CLOCKBUILDERPRO™ FIELD PROGRAMMER KIT

1. Introduction and Scope

This document describes how to use the Si538x/4x ClockBuilder Field Programmer Kit ("CBPROG-DONGLE") with ClockBuilder Pro ("CBPro") to support four programming models. Refer to the text and table below for supported uses:

1. **In-socket NVM Programming**: NVM programming of "**base**" Si538x/4x devices (e.g., Si5341A-A-GM), or any other factory "**pre-programmed**" Si538x/4x device (e.g., Si5341A-A12345-GM) which has unused NVM banks. Silicon Labs provides 44-pin and 64-pin QFN socket adapter boards for this purpose.
2. **In-system NVM Programming**: NVM programming of Si538x/4x devices already mounted on a system PCB. Users are encouraged to include a standard 10-pin header on their PCB to allow the Si538x4x Field Programmer board and ribbon cable to easily connect to the USB to SPI/I2C adapter.
3. **In-system Volatile Register Programming:** of devices mounted on a PCB (e.g., use the Wizard and EVB GUIs to inspect status registers, make volatile configuration updates, debug system firmware, etc.).
4. **In-socket Volatile Register Programming:** of devices mounted in the socket (e.g., use the Wizard and EVB GUIs to inspect status registers, make volatile configuration updates, debug system firmware, etc.).

Location of Target Si538x/4x Device	Software Utility and Programming Model Supported	
	NVM Burn Tool	EVB GUI / Wizard
In-socket	✓ (1)	✓ (4)
In-system	✓ (2)	✓ (3)

Figure 1. Supported Programming Models

2. Kit Contents

Shown below is a diagram of how the various components in the Field Programmer kit are connected to one of the QFN socket adapter boards, or to a PCB for in-system programming.

Figure 2. Example Hardware Configuration (Using QFN Socket Board or Customer PCB)

Copyright © 2015 by Silicon Laboratories

Figure 3 shows the kit contents for the CBPROG-DONGLE kit. Note that the 44-pin and 64-pin sockets are sold separately as part numbers “Si538X4X-44SKT” and “Si538X4X-64SKT”, respectively. The Clock Builder Pro Field Programmer resources including schematics, layout files, and BOM can be found at www.silabs.com/CBProgrammer. Note that the sockets are sold as separate kits.

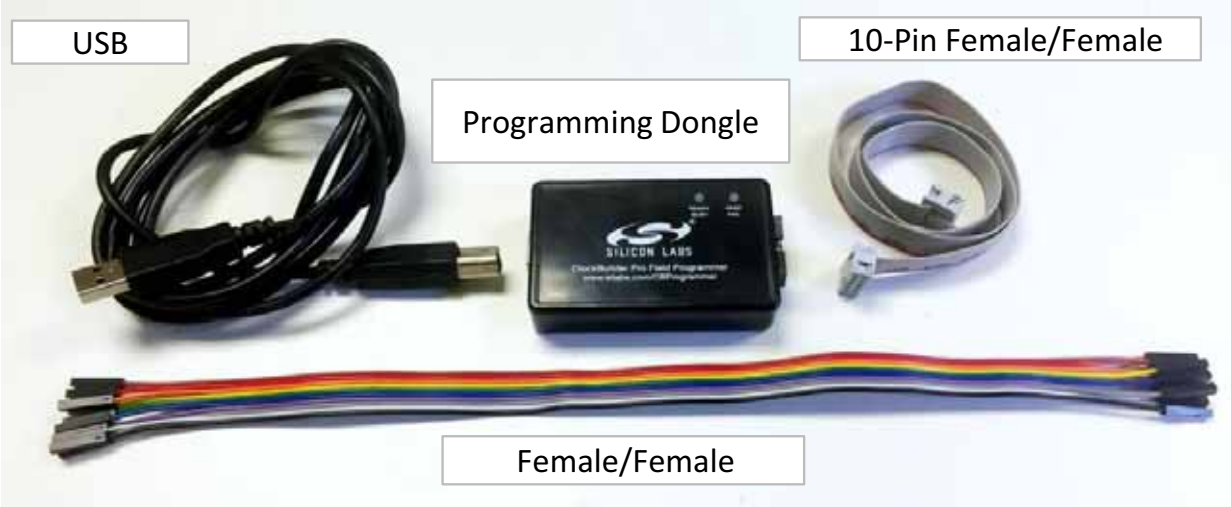


Figure 3. CBPROG-DONGLE Kit Contents

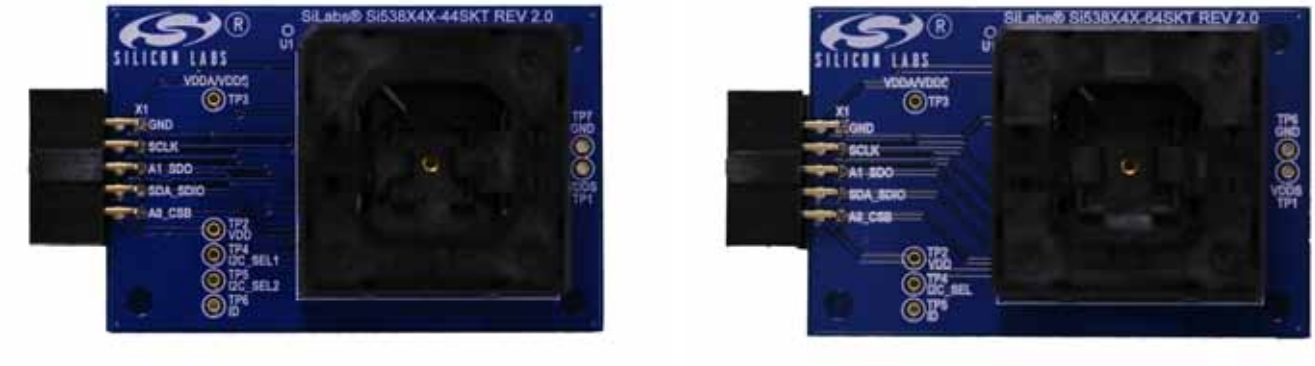


Figure 4. Si538x4x-44SKT-DK (l) and Si538x4x-64SKT-DK (r) Sockets Sold Separately

