

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 in² 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

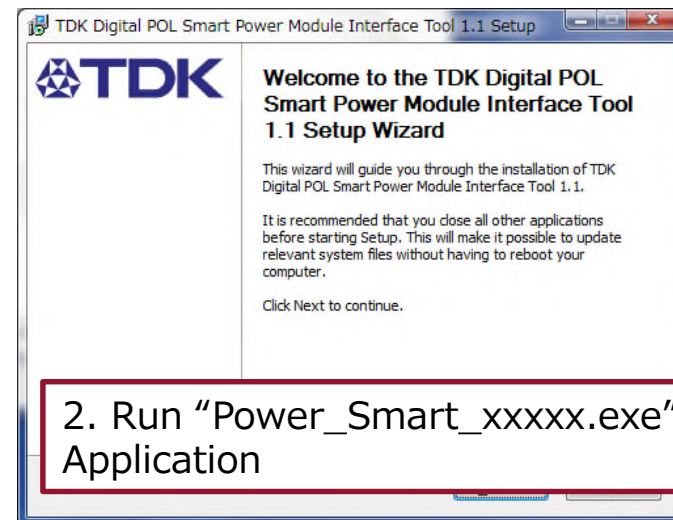
100 Watts

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



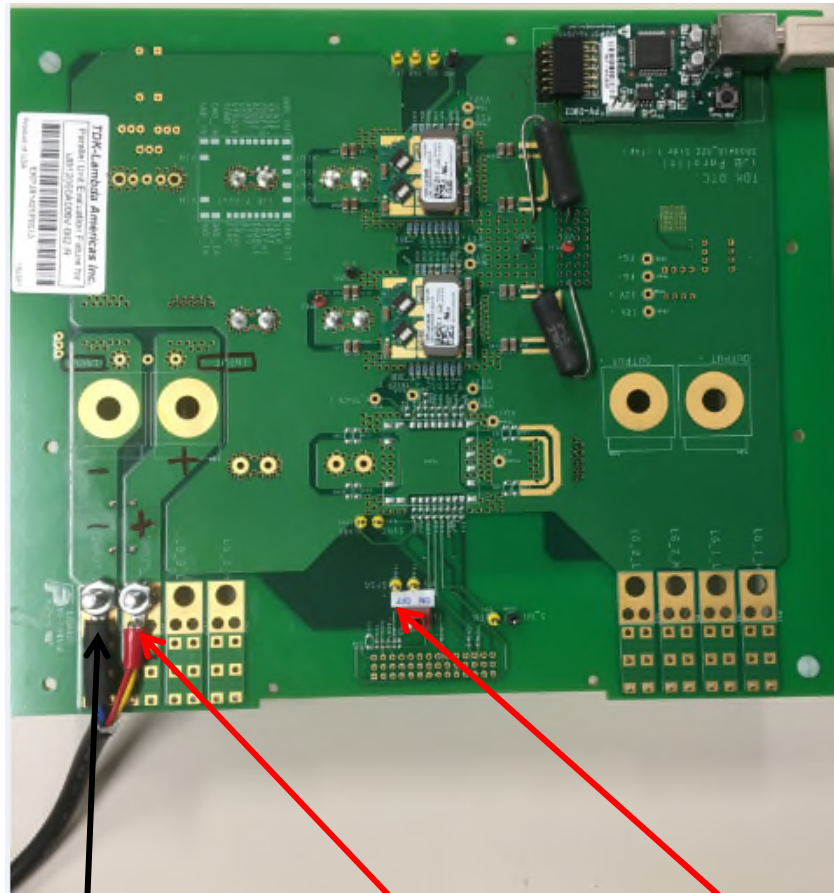
A icon will appear on your desktop after install.

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

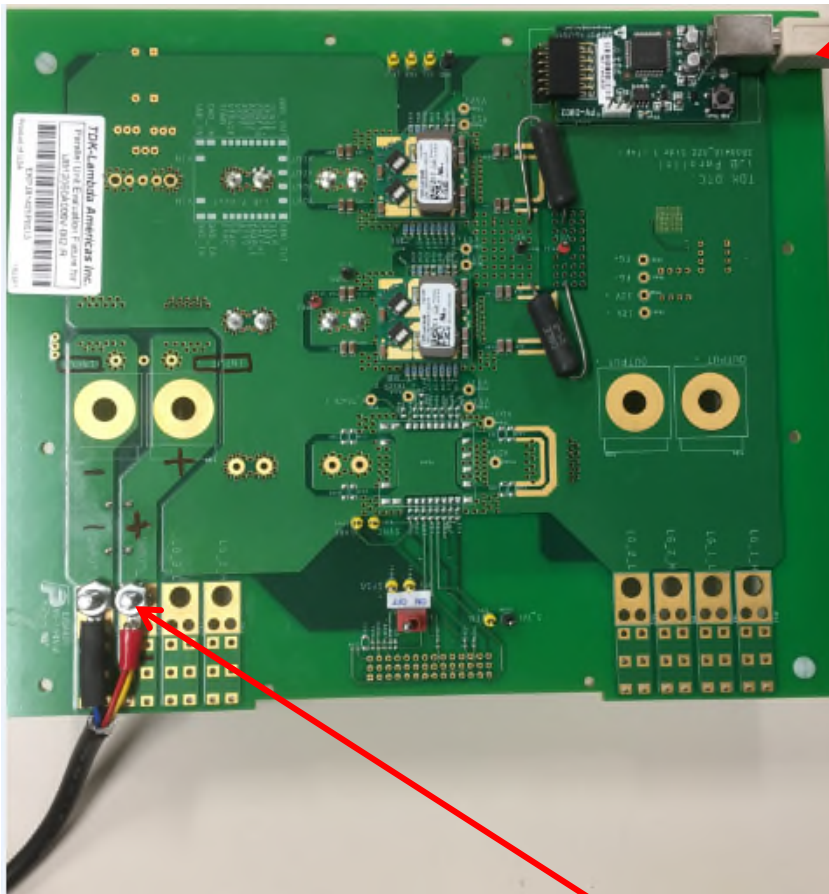


— +
Observe Polarity!

Enable Switch to “OFF” position!

