

# **iJB Parallel Eval Board Operators Guide**

This Guide shows you how to Get Started and use your IJB Parallel Evaluation System.

Please contact to TDK-Lambda if you have any questions or need further product details.

Note: The GUI software is provided on a CD-ROM and is also available at <http://www.us.tdk-lambda.com/lp/contacts/gui-download-page/>. If downloading from the web, registration is required.

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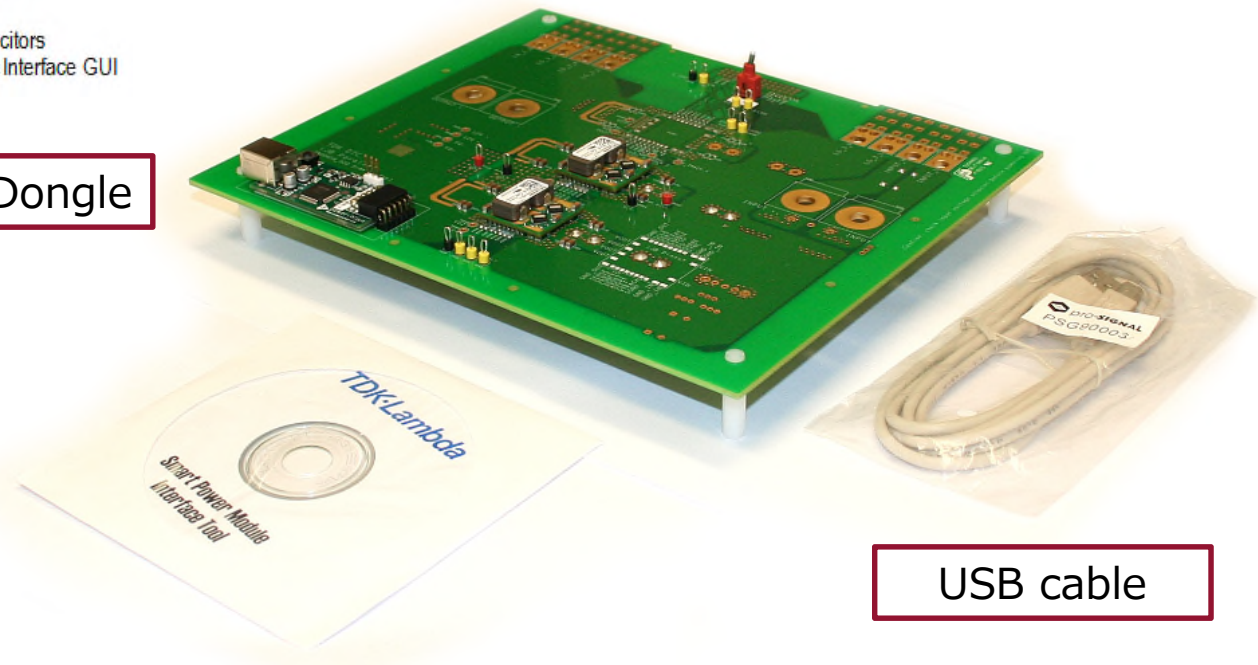
## Features

- iJB12060A007V-002-R power module
- USB to PMBus Dongle Board
- Cables to make PC connection
- Required Input & Output filter capacitors
- CD with TDK Smart Power Module Interface GUI

PMBus Dongle

EVAL Board

Software CD-ROM



USB cable

## Ordering Information

Code	Input Voltage	Output Voltage	Output Current	Note
iJBEB2	8.0-14.0V	0.6 – 2V	110A	Comes with two iJB modules installed to allow parallel module evaluation

## ***TDK-Lambda***

## **iJB Series**

### **60A Non-isolated SMT Point of Load with PMBus**

#### **Features**

- ◆ Only 1.0 in<sup>2</sup> Board Space
- ◆ PMBus Compliant (Read & Write)
- ◆ Surface Mountable
- ◆ Digital Adaptive Control
- ◆ Parallel Operation with Current Sharing
- ◆ Configurable Sequence & Fault Management