3. Software Download and Installation

To install the CBPro software on any **Windows 7** (or above) PC, go:
http://www.silabs.com/CBPro and download the ZIP file to install the software on your host PC.

4. Hardware Configuration

The Field Programmer Dongle acts as an interface between the CBPro GUI and the target device (any supported Si534x or Si538x IC). Connect the provided USB cable to your PC and the CBPROG-DONGLE. The CBPROG-DONLGE is then connected to the target device using the provided cables or a programming socket, depending upon the four ways you may use the programmer as detailed in “5. Ways You can Use the Programmer”.

5. Ways You can Use the Programmer

The following four sections describe four ways you can use the CBPROG-DONGLE.

5.1. In-Socket NVM Programming

This workflow describes the process of programming or “burning” the non-volatile memory (NVM) of loose devices using the Si538X4X-44SKT or Si538X4X-64SKT boards that feature a programming socket. Once completed, this flow will “burn” a complete configuration from CBPro into one of the banks of NVM on the device. Devices shipped from Silicon Labs have two NVM banks available to program (“burn”).

The steps needed to program a device’s NVM are as follows:

1. Assuming the CBPro software installs without error, connect the CBPROG-DONGLE adapter with the USB cable to the PC on which CBPro was installed. Use the USB extender cable (provided with the kit) if your host PC is located far from the CBPROG-DONGLE.

Figure 5. PC to CBPROG-DONGLE Connection

2. Insert a base or previously pre-programmed (e.g. OPN) Si538x/4x device into the QFN socket.

   Socket and DUT Orientation: It is important to ensure the DUT is in the correct orientation before powering up the board. If not orientated correctly the software has a feature to auto-detect it is not able to read the part. Likely the reason is there is no part in the socket or it is oriented incorrectly. The part will not be damaged if oriented incorrectly. The DUT has two circles on the part. The smaller circle is the pin 1 indicator. Pin 1 on the socket is lined up with the U1 and dot symbol on the silk screen.

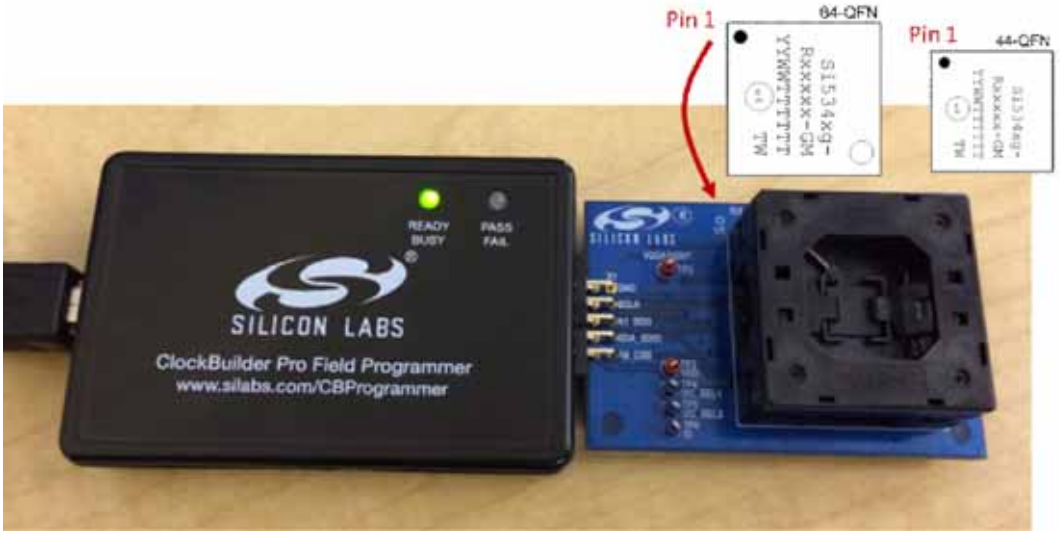


Figure 6. Correct Orientation of a DUT in the QFN Socket

Note: Power is not applied to the socket's VDD and VDDA pins unless explicit action by you within CBPro. It is safe to:
1. Insert or remove a DUT in the socket before or after the socket has been connected to the main board.
2. Insert or remove a DUT in the socket before or after power has been applied to the main board by connecting the USB cable to your PC.

As will be discussed in the walk-through that follows, power is only applied to the DUT when you explicitly scan for a DUT or initiate a burn. Power is automatically off at all other times.

3. Connect the QFN Field Programmer Socket Board with the DUT into the CBPROG-DONGLE. Use the male-to-female ribbon cable if needed.