Input Voltage Range:

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



1) Connect USB from computer to Dongle Input

2) Energize Eval Board

Launch the GUI

Single mode Screen:

The screenshot shows the 'Single Mode' configuration screen. On the left, there's a 'Status' section with indicators for BUSY, OFF, and Power Good. Below that is a 'Faults' section listing various fault conditions like Input OVLO, Output OVP, etc. The main area is divided into tabs: 'General', 'Configure', 'Store', and 'Demo'. The 'Configure' tab is active, showing 'Basic' and 'Fault' sub-tabs. The 'Basic' sub-tab is selected, displaying a 'Configuration' section with fields for V_{OUT} Trim, V_{OUT} Max, V_{OUT} Scale Loop, V_{OUT} Tracking, Slew Rate, ON Rise Time, ON Time Delay, OFF Time Delay, Upper Voltage Margin, and Lower Voltage Margin. Below this is an 'On/Off Configuration' section with settings for Requires OPERATION ON, Requires CTRL Pin Asserted, CTRL Pin Polarity, and CTRL Pin Off Action. At the bottom is a 'Power Stage' section with a 'Calibrated Current Sense Element' field. Red boxes and arrows highlight specific areas: the 'Configure' tab, the 'V_{OUT} Trim' and 'V_{OUT} Max' fields, the 'V_{OUT} Tracking' section, the 'Slew Rate' and 'ON Time Delay' fields, the 'Upper Voltage Margin' and 'Lower Voltage Margin' fields, the 'On/Off Configuration' section, and the 'CTRL Pin Off Action' field.

Configure Tab Shows Default Basic Configuration Settings

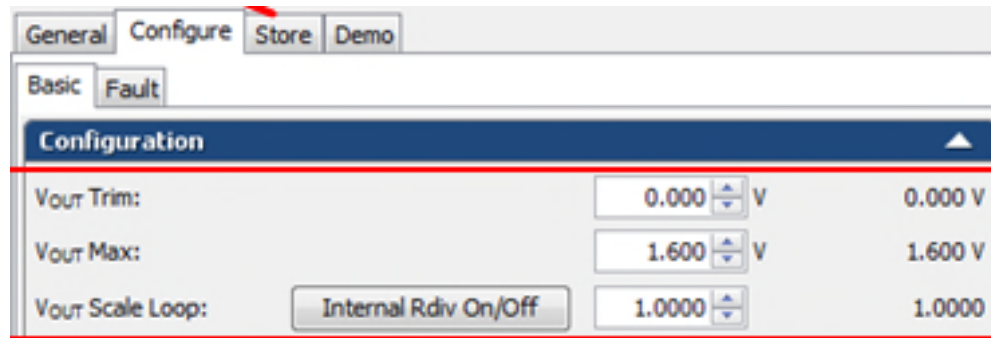
Controls Output voltage Trim values, allowable maximum output voltages and scaling selection (internal or external).

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.

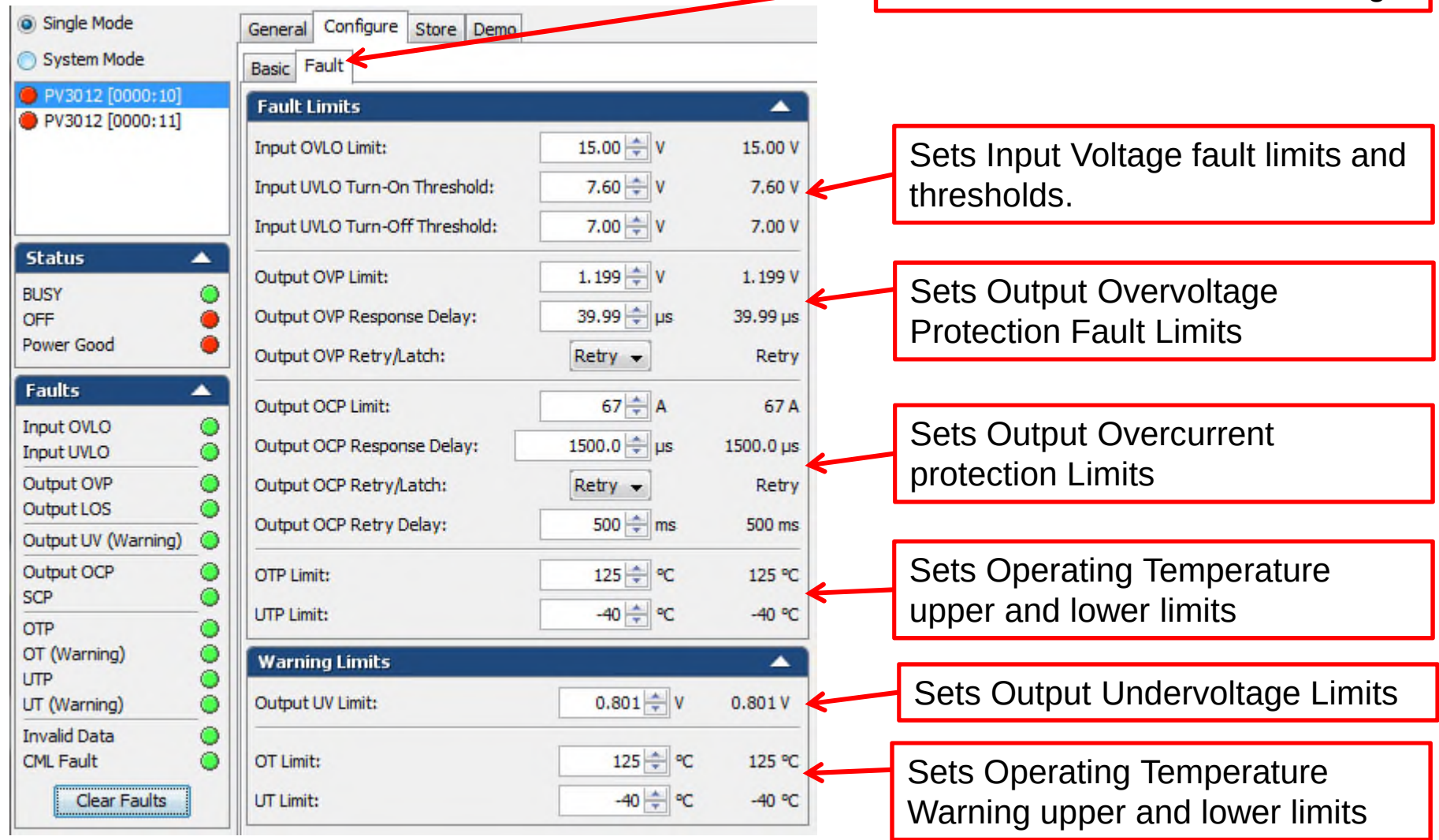
Establishes on/off hardware control features.



