SiT9531x Evaluation Board (EVB) HW User Manual

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1 Introduction

The SiT53XX Evaluation Board is designed for evaluating the SiT9531x family of Quad PLL Frequency Translator, Jitter Cleaner.

- SiT95315
- SiT95316

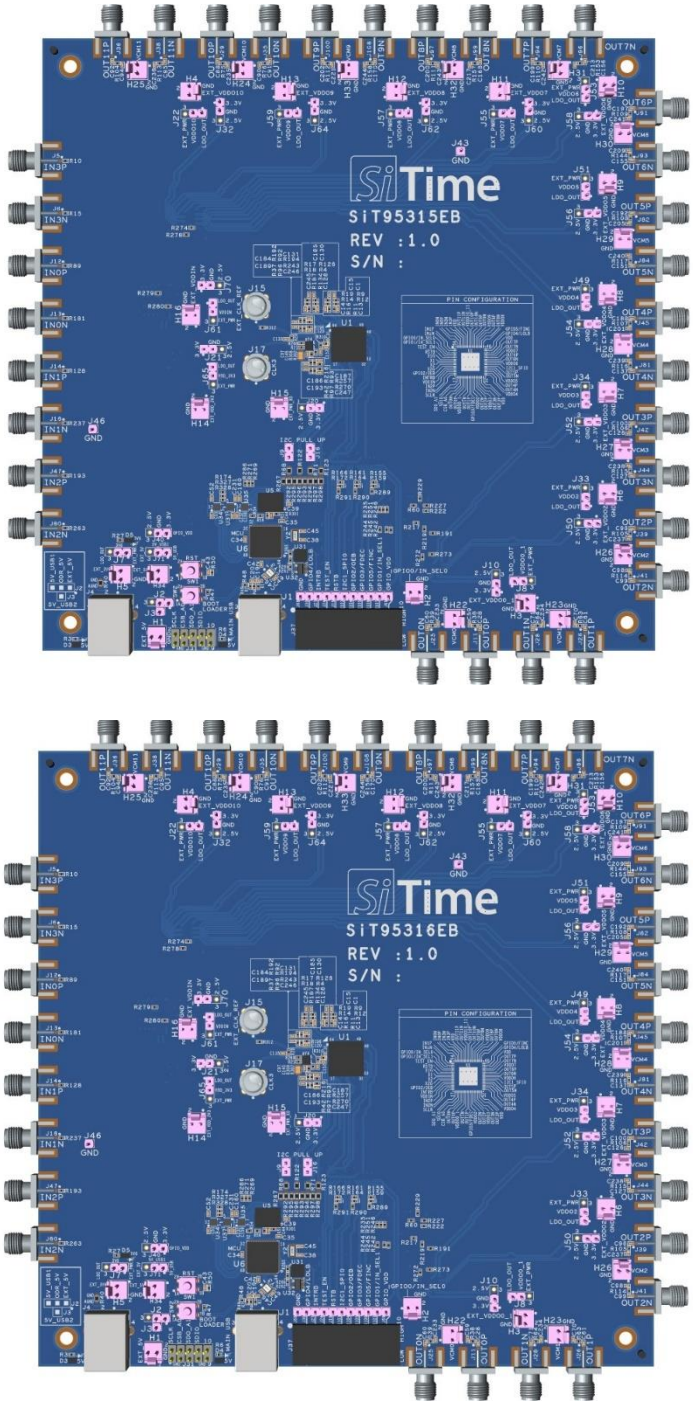


Figure 1. SiT9531x Evaluation Board

2 Features

1) Supports SiT95315 and SiT95316 parts
2) Powered from USB Port or External Power supply
3) 12 Differential Output Clocks supporting wide frequency range
    a. Differential Output from 0.5 Hz to 2.94912 GHz
    b. Single Ended Output from 0.5 Hz to 250 MHz
    c. Differential Input from 0.5 Hz to 2.1 GHz
    d. Single Ended Input from 0.5 Hz to 250 MHz
4) Support LVPECL, CML, HCSL, LVDS and LVCOMS Output Standards
5) Status LEDs for power supplies
6) I^2C or SPI communication via MS430 MCU
7) On board LDO's with configurable jumpers for all Power supplies

3 Top Level Block Diagram

Below is the Top Level Block Diagram for SiT9531x EVK. The Evaluation board can be connected to a PC via the MAIN USB Connector for programming, control and monitoring. The on board MSP430 MCU is used for I^{2}C/SPI communication from SiT9531x using SiTime Clock GUI.

Refer to the SiT9531x Clock GUI manual and User Guide for more information.