Figure 7. System from PC to Programming CBPROG-DONGLE Board to QFN Field Programmer Socket Board

4. Start ClockBuilder Pro by locating the icon (see Figure 8) on your desktop or Windows Start Menu.

Figure 8. ClockBuilder Pro Icon

5. The ClockBuilder Pro Wizard main menu should now appear as shown in Figure 9.

Select the "**NVM Burn Tool**" as shown. **Do not select EVB GUI**.

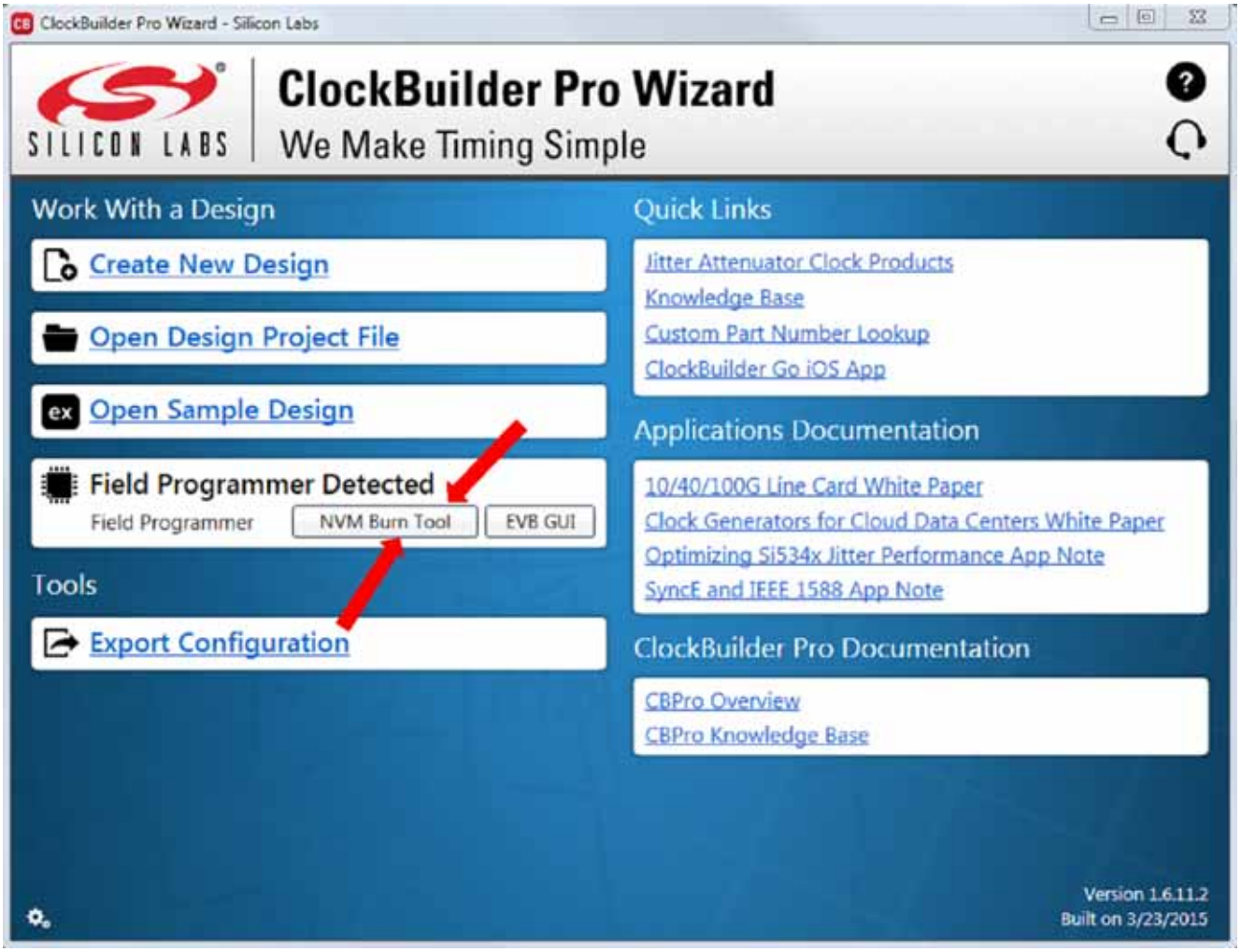


Figure 9. ClockBuilder Pro Wizard

6. In the **Burn NVM** tool window:
   a. Step 1: Make sure "**Kit Field Programmer Socket Board**" is selected.
   b. Step 2: Select "**Scan**".
   If the device is properly orientated in the socket, the middle section of the window will show information about the detected device, including how many NVM banks are available to burn. In socket mode, the CBPROG-DONGLE always communicates in 4-wire SPI host interface mode.
   c. Step 3: Click on "**Select Project File**".

