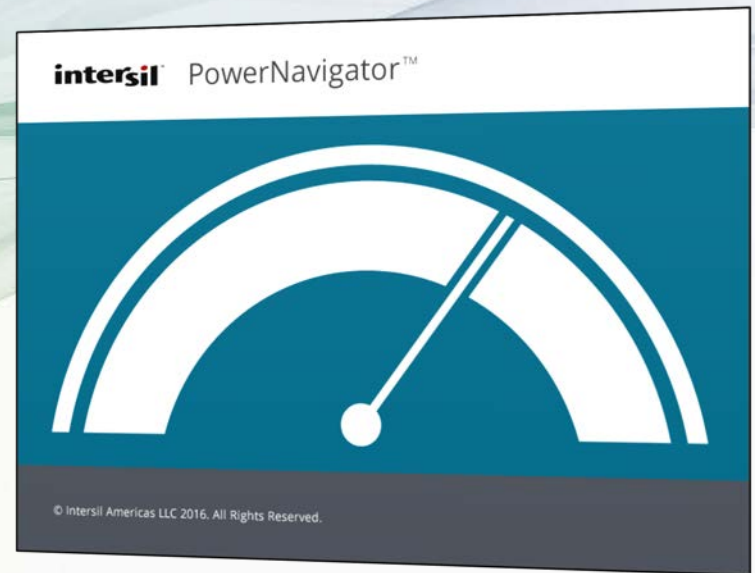


PowerNavigator 5.3

Digital Point of Load User Guide

October 2016



Overview

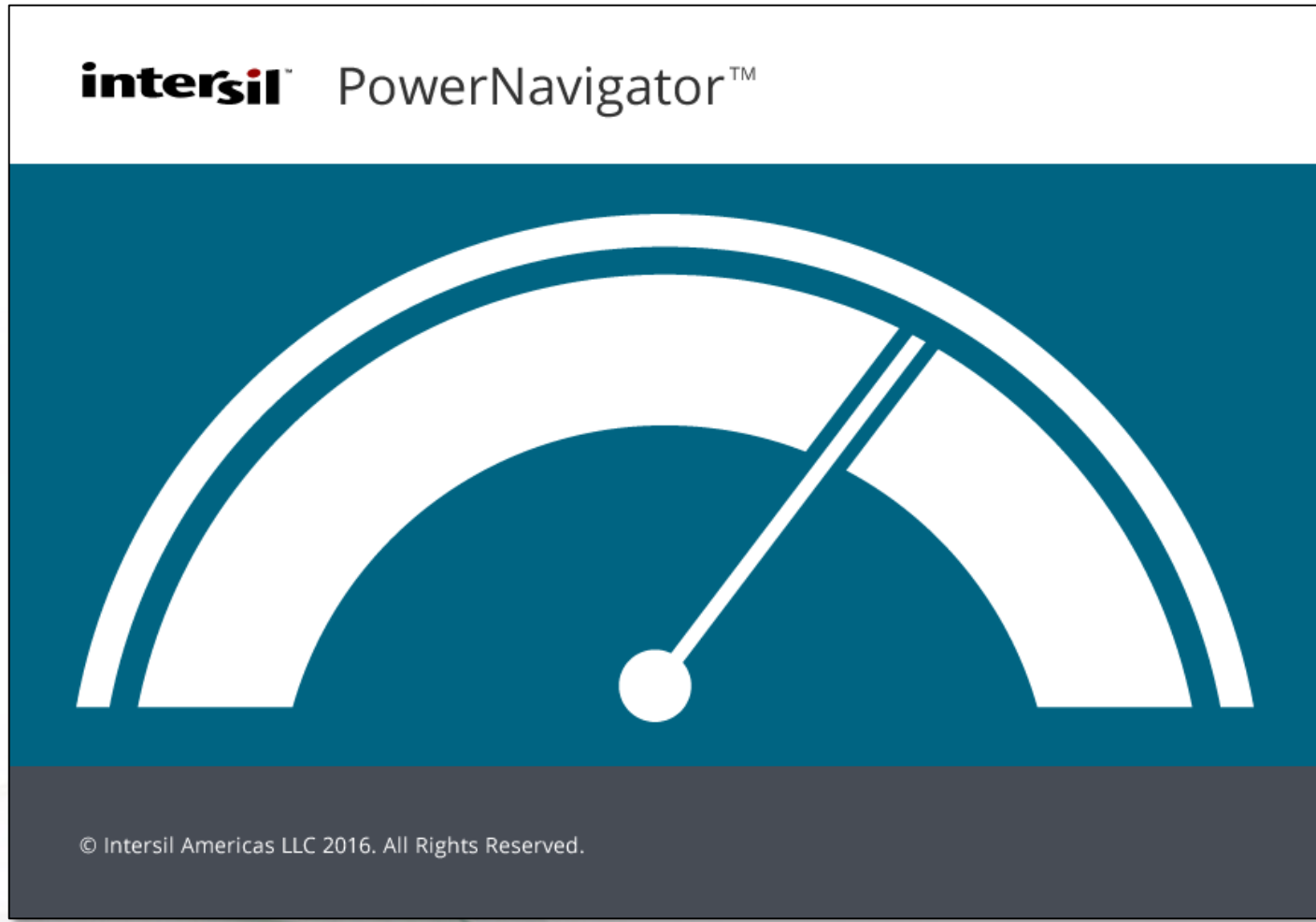
- **This guide walks a user through the steps to setup and configure a digital power device using Intersil's PowerNavigator GUI.**
- **For Digital Multiphase products (ISL691xx and ISL681xx), please see the dedicated Digital Multiphase user guide.**
- **This guide assumes the user has followed the instructions on the website for downloading and installing PowerNavigator and is able to launch the program successfully.**

Overview

- **The following sections are shown in this guide:**

- Hardware free mode
 - Selection of devices
 - Power architecture setup
 - Current sharing
- Connecting to hardware
 - Auto scan of devices
- Device setup with Rail Inspector
 - Changing device parameters
 - Configuration file load and save
- Sequencing
 - Time based sequencing
 - Event based sequencing
- RailScope
 - Adding/monitoring devices
 - Logging
- Production File Hex Creation

Offline Mode (Hardware Free Mode)



PowerNavigator Launch Screen – Offline Mode

Connected Devices

Offline Mode

Project Load

intersil™ PowerNavigator™

Choose an option and click start:

SCAN ATTACHED DEVICES
Dongle connected

BUILD AN OFFLINE SYSTEM

OPEN EXISTING PROJECT
Choose project:

68134-40P-EV1ZA 082516 5.3.34
68137-52P-EV1ZC 080916 5.3.34
68137-61P-EV1ZC 080316 5.3.34
68137-70P-EV1ZC 080416 5.3.34
68147-61P-EV1ZC 082516 5.3.34
Design Example - DPOL
Design Example - Module
ISL69125 31P EV2ZC Ver1.2
ISL69127 6P

PMBus Address: to

Create a new project or load the other two

PowerNavigator v5.3.45

Click on “Build New System” and then “Start”

The PowerNavigator launch screen allows you to select online (hardware connected) or offline modes of operation.

PowerNavigator – System Screen Offline Mode

Part Library contains all supported devices. Click device groups to expand.

Message Viewer x

```
loadTemplate device is not LoadDevice:  
LoadTemplate: deviceId=Load_2, portNames: [-]  
  
loadTemplate device is not LoadDevice:  
LoadTemplate: deviceId=Load_1, portNames: [-VCCINT, -VCCAUX, -VCCIO]
```

Source Id: Source_1

Nvm Tool x System Devices

Devices Memory Action

PowerNavigator – System Screen Offline Mode

Power Navigator 5

File Edit View Option Help

Part Library x Power Map x Rail Scope Sequencing

Part Library

- Generic
- Digital, Integrated FET
- Digital, POL Single Phase
- Digital, POL Dual Phase
 - ZL8800
 - ZL8801
 - ZL8802

ZL8802 specs:
Dual Channe/Dual Phase PMBus™ ChargeMode™ Control DC/DC Digital Controller
Vout min = 0.54V
Vout max = 5.5V
Vin min = 4.5V
Iout max =>40A

Source 1

Expand device groups to see supported devices

Hover over part with mouse to bring up part description and important specs

Message Viewer x

loadTemplate device is not LoadDevice:
LoadTemplate: deviceId=Load_2, portNames: [-]

loadTemplate device is not LoadDevice:
LoadTemplate: deviceId=Load_1, portNames: [-VCCINT, -VCCAUX, -VCCIO]

Source Id: Source_1

Nvm Tool x System Devices

Devices Memory Action

PowerNavigator – System Screen Offline Mode

The screenshot displays the PowerNavigator 5.3.6 software interface. On the left, the 'Part Library' pane shows a tree view with 'Digital, POL Dual Phase' expanded, and 'ZL8800' selected. A red arrow points from the text 'Right click on part to add to compare window.' to the 'ZL8800' entry. The main 'Power Map' area shows a 'Source 1' component. A 'Comparison Window' is open, comparing the specifications of 'ZL8800 specs' and 'ZL8802 specs'. A red arrow points from the text 'Compare window shows device description, key specs and link to datasheet' to the comparison window. The comparison window displays the following details for both parts:

Device Type	Control
Digital, POL Dual Phase	Digital, POL Dual Phase
Dual Channel/Dual Phase PMBus™ ChargeMode™ Control	Dual Channel/Dual Phase PMBus™ ChargeMode™ Control
DC/DC Digital Controller	DC/DC Digital Controller
Vout min = 0.54V	Vout min = 0.54V
Vout max = 5.5V	Vout max = 5.5V
Vin min = 4.5V	Vin min = 4.5V
Vin max = 14V	Vin max = 14V
Iout max = >40A	Iout max = >40A
Key Features:	
-Unique compensation-free design – always stable	
-ChargeMode Control:	
-achieves fast transient response	
-reduced output capacitance	
-provides output stability without compensation	
-Proprietary single wire DDC (Digital-DC) serial bus	
-2-channel output, 2-, 4-, 6- or 8-phase output	

At the bottom of the comparison window, there are links: 'Visit the ZL8800 product information page:' and 'Visit the ZL8802 product information page:'. The software interface also includes a 'Message Viewer' at the bottom left showing 'Power Navigator version 5.3.6' and a 'Nvm Tool' at the bottom right with 'System Devices' selected.

Right click on part to add to compare window.

Compare window shows device description, key specs and link to datasheet

PowerNavigator – System Screen

The screenshot displays the PowerNavigator 5 interface. On the left is the Part Library with a tree view containing categories like Generic, Digital, Integrated FET, POL Single Phase, and POL Dual Phase. The main area is the Power Map, which is a grid with a 'Source 1' component placed on it. A dashed red arrow points from the 'Source 1' component in the Power Map to the 'Digital, POL Single Phase' category in the Part Library. A solid red arrow points from the 'Digital, POL Single Phase' category to the 'Source 1' component. Below the Power Map, there is a Message Viewer showing system messages and an Nvm Tool window with a 'System Devices' tab.

1. Grab any device or label and drag and drop into the PowerMap

2. Drop onto any node identified by a black square.

PowerNavigator 5.3 – System Screen

The screenshot displays the PowerNavigator 5.3 interface. The main window is titled "Power Navigator 5" and contains several panes:

- Part Library:** A tree view on the left showing various power management components like "Digital, Integrated FET" (ZL2101, ZL2102), "Digital, POL Single Phase", "Digital, POL Dual Phase" (ZL8800, ZL8801, ZL8802, ZLS4010), "Digital, Multiphase", "Digital, Module", "Digital, Power Monitor", and "Automotive".
- Power Map:** The central workspace showing a "Power Map" with a "Source 1" block connected to a "Rail 0" block. The "Rail 0" block is currently "Offline" and shows parameters: PG (green), 0V, 0A, Addr: 20, and ZL2102 1 φ. A red dashed arrow points to a connection point on the map with the text "Additional rails can be added". A red solid arrow points to the "Rail 0" block with the text "Drop parts on this node to cascade rails".
- Monitor View:** A panel on the right showing "Rail 0" status. It includes a power good indicator, "Vout" set to 3.3 V, "Pin Enable" dropdown, "Immediate Off" dropdown, "Margin" set to "Nominal", and three gauges: "Output Voltage" (0.00 V, range 2.81-3.79), "Output Current" (0.00 A, range -28-28), and "Input Voltage" (0.00 V, range 2.71-15.88). There is also an "Internal Temperature" gauge (0.00 C, range -65-135).
- Message Viewer:** A panel at the bottom left showing system messages: "Device bus status updated", "Created Rail 0: ZL2102-0 0x20", and "Device bus status updated".
- Nvm Tool:** A panel at the bottom right showing "System Devices" with a table of devices and actions.

Devices	Memory	Action
ZL2102 0x20	User	Store Restore

PowerNavigator – System Screen

The screenshot displays the PowerNavigator 5 software interface. The main window is titled "Power Navigator 5" and features a menu bar (File, Edit, View, Option, Help) and a toolbar. The interface is divided into several panes:

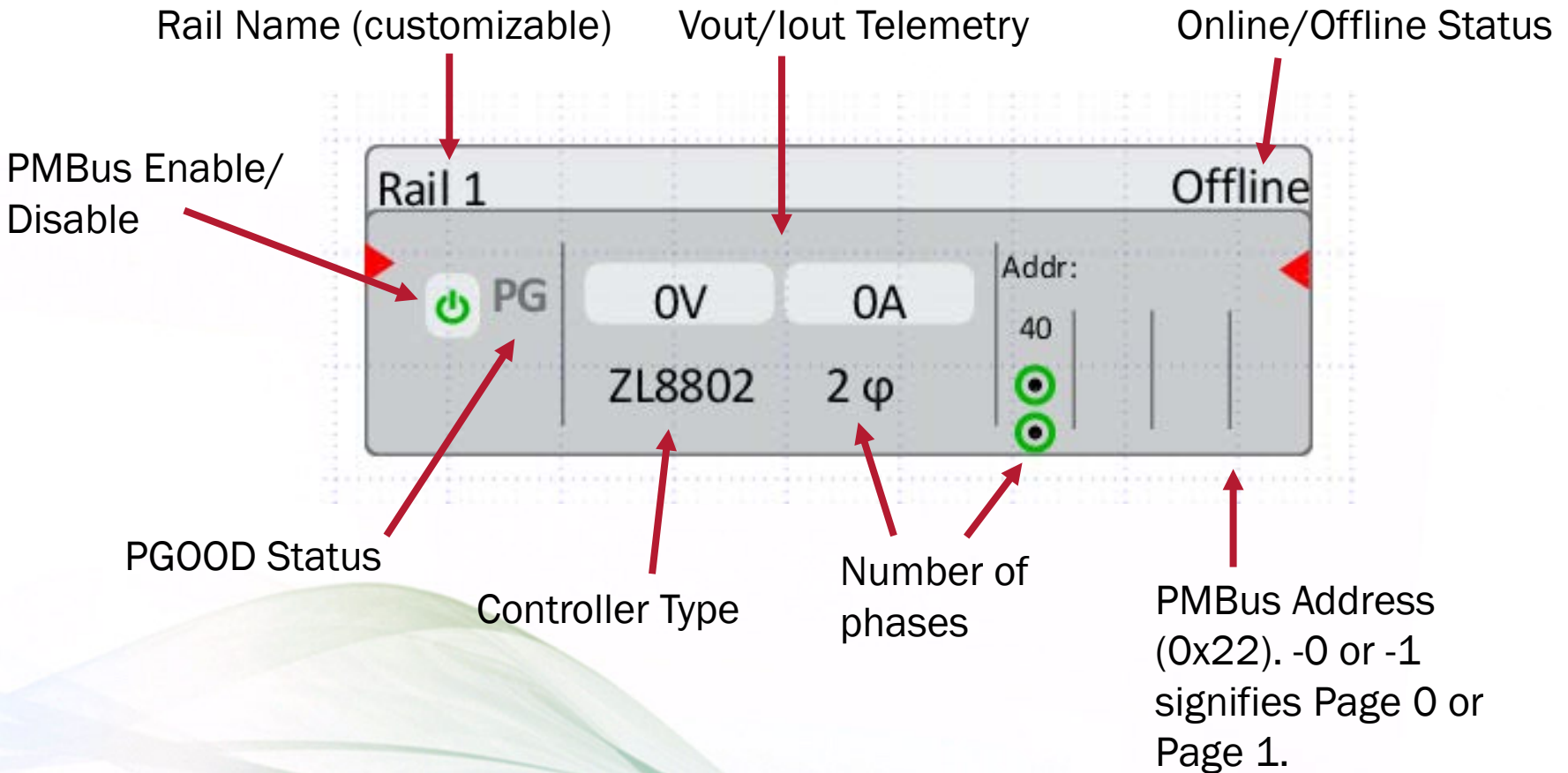
- Part Library:** A tree view on the left showing various power management components like "Digital, Integrated FET" (ZL2101, ZL2102), "Digital, POL Single Phase" (ZL8800, ZL8801, ZL8802, ZLS4010), "Digital, Multiphase", "Digital, Module", "Digital, Power Monitor", and "Automotive".
- Power Map:** The central workspace showing a "Power Map" with a "Source 1" block and four "Rail" blocks (Rail 0, Rail 1, Rail 2, Rail 3). Each rail block is labeled "Offline" and includes a "PG" (Power Good) indicator, a voltage setting (0V), a current setting (0A), and an address. Rail 0 is associated with part ZL2102 (1 φ, Addr: 20). Rail 1 is associated with ZL8802 (2 φ, Addr: 40). Rail 2 is associated with ISL68200 (1 φ, Addr: 21). Rail 3 is associated with ISL8272M (2 φ, Addr: 22). Red arrows point from the text "Individual Rail Block for each device" to each of these rail blocks.
- Monitor View:** A panel on the right for "Rail 0" showing a "Monitor" section with a "Power Good" indicator, a "Vout" of 3.3 V, "Pin Enable" and "Immediate Off" buttons, and a "Margin" set to "Nominal". Below this are three graphs: "Output Voltage" (0.00 V, range 2.81 to 3.79), "Output Current" (0.00 A, range -28 to 28), and "Input Voltage" (0.00 V, range 2.71 to 15.88). At the bottom is an "Internal Temperature" graph (0.00 C, range -65 to 135).
- Message Viewer:** A pane at the bottom left showing system messages: "Device bus status updated", "Created Rail 2: ISL68200-0 0x21", "Device bus status updated", and "Created Rail 3: ISL8272M-0 0x22".
- Nvm Tool / System Devices:** A pane at the bottom right showing a table of devices with memory addresses and actions.