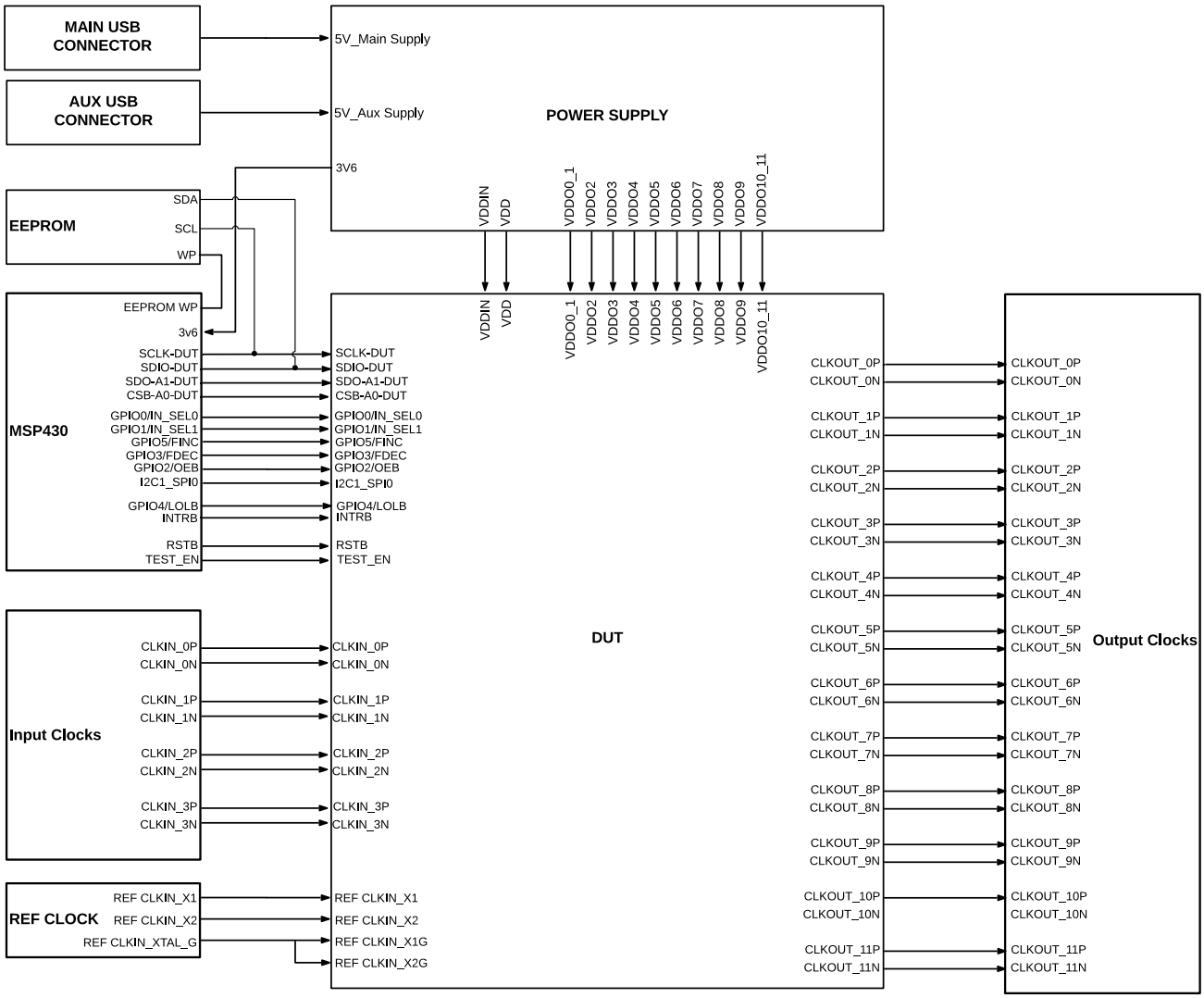


Figure 2. Top Level Block Diagram

3.1. EVB Starter Guide

Power up the SiT9531x EVB using 5 V Supply from a USB cable connected to the PC where the SiTime Clock GUI is installed. All the supplies on board are powered from the on board USB connector. There are 2 USB connectors on the SiT9531x EVK. J1 is the main USB connector that is used for chip communication alongwith supplying power to all the other subsystems of the chip.

J4 is an additional USB connector that can be used for supplying power to the Output Driver Supplies (ODR_SUPPLY_x) if the power supplied from J1 is limited (J1 is limited to ~500 mA as it comes from the USB 2.0 from PC).Default EVK configuration

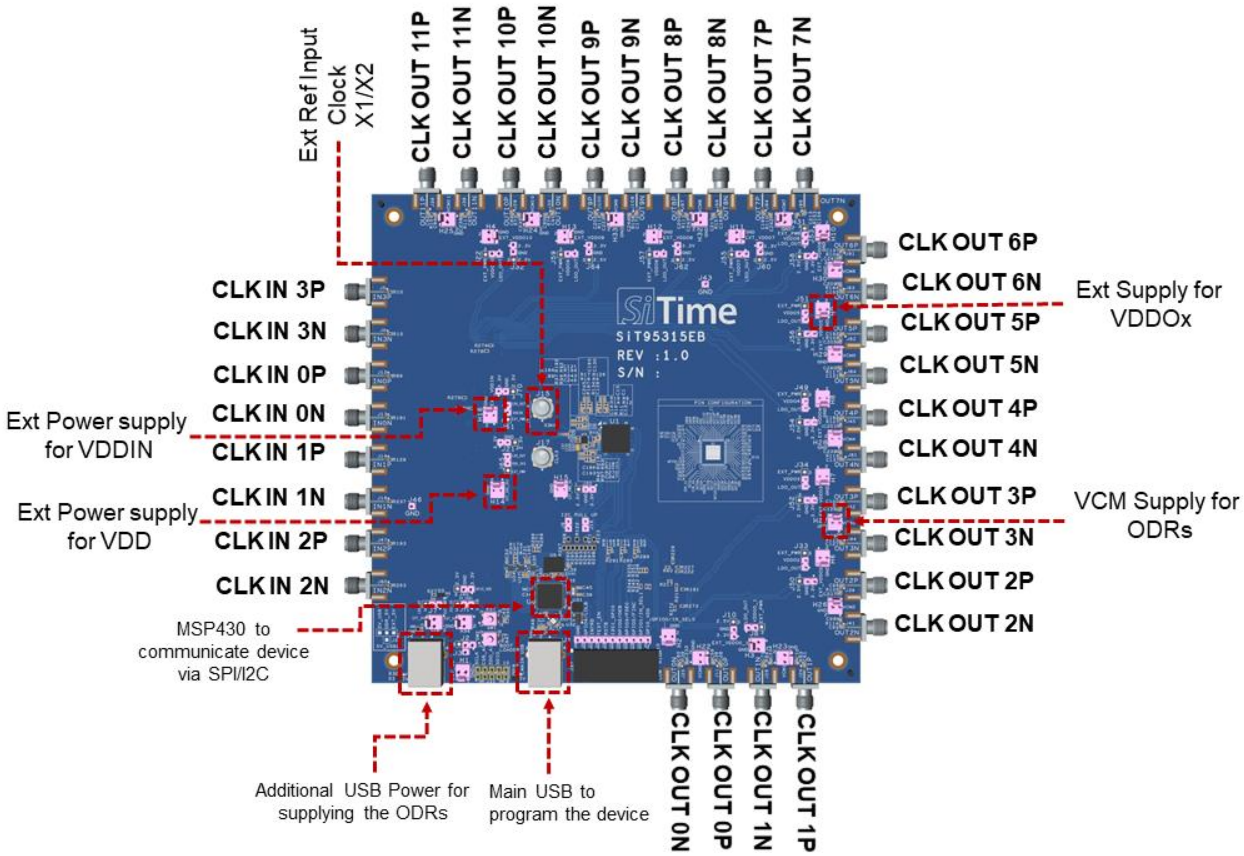
enables the chip subsystems to be powered from J1 connector. In order to power the Output Drivers separately from J4 connector, change the J2 default Jumper configuration from 2 to 3 on J2 and connect to J3 and pin 2 of J2.

There is an additional provision to power up the Output Drivers from External Supply as well. To connect an external power supply, change the default EVK configuration on J2 from 2 to 3 to 1 to 2.

The external Power supply can be connected to H1 2 pin Header (Refer to Section 7).

The default Jumper configuration is already done on the EVK board (Refer to Table 1).

1) Launch the SiTime Clock GUI Software. (Refer to SiTime Clock GUI User Guide for more information)
2) Default Output Driver Configuration is LVDS and Output Driver Supplies are configured to 3.3 V
3) Default Supply for VDD =1.8 V and VDDIN = 3.3 V
4) SiT9531x chip on the EVK can be configured to communicate through I²C/SPI after configuring the same from SiTime SiT9531x Clock GUI.