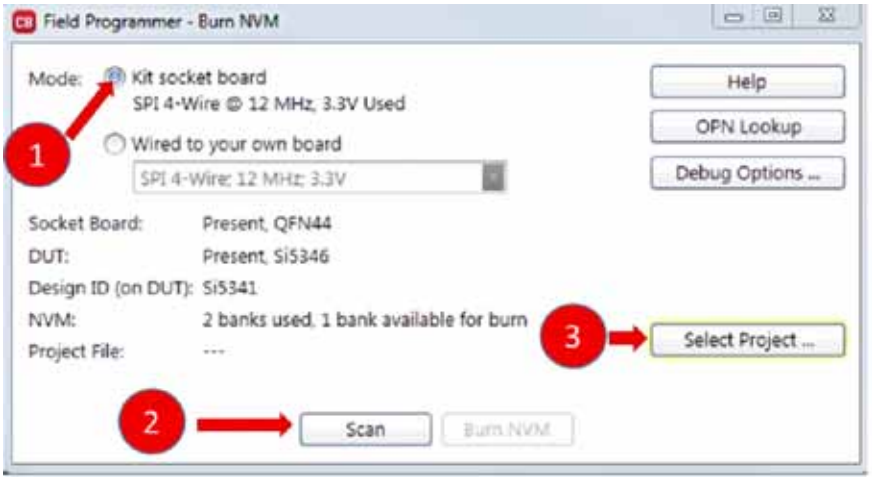


Figure 10. Field Programmer Screen

   d. Step 4: Navigate to and select your CBPro project file in the Windows file browser:

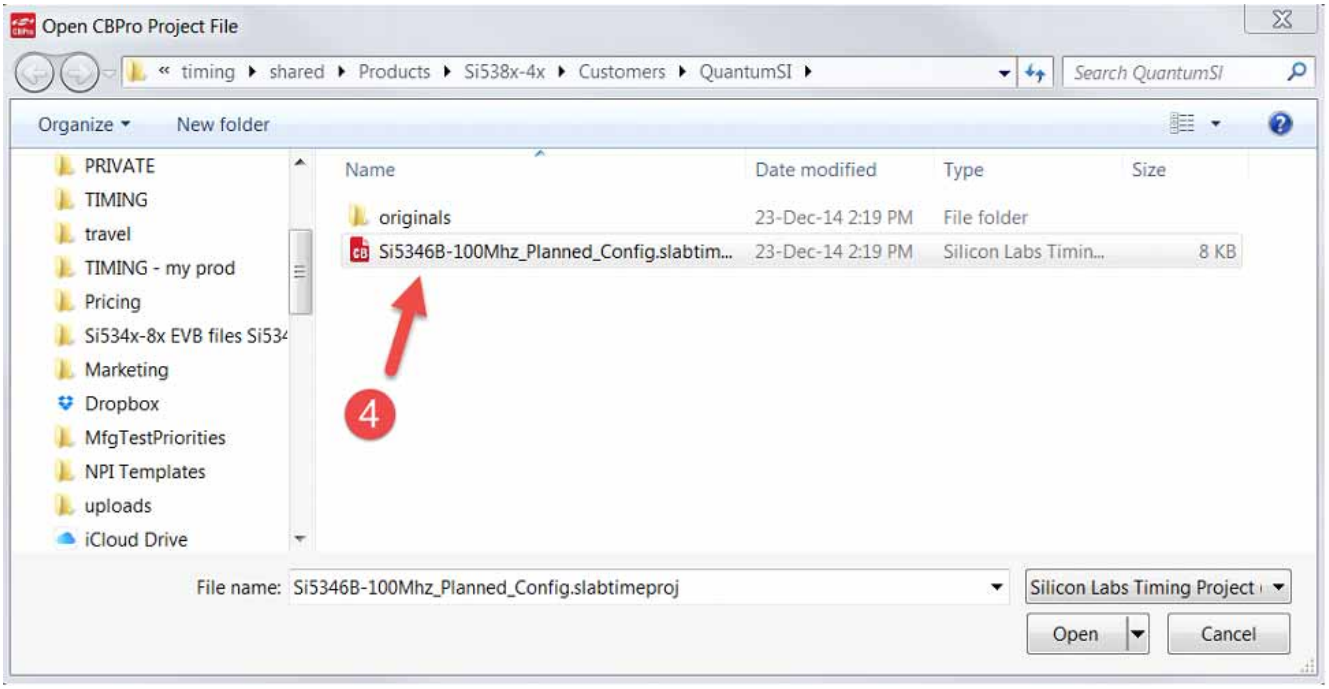


Figure 11. Navigating to CBPro Project File

e. Step 5: After selecting the project file, select "**Burn NVM**" as shown in Figure 12.

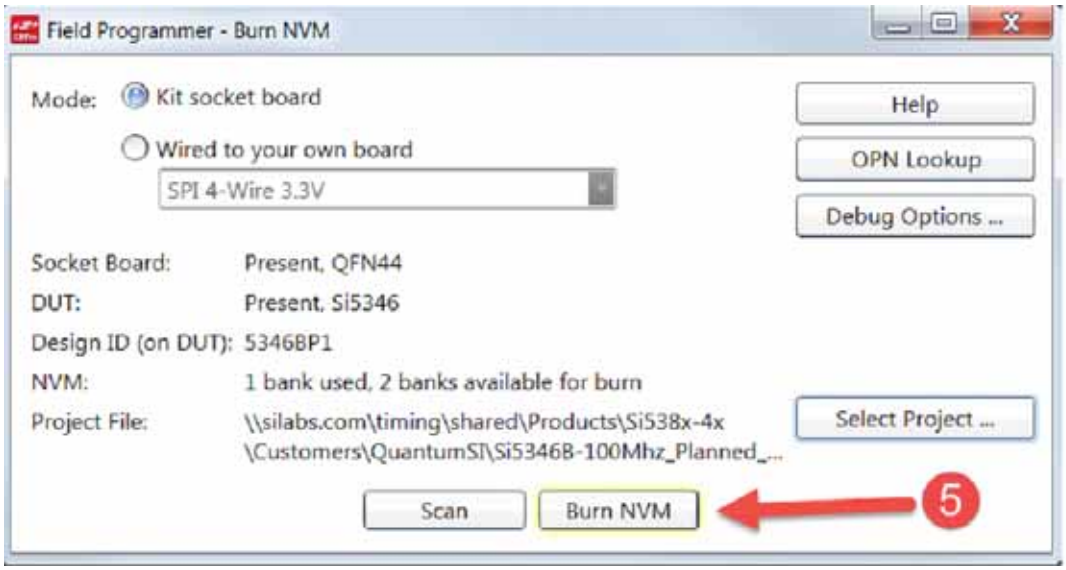


Figure 12. Click on Burn NVM

f. A series of status windows will appear as shown if the target DUT in the socket is successfully "burned".

