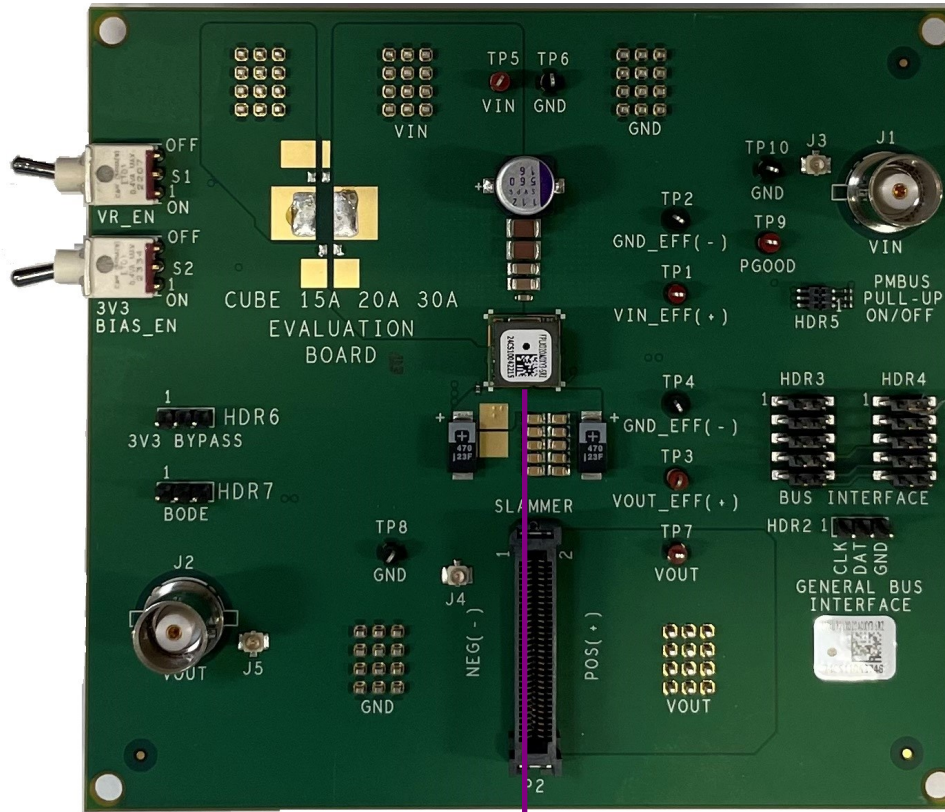
OmniOn Power is a trademark of OmniOn Power Inc. All other trademarks belong to their respective owners.



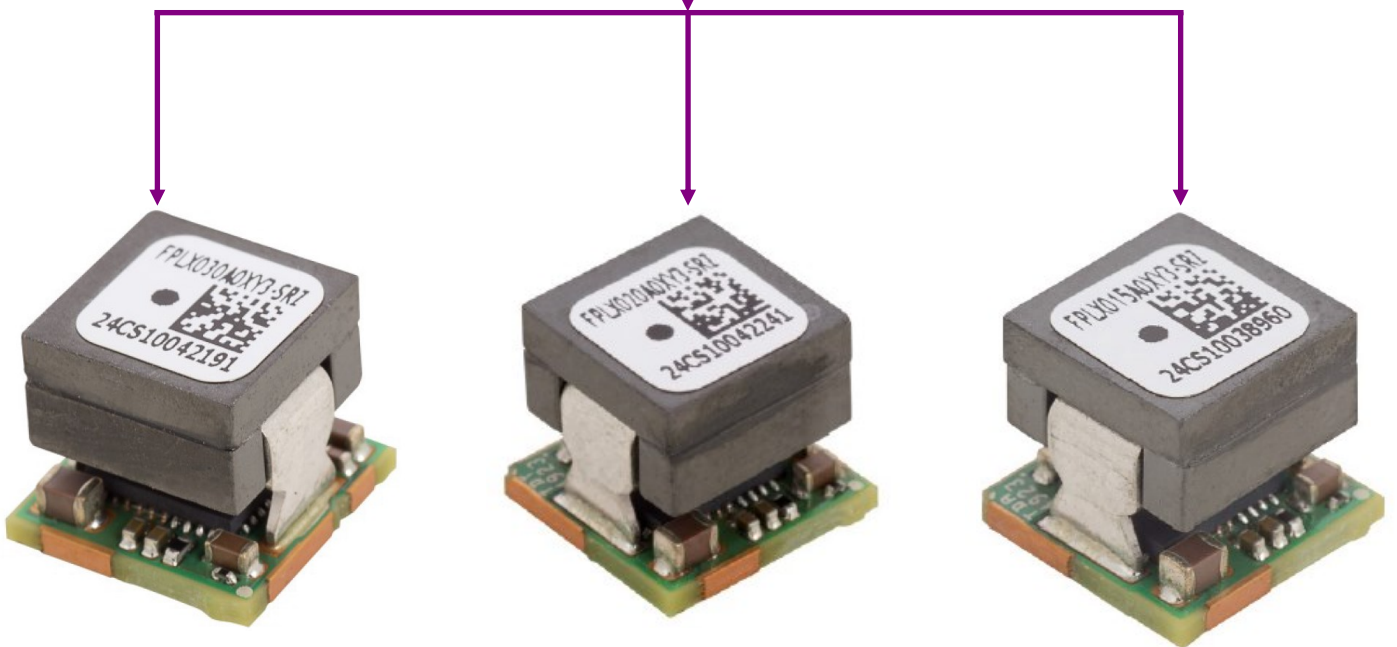
## 1. Description (Continued)