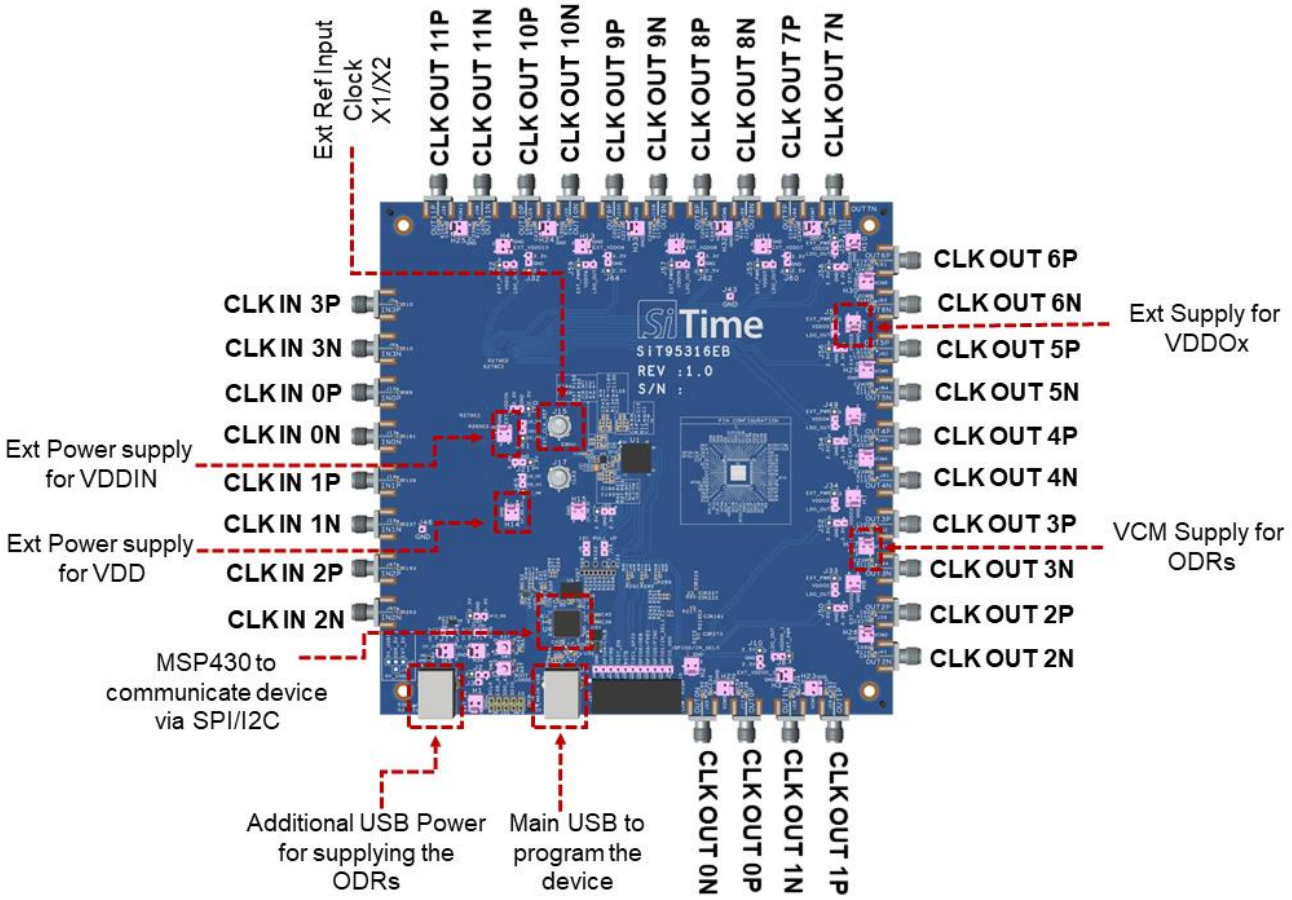


Figure 3. EVB Starter Connection Diagram

4 Jumper Default List

Table 1. SiT9531x Jumper Default List

Jumper location	Type	I=Installed	Jumper location	Type	I=Installed
J2	4-Pin	2 to 3	**J49**	3 -Pin	1 to 2
J7	3-Pin	2 to 3	**J54**	3 -Pin	1 to 2
J71	3-Pin	1 to 2	**J51**	3 -Pin	1 to 2
J65	3-Pin	1 to 2	**J56**	3 -Pin	1 to 2
J61	3-Pin	1 to 2	**J53**	3 -Pin	1 to 2
J70	3-Pin	1 to 2	**J58**	3 -Pin	1 to 2
J9	2-Pin	I	**J55**	3 -Pin	1 to 2
J16	2-Pin	I	**J60**	3 -Pin	1 to 2
J8	3-Pin	1 to 2	**J57**	3 -Pin	1 to 2
J10	3-Pin	1 to 2	**J62**	3 -Pin	1 to 2
J33	3-Pin	1 to 2	**J59**	3 -Pin	1 to 2
J50	3-Pin	1 to 2	**J64**	3 -Pin	1 to 2
J34	3-Pin	1 to 2	**J22**	3 -Pin	1 to 2
J52	3-Pin	1 to 2	**J32**	3 -Pin	1 to 2
J20	3-Pin	O	**J40**	3-Pin	O
J21	3-Pin	O			

5 Status LEDs

Table 2. Status LED Indication

Location	Color	Status Indication
D3	Green	5V Additional USB Power
D4	Green	5V Main USB Power
D5	Green	MSP430 LDO Power

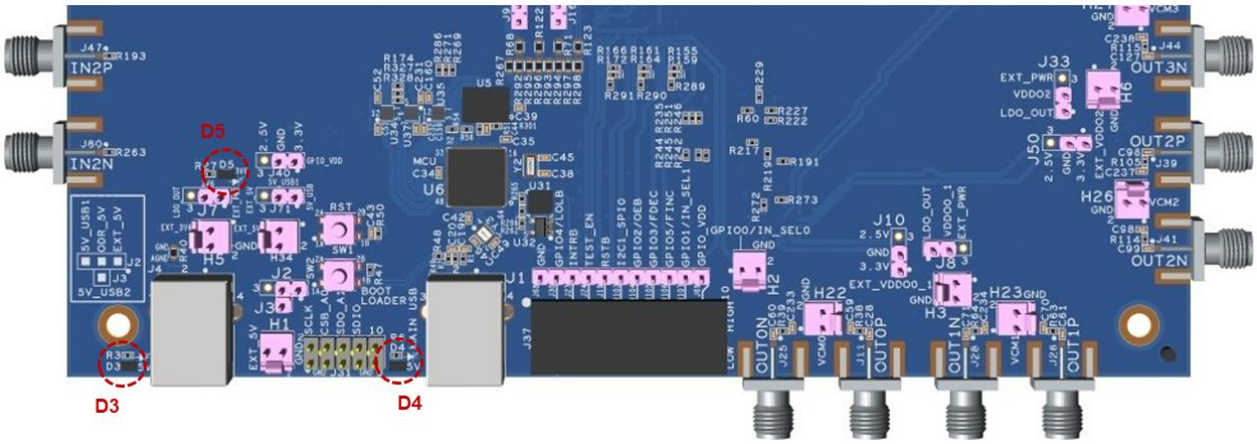


Figure 4. Status LEDs

6 I²C/SPI On Board/External Configuration

The SiT9531x chip can be configured to communicate with I²C and SPI 4 Wire with SiTime SiT9531x Clock GUI. The default EVK configuration will enable the I²C communication with the chip.

