Graphical User Interface Manual

Description

The graphical user interface (GUI) is for _LT8277_ SPI interface evaluation. It controls a Linduino One microcontroller board (_DC2026C_) to send desired SPI commands at a user-defined rate to LT8277. When used with evaluation board _EVAL-LT8277-AZ_, the GUI can configure LT8277 SPI Watchdog Timer (WDT), so that the WDT and Serial Peripheral Interface (SPI) transmission can be evaluated together without touching the board. This GUI provides maximum flexibility to test different conditions of LT8277, including WDT expiration, sending the erroneous Cyclic Redundancy Check (CRC) value, etc.

Hardware Requirements

1. EVAL-LT8277-AZ Board
2. DC2026C Linduino One microcontroller board and a ribbon cable CA2440
3. Windows® PC
4. Power supply and load
5. Cables

Connecting EVAL-LT8277-AZ to the GUI

Software Installation

1. If the QuikEval program has not yet been installed on the computer, navigate to the _Linduino webpage_ and download the program. Install the program as instructed on the webpage. This step is to install the FDTI USB drivers that slow the PC to interface with Linduino properly. Skip this step if the QuikEval is installed on the computer.
2. Download the LT8277 GUI software from the _website_. Launch LT8277_GUI_SetupInstaller.exe and follow the consecutive prompt window to install the GUI at the desired location.
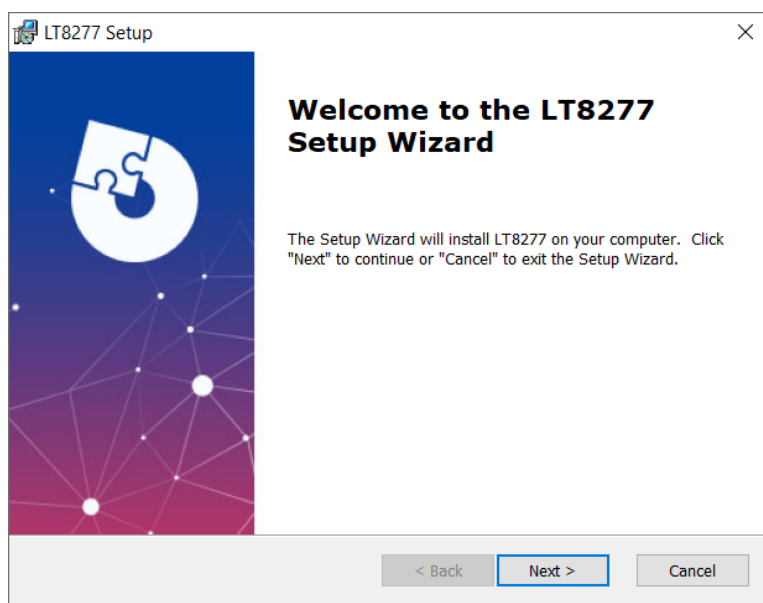

Figure 1. Setup Screen

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TECHNICAL SUPPORT

Setup Connection

1. Connect an input power supply and a load to an evaluation board EVAL-LT8277-AZ. Keep the power supply off.

2. Connect the Linduino to a computer via a USB cable and connect the Linduino to the EVAL-LT8277-AZ J5 via the ribbon cable CA2440. On Linduino, set JP3 to "5V", and do NOT use J2.

3. On EVAL-LT8277-AZ, short the ENABLE turret to the SGND turret to keep the circuit off. Set JP3 = EXT_CTRL to enable watchdog timer control of the GUI.

    NOTE: If JP3 is not at EXT_CTRL position, the watchdog timer is set by other positions of JP3. The GUI has no control over WDT.
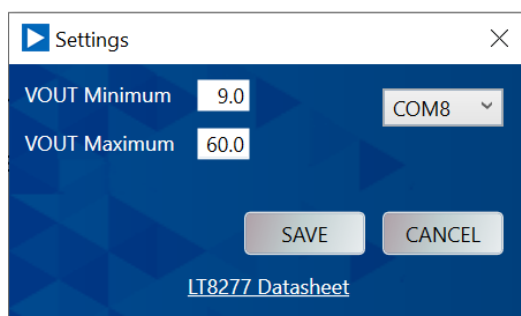
GUI Settings and Initialization

Figure 2. *Settings Window*

1. Launch the LT8277 GUI. Click the gear image at the top right corner of the panel to open the "Settings" window. Select the appropriate COM port of the Linduino USB connection in the drop-down menu. The "VOUT minimum" and "VOUT maximum" adjust the lower and upper boundaries of the "VOUT SELECT" on the front panel. Click the "SAVE" button when complete. Note: The "VOUT Maximum" section of the settings can be set to a value that is larger than 60V.