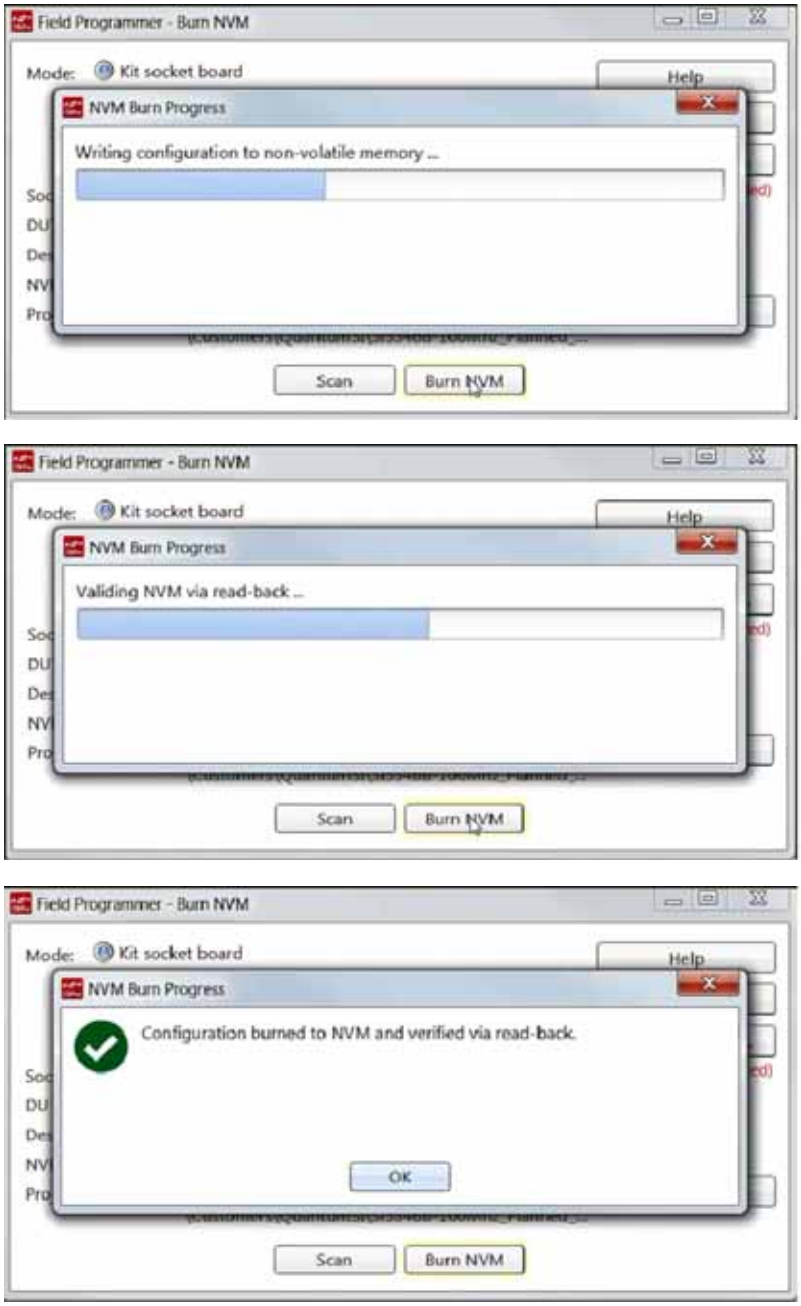


Figure 13. Status Windows

When you click OK, the DUT will be rescanned and you should see the number of banks available to burn decrease by 1.

Note that you may remove the newly programmed DUT at any time: power to the DUT is turned off immediately after scan and burn operations complete.

5.2. In-System NVM Programming

This workflow describes the process of programming or “burning” the non-volatile memory (NVMN) of a device mounted on a PCB, and your goal is to reprogram a device’s NVM with a different configuration from a CBPro project file. Once completed, this flow will “burn” a complete configuration from CBPro into one of the banks of NVM on the device, assuming an open NVM bank is available. Devices shipped from Silicon Labs always have to 2 NVM banks available to program (“burn”). If you don’t know how many banks are still open to burn on your target device, have no fear, as the kit’s software automatically detects and reports the number of remaining NVM banks.

The steps needed to program an “in-system” device’s NVM are as follows:

1. Assuming the CBPro software installs without error (see "3. Software Download and Installation" on page 3), connect the adapter (CBPROG-DONGLE) board with the USB cable to the PC on which CBPro was installed. Use the USB extender cable (provided with the kit) if your host PC is located far from the CBPROG-DONGLE.