#### **Key Market Segments & Applications**



Vi: 8 – 14 VDC

Vo: 0.6 to 3.3 Volts

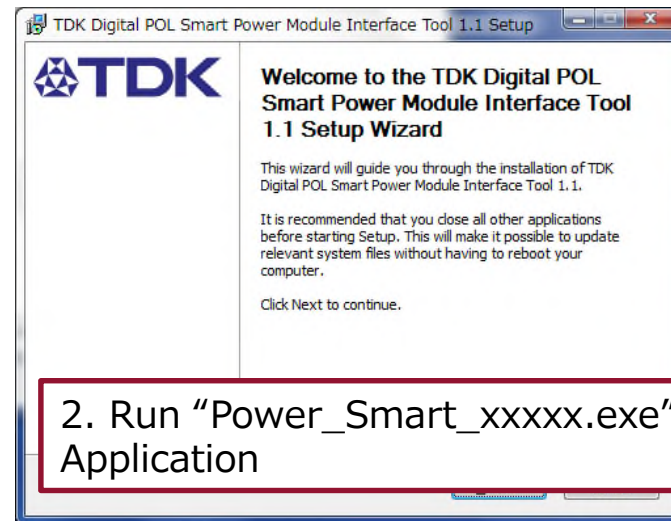
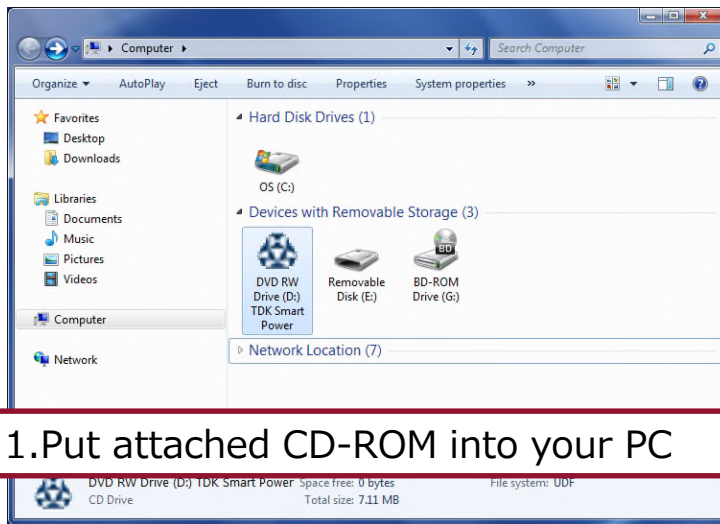
100 Watts

35 Amps



# Install GUI Interface Tool

The Smart Power Interface tool allows the user to configure and operate the iJB device via the PMBus. Install as shown.



\*Require Windows XP or later



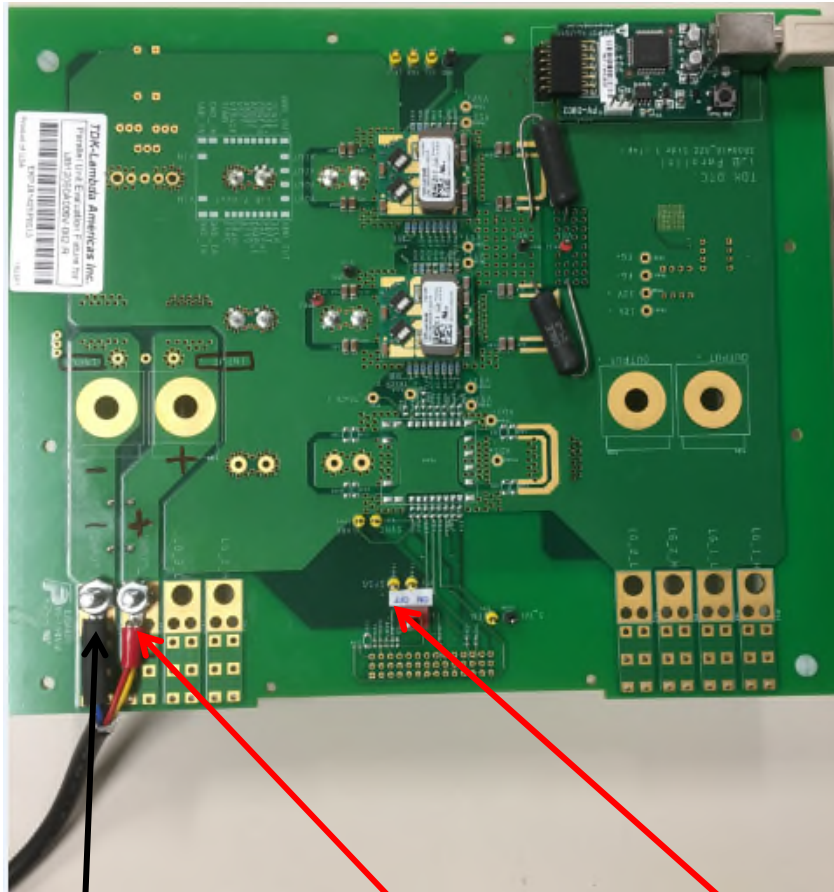
A icon will appear on your desktop after install.