Devices	Memory	Action
ZL2102 0x20	User	Store Restore
ZL8802 0x40	User	Store Restore
ISL68200 0x21		Store Restore

Multiple parts can be added to PowerMap, representing system level view.

PowerMap RailBlock Overview

Example ZL8802 RailBlock (2-PH operation):



PowerMap RailBlock Overview

Example ZL8802 RailBlock (2-CH operation):

Drag and drop interface for configuration of a rail from 2-phase to dual output.

Rail 1 Offline

PG 0V 0A Addr: 40

ZL8802 2 φ

Phase Dot

Detailed description: This screenshot shows the configuration interface for Rail 1. It is currently in 'Offline' status. The interface includes a power button (PG), voltage (0V), and current (0A) readouts. The component is identified as ZL8802 and is configured for 2-phase operation (2 φ). The address is set to 40. A green dot, referred to as the 'Phase Dot', is located below the address field. A red arrow points from this dot towards the Rail 4 interface below.

Rail 4 Offline

PG 0V 0A Addr: 40-1

ZL8802 1 φ

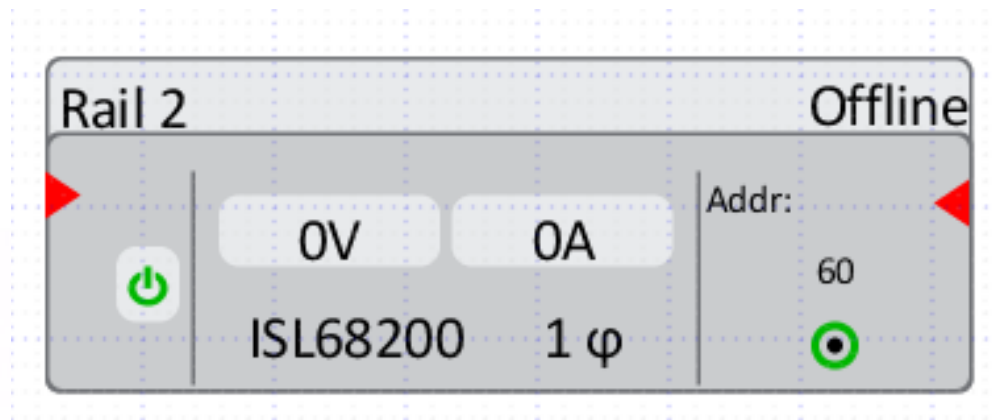
Phase Dot

Detailed description: This screenshot shows the configuration interface for Rail 4. It is also in 'Offline' status. The voltage (0V) and current (0A) readouts are present. The component is ZL8802, but it is now configured for 1-phase operation (1 φ). The address is set to 40-1. A single green dot, the 'Phase Dot', is now present below the address field. A red arrow points from this dot back towards the Rail 1 interface above.

Drag "Phase Dot" to change from 2-phase to 2-Channel operation

PowerMap RailBlock Overview

Example ISL68200 RailBlock:



- Controllers which do not support current share will only have one “slot”.
- In this case, we have a single phase ISL68200 controller at PMBus address 0x60.

PowerNavigator – System Screen

The screenshot displays the PowerNavigator 5 software interface. The main window is titled "Power Navigator 5" and features a menu bar (File, Edit, View, Option, Help) and a toolbar. The interface is divided into several panes:

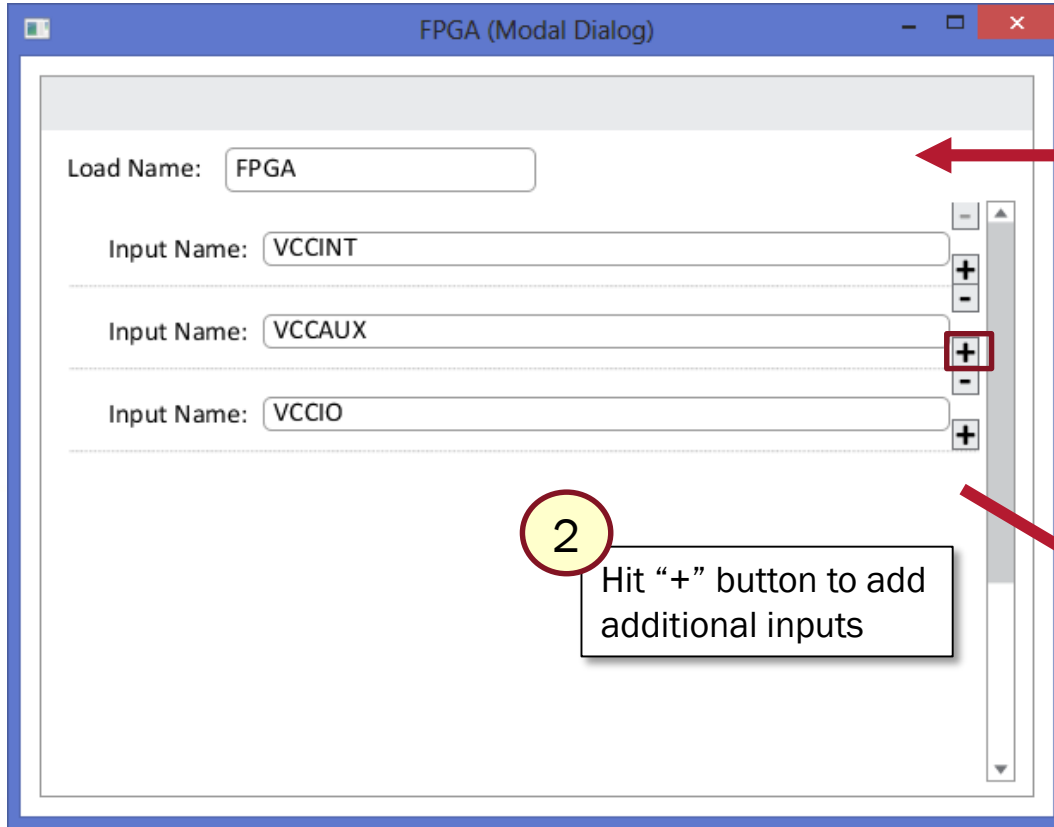
- Part Library:** A tree view on the left showing categories like "Generic", "Load", "Rail", "Digital, Integrated FET", "Digital, POL Single Phase", "Digital, POL Dual Phase", "Digital, Multiphase", "Digital, Module", "Digital, Power Monitor", and "Automotive".
- Power Map:** The central workspace showing a "Power Map" with a "Source 1" block and five "Rail" blocks (Rail 0, Rail 1, Rail 4, Rail 2, Rail 3). Each rail block displays its name, status (Offline), voltage (0V), current (0A), and address. A "Load 1" block is connected to the rails, and a red dashed arrow points from the "Load" category in the Part Library to it. A red arrow points to the "Load 1" block with the label "Load block".
- Monitor View:** A panel on the right showing "Monitor" settings for "Rail 2", including "Vout" (1.0 V), "PMBus & Pin Enab", and three output monitors: "Output Voltage" (0.00 V), "Output Current" (0.00 A), and "Input Voltage" (0.00 V).
- Message Viewer:** A panel at the bottom left showing system messages such as "Set connectable name success", "ISL68200-0 request address change from 0x21 to 0x60", "Update System Success", "Device bus status updated", "Created Load 1", and "ZL2102-0 0x20".
- Nvm Tool / System Devices:** A panel at the bottom right showing a table of system devices.

Device	Address	Connected	Send All	Read All
ZL2102	0x20	Offline	Send All	Read All
ZL8802	0x40	Offline	Send All	Read All
ISL68200	0x60	Offline	Send All	Read All

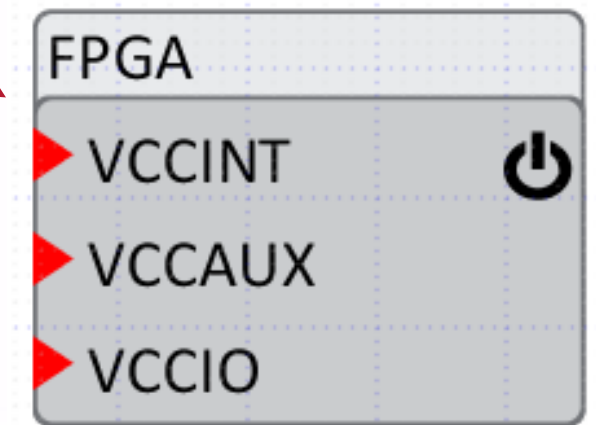
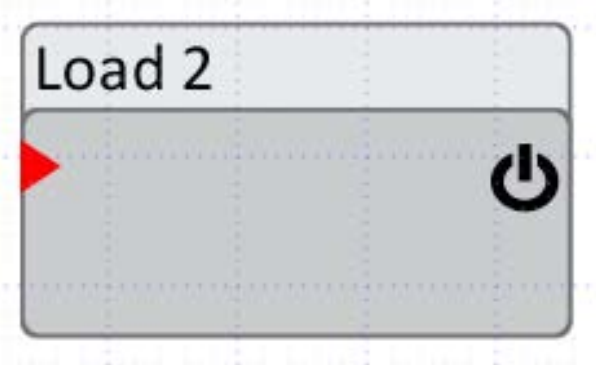
Load Blocks represent system load and can be added to the PowerMap from the Part Library. Double Click to add additional inputs.

Multi-input Load Boxes

1 Double Click Load to bring up Load Inspector dialog box



2 Hit "+" button to add additional inputs



3 Additional inputs are now added to load box

PowerNavigator 5.3 – System Screen

The screenshot displays the PowerNavigator 5.3 System Screen. The interface is divided into several sections:

- Part Library:** A tree view on the left showing categories like Generic, Load, Rail, Digital, Integrated FET, Digital, POL Single Phase, Digital, POL Dual Phase, Digital, Multiphase, Digital, Module, Digital, Power Monitor, and Automotive.
- Power Map:** The central workspace showing a power map with a 'Source 1' block and four rails (Rail 0, Rail 1, Rail 4, Rail 2). Each rail is currently 'Offline'. A 'Multi-input Load Box' is connected to the rails, with an arrow pointing to it from the text 'Multi-input Load Box'.
- Monitor View:** A panel on the right showing the configuration for 'Rail 1'. It includes a 'Power Good' indicator, 'Vout' (3.3 V), 'Pin Enable' dropdown, 'Immediate Off' dropdown, 'Margin' (Nominal) dropdown, and four monitoring graphs: Output Voltage (0.00 V), Output Current (0.00 A), Input Voltage (0.00 V), and Input Current (0.00 A).
- Message Viewer:** A panel at the bottom left showing system messages such as 'Created Load 2', 'Append Connectable Success', and 'Device bus status updated'.
- Nvm Tool / System Devices:** A panel at the bottom right showing a table of system devices.

Device	Address	Connected	Send All	Read All
ZL2102	0x20	Offline	Send All	Read All
ZL8802	0x40	Offline	Send All	Read All
ISL68200	0x60	Offline	Send All	Read All

After configuring system, all sources, rails and loads can be wired together.

PowerNavigator 5.3 – System Screen

The screenshot displays the PowerNavigator 5.3 System Screen, which is used for configuring and monitoring power rails. The interface is divided into several sections:

- Part Library:** A tree view on the left showing various power components like ZL2101, ZL2102, ZL8800, ZL8801, ZL8802, and ISL68200.
- Power Map:** The central workspace showing a power map with four rails (Rail 0, Rail 1, Rail 2, Rail 3) and two power sources (Source 1 and 3v3AUX). Each rail is configured with a voltage (0V), current (0A), and address. Rail 0 is connected to Source 1. The rails are currently in an 'Offline' state.
- Monitor View:** A panel on the right showing real-time monitoring for Rail 1. It includes a power good indicator, output voltage (1.0 V), output current (0.00 A), and input voltage (0.00 V).
- Message Viewer:** A panel at the bottom left showing system messages, including commands like 'WRITE command=VOUT_MARGIN_LOW' and 'WRITE command=POWER_GOOD_ON'.
- Nvm Tool:** A panel at the bottom right showing system devices, including ZL2102 0x20, with options to 'Store' or 'Restore' settings.

A red arrow points from the text 'Source to Rail Wiring' to the connection between Source 1 and Rail 0.

PowerNavigator 5.3 – System Screen

The screenshot displays the PowerNavigator 5.3 software interface. The main window is titled "Power Navigator 5" and features a menu bar (File, Edit, View, Option, Help) and a toolbar. The interface is divided into several panes:

- Part Library:** A tree view on the left showing categories like "Generic", "Digital, Integrated FET", "Digital, POL Single Phase", "Digital, POL Dual Phase", "Digital, Multiphase", "Digital, Module", "Digital, Power Monitor", and "Automotive".
- Power Map:** The central workspace showing a power map with four rails (Rail 0, Rail 1, Rail 2, Rail 3) and two devices (FPGA and 3v3AUX). Each rail is currently "Offline". A right-click context menu is open over the Power Map, listing options such as "Show Layout Assistant", "Select All Wires", "Auto Wire All Power Lines" (highlighted), "Delete All Wires", "Delete Selected Wires", "Delete Device", "Inspect Selected Load/Rail", "Inspect Selected Load/Rail in Window", "View All Fault Status", and "View All Monitors".
- Monitor View:** A panel on the right showing real-time monitoring for "Rail 1". It includes a "Power Good" indicator, "Vout" (1.0 V), "Pin Enable" dropdown, "Immediate Off" button, "Margin" (Nominal), "Output Voltage" (0.00 V), "Output Current" (0.00 A), "VIN" (0.00 V), "Input Current" (0.00 A), and "Voltage Monitor".
- Message Viewer:** A panel at the bottom left showing system messages, including "Rail 4 deleted".
- Nvm Tool / System Devices:** A panel at the bottom right showing a table of devices with columns for "Devices", "Memory", and "Action".

