

Using the Fusion Digital Power™ Designer for TPS536xx VR13 Multiphase Power Solutions

The TPS536xx family of devices are Intel™ fully SVID compliant VR13.0 step down controllers with built-in Non Volatile Memory (NVM). TPS536xx family supports PMBus™ communication for voltage, current, power and temperature telemetry as well as fault conditions to the system controller. All programmable parameters can be configured via PMBus and can be stored in NVM as the new default values. This User's Guide describes the primary programmable parameters, telemetric data and fault reporting available via the Fusion Digital Power™ Designer ("Fusion GUI").

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Fusion Digital Power is a trademark of Texas Instruments.
Intel is a trademark of Intel Corporation.
PMBus is a trademark of SMIF, Inc..

1 Fusion GUI Installation

1.1 Download and Install the Software

1. Click [here](#) to access the Fusion Digital Power home page
2. It is highly recommended that you enable alerts to be notified when a new version of the Fusion Digital Power Designer is available. Scroll down to the *Order Now* panel and click on the *Alert Me* button.
3. To download the latest version, in the *Order Now* panel click on the *Download* button.
4. Once download is complete, navigate to the downloaded install file on your hard drive and double-click on it to begin the installation process
5. Follow the installation instructions. When completed, the Fusion Design Online Icon appears on your desktop.

1.2 Initiate Fusion Digital Online

1. Connect the Fusion GUI USB Interface adaptor to the computer using a USB to Mini USB adaptor and then to the board containing the TPS536xx device via the 10-pin I/O port.



Figure 1. USB Interface Adaptor

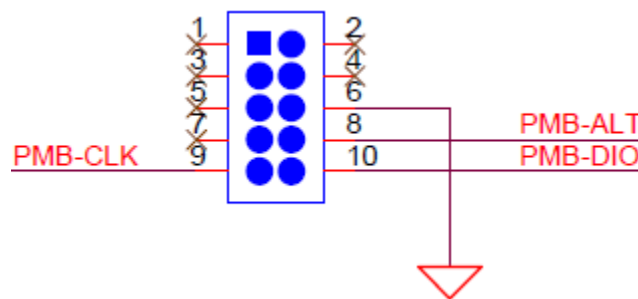


Figure 2. PMBus Connections to TI USB Interface Adaptor

2. Click on the Fusion Design Online Icon. The first time the Fusion GUI is initiated, the Device Scanning Options will pop up

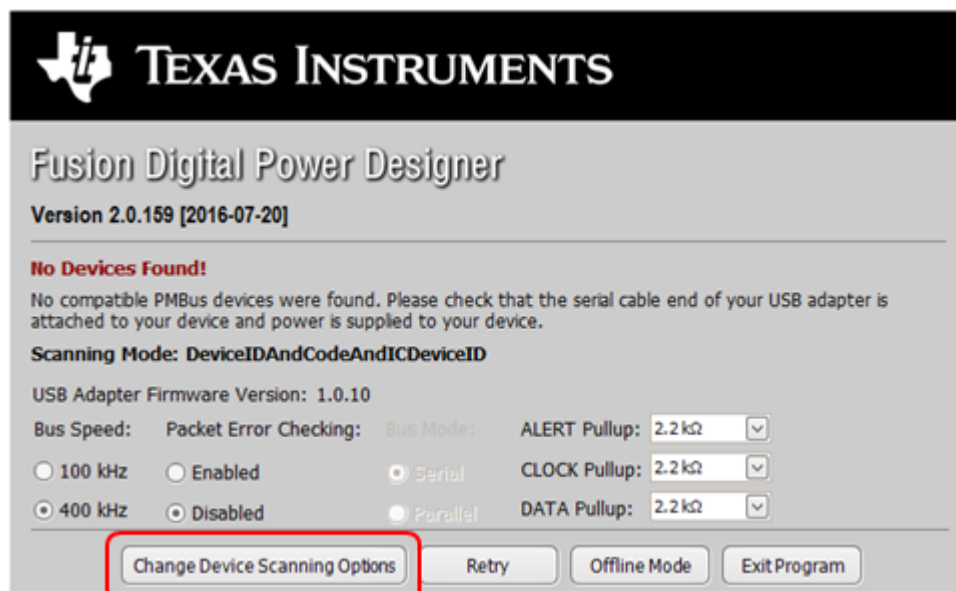


Figure 3. Device Scanning Options

3. Click **Change Device Scanning Options**. The **Device Scan Editor** table appears:

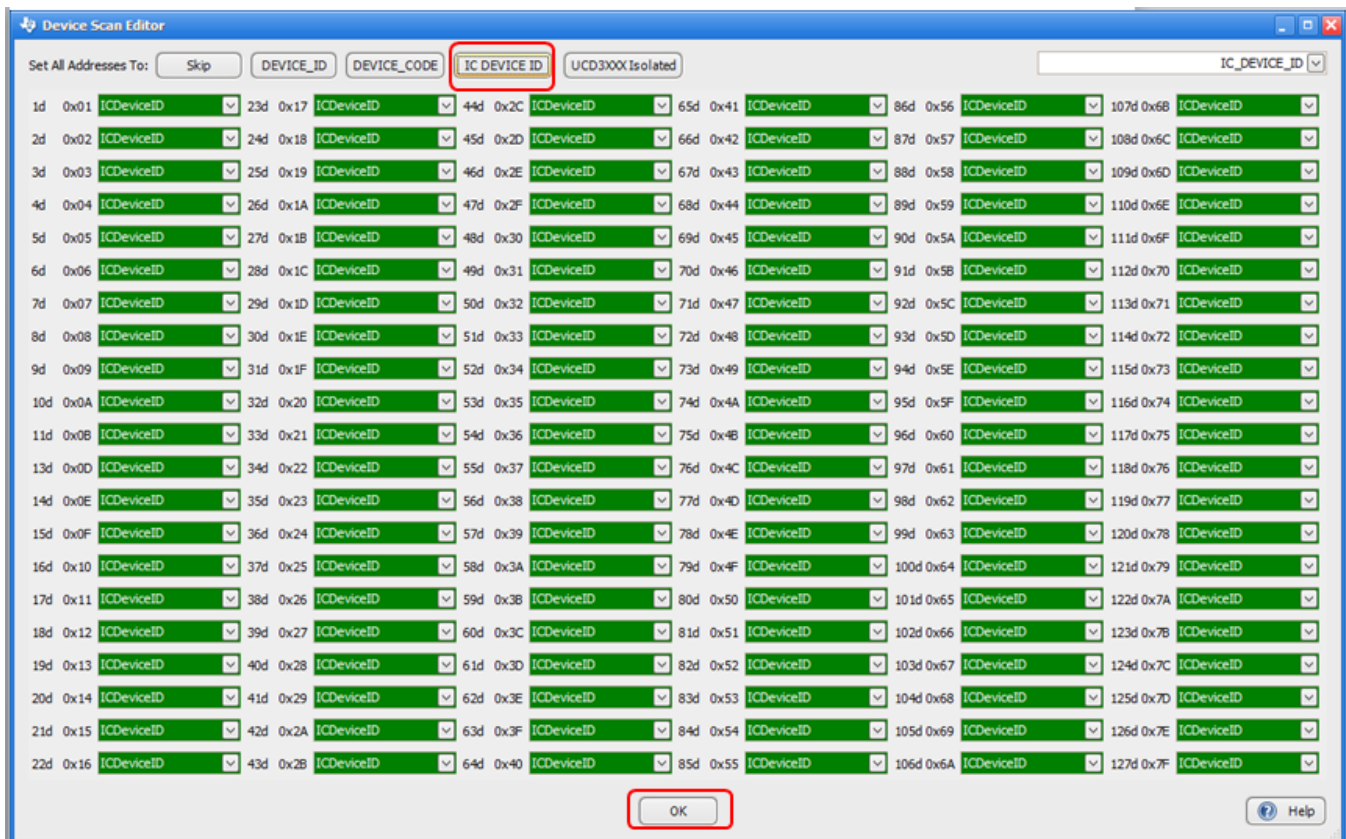


Figure 4. Device Scan Editor

4. Select **IC_DEVICE_ID**
5. Click **OK**
6. The application returns to the previous panel.
7. Click **Retry**

2 Configure Page

After one or more devices have been detected, the Fusion Digital Power GUI displays the **Configure** page.

The **Configure** page is where all user-accessible parameters can be viewed and modified. It is composed of several tabs each of which contain specific groupings of these parameters. Any changes to the settings must be written to RAM to take effect. In order to maintain these changes after V3P3 has been powered down, they must be stored to NVM.

2.1 Applying and Saving Settings to the Controller

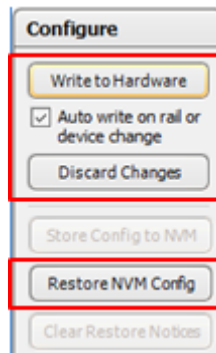


Figure 5. Register Write Panel

- When a selection is changed from what is currently in RAM, **Write to Hardware** becomes viewable. Select **Write to Hardware** to write the new setting to the device RAM.
- To undo any changes before **Write to Hardware** is selected, click on **Discard Changes**.
- If the wants to discard changes written to RAM, select **Restore NVM Config** to reload the NVM settings into RAM.
- When a change is made to a value stored in RAM, the **Store Config to NVM** becomes available. Select **Store Config to NVM** to write these changes to NVM so they are not lost when V3P3 is powered down.

