

## AN-SL2001-01

## Graphical User Interface (GUI) for SL2001/2002

### Introduction

The Graphical User Interface (GUI) is a computer program for Windows that allows customers to configure the SL2001 or SL2002 ICs through I<sup>2</sup>C programming and/or nonvolatile memory in the ICs. The SL2001 is targeted for higher peak power and higher input voltage applications, whereas the SL2002 is targeted for lower peak power and lower input voltage applications. This GUI application note is written for GUI revision 0.0.39. The GUI.exe is an executable file that opens the I<sup>2</sup>C Communicator program (GUI) that enables changing various parameters of the SL2001/2002 IC and when they are executed, the chip is programmed through the I<sup>2</sup>C dongle (provided with the EVK) connected to the USB port of the computer. This application note introduces various features and functionalities of the GUI.

There are three key sections in this App note. The first two sections refer to additional documents for the software installation and the board connections for the experimental setup, respectively. The next section covers the seven tabs on the GUI program.

- Software Installation
- Lab Setup and Board Connections
- GUI Features and Functionalities
  - Setup
  - Preset Power Profile
  - RES Load Calculator
  - Timing Calibration
  - Multi Comm
  - NVM Comm
  - Fault Config

### Software Installation

A single installation file named “SL200XGUI.exe” allows installing both the GUI and the USB driver for the I<sup>2</sup>C dongle. Please follow the step-by-step instructions on the Quick Start Guide [1] to install the software and the drivers for both PC and MAC computers.

### Lab Setup and Board Connection

Fig.1 shows the lab setup of the various equipment. Please refer to the Application Note of the evaluation board [2] for more detailed information about the various equipment.

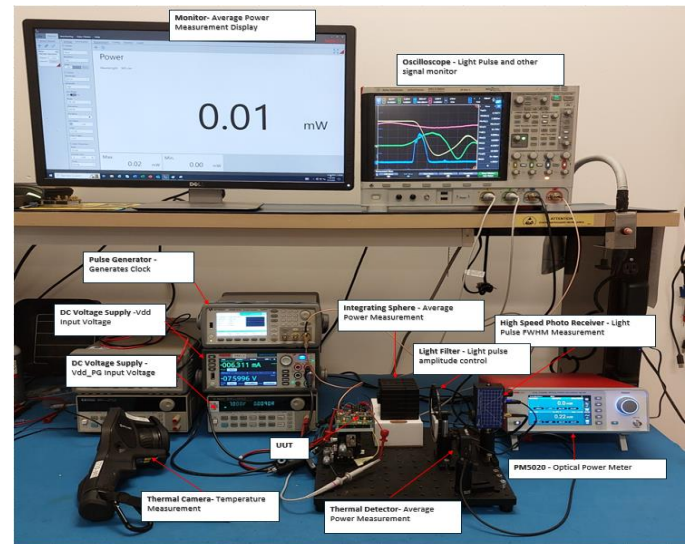


Fig.1 Lab setup

Fig.2 shows various connections of a typical evaluation board for SL2001/2002. To make all the necessary board connections and power up the board, please follow the step-by-step instructions provided in the Quick Start Guide [1].

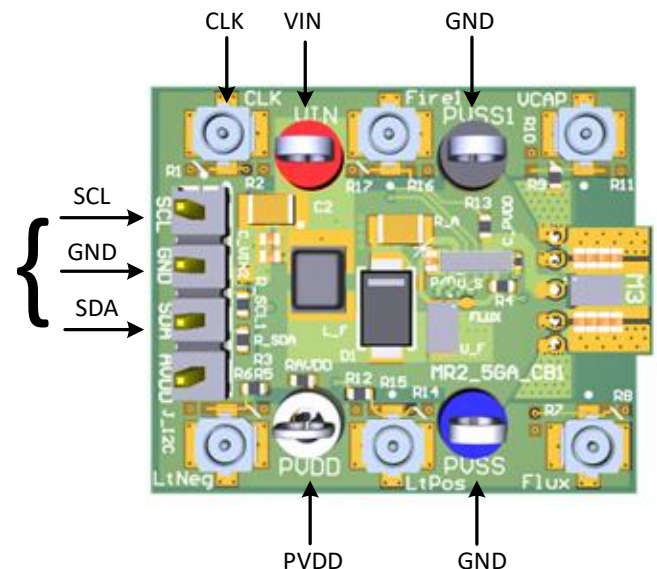


Fig.2 Board Connections

## GUI Features and Functionalities

The following five subsections present the various features and functionalities of the GUI by describing the seven tabs of the program.