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

Evaluation Board with different module variants



OPTIONS



FPLX030

FPLX020

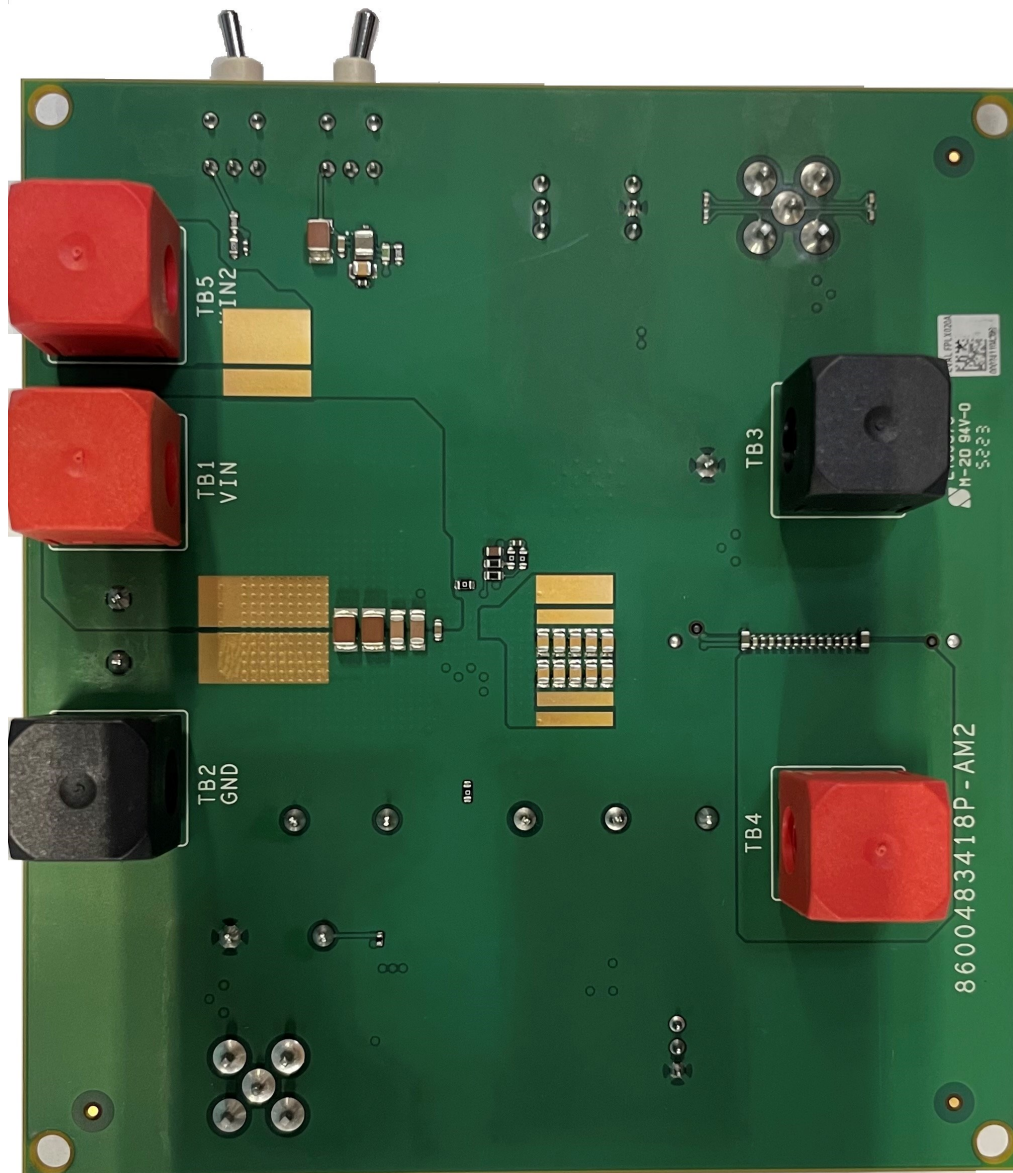
FPLX015

## 1. Description (Continued)

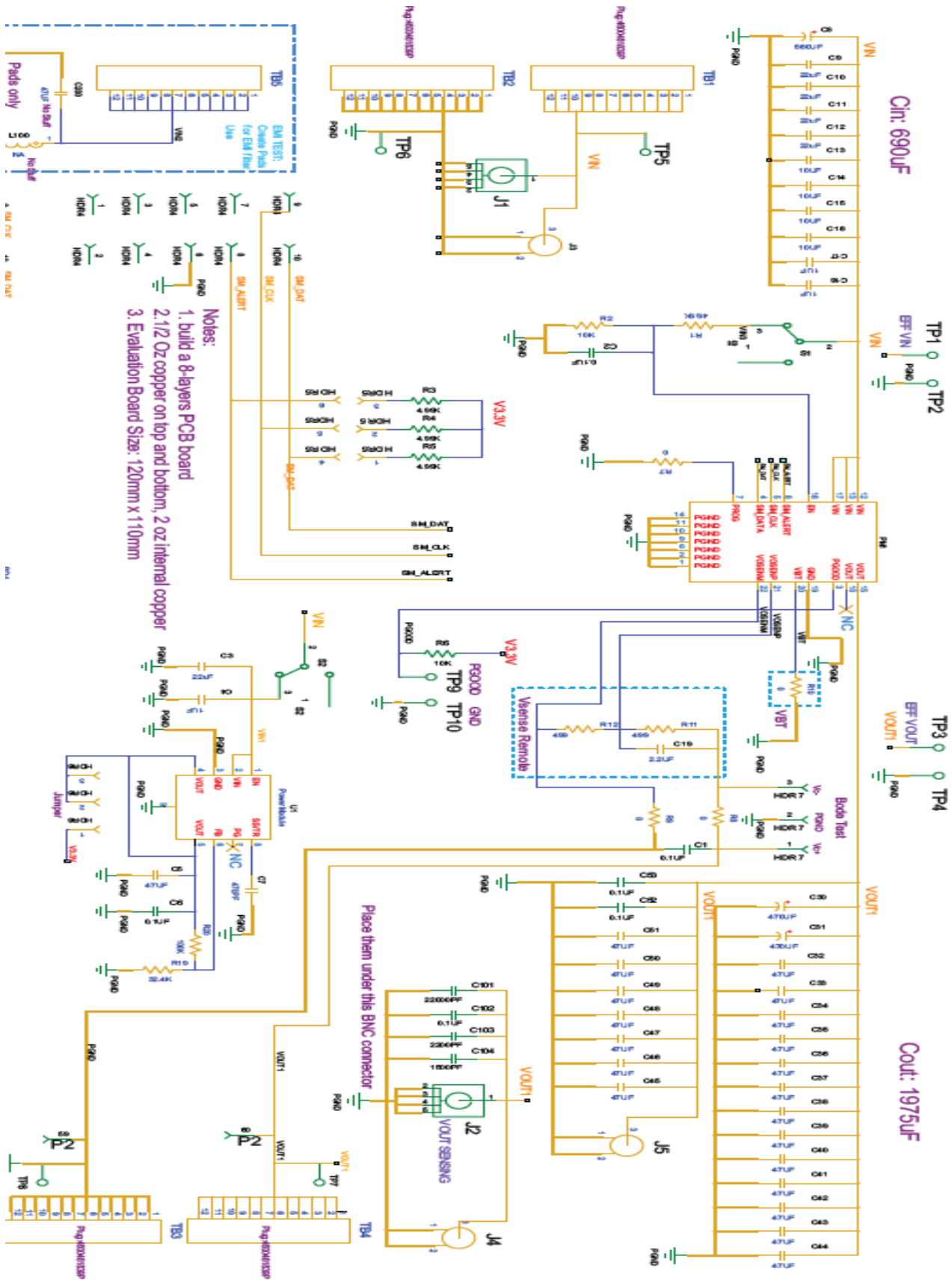
The Installed components are as follows. The schematic on the following page shows maximum capability and includes expansion capability:

- 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 Elektronik, Part No is 74640016.

