

iJA Evaluation Kit Operators Guide



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

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

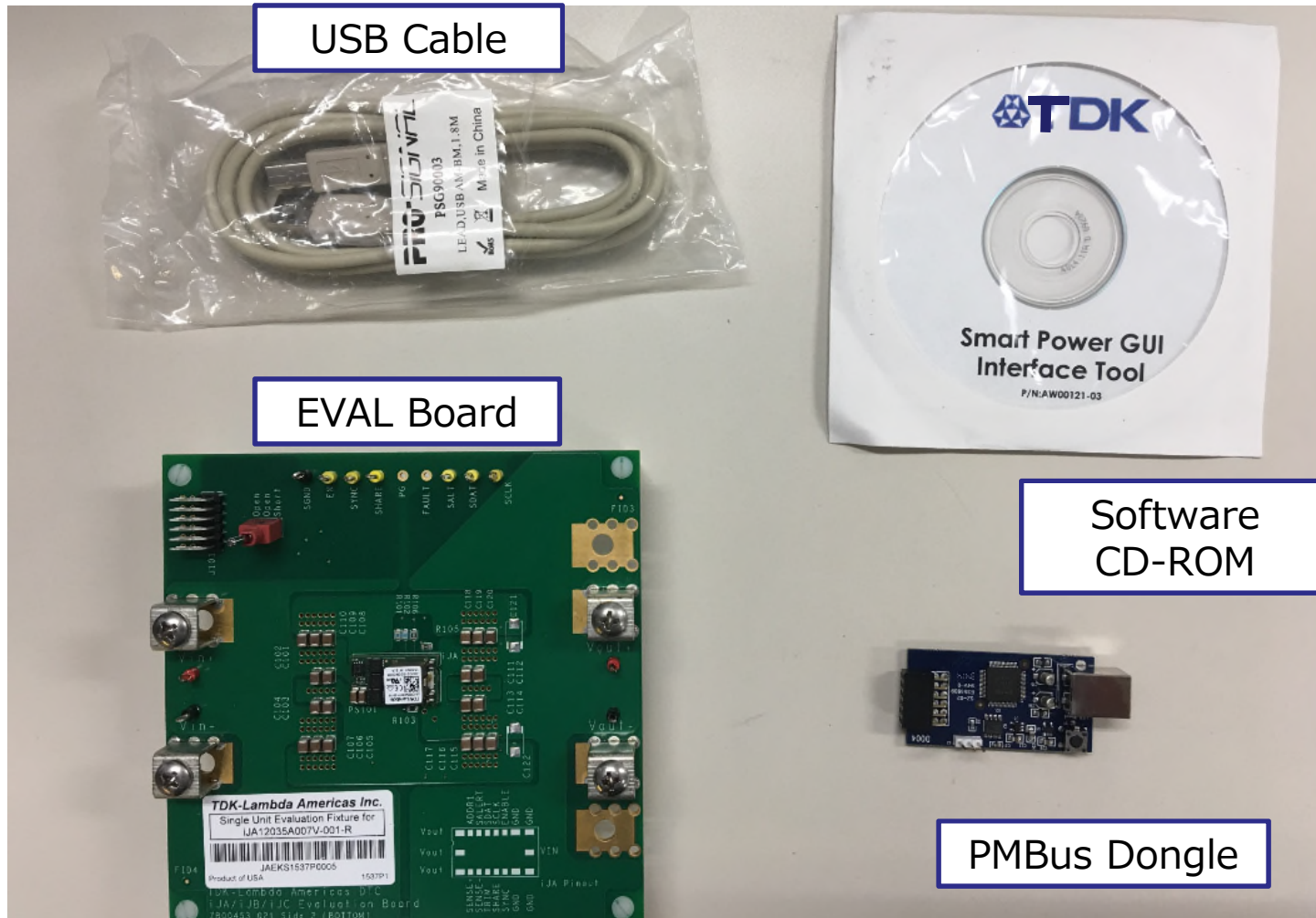
Note: The GUI software is provided on a CD-ROM and is also available at <http://www.us.tdk-lambda.com/lp/contacts/gui-download-page/>. If downloading from the web, registration is required.

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iJA Evaluation Kit Contents



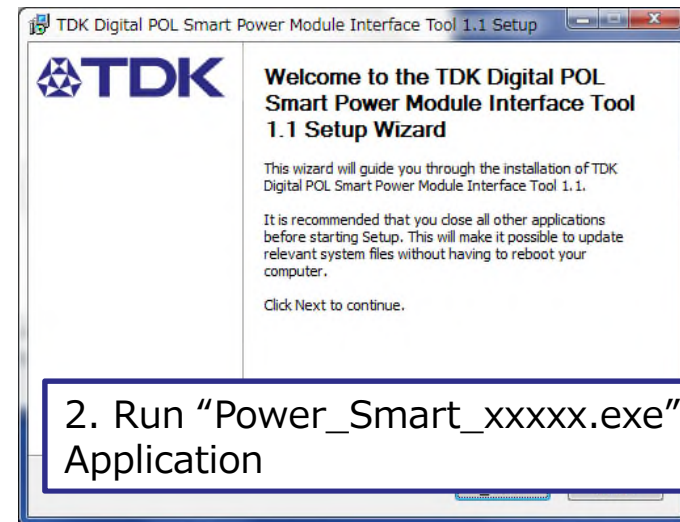
Install Smart Power GUI Interface Tool



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



1. Put attached CD-ROM into your PC



2. Run "Power_Smart_XXXXX.exe" Application

*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/>

iJA Eval Board Installation



- **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**

About the iJA



TDK-Lambda

iJA Series

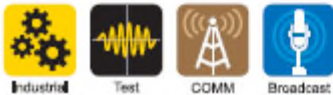
100W, 35A Non-isolated SMT Point of Load with PMBus

