User's Graphical User Interface(GUI) for LP555x Evaluation Board PowerWise™ Technology Compliant Energy Management Unit

National Semiconductor
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Overview

A user's graphical user interface (GUI) is provided to control LP555x evaluation boards via USB connection. The GUI for LP5551 is shown in *Figure 1* as an example. The GUI can read and write LP555x registers and send PWI commands to program the output voltages of the switching regulators and LDOs. The GUI can also control the operation modes of LP555x, such as sleep, wakeup, shutdown and reset, by generating PWI commands. Functions and performance of the LP555x can be tested easily through the GUI.

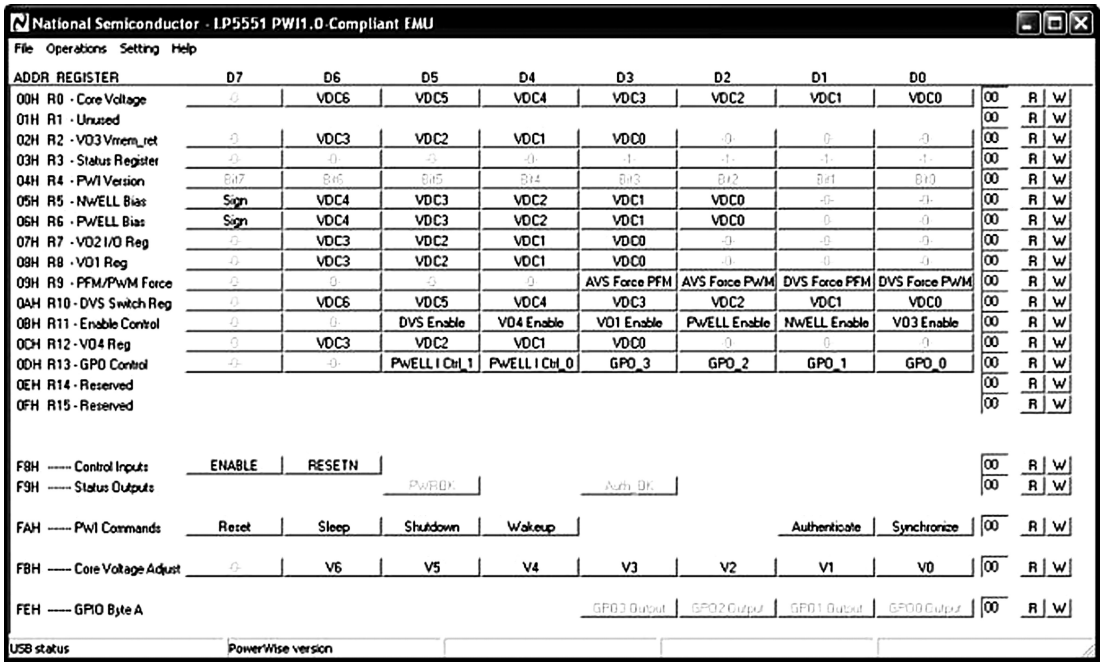

FIGURE 1. LP5551 Evaluation Board User's GUI

Quick Start

1. Run the GUI ('Evaluation.exe', with 'Evaluation.ini' and 'usblptio.dll' in the same folder) from the PC.
2. Connect the LP555x Demo Board to a PC using a USB cable.
3. Check authentication by clicking the 'Authenticate' button on the lower part of the GUI. Then click 'R' on the right of the 'Auth_OK' button to read back the authenticate result. If 'PWROK' and "Auth_OK' are both '1' (in their depressed positions), then authentication is succeeded and the GUI is ready to control the LP555x evaluation board.
4. From the menu: Operations -> Read all, the default register values can be read from the LP555x and shown in the GUI, as shown in *Figure 2*.