To change the communication to SPI 4 Wire, it is preferable to remove the jumpers J9 and J16.

External Hardware can also be used to communicate with the SiT9531x chip in I²C/SPI using the J31 connector. When using external connection option, remove R267, R293, R295 and R297 and solder R292, R294, R296 and R298 (each 0 Ω) to enable the external interface to the chip using J31.

7 SiT9531x EVK Board Power Supply Connection Details

The power supplies on the EVK are configured to 3.3 V by default except the VDD supply which is set to 1.8 V.The on board supplies/LDO's are also configurable to 1.8 V and 2.5 V.

There is a provision for connecting external supplies after bypassing the on board regulators for all the supplies.

Please refer to SiT9531x datasheet for configuring the supply voltages on the various Power Supply rails.

7.1. VDDIN and VDDOX Supply Regulator

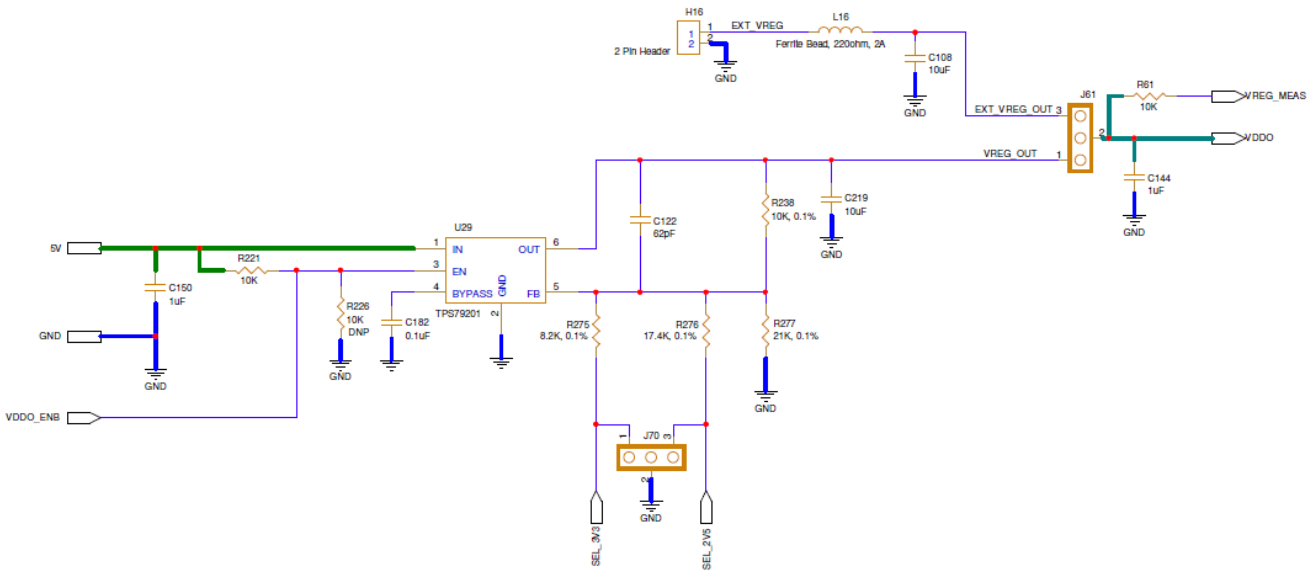


Figure 5. Supply Regulator for VDDIN and VDDOX Supply

Note: For changing the LDO Output Power Supply Voltage, connect the corresponding Jumpers (for ex- J70) in Figure 5 to below settings:

1. 3.3 V - Connect the 3-Pin Jumper from 1 to 2.
2. 2.5 V - Connect the 3-Pin Jumper from 2 to 3.
3. 1.8 V - Remove the Jumper.

7.2. VDD Supply Regulator

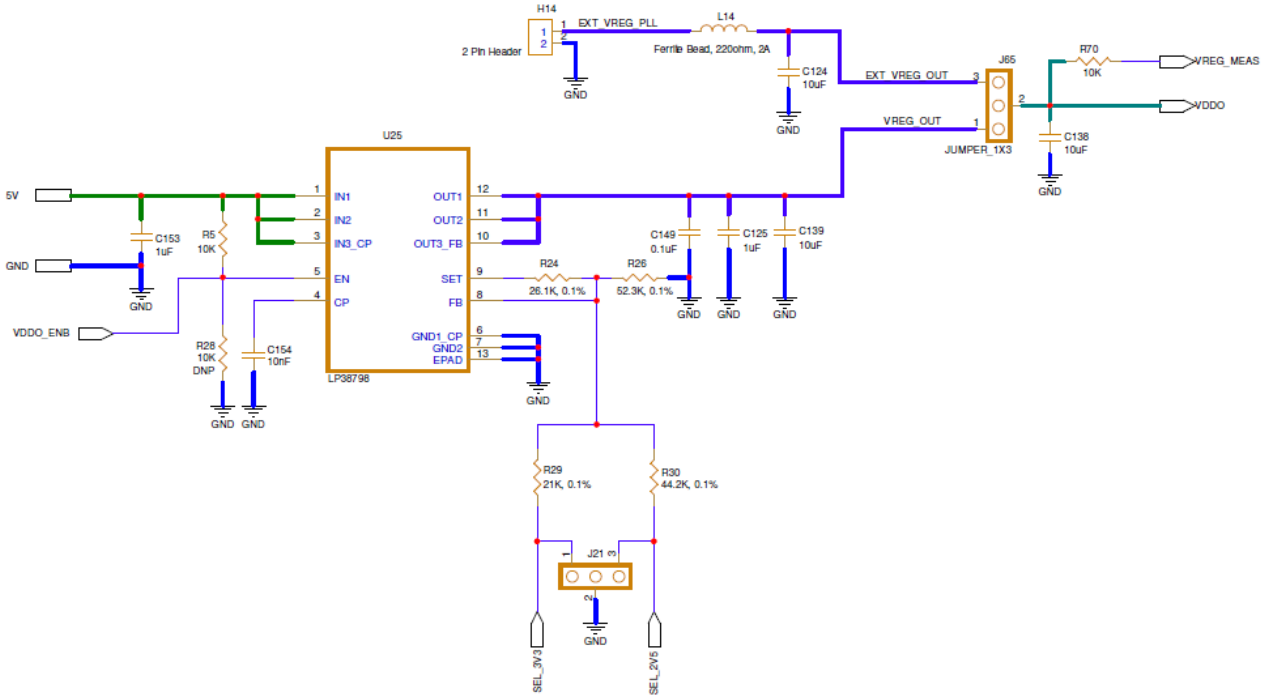


Figure 6. Supply Regulator for VDD Supply

Note: For changing the VDD (for ex- J21) Supply, connect the Jumper to below settings:

1. 3.3 V - Connect the 3-Pin Jumper from 2 to 3.
2. 2.5 V - Connect the 3-Pin Jumper from 1 to 2.
3. 1.8 V - Remove the Jumper.