Features

- ◆ Only 0.45 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



Vo: 0.6 to 3.3 Volts

100 Watts

35 Amps

About the EVAL Board



ON/OFF Switch

TEST Pins

PMBus Connector Pinout

12	2		
○	○	○	○
○	○	○	□
11	1		

1	SALT	2	5V(USB)
3	SDAT	4	SGND
5	SCLK	6	SGND
7	-	8	SGND
9	-	10	SGND
11	-	12	SGND

ON OFF

Input Terminals

Output Terminals



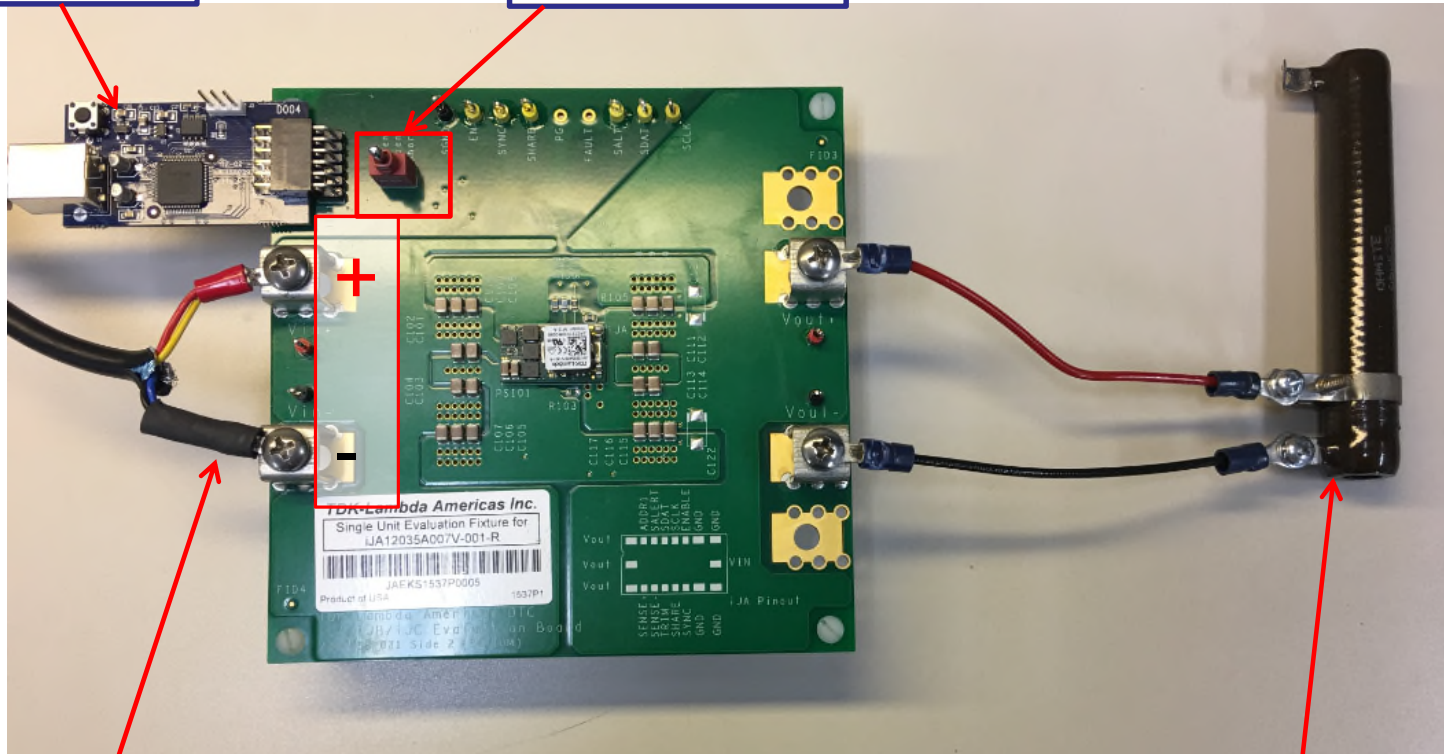
This Eval kit does NOT have input fuse. Please verify polarity of electrical connection before power up. Permanent Damage will occur if polarity is reversed.