- 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.

Run the GUI (cont.)

Single mode Screen:



The screenshot shows the 'Single Mode' screen of the TDK GUI. The interface includes a left sidebar with 'Single Mode' and 'System Mode' options, and a list of faults. The main area is divided into 'General', 'Configure', 'Store', and 'Demo' tabs, with 'Basic' and 'Fault' sub-tabs. The 'Fault' sub-tab is active, displaying 'Fault Limits' and 'Warning Limits' sections. Red arrows point from text boxes to specific settings in the GUI.

Shows Default Fault Limit Settings (points to the 'Fault' sub-tab)

Sets Input Voltage fault limits and thresholds. (points to Input OVLO Limit, Input UVLO Turn-On Threshold, and Input UVLO Turn-Off Threshold)

Sets Output Overvoltage Protection Fault Limits (points to Output OVP Limit, Output OVP Response Delay, and Output OVP Retry/Latch)

Sets Output Overcurrent protection Limits (points to Output OCP Limit, Output OCP Response Delay, Output OCP Retry/Latch, and Output OCP Retry Delay)

Sets Operating Temperature upper and lower limits (points to OTP Limit and UTP Limit)

Sets Output Undervoltage Limits (points to Output UV Limit)

Sets Operating Temperature Warning upper and lower limits (points to OT Limit and UT Limit)

Status: BUSY (green), OFF (red), Power Good (red)

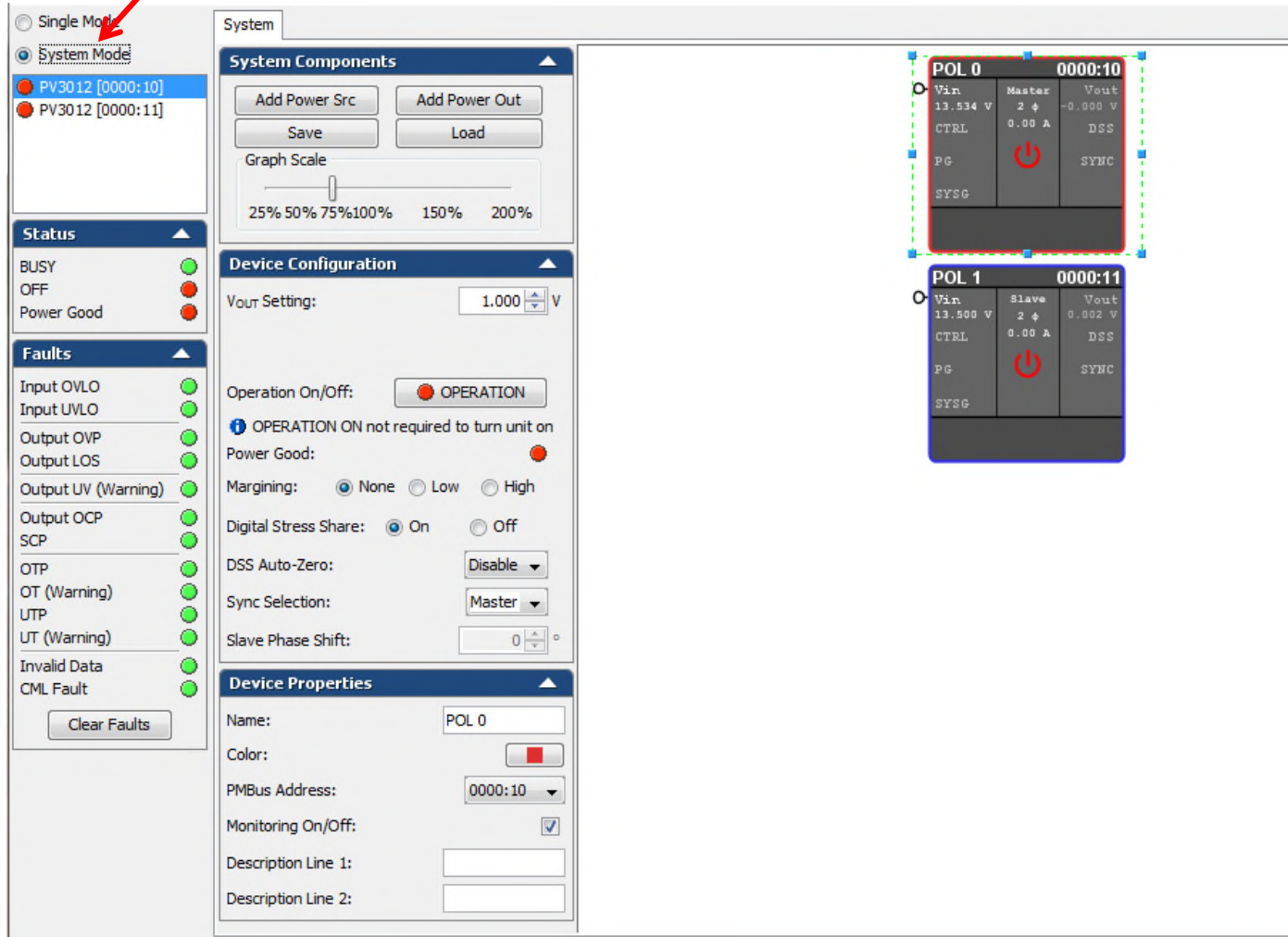
Faults: Input OVLO (green), Input UVLO (green), Output OVP (green), Output LOS (green), Output UV (Warning) (green), Output OCP (green), SCP (green), OTP (green), OT (Warning) (green), UTP (green), UT (Warning) (green), Invalid Data (green), CML Fault (green).

Parameter	Value	Unit
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	μs
Output OVP Retry/Latch	Retry	
Output OCP Limit	67	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

Run the GUI (cont.)

