Using the LM36922EVM Evaluation Module

User's Guide

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LM36922EVM User's Guide

1 Introduction

The Texas Instruments LM36922EVM evaluation module (EVM) helps designers evaluate the operation and performance of the LM36922 Highly Efficient Dual-String White LED driver. The device offers configurability via I²C-compatible interface. The module can be easily configured to support 1, or 2 parallel LED strings with 2, 3, 4, 5, 6, 7 or 8 series LEDs.

The EVM contains one LED Backlight Driver (See Table 1).

Table 1. Device and Package Configurations

LED DRIVER	IC	PACKAGE
U1	LM36922	0.4 mm-pitch, 12-Bump DSBGA

2 Setup

This section describes the jumpers and connectors on the EVM as well as how to properly connect, set up, and use the LM36922EVM.

2.1 Input/Output Connector Description

VL / GND - These are the power input terminals for the driver. The terminal block provides a power (VIN) and ground (GND) connection to allow the user to attach the EVM to a cable harness.

VUSB VIO VL - This pin provides power for the I²C and HWEN pullup resistors (RSCL, RSDA, RHWEN). It is recommended that this pin is connected to the VIN pin. If desired, it can be connected to the USB2ANY 3.3-V line provided by the USB interface connector. When VIO is connected to VIN communication via the I²C interface may not be possible if the supply voltage to the LED driver is below approximately 3 V.

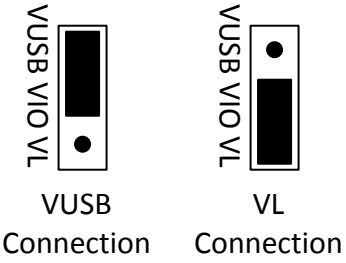

Figure 1. VIO Jumper Settings

SDA SCL - These connections allow the user to externally control the I²C lines. For independent control of the I²C lines, **do not** connect the VIO jumper to either the 3.3 V or the VIN pin.

HWEN - This is the jumper used to enable the LED driver (HWEN pin). The driver will be enabled when the HWEN pin is high (VIO) and disabled when it is low (GND).

VL VIN - The user can measure the Backlight Driver Input Current by omitting this jumper and inserting a current meter between pins 1 (VIN) and 2 (VL).

BL_ADJ - This pin provides a method for connecting either the USB2ANY or an external signal to the BL_ADJ input. The BL_ADJ pin is connected to ground via a 4.7-kΩ resistor (RBL_ADJ). The LM36922EVM GUI provides a method for controlling BL_ADJ when a jumper is inserted between connector pins 1 and 2. When connecting an external signal remove the jumper between pins 1 and 2 and connect the signal generator to pin 1 and GND.

PWM - This pin provides a method for connecting either the USB2ANY or an external signal generator to the PWM input. The PWM pin is connected to ground via a 4.7-kΩ resistor (RPWM). The LM36922EVM GUI provides a method for generating a PWM signal when a jumper is placed between connector pins 1 and 2. When connecting an external signal generator remove the jumper between pins 1 and 2 and connect the signal generator to pin 1 and GND.

OUT - This connector provides a way to disconnect the output voltage to each LED string and access to the regulated output of the driver. The user can measure VOUT with reference to GND while connecting and disconnecting the LED strings.

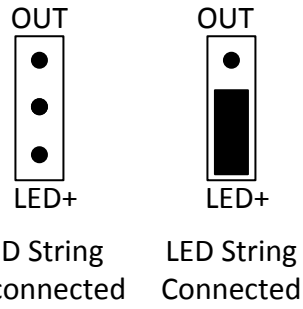

Figure 2. OUT Jumper Settings

HL1, HL2 - This connector provides a star connection to the LED string allowing the user to configure the LED string for 2, 3, 4, 5, 6, 7 or 8 series LEDs.

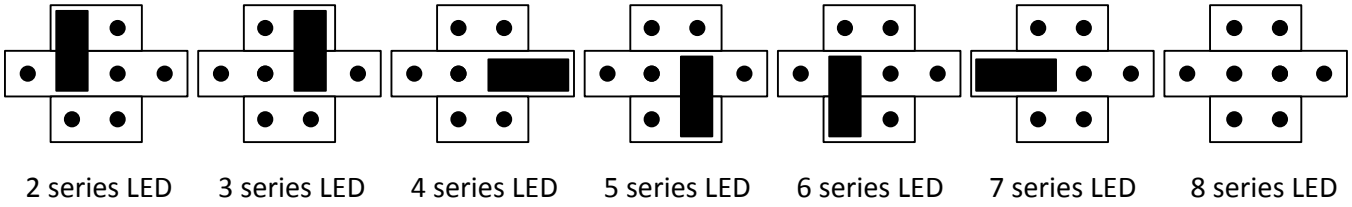

Figure 3. HL1, HL2 star jumper configuration settings

ILED1, ILED2 -The LM36922EVM provides a way to accurately measure the LED current through each LED string on board. Resistors RL1 and RL2 (10 Ω) are placed between the cathode of last LED in each respective string and the LM36922 Current Sink Output.

2.2 Setup

The input voltage range for the backlight driver is 2.5 volts to 5.5 volts. The on-board LEDs or an LED module should be connected for proper operation.

2.3 Operation

For proper operation of the LM36922EVM, the jumpers should be properly configured. The recommended setting, using shorting blocks is:

VIO to VIN: install jumper between pins 2 and 3

VL to VIN: jumper installed

OUT to LED+: install jumper between pins 2 and 3.

PWM from USB2ANY: jumper installed

HL1, HL2: install jumper in position 3 for each string

In this configuration, the device will power up when power is applied.