**Bottom View of Evaluation Board**

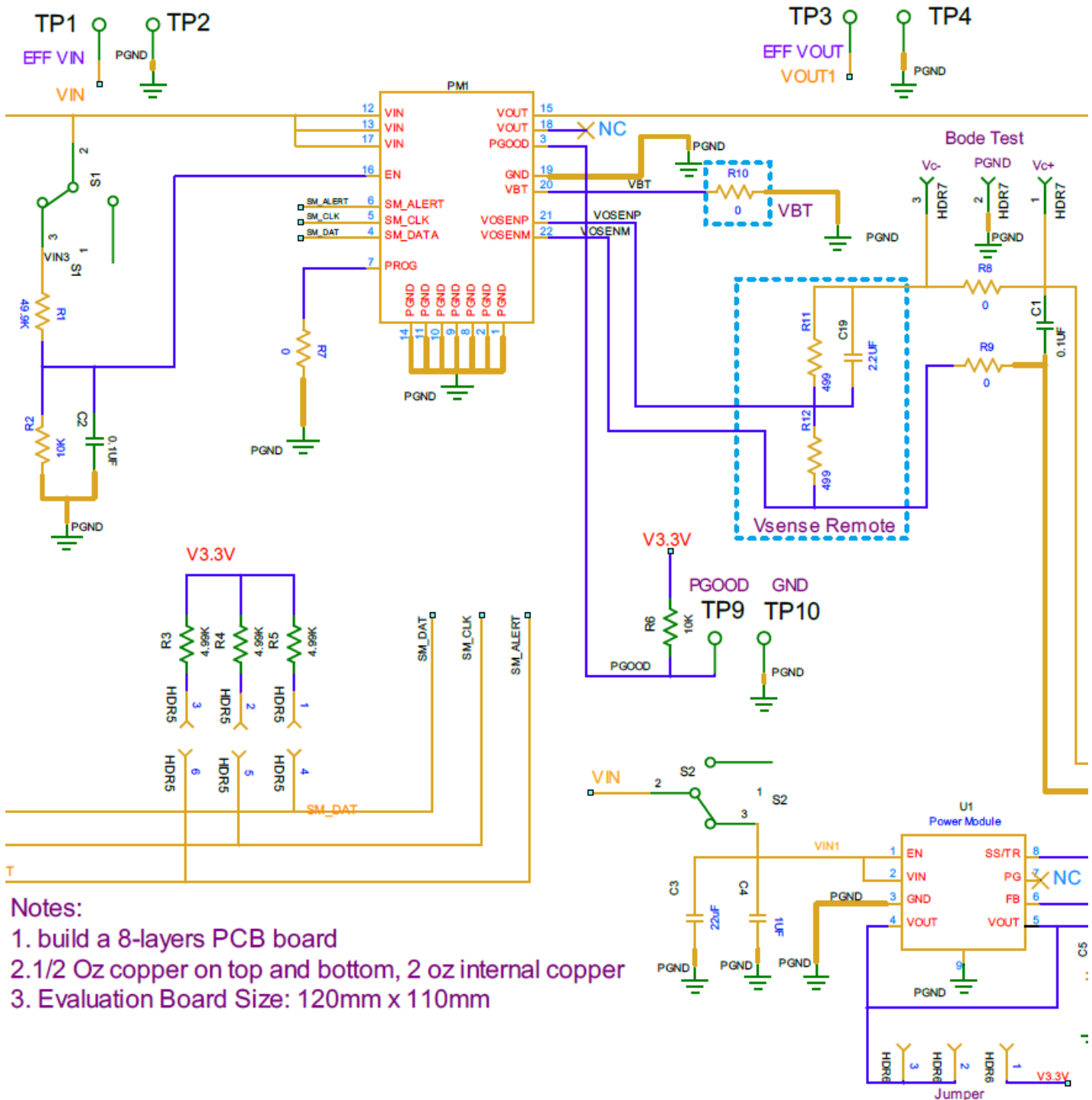


## 2. Schematic



## 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.

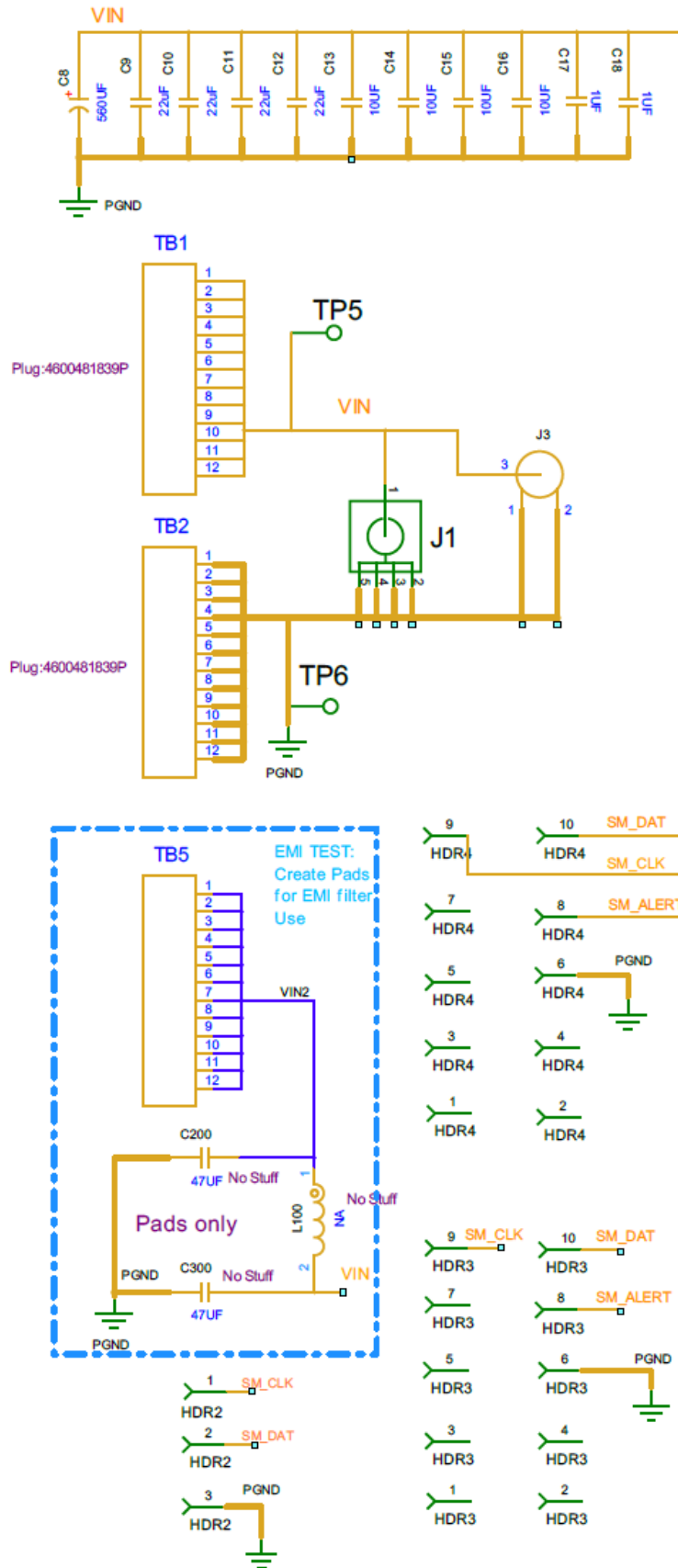


### Notes:

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)



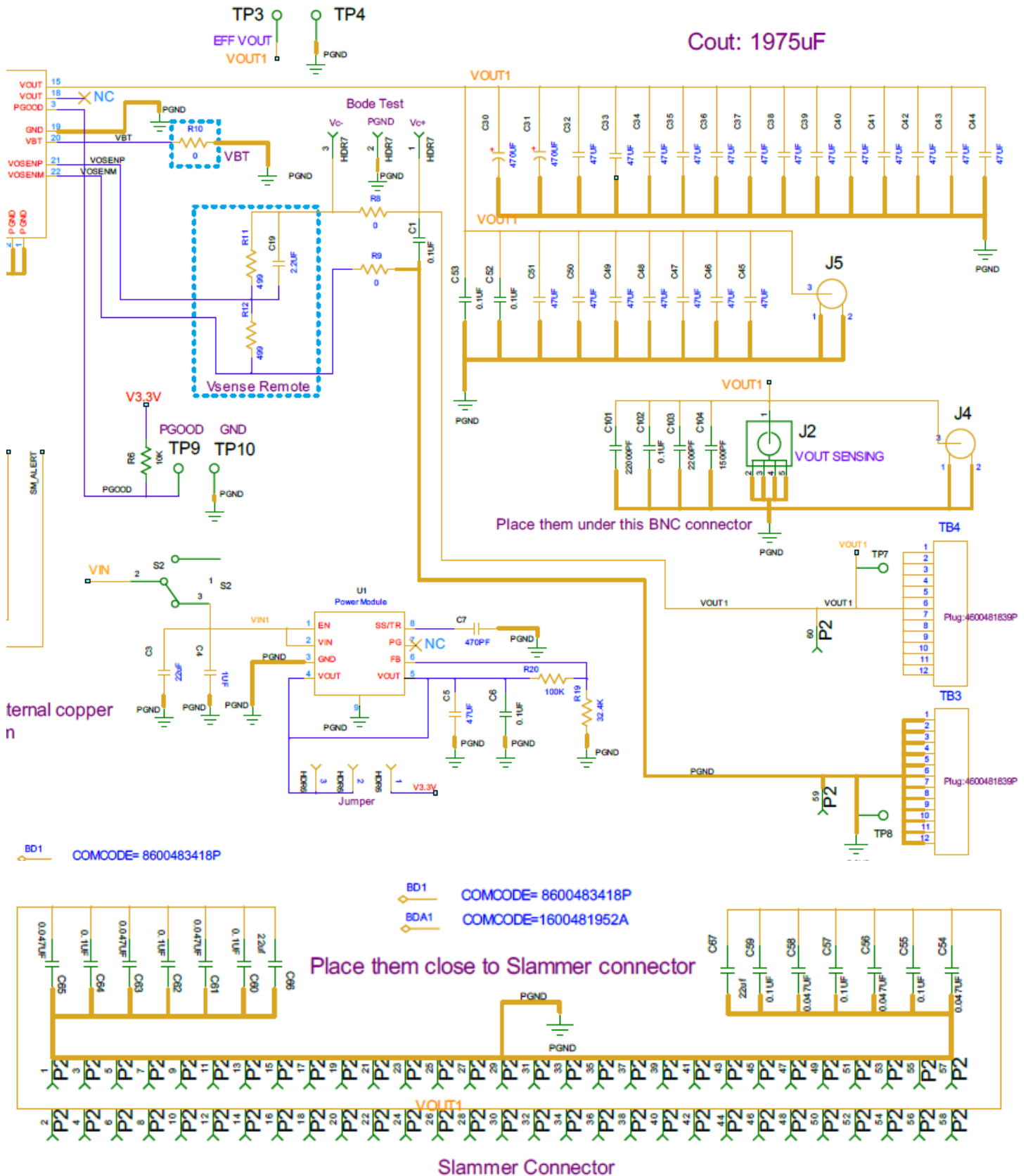


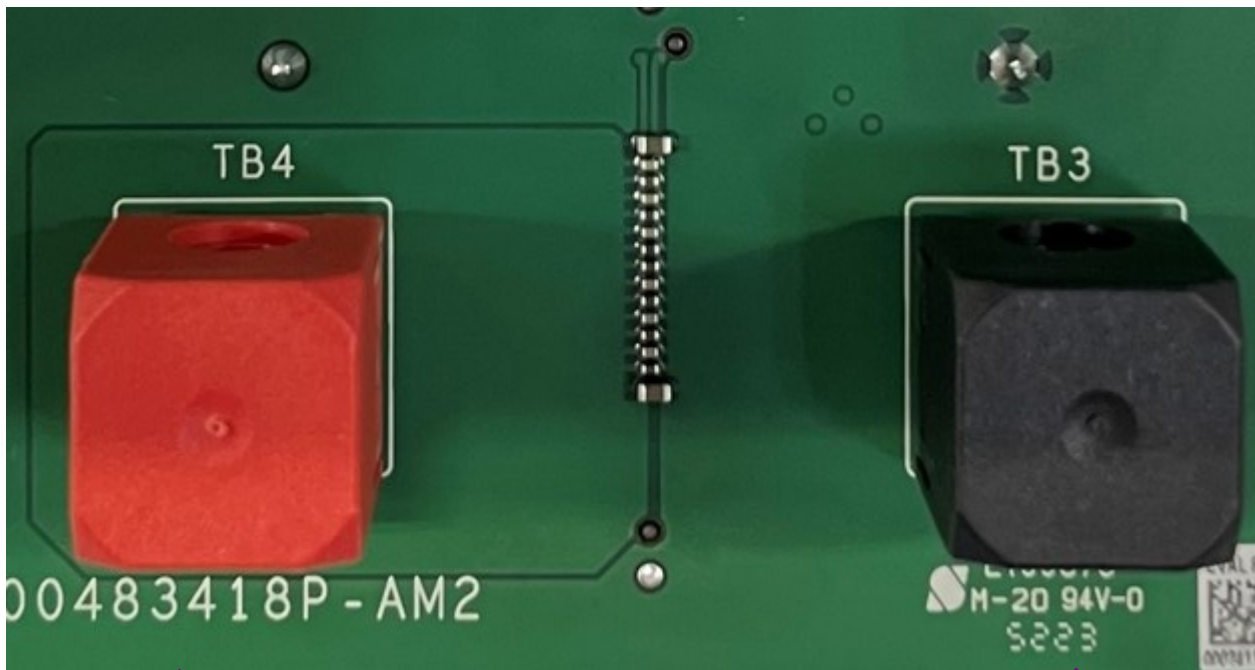
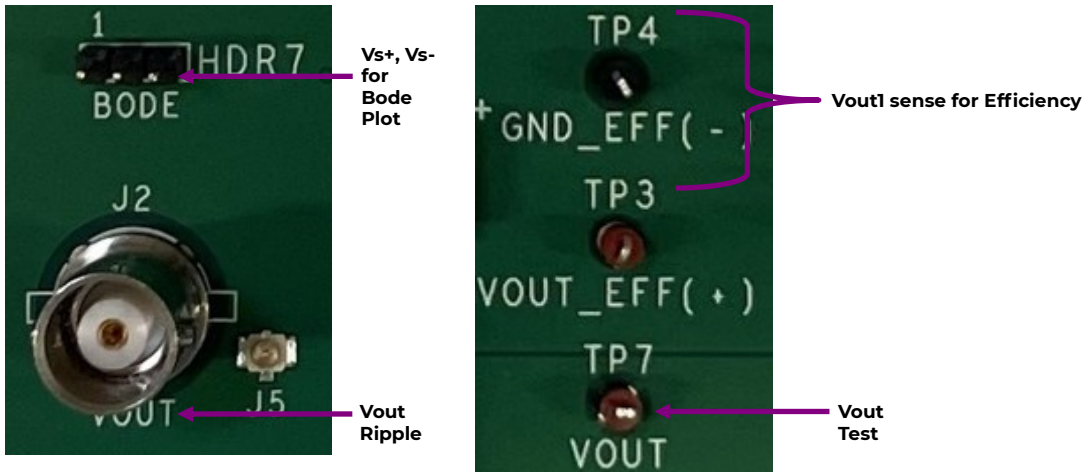