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

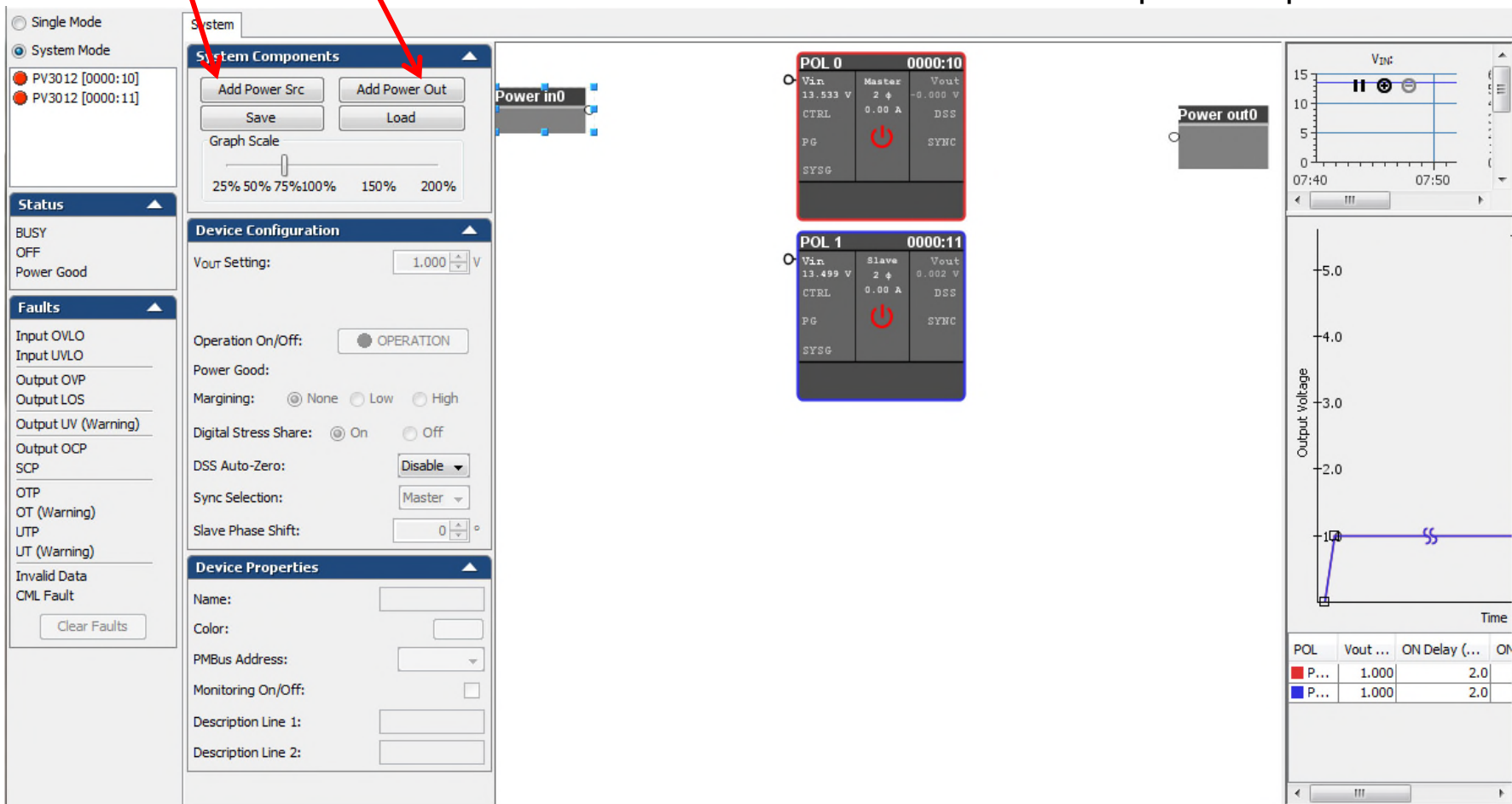
System Mode



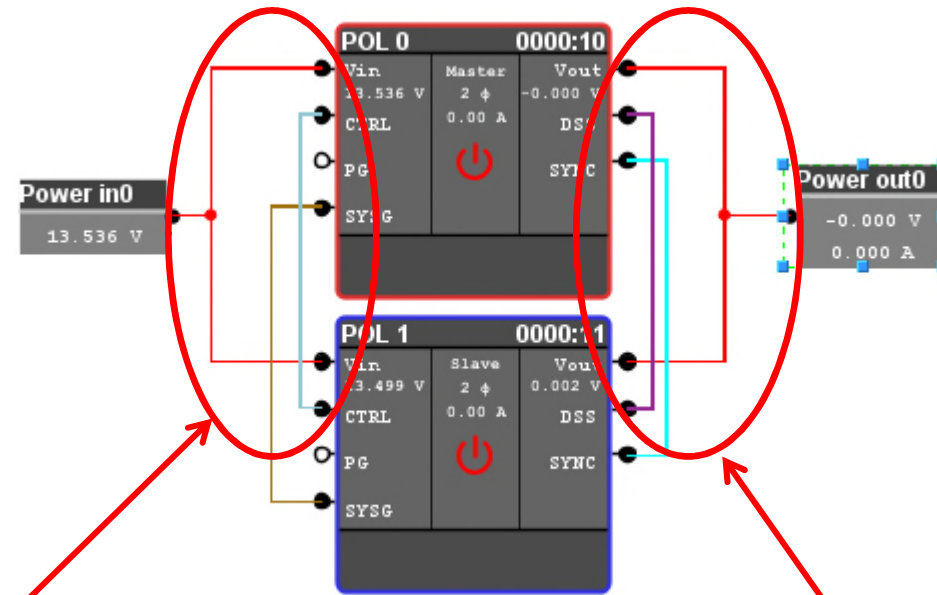
The screenshot displays the TDK GUI interface. On the left, the 'System Mode' is selected, indicated by a red arrow. Below it, the 'Status' section shows 'BUSY' and 'Power Good' indicators. The 'Faults' section lists various fault conditions, all of which are currently green, indicating no faults. The 'System Components' section includes buttons for 'Add Power Src', 'Add Power Out', 'Save', and 'Load', along with a 'Graph Scale' slider. The 'Device Configuration' section shows 'Vout Setting' at 1.000 V, 'Operation On/Off' set to 'OPERATION', and various other settings like 'Margining', 'Digital Stress Share', 'DSS Auto-Zero', 'Sync Selection', and 'Slave Phase Shift'. The 'Device Properties' section shows 'Name' as 'POL 0', 'Color' as red, 'PMBus Address' as '0000:10', and 'Monitoring On/Off' checked. On the right, the 'Schematic Capture' feature is shown, displaying two power converter blocks: 'POL 0' (Master) and 'POL 1' (Slave). Both blocks show 'Vin' at 13.534 V and 'Vout' at -0.000 V. The 'CTRL' input is set to 'DSS' and the 'PG' input is set to 'SYNC'. The 'SYSG' input is also set to 'SYNC'.