**Please check latest version on our website**

<http://www.us.tdk-lambda.com/lp/contacts/gui-download-page/>

- **System requirements**
  - **Windows XP, Windows 7 (32bit or 64bit)**
  - **Java**
  - **Free USB port**
- **GUI installation**
  - **Do not connect USB cable !**
  - **Install “SmartPower\_1.1\_20130926\_win32-setup.exe”**
  - **Follow the instruction by the installer**
  - **Close GUI**
- **Evaluation board set-up**
  - **Apply 12V source to the Vin terminal (see picture 1)**
  - **Connect USB cable to board and PC**
  - **Driver will be installed**

# Connect the Power



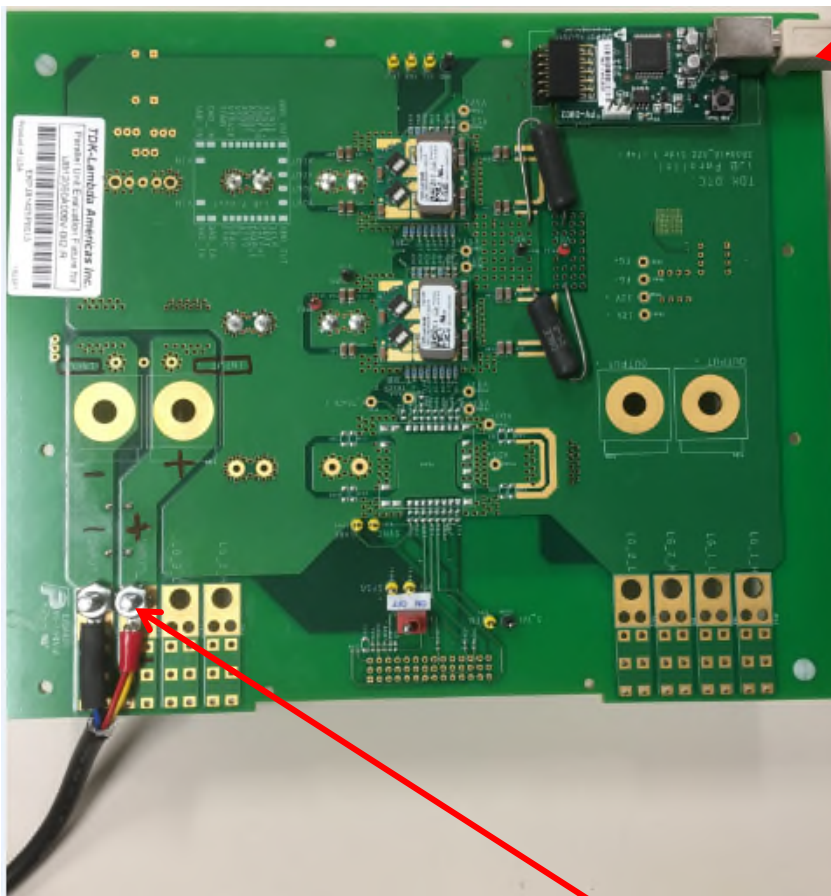
## Input Voltage Range:

Code	Input Voltage
iJB_Evaluation_Kit-R	8.0-14.0V
iJB_Eval_Kit_Parallel-R	8.0-14.0V

-  
+  
**Observe Polarity!**

**Enable Switch to "OFF" position!**





1) Connect USB from computer to Dongle Input

2) Energize Eval Board



Launch the GUI

## Single mode Screen:

The screenshot shows the 'Configure' tab of the GUI. The 'Basic' sub-tab is active, displaying the 'Configuration' section. The settings are as follows:

Parameter	Value	Unit	Default
V <sub>OUT</sub> Trim:	0.000	V	0.000 V
V <sub>OUT</sub> Max:	1.600	V	1.600 V
V <sub>OUT</sub> Scale Loop:	Internal Rdiv On/Off		1.0000
V <sub>OUT</sub> Tracking:	Off		OFF
Slew Rate:	1.042	mV/μs	1.042 mV/μs
ON Rise Time:	2.9	ms	2.9 ms
ON Time Delay:	2.0	ms	2.0 ms
OFF Time Delay:	0.0	ms	0.0 ms
Upper Voltage Margin:	5.0	%	1.050 V
Lower Voltage Margin:	-5.0	%	0.950 V

The 'On/Off Configuration' section is also visible:

Parameter	Value	Default
Requires OPERATION ON:	No	NO
Requires CTRL Pin Asserted:	Yes	YES
CTRL Pin Polarity:	Active High	HIGH
CTRL Pin Off Action:	Turn Off Delay	DELAY

The 'Power Stage' section shows:

Parameter	Value	Unit	Default
Calibrated Current Sense Element (@ 25°C):	0.770	mΩ	0.770 mΩ