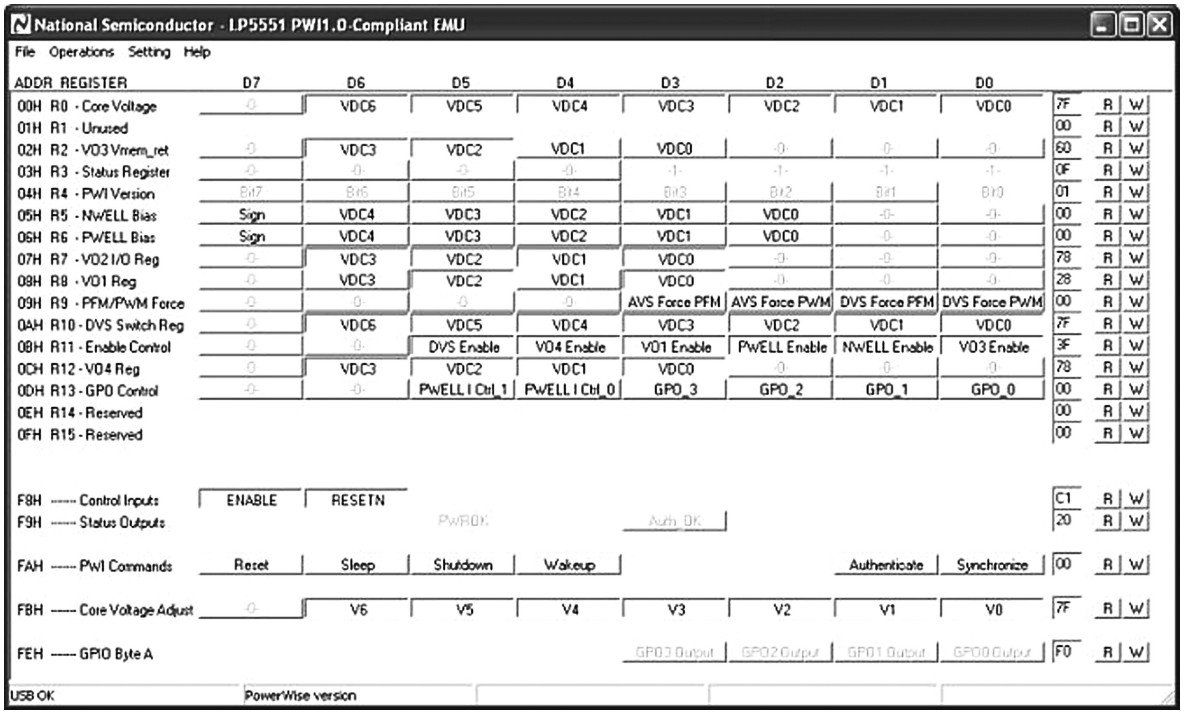

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FIGURE 2. LP5551 GUI with Default Register Values and Commands

There are a few ways to read and write to the registers through the GUI.

Register Read:

- Click button 'R' at the right of each register to read the register value from the LP555x.
- Operations -> Read all (Ctrl+R), to read all register values.
- Operations -> Direct access, to read a single register by providing its address.
- Settings -> Register polling, when 'polling time' is not zero, all registers are read in once every 'polling time'.

Register Write:

- Click button 'W' at the right of each register to write to it in LP555x.
- Operations -> Write all (Ctrl+W), to write the current values in the GUI to all registers in the LP555x.
- Operations -> Direct access, to write to a register by providing its address and value.
- Settings -> Update immediately, when checked, registers in LP555x are written whenever the buttons in the GUI are updated.

GUI Layout and Conventions

GUI LAYOUT

The upper half of the GUI is the register interface and the lower half is the control and PWI command interface.

From the left to the right of the GUI, as shown in Fig. 2:

- The 1st column is the addresses for LP555x registers and control commands.
- The 2nd column shows the register names in LP555x.
- The 3rd column gives brief descriptions of registers and control commands.
- The 8 buttons in the register interface represent the 8 bits of each register. From the left to the right: MSB to LSB. Buttons in the control and PWI command interface represent each command and status.
- The two-digit HEX numbers show the contents of each register.
- The 'R' and 'W' buttons at the right end of each line are for reading from or writing to the register in the same line.