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



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 TDK iJB Parallel Eval Board Operators Guide software interface. Both screenshots show the 'Fault Limits' and 'Warning Limits' sections. Red boxes highlight the 'Output OVP Limit' and 'Output OCP Limit' settings, which are set to 1.520 V and 50 A respectively. Red arrows point to the module selection dropdowns, indicating that the settings apply to the selected module.

Left Screenshot (PV3012 [0000:10]):

- Module Selection:** PV3012 [0000:10] (highlighted with a red box and arrow)
- Status:** BUSY (green), OFF (green), Power Good (green)
- Faults:** Input OVLO (green), Input UVLO (green), Output OVP (green), Output LOS (green), Output UV (Warning) (green), Output OCP (green), SCP (green), OTP (green), OT (Warning) (green), UTP (green), UT (Warning) (green), Invalid Data (green), CML Fault (green)
- 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: 1.520 V
 - Output OVP Response Delay: 39.99 μ s
 - Output OVP Retry/Latch: Retry
 - Output OCP Limit: 50 A
 - Output OCP Response Delay: 1500.0 μ 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

Right Screenshot (PV3012 [0000:11]):

- Module Selection:** PV3012 [0000:11] (highlighted with a red box and arrow)
- Status:** BUSY (green), OFF (green), Power Good (green)
- Faults:** Input OVLO (green), Input UVLO (green), Output OVP (green), Output LOS (green), Output UV (Warning) (green), Output OCP (green), SCP (green), OTP (green), OT (Warning) (green), UTP (green), UT (Warning) (green), Invalid Data (green), CML Fault (green)
- 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: 1.520 V
 - Output OVP Response Delay: 39.99 μ s
 - Output OVP Retry/Latch: Retry
 - Output OCP Limit: 50 A
 - Output OCP Response Delay: 1500.0 μ 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

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

General | Configure | **Store**

Default Settings

Storage Space Usage: 21%

Store | Restore | Erase

Customer info

Customer Name: TDK (21)

Product ID: Digital POL Module (4)