Configure Tab Shows Default Basic Configuration Settings

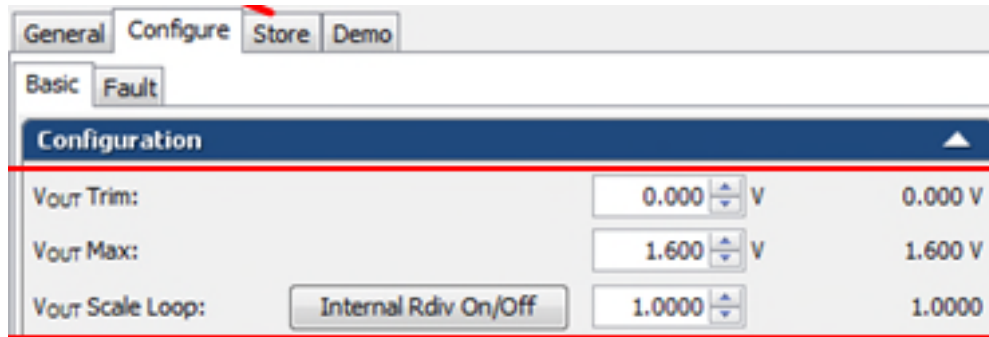
Controls Output voltage Trim values, allowable maximum output voltages and scaling selection (internal or external).

Controls Ratiometric output voltages for non parallel operation.

Controls Output voltage timing on power up and power down.

Sets incremental voltage margin control in percent.

Establishes on/off hardware control features.



- The Power Modules feature an internal voltage divider which can be disabled to enhance voltage setpoint accuracy when no attenuation is required. (output voltage 1.500 volts or lower). During startup the module will turn the divider on or off depending on the VOUT\_OV\_FAULT\_LIMIT that was determined based on Rset value. With voltage attenuation off, VOUT\_MAX = 1.6 V. With voltage attenuation on, VOUT\_MAX = 3.5 V.
- If you want to change to higher voltage then you must turn voltage divider on (select 0.2857). This will happen automatically if resistor on Vset pin is changed so generally a user does not need to worry about this item, but in case of EV-kit they may need to turn on or off.

## Single mode Screen:

The screenshot shows the 'Fault' configuration tab in a GUI. On the left, there are mode selection buttons (Single Mode, System Mode), device selection (PV3012 [0000:10], PV3012 [0000:11]), and status/faults indicators. The main area contains several sections of settings:

- Fault Limits:**
  - Input OVLO Limit: 15.00 V
  - Input UVLO Turn-On Threshold: 7.60 V
  - Input UVLO Turn-Off Threshold: 7.00 V
  - Output OVP Limit: 1.199 V
  - Output OVP Response Delay: 39.99  $\mu$ s
  - Output OVP Retry/Latch: Retry
  - Output OCP Limit: 67 A
  - Output OCP Response Delay: 1500.0  $\mu$ s
  - Output OCP Retry/Latch: Retry
  - Output OCP Retry Delay: 500 ms
  - OTP Limit: 125  $^{\circ}$ C
  - UTP Limit: -40  $^{\circ}$ C
- Warning Limits:**
  - Output UV Limit: 0.801 V
  - OT Limit: 125  $^{\circ}$ C
  - UT Limit: -40  $^{\circ}$ C

Shows Default Fault Limit Settings

Sets Input Voltage fault limits and thresholds.

Sets Output Overvoltage Protection Fault Limits

Sets Output Overcurrent protection Limits

Sets Operating Temperature upper and lower limits

Sets Output Undervoltage Limits

Sets Operating Temperature Warning upper and lower limits

# Run the GUI (cont.)

- Connect the Converters  
Use the GUI Schematic Capture feature to connect the two onboard converters for parallel operation

System Mode

The screenshot displays the TDK GUI in System Mode. A red arrow points to the 'System Mode' radio button in the top-left corner. The left sidebar shows the 'Status' section with 'BUSY' (green), 'OFF' (red), and 'Power Good' (red) indicators, and the 'Faults' section with various fault indicators (green). The central configuration panel includes:

- System Components:** 'Add Power Src', 'Add Power Out', 'Save', 'Load', and a 'Graph Scale' slider (25% to 200%).
- Device Configuration:** 'Vout Setting' (1.000 V), 'Operation On/Off' (OPERATION), 'Power Good' (red), 'Margining' (None), 'Digital Stress Share' (On), 'DSS Auto-Zero' (Disable), 'Sync Selection' (Master), and 'Slave Phase Shift' (0).
- Device Properties:** 'Name' (POL 0), 'Color' (red), 'PMBus Address' (0000:10), 'Monitoring On/Off' (checked), and two empty 'Description Line' fields.

The right schematic capture area shows two power modules, POL 0 (0000:10) and POL 1 (0000:11), connected in parallel. Each module displays its input/output voltages, current, and control signals (CTRL, PG, SYSG).