Connect It Up



Connect
Dongle to
Eval Board

Switch in
"OPEN"
Position



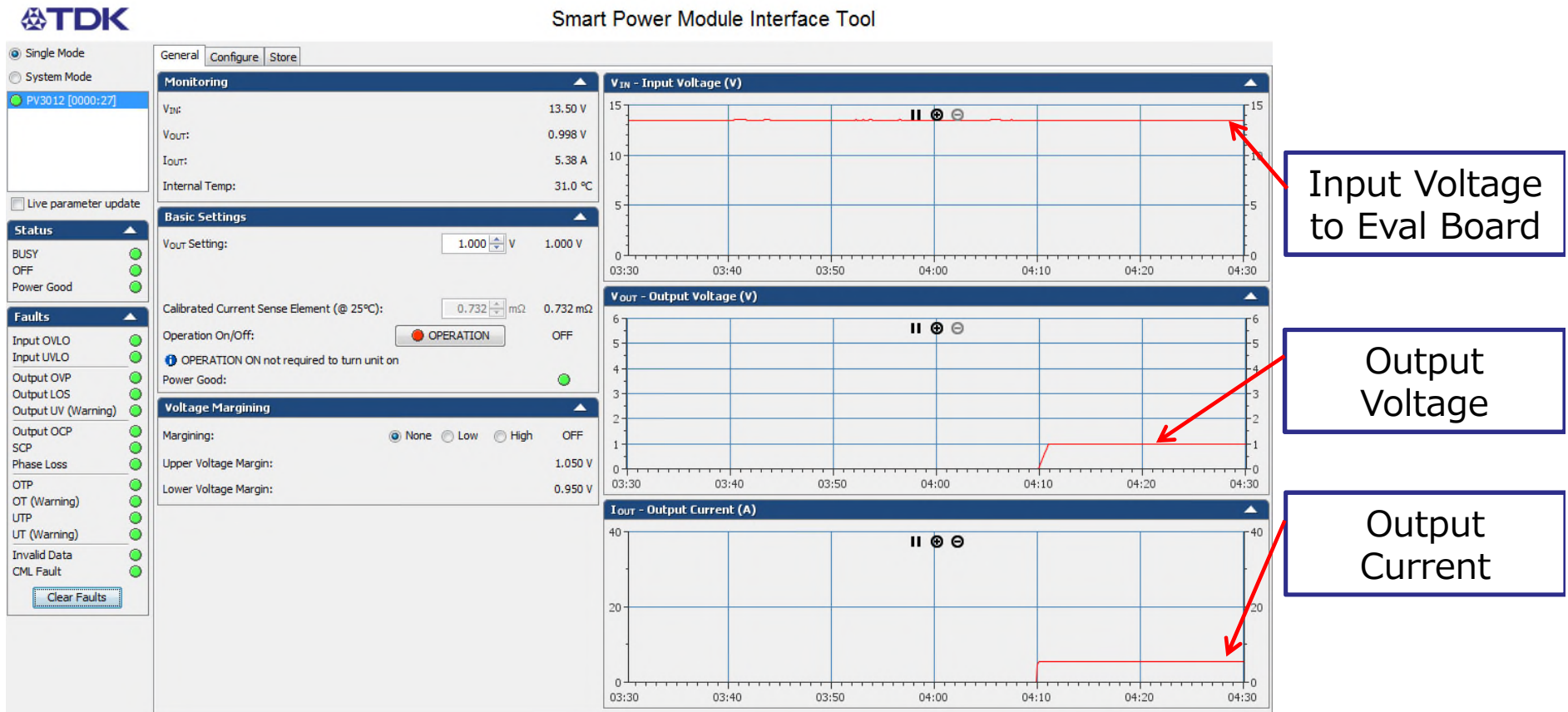
8.0 to 14 VDC
**Observe
Polarity!**

Connect
Resistive Load

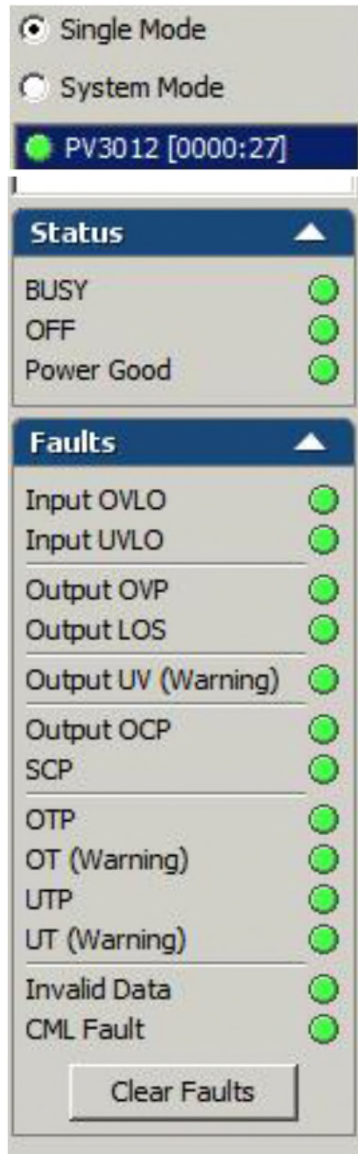
Power It Up / Run the GUI - Basic



- Energize the Eval Board
- Open the GUI
- Cycle Power Switch to “Short” Position