Right-click on PowerMap to bring up contextual menu. Select “Auto Wire All Power Lines” to auto wire PowerMap.

PowerNavigator 5.3 – System Screen

The screenshot displays the PowerNavigator 5.3 software interface. The main window is titled "Power Navigator 5" and shows a "Power Map" view. On the left, a "Part Library" pane lists various components under "Digital, Integrated FET", including ZL2101, ZL2102, ZL8800, ZL8801, ZL8802, and others. The central "Power Map" area shows a "Source 1" connected to four rails: Rail 0 (ZL2102, 1 phase), Rail 1 (ZL8802, 2 phase), Rail 2 (ZL8802, 2 phase), and Rail 3 (ISL68200, 1 phase). Each rail is connected to specific loads: Rail 0 to VCCINT, VCCAUX, and VCCIO; Rail 1 to VCCAUX; Rail 2 to VCCAUX; and Rail 3 to 3v3AUX. The "Monitor View" on the right shows the status of "Rail 1", including "Power Good", "Vout" (1.0 V), "Output Voltage" (0.00 V), "Output Current" (0.00 A), "VIN" (0.00 V), and "Input Current" (0.00 A). The "Message Viewer" at the bottom left shows a log of commands and responses, such as "40-1.20.1E.00 => WRITE command=VOUT_MARGIN_LOW" and "40-1.40.23.5C => WRITE command=VOUT_OV_FAULT_LIMIT". The "Nvm Tool" and "System Devices" panes at the bottom right show the configuration for the ZL2102 0x20 device, including a "User" dropdown and "Store" and "Restore" buttons.

Fully wired PowerMap with multi-input loads.

PowerNavigator 5.3 – System Screen

The screenshot displays the PowerNavigator 5.3 software interface. The main window is titled "Power Navigator 5" and contains several panes:

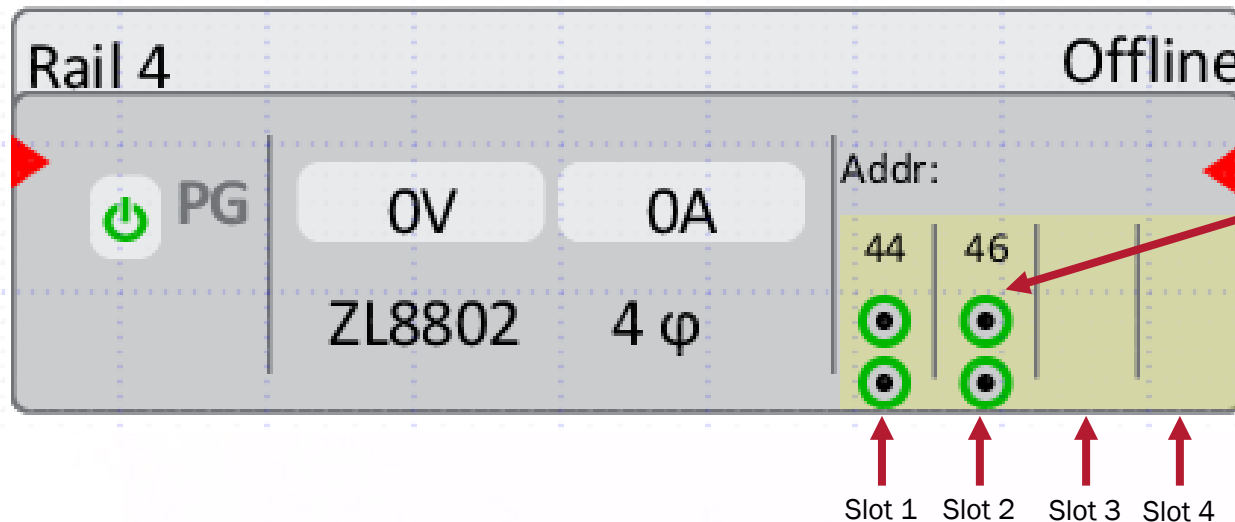
- Part Library:** A tree view on the left showing categories like "Generic", "Digital, Integrated FET", "Digital, POL Single Phase", "Digital, POL Dual Phase", "Digital, Multiphase", "Digital, Module", "Digital, Power Monitor", and "Automotive".
- Power Map:** The central workspace showing a power distribution diagram. It features a "Source 1" block connected to four rails: Rail 0 (ZL2102, 1 phase), Rail 1 (ZL8802, 2 phases), Rail 2 (ZL8802, 2 phases), and Rail 3 (ISL68200, 1 phase). Each rail is currently "Offline". Red arrows indicate connections to various components: Rail 0 to VCCINT, VCCAUX, and VCCIO; Rail 1 to VCCAUX; Rail 2 to VCCAUX; and Rail 3 to 3v3AUX.
- Monitor View:** A panel on the right for monitoring "Rail 0". It includes a power good indicator, a "Vout" field set to 3.3 V, a "Pin Enable" dropdown, an "Immediate Off" button, a "Margin" dropdown set to "Nominal", and three graphs: "Output Voltage" (0.00 V), "Output Current" (0.00 A), and "VIN" (0.00 V). Each graph has a color-coded scale.
- Message Viewer:** A panel at the bottom left showing system messages, including "Rail 4 deleted".
- Nvm Tool:** A panel at the bottom right showing "System Devices" with a table of devices and their memory addresses.

Devices	Memory	Action
ZL2102	0x20	User Store Restore

To implement a current sharing rail, drag a part from the part library onto an open RailBlock “slot”.

PowerMap RailBlock Overview

Example ZL8802 RailBlock (4-PH operation):



Dots represent number of phases

- The ZL8802 allows for 2-PH, 4-PH, 6-PH or 8-PH operation via current share.
- Each “slot” in the RailBlock represents shows how many controllers can be paralleled in a current share group.
- To create a current share group, a controller can be dragged from the part library into a “slot”, creating a current share rail.
- In this case, we have a 4-phase design, with two ZL8802 controllers – one at PMBus address 0x44 and another at 0x46.

PowerNavigator 5.3 – System Screen

The screenshot displays the PowerNavigator 5.3 System Screen. The main window is titled "Power Navigator 5" and features a "Power Map" tab. The "Part Library" on the left lists various components, including "Digital, Integrated FET" (ZL2101, ZL2102), "Digital, POL Single Phase" (ZL8800, ZL8801, ZL8802), "Digital, Multiphase", "Digital, Module", "Digital, Power Monitor", and "Automotive".

The "Power Map" shows four rails (Rail 0, Rail 1, Rail 2, Rail 3) connected to a "Source 1". Each rail is configured with a specific component and parameters:

- Rail 0:** ZL2102, 1 phase, 0V, 0A, Addr: 20. It is connected to an FPGA component (VCCINT, VCCAUX, VCCIO).
- Rail 1:** ZL8802, 2 phase, 0V, 0A, Addr: 40.
- Rail 2:** ZL8802, 4 phase, 0V, 0A, Addr: 42 | 44. A text annotation "ZL8802 4PH Current Share" is placed next to this rail.
- Rail 3:** ISL68200, 1 phase, 0V, 0A, Addr: 21. It is connected to a 3v3AUX component.

The "Monitor View" on the right shows the status of the selected rail (Rail 0). It includes a "Monitor" section with a "Rail 0" dropdown, a "Power Good" indicator, and a "Vout" of 3.3 V. Below this are "Output Voltage" and "Output Current" meters, both showing 0.00 V and 0.00 A respectively. The "VIN" meter shows 0.00 V. The "Margin" is set to "Nominal".

The "Message Viewer" at the bottom left displays the following messages:

```
Created Rail 2: ZL8802-1 0x42 0x0
Created Rail 3: ISL68200-0 0x21
Created 3v3AUX
Successfully set user data
```

The "Source Id: Source_1" is displayed at the bottom left of the main window.

The "Nvm Tool" at the bottom right shows a table of system devices:

Devices	Memory	Action
ZL2102 0x20	User	Store Restore

Monitoring View

The screenshot displays a vertical stack of monitoring panels for a device rail. At the top, the rail name is '1.0V AUX'. Below it is a power good indicator labeled 'PG'. The output voltage is set to '1.0 V'. The interface includes several monitoring graphs: Output Voltage (0.01 V), Output Current (0.00 A), Input Voltage (12.08 V), Power Stage Temp (24.47 C), and Internal Temperature (28.56 C). At the bottom, the duty cycle is 0.0% and the switching frequency is 533.0 kHz.

Device rail name

View configuration options

Adjustment on output voltage

PGOOD indicator

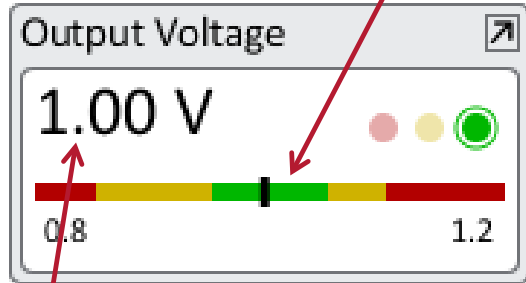
Monitoring readouts for Vin, Vout, Iout, Iin

Temperature monitors for both internal (controller junction) and external (power stage FETs)

Duty cycle and switching frequency

Readouts

Analog sliding meter with color indicators. Green is within normal limits, yellow in PMBus warning limits, red for exceeding OVP/UVP settings



Clicking this button will open the window below allowing adjustment of limits

Operation and fault lights

Digital readout of output voltage

The 'Vout Margins & Limits' window contains the following settings:

Parameter	Value	Percentage
Vout Max	1.15 V	
Vout OV Fault Limit	1.1 V	10.0 %
Vout Margin High	1.05 V	5.0 %
Vout Margin Low	0.95 V	-5.0 %
Power Good Threshold	0.9 V	-10.0 %
Vout UV Fault Limit	0.85 V	-15.0 %
Margin/Limits Track Vout	<input checked="" type="checkbox"/>	
Display Limit High	1.2 V	20.0 %
Display Limit Low	0.8 V	-20.0 %
Display Limits Track Vout	<input checked="" type="checkbox"/>	
Vout Command	1.0 V	

The window also includes a 'Set to Defaults' button and a smaller version of the 'Output Voltage' window in the bottom right corner, which is identical to the one shown in the top left.

Connecting to Hardware

intersil™ PowerNavigator™



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Connect to Hardware...

- **To connect to hardware, a USB to PMBus adapter (ZLUSBEVAL3Z, included with all demo kits) is required.**
- **STEP 1: Connect USB cable from PC to USB adapter**
- **STEP 2: Connect USB to PMBus adapter to demo board hardware**
- **STEP 3: Power demo board**
- **STEP 4: Launch PowerNavigator software**

Connect to Hardware...

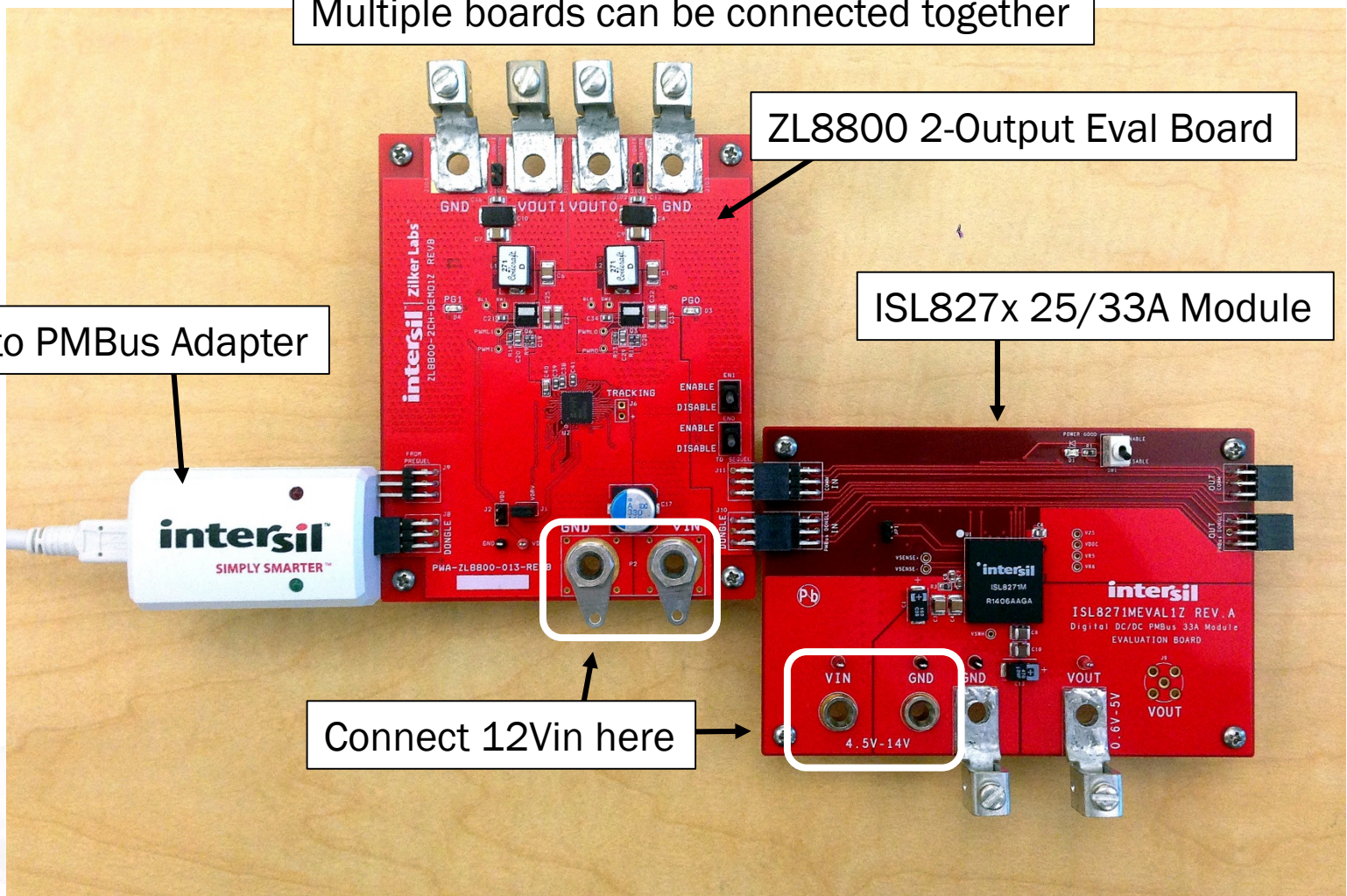
Multiple boards can be connected together

USB to PMBus Adapter

ZL8800 2-Output Eval Board

ISL827x 25/33A Module

Connect 12Vin here

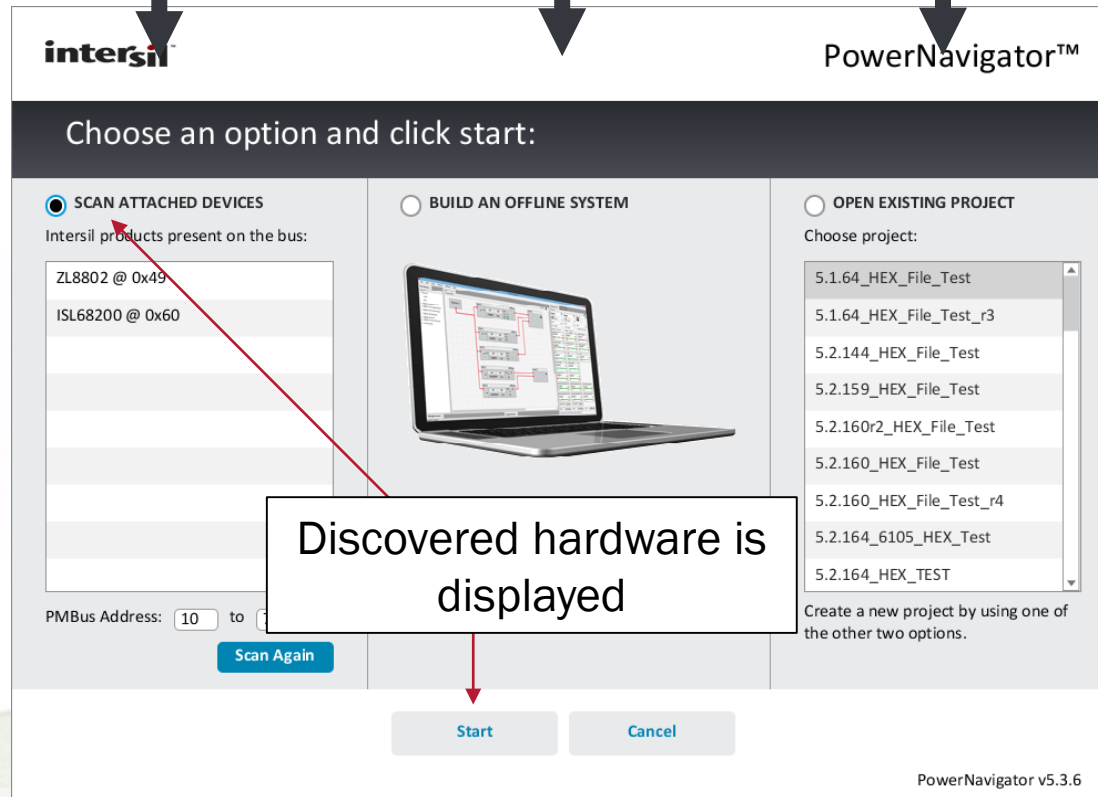


PowerNavigator Launch Screen

Connected Devices

Offline Mode

Project Load



All discovered hardware is displayed in the "Scan Devices" window. The PMBus scan range can be adjust – default range is 0x10 to 0x7F.