GUI CONVENTIONS

In the GUI, buttons in D7 to D0 columns represent a digital bit of LP555x registers or a control command.

Buttons with grey text represent read-only or unused bits.

Buttons in the depressed position show the corresponding bits are equal to '1'. For example, in Fig. 3, 'ENABLE' = '1', 'RESETN' = '1', 'PWROK' = '1' and 'Auth_OK' = '1'.

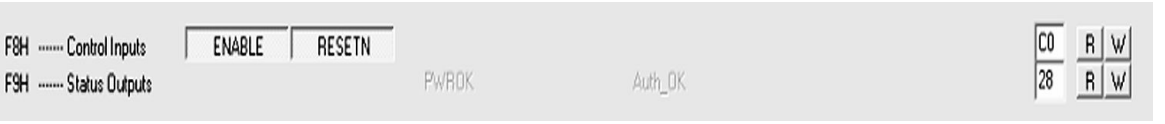

FIGURE 3. Buttons in Their Depressed Position Mean that the Corresponding Bits = '1'

Buttons in the raised position show the corresponding bits are equal to '0'. For example, in Fig. 4, 'ENABLE' = '0', 'RESETN' = '0', 'PWROK' = '0' and 'Auth_OK' = '0'.

FIGURE 4. Buttons in Their Raised Position Mean that the Corresponding Bits = '0'

Register Interface (Direct Read and Write)

A register control established through PWI interface allows users to directly access to the LP555x registers. A set of up to sixteen 8-bit registers in the PWI slave are supported by the PWI standard. By reading and writing through the GUI, output voltages of switching regulators, LDOs and others, such as P- and N- well biasing voltages, can be controlled. Please refer to the LP555x data sheets for the details related to the coding of the registers at www.national.com and powerwise.national.com.

Control and PWI command interface

The lower part of the GUI is for hardware resets, enables and direct PWI commands, as shown in Fig. 2. Please refer to PowerWise Interface Specification for the details of PWI standard at pwistandard.org.

- Control Inputs
  - RESETN: controls hardware reset pin, active low, default = 1.
  - ENABLE: controls hardware enable pin, active high, default = 1.
- Status Outputs:
  - PWROK: if the evaluation board is correctly powered, a '1' will be showed in this button, otherwise '0'.
  - Auth_OK: if authentication is successful after clicking 'Authenticate' button, a '1' will be returned when the button 'R' on the right of this row is clicked, otherwise, '0'.
- PWI Commands:
  Please deselect a command after it is sent
  - Reset: writing the reset command will initialize the PWI slave and set all the slave registers to default.
  - Sleep: writing the sleep command to the PWI slave activates the Sleep-mode. In the sleep mode, the core voltage is 0V, and the LDO3 output (memory voltage) will be controlled by its retention value (R2). Other voltages retain their programmed values.
  - Shutdown: writing the shutdown command will cause the PWI slave to switch off all regulators, thus causing all output voltages to go to zero. Toggle hardware 'ENABLE' or 'RESETN' to activate the outputs.
  - Wakeup: this command allows the PWI slave to move from sleep-mode to active-mode. The core voltage returns to the default value and LDO3 tracks the core voltage.
  - Authenticate: the authenticate command is a nine-frame sequence consisting of the Authenticate-command followed by four challenge/response frame sequences. If authentication succeeds, a '1' will be returned at 'Auth_OK' after reading the status output.
  - Synchronize: this command synchronizes the master and the slave. The master sends a stream of '1's and forces the slave to resynchronize to the stop bit ('0') of the command.
  - Core Voltage Adjust:
    Adjust core voltage directly. This command has the same effect as executing a register write to the register R0. However, the core voltage adjustment frame command only requires one frame to write to the R0, while a register write command needs two frames to execute.
    Note that both of the core voltage adjustment command and a register write to R0 can change the content of register R0. However, the content shown in the GUI does not update until a register read is performed.