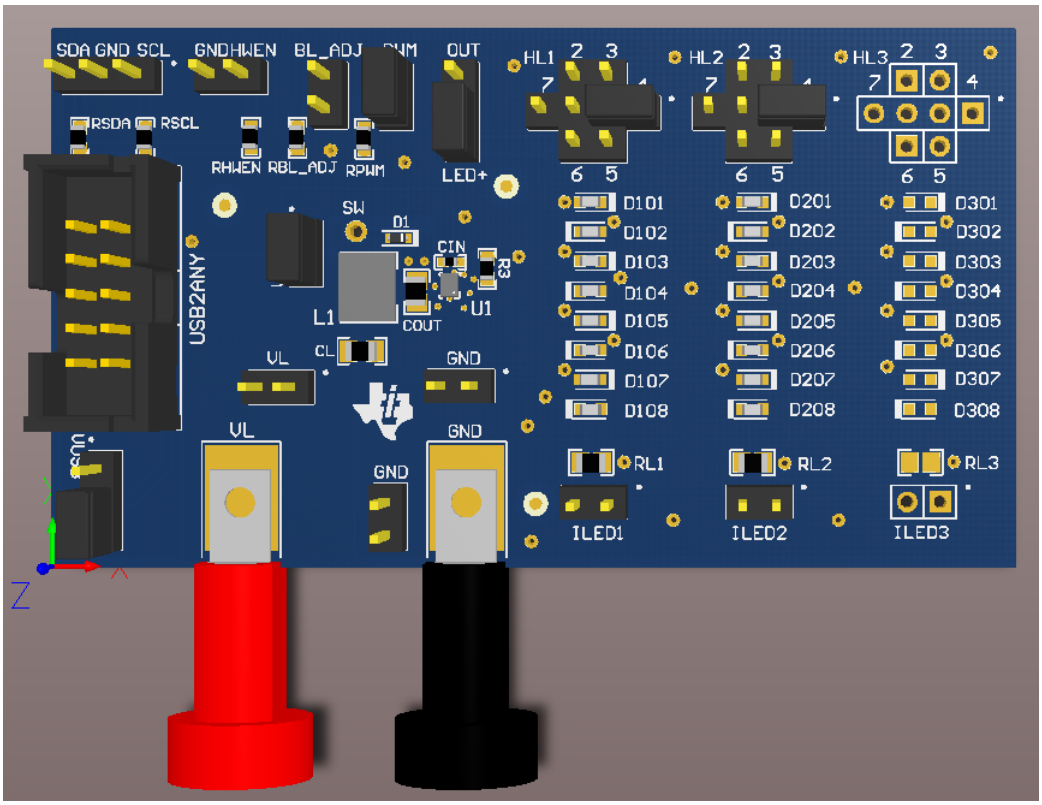

Figure 4. Jumper Configuration

3 Board Layout

Figure 5, Figure 6, Figure 7 and Figure 8 show the board layout for the LM36922EVM. The EVM offers resistors, capacitors, and jumpers to enable the device and to configure it as desired.

The LM36922 will dissipate power, especially during high brightness maintained for a long duration. Power will also be dissipated on the series LEDs in each LED strings. The EVM layout is designed to minimize temperature rise during operation, however prolonged usage at high brightness should be avoided.