# Run the GUI (cont.)

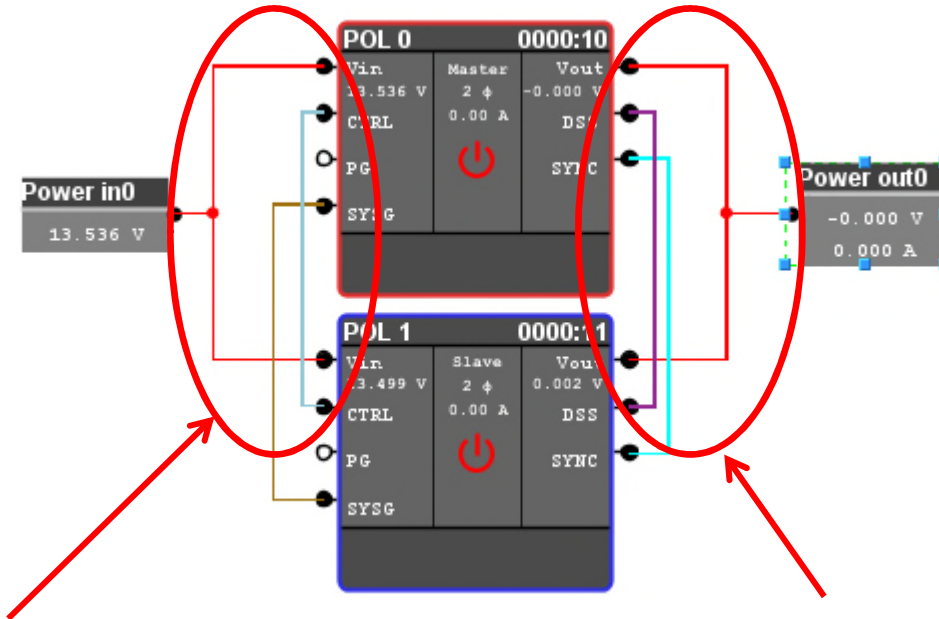
- Click Add Power Source
- Click Add Power Out
- Connect the Converters
  - Use the GUI Schematic Capture feature to connect the two onboard converters for parallel operation

The screenshot displays the TDK GUI interface. On the left, there are panels for 'Status' (showing BUSY, OFF, Power Good) and 'Faults' (listing various warnings like Input OVLO, Output OVP, etc.). The main area is divided into several sections:

- System Components:** Contains 'Add Power Src' and 'Add Power Out' buttons, which are highlighted with red arrows. Below them are 'Save' and 'Load' buttons, and a 'Graph Scale' slider.
- Device Configuration:** Shows 'Vout Setting' at 1.000 V, 'Operation On/Off' set to OPERATION, 'Power Good' status, 'Margining' set to None, 'Digital Stress Share' set to On, 'DSS Auto-Zero' set to Disable, 'Sync Selection' set to Master, and 'Slave Phase Shift' at 0.
- Device Properties:** Includes fields for Name, Color, PMBus Address, Monitoring On/Off, and two Description Lines.
- Monitoring:** Two converter status windows are shown:
  - POL 0 0000:10:** Vin: 13.533 V, Master, Vout: -0.000 V, CTRL: 0.00 A, DSS, PG: SYNC, SYSG.
  - POL 1 0000:11:** Vin: 13.499 V, Slave, Vout: 0.002 V, CTRL: 0.00 A, DSS, PG: SYNC, SYSG.
- Graphs:** A 'V<sub>IN</sub>' graph shows a voltage step from 10V to 15V. An 'Output Voltage' graph shows a step from 1.0V to 5.0V.
- Table:** A table at the bottom right summarizes the converter settings:
 

POL	Vout ...	ON Delay (...)	ON
■ P...	1.000	2.0	
■ P...	1.000	2.0	

# Run the GUI (cont.)



Use the hand tool to connect POL 0 and POL 1 Vin connections to the Power in0 Block as shown.

Use the hand tool to connect POL0 and POL1 Vout connections to the Power out0 Block as shown.

Remaining Connections are made automatically!



# Establish Fault Limits

Selects which of the two modules the settings apply to.

The image displays two side-by-side screenshots of the PV3012 converter configuration interface. Both screenshots show the 'Fault Limits' section with the following settings:

- Input OVLO Limit: 15.00 V
- Input UVLO Turn-On Threshold: 7.60 V
- Input UVLO Turn-Off Threshold: 7.00 V
- Output OVP Limit: 1.520 V
- Output OVP Response Delay: 39.99 μs
- Output OVP Retry/Latch: Retry
- Output OCP Limit: 50 A
- Output OCP Response Delay: 1500.0 μs
- Output OCP Retry/Latch: Retry
- Output OCP Retry Delay: 500 ms
- OTP Limit: 125 °C
- UTP Limit: -40 °C
- Output UV Limit: 0.801 V
- OT Limit: 125 °C
- UT Limit: -40 °C

Red boxes highlight the 'Output OVP Limit' and 'Output OCP Limit' settings in both screenshots. Red arrows point to the module selection dropdowns, which are set to 'PV3012 [0000:10]' on the left and 'PV3012 [0000:11]' on the right.

Since both modules are connected in parallel, all values for each of the converters must be the same for uniform operation.