PowerNavigator 5.3 – Connect to HW

The screenshot displays the PowerNavigator 5.3 software interface, which is used for configuring and monitoring power rails. The interface is divided into several main sections:

- Part Library:** A sidebar on the left lists various power management components such as Digital, Integrated FET, Digital, POL Single Phase, Digital, POL Dual Phase, Digital, Multiphase, Digital, Module, Digital, Power Monitor, and Automotive.
- Power Map:** The central workspace shows a grid of power rails. A "Source 1" is highlighted with a blue box. Three rails are visible:
 - Rail 10:** 1.2V, 24.84A, ZL8802, 1 φ, Addr: 49-1
 - Rail 9:** 1V, 8.8A, ZL8802, 1 φ, Addr: 49-0
 - Rail 0:** 0.99V, 0A, ISL68200, 1 φ, Addr: 60
- Monitor View:** The right-hand side provides detailed monitoring for three selected rails: Rail 0, Rail 10, and Rail 9. Each rail's status is shown with a green power good indicator and a "PG" label. Below the status are controls for Vout, Pin Enable, Immediate Off, Margin, Output Voltage, Output Current, Input Voltage, Input Current, and Power Stage Temp. For example, Rail 0 shows 0.99V output voltage and 0.00A output current, while Rail 10 shows 1.20V output voltage and 24.84A output current.
- Message Viewer:** A bottom-left pane showing "Source Id: Source_1".
- Nvm Tool & System Devices:** A bottom-right pane with tabs for "System Devices", "Devices", "Memory", and "Action".

A red arrow points from the text below to the Rail 0 component in the Power Map, indicating that the PowerMap is automatically populated with attached hardware.

PowerMap is automatically populated with attached hardware

PowerNavigator 5.3 – Connect to HW

The screenshot displays the PowerNavigator 5.3 software interface. The main window is divided into several sections:

- Part Library:** A sidebar on the left containing a tree view of components like 'Generic', 'Load', and 'Rail'.
- Power Map:** The central workspace showing a circuit diagram. A 'Source 1' block is connected to three 'Rail' blocks (Rail 10, Rail 9, and Rail 0). These rails are then connected to a 'Load 1' block. The Rail 10 block shows a voltage of 1.2V and a current of 24.88A. The Rail 9 block shows 1V and 8.83A. The Rail 0 block shows 0.99V and 0A.
- Monitor View:** A panel on the right showing real-time data for each rail. It includes 'Output Voltage', 'Output Current', 'Input Voltage', 'Input Current', and 'Power Stage Temp' for Rail 0, Rail 9, and Rail 10. For example, Rail 0 shows 0.99V output and 0.00A output current.
- Message Viewer:** A panel at the bottom left showing the source ID as 'Source_1'.
- Nvm Tool:** A panel at the bottom right showing system devices and memory.

A red arrow points from the text below to the Rail 0 block in the Power Map.

System load can be added to PowerMap. RailBlocks can be wired to input source and load.

PowerNavigator 5.3 – Project Save

The screenshot displays the PowerNavigator 5.3 software interface. The 'File' menu is open, with the 'Save' option highlighted. A red box highlights the 'File' menu, and a red arrow points from the 'Save' option to the 'Save Project' dialog box. The dialog box is titled 'Save Project' and contains a 'Project Name' field with the text 'new'. Below the field is a list of project names, with 'example' visible. There is a checkbox labeled 'Do not save perspective' which is currently unchecked. A warning message reads 'Please disable devices before save project.' At the bottom of the dialog are 'Save' and 'Cancel' buttons. The background shows the main software interface with various rail monitors and a power map.

To save a project, go to File -> Save

Saving a project will save any device configuration files, PowerMap setup, and PowerNavigator perspective settings.

PowerNavigator – Rail Inspector

intersil™ PowerNavigator™



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PowerNavigator 5.3 – Rail Inspector

- **Rail Inspector tool eases device configuration**
 - Double click on RailBlocks to bring up individual Rail Inspector for each device.
 - Each device in PowerNavigator can have its own, customized Rail Inspector.
- **Rail Inspector tool can be used to:**
 - Quickly see rail summary, including PMBus addresses, controller type, PMBus status, device options, fault status, etc.
 - Save/Load Configuration Files
 - Configure device using command tool
- **Allows for future expandability**
 - Future releases of PowerNavigator will expand Rail Inspector features

PowerNavigator 5.3 – Rail Inspector

1

Double Click RailBlock to bring up Load Inspector window

2

Rail Inspector Window will appear

The screenshot displays the PowerNavigator 5.3 software interface. The main window shows a Power Map with three rail blocks: Rail 10 (1.2V, 24.88A), Rail 9 (1V, 8.86A), and Rail 0 (0.99V, 0A). A red arrow points from a callout box labeled '1' to the Rail 0 block. Another red arrow points from a callout box labeled '2' to the Rail Inspector window that has opened. The Rail Inspector window for Rail 0 shows the following information:

- EN Mode: PMBus & Pin Enable
- PMBus Enable:
- Power Good:
- Rail Information:
 - Rail Name: Rail 0
 - Devices: ISL68200, Address: 0x60, Config File: Load, Save
- Voltage & Current:
 - Input Voltage: 12.12 V
 - Frequency Switch: 400 kHz
 - Output Voltage: 1.0 V
 - Load Current: 0.0 A
- Rail Status:
 - Vout Status: Enabled
 - PMBus Status: Online
- Configuration Settings:
 - Programming Pin 1: 0x80
 - Programming Pin 2: 0xa0
 - Programming Pin 3: 0x08
 - Programming Pin 4: 0x00

Example Rail Inspector – ISL68200

The screenshot displays the Rail Inspector software interface for the ISL68200. The interface is divided into several sections:

- Overview:** A sidebar on the left contains a navigation menu with categories: Configuration (Design Requirements, Component Selection, Efficiency, Current Sense, Pinstrap Configuration, Design Verification, Schematic), Telemetry (Monitor, Fault, Phase Scope), and Command Tools (New).
- EN Mode:** A dropdown menu is set to "PMBus & Pin Enable".
- PMBus Enable:** A green toggle switch is turned on.
- Power Good:** A green indicator light is on.
- Rail Information:** A section with a "Rail Name" field containing "Rail 0". Below it is a table with columns "Devices", "Address", "Config File", and "Page". The table contains one entry: "ISL68200", "0x60", "Load Save", and "--".
- Rail Status:** A section showing "Vout Status: Enabled" and "PMBus Status: Online".
- Voltage & Current:** A section displaying "Input Voltage: 12.12 V", "Frequency Switch: 400 kHz", "Output Voltage: 1.0 V", and "Load Current: 0.0 A".
- Configuration Settings:** A section listing "Programming Pin 1: 0x80", "Programming Pin 2: 0xa0", "Programming Pin 3: 0x08", and "Programming Pin 4: 0x00".

Callouts with red arrows point to specific features:

- Load/Save Configuration Files:** Points to the "Load" and "Save" buttons in the Rail Information table.
- Enable/Disable Output from within Rail Inspector:** Points to the PMBus Enable toggle switch.
- Device Parameters/Telemetry:** Points to the Input Voltage, Frequency Switch, Output Voltage, and Load Current values.
- Rail Status:** Points to the Vout Status and PMBus Status indicators.
- Device Option Summary:** Points to the Configuration Settings section.
- Rail Inspector Navigation:** Points to the Overview sidebar.

Example Rail Inspector – ISL68200

The screenshot shows the 'Rail 0' window with the following configuration:

- EN Mode:** PMBus & Pin Enable
- PMBus Enable:**
- Power Good:**
- Input Voltage:**
 - Max Input Voltage: 13.2 V (10.0 % tolerance)
 - Typ Input Voltage: 12.0 V
 - Min Input Voltage: 10.8 V (-10.0 % tolerance)
 - Track by Percent
- Output Voltage:**
 - Output Voltage: 1.0 V
 - Vout Tolerance: 5.0 %
 - Vout Ripple: 10.0 mV (1.0 % tolerance)
 - Track by Percent
- Load:**
 - Max Load Current: 30.0 A
 - Max Load Step: 15.0 A (50.0 % tolerance)
 - Over Current Trip Point: 37.5 A (125.0 % tolerance)
 - Track by Percent

Design Requirements – Enter Vin, Vout and Iout requirements

Example Rail Inspector – ISL68200

The screenshot displays the Rail Inspector software interface for the ISL68200. The main window shows a schematic diagram of a buck converter with the following components and parameters:

- Q1 (MOSFET):** $R_{ds(on)} = 5.0\text{ m}\Omega$, Quantity = 1
- Q2 (MOSFET):** $R_{ds(on)} = 1.2\text{ m}\Omega$, Quantity = 1
- Inductor:** $L = 0.22\text{ }\mu\text{H}$, $\text{DCR} = 0.29\text{ m}\Omega$
- Output Capacitor:** $C = 47.0\text{ }\mu\text{F}$, $\text{ESR} = 4.0\text{ m}\Omega$, $\text{ESL} = 0.6\text{ nH}$
- Input Capacitor:** $C = 220.0\text{ }\mu\text{F}$, $\text{ESR} = 4.0\text{ m}\Omega$, $\text{ESL} = 1.0\text{ nH}$
- Switching Frequency (FSW):** 400 kHz
- Input Voltage (VIN):** 12.0 V
- Output Voltage (VOUT):** 1.0 V

The component selection panel for the UFET (Q1) is shown on the right, with the following parameters:

- Manufacturer Part No:
- Quantity: 1
- $R_{ds(on)}$ at 5V: 5.0 m Ω
- Qg: 10.0 nC
- Coss: 0.5 nF
- Ton_Switch: 5.0 ns
- Toff_Switch: 5.0 ns

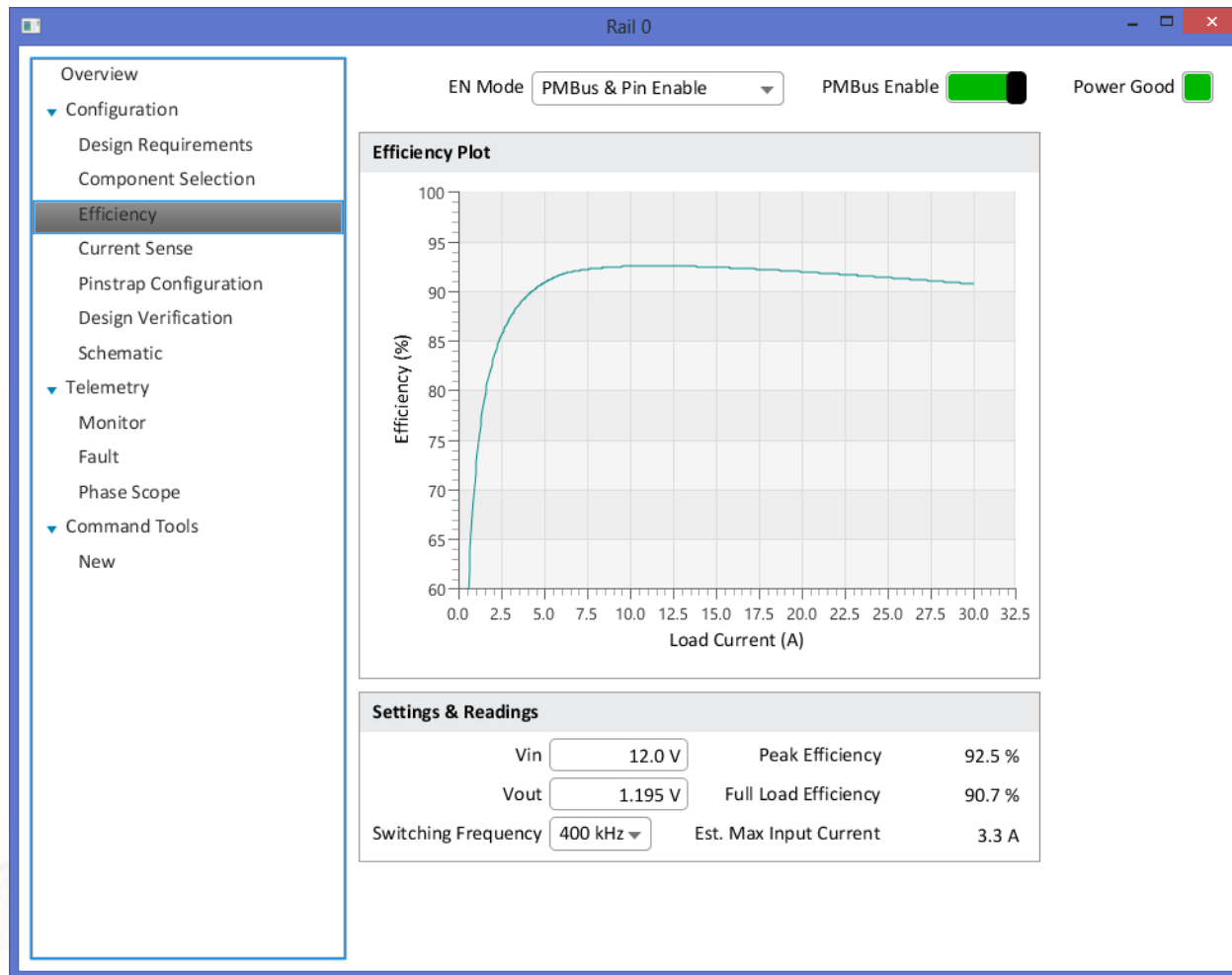
At the bottom of the interface, there are two summary tables:

Current	
Inductor Peak-Peak Ripple	10.417 A
Peak Current at Full Load	35.208 A

DCR Match	
RDCR	9.53 k Ω
CDCR	1.0 μF

Component Selection – Enter FET, Inductor and Output Cap information

Example Rail Inspector – ISL68200



Efficiency – Real time plot of efficiency with selected components and switching frequency.