VDD should be configured to 1.8 V by default.

7.3. GPIO_VDD Supply Regulator

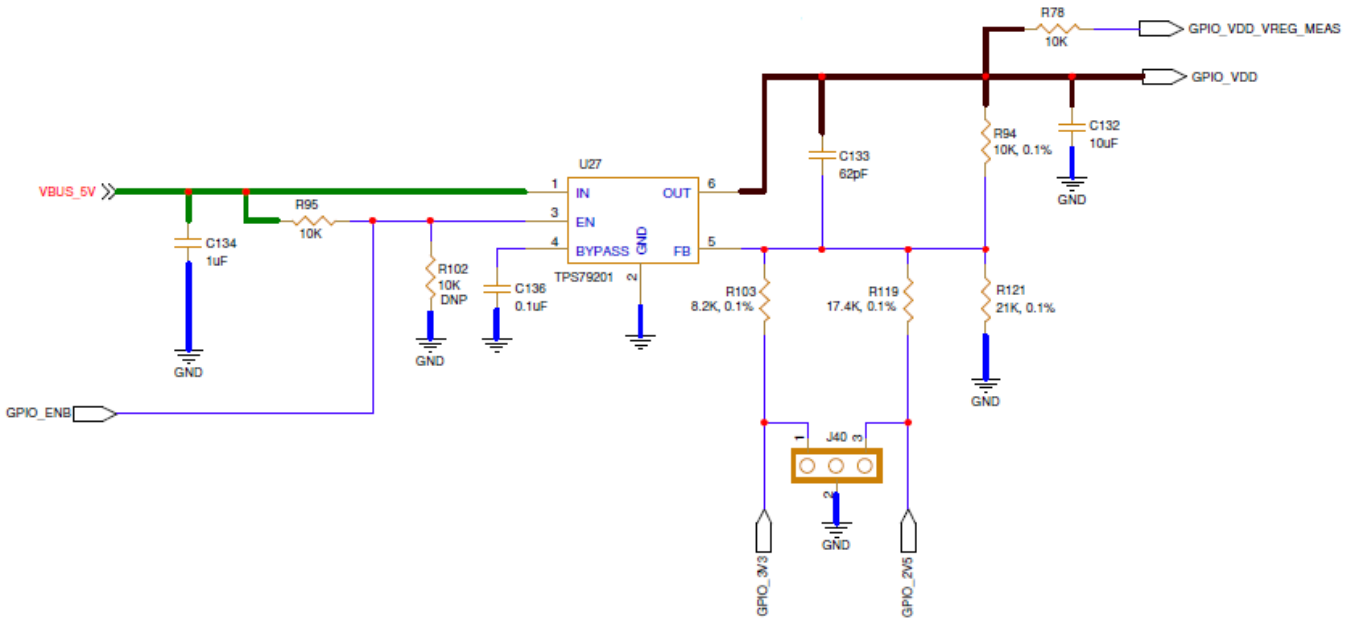


Figure 7. Supply Regulator for GPIO_VDD Supply

Note: For changing the GPIO_VDD (for ex- 40) Supply, connect the Jumper to below settings:

1. 3.3 V - Connect the 3-Pin Jumper from 2 to 3.
2. 2.5 V - Connect the 3-Pin Jumper from 1 to 2.
3. 1.8 V - Remove the Jumper.

GPIO_VDD is configured to 1.8 V by default. VDDIO can either be configured to VDD or VDDIN, GPIO_VDD should always track the VDDIO supply.

8 External Clock Reference Input (X1/X2)

The SiT9531x EVB has the SiT30100 oscillator (Y4) soldered for providing a stable reference clock to SiT9531x. The EVB can also connect to an external reference clock using the SMA connector(J15).

For changing from SiT30100 oscillator to external reference clock configuration, uninstall R310(0 Ω) and install C31(1 uF).

Refer to the SiT9531x family of parts datasheet for the XO Pathway connection options.

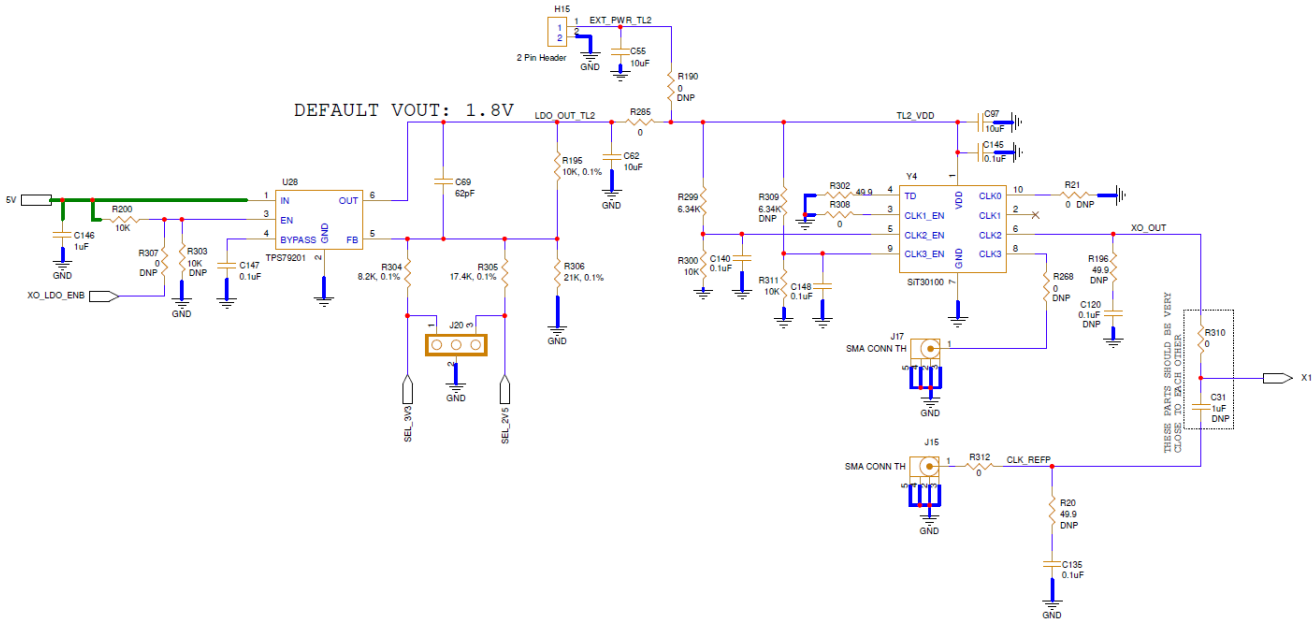


Figure 8. External Reference Connection

9 Input Clock Circuitry (INx_P/INx_N)

The SiT9531x EVB has 4 Differential Inputs and 8 Single Ended Inputs (IN0P/IN0N, IN1P/IN1N, IN2P/IN2N, IN3P/IN3N) for receiving the external clock input signals. The input clock termination arrangement is shown in Figure 9. All the Input clocks are AC Coupled and having single ended 50 Ω terminations by default. The Inputs can be configured either to work as Single Ended(AC/DC) or Differential(AC/DC) based on the required configuration.