GUI Features



Status and Fault Indicators

green except during NVM storage operation

shows if the module is ON or OFF

indicates if V_{out} is within the limits

green when V_{in} is lower than set limit in the fault section

green when V_{in} is higher than set limit in the fault section

green when V_{out} is lower than set limit in the fault section

loss of sense, when V_{sense} is lost module will be set OFF

green when V_{out} is higher than set limit in the fault section

green when I_{out} is lower than set limit in the fault section

green when short circuit protection has not been active

green when Temp. is lower than set limit in the fault section

green when Temp. is lower than set limit in the fault section

green when Temp. is higher than set limit in the fault section

green when Temp. is higher than set limit in the fault section

indicates invalid or unsupported data

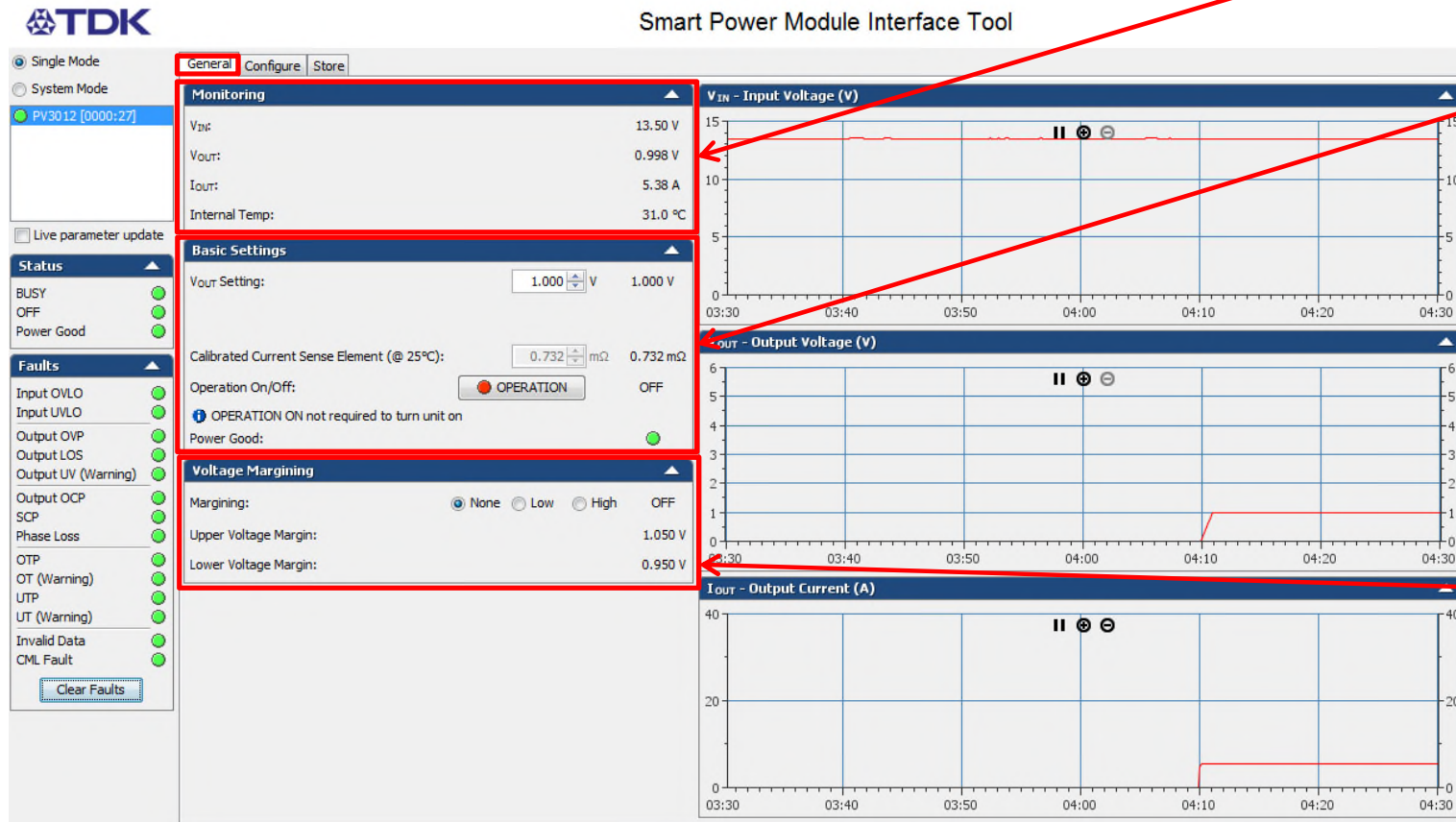
indicates communication / memory / logic status

Clear Faults can be used to clear any previous fault flags that were raised

GUI Features (cont.)



The General Tab



Monitoring:

Shows:

- Vin
- Vout
- I out
- Internal Temperature

Basic Settings

- Sets V out
- Controls Output ON/Off with Operation button
- Displays value of internal calibrated shunt

Voltage Margining

- Enable Hi and Low output margins.
- Values fr margins set on Configure Tab
- Useful for device load testing.

GUI Features (cont.)



The Configure Tab - Basic

Single Mode
System Mode

PV3012 [0000:10]
PV3012 [0000:11]

Status
BUSY
OFF
Power Good

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

General Configure Store Demo

Basic Fault

Configuration

Vout Trim:	0.000 V	0.000 V
Vout Max:	1.600 V	1.600 V
Vout Scale Loop:	Internal Rdiv On/Off	1.0000
Vout Tracking:	<input checked="" type="radio"/> Off <input type="radio"/> 50% <input type="radio"/> 100%	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

On/Off Configuration

Requires OPERATION ON:	<input type="radio"/> Yes <input checked="" type="radio"/> No	NO
Requires CTRL Pin Asserted:	<input checked="" type="radio"/> Yes <input type="radio"/> No	YES
CTRL Pin Polarity:	<input checked="" type="radio"/> Active High <input type="radio"/> Active Low	HIGH
CTRL Pin Off Action:	<input type="radio"/> Immediate Off <input checked="" type="radio"/> Turn Off Delay	DELAY

Power Stage

Calibrated Current Sense Element (@ 25°C):	0.770 mΩ	0.770 mΩ
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Configuration

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

Controls Ratiometric output voltages for non-parallel multiple device operation.