## 2.1.2. Output Connections

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

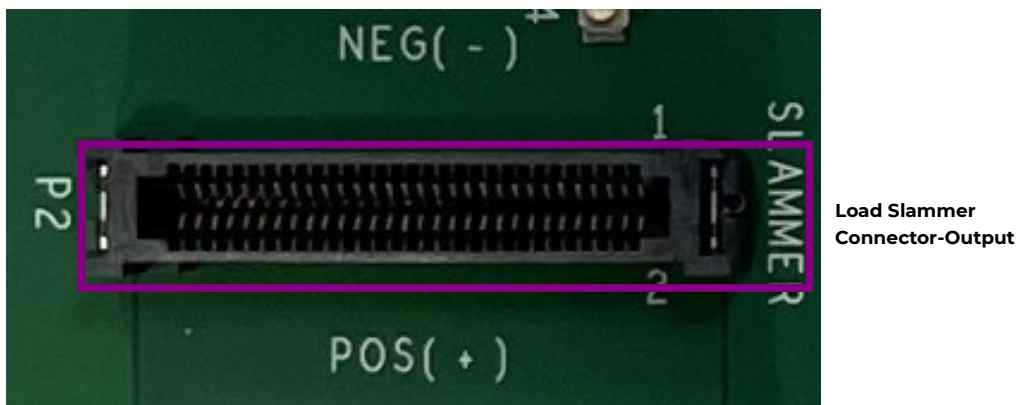




DC Output1: 0.45V to 2V-FPLX030  
0.45V to 3.6V-FPLX020/ FPLX015



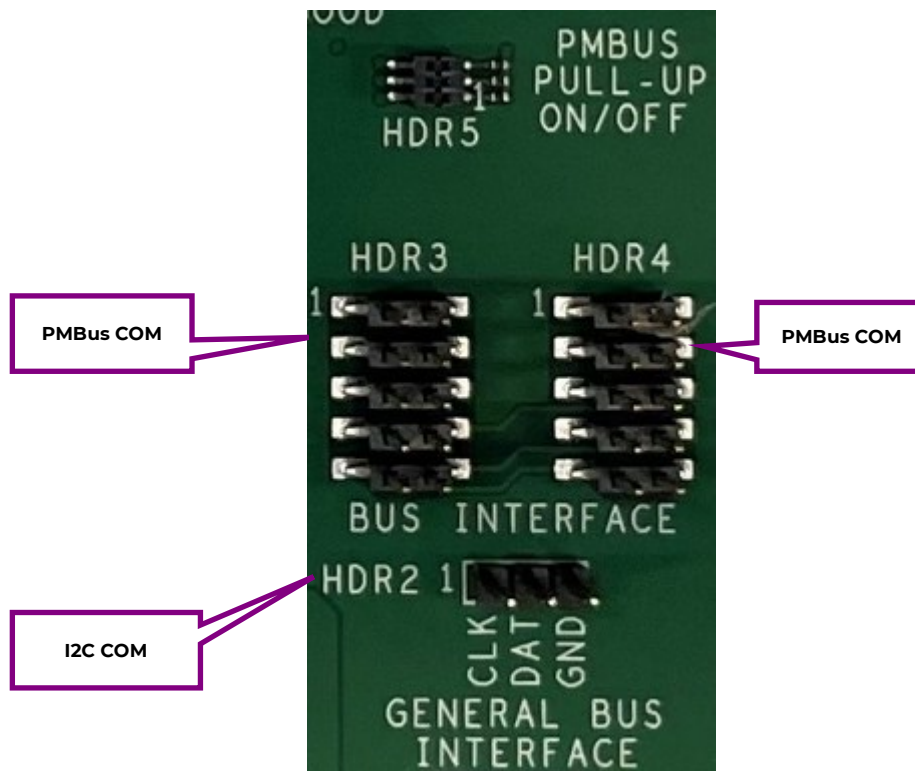
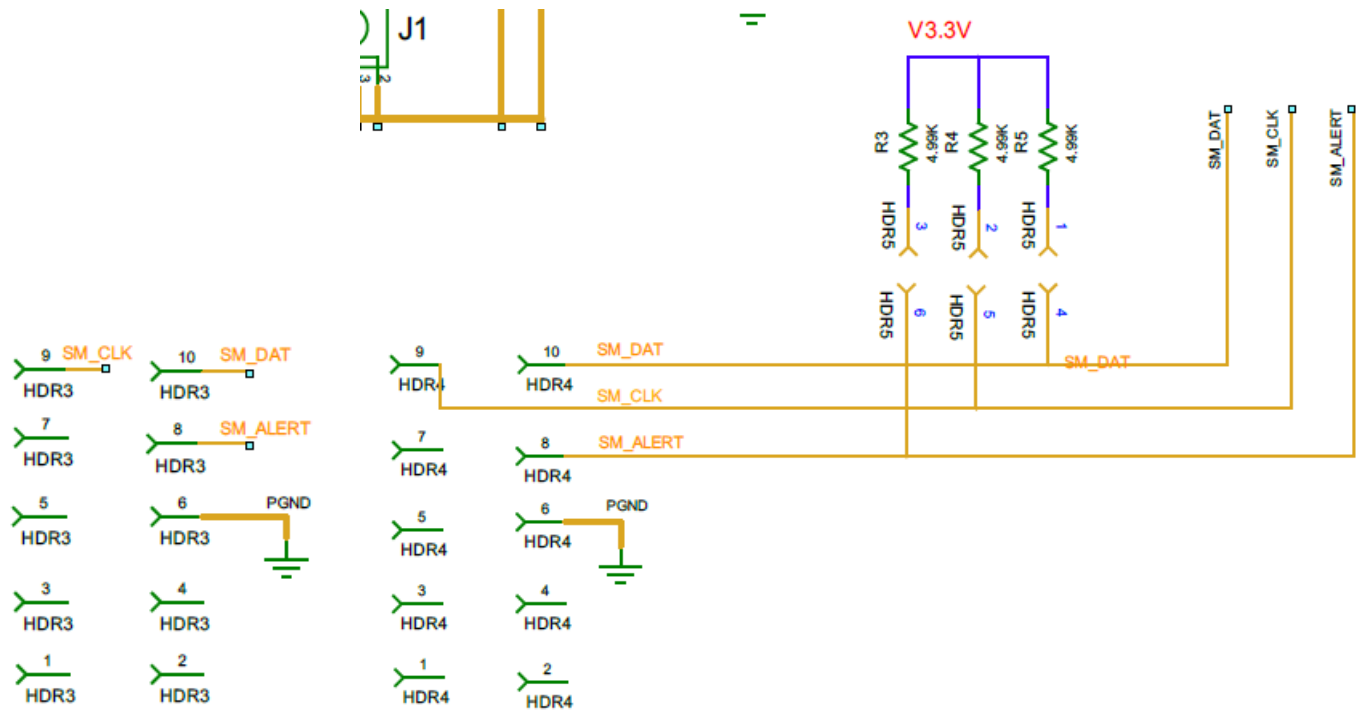
### 2.1.3. Load Transient Connection