### i) Setup

Fig. 3 shows the Setup tab of the GUI. The top right corner Scale box is used to set the size of the texts in this application. Depending on the screen/ monitor size and resolution, the user may need to adjust this parameter for better viewing of the texts in this application. In order to prevent unreadable text in the GUI, this button has a range of 0.5 to 1.5. If a user tries to input a value outside of this range, then the previous range value will remain unchanged. If you have the EVK hardware connected to the computer, the GUI will automatically detect the correct device between SL2001 and SL2002. SL2001 is targeted for higher peak power and higher input voltage applications, whereas SL2002 is targeted for lower peak power and lower input voltage applications.

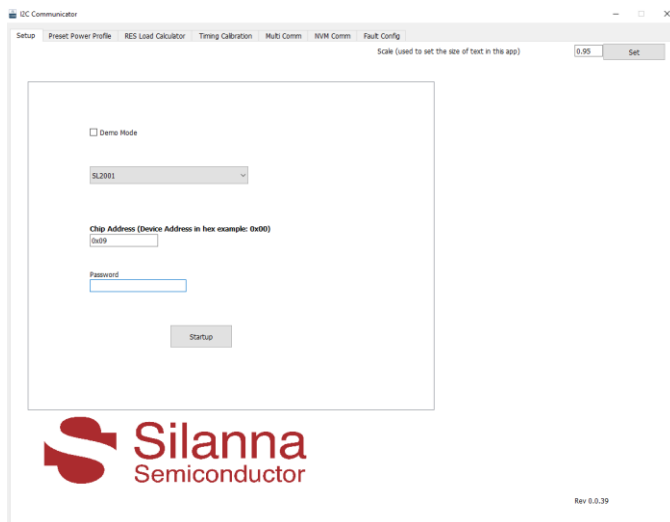


Fig.3 The Setup Tab from the GUI

When the Demo Mode box is checked, the user can select either SL2001 or SL2002 and the GUI will configure itself for selected device. The Demo Mode allows the user to try various features of the GUI without connecting the evaluation board (hardware emulation mode), hence the GUI will emulate functions as if a part is connected; however, if there is no hardware/ I<sup>2</sup>C dongle connected to the computer and the user tries to communicate with the IC (e.g. WriteI2C button in Timing Calibration Tab), the command prompt window will still generate some device connection related errors that can be ignored (shown in Fig.4). The Demo Mode button should be unchecked when

evaluating an actual evaluation board (EVB) or otherwise connected via the I<sup>2</sup>C dongle to an SL2001 and SL2002.

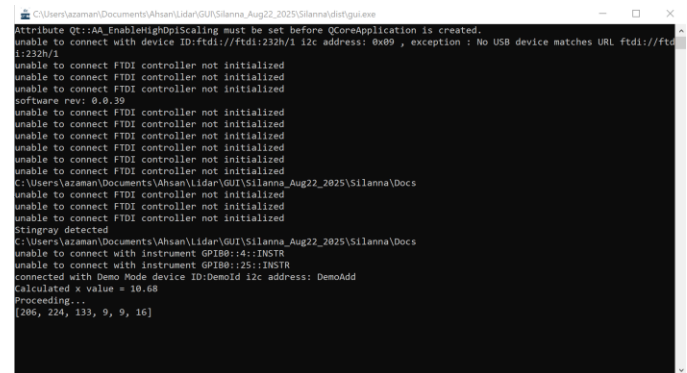


Fig.4 The Command Prompt Window showing errors that can be ignored when the GUI is in Demo mode

The chip address should be set to 0x09, which is the default I<sup>2</sup>C address for both the SL2001 and SL2002. Both parts do include the ability to change this address to 3 other address options via either I<sup>2</sup>C writes or NVM programming as described in the NVM and VM programming guide for SL2001 and 2002 [3].