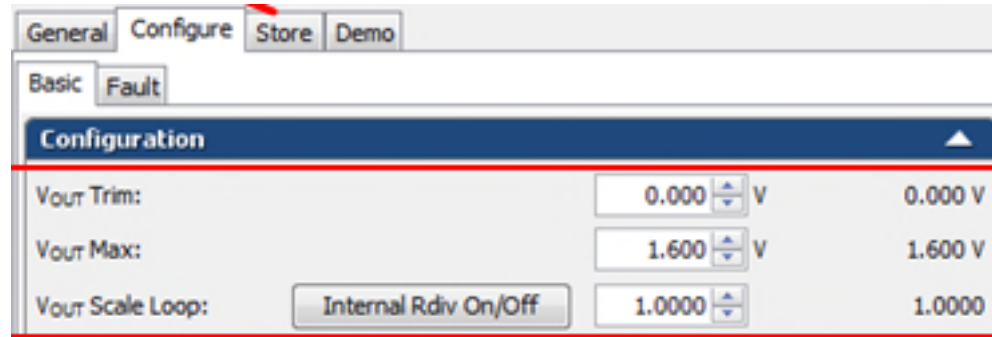
Controls Output voltage timing on power up and power down.

Sets incremental voltage margin control in percent.

On/Off Configuration

Establishes on/off hardware control features.

GUI Features (cont.)



- 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.

GUI Features (cont.)



The Configure Tab - Fault

Single Mode
System Mode
PV30 12 [0000:27]
Live parameter update
Status
BUSY
OFF
Power Good
Faults
Input OVLO
Input UVLO
Output OVP
Output LOS
Output UV (Warning)
Output OCP
SCP
Phase Loss
OTP
OT (Warning)
UTP
UT (Warning)
Invalid Data
CML Fault
Clear Faults

General Configure Store
Basic Fault
Fault Limits
Input OVLO Limit: 15.00 V 15.00 V
Input UVLO Turn-On Threshold: 7.60 V 7.60 V
Input UVLO Turn-Off Threshold: 7.00 V 7.00 V
Output OVP Limit: 3.500 V 3.500 V
Output OVP Response Delay: 40.00 μs 40.00 μs
Output OVP Retry/Latch: Retry Retry
Output OCP Limit: 40 A 40 A
Output OCP Response Delay: 1500.0 μs 1500.0 μs
Output OCP Retry/Latch: Retry Retry
Output OCP Retry Delay: 500 ms 500 ms
OTP Limit: 120 °C 120 °C
UTP Limit: -50 °C -50 °C
Warning Limits
Output UV Limit: 0.801 V 0.801 V
OT Limit: 110 °C 110 °C
UT Limit: -30 °C -30 °C

Fault Limits

- Sets Values for Input Over Voltage Lock Out (OVLO), Output Over Voltage Protection, Output Overcurrent Protection (OCP) and Over/Under Temperature Protection (OTP and UTP).
- Once Fault limits are exceeded, device shuts down.

Warning Limits

- Sets Warning Limits for Output Under Voltage (UV), device Overtemperature (OT) and Undertemperature (UT).
- Warning thresholds do not cause shutdown of supply.

The Store Tab



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

V_{OUT} Setting: 1.500 V
V_{OUT} Trim: 0.000 V
V_{OUT} Max: 1.600 V
V_{OUT} Scale Loop: 1.0000
V_{OUT} 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 V_{OUT} 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 Module



Exercise:

Change output voltage to 3.3 volts, Change Margin to 10%, Adjust On/Off Configuration.

Basic | Fault

Configuration

Vout Trim:	-0.001 V	-0.001 V
Vout Max:	3.400 V	3.400 V
Vout Scale Loop:	Internal Rdiv On/Off	0.2857
Vout Tracking:	<input checked="" type="radio"/> Off <input type="radio"/> 50% <input type="radio"/> 100%	OFF
Slew Rate:	1.094 mV/μs	1.094 mV/μs
ON Rise Time:	3.8 ms	3.8 ms
ON Time Delay:	2.0 ms	2.0 ms
OFF Time Delay:	0.0 ms	0.0 ms
Upper Voltage Margin:	10.0 %	1.100 V
Lower Voltage Margin:	-10.0 %	0.900 V

On/Off Configuration

Requires OPERATION ON:	<input checked="" type="radio"/> Yes <input type="radio"/> No	YES
Requires CTRL Pin Asserted:	<input checked="" type="radio"/> Yes <input type="radio"/> No	YES
CTRL Pin Polarity:	<input type="radio"/> Active High <input checked="" type="radio"/> Active Low	LOW
CTRL Pin Off Action:	<input type="radio"/> Immediate Off <input checked="" type="radio"/> Turn Off Delay	DELAY