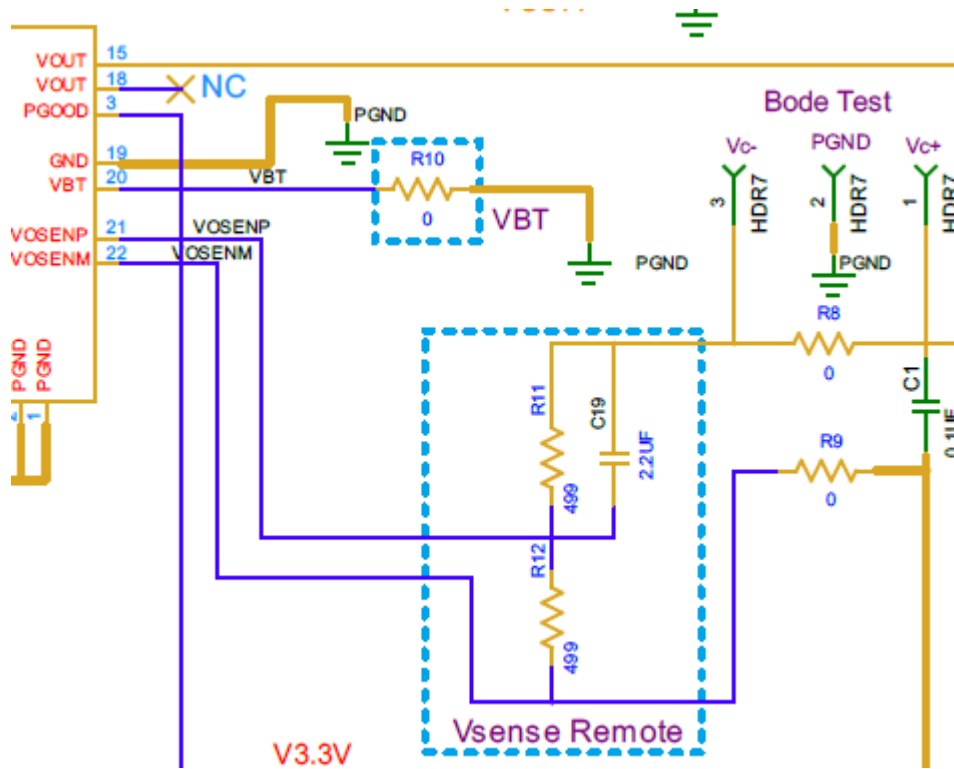
## 2.1.4. PMBus Connection

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

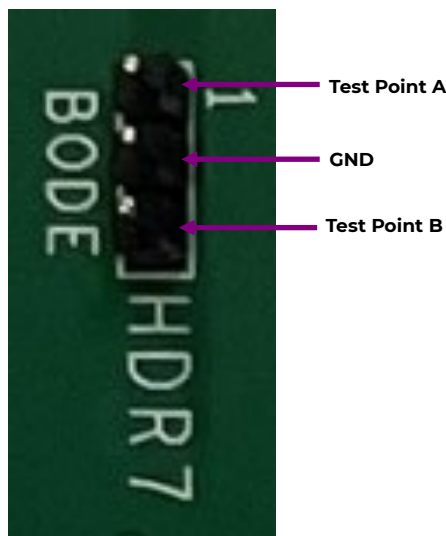


### 2.1.5. Bode Plot Connection

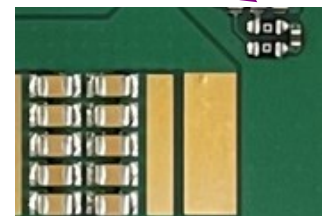
Evaluation Board is provided with test points for Bode Plot connections. Populate a 10-50 ohm resistor between test points A&B by replacing the 0 ohm resistor on R8 and R9, and inject a small signal across Point A and Point B by using a transformer. Measure voltage of Ch1( A and GND) and Ch2(B and GND);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



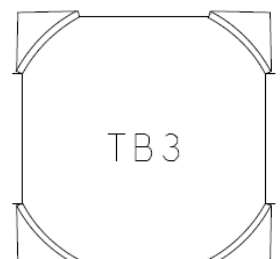
Bode Measurement



- C43
- C45
- C47
- C49
- C51
- C42
- C44
- C46
- C48
- C50



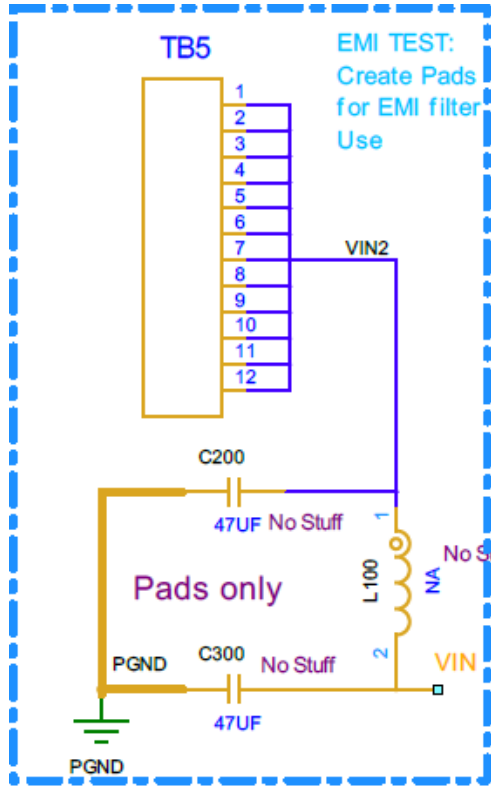
- C66
- C65
- C64
- C63
- C62
- C61
- C60
- C59
- C58
- C57
- C56
- C55
- C54
- C53
- C67



## 2.1.6. Summary of all Test Connections

### Bias Rails


Optional EMI Filter Components



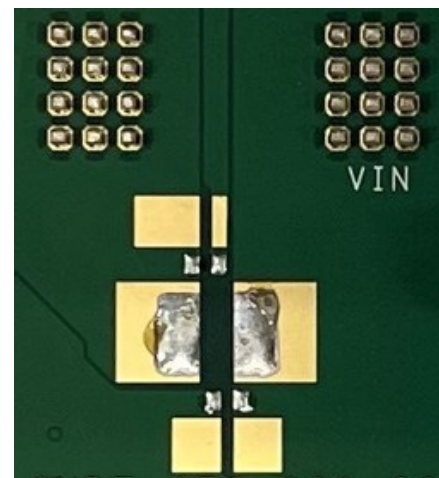
BOTTOM SIDE



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

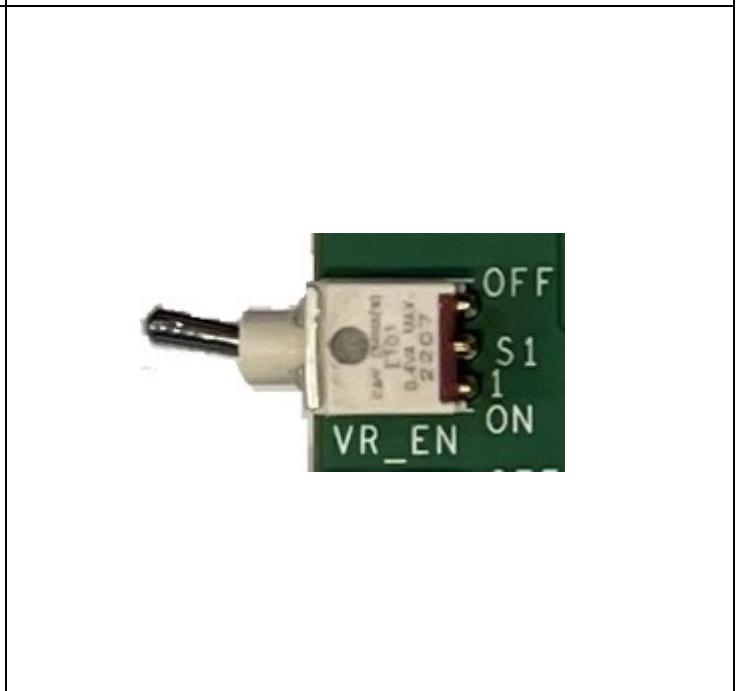
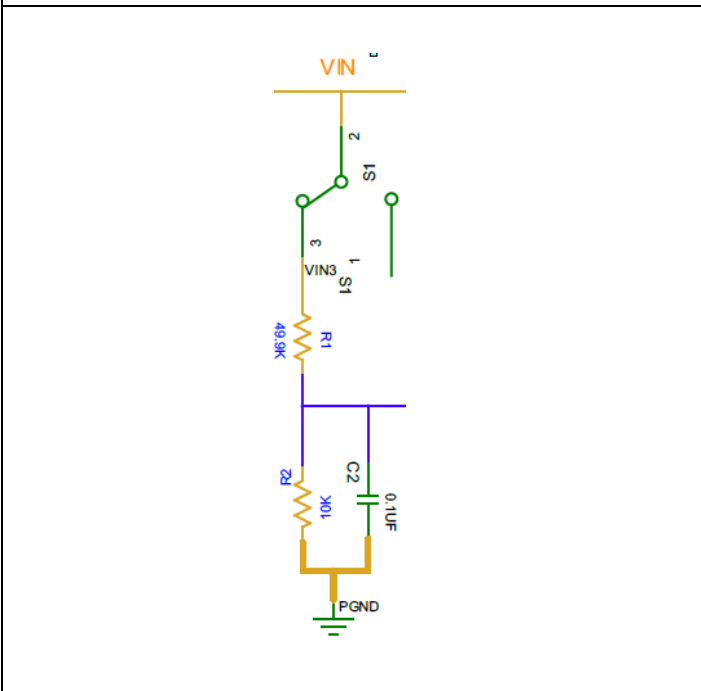
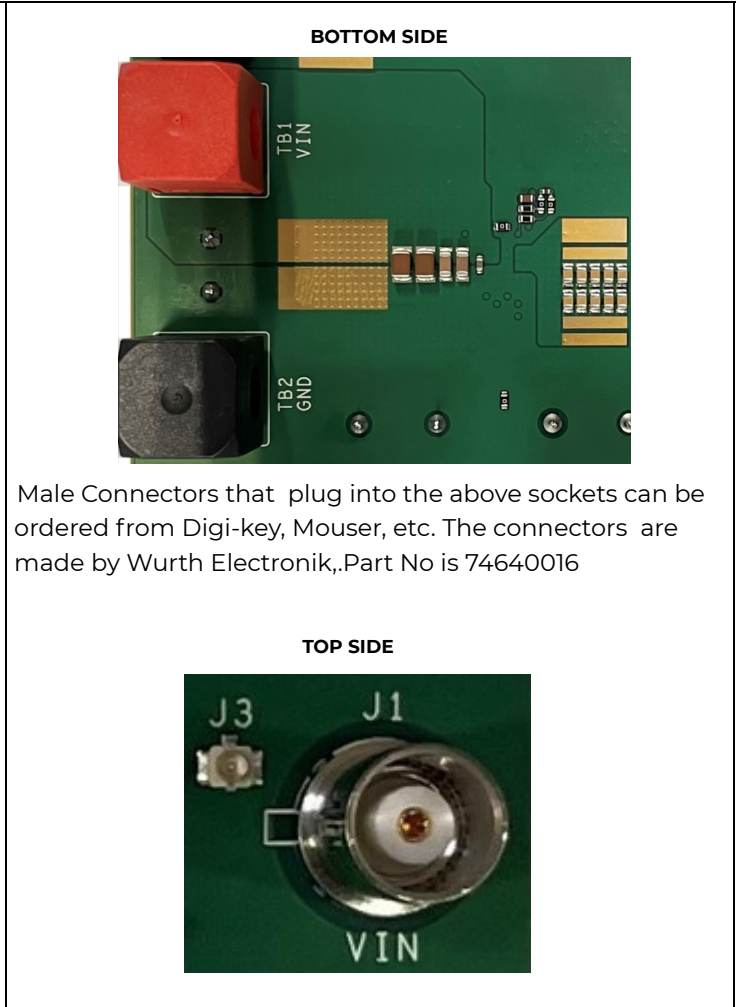
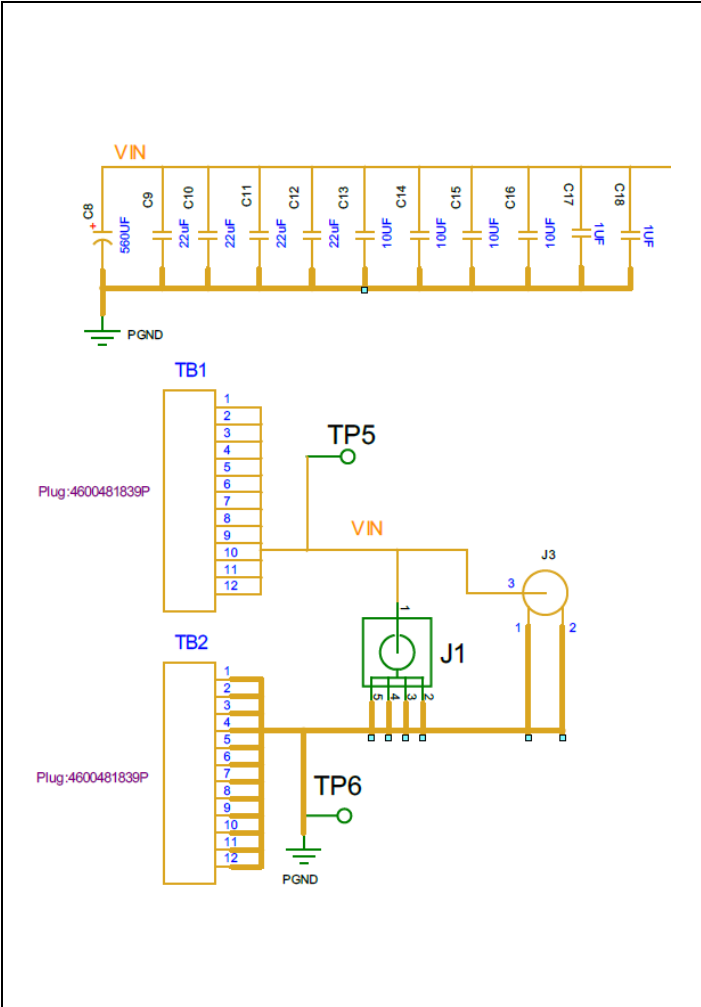