Example Rail Inspector – ISL68200

Overview

- Configuration
 - Design Requirements
 - Component Selection
 - Efficiency
 - Current Sense**
 - Pinstrap Configuration
 - Design Verification
 - Schematic
- Telemetry
 - Monitor
 - Fault
 - Phase Scope
- Command Tools
 - New

EN Mode: PMBus & Pin Enable

PMBus Enable:

Power Good:

Over Current

Desired Over Current Trip Point: 37.5 A

Current Sense Calculatons

Current sense gain resistor (Risen): 107.0 Ω

lout gain resistor (Riout): 14.7 k Ω

Calculate OC Trip Points

Average Over Current Trip Point: 37.5 A

Peak Over Current Trip Point: 48.75 A

Current Sense Diagram

ISL68200 INTERNAL CIRCUIT

DRIVER

VIN

INDUCTOR + VL

DCR

VOUT

COUT

PLACE THESE IN CLOSE PROXIMITY TO ISL68200

+Vc(s)

OPTIONAL

R

C

CURRENT SENSE

CSEN

CSRTN

$I_{SEN} = I_L \frac{DCR}{R_{ISEN}}$

Current Sense – Automatic calculation of current sense resistor settings based on desired OC trip point.

Example Rail Inspector – ISL68200

Rail 0

EN Mode **PMBus & Pin Enable** PMBus Enable Power Good

PROG1 Pin

Output Voltage

Register Value 0x5E

Rup 45.3 kΩ

Rdown 150 kΩ

Reset **Send**

PROG2 Pin

Disable PFM

TCOMP

PMBus Address

Register Value 0xA0

Rup OPEN

Rdown 105 kΩ

Reset **Send**

PROG3 Pin

OCP/OTP

FSW

AV Gain

25 kHz Clamp

Register Value 0x08

Rup 29.4 kΩ

Rdown 15 kΩ

Reset **Send**

PROG4 Pin

SS dv/dt

R4 RR

AV Multiplier

Register Value 0x00

Rup OPEN

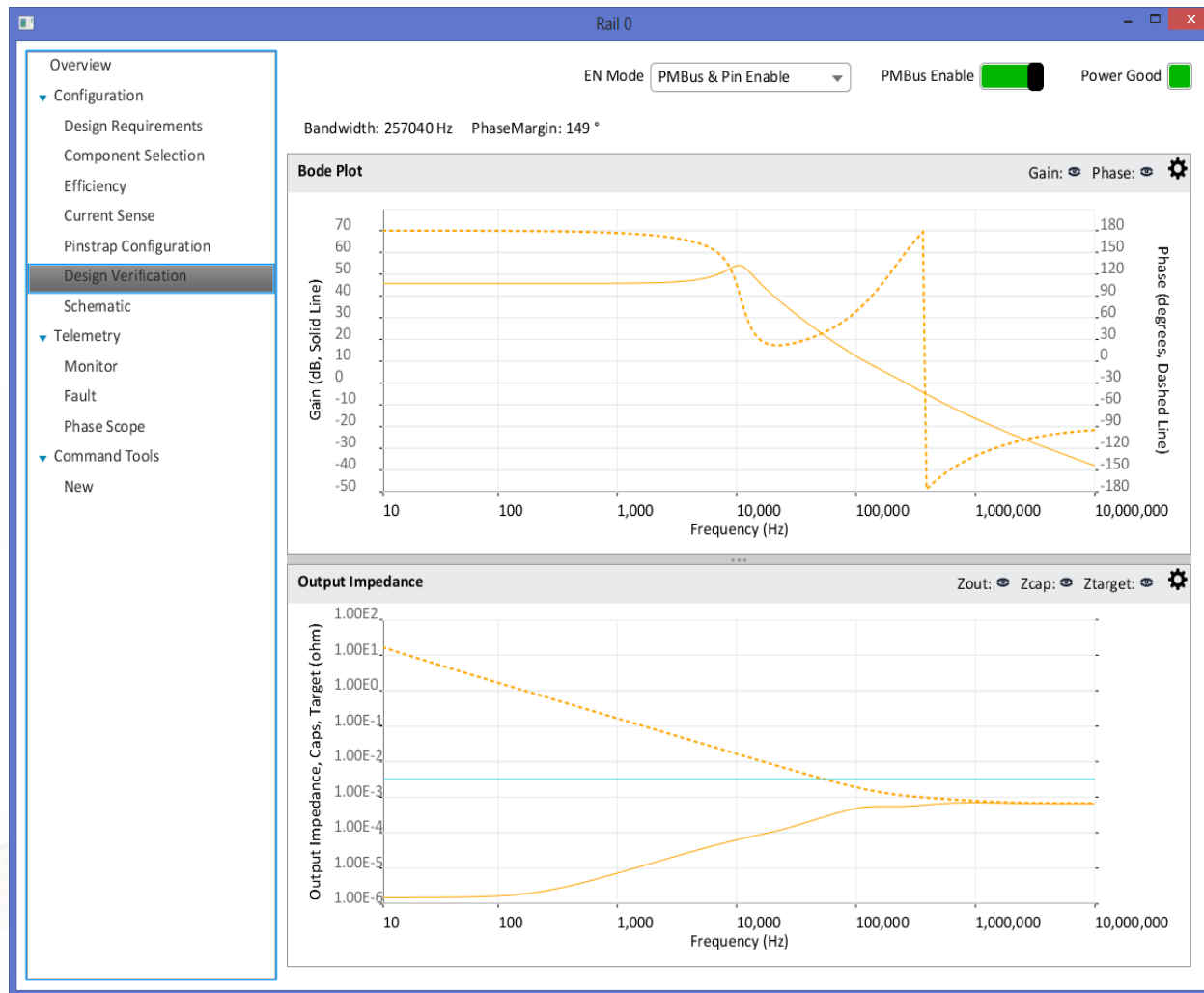
Rdown 10 kΩ

Reset **Send**

*Settings other than those selected by PROGx To finalize changes, resistor values on hardware

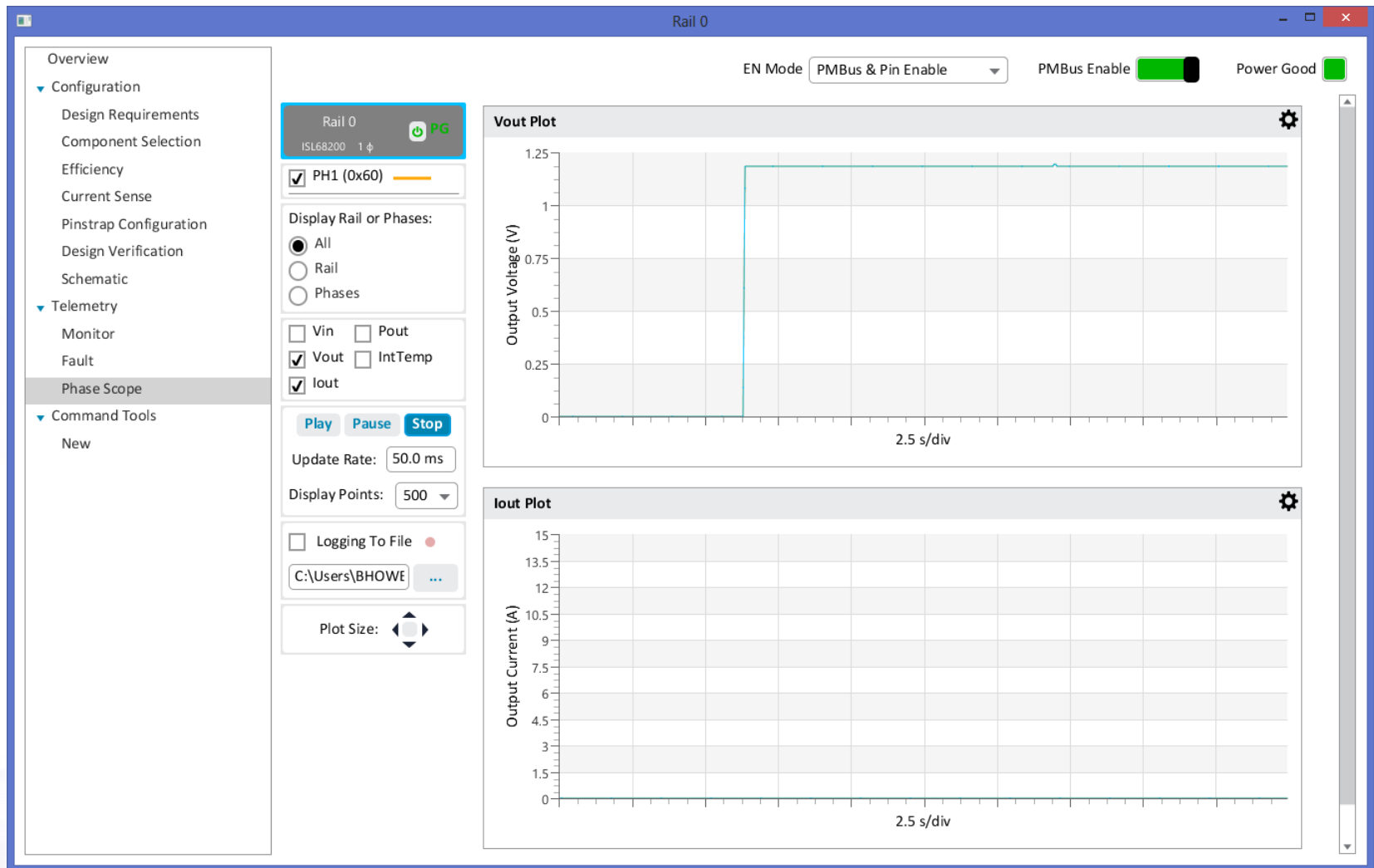
Pinstrap Configuration – Select pinstrap resistors to setup device default settings.

Example Rail Inspector – ISL68200



Design Verification – Bode and Output Impedance plots of design.

Example Rail Inspector – ISL68200



Phase Scope – Real time plotting of all telemetry parameters.

Example Rail Inspector – ISL68200

Overview

- Configuration
 - Design Requirements
 - Component Selection
 - Efficiency
 - Current Sense
 - Pinstrap Configuration
 - Design Verification
 - Schematic
- Telemetry
 - Monitor
 - Fault
 - Phase Scope
- Command Tools
 - New
 - Command Tool 1

EN Mode: PMBus & Pin Enable | PMBus Enable: | Power Good:

ISL68200-00x60

File | Command Sets | Targets

Cmd: VOUT_COMMAND | Search | Send | Read

Hex: 0099 | X | 1.195 V | VOUT_COMMAND

Cmd: READ_IOUT | Search | Read

Command Line to select PMBus command

Send/Read commands to target device

Add/Remove command lines in command tool

Select Command Tool in Rail Inspector

X	false	Busy
X	false	Off
X	false	Vout O
X	false	Iout O
X	false	Vin UV
X	false	Temperature
X	true	Comm/Logic
X	false	None of the above

Example Rail Inspector – ISL68200

Clicking “Search” allows the user to quickly find any PMBus command the device supports

Command Search

Command Code	Command Description
d4h: AV_GAIN	d1h: TEMP_COMP
03h: CLEAR_FAULTS	d2h: ULTRASONIC_PFM_ENABLE
d0h: ENABLE_PFM	21h: VOUT_COMMAND
d3h: FAULT_BEHAVIOR	24h: VOUT_MAX
33h: FREQUENCY_SWITCH	20h: VOUT_MODE
adh: IC_DEVICE_ID	
ae: IC_DEVICE_REVISION	
02h: ON_OFF_CONFIG	
01h: OPERATION	
98h: PMBUS_REVISION	
8ch: READ_IOUT	
dch: READ_PROG1	
ddh: READ_PROG2	
deh: READ_PROG3	
dfh: READ_PROG4	
8dh: READ_TEMP	
88h: READ_VIN	
8bh: READ_VOUT	
d6h: SET_RR	
d5h: SS_DVID_RATE	
78h: STATUS_BYTE	

Sequencing

intersil™ PowerNavigator™



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PowerNavigator – Sequencing

- **All Intersil Digital Power Controllers and modules with a DDC bus support autonomous sequencing between rails.**
- **Sequencing is configured using the PowerNavigator sequencing tool.**
- **Once configured, all sequencing events are handled automatically using Intersil's proprietary DDC bus.**
 - Controllers and/or modules will automatically communicate via DDC bus, synchronizing sequencing events.

PowerNavigator – System Screen

The screenshot shows the PowerNavigator 5 interface. The main window is titled "Power Navigator 5" and has a menu bar with File, Edit, View, Option, and Help. The "Sequencing" tab is selected and highlighted with a red box and a callout "Sequencing Tab". The Power Map shows a Source 1 connected to four rails: Rail 0 (ZL2102, 1 φ), Rail 1 (ZL8802, 2 φ), Rail 2 (ZL8802, 4 φ), and Rail 3 (ISL68200, 1 φ). These rails are connected to an FPGA (VCCINT, VCCAUX, VCCIO) and a 3v3AUX device. The right sidebar shows the Monitor View for Rail 0, displaying Vout (1.195 V), Output Voltage (1.19 V), Output Current (0.00 A), Input Voltage (12.12 V), External Temperature (30.39 C), and Fsw (400 kHz). The bottom left has a Message Viewer with a log of events, and the bottom right has a System Devices table.

Devices	Memory	Action
ZL2102 0x20	User	Store Restore
ZL8802 0x40	User	Store Restore
ZL8802 0x42	User	Store Restore
ZL8802 0x44	User	Store Restore

The sequencing tab allows for power up and power down sequencing of devices in the PowerMap.

PowerNavigator GUI - Sequencing

The screenshot displays the PowerNavigator 5 GUI with the Sequencing tab selected. The interface includes a Part Library on the left, a Sequencing table, a timing diagram, and a Monitor View on the right.

Sequencing Table:

Rail	Sequencing	Ton Delay	Ton Rise	Tracking	Response	SAG
Rail 2	<input checked="" type="checkbox"/>	5 ms	5 ms	<input type="checkbox"/>	100% Vout Limited	After PG
Rail 1	<input checked="" type="checkbox"/>	5 ms	5 ms	<input type="checkbox"/>	100% Vout Limited	After PG
Rail 0	<input checked="" type="checkbox"/>	5 ms	10 ms	<input type="checkbox"/>		

Timing Diagram:

The diagram plots Vout (V) on the y-axis (0.2 to 1.8) against Time (ms) on the x-axis (2.8 to 34.0). It shows three sequential ramps: a blue ramp for Rail 2 (0.8V), an orange ramp for Rail 1 (1.2V), and a green ramp for Rail 0 (1.8V). Vertical dashed lines indicate the start of each ramp.

Monitor View:

The Monitor View shows the status of three rails:

- Rail 0:** Power Good (PG) is on. Vout is 1.8 V.
- Rail 1:** Power Good (PG) is on. Vout is 1.0 V.
- Rail 3:** Power Good (PG) is on. Vout is 1.0 V.

Each rail has associated gauges for Output Voltage, Output Current, and Input Voltage.