Power Stage

Calibrated Current Sense Element (@ 25°C):	0.732 mΩ	0.732 mΩ
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Fault

Fault Limits

Input OVLO Limit:	15.00 V	15.00 V
Input UVLO Turn-On Threshold:	7.60 V	7.60 V
Input UVLO Turn-Off Threshold:	7.00 V	7.00 V
Output OVP Limit:	3.600 V	3.600 V
Output OVP Response Delay:	40.00 μs	40.00 μs
Output OVP Retry/Latch:	Retry	Retry
Output OCP Limit:	40 A	40 A
Output OCP Response Delay:	1500.0 μs	1500.0 μs
Output OCP Retry/Latch:	Retry	Retry
Output OCP Retry Delay:	500 ms	500 ms
OTP Limit:	120 °C	120 °C
UTP Limit:	-50 °C	-50 °C

Warning Limits

Output UV Limit:	0.801 V	0.801 V
OT Limit:	110 °C	110 °C
UT Limit:	-30 °C	-30 °C

Annotations:

- Vout max: 3.400
- Click Internal Rdiv On/Off
- Output OVP Limit: 3.600
- Set Margins to +10% and -10%.
- Requires Operation ON: YES

Exercise the Module (cont.)



Single Mode
System Mode
PV30 12 [0000:27]

General Configure Store

Monitoring

V _{IN} :	13.50 V
V _{OUT} :	0.009 V
I _{OUT} :	0.00 A
Internal Temp:	33.8 °C

Basic Settings

V_{OUT} Setting: 3.300 V 3.300 V

Calibrated Current Sense Element (@ 25°C): 0.732 mΩ 0.732 mΩ

Operation On/Off: OPERATION OFF

CONTROL Pin Asserted required to turn unit on

Power Good:

Voltage Margining

Margining: None Low High OFF

Upper Voltage Margin: 3.630 V

Lower Voltage Margin: 2.970 V

Clear Faults

Status

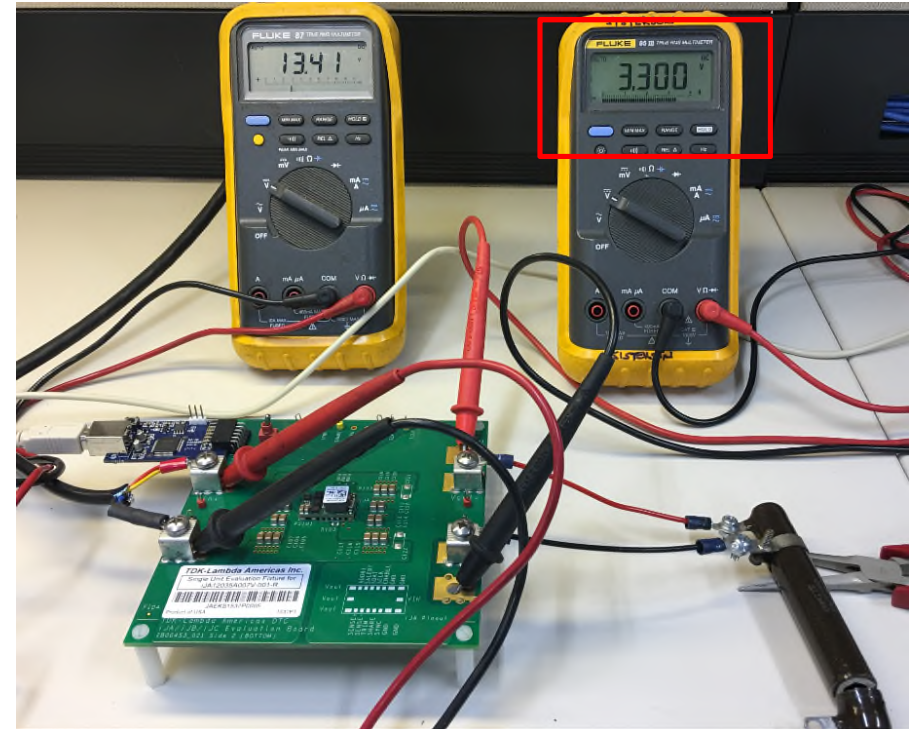
BUSY: OFF: Power Good:

Faults

- Input OVLO:
- Input UVLO:
- Output OVP:
- Output LOS:
- Output UV (Warning):
- Output OCP:
- SCP:
- Phase Loss:
- OTP:
- OT (Warning):
- UTP:
- UT (Warning):
- Invalid Data:
- CML Fault:

Set output to
3.300 Volts

Press Operation
Button



Exercise the Module (cont.)