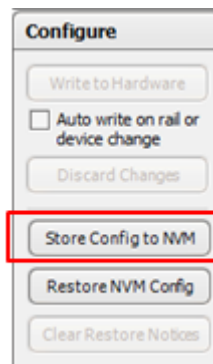


Figure 6. Store Config to NVM

Throughout this document the terms “pages”, “tabs”, “panels”, “drop-down lists”, “value boxes” and “radio buttons” are used. An example of each one of these elements on the **Configure** page is briefly described here:

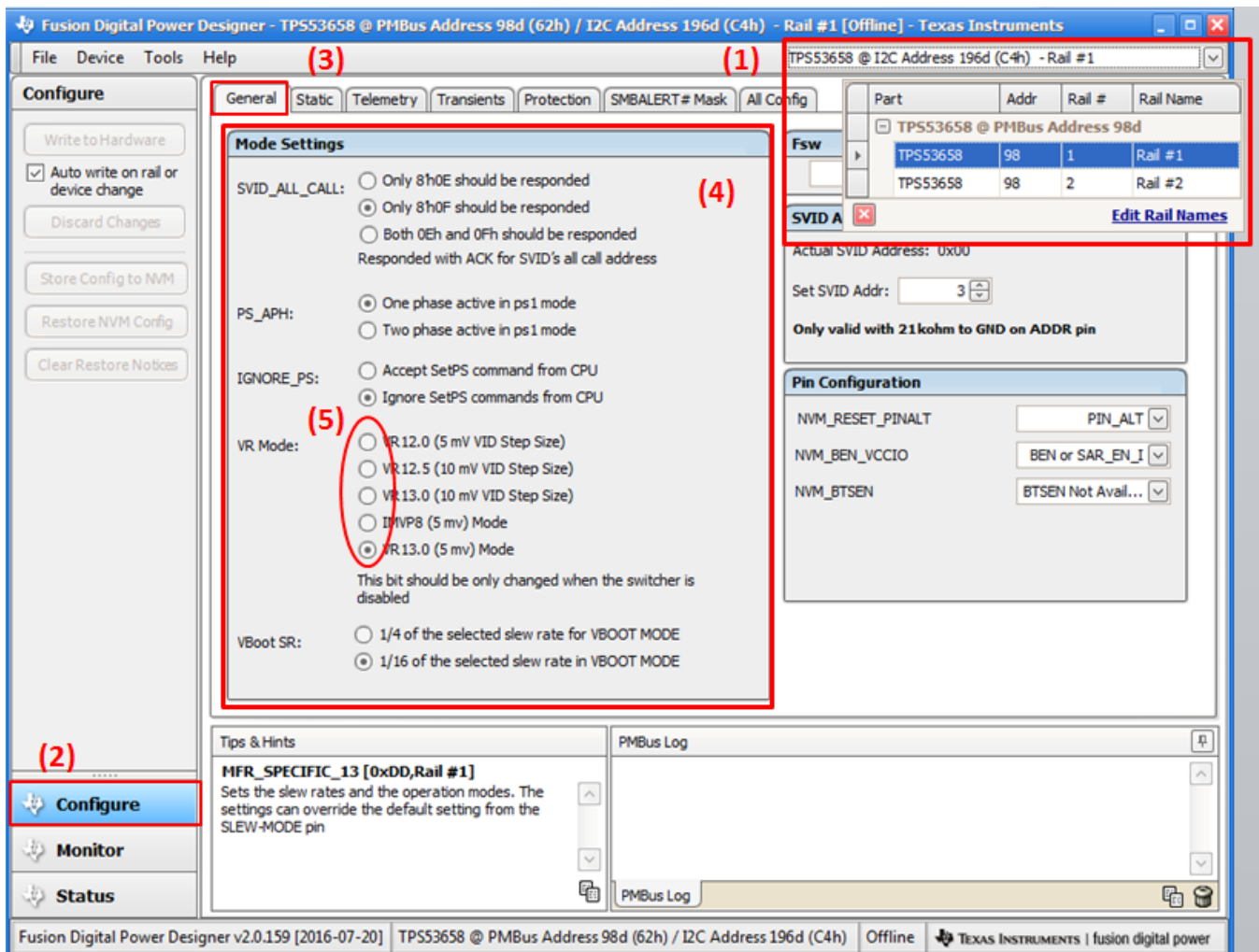


Figure 7. Configure Page

1. Part/Rail drop-down list. Each rail for all TPS536xx parts detected on the bus can be selected here. This list is used to determine which rail is being controlled/monitored via the GUI.
2. There are 4 pages that separate the main functions of the GUI:
 - **Configure**: This is a collection of tabs used to view and change all user-accessible parameters.
 - **Monitor**: This page displays all voltage, current, power and temperature telemetric data in real time. VR status and faults are also summarized here.
 - **Status**: This is a complete list of all Status Registers.
 - **Security**: This page displays the list of registers which will be write-protected when security is enabled.
3. **General** tab. This tab within the **Configure** page displays basic configuration settings for the controller, not specific to any particular category of settings. The General tab and all others are described in more detail below.
4. **Mode Settings** is an example of a panel. Each panel groups related controls together for finer categorization. These panels will be described in more detail below.
5. Radio buttons are used to allow choices of specific behavioral settings. In this case, they are used to select one of five VR Modes.

2.2 General Tab

The **General** tab contains many of the basic functional settings for the device.

The screenshot shows the 'General' tab selected in a configuration interface. The 'General' tab is highlighted with a red box. Below the tabs, there are four main configuration sections:

- Mode Settings:**
 - SVID_ALL_CALL:** Radio buttons for:
 - Only 8h0E should be responded
 - Only 8h0F should be responded** (selected)
 - Both 0Eh and 0Fh should be responded

Responded with ACK for SVID's all call address
 - PS_APH:** Radio buttons for:
 - One phase active in ps1 mode** (selected)
 - Two phase active in ps1 mode
 - IGNORE_PS:** Radio buttons for:
 - Accept SetPS command from CPU
 - Ignore SetPS commands from CPU** (selected)
 - VR Mode:** Radio buttons for:
 - VR.12.0 (5 mV VID Step Size)
 - VR.12.5 (10 mV VID Step Size)
 - VR.13.0 (10 mV VID Step Size)
 - IMVP8 (5 mv) Mode
 - VR.13.0 (5 mv) Mode** (selected)

This bit should be only changed when the switcher is disabled
 - VBoot SR:** Radio buttons for:
 - 1/4 of the selected slew rate for VBOOT MODE
 - 1/16 of the selected slew rate in VBOOT MODE** (selected)
- Fsw:** A dropdown menu set to 600 kHz.
- SVID Address:**
 - Actual SVID Address: 0x00
 - Set SVID Addr: 3 (with up/down arrows)
 - Only valid with 21kohm to GND on ADDR pin
- Pin Configuration:**
 - NVM_RESET_PINALT: PIN_ALT (dropdown)
 - NVM_BEN_VCCIO: BEN or SAR_EN_I (dropdown)
 - NVM_BTSEN: BTSEN Not Avail... (dropdown)

Figure 8. General Tab

2.2.1 Mode Settings

Mode Settings

SVID_ALL_CALL: Only 8'h0E should be responded
 Only 8'h0F should be responded
 Both 0Eh and 0Fh should be responded
 Responded with ACK for SVID's all call address

PS_APH: One phase active in ps1 mode
 Two phase active in ps1 mode

IGNORE_PS: Accept SetPS command from CPU
 Ignore SetPS commands from CPU

VR Mode: VR.12.0 (5 mV VID Step Size)
 VR.12.5 (10 mV VID Step Size)
 VR.13.0 (10 mV VID Step Size)
 IMVP8 (5 mv) Mode
 VR.13.0 (5 mv) Mode
 This bit should be only changed when the switcher is disabled

VBoot SR: 1/4 of the selected slew rate for VBOOT MODE
 1/16 of the selected slew rate in VBOOT MODE

Figure 9. MFR_SPECIFIC_13 Settings Panel

These are the settings defined by the MFR_SPECIFIC_13 register

2.2.2 F_{sw}

Fsw

600 kHz

Figure 10. Switching Frequency Panel

- Switching frequency: 15 settings from 300kHz to 1000kHz

2.2.3 SVID Address

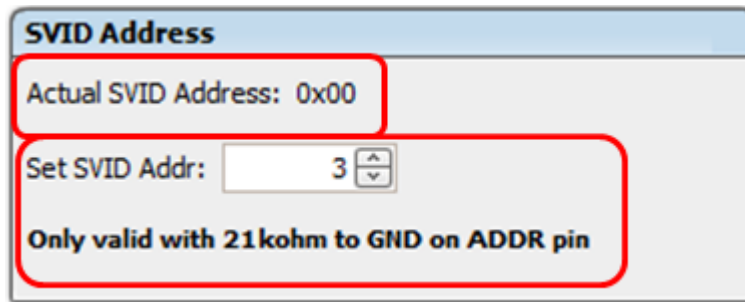


Figure 11. Set SVID Address Panel

- **Actual SVID Address:** Shows the actual address detected (set via ADDR pin resistor to ground).
- **Set SVID Addr:** Allows the user to set the SVID Address via an NVM register. This selection is only valid if the ADDR pin resistor to ground = 21 kΩ.