2. Click the "INITIALIZE" button to establish Linduino communication with the PC (see *Figure 3*). Note: Linduino gets programmed with LT8277 firmware at this step. After initialization, GUI and Linduino are reset to the default condition, which is 0x1000, WDT on with default 36V, SPI one-time send.

Power on the Setup

Turn on the 12V input power supply connected to the EVAL-LT8277-AZ. Release the short of ENABLE to GND. The demo board starts operating.

NOTE: It is recommended to power on the demo circuit and release ENABLE after setup connection and GND initialization. Make sure that the voltage applied to the V_{IN} does not exceed 40V.

Figure 3. Front Panel

Front Panel Functions

Adjust SPI Command

Use the "Adjust SPI command" section to determine the 2-byte SPI data sent from Linduino to LT8277. Move the slider, fill in the blanks or click on the switches to configure the following functions individually.

	BITS	1	0
V_{OUT} Select	[6:0]	Output Voltage = 0.5 x V_{OUT} select + 9	
Clockout Phase Angle	7	45°	90°
Clockout Select	8	CLKOUT enabled	CLKOUT disabled
Phase Dropping at Light Load	9	Does not drop Phase 2	Drop phase 2
Soft Start Speed	10	4 times faster speed	Original speed

Bit 11 is reserved. Bits 15 to 12 are CRC. Refer to the datasheet for a detailed description of each function.

To change several settings simultaneously, type in a specific SPI command in HEX by filling in the text fields at the bottom. CRC bits are automatically calculated and updated when bits [10:0] are changed. The user can also insert CRC values manually. If the user-defined CRC is wrong, a warning will be issued, see *Figure 4*. However, the GUI will send the erroneous CRC bits regardless.

NOTE: In V_{OUT} SELECT, the GUI allows the user to send a value of more than 60V in the SPI command. To do so, adjust the V_{OUT} maximum in the settings to more than 60V. However, when LT8277 receives the SPI command with Vout select more than 60V, LT8277 will automatically replace the register with 60V, so that the actual output voltage is no more than 60V.

Figure 4. HEX text field, Left: Wrong CRC; Right: Correct CRC

SPI Transmission

Use this section to set the Linduino SPI and data transmission modes: Repeat or One-time send. In the Repeat mode, SPI commands are sent repeatedly. The transmission period can be adjusted by the slide bar. In this mode, when SPI data is changed, the SPI command is updated and sent to LT8277 immediately. The colored bar is an LT8277 WDT timeout status reference. Keeping the transmission rate in the green region prevents WDT timeout.
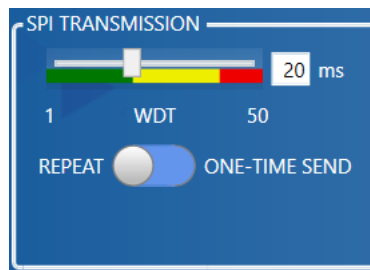

Figure 5. Repeat Mode

In the "One-Time Send" mode, one SPI command is sent only when the "SEND" button is clicked.
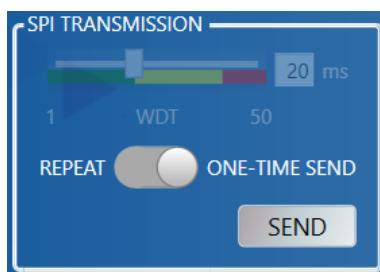