The Password box can be left empty for most of the GUI features and functionalities, including all features in the Preset Power Profile, Timing Calibration and Fault Config tabs (discussed in the following subsections). In some cases, the Silanna Marketing and Applications team may provide customers with a specific password to allow access to password protected registers of SL2001/2002 for the Multi Comm and NVM Comm tabs (discussed in the following subsections). Please note, once a password is entered, the GUI will remember it until the user erases it. The Startup button is used to configure the GUI for proper operation. Regardless of whether a password is included in the password box, it is important to click the startup button any time that (a) the GUI is restarted, (b) a new SL2001 or SL2002 part is connected to the GUI, or (c) a connected part is restarted.

Once the Setup screen is configured as shown in Fig.3, press the Startup button to start the program. At this point the program is communicating with the SL2001/2 IC through the I<sup>2</sup>C dongle connected with the PC.

### ii) Preset Power Profile

The preset power profile tab allows selecting among various preset values for SL2001/2002 power and fault configuration profiles. The Description/Notes box provides information about the settings and may show other information like how much power will be generated by selecting each profile and the associated operating conditions.

In order to not accidentally overstress the board, the Vin voltage should never be raised to a higher voltage, while the external clock is running. The GUI will display a warning message as shown in Fig.5 below to remind the user to pause the external clock before pressing the OK button. After pressing the OK button, the user should adjust the input voltage according to the new setting first before resuming the external clock.

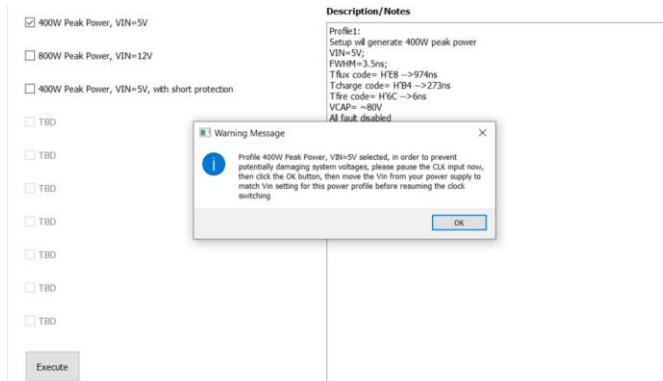


Fig.5 The Preset Power Profile Tab from the GUI

## iii) RES Load Calculator

For Evaluation boards that have a resistive load in place of the laser, the RES Load Calculator tab can be used to estimate the peak current and full wave half magnitude (FWHM) values. Details of the settings for this tab settings are provided in a separate application note “AN-SL2001-06 (Laser Emulation using Resistor)”.

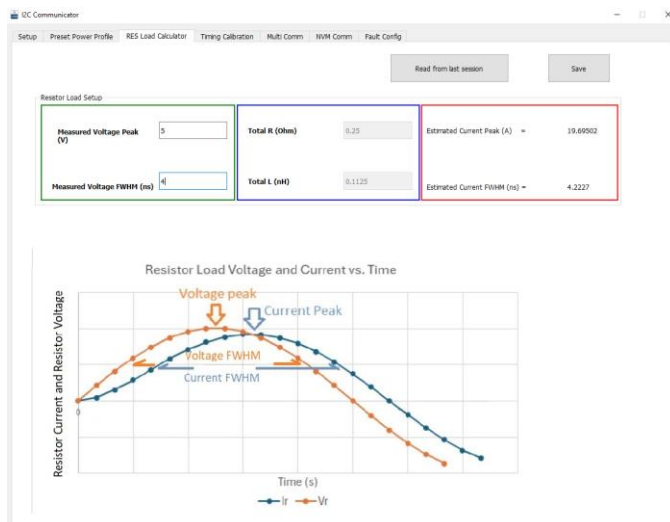


Fig.6 The Res Load Calculator Tab from the GUI

## iv) Timing Calibration

Fig.7 shows the Timing Calibration tab of the GUI. This tab allows modifying the HEX values of the Flux, Charge and Fire time codes and provides an estimation for Flux, Fire and Charge times, as well as the inductor peak current and

Vcap voltage. In order for the calculation in this sheet to be correct, the input parameters for Vin, Fluxing Inductor value and Cres Value need to be specified based on the operating condition and component values on the board (please check the corresponding test report of the EVK being tested). The calculations for Timing Pulse Widths are included in the product datasheets [4]. The Flux Time Code, Charge Time code and Fire Time code text boxes allow the user to input HEX values to modify the corresponding timings. The calculations to the right are immediately updated when any hex values are changed.