From the General Tab:
Adjust the Margin from 1.00 Volt +10% and -10%

Voltage Margining

Margining: None Low High OFF

Upper Voltage Margin: 1.100 V

Lower Voltage Margin: 0.900 V

Monitoring

V_{IN}: 13.49 V

V_{OUT}: 1.005 V

I_{OUT}: 3.32 A

Internal Temp: 32.0 °C

Voltage Margining

Margining: None Low High LOW

Upper Voltage Margin: 1.100 V

Lower Voltage Margin: 0.900 V

Monitoring

V_{IN}: 13.50 V

V_{OUT}: 0.905 V

I_{OUT}: 2.99 A

Internal Temp: 31.7 °C

Voltage Margining

Margining: None Low High HIGH

Upper Voltage Margin: 1.100 V

Lower Voltage Margin: 0.900 V

Monitoring

V_{IN}: 13.49 V

V_{OUT}: 1.103 V

I_{OUT}: 3.67 A

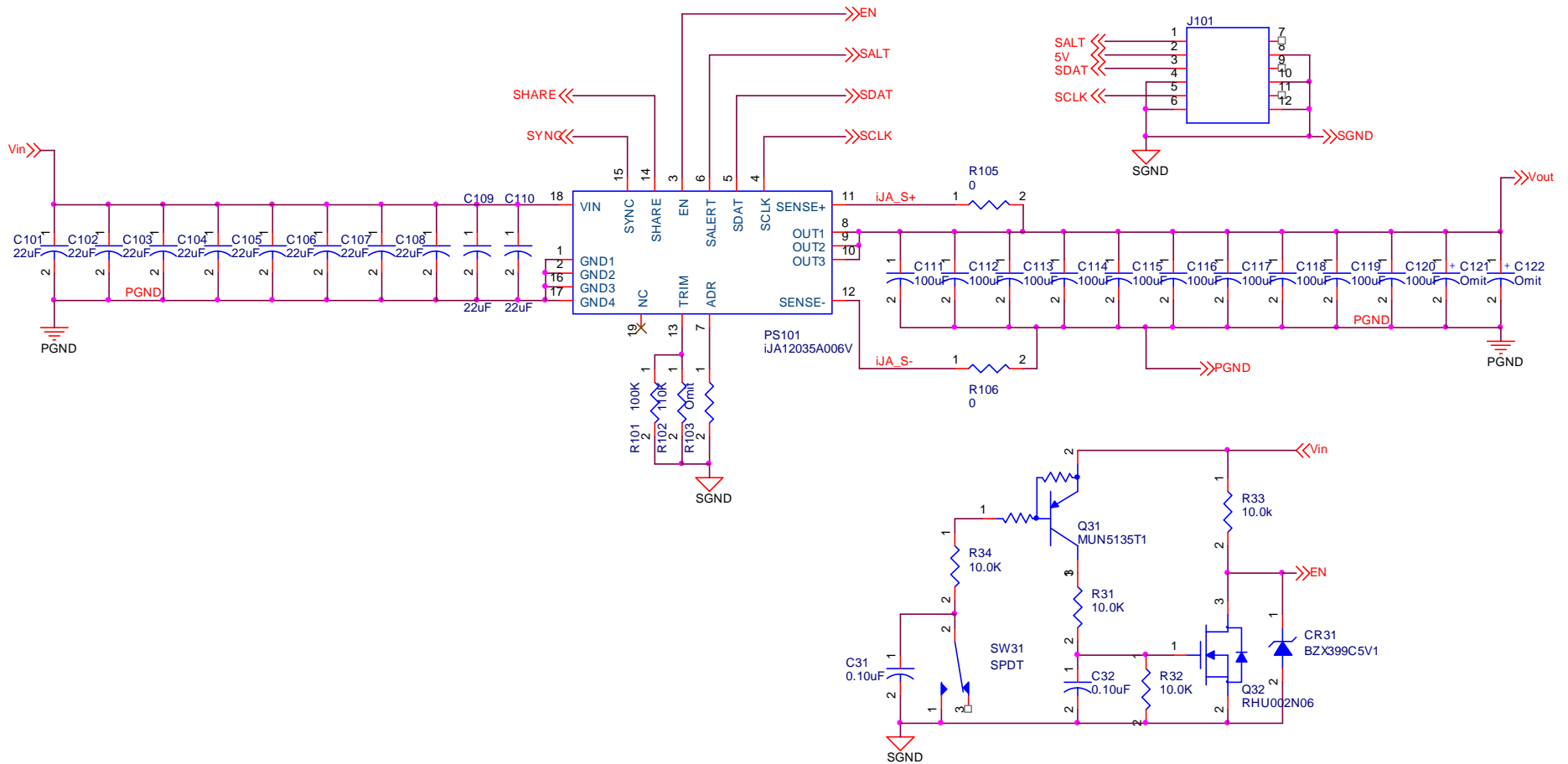
Internal Temp: 31.6 °C

Appendix

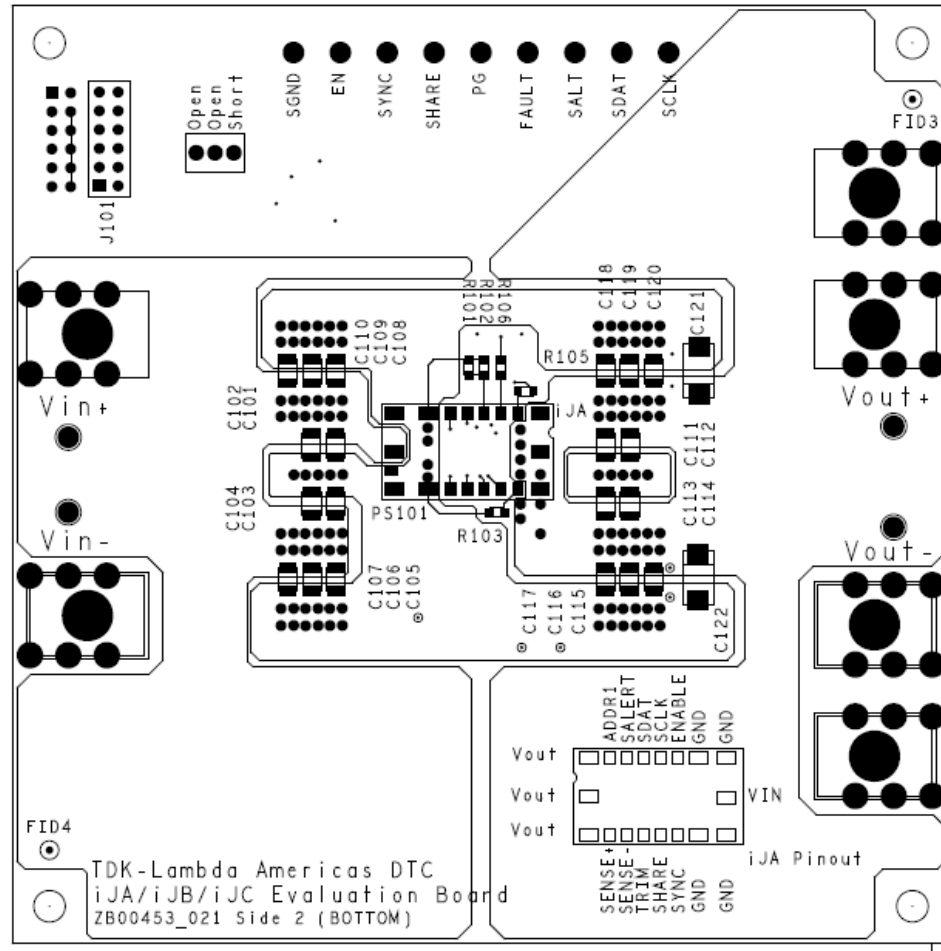


- iJA Eval Board Schematic
- iJA Eval Board Silkscreen
- iJA Eval Board BOM

Eval Board Schematic (iJA series)



Board Layout (iJA Series)



BOM (iJA Series)



BOM.Ref Des	Description	Manufacturers,Mfr. Part Number	Manufacturer
C101	Capacitor	C3225X7R1C226MT	TDK
C102	Capacitor	C3225X7R1C226MT	TDK
C103	Capacitor	C3225X7R1C226MT	TDK
C104	Capacitor	C3225X7R1C226MT	TDK
C105	Capacitor	C3225X7R1C226MT	TDK
C106	Capacitor	C3225X7R1C226MT	TDK
C107	Capacitor	C3225X7R1C226MT	TDK
C108	Capacitor	C3225X7R1C226MT	TDK
C109	Capacitor	C3225X7R1C226MT	TDK
C110	Capacitor	C3225X7R1C226MT	TDK
C111	Capacitor	C3225X5R0J107MT	TDK