Menus

Menus of the GUI provide various operations and settings of the GUI.

- File
  - Open profile: open a profile to overwrite the current settings in the GUI. A dialog shown in Fig. 5 will pop up, providing a choice of overwriting register contents in the LP555x or not.

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FIGURE 5. Confirm Overwriting Registers in LP555x

- Save profile: save the current settings as a profile;
- Exit: close the GUI
- Operations
  - — Write all: write all the current settings in the GUI to the registers in LP555x;
  - — Read all: read all the register current values from the LP555x;
  - — Set default all: set all the values in the GUI to default (please refer to the LP555x data sheets for the default value settings). A dialog shown in Fig. 5 provides choice of overwriting register contents in the LP555x or not.
  - — Direct access: read from or write to an address directly. As shown in Fig. 6, a register can be written directly in the 'write' section, while a register can be read in the 'read' section.

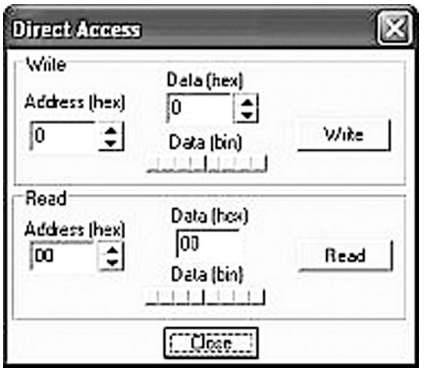

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FIGURE 6. Direct Access to Registers

- Output voltages: as shown in Fig. 7, 16 outputs of the on-board ADC can be shown. The first row shows the ADC data (hex format) and the second row shows the corresponding voltages.

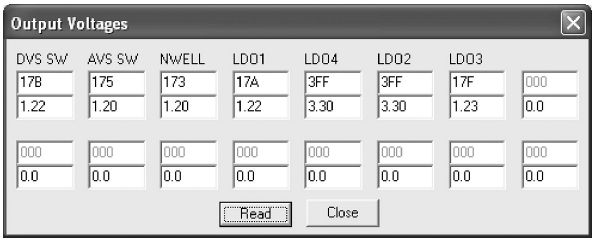

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FIGURE 7. Output Voltages Obtained by ADCs

- Settings
  - — Update immediately: when checked, registers in LP555x are written whenever updated in the GUI.
  - — Register polling: a polling time can be set in the dialog shown in Fig. 8. When the polling time is not zero, 'read all' is performed once every 'polling time'; when the bar is set at 'polling is not available', auto-polling is stopped.

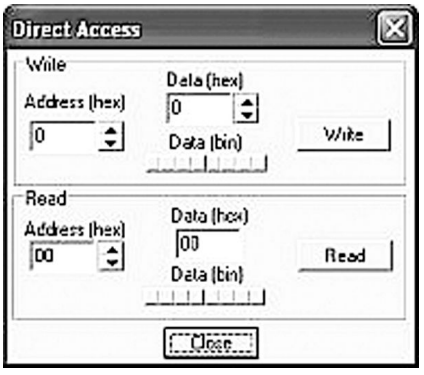

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FIGURE 8. Register Polling Interval

- History: previous register read and write actions are listed in the history window, as shown in Fig. 9.

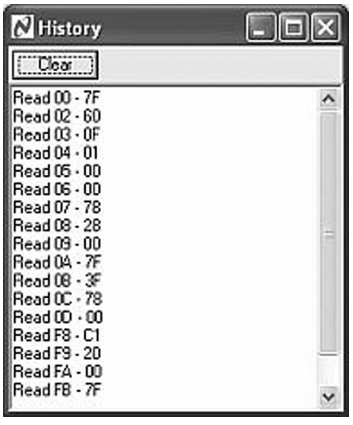

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FIGURE 9. History Window

- Help: version information, website and help email address.

Notes

Notes

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