2.2.4 Pin Configuration

2.2.4.1 NVM_RESET_PINALT

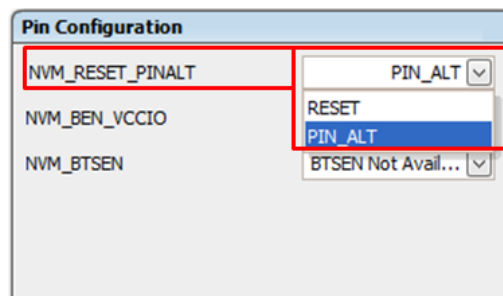


Figure 12. NVM_RESET_PINALT Drop-Down List

NVM_RESET_PINALT: Selects function of PINALT#_ RESET# pin as either:

- **PINALT#:** Input power alert flag
- **RESET#:** Boot voltage reset

2.2.4.2 NVM_BEN_VCCIO

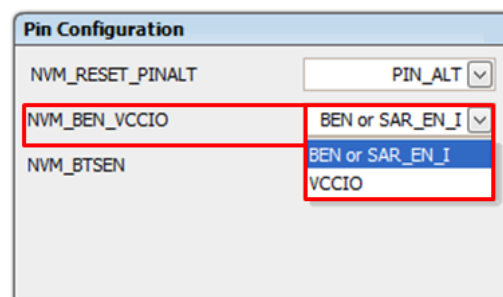


Figure 13. NVM_BEN_VCCIO Drop-Down List

NVM_BEN_VCCIO: Configures BEN_VCCIO pin as either:

- **BEN (SAR_EN):** Active high enable for Rail 2
- **VCCIO:** Input to monitor VCCIO and its UV fault conditions

2.2.4.3 NVM_BTSEN

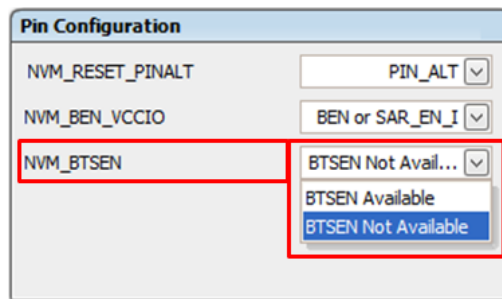
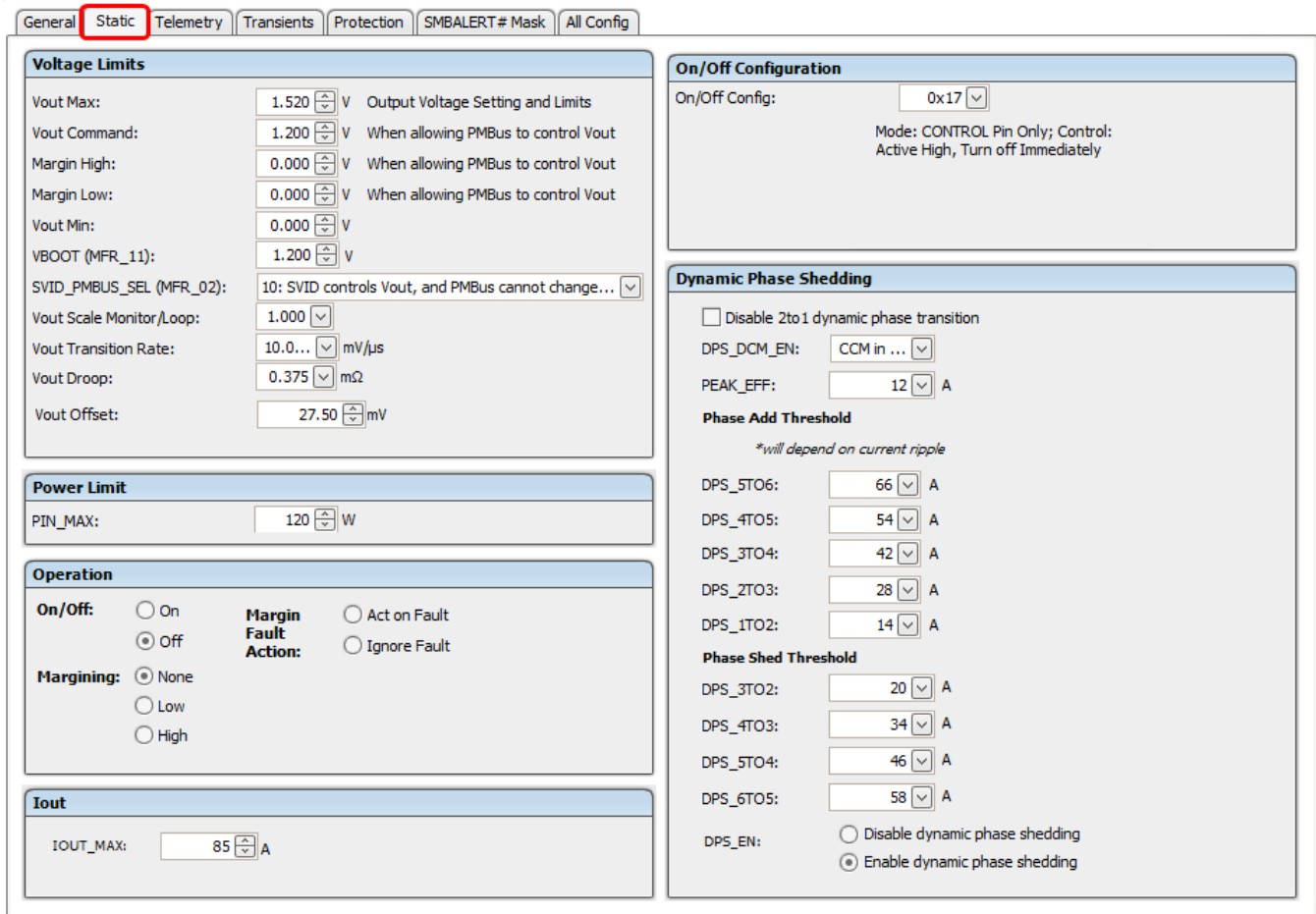


Figure 14. NVM_BTSEN Drop-Down List

- **NVM_BTSEN:** Selects whether or not BTSEN signal will be used to report temperature of Rail 2.

2.3 Static Tab

This tab contains the settings which are not specifically intended to affect transient performance.



The screenshot shows the 'Static' configuration tab for a power supply. The 'Static' tab is highlighted in red. The interface is divided into several sections:

- Voltage Limits:** Includes fields for Vout Max (1.520 V), Vout Command (1.200 V), Margin High (0.000 V), Margin Low (0.000 V), Vout Min (0.000 V), VBOOT (MFR_11) (1.200 V), SVID_PMBUS_SEL (MFR_02) (10: SVID controls Vout, and PMBus cannot change...), Vout Scale Monitor/Loop (1.000), Vout Transition Rate (10.0... mV/μs), Vout Droop (0.375 mΩ), and Vout Offset (27.50 mV).
- Power Limit:** Includes a field for PIN_MAX (120 W).
- Operation:** Includes radio buttons for On/Off (On, Off), Margin Fault Action (Act on Fault, Ignore Fault), and Margining (None, Low, High).
- Iout:** Includes a field for IOUT_MAX (85 A).
- On/Off Configuration:** Includes a dropdown for On/Off Config (0x17) and a text description: Mode: CONTROL Pin Only; Control: Active High, Turn off Immediately.
- Dynamic Phase Shedding:** Includes a checkbox for 'Disable 2to1 dynamic phase transition', a dropdown for DPS_DCM_EN (CCM in ...), a dropdown for PEAK_EFF (12 A), and several dropdowns for Phase Add Threshold (DPS_5TO6: 66 A, DPS_4TO5: 54 A, DPS_3TO4: 42 A, DPS_2TO3: 28 A, DPS_1TO2: 14 A) and Phase Shed Threshold (DPS_3TO2: 20 A, DPS_4TO3: 34 A, DPS_5TO4: 46 A, DPS_6TO5: 58 A). It also includes radio buttons for DPS_EN (Disable dynamic phase shedding, Enable dynamic phase shedding).

Figure 15. Static Tab

2.3.1 Voltage Limits

- **Vout Max:** The highest allowable value of V_{OUT} .
- **Vout Command:** Output voltage setting.
- **Margin High:** V_{OUT} set voltage when Margining High is selected in the Operation panel.
- **Margin Low:** V_{OUT} set voltage when Margining Low is selected in the Operation panel.
- **Vout Min:** The lowest allowable value of V_{OUT} .
- **Vboot:** Boot voltage.
- **SVID_PMBUS_SEL:** Selects whether output voltage is controlled by SVID or by PMBus.
- **Vout Scale Monitor/Loop:** Select either 1.000 output voltage scaling or 1.125 scaling.
 - 1.125 is used if the output is gained up to $1.125 \times VSP$ via an external voltage divider.
 - 1.000 is used when no up-scaling is performed via an external voltage divider.
- **Vout Transition Rate:** Pull-down menu with values from 0.3125 mV/μs up to 40 mV/μs to control the slew rate of the output.
- **Vout Droop:** Pull-down menu to set the DC Load Line. There are 64 values from 0.000 to 3.000mΩ for Rail 1, and 16 values ranging from 0.000 to 0.875 for Rail 2.
- **Vout Offset:** DC voltage offset applied to the output.

2.3.2 Power Limit

- **PIN_MAX:** Input power sensor scaling value (34 W - 510 W)

2.3.3 Operation

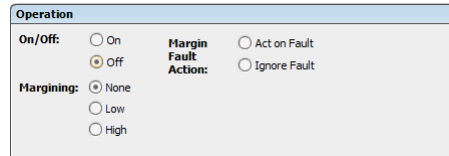


Figure 16. Operation Panel

- **On/Off:** Enables/Disables controller if *Act on ON_OFF* bit is selected in ON_OFF_CONFIG (02h) register. (See On/OFF Configuration description below)
- **Margining:** Choose Low, High, or No Margining.
- **Margin Fault Action:** Behavior of the controller if output violates margin voltages.