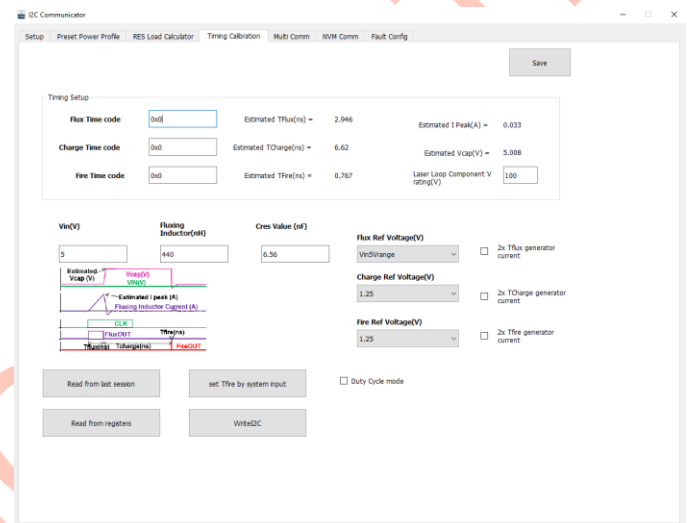


Fig.7 The Timing Calibration Tab from the GUI

The Flux, Charge and Fire Ref voltages can be selected from the corresponding pull-down menus to modify the timing ranges according to the equations shown in the datasheet (Fig.8).

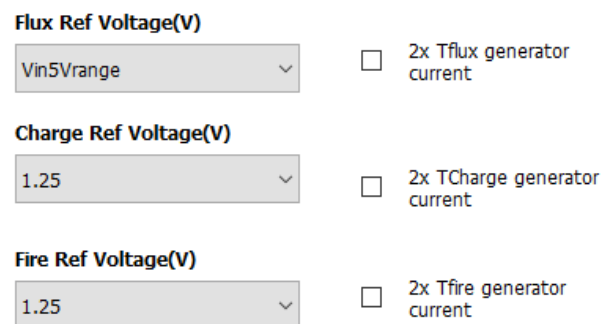


Fig.8 Ref Voltage selection of the Timing Calibration Tab

The Flux Ref Voltage (V) pull down menu (Fig.9) allows changing the flux time dependency on the Vin. The following bullet points give description for each of the selection options.

### Flux Ref Voltage(V)

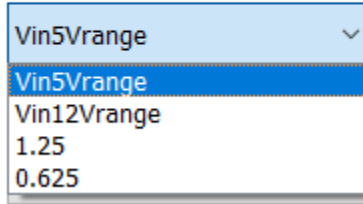


Fig.9 Flux Ref Voltage pull-down menu

- Vin 5V range is for  $V_{in}=5V$  (+/- 2.2V) the Flux time will change such that the  $iL_{peak}$  will remain relatively constant for  $V_{in}$  within the range above.
- Vin 12V range is for  $V_{in}=12$  (+/-3V) the Flux time will change such that the  $iL_{peak}$  will remain relatively constant for  $V_{in}$  within the range above.
- 1.25 will result in constant flux time such that  $i_{peak}$  will change proportional to  $V_{in}$
- 0.625 will result in half the current for the DAC, effectively doubling the flux time compared to 1.25 setting. This will result in  $i_{peak}$  to change proportional to  $V_{in}$  as well.

The Charge Ref Voltage (V) pull down menu (Fig.10) allows selection between the default value (1.25) or  $\frac{1}{2}$  of the reference voltage (0.625) in order to approximately double the Charge Time per the equation in the datasheet.