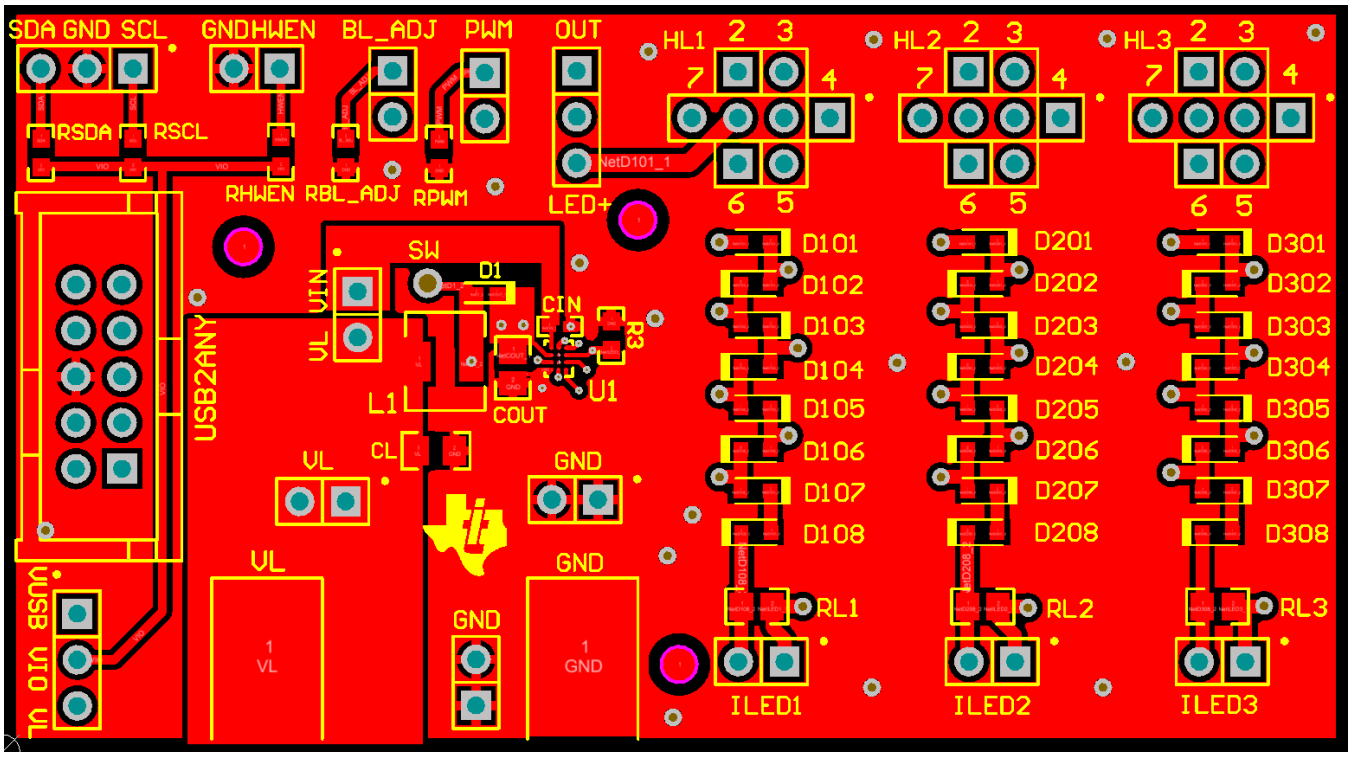

Figure 5. Top Assembly Layer

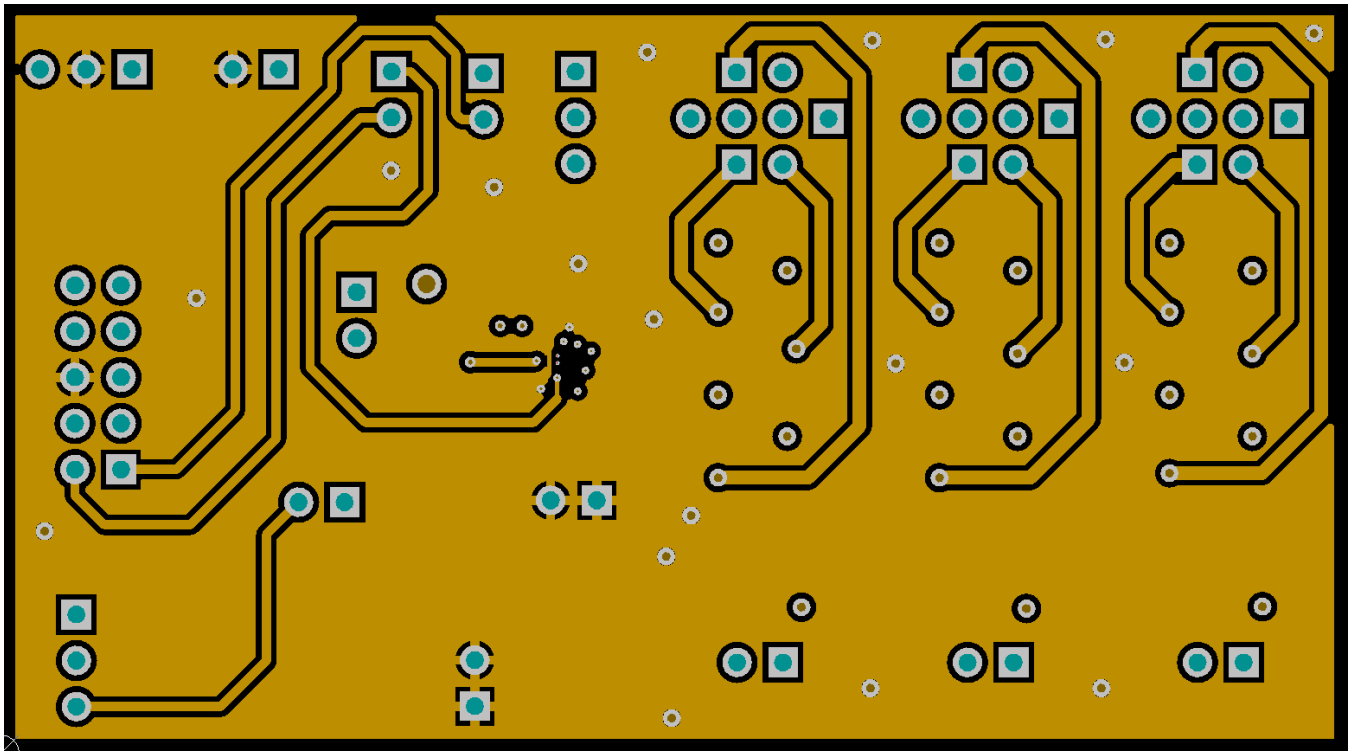

Figure 6. Middle Layer 1 Routing