2.3.4 Iout

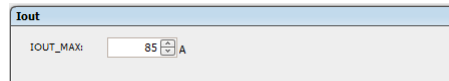


Figure 17. Iout Value Box

- **IOUT_MAX:** Maximum output current, from 0 A to 255 A.

2.3.5 On/Off Configuration

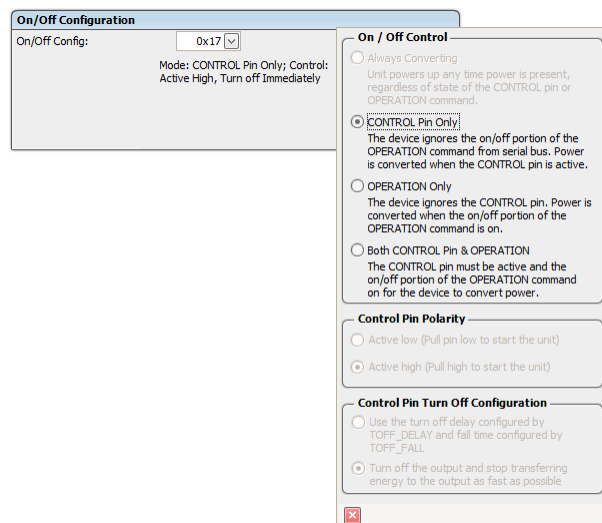


Figure 18. On/Off Configuration Panel

- **CONTROL pin Only:** The outputs are enabled/disabled via the active high ENB_A or ENB_B (control pin). The *Act on ON_OFF* bit (OPERATION[7]) is ignored.
- **OPERATION Only:** The outputs ignore the active high ENB_A or ENB_B (control pin) and are enabled/disabled only by the *Act on ON_OFF* bit (OPERATION[7]).
- **Both CONTROL Pin and OPERATION:** The outputs can be enabled and disabled by either the active high ENB_A or ENB_B (control pin) or the *Act on ON_OFF* bit (OPERATION[7]).
- *Greyed-out* settings are not selectable and are for information only.

2.3.6 Dynamic Phase Shedding

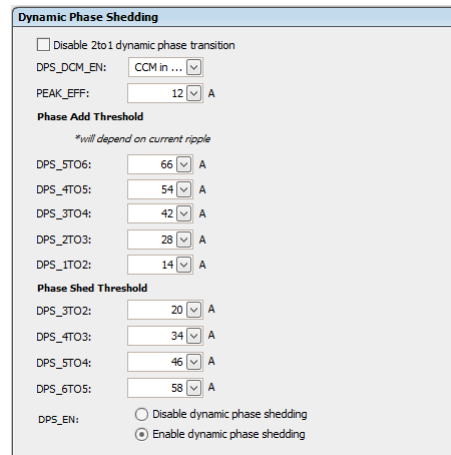


Figure 19. DPS Panel

- **Disable 2 to 1 dynamic phase transition:** Check to enable single-phase operation during normal operation (single-phase operation continues to occur in PS2 Mode).
- **DPS_DCM_EN:** Use this pull-down list to choose either CCM or DCM during single-phase operation.
- **PEAK_EFF:** Pull-down to select 12 A, 14 A, 16 A or 18 A to set the phase shedding offset between phases which results in the highest efficiency for the application.
- **DPS_PH# TO PH#+1:** Pull-down list of four current levels at which phase addition occurs. These values will scale by default based on the PEAK_EFF setting.
- **DPS_PH# TO PH#-1:** Pull-down list of four current levels at which phase shedding occurs.
- **DPS_EN:** Radio buttons to select whether phase shedding (and adding) is Disabled or Enabled.

2.4 Telemetry Tab

This tab contains the settings which affect the IIN and IMON telemetry data

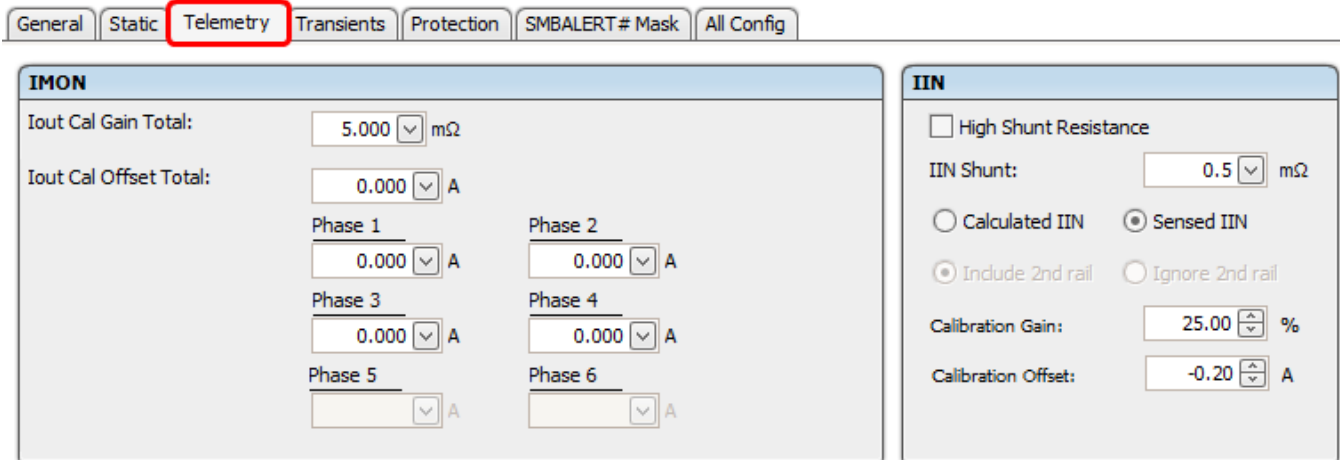


Figure 20. Telemetry Tab

2.4.1 Imon Calibration

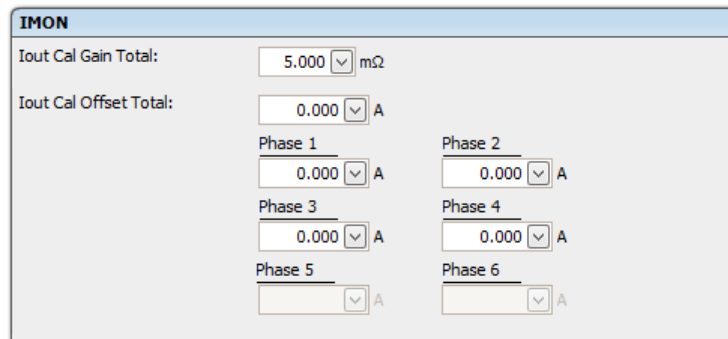


Figure 21. Imon Panel

- **Iout Cal Gain Total:** Pull-down list of 32 gain settings from 4.766 to 5.250. Gain is set as a ratio of 5 mV/A ($I_{OUT_REPORTED} = I_{OUT} \times 5.000 \text{ m}\Omega \div \text{gain setting}$). Gain can be adjusted from (5.000 mΩ ÷ 5.250 mΩ) to (5.000mΩ ÷ 4.766 mΩ).
- **Iout Cal Offset Total:** Offset applied to total current output value. Pull-down list with 32 settings from -3.750 A to +4.000 A
- **Iout Cal Offset Per Phase:** Offset applied to individual phase current output value. Pull-down list with 16 settings from -0.875 A to +1.000 A

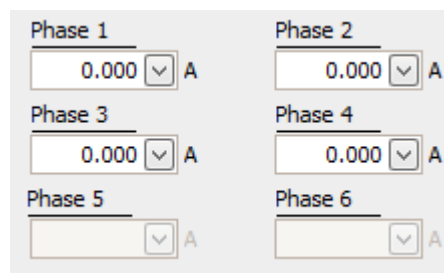


Figure 22. Per-Phase Iout Calibration Drop-Down Lists

2.4.2 IIN

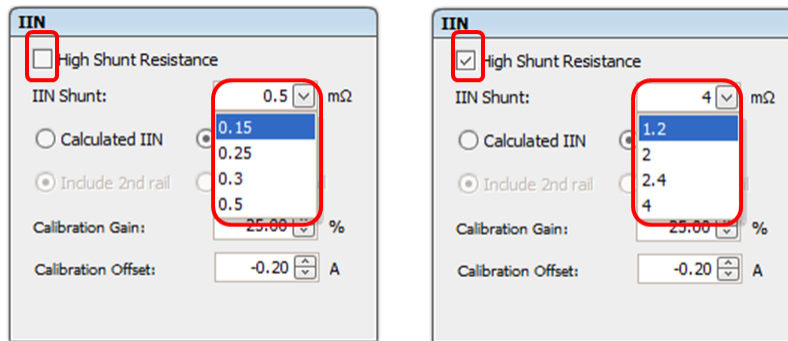


Figure 23. I_{IN} Shunt Selection Panel

- **High Shunt Resistance:** The selection box provides a high or low I_{IN} Shunt Resistance selection range. When unchecked, the selection box displays four values from 0.15 mΩ to 0.5 mΩ. When checked, the box displays four values from 1.2 mΩ to 4.0 mΩ.
- **Calculated IIN or Sensed IIN:** These radio buttons allow the user to select between reported I_{IN} which is sensed across an inductor/shunt resistor or a calculated I_{IN} . This calculated value reports I_{IN} based on the real-time measured values of V_{IN} , V_{OUT} , I_{OUT} and a fixed value of efficiency (95% for Rail 1, 92% for Rail 2).