Input Clocks can be configured as:

1) Single Ended AC Coupled (with the default EVK Input Termination Connection)
2) Single Ended DC Coupled (change C130 (1 uF) to 0 ohms short – R4 and R18 can also be removed if the Single Ended External Source is not able to drive the 50 ohms load)
3) Differential DC Coupled (connect R62 also apart from the default EVK Input termination Connection)
4) Differential AC Coupled (with the default EVK Input Termination Connection)

Refer to the SiT9531x family of parts datasheet for the Single Ended and Differential Input Termination connection information.

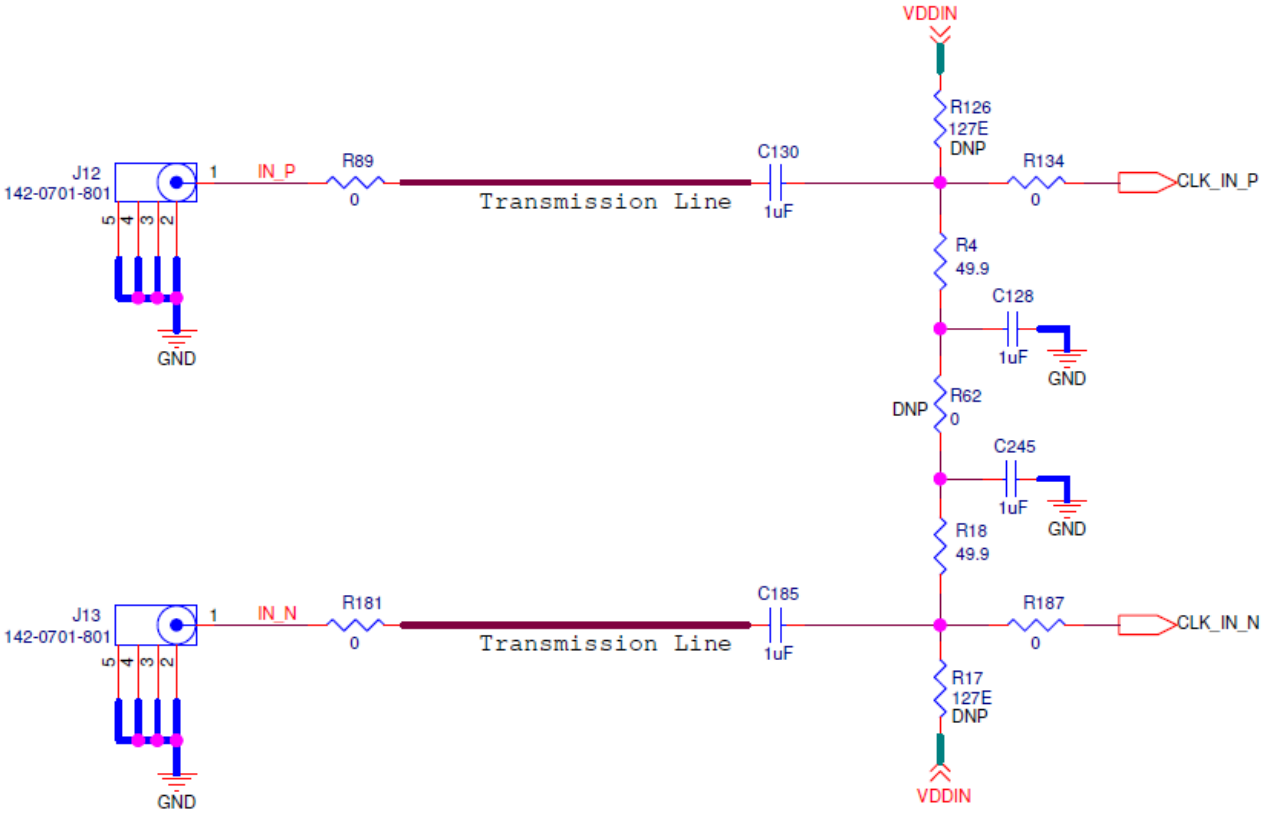


Figure 9. Input Clock Termination Circuit

10 Output Clock Circuitry (OUTxP/OUTxN)

The SiT9531x EVK has 12 differential Outputs which are AC coupled by default to its respective SMA connector. The Output Clock Termination is shown in Figure 10.

In case DC coupling is required, the AC coupling capacitors (for ex- C96 & C99) can be replaced by a 0 ohm resistor.

Refer to the SiT9531x datasheet for the Output Termination Connection information.