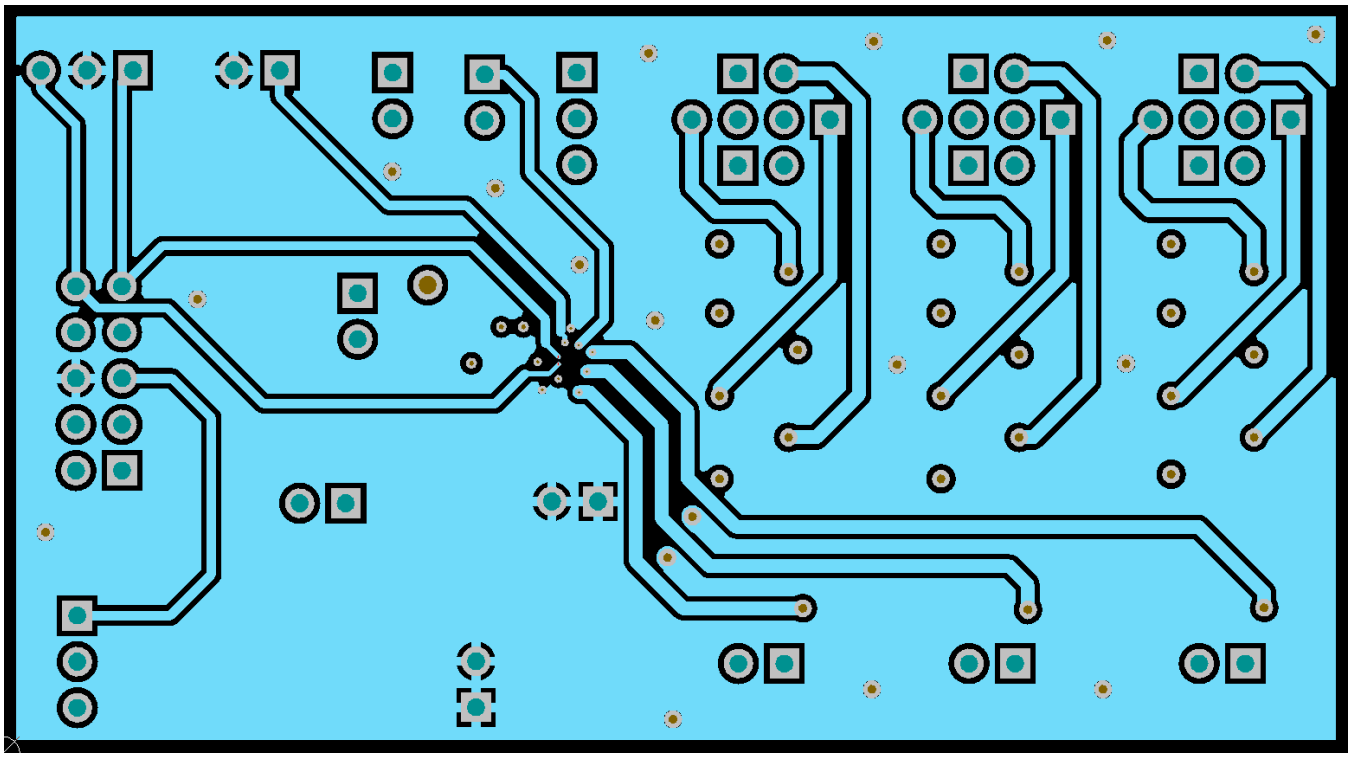

Figure 7. Middle Layer 2 Routing

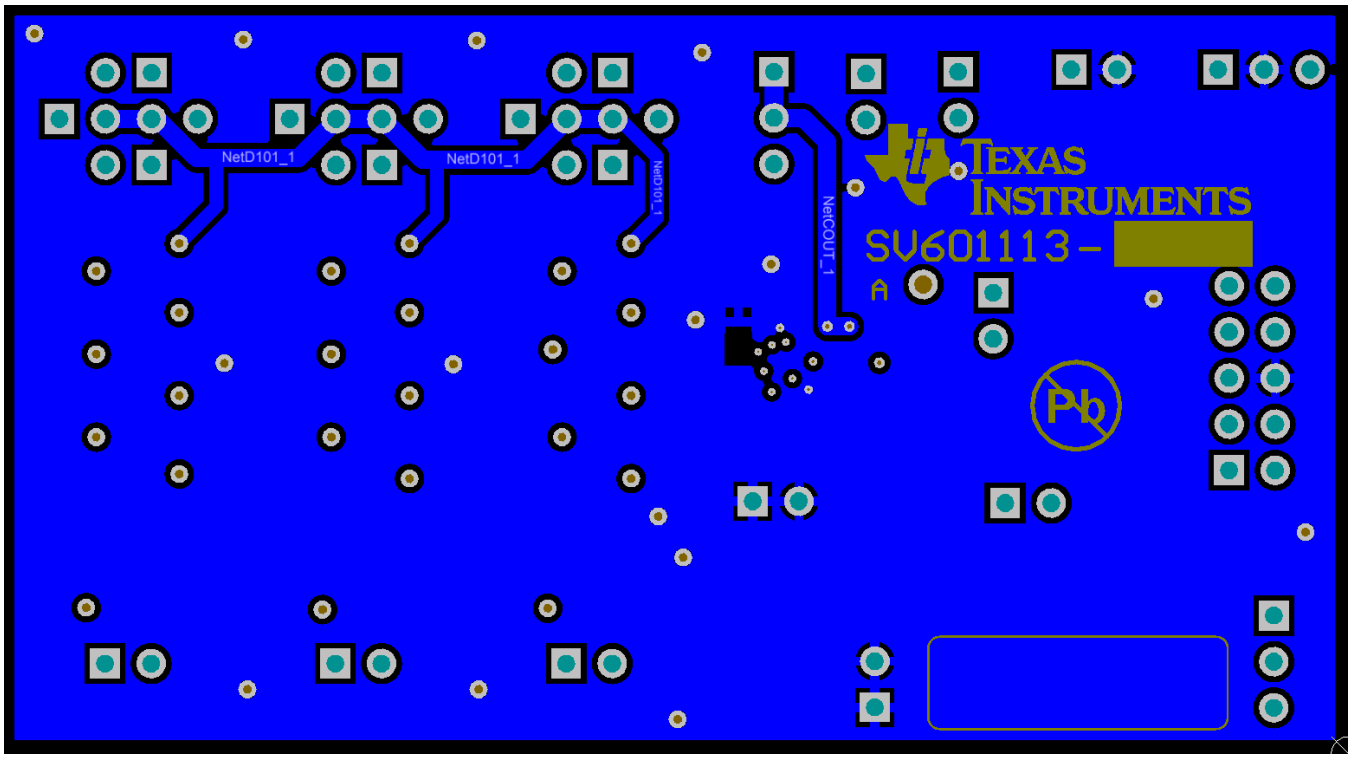

Figure 8. Bottom Assembly Layer (MIRRORED)