### Charge Ref Voltage(V)

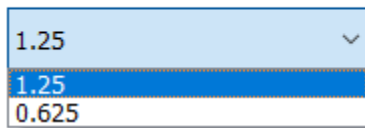


Fig.10 Charge Ref Voltage pull-down menu

The Fire Ref Voltage (V) pull down menu (Fig.11) allows selection between the default value (1.25) or  $\frac{1}{2}$  of the reference voltage (0.625) in order to approximately double the Charge Time per the equation in the datasheet.

### Fire Ref Voltage(V)

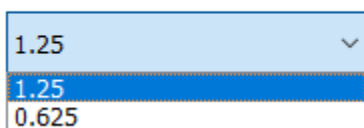


Fig.11 Charge Ref Voltage pull-down menu

In addition to the above settings, the user can check any of the tick marks shown in Fig.12 to double the internal

generator currents, which will effectively halve the calculated times according to the equations in the datasheet. So, the GUI offers the user with both options, i.e. doubling and halving the Flux, Charge and Fire times.

- ☐ 2x Tflux generator current
- ☐ 2x TCharge generator current
- ☐ 2x Tfire generator current

Fig.12 Charge Ref Voltage pull-down menu

Once a preferred timing setting is established, user can click on "Save" button to store the information into GUI memory. After chip and GUI shut down and re-launch users need to return to the setup page and click on the Startup button, then they can return to the Timing Calibration tab and quickly resume back to this setting by clicking on "Read from last session" button to load those settings back into the GUI page, then the "Write I2C" button to load those parameters in the IC. If further changes are made, users can click on the "Save" button again to overwrite the previous saved information.

The "Set Tfire by System Input" button allows the GUI to set the Tfire setting to a default value (with no variation due to any other inputs at this time). The "Read from Registers" button allows reading the values from the SL2001/2002 internal registers and copying them over to the corresponding cells in the Timing Calibration page.

Checking the Duty Cycle Mode box will put the SL2001/2002 IC in duty cycle mode of operation. For details of this mode, please refer to the datasheet for SL2001/2002 [4].

## v) Multi Comm

Fig.13 shows the Mutli Comm tab of the GUI as well as the Single Register Edit pop up page. The Multi Comm tab allows the user to read the existing values from the registers of the SL2001/2 IC and change the values before writing them back to the corresponding registers. For the



complete list of SL2001/2 registers and their functions please review the datasheet [4] and the Programming Guide [3]. Please note, there are registers which are internal to Silanna use and are not accessible to the customers/ users outside Silanna.

The 'Read from I2C' button allows reading from the accessible registers identified between the 'Start' and 'Stop' text boxes.

These two boxes expect Hex values of the target registers. After the registers are read and present in the Multi Comm table, there are 2 methods to edit the register values. If any register is selected in the table, the 'Edit' button pops up a Single Register Edit Page which provides detailed information about the bit options in that register. Users can change any bit values and click on "write" to write to the IC. Rather than use the "Edit" button to pop up the Single Register Edit Page, users can also just modify values in the Multi Comm table for any registers, then click "Execute" to perform all read and write functions in the table. Register contents can also be edited by double clicking value on the 'Set Value' column but the user needs to change 'Read/Write' column to W to be able to do so.