⚠ Customer name and product ID fields can not be empty

Vout ~ Margins

Vout Setting: 1.500 V

Vout Trim: 0.000 V

Vout Max: 1.600 V

Vout Scale Loop: 1.0000

Vout Tracking: Off

Slew Rate: 1.042 mV/μs

ON Rise Time: 2.9 ms

ON Time Delay: 2.0 ms

OFF Time Delay: 0.0 ms

Upper Voltage Margin: 10.0 %

Lower Voltage Margin: -10.0 %

Current Sense ~ Power ~ Margining

Calibrated Current Sense Element (@ 25°C): 0.277 mΩ

Operation On/Off: On

ⓘ CONTROL Pin Asserted required to turn unit on

Margining: None

On/Off Configuration

Requires OPERATION ON: Yes

Requires CTRL Pin Asserted: Yes

CTRL Pin Polarity: Active Low

CTRL Pin Off Action: Turn Off Delay

Control loop

Optimization Factor (Dynamic): 9 Lowest Transient

Digital Stress Share

Digital Stress Share: Off

DSS Auto-Zero: Disable

DSS Vout Correction Range: 100 mV

DSS Bandwidth: 10

Nominal Current Sense Element (@ 25°C): 0.28 mΩ

Fault Limits

Input OVLO Limit: 15.00 V

Input UVLO Turn-On Threshold: 7.60 V

Input UVLO Turn-Off Threshold: 6.80 V

Output OVP Limit: 1.600 V

Output OVP Delay: 40 μs

Output OVP Retry/Latch: Retry

Output OCP Limit: 118 A

Output OCP Delay: 300.0 μs

Output OCP Retry/Latch: Retry

Output OCP Retry Period: 500 ms

OTP Fault Limit: 135 °C

UTP Fault Limit: -40 °C

Warning Limits

Output UV Warning Limit: 0.801 V

OTP Warning Limit: 135 °C

UTP Warning Limit: -40 °C

ⓘ Dynamic phase dropping only applies to dual phase mode

Programmable Power Good

Programmable Power Good: 12 %

PMBus Address

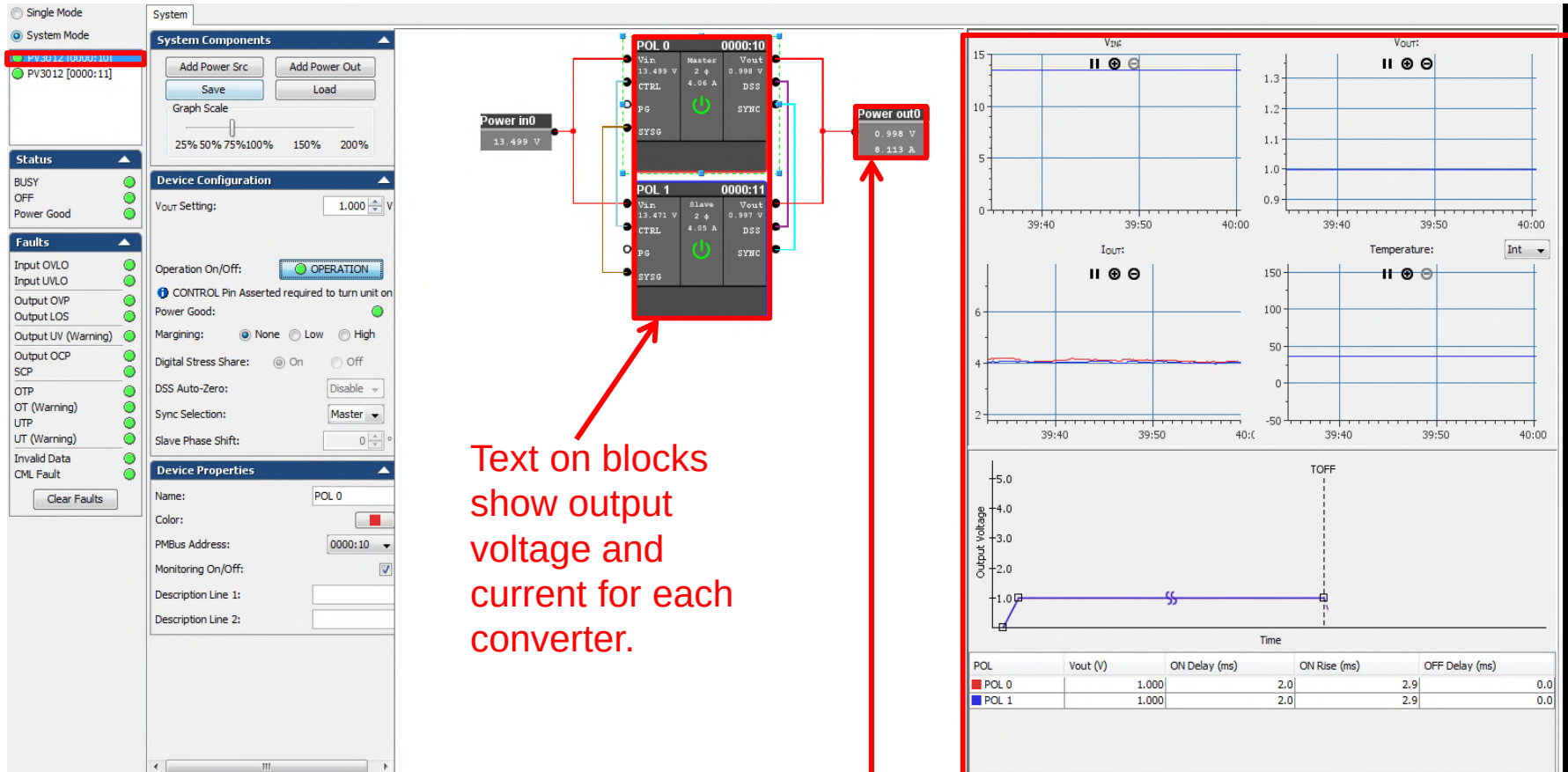
PMBus Address: 0x 27

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

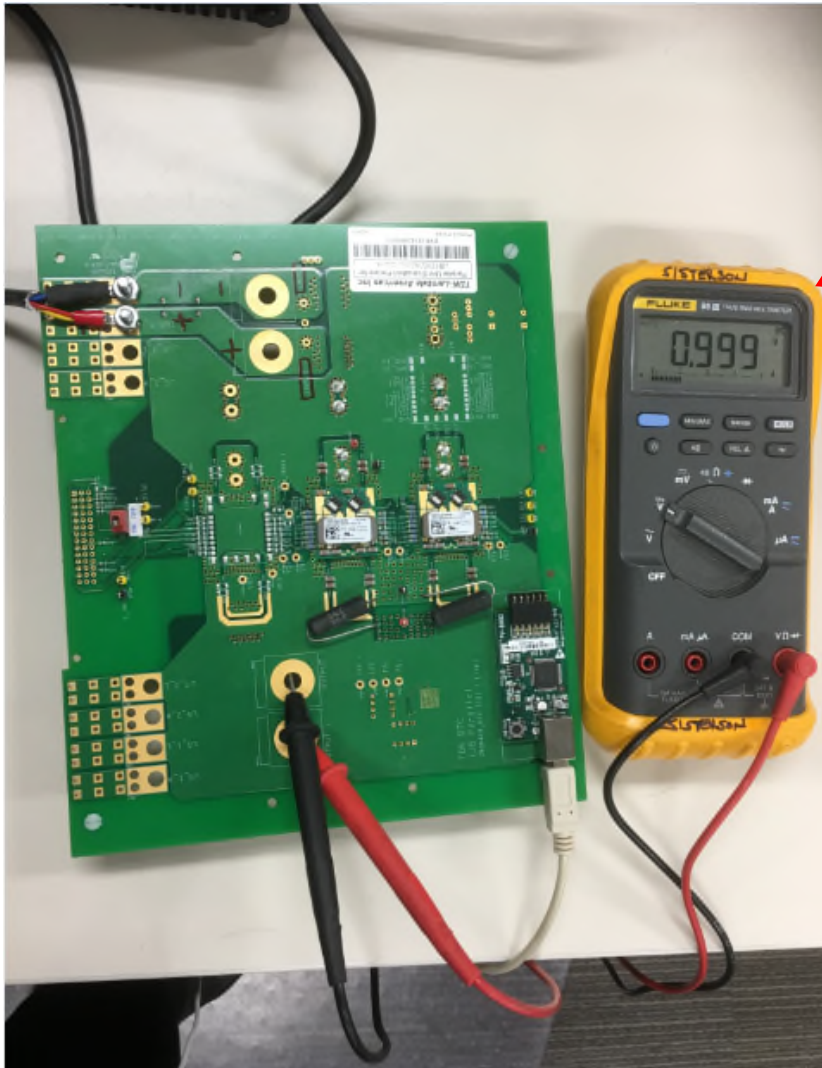
Turn ENABLE switch on eval board "ON".