4 Schematic

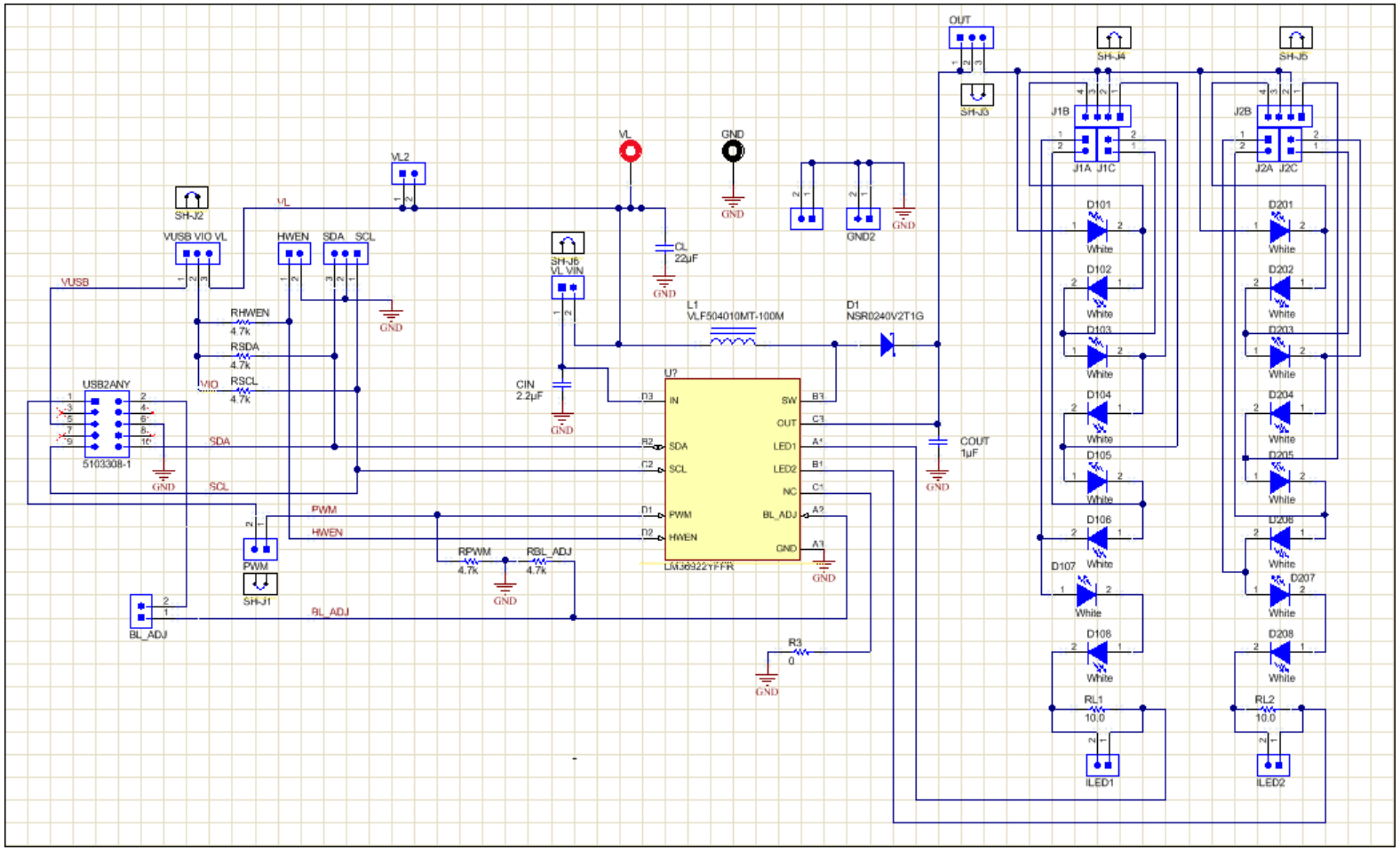

Figure 9. LM36922EVM Schematic

Table 2. Bill of Materials

DESIGNATOR	DESCRIPTION	MANUFACTURER	PART NUMBER	QTY
!PCB	Printed Circuit Board	Any	SV601113	1
BL_ADJ, GND2, GND3, HWEN, ILED1, ILED2, J1A, J1C, J2A, J2C, PWM, VL2, VL VIN	Header, TH, 100mil, 2x1, Gold plated, 230 mil above insulator	Samtec	TSW-102-07-G-S	13
CIN	CAP, CERM, 2.2uF, 25V, +/-10%, X5R, 0402	TDK	C1005X5R1E225K050BC	1
CL	CAP, CERM, 22uF, 16V, +/-10%, X5R, 0805	TDK	C2012X5R1C226K125AC	1
COUT	CAP, CERM, 1uF, 50V, +/-10%, X7R, 0805	TDK	C2012X7R1H105K125AB	1
D1	Diode, Schottky, 40V, 0.25A, SOD-523	ON Semiconductor	NSR0240V2T1G	1
D101, D102, D103, D104, D105, D106, D107, D108, D201, D202, D203, D204, D205, D206, D207, D208	LED, White, SMD	Rohm	SML312WBCW1	16
GND	Standard Banana Jack, Insulated, Black	Keystone	6092	1
J1B, J2B	Header, TH, 100mil, 4x1, Gold plated, 230 mil above insulator	Samtec	TSW-104-07-G-S	2
L1	Inductor, Shielded, Ferrite, 10uH, 1A, 0.21 ohm, SMD	TDK	VLF504010MT-100M	1
OUT, SDA SCL, VUSB VIO VL	Header, TH, 100mil, 3x1, Gold plated, 230 mil above insulator	Samtec	TSW-103-07-G-S	3
RBL_ADJ, RHWEN, RPWM, RSCL, RSDA	RES, 4.7k ohm, 5%, 0.1W, 0603	Vishay-Dale	CRCW06034K70JNEA	5
RL1, RL2	RES, 10.0 ohm, 1%, 0.125W, 0805	Vishay-Dale	CRCW080510R0FKEA	2
R3	RES, 0, 5%, 0.1 W, 0603	Vishay-Dale	CRCW06030000Z0EA	1
SH-J1, SH-J2, SH-J3, SH-J4, SH-J5, SH-J6	Shunt, 100mil, Flash Gold, Black	Sullins Connector Solutions	SPC02SYAN	6
U1	Highly Efficient Triple-String White LED Driver, YFF0012AHAH	Texas Instruments	LM36922YFFR	1
USB2ANY	Header (shrouded), 100mil, 5x2, Gold, TH	TE Connectivity	5103308-1	1
VL	Standard Banana Jack, Insulated, Red	Keystone	6091	1

5 USB Interface Board and I²C-Compatible Interface Program

Texas Instruments has created an I²C-compatible program and USB docking board (USB2ANY) that can help exercise the part in a simple way. Contained in this document is a description of how to use the USB2ANY interface box and interface software.

The LM36922EVM has the means to “plug into” the USB docking board. The USB docking board provides all the control signals for the simple interface. Power to the part must be provided externally. A USB cable (provided) must be connected to the board from a PC.

The I²C-compatible interface program provides all of the control that the LM36922 part requires. For proper operation, the USB docking board should be plugged into the PC before the interface program is opened. Once connected, and the program is executed, a basic interface window will open. The image below shows the default settings.