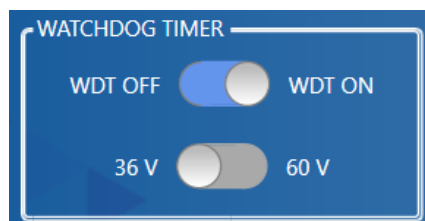*Figure 6. One-Time Send Mode*

Watchdog Timer
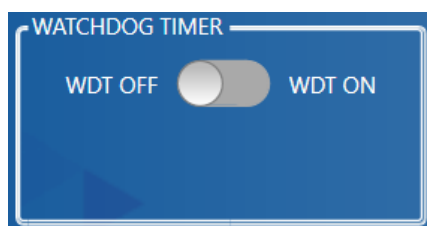

Figure 7. WDT On

Figure 8. WDT Off

With EVAL-LT8277-AZ board JP3 set to "EXT_CTRL", the LT8277 SPI watchdog timer can be controlled with this section. In the WDT on mode, WDT is reset when LT8277 receives a valid SPI command. The minimum WDT expiration time in 20ms, so sending SPI commands repeatedly with a period <20ms guarantee normal operation. When WDT expires, the output voltage goes to the default value. The user can set 36V or 60V as the default output voltage. Other functions like output clock phase angle, output clock on/off, phase dropping, and soft start speed are not reset by WDT.

The following table shows the LT8277 WDT operation states with different SPI transmission modes and WDT settings.

SPI Transmisison	LT8277 WDT	LT8277 State
Repeat <20ms	On	OK
Repeat <20ms	Off	OK
One-Time	On	WDT Expire
One-Time	Off	OK

Examples

One-Time Sending Example

1. After GUI initialization and setup powered on, with EVAL-LT8277-AZ board JP3 set to "EXT_CTRL", set GUI "Watchdog Timer" and "SPI Transmission" sections like figure 9, which turns off WDT and sets SPI transmission as one-time send mode.

2. Use the "Adjust SPI Command" section to set the desired SPI command. In *Figure 9*, the V_{OUT} select is adjusted to 50V.

3. Click the "Send" button.

A SPI command is sent to LT8277, and LT8277 output voltage and other functions are set to the desired value.

Figure 9. One-Time Sending Example

Repeat Sending Example

1. After GUI initialization and setup powered on, with EVAL-LT8277-AZ board JP3 set to "EXT_CTRL", set GUI "Watchdog Timer" and "SPI Transmission" sections like figure 10, which turns on the WDT, and sends SPI command repeatedly with 20ms period. Select default WDT expires V_{OUT} voltage 36V or 60V.

2. Use the "Adjust SPI Command" section to set the desired SPI command. In *Figure 10*, the V_{OUT} select is adjusted to 40V.

Linduino sends SPI commands repeatedly every 20ms, and LT8277 output voltage and other functions are set to the desired value.
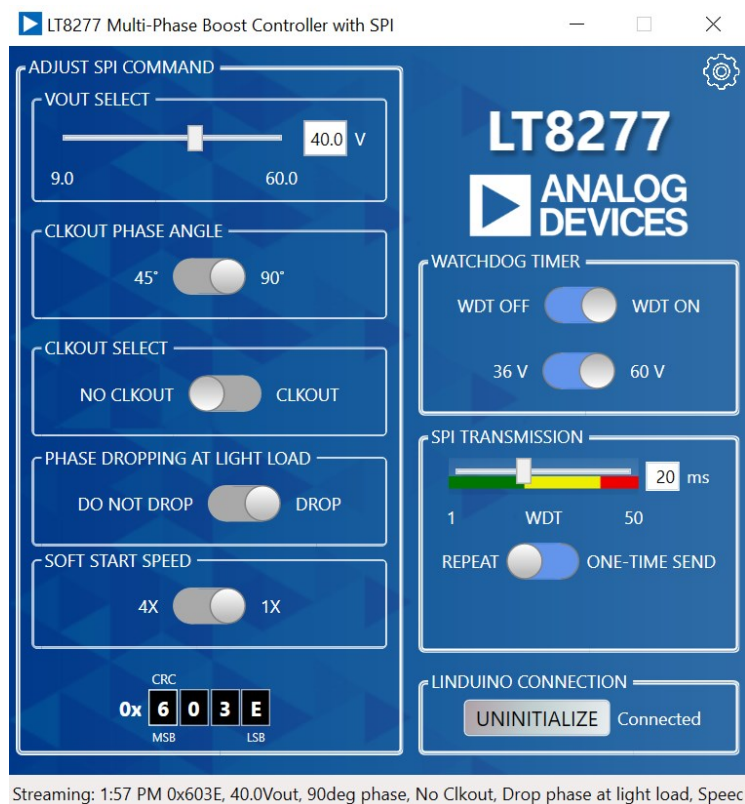
Figure 10. Repeat Sending Example