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

Shows output voltage at 0.999 V

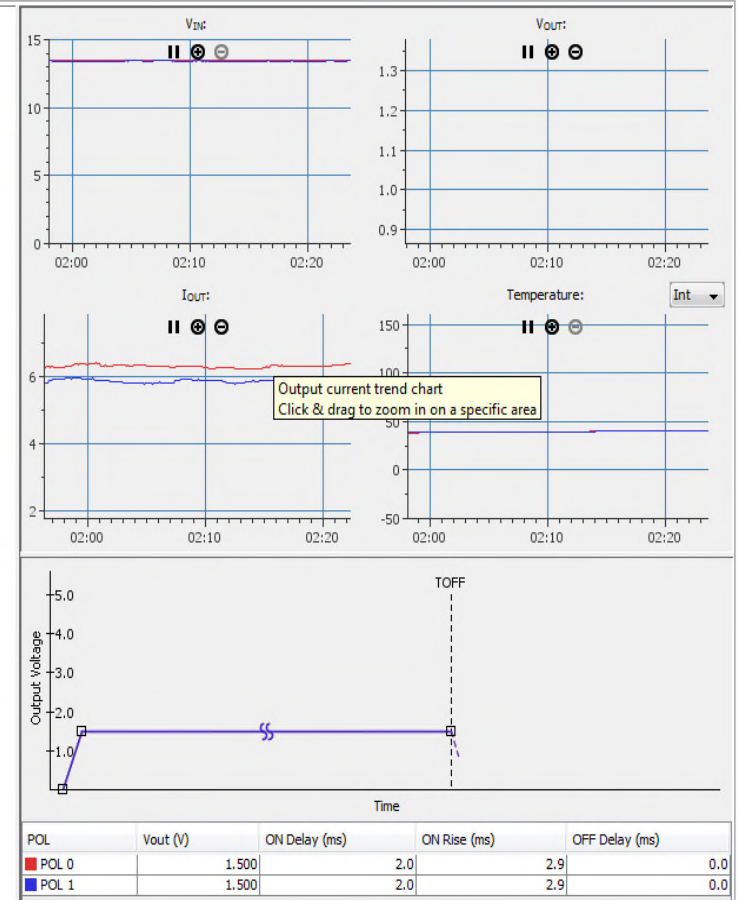
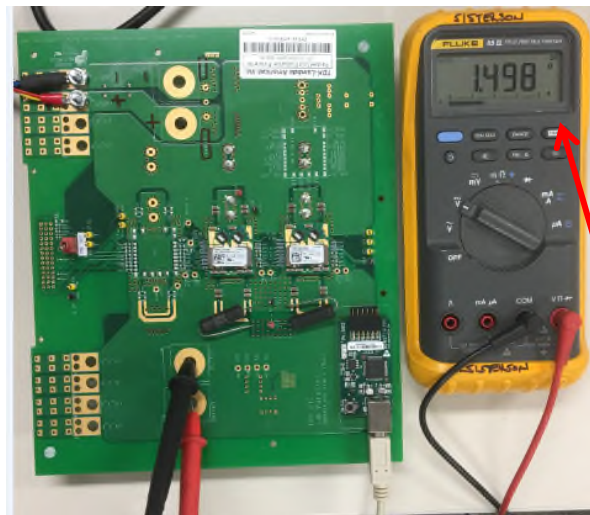
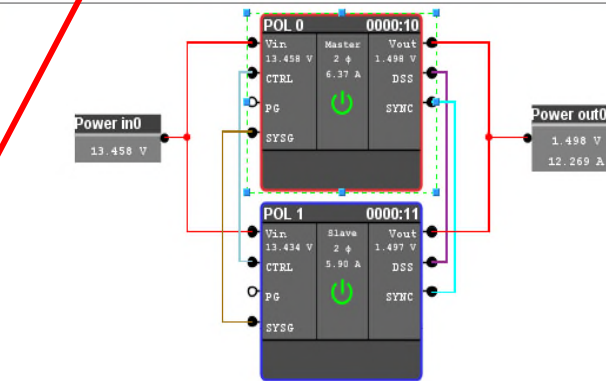
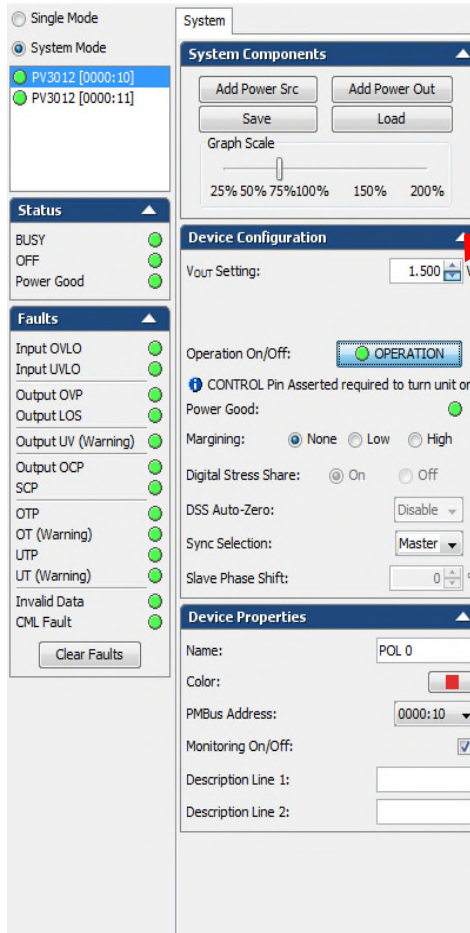
Graphs show output voltages and currents in real time for each device.



Output Value measured at 0.999
Volts

Exercise the Module (cont.)

Change the output voltage to 1.5 Volts:



See the change on the output at the board.

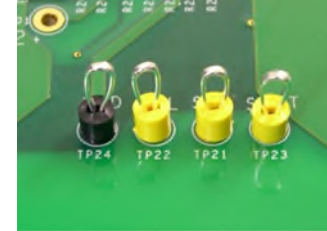
i²C Test Points :