TOP SIDE





**Input Section**

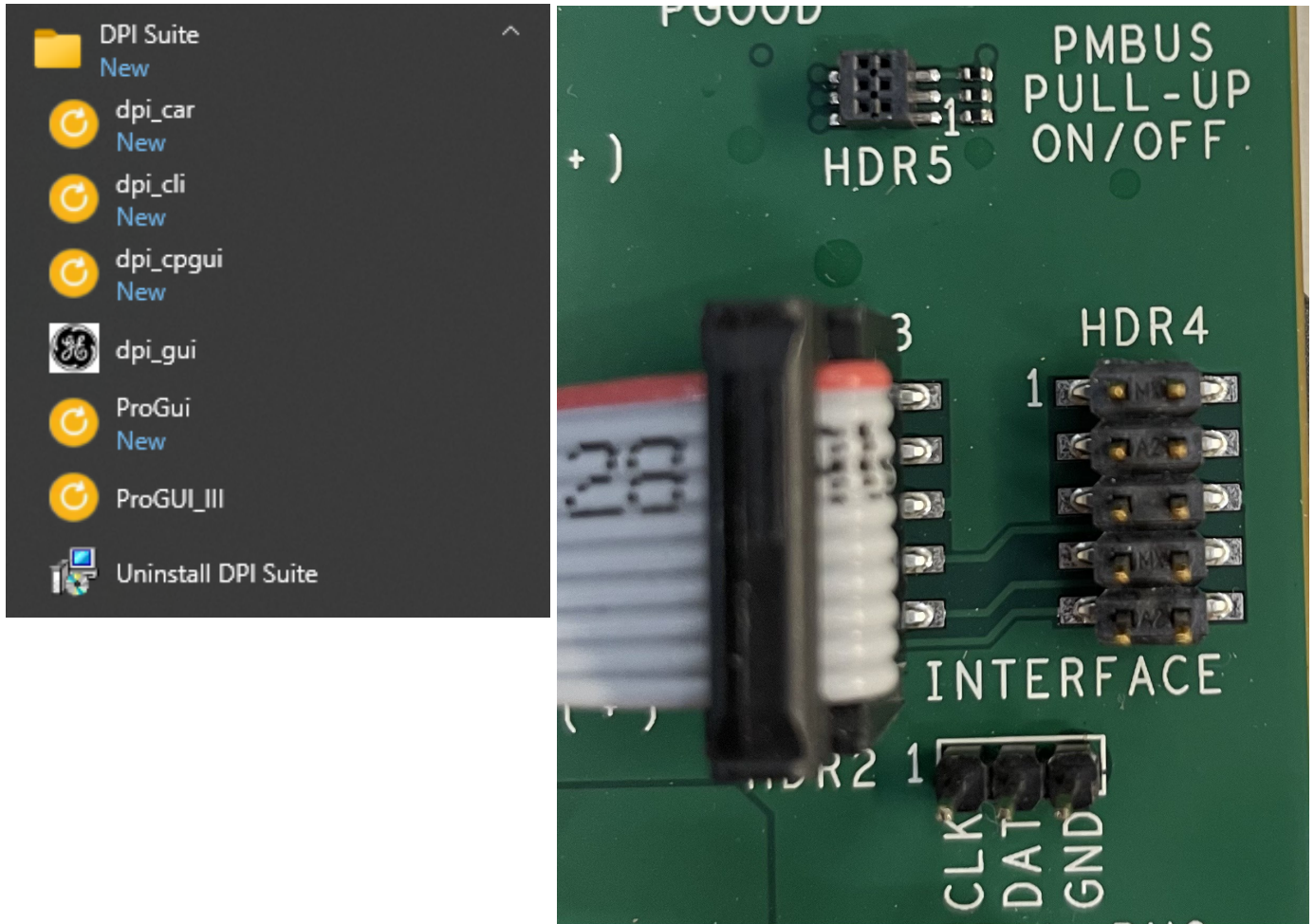


Output Section

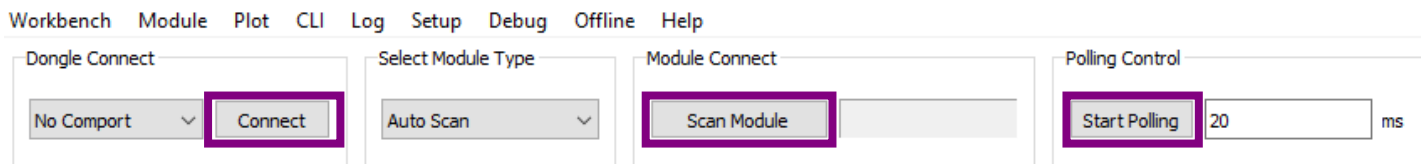
<p>Schematic diagram of the output section. It shows a network of capacitors: C101 (22000PF), C102 (0.1uF), C103 (22000PF), and C104 (15000PF). A VOUT SENSING circuit is connected to connector J4. The output is labeled VOUT1.</p>	<p>Photographs of the physical components on the PCB: J2 (a large connector), TP8 (a test point), GND (ground), and J4 (a small connector).</p>
<p>Detailed schematic of the output filter network. It shows a series of capacitors C30 through C44 (all 47uF) and C50 through C59 (all 47uF). The network is connected to connector J5 and ground (PGND). The output is labeled VOUT1.</p>	<p>Photographs showing the top and bottom sides of the output filter network components. The top side shows connector J5 and the bottom side shows the capacitors and their connections.</p>
<p>Schematic diagram showing the connection of the output section to test points TP7 and TP8, and connectors TB3 and TB4. The output is labeled VOUT1. The connectors are Plug:4600481839P.</p>	<p>Photograph of the bottom side of the PCB showing components TB3 and TB4. The components are connected to the output section.</p> <p>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.</p>

## 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.

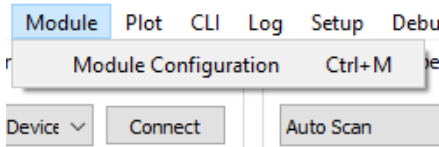


Click on Connect and then Scan Module to find the FPLX module and then click on Start Polling.