- Set Output OVP to 1.52 Volts for both converters
- Set Output OCP to 50 Amps for both converters

# The Store Tab

The screenshot shows the configuration software interface with the 'Store' tab selected. The 'Store' button is highlighted with a red box, and a red arrow points to it from a text box on the right. The interface includes various configuration sections such as 'Default Settings', 'Customer info', 'Vout ~ Margins', 'Current Sense ~ Power ~ Margining', 'On/Off Configuration', 'Control loop', 'Digital Stress Share', 'Fault Limits', 'Warning Limits', and 'Programmable Power Good'.

The NVM capacity on the iJX devices is limited; using the Store function is not advised.

Values can be changed in working memory without using the "store" command.

# Exercise the Modules

Turn ENABLE switch on eval board "ON".

The screenshot displays the TDK software interface for monitoring a power system. On the left, the 'System Components' panel shows two power modules: PV3012 [0000:10] (highlighted in red) and PV3012 [0000:11]. The 'Status' panel shows 'Power Good' as active. The 'Faults' panel lists various protection events, all of which are currently inactive. The 'Device Configuration' panel shows the output voltage set to 1.000 V and the system in 'OPERATION' mode. The 'Device Properties' panel shows the selected module is 'POL 0'.

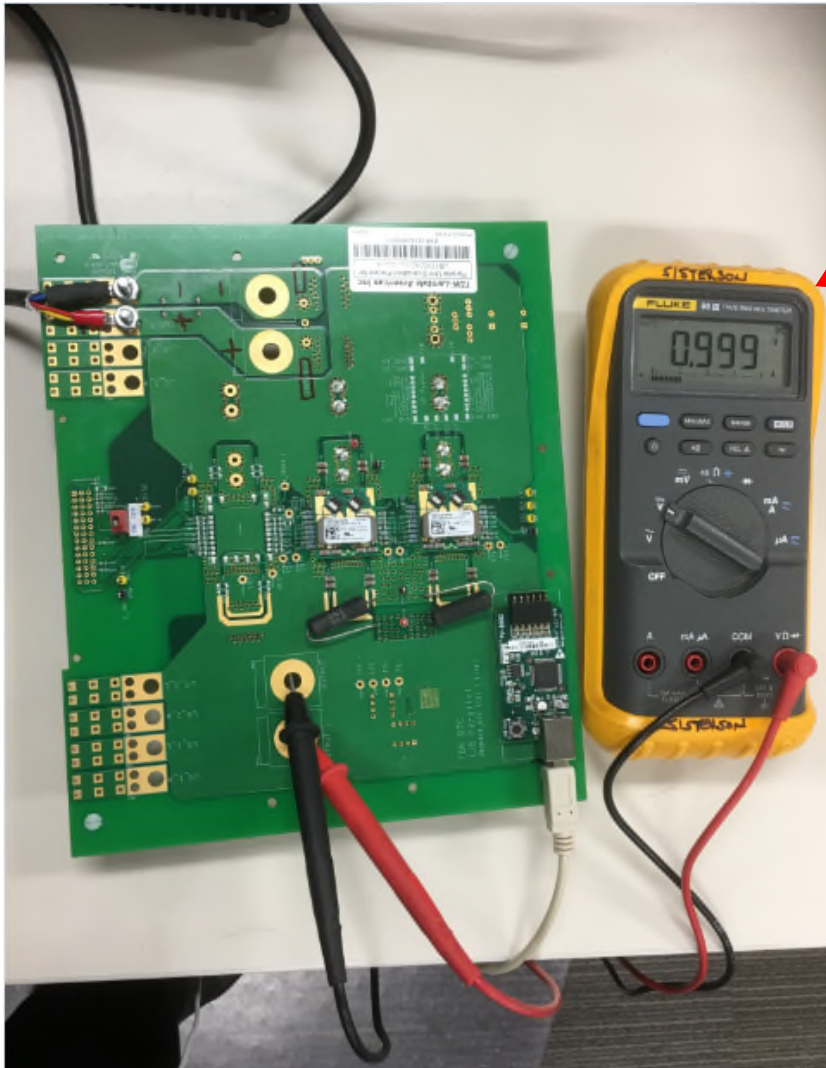
The central diagram shows a block representation of the two converters. 'POL 0' (0000:10) is the master, and 'POL 1' (0000:11) is the slave. They are connected to a 'Power in0' source (13.499 V) and a 'Power out0' output (0.998 V, 8.113 A). The diagram includes labels for V<sub>in</sub>, V<sub>out</sub>, CTRL, PG, and SYNC signals.

On the right, four real-time graphs are displayed: V<sub>in</sub>, V<sub>out</sub>, I<sub>out</sub>, and Temperature. The V<sub>in</sub> graph shows a steady input voltage of approximately 13.5 V. The V<sub>out</sub> graph shows a steady output voltage of approximately 1.0 V. The I<sub>out</sub> graph shows a steady output current of approximately 8.1 A. The Temperature graph shows a steady temperature of approximately 50°C. A fifth graph at the bottom shows the 'Output Voltage' over time, with a 'TOFF' event indicated by a vertical dashed line.