C112	Capacitor	C3225X5R0J107MT	TDK
C113	Capacitor	C3225X5R0J107MT	TDK
C114	Capacitor	C3225X5R0J107MT	TDK
C115	Capacitor	C3225X5R0J107MT	TDK
C116	Capacitor	C3225X5R0J107MT	TDK
C117	Capacitor	C3225X5R0J107MT	TDK
C118	Capacitor	C3225X5R0J107MT	TDK
C119	Capacitor	C3225X5R0J107MT	TDK
C120	Capacitor	C3225X5R0J107MT	TDK
C32	Capacitor	C1608X7R1H104KT	TDK
CONN1	Connector	8196	Keystone
CONN2	Connector	8196	Keystone
CONN5	Connector	8196	Keystone
CONN6	Connector	8196	Keystone
CR31	Zener diode SOD323	BZX384-B5V1	NXP semiconductor
J1	12 pin header	MC34771	Multi comp
PS1	Digital POL Module		TDK Lambda Americas Inc
PWB1	PWB		TDK Lambda Americas Inc
Q31	Transistor SOT323	MUN5135T1G	On semiconductor
Q32	Mosfet SOT323	RHU002N06	Rohm
R101	Resistor 0805	RK73H2ATTEI003F	KOA
R102	Resistor 0805	RK73H2ATTEI103F	KOA
R105	Resistor 0805	RK73Z2ATTE	KOA
R106	Resistor 0805	RK73Z2ATTE	KOA
R7	Resistor 0805	RK73Z2ATTE	KOA
R31	Resistor 0805	RK73H2ATTEI002F	KOA
R32	Resistor 0805	RK73H2ATTEI002F	KOA
R33	Resistor 0805	RK73H2ATTEI002F	KOA
R34	Resistor 0805	RK73H2ATTEI002F	KOA
SW31	Toggle switch	2AS3T2A1M2RE	Multi comp
TP1	Test pin	5014	Keystone
TP2	Test pin	5014	Keystone
TP3	Test pin	5014	Keystone
TP4	Test pin	5014	Keystone
TP5	Test pin	5011	Keystone
TP6	Test pin	5014	Keystone
TP7	Test pin	5014	Keystone
TP10	Test pin	5010	Keystone
TP11	Test pin	5011	Keystone
TP12	Test pin	5010	Keystone
TP13	Test pin	5011	Keystone