Message Viewer:

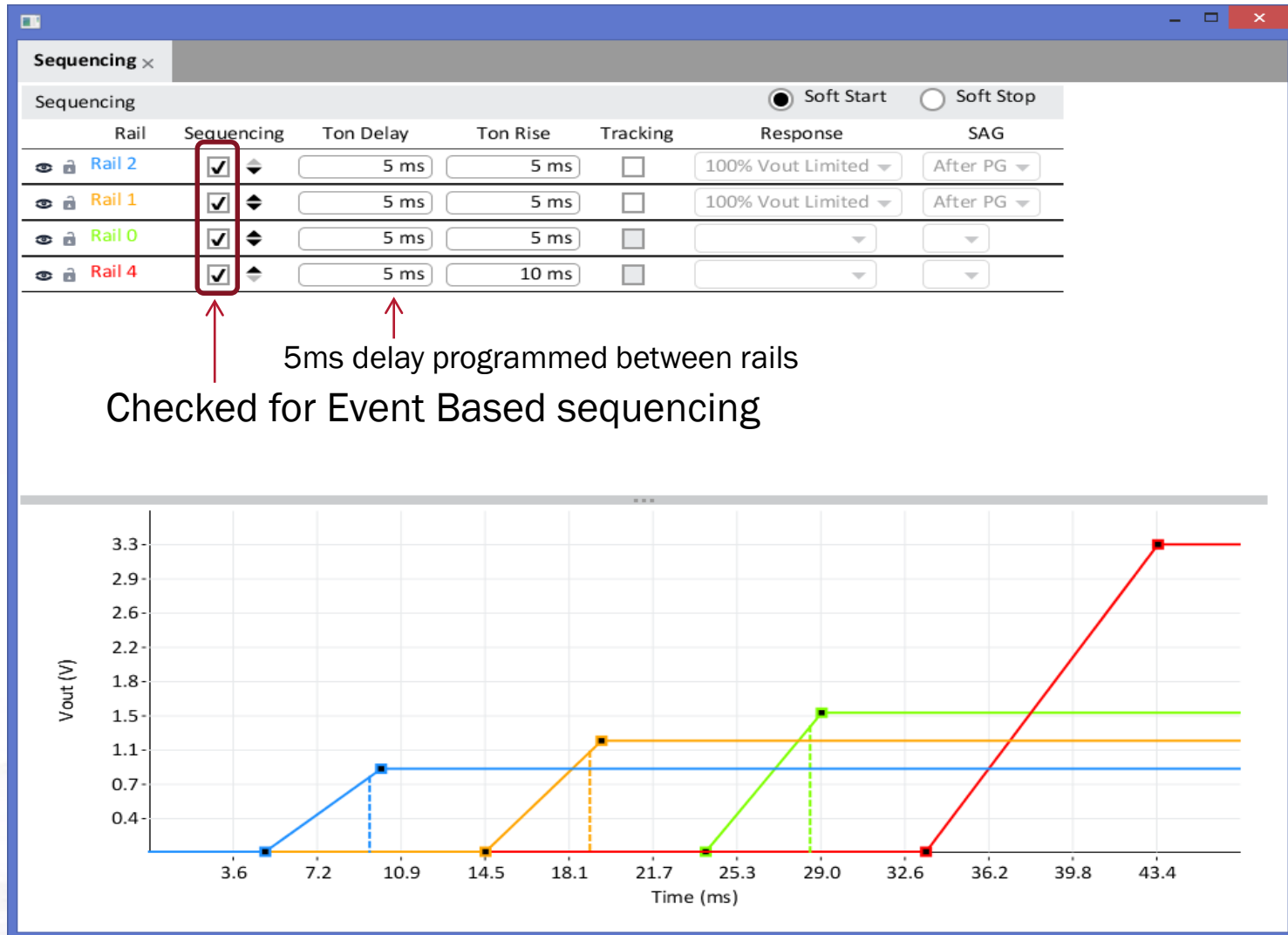
```
44-1.e0.00.81 => WRITE command=SEQUENCE
40-0.e2.4.00.00.20.00 => WRITE command=DDC_GROUP
40-1.e2.4.00.00.20.00 => WRITE command=DDC_GROUP
40-0.e0.82.80 => WRITE command=SEQUENCE
40-1.e0.82.80 => WRITE command=SEQUENCE
20.d3.00.00 => WRITE command=DDC_CONFIG
20.e9.C0.00 => WRITE command=MISC_CONFIG
20.e0.81.00 => WRITE command=SEQUENCE
```

Sequencing Tab in GUI

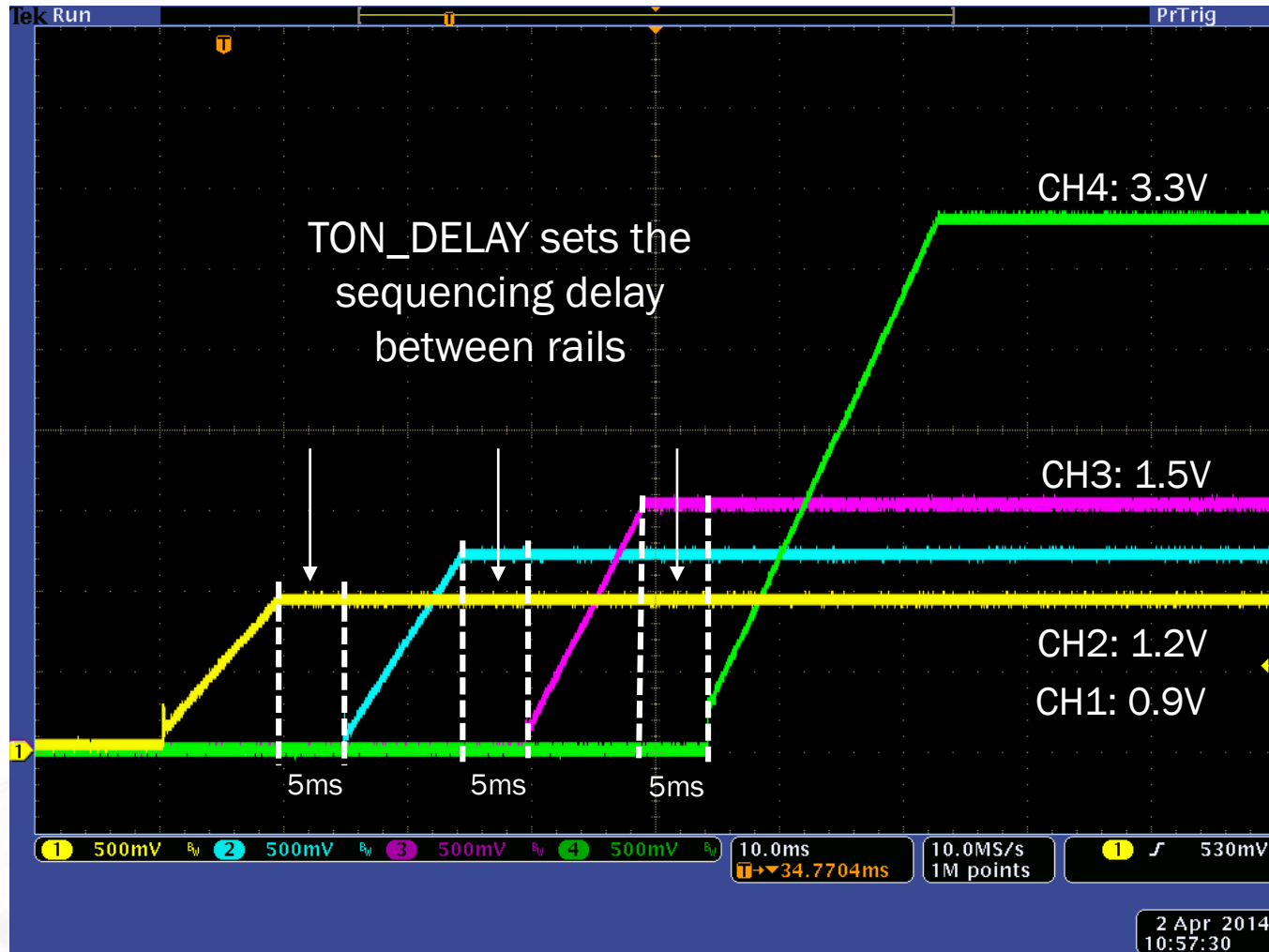
PowerNavigator – Sequencing

- **Event based sequencing waits for the device PGOOD to transition high (the event) before sequential rails start-up**
 - Sequence order is set by Prequel/Sequel using the SEQUENCE PMBus command
 - TON_DELAY is used to set the time delay between sequenced rails
- **Timed based sequencing uses a timer from a global enable to sequence rails at start-up.**
 - TON_DELAY sets the sequence order on the way up. TOFF_DELAY sets the order on the way down.