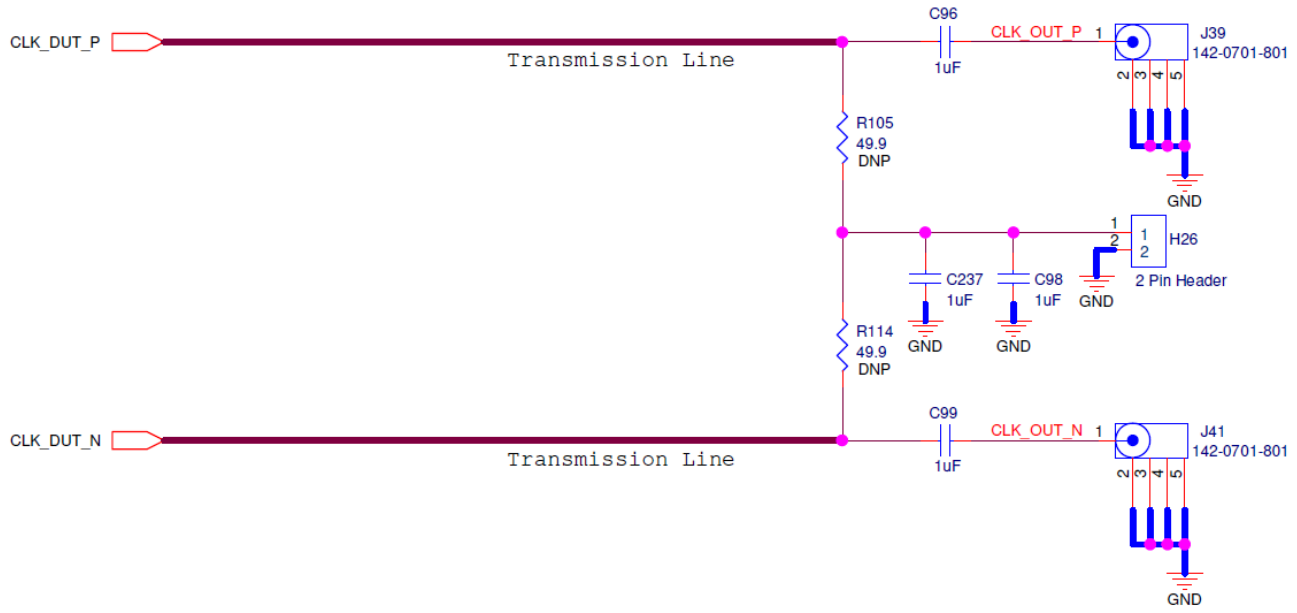


Figure 10. Output Clock Termination Circuit

11 GPIO Configuration

The GPIO's on the chip are by default configured by the on board MSP430 and can be used to set the status as High or Low by using the GUI Console(Refer to SiT9531x Clock GUI User Guide)

The GPIO status when configured from the chip can also be read back using the MSP430 in the default EVK configuration. There is also a provision to control the status using the DIP_SPDT(J37) Switch but whenever DIP_SPDT switch is being used to control/set the GPIO voltage on the chip, the MCU side GPIO resistors should be removed to make sure there is no contention on the GPIO bus.

For example, if GPIO5/FINC in Figure 11 needs to be controlled from J37, R150 needs to be removed. The GPIO status can be manually measured using the berg pin connectors placed near to the J37 switch for each of the GPIO's.

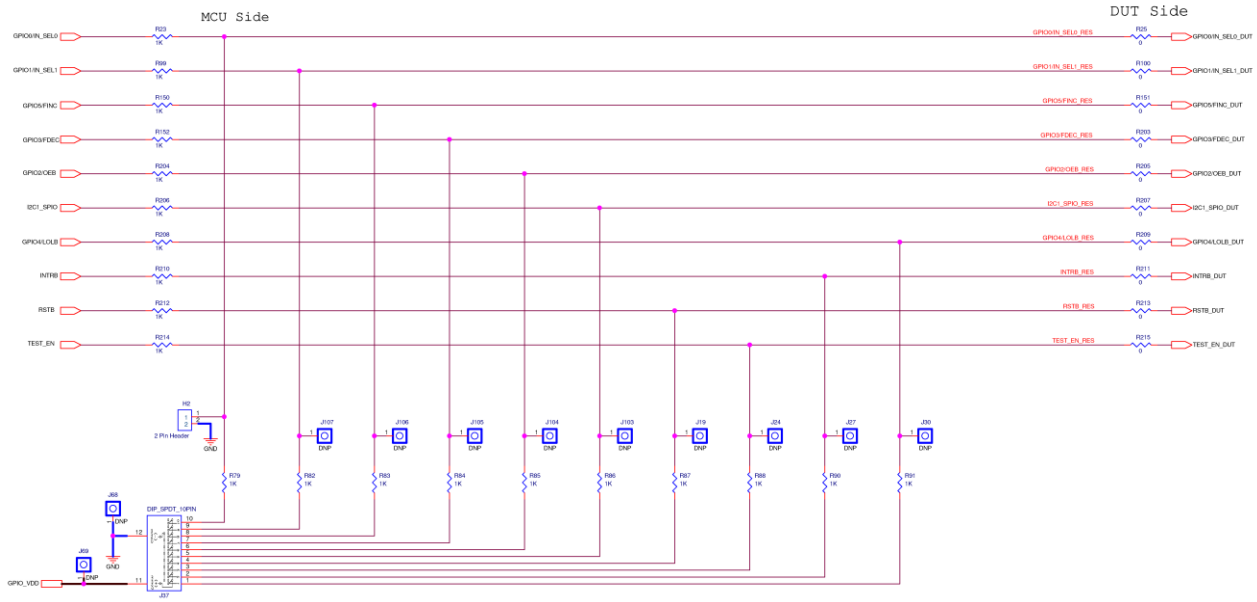


Figure 11. GPIO Control Status

12 EEPROM Configuration

The SiT9531x EVK has on board EEPROM that shares the same I²C bus as the chip. The EEPROM can be flashed externally or using the on board MSP430 and the EEPROM contents can be further readback from the chip. Refer to the SiT9531x family of parts datasheet for the EEPROM configuration.

13 MSP430 Programming Instructions

The SiT9531x EVK uses the MSP430 to communicate to the chip via I²C/SPI and is also used to configure/read the FLEXIO status of the chip. The MSP430 firmware is also version controlled and flashed to the MSP430 to handle multiple functions on the EVK.

In the rare event of a firmware update required for the MSP430, please follow the below steps to upgrade the MCU firmware:

1. The HOST_USB software can be downloaded from path:

   Download Software at:

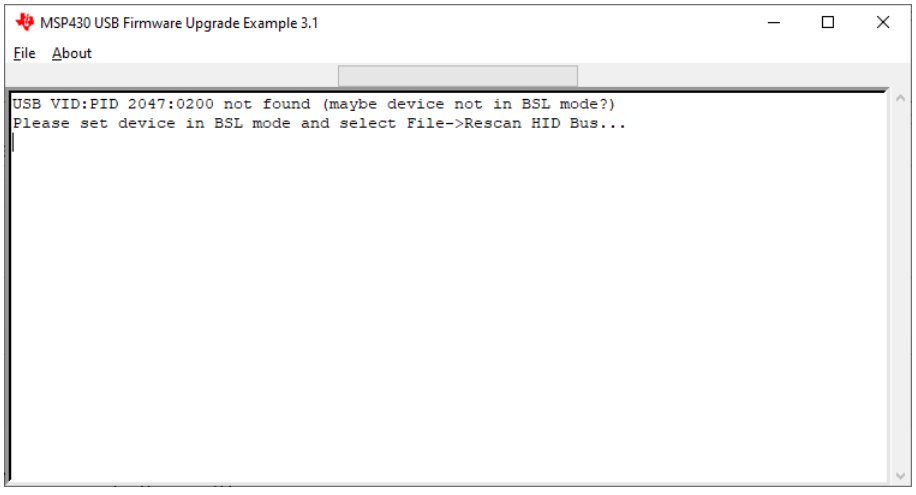
   https://software-dl.ti.com/msp430/msp430_public_sw/mcu/msp430/MSP430Ware/3_80_09_03/ _FDS.html