Text on blocks show output voltage and current for each converter.

Shows output voltage at 0.999 V

Graphs show output voltages and currents in real time for each device.



Output Value measured at 0.999  
Volts



# Exercise the Module (cont.)

Change the output voltage to 1.5 Volts:

**System Components**

System Mode:  System Mode

System Components: PV3012 [0000:10], PV3012 [0000:11]

Graph Scale: 25% 50% 75% 100% 150% 200%

**Device Configuration**

Vout Setting: 1.500 V

Operation On/Off:  OPERATION

CONTROL Pin Asserted required to turn unit on

Power Good:

Margining:  None  Low  High

Digital Stress Share:  On  Off

DSS Auto-Zero: Disable

Sync Selection: Master

Slave Phase Shift: 0

**Device Properties**

Name: POL 0

Color:

PMBus Address: 0000:10

Monitoring On/Off:

Description Line 1:

Description Line 2:

**Power in0**: 13.458 V

**Power out0**: 1.498 V, 12.269 A

**Output current trend chart**  
Click & drag to zoom in on a specific area

**Output Voltage** vs **Time**

POL	Vout (V)	ON Delay (ms)	ON Rise (ms)	OFF Delay (ms)
POL 0	1.500	2.0	2.9	0.0
POL 1	1.500	2.0	2.9	0.0

See the change on the output at the board.

**i<sup>2</sup>C Test Points :**

**TP 24: i<sup>2</sup>C Bus Signal Ground**

**TP 23: i<sup>2</sup>C Bus Signal Alert**

**TP 21: i<sup>2</sup>C Bus Signal Data**

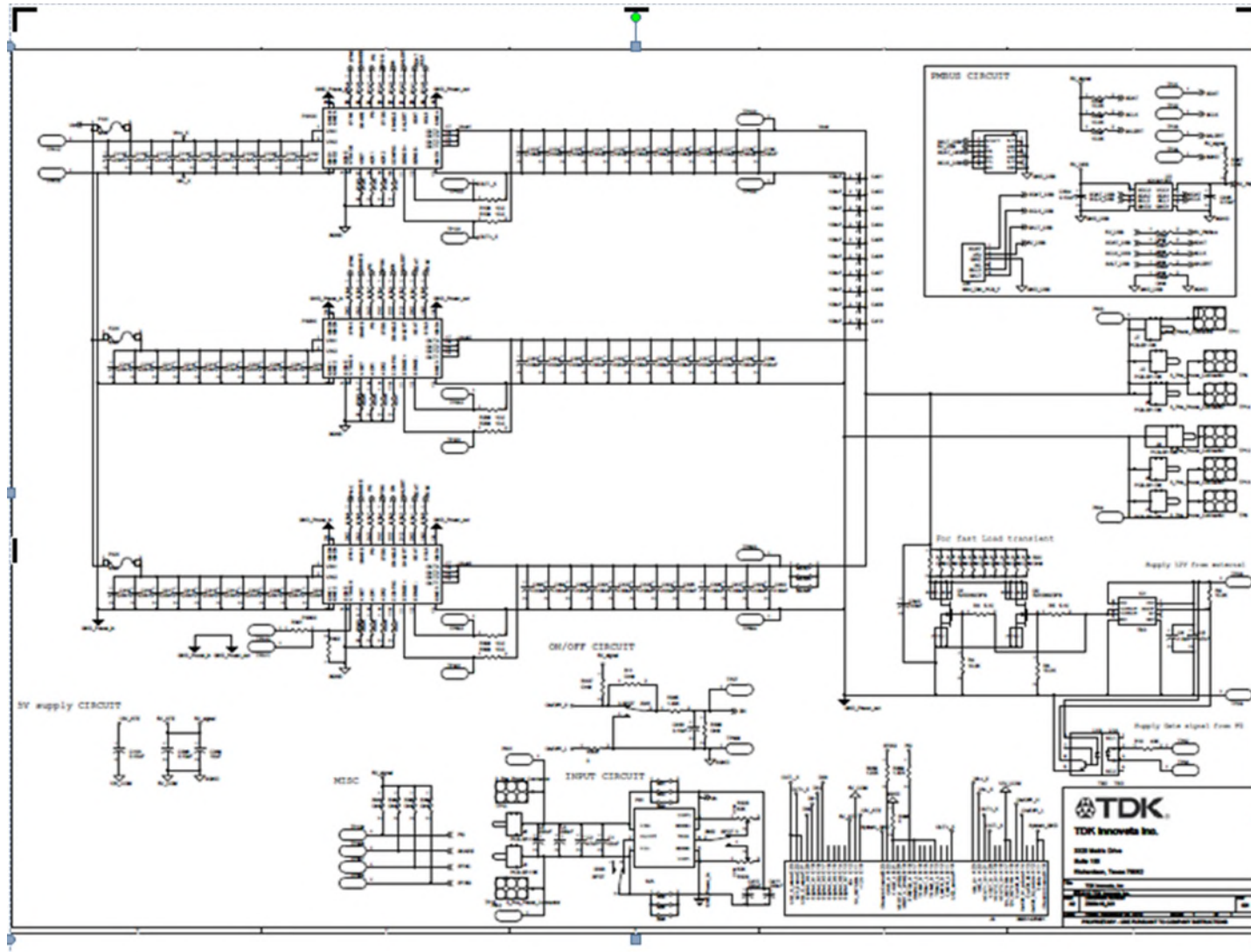
**TP 22: i<sup>2</sup>C Bus Signal Clock**