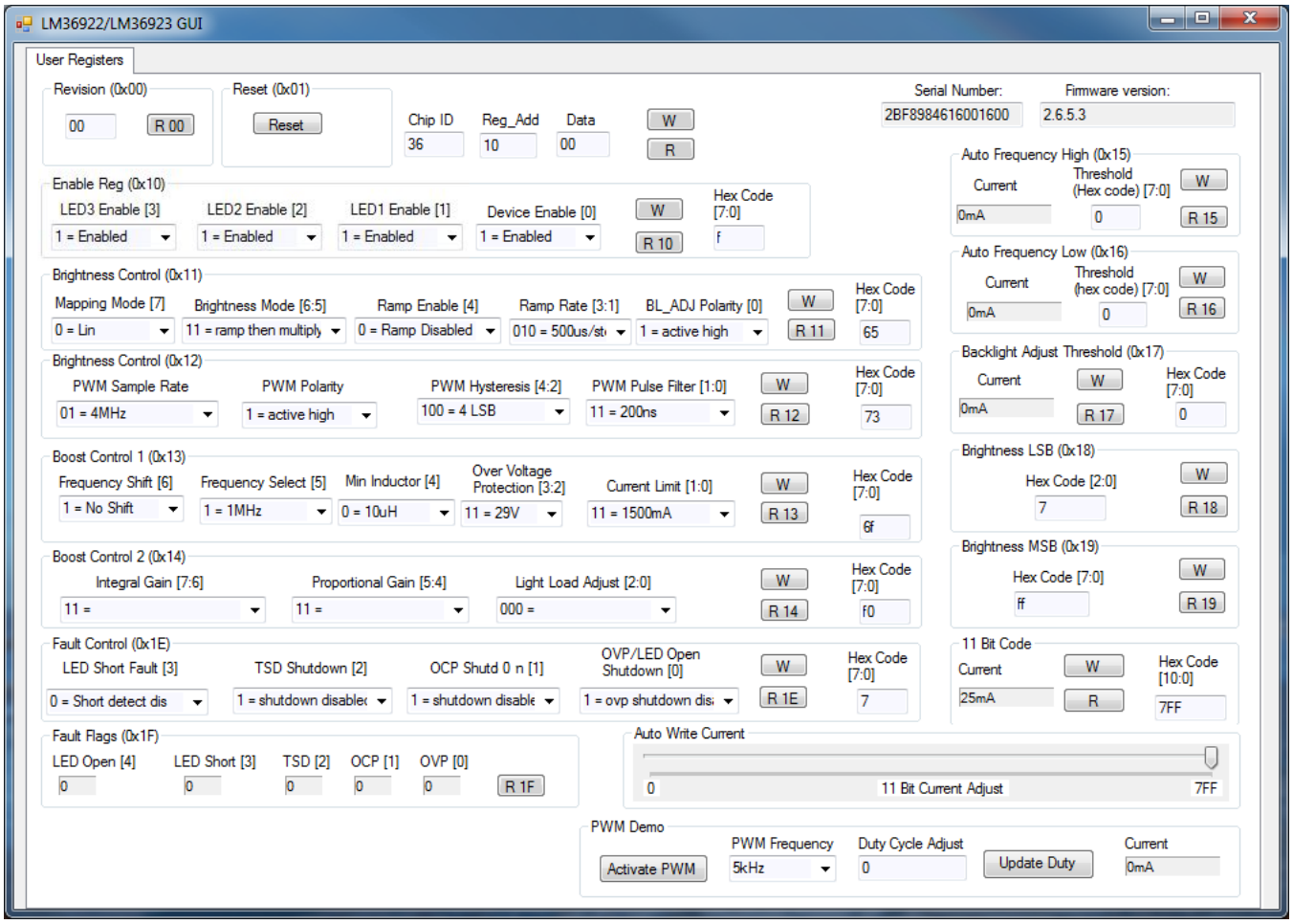

Figure 10. LM36922 General User Interface

The “I²C Interface” fields may be used to write or read any LM36922 register. Selecting the "Reset" button resets all registers to their default values and updates all GUI fields.

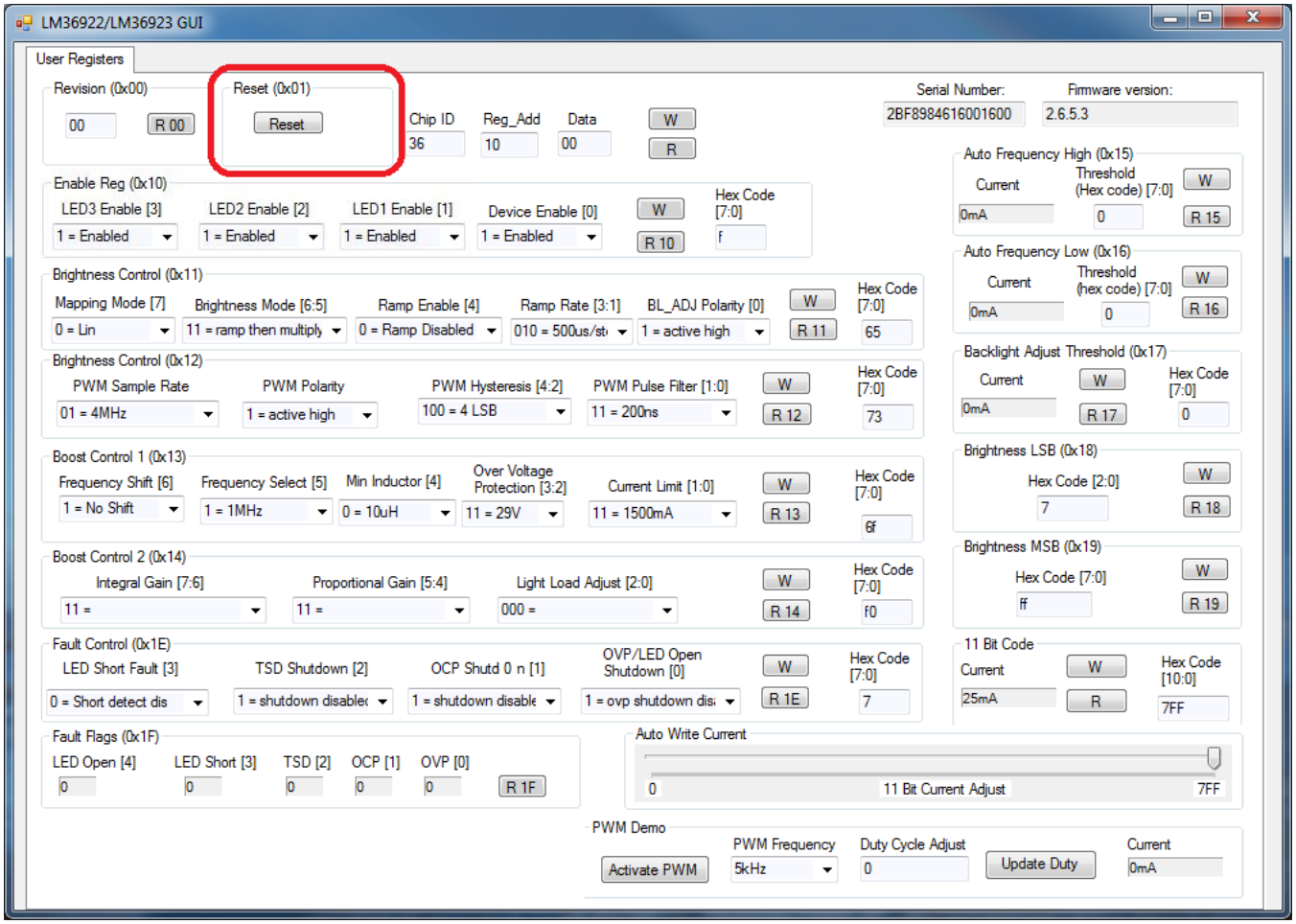

Figure 11. I²C interface Fields

5.1 User Interface

the LM36922 GUI provides the user with access to all of the registers found on the device. Through a combination of buttons, drop-down boxes and sliders, the user can configure the LM36922 to perform in the desired mode. Please note that no data is written to the device until the Write button found within the corresponding register is pressed, the one exception to this is the Auto Write Content slider.