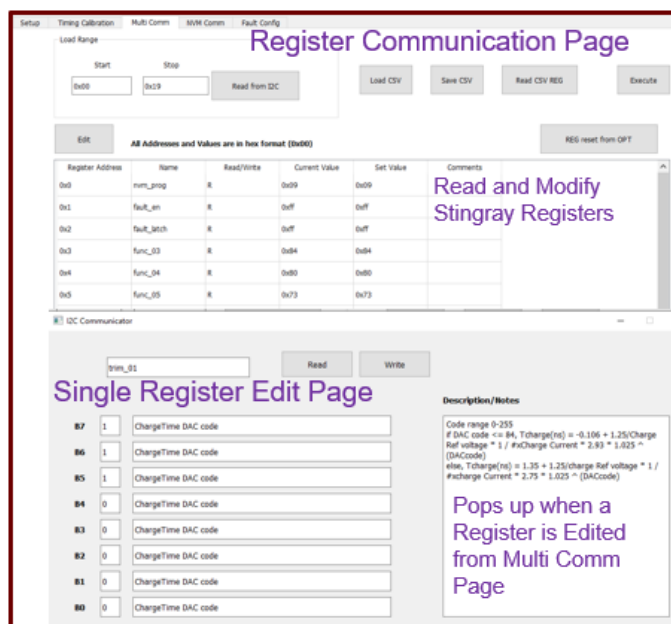


Fig.13 The Multi Comm Tab from the GUI

As an alternative to using the "Read from I2C" button to load and read a range of registers, the user can also use a CSV file to load a series of register reads and writes. Once the Multi Comm Table is present, the user can click the "Save CSV" button to save all of the rows to a csv file. Then, the user can edit that csv file using a text editor or Excel and load the modified register settings back into the GUI by pressing the "Load CSV" button. by pressing the 'Load CSV' button. Fig.14 shows an example csv file.

| C12 |                 |                   |            |               |           |          |   |
|-----|-----------------|-------------------|------------|---------------|-----------|----------|---|
|     | A               | B                 | C          | D             | E         | F        | G |
| 1   | Register A Name |                   | Read/Write | Current Value | Set Value | Comments |   |
| 2   | 0x10            | Flux Time Control | R          | 0xce          | 0xce      |          |   |
| 3   | 0x11            | Charge Time Cntrl | R          | 0xe0          | 0xe0      |          |   |
| 4   | 0x12            | Fire Time Control | R          | 0x85          | 0x85      |          |   |
| 5   | 0x13            | Function 3        | R          | 0x09          | 0x09      |          |   |
| 6   | 0x14            | Function 4        | R          | 0x09          | 0x09      |          |   |
| 7   | 0x15            | Function 5        | R          | 0x10          | 0x10      |          |   |
| 8   | 0x16            | Function 6        | R          | 0x2e          | 0x2e      |          |   |
| 9   |                 |                   |            |               |           |          |   |
| 10  |                 |                   |            |               |           |          |   |

Fig.14 Example of a CSV file to Load from the GUI

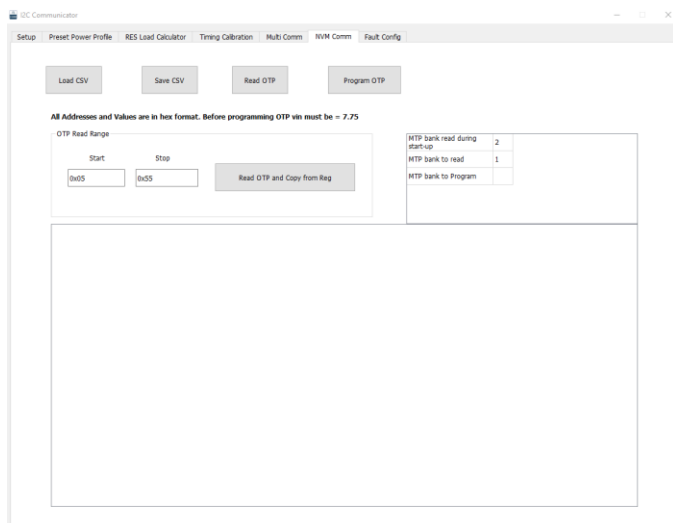
Once the target register values are modified, the user needs to click on the 'Execute' button to write to the registers through the I2C connection. Please note, the GUI automatically reads the registers when transferring from one tab to another.

The "Read CSV Reg" button provides the ability to read all of the register values for registers present in the Multi Comm table without performing any writes.

The "REG reset from OTP" function will read the values from the non-volatile memory into the Multi Comm table (rather than the values in the volatile registers).

## vi) NVM Comm

Fig.15 shows the NVM Comm tab of the GUI. This tab allows the user to read and write from the non-volatile memory of the SL2001/2002 IC. Please refer to the NVM and VM Programming Guide for SL2001/ 2002 [3] for the details on how to program the NVM of the IC using both the GUI and standard I2C protocol (further information about this GUI page is located in that document). For NVM programming the Vin voltage needs to be set at 7.75V and the external clock needs to be grounded to avoid any unexpected laser firing during the NVM programming process. There are 7 Bytes of 3-time programmable MTP (Multiple Time Programmable) memory and 219 Bytes of customer usage OTP (One Time Programmable) memory on the IC. The buttons on this tab are very similar to the Multi Comm tab where the user can select the start and stop Hex address of the target memory cells and set their values. Clicking on the Program OTP button will execute the command to write to the internal memory cells of SL2001/2 IC.