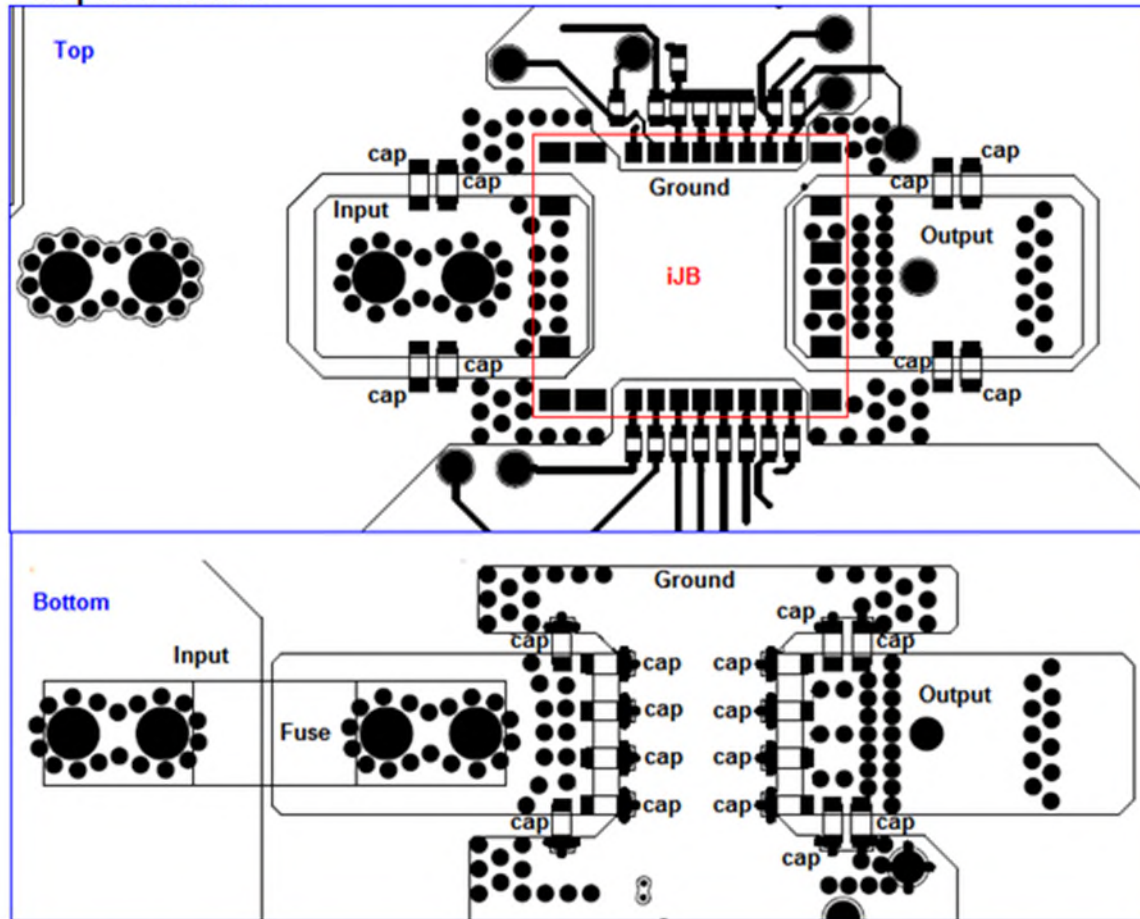
- iJB Parallel Eval Board Simplified Schematic
- Simplified Layout

# Simplified Schematic



# Simplified Layout

**SIMPLIFIED LAYOUT – showing vias & placement of suggested ceramic filter capacitors near power module**



REF DESIGNATOR	VALUE, SIZE, RATING	PART NUMBER	SUPPLIER
COOUTPUT – 12 pieces	100uF, 1206, 6.3V	C3216X5R0J107MT	TDK
Note 10 additional output capacitors of same type (C401-C410) are populated further away from power module			
CINPUT – 10 pieces	22uF, 1206, 16V	C3216X5R1C226MT	TDK