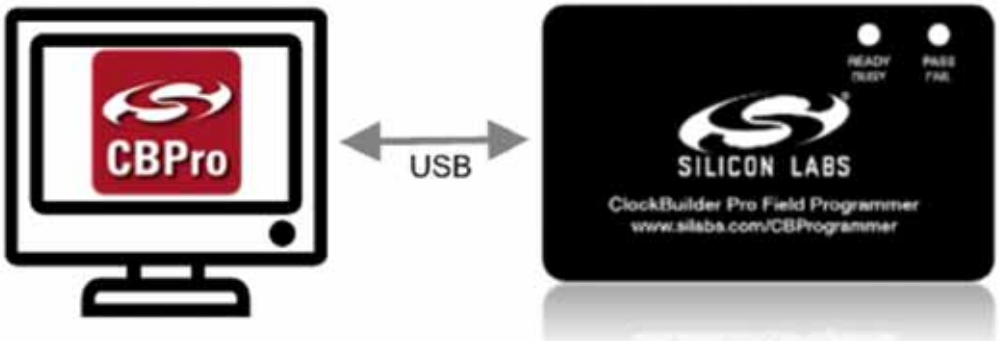


Figure 14. PC to CBPROG-DONGLE Connection

2. Lookup and verify the **host I/O mode (I2C or SPI)**, **the I2C address**, and the interface **I/O voltage level** compatibility of your host’s I/O voltage (for I2C or SPI) and the DUT’s.

   The value set at the DUT’s register address of 0x09043 determines how the I/O supply voltages must be configured to communicate reliably with the CBPROG-DONGLE. You can look up your DUT’s host I/O voltage using the “**OPN Lookup**” option in the NVM Burn tool as shown in Figure 15.

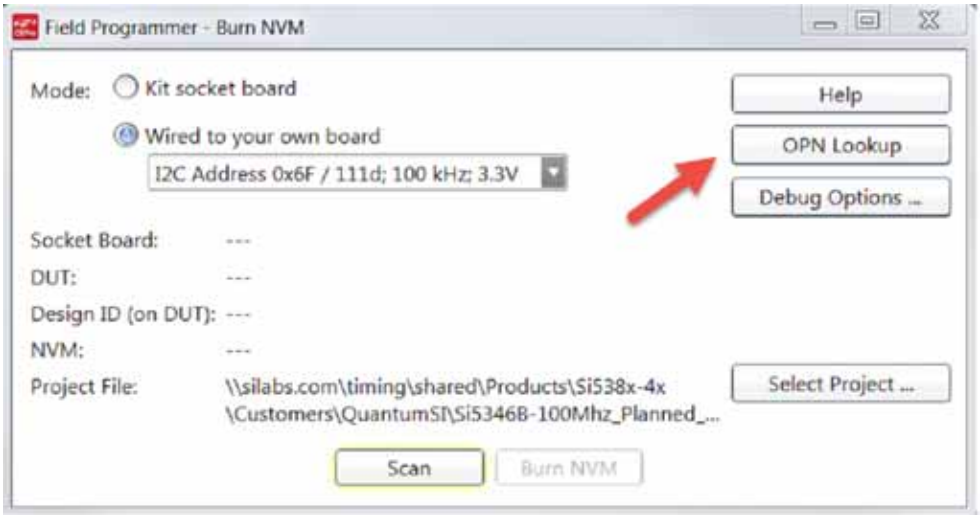


Figure 15. OPN Lookup Option

If you have a custom OPN mounted on your board (a part number with a 5 digit code in the middle of the part number, such as Si5346B-A03260-GM), you should look up the host I/O setting (located at address of 0x09043) by selecting the **OPN Lookup** option. A browser will open and you will then enter in your custom OPN, as shown below.

a. Select "**Clock or Buffer**".

b. Enter in your full ordering part number (OPN). E.g., Si5346B-A03260-GM.

c. Click the blue arrow to lookup your OPN to verify the host I/O voltage setting of your DUT.