2.5 Transient Tab

This tab contains the settings intended to affect the transient performance of the controller

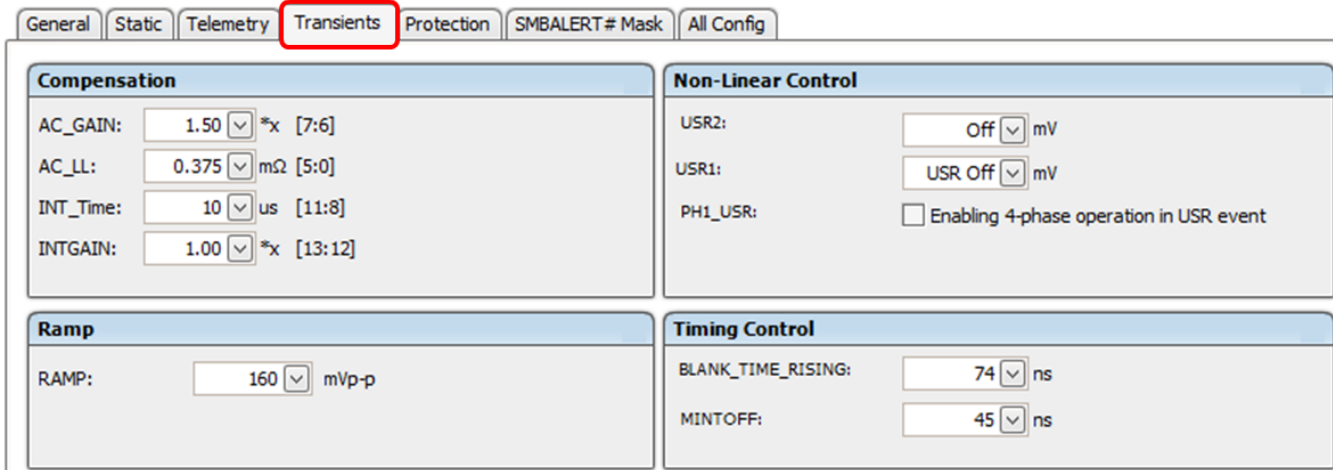


Figure 24. Transient Tab

2.5.1 Compensation

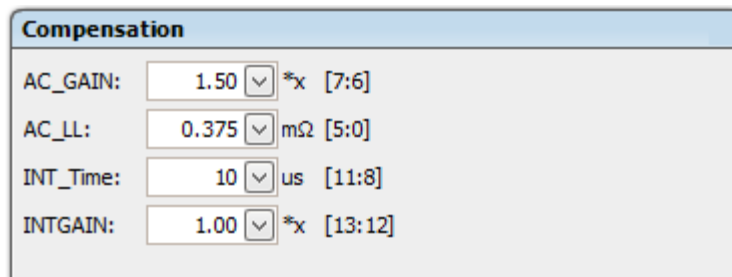


Figure 25. Compensation Panel

- **AC_GAIN:** Pull-down list has four settings: 0.5, 1.0, 1.5, 2.0.
- **AC_LL:** Pull-down list with 61 settings for AC Load Line, from 0.375 mΩ to 3.125 mΩ
- **INT_Time:** Dynamic Integration Time Constant. Pull-down list with 15 settings from 1.0 us to 40 us
- **INTGAIN:** Integrator Gain. Pull-down list with four settings: 0.50, 0.66, 1.0, 2.0

2.5.2 Ramp

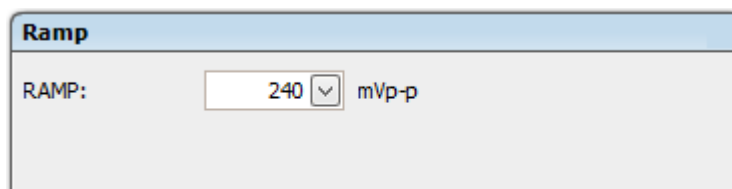
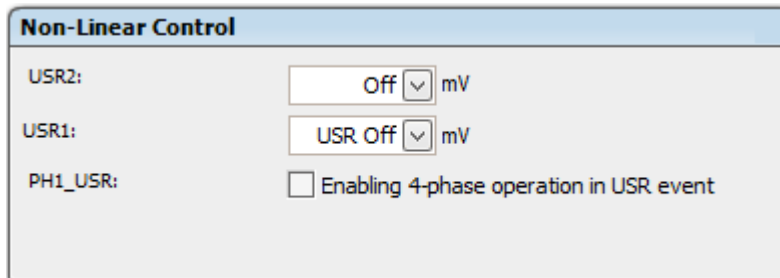


Figure 26. Ramp Panel

- **Ramp:** Pull-down list with 8 Ramp values from 40 mV to 320 mV

2.5.3 Non-Linear Control



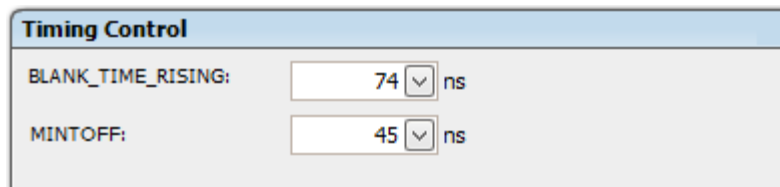
The Non-Linear Control panel contains three settings:

- USR2:** A pull-down menu set to "Off" followed by "mV".
- USR1:** A pull-down menu set to "USR Off" followed by "mV".
- PH1_USR:** An unchecked checkbox labeled "Enabling 4-phase operation in USR event".

Figure 27. Non-Linear Control Panel

- **USR2:** Higher USR voltage range. Pull-down list of 7 Values ranging from 140 mV to 380 mV or disabled with **USR2 OFF** setting. All available phases are active when USR2 is triggered.
- **USR1:** Lower USR voltage range. Pull-down list of 7 Values ranging from 90 mV to 270 mV or disabled with **USR1 OFF** setting.
- **PH1_USR:** This selection (Rail 1 only) enables 4-phase operation if USR1 is triggered. Unchecked limits USR1 to 3-phases.

2.5.4 Timing Control



The Timing Control panel contains two settings:

- BLANK_TIME_RISING:** A pull-down menu set to "74" followed by "ns".
- MINTOFF:** A pull-down menu set to "45" followed by "ns".

Figure 28. Timing Control Panel

- **BLANK_TIME_RISING:** Pull-down list with eight values for blanking time ranging from 56 ns to 98 ns.
- **MINTOFF:** Pull-down list with four values for the minimum off time ($t_{OFF(min)}$) of 45 ns, 60 ns, 75 ns, 90 ns.

2.6 Protection Tab

This tab contains the settings for over-temperature and input and output current and voltage protection.

The screenshot shows the 'Protection' tab selected in a configuration menu. The settings are organized into five sections:

- Output Voltage:**
 - Vout UV Fault Response: Click... (dropdown)
 - Vout OV Fault Response: Click... (dropdown)
- Input Voltage:**
 - VIN_ON: 4.000 (dropdown) V
 - VIN_UV_FAULT_LIMIT: 4.250 (dropdown) V
 - VIN_OV_FAULT_LIMIT: 17 (spin) V
- Output Current:**
 - Iout OC Warn Limit: 85 (spin) A
 - Iout OC Fault Limit: 106 (spin) A
 - Iout OC Fault Response: Click... (dropdown)
 - Per-Phase OCL: 54 (spin) A
- Input Current:**
 - IIn OC Warn Limit: 16.0 (spin) A
 - IIn OC Fault Limit: 16.0 (spin) A
 - IIn OC Fault Response: Click... (dropdown)
- Temp:**
 - Temp Warn Limit: 105 (spin) °C
 - Temp Fault Limit: 115 (spin) °C
 - Temp Fault Response: Click... (dropdown)
 - TMAX: 90 (spin) °C

Figure 29. Protection Tab

2.6.1 Output Voltage

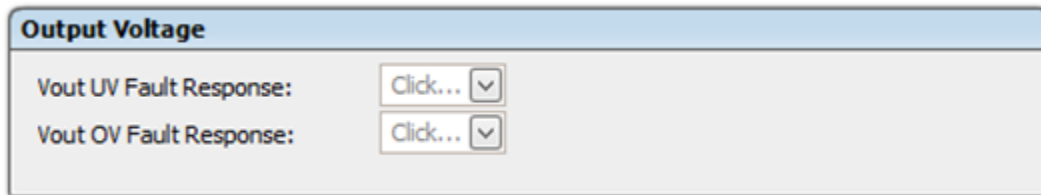


Figure 30. Output Voltage Panel

- **Vout UV Fault Response:** Lists the behavior settings for the UV condition. Modifications are not allowed. For information only.
- **Vout OV Fault Response:** Lists the behavior settings for and OV condition. Modifications are not allowed. For information only.

2.6.2 Input Voltage

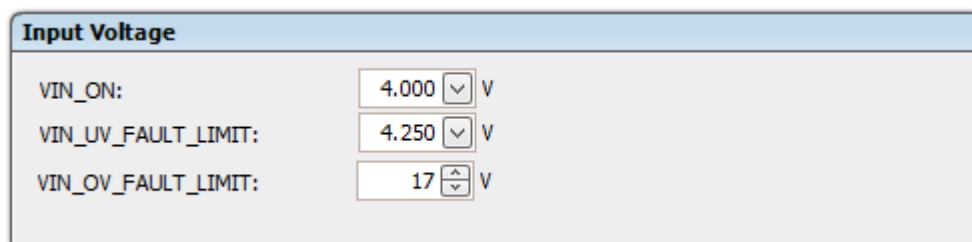


Figure 31. Input Voltage Panel

- **VIN_ON:** P12V Undervoltage lockout (UVLO) OK threshold.
- **VIN_UV_FAULT_LIMIT:** P12V Undervoltage lockout (UVLO) Fault threshold.
- **VIN_OV_FAULT_LIMIT:** P12V Overvoltage (OV) Fault threshold.