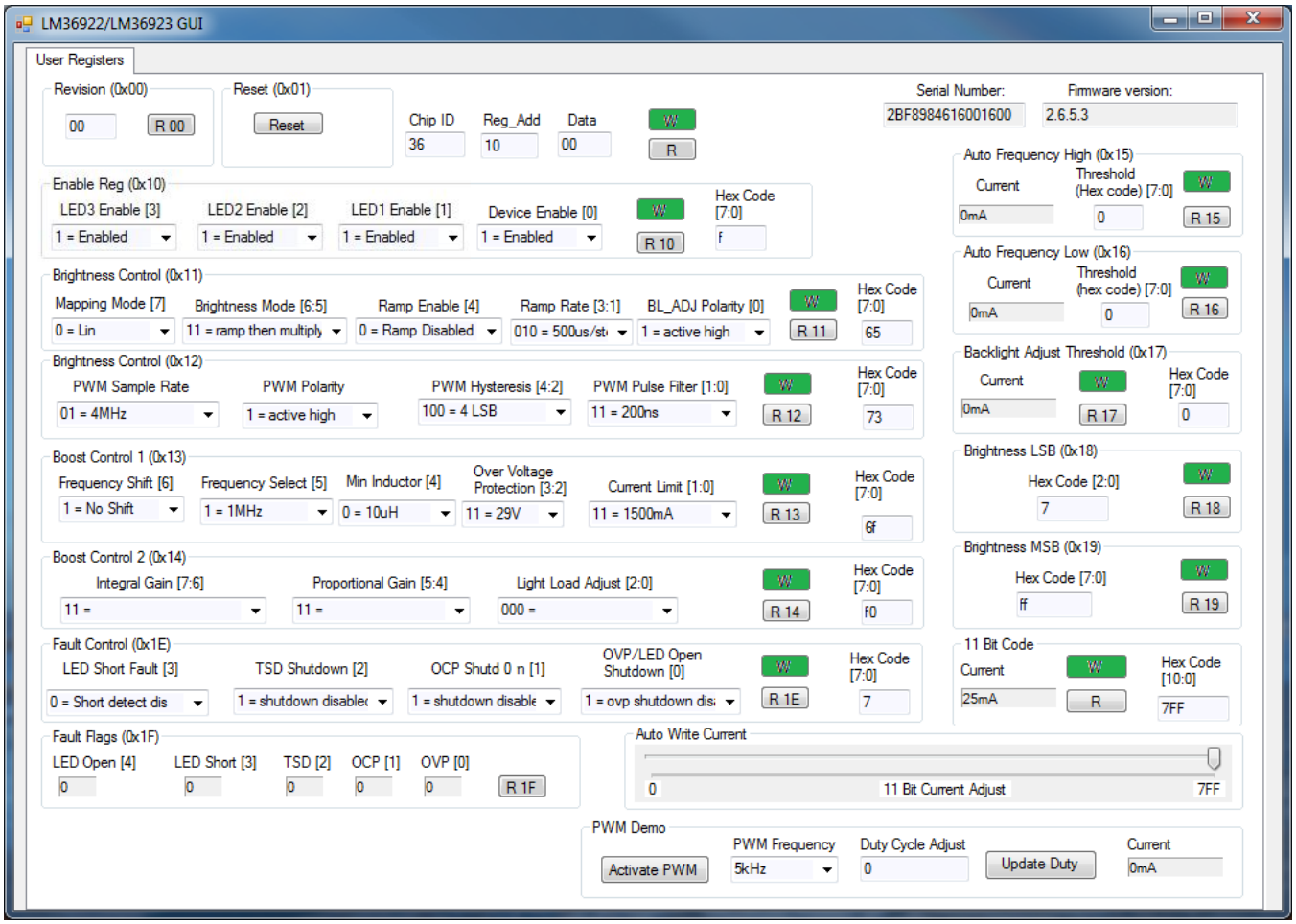

Figure 12. Write Buttons

5.2 Flags

The contents of the LM36922 fault registers are read upon clicking the “R 1F” button. The registers are cleared upon read back.