TP 24: i²C Bus Signal Ground

TP 23: i²C Bus Signal Alert

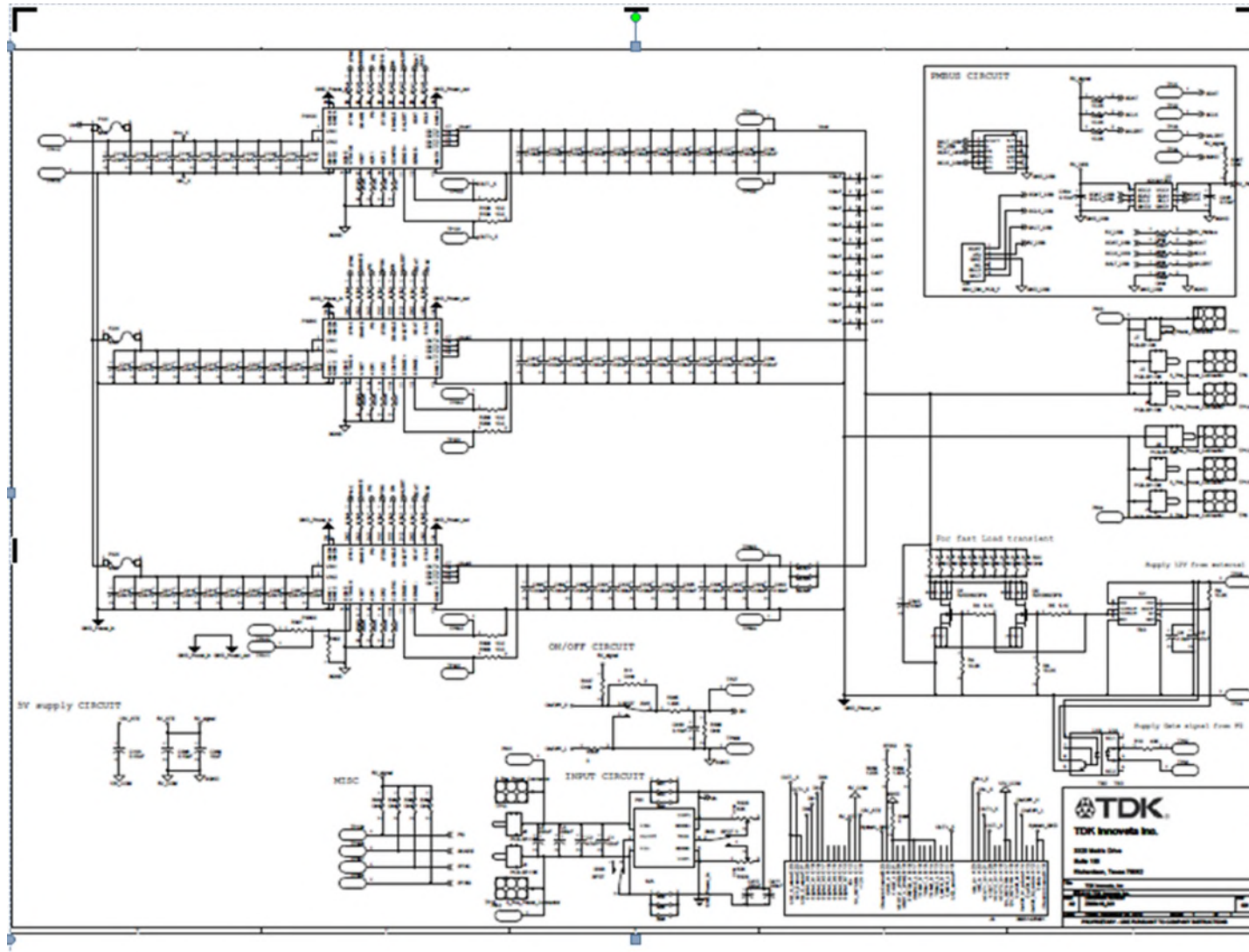
TP 21: i²C Bus Signal Data

TP 22: i²C Bus Signal Clock



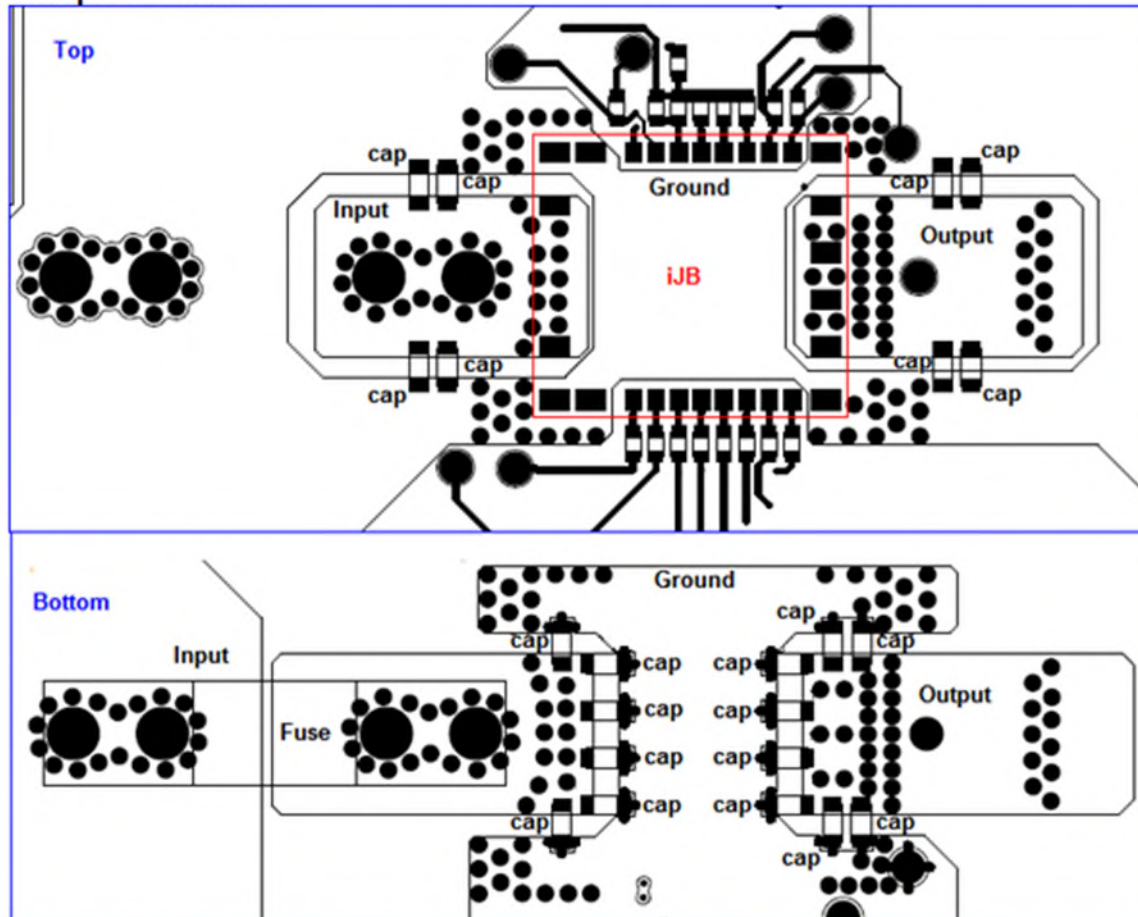
- iJB Parallel Eval Board Simplified Schematic
- Simplified Layout

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
COUTPUT – 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

Mouser Electronics

Authorized Distributor

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