**Fig 15: The NVM Comm Tab from the GUI**

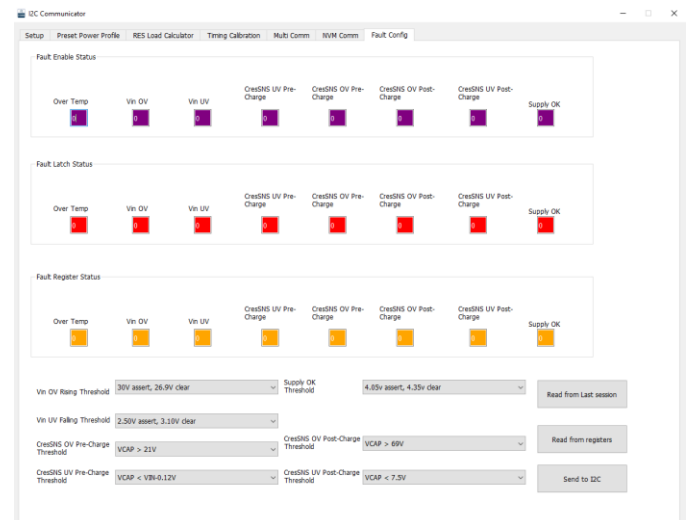
## vii) Fault Config

Fig.16 shows the Fault Config Tab of the GUI. This tab allows the user to enable and monitor various fault status of the SL2001/2 IC, such as over temperature, over voltage, under voltage etc. The first row of boxes allows enabling and disabling eight different faults of the IC by changing between 0 (disable) and 1 (enable) and the boxes will change colors. Similarly, the second row allows setting the fault recovery behavior between hiccup (0) and latch (1). The hiccup mode allows the IC to self-restart the operation after waiting for 28 ms, where the latch mode requires the part to either be power down (remove Vin and Vdd) or soft reset via I2C write (Using Multi-Comm page, register address 0x15, set bit 7 “DigSoftReset” =1) before it can restart.

The third row of boxes is used to monitor the fault status of these 8 faults, where value 1 means this fault had occurred since device powering up or since the last time user erased it. The fault status register is not self-clearing. The user will need to reset it to 0 and read from the device to check the present status.

Finally, the bottom section allows adjusting the various fault thresholds. The threshold selection options will vary between SL2001 (targeted for higher input voltage and higher peak output power applications) and SL2002 (targeted for lower input voltage and lower peak output power applications). The three buttons at the bottom right corner of the tab allow reading from the last sessions, reading from the fault registers and writing back to various fault registers and their threshold values through the I<sup>2</sup>C connection. For more details about the Faults in SL2001

and SL2002, please refer to the corresponding datasheets [4].



**Fig.16 The Fault Config Tab from the GUI**

## Summary and Conclusion

In summary, the GUI is a very powerful tool to configure the SL2001/2002 IC based on customer applications and specs. This application note provides a high-level summary of various features and functionalities of the GUI. For more details, please contact Silanna's Application team for scheduling a training.

## References

- [1] Quick Start Guide which provides step-by-step instructions on how to set up the GUI software and initialize the evaluation board hardware
- [2] Application Note for the Evaluation Board provides configuration details and test results for various tests performed using GUI and EVK hardware
- [3] Application Note for NVM and VM Programming Guide for SL2001 and 2002 provides instructions on how to program various non-volatile and volatile memory blocks in the IC.
- [4] SL2001 and SL2002 Datasheets provide details of SL2001 and SL2002 respectively, e.g. pin out, electrical characteristics table, operation details, faults etc.

## Revision History

| Revision | Date        | Author | Note  |
|----------|-------------|--------|---|
| 0.1      | 25 Jul 2025 | AZ     | Draft release.  |
| 1.0      | 25 Aug 2025 | AZ     | Updated to GUI rev 0.0.39<br>Document Control Release |