MSP430 Programming Procedure

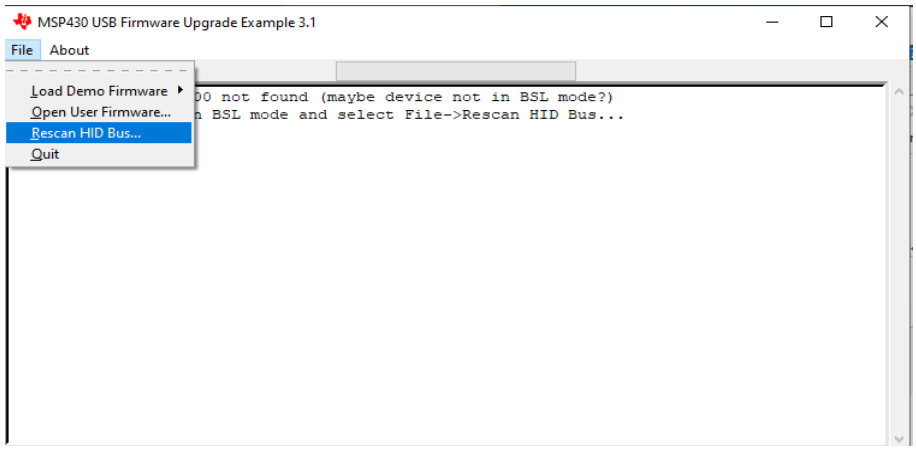
2. Open the GUI from –

   C:\ti\msp\MSP430Ware_3_80_07_00\usblib430\Host_USB_Software\Python_Firmware_Upgrader

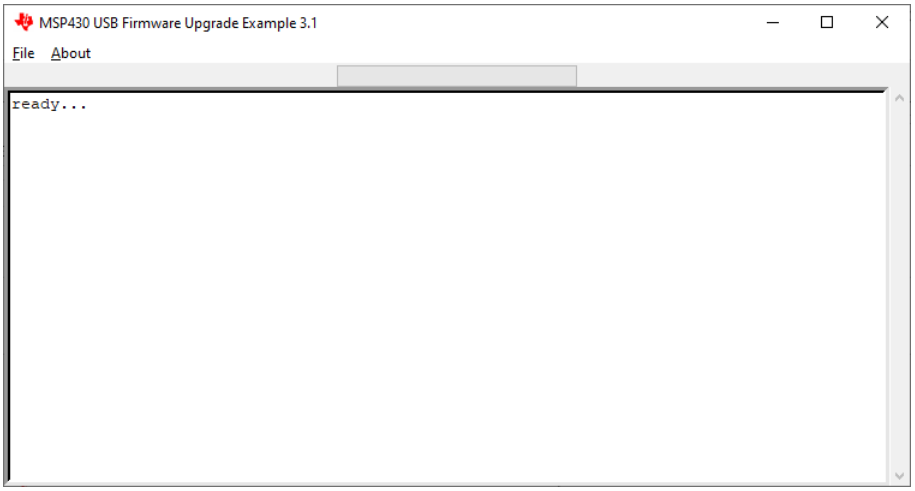
3. Connect the board to supply and USB using micro USB cable. Reset the chip by pressing ‘SW1’ and ‘SW2’ together.
4. This will take MSP430 to programming mode.
5. If MSP430 is not detected, then the GUI will appear as shown below:



6. Reset the MCU and Rescan HID Bus in case the device (MSP430) is not detected as shown:

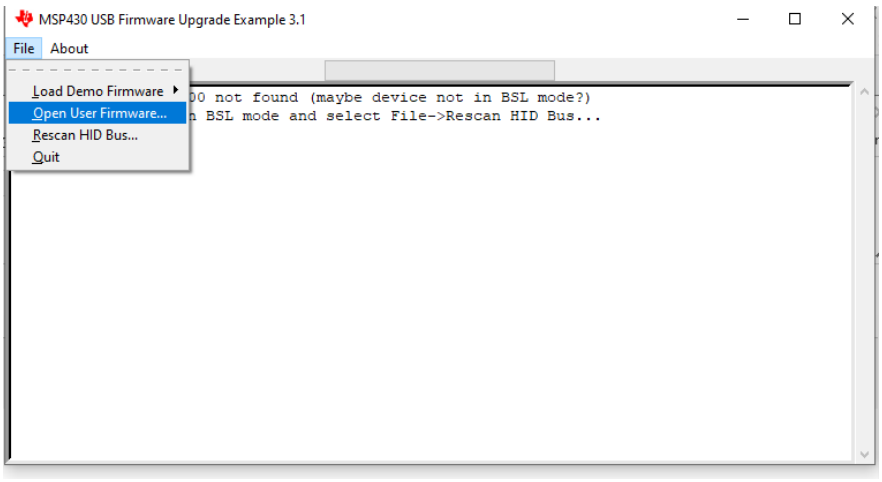


7. If the device (MSP430) is in Programming mode, then it shows as ready as shown below:

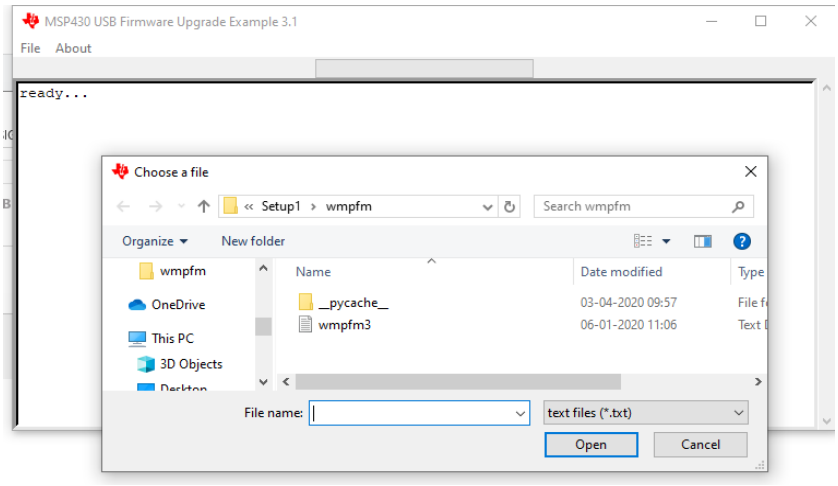


8. Go to File-> Open User Firmware option. Open the location where the firmware file is placed.

C3_EchoToHost.txt



9. Browse to the firmware path and select the file.



10. Select the firmware. The tool should load the firmware into the MCU and and show a completion message as shown:

14 SiTime Clock GUI Installation and EVB Configuration

SiTime SiT9531x Clock GUI provides an easy interface to verify the performance of chip in the lab. The GUI uses the MSP430 microcontroller for the USB to I^2C/SPI communication on the board, the MSP430 MCU related software drivers are also configured while installing the GUI.

Refer to the SiTime SiT9531x Clock GUI User Guide for detailed Installation and EVB configuration instructions.

Table 3. Revision History

Revisions	Release Date	Change Summary
0.5	14-Feb-2024	Initial Release

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