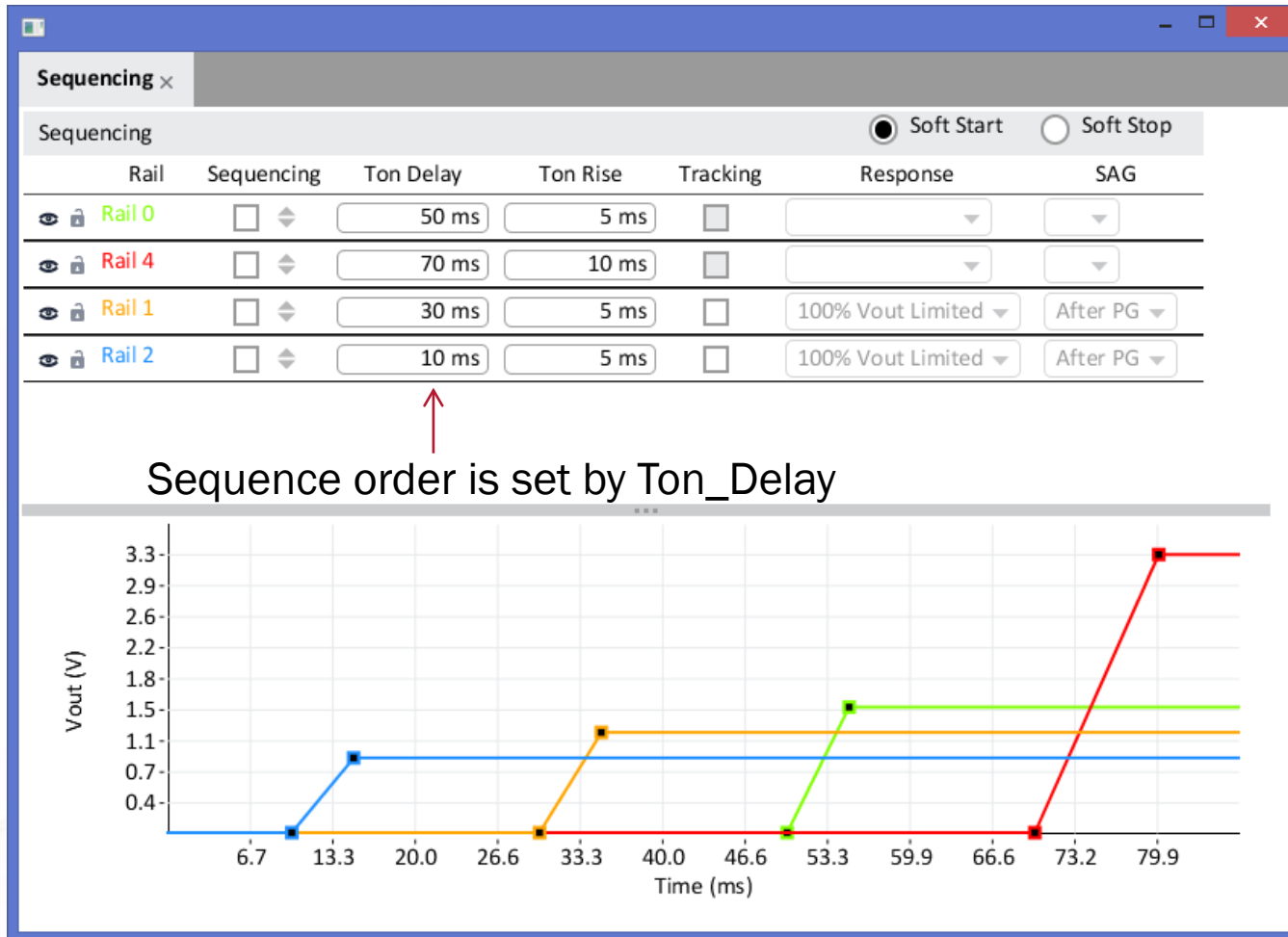
Event Based Sequence Example



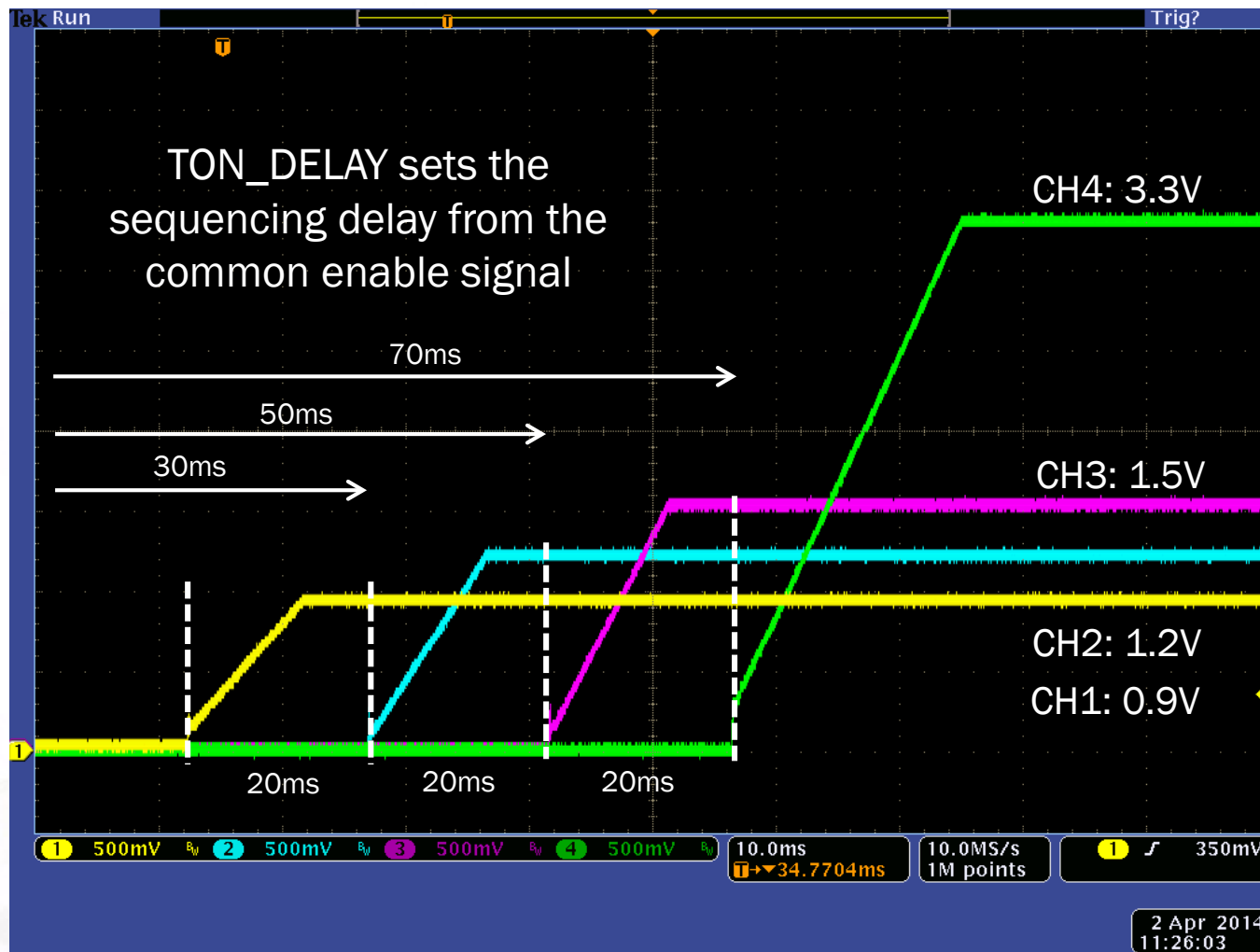
Event Based Sequence Example



Time Based Sequence Example



Time Based Sequence Example



RailScope

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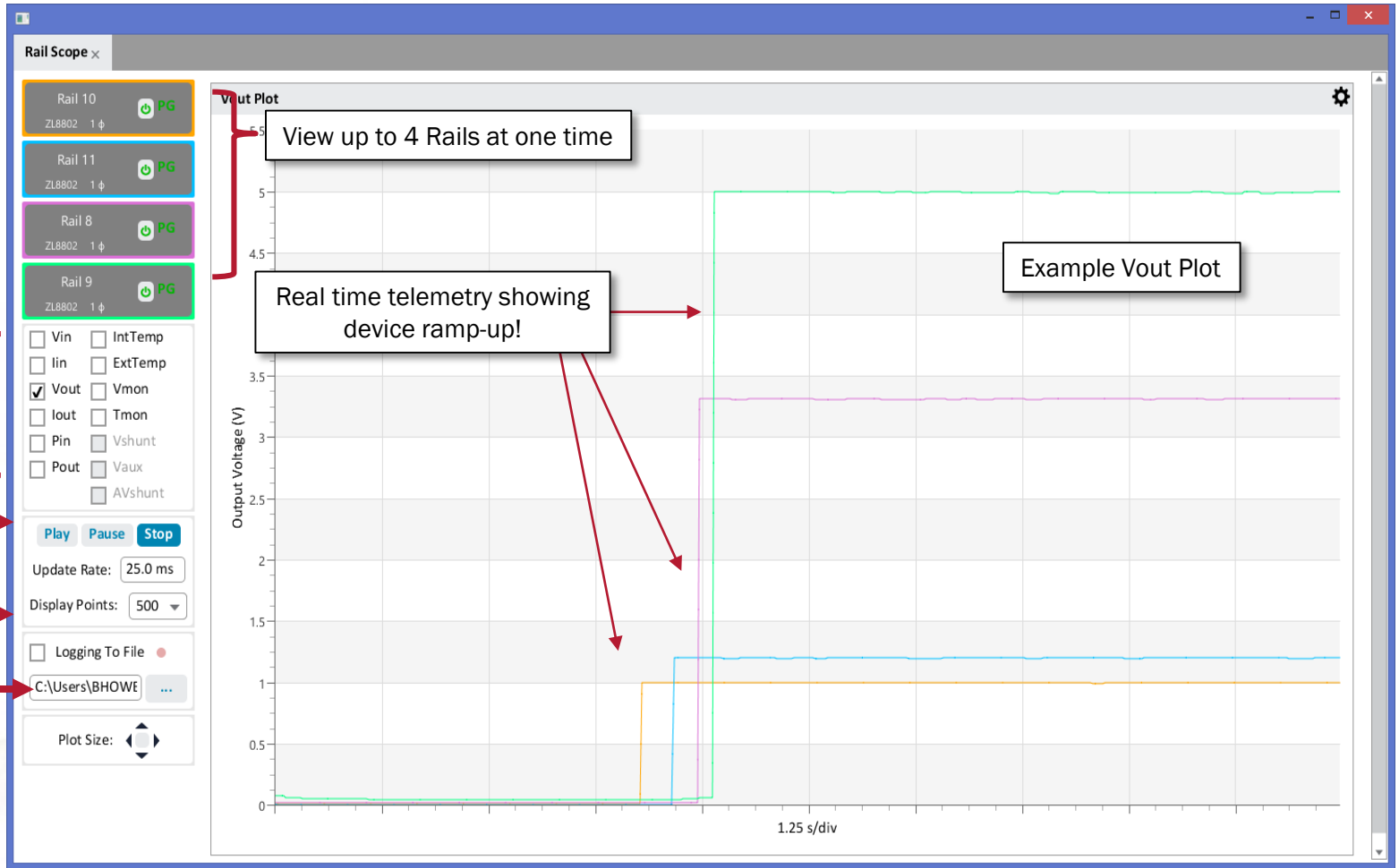


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PowerNavigator 5.3 – RailScope

- **New RailScope allows the user to plot telemetry parameters from up to 4 devices.**
 - Similar to a Low Bandwidth Oscilloscope integrated into PowerNavigator.
 - Allows user to plot multiple telemetry values at a time.
- **Logging capability is also built-in.**
 - All telemetry values can be logged to a .csv file for later viewing.
 - Status registers are also logged.
- **Adjustable update rate allows users to control how much data they collect.**
 - Data can be updated as fast as 1ms and as slow as 1000ms.
 - Displayed points can be as few as 50 to as many as 500.

PowerNavigator - RailScope



Select up to 4 telemetry parameters per device

RailScope controls

Enable/disable logging

Adjust Plot size

View up to 4 Rails at one time

Real time telemetry showing device ramp-up!

Example Vout Plot

RailScope: Initial Setup

1

If RailScope is not visible, go to View->RailScope

2

Double Click on the "Slots" to add rails to RailScope

3

In "Load Rail" window, select rail to add to each slot.

4

Click "Ok" when done

Power Navigator 5

File Edit View Option Help

Part Library x Power Map Rail Scope x

Part Library

- Generic
- Digital, Integrated FET
- Digital, POL Single Phase
- Digital, POL Dual Phase
- Digital, Multiphase
- Digital, Module
- Digital, Power Monitor
- Automotive

SLOT 1 (Double Click to Add)

SLOT 2 (Double Click to Add)

SLOT 3 (Double Click to Add)

SLOT 4 (Double Click to Add)

Vin IntTemp

Iin ExtTemp

Vout Vmon

Iout Tmon

Pin Vshunt

Pout Vaux

AVshunt

Play Pause Stop

Update Rate: 25.0 ms

Display Points: 500

Logging To File

C:\Users\BHOWE

Plot Size: [Adjust]

Output Voltage (V)

Output Voltage: 5.0 V

Output Current: 0.00 A

Input Voltage: 12.08 V

Power Stage Temp: 33.88 C

Internal Temperature: 39.56 C

External Temperature: 39.06 C

Load Rail

Please select a rail:

- No Selection
- Rail 10 : ZL8802
- Rail 11 : ZL8802
- Rail 8 : ZL8802
- Rail 9 : ZL8802

Please Choose Chart Style:

Solid Dashed Dotted

ORANGE

Reset Color

Ok Cancel

Message Viewer x

48-1.1.41 => WRITE command=OPERATION

RailScope: Example View with 2 Telemetry Parameters

The screenshot displays the RailScope software interface. On the left, a 'Part Library' sidebar lists various rail configurations. The main area features two plots: 'Vin Plot' (Input Voltage) and 'Vout Plot' (Output Voltage). The 'Vin Plot' shows a steady-state input voltage of approximately 12.0V. The 'Vout Plot' shows a transient response where the output voltage ramps up from 0V to a steady-state value of about 5.0V. A 'Monitor View' panel on the right provides real-time telemetry for 'Rail 9', including Power Good status, Output Voltage (5.00V), Output Current (1.13A), Input Voltage (12.02V), Power Stage Temp (33.88C), and Internal Temperature (41.06C). A 'Message Viewer' at the bottom shows the command '49-0.1.81 => WRITE command=OPERATION'. A callout box on the left states 'Vin and Vout Telemetry Parameters selected', and another callout box at the top right states 'Chart Area automatically splits into two graphs'.

Part Library

- Generic
- Digital, Integrated FET
- Digital, POL Single Phase
- Digital, POL Dual Phase
- Digital, Multiphase
- Digital, Module
- Digital, Power Monitor
- Automotive

Rail 10
ZL8802 1 φ PG

Rail 11
ZL8802 1 φ PG

Rail 8
ZL8802 1 φ PG

Rail 9
ZL8802 1 φ PG

Vin IntTemp
 Iin ExtTemp
 Vout Vmon
 Iout Tmon
 Pin Vshunt
 Pout Vaux
 AVshunt

Play Pause Stop

Update Rate: 25.0 ms

Display Points: 500

Logging To File

C:\Users\BHOWE

Plot Size:

Vin Plot

Input Voltage (V)

1.25 s/div

Vout Plot

Output Voltage (V)

1.25 s/div

Chart Area automatically splits into two graphs

Vin and Vout Telemetry Parameters selected

Monitor View

Rail 9

Power Good PG

Vout 5.00 V

PMBus Enable

Soft Off

Margin Nominal

Output Voltage 5.00 V

Output Current 1.13 A

Input Voltage 12.02 V

Power Stage Temp 33.88 C

Internal Temperature 41.06 C

External Temperature 41.06 C

Message Viewer

49-0.1.81 => WRITE command=OPERATION

ZL8802-0 0x48 φ 1

Nvm Tool System Devices

Devices Memory Action

RailScope: Example View with 4 Telemetry Parameters

The screenshot displays the RailScope software interface within the Power Navigator 5 environment. The interface is divided into several sections:

- Part Library:** Lists various power components like Rail 10, Rail 11, Rail 8, and Rail 9, each with a status indicator (PG).
- Parameter Selection:** A central panel allows users to select telemetry parameters. The following parameters are checked:
 - Vin
 - Vout
 - Iout
 - Tmon
- Control Panel:** Includes buttons for Play, Pause, and Stop, along with settings for Update Rate (25.0 ms) and Display Points (500).
- Monitor View:** A sidebar on the right provides real-time data for Rail 9:
 - Power Good: PG
 - Vout: 5.0 V
 - Output Current: 1.17 A
 - Input Voltage: 12.00 V
 - Power Stage Temp: 32.94 C
 - Internal Temperature: 41.06 C
 - External Temperature: 39.56 C
- Chart Area:** The main workspace contains four plots:
 - Vin Plot:** Input Voltage (V) vs. time (1.25 s/div).
 - Iout Plot:** Output Current (A) vs. time (1.25 s/div).
 - Vout Plot:** Output Voltage (V) vs. time (1.25 s/div).
 - Tmon Plot:** Power Stage Temperature (C) vs. time (1.25 s/div).

A callout box with the text "Chart Area automatically splits into four graphs" has four red arrows pointing to the corners of the plot area. Another callout box on the left, titled "Vin, Vout, Iout and Temp Telemetry Parameters selected", has a red arrow pointing to the parameter selection checkboxes.

RailScope: Example Zoom-in

The screenshot displays the RailScope software interface, which is part of the Power Navigator 5 suite. The interface is divided into several sections:

- Part Library:** Lists various power components like Rail 10, Rail 11, Rail 8, and Rail 9, each with a status indicator (PG).
- Monitor View:** Shows the status of Rail 9, including Power Good (PG), Vout (5.0 V), Output Current (1.20 A), Input Voltage (12.02 V), Power Stage Temp (35.62 C), Internal Temperature (43.06 C), and External Temperature (43.06 C).
- Plots:** Four plots are visible: Vin Plot (Input Voltage (V)), Iout Plot (Output Current (A)), Vout Plot (Output Voltage (V)), and Tmon Plot (Temperature (C)). The Vout Plot is currently zoomed in, showing a yellow highlighted area. A red arrow points to this area, with a text box that reads: "Click and drag to highlight zoom area in chart. Double click to return to previous Zoom level."
- Message Viewer:** Shows a message: "49-0.1.81 => WRITE command=OPERATION".
- Nvm Tool:** Shows System Devices, Devices, Memory, and Action.

The Vout Plot shows a zoomed-in view of the output voltage, with a yellow highlighted area indicating the zoomed-in region. The zoomed-in view shows a steady-state output voltage of approximately 5.0 V. The zoomed-in view also shows the output current, which is approximately 1.20 A. The zoomed-in view also shows the input voltage, which is approximately 12.02 V. The zoomed-in view also shows the power stage temperature, which is approximately 35.62 C. The zoomed-in view also shows the internal temperature, which is approximately 43.06 C. The zoomed-in view also shows the external temperature, which is approximately 43.06 C.

RailScope: Example X- & Y-axis Scale Options

The screenshot displays the Power Navigator 5 interface with the RailScope module active. The interface includes a Part Library on the left, a central plot area with four plots (Vin, Vout, Iout, Tmon), and a right-hand Monitor View. A 'Set Bounds for Vout' dialog box is open, showing 'Auto Ranging' checked and 'Lower bound' set to 0.0 and 'Upper bound' set to 5.0. Three callout boxes provide instructions: one points to the gear icon for the Vout plot, another points to the 'Auto Ranging' checkbox, and a third points to the 'Lower bound' and 'Upper bound' input fields. The Vout plot shows a step change in output voltage from 0V to approximately 1.2V. The Vin plot shows a constant input voltage of about 12.5V. The Iout plot shows a constant output current of about 0.5A. The Tmon plot shows a constant power stage temperature of about 32.94°C. The Monitor View on the right shows various temperature and voltage readings.

Click Toolbox icon to bring up y-axis limits box

When "Auto Ranging" check box is clicked, PowerNavigator will auto-set y-axis scale

Unchecking "Auto Ranging" box allows user to set upper and lower bounds

X-axis scale is set by update rate and display point user settings

Update Rate: 25.0 ms
Display Points: 500

Lower bound: 0.0
Upper bound: 5.0

Ok Cancel

Message Viewer
49-0.1.81 => WRITE command=OPERATION

Nvm Tool System Devices
Devices Memory Action

RailScope: Logging Feature

- **Once enabled, logging feature will automatically log all selected telemetry parameters and the STATUS_WORD register for each device.**
- **All data is saved to a .csv file, which can be opened in Excel for later data analysis.**
 - Once the .csv file size exceeds 50MB, a new file will automatically be created.
 - There is no limit on how long logging can run for.
- **The log file name and path can be changed by the end user.**



RailScope: Example Log File

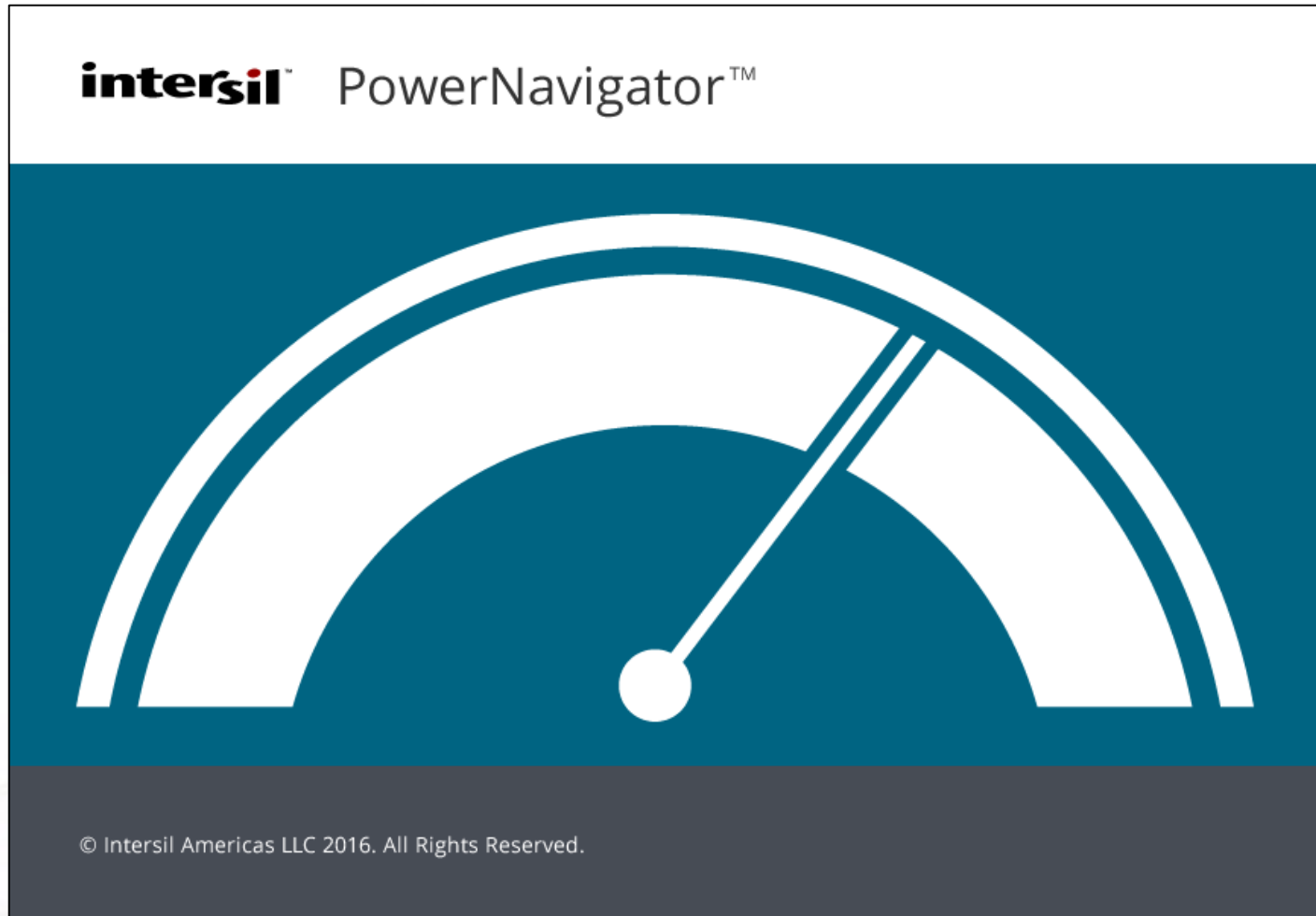
PN5p2_TelemetryLog.0.0.csv [Read-Only] - Excel