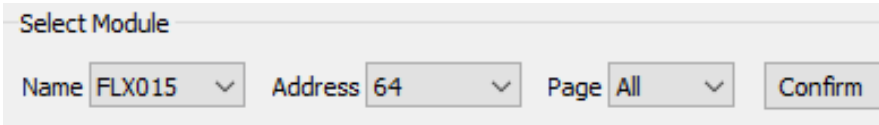


## 2.2.1. ProGUI Connection and Setup - Initialization

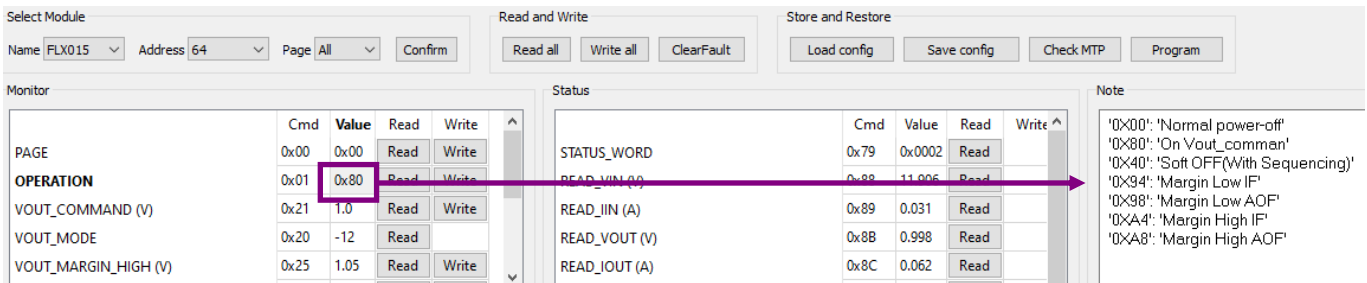
- Click on “Module” in the top left corner and then click on Module Configuration.



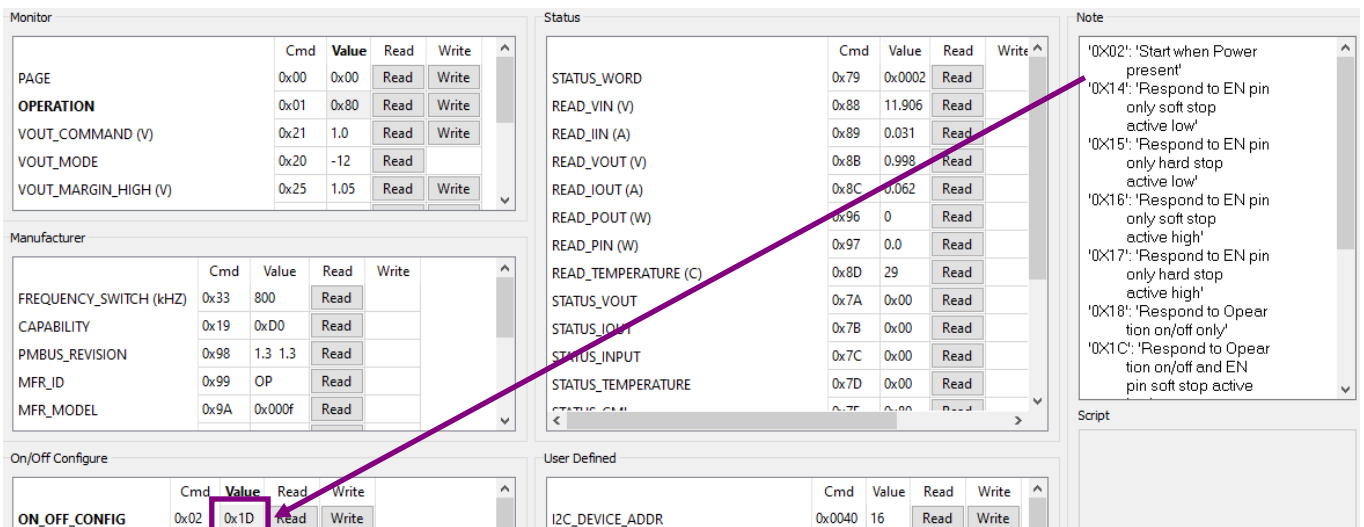
- A new window will open up. Click on the Confirm button to allow access to the module.



- 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

The screenshot shows the 'Module Configuration' window for a device named 'FLX015'. The interface is divided into several sections: 'Monitor', 'Manufacturer', 'On/Off Configure', 'Limits', 'Status', 'User Defined', and 'Note'. At the top, there are control buttons for 'Confirm', 'Read and Write' (with 'Read all', 'Write all', and 'ClearFault' sub-buttons), 'Store and Restore' (with 'Load config' and 'Save config' sub-buttons), and 'Check MTP' / 'Program'.

Callouts provide the following explanations:

- Starts communication:** Points to the 'Confirm' button.
- Read / Write command for all registers:** Points to the 'Read all' and 'Write all' buttons.
- Use these to save values of all registers to a local file on the or load a local file with desired register values:** Points to the 'Load config' and 'Save config' buttons.
- MTP shows current no. of writes available and Program writes all register values into NVM:** Points to the 'Check MTP' and 'Program' buttons.
- Core R/W registers affecting many other registers:** Points to the 'Monitor' section.
- Read only registers with MFR data:** Points to the 'Manufacturer' section.
- Adjustment of ON/OFF thresholds and ramp-up:** Points to the 'On/Off Configure' section.
- Fault, and Warning Thresholds and Response behavior:** Points to the 'Limits' section.
- Read only registers with Performance data and Status Registers:** Points to the 'Status' section.
- Advanced Performance registers including Module Calibration and response:** Points to the 'User Defined' section.

The 'Monitor' section contains the following data:

Register Name	Cmd	Value	Read	Write
PAGE	0x00	0x00	Read	Write
OPERATION	0x01	0x80	Read	Write
VOUT_COMMAND (V)	0x21	1.0	Read	Write
VOUT_MODE	0x20	-12	Read	Write
VOUT_MARGIN_HIGH (V)	0x25	1.05	Read	Write

The 'Manufacturer' section contains the following data:

Register Name	Cmd	Value	Read	Write
FREQUENCY_SWITCH (KHZ)	0x33	800	Read	Write
CAPABILITY	0x19	0xD0	Read	Write
PMBUS_REVISION	0x98	1.3 1.3	Read	Write
MFR_ID	0x99	OP	Read	Write
MFR_MODEL	0x9A	0x00f	Read	Write

The 'On/Off Configure' section contains the following data:

Register Name	Cmd	Value	Read	Write
ON_OFF_CONFIG	0x02	0x1D	Read	Write
VOUT_MAX (V)	0x24	2.25	Read	Write
VOUT_MIN (V)	0x2B	0.25	Read	Write
VIN_ON (V)	0x35	6.0	Read	Write
VIN_OFF (V)	0x36	5.5	Read	Write

The 'Limits' section contains the following data:

Register Name	Cmd	Value	Read	Write
VOUT_OV_FAULT_LIMIT (V)	0x40	2.2	Read	Write
VOUT_OV_FAULT_RESPONSE	0x41	0xBF	Read	Write
VOUT_UV_FAULT_LIMIT (V)	0x44	0.3	Read	Write
VOUT_UV_FAULT_RESPONSE	0x45	0xBF	Read	Write
IOUT_OC_FAULT_LIMIT (A)	0x46	18.0	Read	Write

The 'Status' section contains the following data:

Register Name	Cmd	Value	Read	Write
STATUS_WORD	0x79	0x0002	Read	Write
READ_VIN (V)	0x88	11.906	Read	Write
READ_IIN (A)	0x89	0.031	Read	Write
READ_VOUT (V)	0x8B	0.998	Read	Write
READ_IOUT (A)	0x8C	0.062	Read	Write
READ_POUT (W)	0x96	0	Read	Write
READ_PIN (W)	0x97	0.0	Read	Write
READ_TEMPERATURE (C)	0x8D	29	Read	Write
STATUS_VOUT	0x7A	0x00	Read	Write
STATUS_IOUT	0x7B	0x00	Read	Write
STATUS_INPUT	0x7C	0x00	Read	Write
STATUS_TEMPERATURE	0x7D	0x00	Read	Write