2.6.3 Output Current

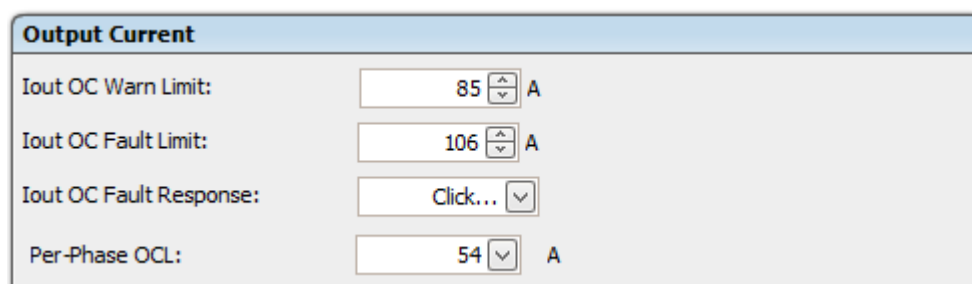


Figure 32. Output Current Panel

- **Iout OC Warn Limit:** Output over-current Warning Limit.
- **Iout OC Fault Limit:** Output over-current Fault limit. Can be changed here temporarily but will automatically be set to 25% above the OC Warning Limit stored in NVM after V3P3 is powered down or after an NVM write.
- **Iout OC Fault Response:** Settings for behavior of controller when output over-current limit is reached. See descriptions in [Figure 33](#)

✕

Response

Continue Without Interruption
 The device continues to operate indefinitely while maintaining the output current at the value set by IOUT_OC_FAULT_LIMIT without regard to the output voltage (known as constant-current or brickwall limiting).

Maintain Output Current Per Limits
 The device continues to operate indefinitely while maintaining the output current at the value set by IOUT_OC_FAULT_LIMIT as long as the output voltage remains above the minimum value specified by IOUT_OC_UV_FAULT_LIMIT. If the output voltage is pulled down to less than this value, the device shuts down and restarts per the configuration below.

Continue Operation For ▲▼ **msec**
 The device continues to operate, maintaining the output current at the value set by IOUT_OC_FAULT_LIMIT without regard to the output voltage, for the specified time. If the device is still operating in current limiting at the end of the delay time, the device responds as programmed below.

Shut Down Immediately
 The device shuts down immediately (disables the output); configure restart below.

Restart

Do Not Restart
 The unit does not attempt to restart. The output remains disabled until the fault is cleared.

Restart Up To ▲▼ **Times**
 The device attempts to restart up to the specified number of times.
 If the device fails to restart (the fault condition is no longer present and the device is delivering power to the output and operating as programmed) in the allowed number of retries, it disables the output and remains off until the fault is cleared.

Restart Continuously
 The device attempts to restart continuously, without limitation, until it is commanded OFF (by the CONTROL pin or OPERATION command or both), bias power is removed, or another fault condition causes the unit to shut down.

Time between the start of each restart attempt: ▲▼ **msec**

Figure 33. Iout Fault Response Panel

2.6.4 Input Current

Input Current

Iin OC Warn Limit: 16.0 A

Iin OC Fault Limit: 16.0 A

Iin OC Fault Response: Click...

Figure 34. Input Current Panel

- **Iin OC Warn Limit:** Input over-current Warning Limit. Eight values from 8 A to 63.5 A.
- **Iin OC Fault Limit:** Input over-current Fault Limit. Eight values from 8 A to 63.5 A.
- **IinOC Fault Response:** Settings for behavior of controller when input over-current limit is reached. Values are not selectable but are for inspection only. See descriptions below:

Response

Continue Without Interruption
The device continues to operate indefinitely while maintaining the output current at the value set by IOUT_OC_FAULT_LIMIT without regard to the output voltage (known as constant-current or brickwall limiting).

Maintain Output Current Per Limits
The device continues to operate indefinitely while maintaining the output current at the value set by IOUT_OC_FAULT_LIMIT as long as the output voltage remains above the minimum value specified by IOUT_OC_UV_FAULT_LIMIT. If the output voltage is pulled down to less than this value, the device shuts down and restarts per the configuration below.

Continue Operation For 0 msec
The device continues to operate, maintaining the output current at the value set by IOUT_OC_FAULT_LIMIT without regard to the output voltage, for the specified time. If the device is still operating in current limiting at the end of the delay time, the device responds as programmed below.

Shut Down Immediately
The device shuts down immediately (disables the output); configure restart below.

Restart

Do Not Restart
The unit does not attempt to restart. The output remains disabled until the fault is cleared.

Restart Up To 1 Times
The device attempts to restart up to the specified number of times. If the device fails to restart (the fault condition is no longer present and the device is delivering power to the output and operating as programmed) in the allowed number of retries, it disables the output and remains off until the fault is cleared.

Restart Continuously
The device attempts to restart continuously, without limitation, until it is commanded OFF (by the CONTROL pin or OPERATION command or both), bias power is removed, or another fault condition causes the unit to shut down.

Time between the start of each restart attempt: 0 msec

Figure 35. IIN Fault Response Panel

2.6.5 Temp

Temp

Temp Warn Limit: 105 °C TMAX: 90 °C

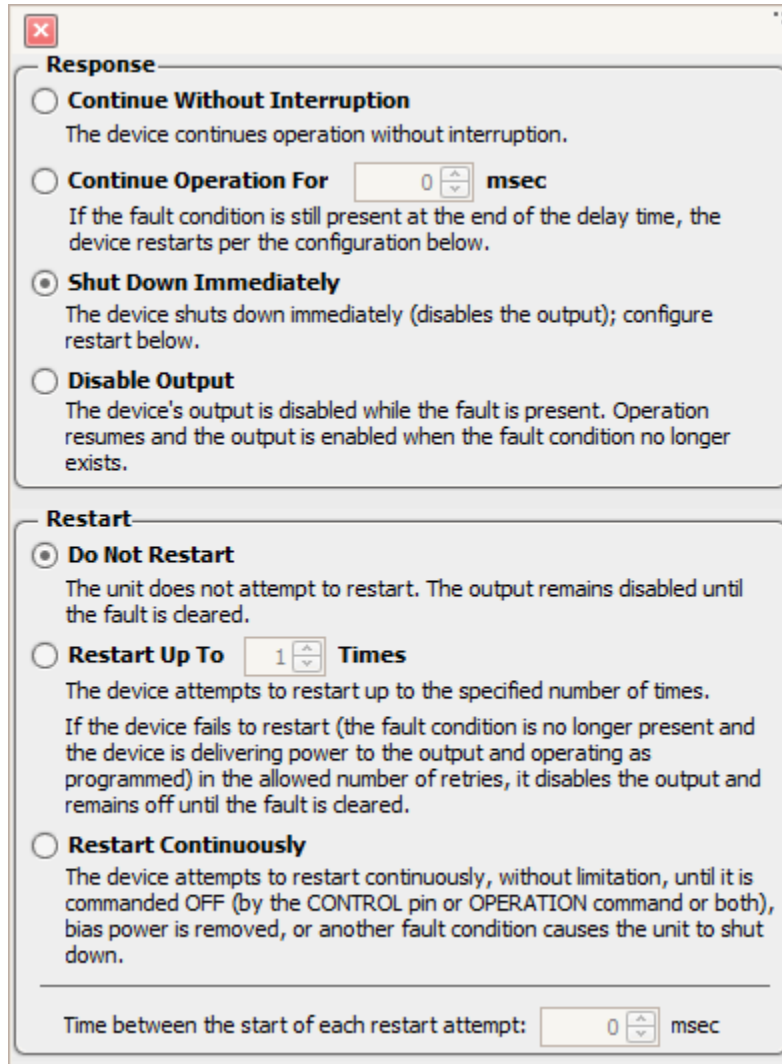
Temp Fault Limit: 115 °C

Temp Fault Response: Click...

Figure 36. Temperature Panel

- **Temp OC Warn Limit:** Temperature sensor Warning Limit. Temperatures up to 255°C.
- **Temp OC Fault Limit:** Temperature sensor Fault Limit. Temperatures up to 255°C.

- **Temp Fault Response:** Settings for behavior of controller when Over Temperature Limit is reached. See descriptions in [Figure 37](#)
- **TMAX:** Sets the value in SVID Temp Max register (common for both rails). Eight values from 90°C to 125°C.



Response

Continue Without Interruption
The device continues operation without interruption.

Continue Operation For msec
If the fault condition is still present at the end of the delay time, the device restarts per the configuration below.

Shut Down Immediately
The device shuts down immediately (disables the output); configure restart below.

Disable Output
The device's output is disabled while the fault is present. Operation resumes and the output is enabled when the fault condition no longer exists.

Restart

Do Not Restart
The unit does not attempt to restart. The output remains disabled until the fault is cleared.

Restart Up To Times
The device attempts to restart up to the specified number of times.
If the device fails to restart (the fault condition is no longer present and the device is delivering power to the output and operating as programmed) in the allowed number of retries, it disables the output and remains off until the fault is cleared.

Restart Continuously
The device attempts to restart continuously, without limitation, until it is commanded OFF (by the CONTROL pin or OPERATION command or both), bias power is removed, or another fault condition causes the unit to shut down.