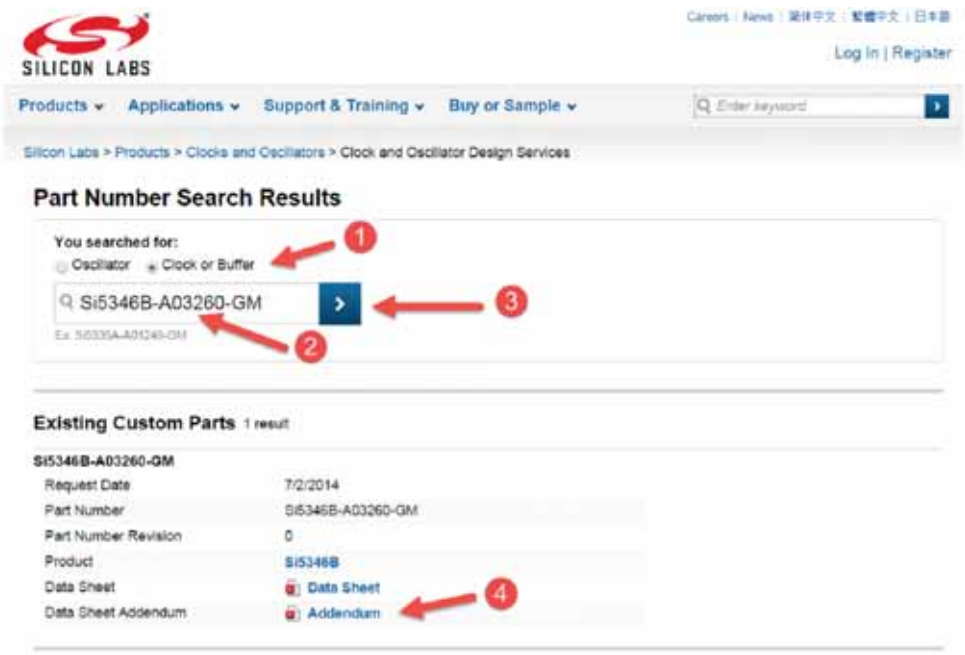


Figure 16. OPN Lookup

3. When the utility displays the OPN's files, click on Addendum to verify the I/O Power Supply setting of your DUT in the Data Sheet Addendum.
   "VDD Core" indicates the I/O supply for the I2C/SPI interface will operate from a 1.8 V supply.
   "VDDA 3.3 V" indicates the I/O supply for the I2C/SPI interface will operate from a 3.3 V supply.

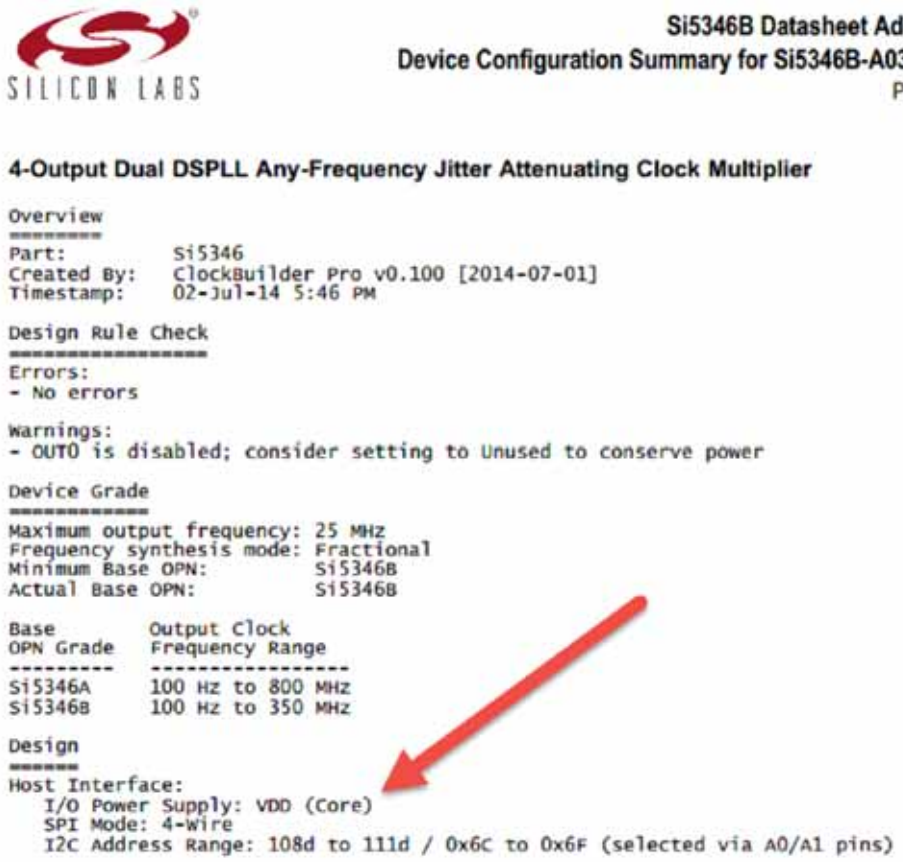


Figure 17. Finding the I/O Power Supply Type

Figure 18 shows an example data sheet addendum showing VDDA (3.3 V).

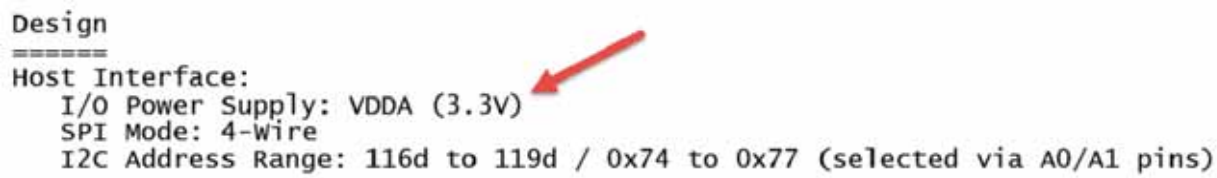


Figure 18. Finding VDDA Value

4. Connect/wire the pins of the CBPROG-DONGLE to your host system with the target Si538x4x device. Use the male-to-female ribbon cable to connect to your host board fitted with a standard 10-pin header. This assumes you included the 10-pin header on your PCB and followed the recommended pinout and connections to the target Si438x/4x on your PCB. Note the pinout diagram and descriptions in the table below.