Watchdog Timer Expire Example

1. Follow the steps in "*Repeat Sending Example*" and send SPI commands repeatedly.

2. Switch the "SPI Transmission" mode from "Repeat" to "One-Time Send".

The moment that the SPI Transmission is changed, Linduino stops sending data. Because WDT is on, it expires, and the output voltage will be set to the default value of 36V or 60V.

Linduino Removal Example

If users want to set Vout other than 36V or 60V, and remove the Linduino connection after the V_{OUT} setting, follow the steps below:

1. After GUI initialization and setup powered on, with EVAL-LT8277-AZ board JP3 set to "SPI_ADJ", the LT8277 watchdog timer is turned off on the board regardless of GUI watchdog timer settings.

2. Set GUI "SPI Transmission" sections as one-time send mode, see *Figure 6*.

3. Use the "Adjust SPI Command" section to set the desired SPI command. Click the "Send" button.

4. Remove the ribbon cable connection between Linduino and EVAL-LT8277-AZ.

LT8277 output voltage and other functions are set to the desired value without connection to Linduino.

Multiphase Example

LT8277 allows multiple parts to work in parallel and build 4-phase or 8-phase applications. This GUI could also be used in multi-phase applications. *Figure 11* shows an example of an 8-phase, with four LT8277 connected on the common SPI bus. Use GUI to send SPI commands onto the SPI bus, so that all the parts can be configured at the same time.
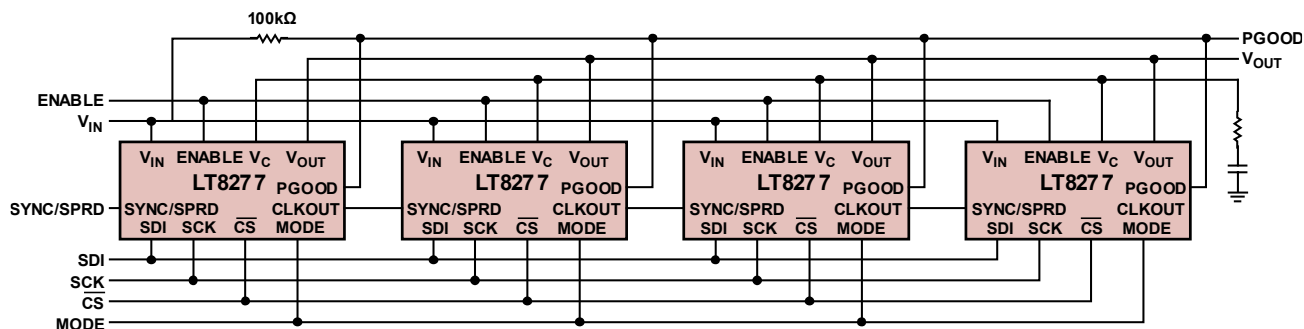

Figure 11. Multiphase Circuit Diagram

In the 4-phase application, enable the CLKOUT and set the CLKOUT phase angle to 90°. Send SPI command one time or repeatedly before a load of the evaluation board is enabled.

Figure 12. 4-Phase Application Clock Setting

In the 8-phase application, enable the CLKOUT and set the CLKOUT phase angle to 45°. Send SPI command one time or repeatedly before a load of the evaluation board is enabled.
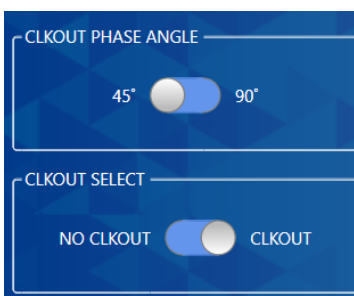

Figure 13. 8-Phase Application Clock Setting

Ensure the CLKOUT and CLK PHASE ANGLE are properly set before turning on the loads of the multiphase circuit.