Time between the start of each restart attempt: msec

Figure 37. Temperature Fault Response Panel

2.7 SMBALERT# Mask Tab

This tab contains the all maskable **SMBALERT#** commands. Each alert can be individually selected and masked.

General Static Telemetry Transients Protection **SMBALERT# Mask** All Config

VOUT Mask Rail #2		MFR_SPECIFIC Mask Rail #2		INPUT Mask Rail #2	
7	<input type="checkbox"/> Vout OV Fault	7	<input type="checkbox"/> FAULT_PS	7	<input type="checkbox"/> Vin OV Fault
6	<input type="checkbox"/> Not supported	6	<input type="checkbox"/> VSNS_OPEN	6	<input type="checkbox"/> Not supported
5	<input type="checkbox"/> Not supported	5	<input type="checkbox"/> MFR_MAXPHW	5	<input type="checkbox"/> Not supported
4	<input type="checkbox"/> Vout UV Fault	4	<input type="checkbox"/> TSNS_LOW	4	<input type="checkbox"/> Vin UV Fault
3	<input type="checkbox"/> VOUT_MAX Warning	3	<input type="checkbox"/> RST_VID	3	<input type="checkbox"/> Unit off: Insufficient Vin
2	<input type="checkbox"/> Not supported	2	<input type="checkbox"/> Not supported	2	<input type="checkbox"/> IIN OC Fault
1	<input type="checkbox"/> Not supported	1	<input type="checkbox"/> Not supported	1	<input type="checkbox"/> IIN OC Warning
0	<input type="checkbox"/> Not supported	0	<input type="checkbox"/> PHFLT	0	<input type="checkbox"/> PIN OP Warning

IOUT Mask Rail #2		CML Mask Rail #2		TEMPERATURE Mask Rail #2	
7	<input type="checkbox"/> IOUT OC Fault	7	<input type="checkbox"/> Invalid Command	7	<input type="checkbox"/> OT Fault
6	<input type="checkbox"/> Not supported	6	<input type="checkbox"/> Invalid Data	6	<input type="checkbox"/> OT Warning
5	<input type="checkbox"/> IOUT OC Warning	5	<input type="checkbox"/> PEC Fault	5	<input type="checkbox"/> Not supported
4	<input type="checkbox"/> Not supported	4	<input type="checkbox"/> Memory Fault	4	<input type="checkbox"/> Not supported
3	<input type="checkbox"/> Current Share Fault	3	<input type="checkbox"/> Not supported	3	<input type="checkbox"/> Not supported
2	<input type="checkbox"/> Not supported	2	<input type="checkbox"/> Not supported	2	<input type="checkbox"/> Not supported
1	<input type="checkbox"/> Not supported	1	<input type="checkbox"/> Other Comms Fault	1	<input type="checkbox"/> Not supported
0	<input type="checkbox"/> Not supported	0	<input type="checkbox"/> Not supported	0	<input type="checkbox"/> Not supported

Figure 38. SMBALERT# Mask Tab

2.8 All Config Tab

This tab contains the all available settings including some not available on the main tabs. All settings here are grouped by register. [Figure 39](#) is shown here for reference only.

Command	Code	Value/Edit	Hex/Edit
Calibration			
IOUT_CAL_GAIN_TOTAL	0x38	5.000 mQ	0xD140
IOUT_CAL_OFFSET	0x39	0.000 A	0xE800
VOUT_SCALE_LOOP	0x29	1.125	0xE809
VOUT_SCALE_MONITOR	0x2A	1.125	0xE809
Configuration			
FREQUENCY_SWITCH	0x33	600 kHz	0x0258
IC_DEVICE_ID	0xAD	0x58	0x58
IL_DEVILE_KEY	0xA6	0x03	0x03
MFR_SPECIFIC_00	0xD0	0x10	0x3431
MFR_SPECIFIC_01	0xD1	IOUT_G...	0x02F0
MFR_SPECIFIC_02	0xD2	SVID_P...	0x01
MFR_SPECIFIC_05	0xD5	PMBR_V...	0x00
MFR_SPECIFIC_06	0xD6	NVM_DA...	0x1000
MFR_SPECIFIC_07	0xD7	AC_LL2...	0x3621
MFR_SPECIFIC_09	0xD9	ISR2_0...	0x04C7
MFR_SPECIFIC_10	0xDA	IOUT_M...	0x1E14
MFR_SPECIFIC_11	0xDB	VBCU1...	0x1F
MFR_SPECIFIC_12	0xDC	DYN_IN...	0x0700
MFR_SPECIFIC_13	0xDD	NVM_P1...	0x0185
MFR_SPECIFIC_14	0xDE	DPS_GT...	0x0005
MFR_SPECIFIC_15	0xDF	TWQ_I...	0x0000
MFR_SPECIFIC_16	0xE0	5th SVID...	0x00...
MFR_SPECIFIC_17	0xE1	3rd SVID...	0x00...
MFR_SPECIFIC_18	0xF2	1.125 SVID...	0x00...
MFR_SPECIFIC_20	0xE4	NUM_PH...	0x02
MFR_SPECIFIC_32	0xF0	PIN_OP...	0x00E1
MFR_SPECIFIC_40	0xF8	PIN_MA...	0x0C
SMBALERT_MASK_CML	0x1D	00000000	0x00
SMBALERT_MASK_INPUT	0x1B	00000000	0x00
SMBALERT_MASK_IOUT	0x18	00000000	0x00
SMBALERT_MASK_MFR_SPECIFIC	0x16	00000000	0x00
SMBALERT_MASK_TEMPERATURE	0x1D	00000000	0x00
SMBALERT_MASK_VOUT	0x1B	00000000	0x00
VOUT_CMDMAND	0x71	2.560 V	0x00CF
VOUT_DROOP	0x28	0.500 mQ	0xD020
Manufacturer Info			
CAPABILITY	0x19	0xD0	0xD0
MFR_DATE	0x3D	July, 2016	0x1007
MFR_ID	0x99		0x0000
MFR_IOUT_MAX	0xA6	0.3662 A	0xAABE
MFR_MODEL	0x9A		0x0000
MFR_PIN_MAX	0xA3	60 W	0x003C
MFR_REVISION	0x9B	1	0x0000
MFR_SERIAL	0x9E	1A83640C	0x1A...
MFR_VOUT_MAX	0xA5	0.000 V	0xC292
MFR_VOUT_MIN	0xA4	0.000 V	0xC291
PMBUS_REVISION	0x90	0x33	0x33
On/Off Configuration			
ON_OFF_CONFIG	0x02	0x17	0x17
OPERATION	0x01	0x00	0x00
TON_DELAY	0x60	0.480 ms	0xB1FC
Status			
MFR_MAX_TEMP_1	0xC0	20 °C	0xD0DA
MFR_SPECIFIC_03	0xD3	NUM_M...	0x0001
MFR_SPECIFIC_04	0xD4	2.566 V	0xC291
MFR_SPECIFIC_06	0xD6	CF_CPU...	0x09
READ_IIN	0x09	0.06 A	0xB81D
READ_IOUT	0x0C	0.31 A	0xAA71
READ_PIN	0x57	0.70 W	0xB7C8
READ_POUT	0x96	0.16 W	0xA282
READ_TEMPERATURE_1	0x6D	28 °C	0xD8BA
READ_VIN	0x00	12.281 V	0xD312
READ_VOUT	0x8B	2.570 V	0x00D0
STATUS_BYTE	0x78	00000000	0x00
STATUS_CML	0x7E	00000000	0x00
STATUS_INPUT	0x7C	00000000	0x00
STATUS_IOUT	0x7B	00000000	0x00
STATUS_MFR_SPECIFIC	0x80	00000000	0x00
STATUS_TEMPERATURE	0x7D	00000000	0x00
STATUS_VOUT	0x7A	00000000	0x00
STATUS_WORD	0x79	00000000	0x0000
Limits			
IIN_OC_FAULT_LIMIT	0x5B	16.0 A	0xF820
IIN_OC_FAULT_RESPONSE	0x5C	Click...	0x00
IIN_OC_WARN_LIMIT	0x5D	16.0 A	0xF820
IOUT_OC_FAULT_LIMIT	0x46	25 A	0x0019
IOUT_OC_FAULT_RESPONSE	0x47	Click...	0x00
IOUT_OC_WARN_LIMIT	0x4A	20 A	0x0014
OT_FAULT_LIMIT	0x4F	115 °C	0x0079
OT_FAULT_RESPONSE	0x50	Click...	0x00
OT_WARN_LIMIT	0x51	105 °C	0x0069
PIN_OP_WARN_LIMIT	0x68	450 W	0x00E1
VIN_ON	0x35	4.000 V	0xF820
VIN_OV_FAULT_LIMIT	0x6E	17 V	0x0011
VIN_OV_FAULT_RESPONSE	0x6F	Click...	0x00
VIN_UV_FAULT_LIMIT	0x69	4.750 V	0xF011
VIN_UV_FAULT_RESPONSE	0x6A	Click...	0x00
VOUT_OV_FAULT_LIMIT	0x40	2.800 V	0x00E7
VOUT_OV_FAULT_RESPONSE	0x41	Click...	0x00
VOUT_UV_FAULT_LIMIT	0x44	2.200 V	0x00BA
VOUT_UV_FAULT_RESPONSE	0x45	Click...	0x00

Figure 39. All Config Tab

3 PMBus GUI Monitor Page

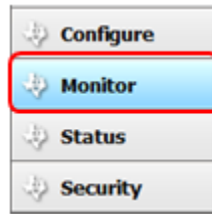


Figure 40. Monitor Page Selection

The Monitor Page allows the user to view all of the real-time telemetry on one screen. Refer to Figure 41 for key features of the Monitor Page.