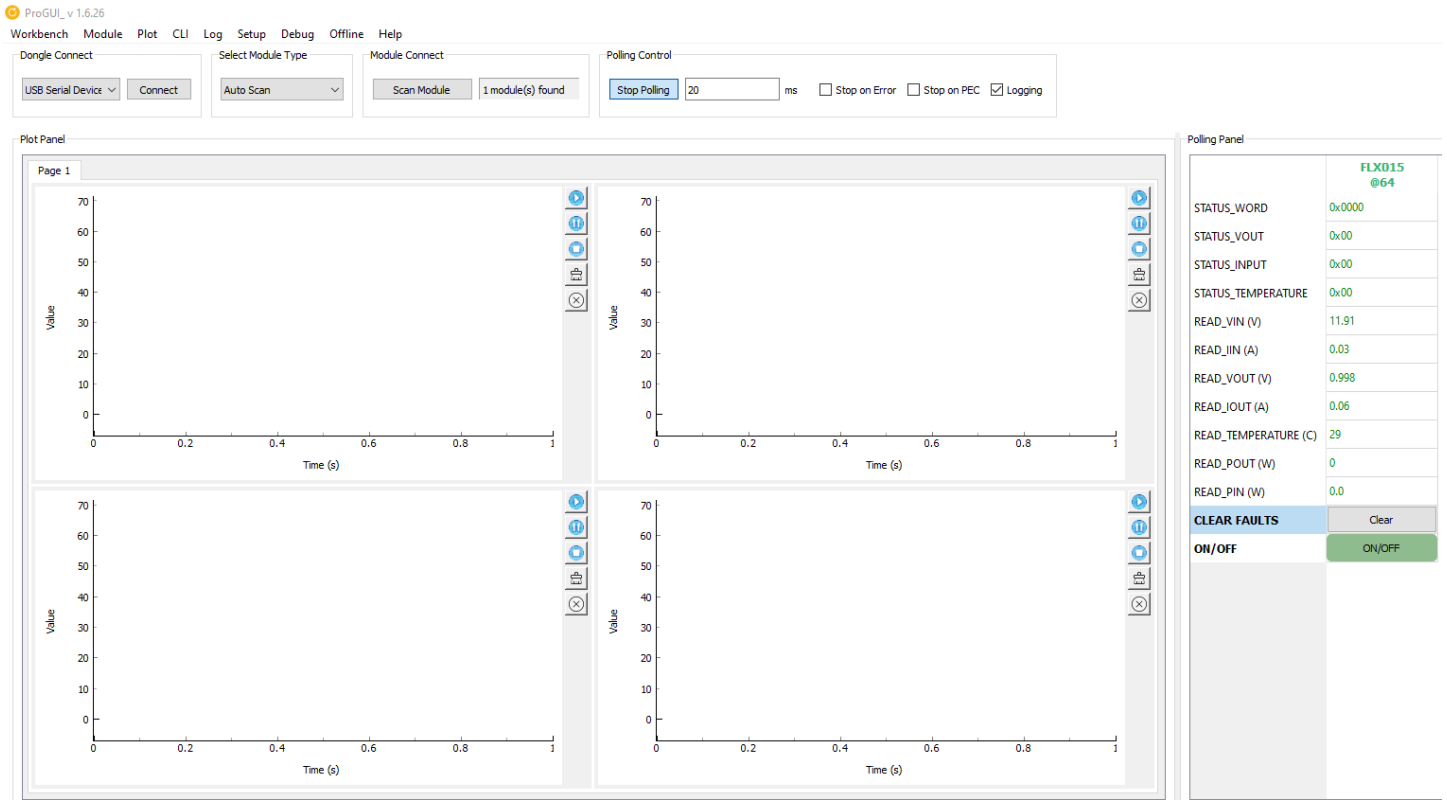
The 'User Defined' section contains the following data:

Register Name	Cmd	Value	Read	Write
I2C_DEVICE_ADDR	0x0040	16	Read	Write
PMB_DEVICE_ADDR	0x0040	64	Read	Write
I2C_PMB_ADD_LOCK	0x00D4	1	Read	Write
RELATIVE_OVP_THRESH_EN	0x005E	1	Read	Write
RELATIVE_OVP_THRESH	0x005E	3	Read	Write
FIXED_OVP_THRESH	0x0060	6	Read	Write
RELATIVE_UVP_THRESH_EN	0x005E	1	Read	Write
RELATIVE_UVP_THRESH	0x005E	3	Read	Write
DISABLE_REL_OVP	0x0060	0	Read	Write
VBOOT_OVERRIDE_PIN	0x005E	1	Read	Write
FOVP_OVERRIDE_PIN	0x005E	1	Read	Write
ROVP_OVERRIDE_PIN	0x005E	1	Read	Write
DISABLE_REL_UVP	0x0060	0	Read	Write

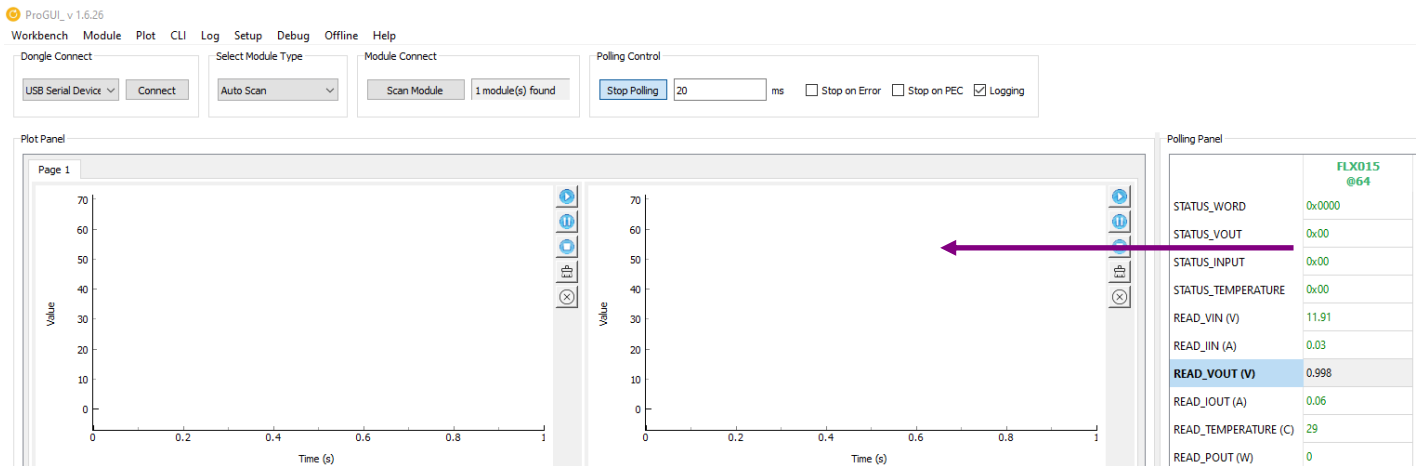
The 'Note' section contains the following text:

```
'0x00': 'Normal power-off'
'0x80': 'On Vout_commen'
'0x40': 'Soft OFF(With Sequencing)'
'0x34': 'Margin Low IP'
'0x38': 'Margin Low AOP'
'0xA4': 'Margin High IP'
'0xA8': 'Margin High AOP'
```

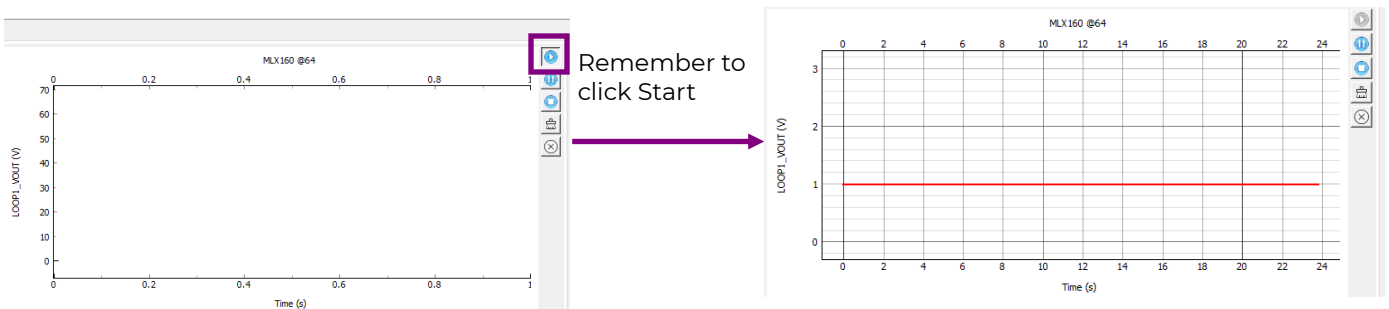
### 2.2.3. ProGUI Connection and Setup - Polling



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.

Polling Panel

FLX015 @64	
STATUS_WORD	0x0801
STATUS_VOUT	0x00
STATUS_INPUT	0x00
STATUS_TEMPERATURE	0x00
READ_VIN (V)	11.88
READ_IIN (A)	0.03
READ_VOUT (V)	0.102
READ_IOUT (A)	0.06
READ_TEMPERATURE (C)	28
READ_POUT (W)	0
READ_PIN (W)	0.0
<b>CLEAR FAULTS</b>	Clear
<b>ON/OFF</b>	ON/OFF

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

Polling Panel

FLX015 @64	
STATUS_WORD	0x0000
STATUS_VOUT	0x00
STATUS_INPUT	0x00
STATUS_TEMPERATURE	0x00
READ_VIN (V)	11.91
READ_IIN (A)	0.03
READ_VOUT (V)	0.998
READ_IOUT (A)	0.06
READ_TEMPERATURE (C)	29
READ_POUT (W)	0
READ_PIN (W)	0.0
<b>CLEAR FAULTS</b>	Clear
<b>ON/OFF</b>	ON/OFF

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

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

The screenshot shows the ProGUI interface with the 'Module Configuration' menu open. The 'Select Module' dialog is set to Name: FLX015, Address: 64, Page: All. Below, the 'Monitor' and 'Status' panels are visible. The 'Monitor' panel shows the 'ON\_OFF\_CONFIG' register with a value of 0x02. The 'Status' panel shows various status registers like STATUS\_WORD, READ\_VIN (V), etc. The 'On/Off Configure' panel shows the 'ON\_OFF\_CONFIG' register with a value of 0x02. The 'User Defined' panel shows the 'I2C\_DEVICE\_ADDR' register with a value of 16.

Change ON\_OFF\_CONFIG to 0x02 and then module turns ON.

The 'On/Off Configure' panel shows the 'ON\_OFF\_CONFIG' register with a value of 0x02. The 'Polling Panel' shows the status of the module, with 'READ\_VOUT (V)' highlighted at 0.998.

Register	Value
STATUS_WORD	0x0000
STATUS_VOUT	0x00
STATUS_INPUT	0x00
STATUS_TEMPERATURE	0x00
READ_VIN (V)	11.91
READ_IIN (A)	0.03
<b>READ_VOUT (V)</b>	<b>0.998</b>
READ_IOUT (A)	0.06

## 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 to 3.6 with FB divider)
VOUT_MAX	0x24	2	16-bit linear	V	R/W	0x2400 (2.25 V)	0.4 to 2.25/(0.5 to 3.7 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 to 14.5
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 to 3.6 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 to 3.6 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 Elektronik	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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