	A	B	Telemetry parameters for "VCCIO" rail				F	G	Telemetry parameters for "AUX" rail				K	L
1														
2	Log started													
3														
4	23/04/2015 10:58:04.0225													
5	TimeStamp	VCCIO_STATUS	VCCIO_Vin	VCCIO_Vout	VCCIO_Iout	VCCIO_IntTemp	AUX_STATUS	AUX_Vin	AUX_Vout	AUX_Iout	AUX_IntTemp	CORE_STATUS		
6	23/04/2015 10:58:04.0265	0x0000	11.921875	0.800292969	-0.048583984	32.1875	0x0000	11.890625	1.001953125	0.373046875	51.125	0x0000		
7	23/04/2015 10:58:04.0467	0x0000	11.921875	0.799682617	-0.047790527	31.71875	0x0000	11.875	1.001953125	0.387695313	51.625	0x0000		
8	23/04/2015 10:58:04.0667	0x0000	11.9375	0.799682617	-0.047363281	31.84375	0x0000	11.890625	1.003540039	0.320800781	51.625	0x0000		
9	23/04/2015 10:58:04.0867	0x0000	11.953125	0.800292969	-0.047485352	32.125	0x0000	11.890625	1.003540039	0.334472656	51.125	0x0000		
10	23/04/2015 10:58:05.0067	0x0000	11.9375	0.800048828	-0.04876709	31.90625	0x0000	11.890625	1.005249023	0.386230469	51.625	0x0000		
11	23/04/2015 10:58:05.0268	0x0000	11.921875	0.800292969	-0.047485352	31.9375	0x0000	11.890625	1.003540039	0.357421875	51.625	0x0000		
12	23/04/2015 10:58:05.0468	0x0000	11.921875	0.801513672	-0.049682617	32.0625	0x0000	11.890625	1.003540039	0.37890625	51.625	0x0000		
13	23/04/2015 10:58:05.0669	0x0000	11.921875	0.800048828	-0.047790527	31.71875	0x0000	11.890625	1.005249023	0.374023438	51.125	0x0000		
14	23/04/2015 10:58:05.0869	0x0000	11.9375	0.800048828	-0.047485352	31.71875	0x0000	11.890625	1.001953125	0.358886719	51.125	0x0000		
15	23/04/2015 10:58:06.0069	0x0000	11.9375	0.799682617	-0.048400879	31.9375	0x0000	11.890625	1.003540039	0.329101563	51.625	0x0000		
16	23/04/2015 10:58:06.0269	0x0000	11.96875	0.800048828	-0.04510498	31.625	0x0000	11.890625	1.003540039	0.37890625	51.125	0x0000		
17	23/04/2015 10:58:06.0471	0x0000	11.953125	0.800048828	-0.046142578	31.9375	0x0000	11.890625	1.003540039	0.427246094	51.125	0x0000		
18	23/04/2015 10:58:06.0671	0x0000	11.921875	0.80065918	-0.048156738	31.78125	0x0000	11.890625	1.003540039	0.387695313	51.625	0x0000		
19	23/04/2015 10:58:06.0871	0x0000	11.9375	0.800048828	-0.047363281	31.84375	0x0000	11.890625	1.003540039	0.368164063	51.125	0x0000		

Each telemetry entry is time stamped

Rail name can be set by user (taken from PowerMap)

Hex File Creation



Configuration File Overview

- **Intersil Digital Power controllers use configuration files to program important device parameters.**
 - Configuration files are basically a list of PMBus commands defining device operation. i.e. `Vout_Command = 1.0V`, `Iout_Cal_Gain = 0.5mV/A`, etc...
- **Device configuration only needs to be done one time – programmed parameters are stored inside non-volatile memory for future use. NVM supports multiple writes and is re-programmable.**
- **Several Options are available for programming devices in a production environment.**

Programming Devices in Manufacturing Environment

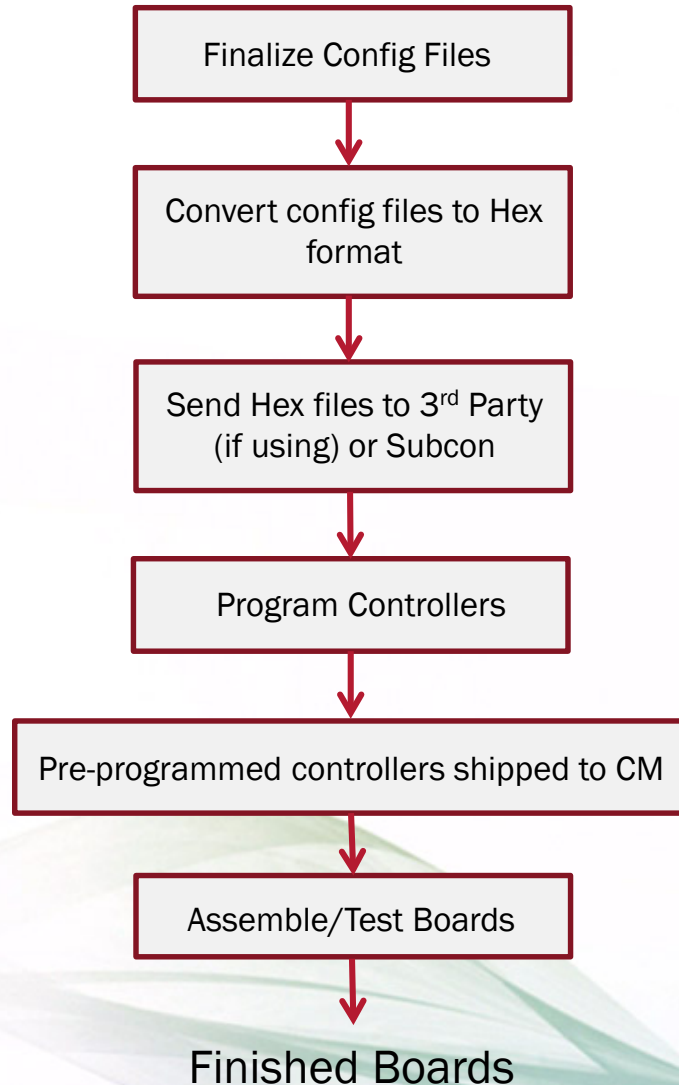
- **Option 1: Program controllers pre-board assembly**

- Devices are programmed on a high speed production programmer before being assembled on a board.
- Can use a supported 3rd party programming house OR offline programmer at sub-contractor.

- **Option 2: Program controllers after board assembly**

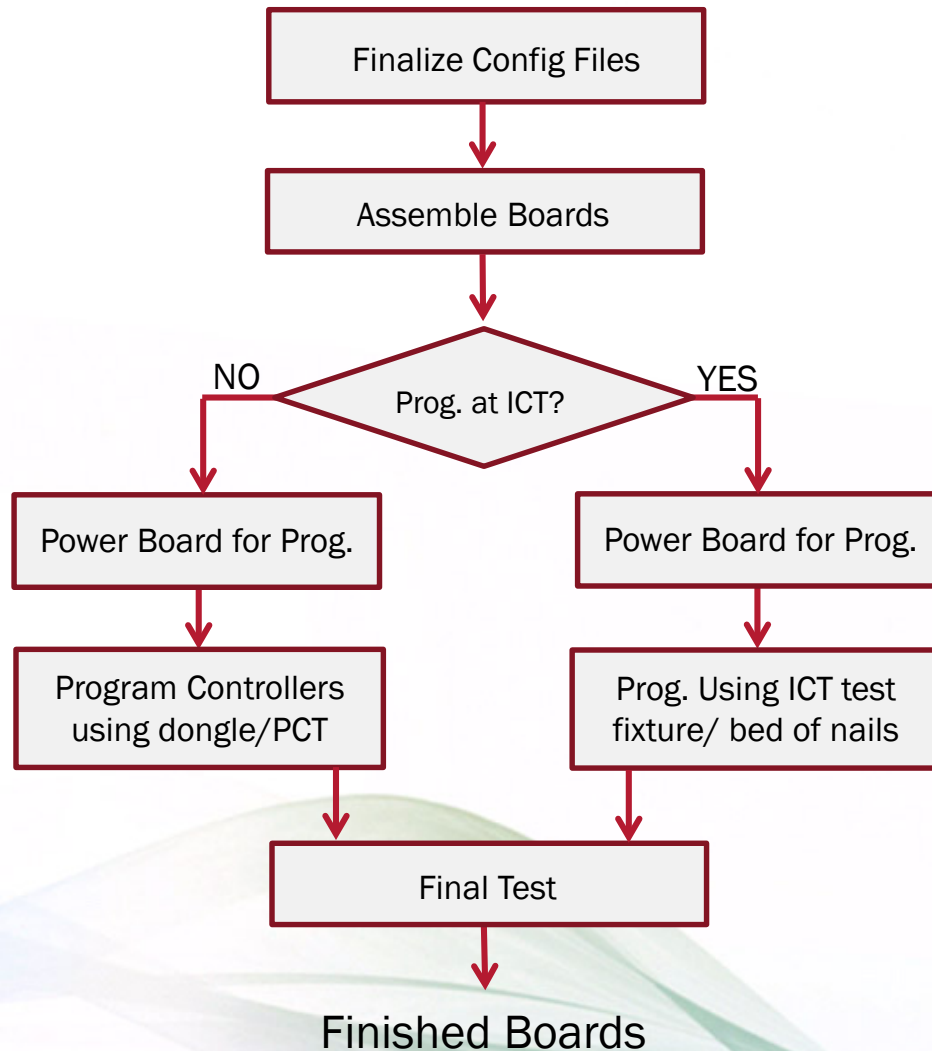
- Devices are programmed on PCB post board assembly
- Can be done at ICT (using a bed of nails approach or onboard microcontroller) OR using Intersil dongle and Production Configuration Tool (PCT).
- Requires board to be powered up with all controllers DISABLED until they are fully programmed.

Typical Flow – Pre-Programmed Devices



- Controllers are programmed prior to PCB manufacture.
- Hex files are created using PowerNavigator software (File->Export Production Hex).
- Programming is done either with a 3rd party or using offline programmer at subcon.
- Typical programming time: 4-7 seconds per device.
- Individual part numbers are assigned to each device after programming to make sure boards are assembled correctly.

Typical Flow – Programming Parts on Board



- Controllers are programmed after board assembly.
- Typical Programming time: 5-10s per device.
- Simplified inventory and configuration file management.
- Controllers must be powered to program, but output must remain disabled until part is fully programmed.
- Special attention to sequencing must be made when using self-enabled parts.

HEX File Creation – Step 1, Project Save

Step 1: To create a production HEX file, first save your project

NOTE: Before saving a project, the HW enable pin on all controllers must be held low.

NOTE: All Project files are stored in the directory:
C:\Users\USERNAME\Documents\Intersil\PowerNavigator\Projects

Source Id: Source_1

HEX File Creation – Step 2, Export HEX Files

Step 2: Go to File -> Export Production Hex

Click "Export"

NOTE: All Production HEX files are stored in the saved project folder, located in the directory:
C:\Users\USERNAME\Documents\Intersil\PowerNavigator\Projects

Select	Device	Rail(s)	Programming Address (for programming house only)	Output Hex Filename (.hex)
<input checked="" type="checkbox"/>	ZL2102-0 0x20	VCCINT	0x20	ZL2102-0
<input checked="" type="checkbox"/>	ZL8802-0 0x40	VCCAUX	0x20	ZL8802-0
<input checked="" type="checkbox"/>	ZL8802-1 0x42	VCCIO	0x20	ZL8802-1
<input checked="" type="checkbox"/>	ZL8802-2 0x44	VCCIO	0x20	ZL8802-2

Example Hex File Creation

Export Production Hex

This utility converts configuration data saved in human-readable format into the proper hex format used for production programming.

What is the programming address? The PMBus address during production programming can differ from the in-system address. A programming socket might use address 0x20 while final in-system address is 0x36. Ask your programming house which address is needed.

Project location: C:\Users\BHOWELL\Documents\Intersil\PowerNavigator\Projects\example

Select	Device	Rail(s)	Programming Address (for programming house only)	Output Hex Filename (.hex)
<input checked="" type="checkbox"/>	ZL2102-0 0x20	VCCINT	<input type="text" value="0x20"/>	<input type="text" value="ZL2102-0"/>
<input checked="" type="checkbox"/>	ZL8802-0 0x40	VCCAUX	<input type="text" value="0x20"/>	<input type="text" value="ZL8802-0"/>
<input checked="" type="checkbox"/>	ZL8802-1 0x42	VCCIO	<input type="text" value="0x20"/>	<input type="text" value="ZL8802-1"/>
<input checked="" type="checkbox"/>	ZL8802-2 0x44	VCCIO	<input type="text" value="0x20"/>	<input type="text" value="ZL8802-2"/>

Devices from PowerMap automatically populated

Programming address is address used on High Speed programmer socket

HEX file name can be set by user

Example Configuration File

```
# ZL8800-0 0x28
# connected: true
# DEVICE_ID
# IC_DEVICE_ID
# IC_DEVICE_REV

# 2014/01/16 17:55:45000
RESTORE_FACTORY
STORE_DEFAULT_ALL
STORE_USER_ALL

### Begin User Store
RESTORE_USER_ALL

# Global commands
FREQUENCY_SWITCH          0xfa50          # 296 kHz
VIN_OV_FAULT_LIMIT       0xd380          # 14 V
VIN_OV_FAULT_RESPONSE    0x80
VIN_OV_WARN_LIMIT        0xd360          # 13.5 V
VIN_UV_WARN_LIMIT        0xca5e          # 4.734 V
VIN_UV_FAULT_LIMIT       0xca4c          # 4.594 V
VIN_UV_FAULT_RESPONSE    0x80
IIN_CAL_GAIN              0xba00          # 1 mV/A
USER_GLOBAL_CONFIG        0x80
VMON_OV_FAULT_RESPONSE   0x80
VMON_UV_FAULT_RESPONSE   0x80
PRIVATE_PASSWORD
PUBLIC_PASSWORD
```

ZL8800----01.04
0x49A02400
0x01040000

Header information with device type, FW version, creation date, etc.

This sequence of commands used to clear contents of NVM.

Programmed device parameters

Example HEX File

```
000340F499
000440F10087
0003401530
000440F10087
000340112C
000440F10087
00054046C0DB82
0005404B80D562
000540E720DBE2
000540E800D628
000440D80193
00054038E9C295
0005403924C4E8
000540D0C0AB01
000440DCAC8D
000D40D50940CC7BF0AEFC60997B74
000540D750A2C9
000340112C
000440F10087
0003401225
000440F10087
```

Configuration file translated into machine readable hex format.

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