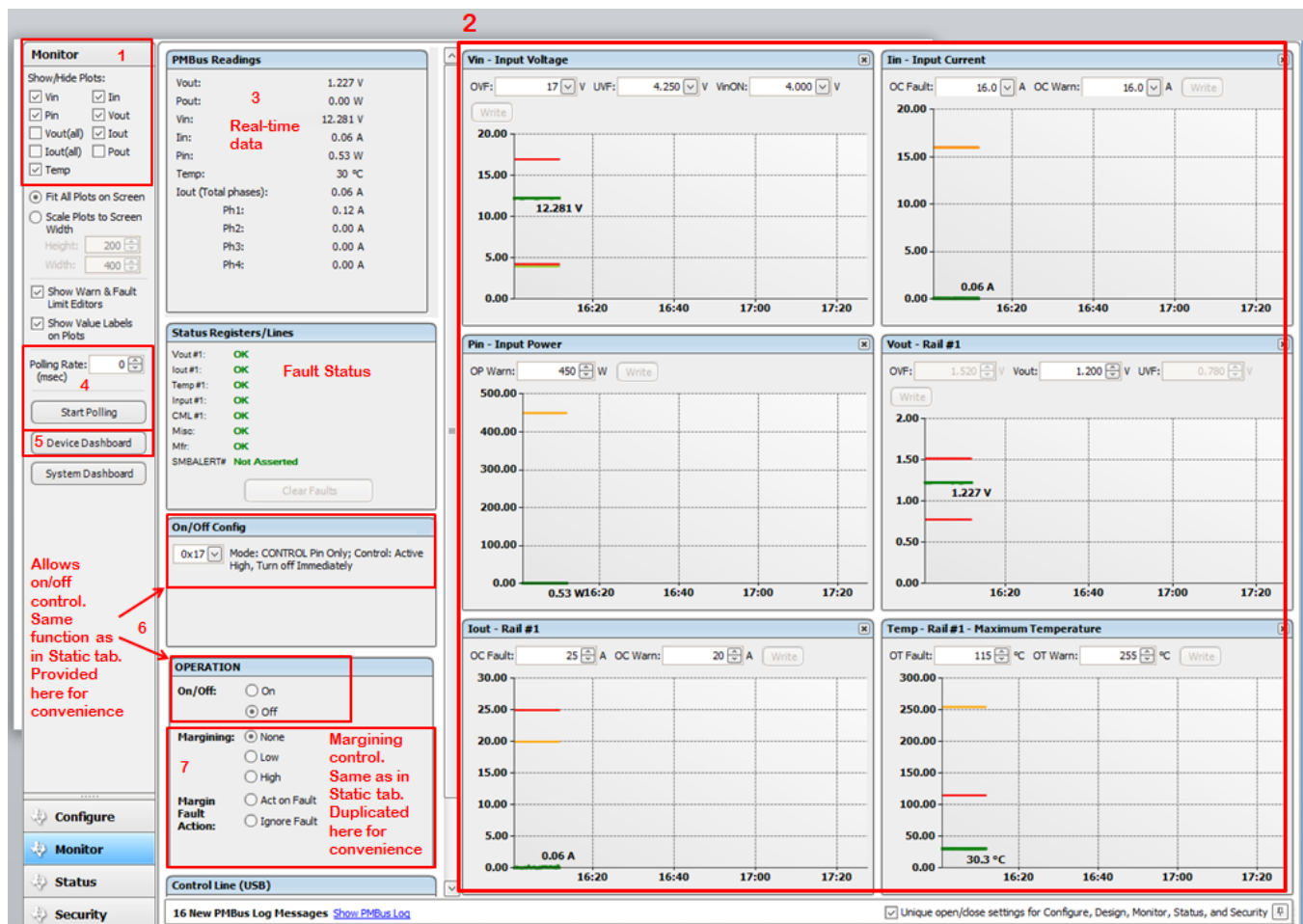


Figure 41. Monitor Page

- Plot Selection/Configuration:** This section of the page allows the user to select which graphs to display. Options include V_{IN} , I_{IN} , P_{IN} , V_{OUT} , I_{OUT} , P_{OUT} , and Temperature. Additionally, the user can select whether the plots are scaled to fit the screen or to a specific size. The user can also select whether or not the real-time value is displayed on the graph and if the warning and fault limit values will be visible in the chart.
- Plot display region:** All plots selected above will display here.
- PMBus Readings:** This section displays the real-time PMBus telemetry values. This includes V_{IN} , I_{IN} , P_{IN} , V_{OUT} , I_{OUT} , P_{OUT} , and Temperature.
- Polling Options:** This section allows the user to select whether the GUI is actively polling the device

for PMBus telemetry values (Start Polling, Stop Polling). The PMBus polling update rate can also be changed.

5. **Device and System Dashboard:** Allows the user to access the Device and System Dashboards.
6. **On/Off Config and Operation:** Same as the On/Off Config in the Operation panel of the Static Tab on the Configuration Page (see [Figure 18](#)). It is provided here again to allow the user to control this function right from the Monitor page.
7. **Margining:** Same as the Margin settings in the Operation panel of the Static Tab on the Configuration Page (see [Figure 16](#)). It is provided here again to allow the user to control this function right from the Monitor page

4 Status page

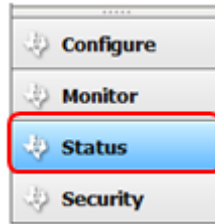


Figure 42. Status Page Selection

The Status page shows the status of each fault bit.

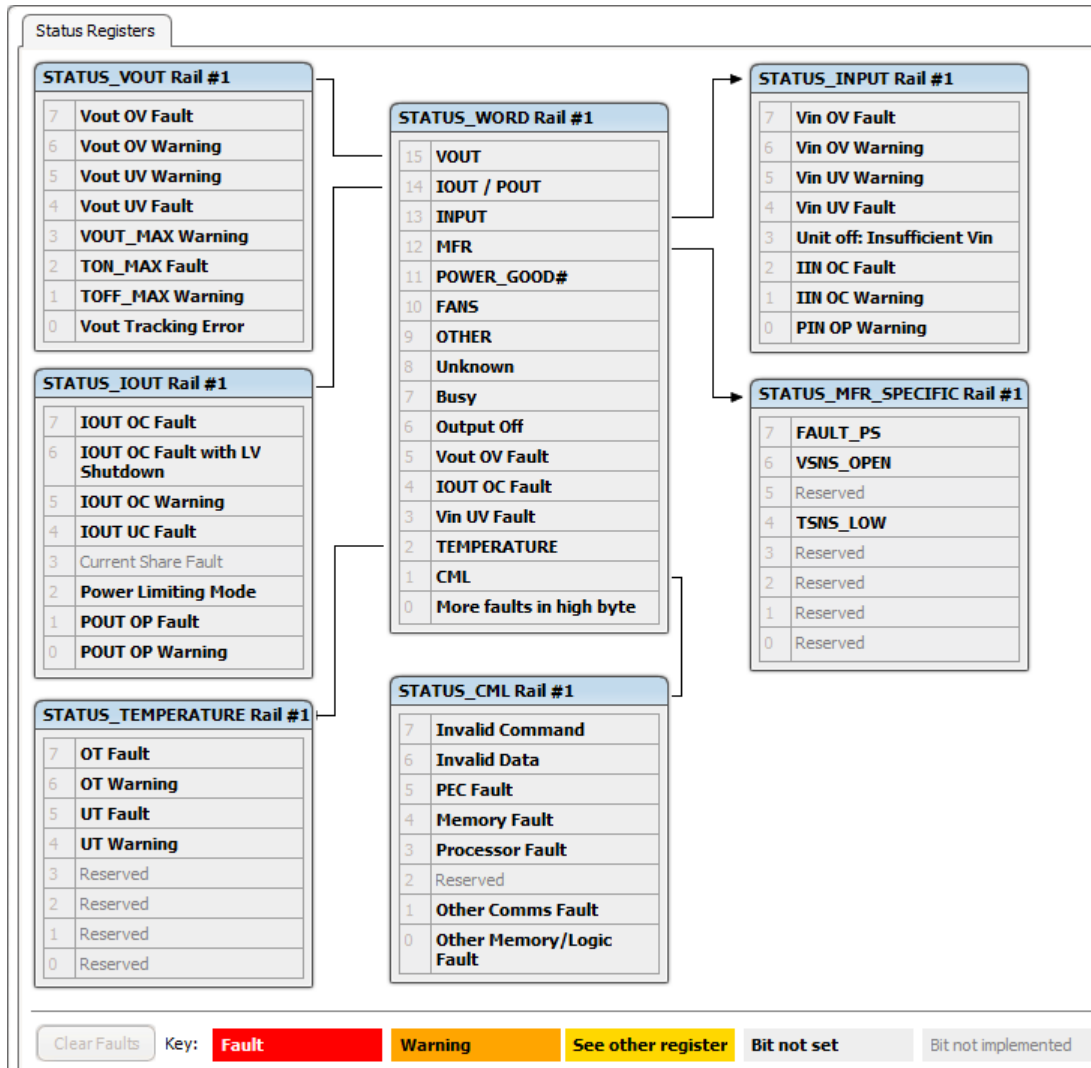


Figure 43. Status Page

5 Security Page



Figure 44. Security Page Selection

The Security page contains the full list of commands that can be write-protected when security is enabled.

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