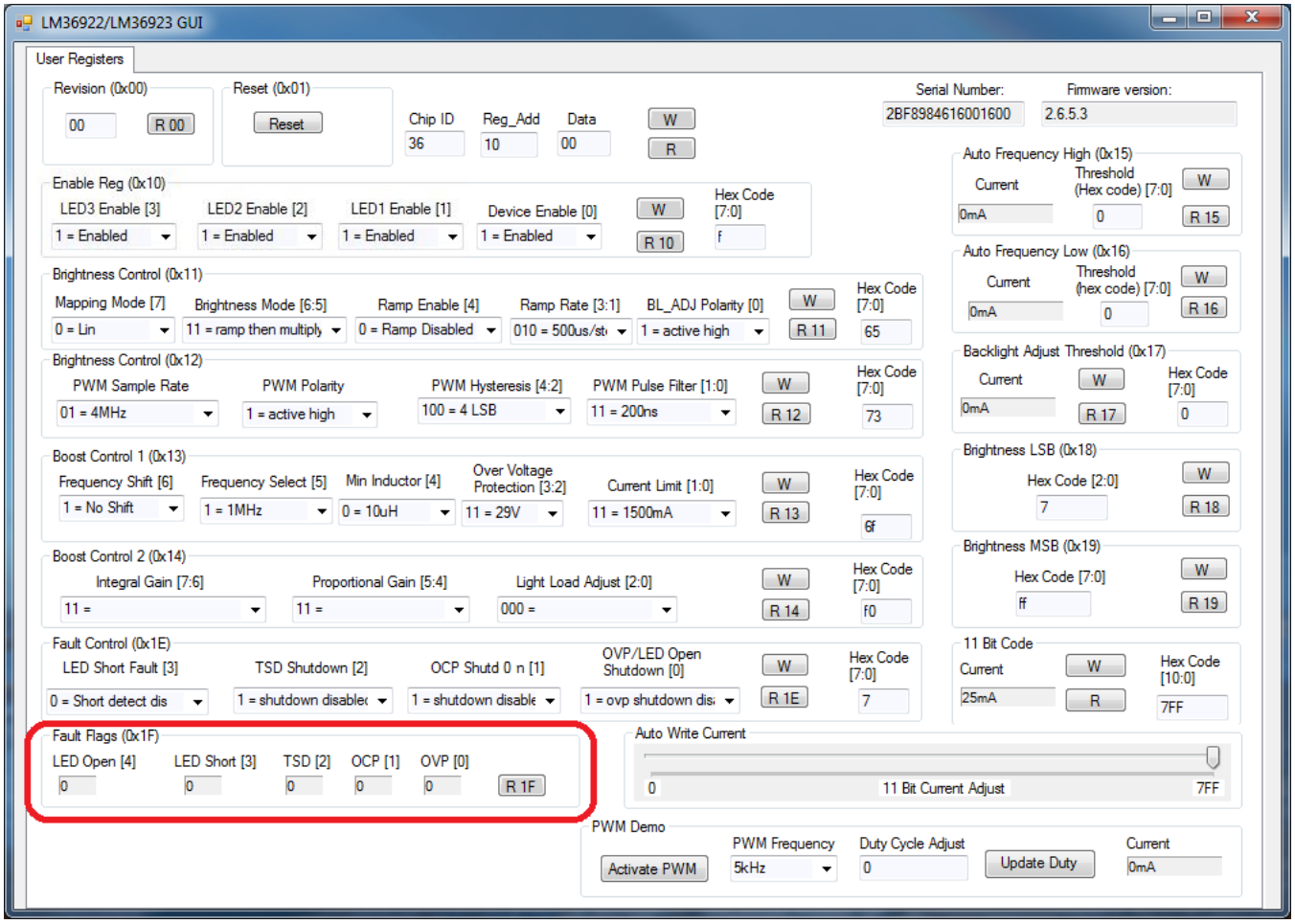

Figure 13. Fault Flags

5.3 I/O Pin Controls

The LM36922EVM provides the user with the capability to control the PWM input without the need of an external source. The PWM signal will be low until the "Activate PWM" button is clicked or whenever the "Duty Cycle Adjust" value is set to 0. In order to change the PWM duty cycle the user needs to type the desired duty cycle in the "Duty Cycle Adjust" box then click the "Update Duty" button.

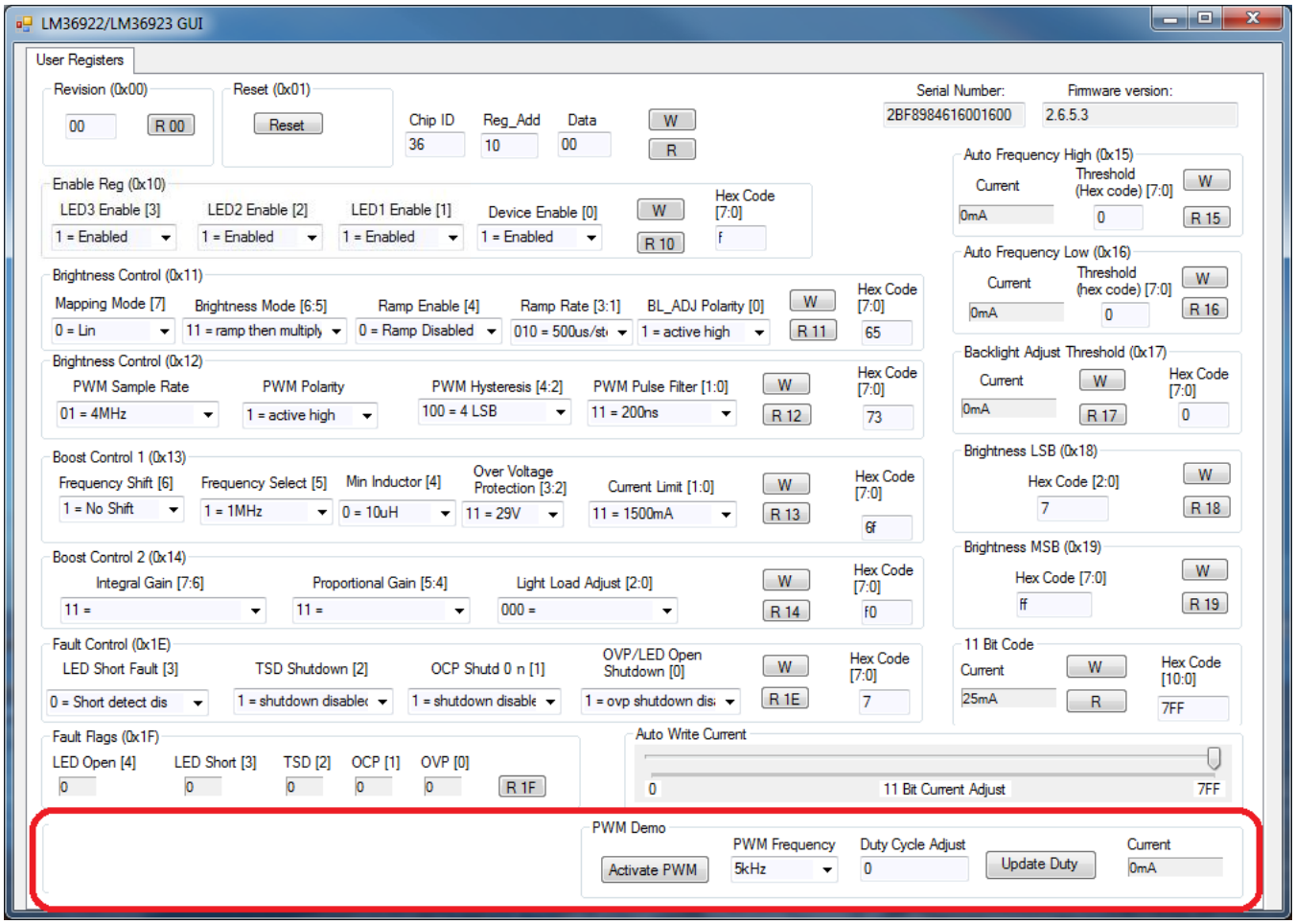

Figure 14. PWM Input Pin Control

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