Figure 19. Interface Pins on Header (Front View of CBPROG-DONGLE)

Table 1. Interface Pin Connections from CBPROG-DONGLE

Pin #	Description	Wire to Your PCB?	I^2C	4-wire SPI	3-wire SPI
9	A0_CSB	3- or 4-Wire SPI	Can be used to set I^2C address bit A0 high or low. Routed to A0 DUT pin on the programming Field Programmer Socket Boards.	Drives the chip select signal during SPI transactions	Drives the chip select signal during SPI transactions
10	VDD	Never	Supplies the Core VDD voltage to the DUT when using a programming Field Programmer Socket Board. Do not use this pin for in-system programming.	Supplies the Core VDD voltage to the DUT when using a programming Field Programmer Socket Board. Do not use this pin for in-system programming.	Supplies the core VDD voltage to the DUT when using a programming Field Programmer Socket Board. Do not use this pin for in-system programming.
7	SDA_SDIO	Always	Serial data signal for I^2C transactions.	Serial data out to DUT for 4-wire SPI transactions (MOSI).	Bidirectional Serial data for 3-wire SPI transactions (SDIO).
8	I2C_SEL1	Never	Used to set I2C_SEL signal high to set the DUT for I^2C communication. (Refer to specific part pinout and the programming Field Programmer Socket Board to determine whether to use I2C_SEL1 or I2C_SEL2)	Used to put I2C_-SEL signal low for SPI communication. (Refer to specific part pinout and the programming Field Programmer Socket Board to determine whether to use I2C_-SEL1 or I2C_SEL2)	Used to put I2C_-SEL signal low for SPI communication. (Refer to specific part pinout and the programming Field Programmer Socket Board to determine whether to use I2C_-SEL1 or I2C_SEL2)

Table 1. Interface Pin Connections from CBPROG-DONGLE (Continued)

Pin #	Description	Wire to Your PCB?	I^2C	4-wire SPI	3-wire SPI
5	A1_SDO	4-Wire SPI Only	Can be used to set I2C address bit A1 high or low. Routed to A1 DUT pin on the programming Field Programmer Socket Boards.	Serial data from DUT for 4-wire SPI transactions (MISO).	Not used
6	I2C_SEL2	Never	Used to set I2C_SEL signal high to set the DUT for I2C communication. (Refer to specific part pinout and the programming Field Programmer Socket Board to determine whether to use I2C_SEL1 or I2C_SEL2)	Used to put I2C_SEL signal low for SPI communication. (Refer to specific part pinout and the programming Field Programmer Socket Board to determine whether to use I2C_SEL1 or I2C_SEL2)	Used to put I2C_SEL signal low for SPI communication. (Refer to specific part pinout and the programming Field Programmer Socket Board to determine whether to use I2C_SEL1 or I2C_SEL2)
3	SCLK	Always	Serial clock signal for I2C transactions.	Serial clock signal for SPI transactions.	Serial clock signal for SPI transactions.
4	VDDA_VDDS	Never	Supplies the VDDA and VDDS voltages to the DUT when using a programming Field Programmer Socket Board. Do not use this pin for in-system programming.	Supplies the VDDA and VDDS voltages to the DUT when using a programming Field Programmer Socket Board. Do not use this pin for in-system programming.	Supplies the VDDA and VDDS voltages to the DUT when using a programming Field Programmer Socket Board. Do not use this pin for in-system programming.
1	GND	Always	GND	GND	GND
2	ID	Never	The programming Field Programmer Socket Boards provide a voltage on this pin to identify the board. For in-system programming, this pin should be grounded or not connected to any signal.	The programming Field Programmer Socket Boards provide a voltage on this pin to identify the board. For in-system programming, this pin should be grounded or not connected to any signal.	The programming Field Programmer Socket Boards provide a voltage on this pin to identify the board. For in-system programming, this pin should be grounded or not connected to any signal.

5.2.1. I²C Hardware Configuration

For I²C Communication connecting to an external DUT board, the following pins should be used from the:

CBPROG-DONGLE pins

- Pin 3: Serial Clock SCLK
- Pin 7: Serial Data SDA
- Pin 1: Ground

DUT pins

- A0/CS: Drive this pin high or low to set the I²C Address.
- A1/SDO: Drive this pin high or low to set the I²C Address.
- VDDA: The DUT should be externally powered. VDDA must be set to 3.3 V.
- VDD: The core voltage must be set to 1.8 V.

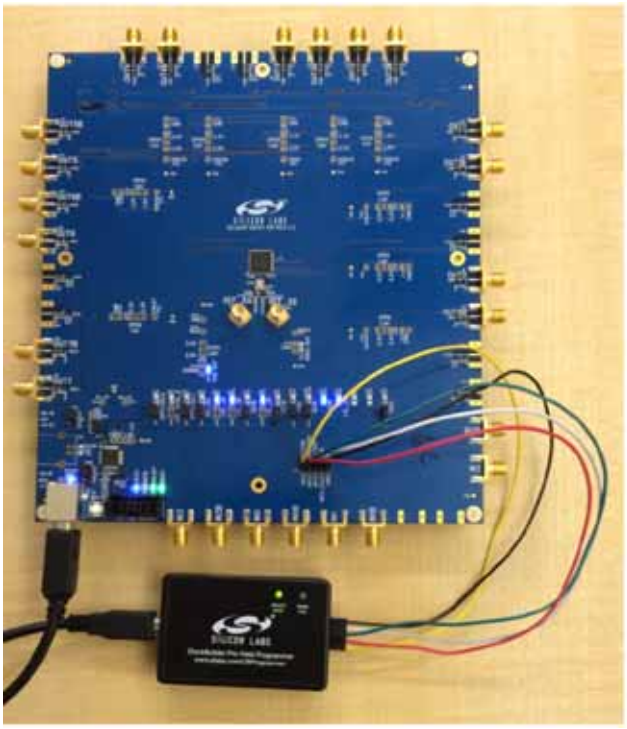


Figure 20. Example I2C Connection to External System Target Board Using Jumper Wires (Si5346-EVB)

When using SPI Communication with long wires as shown above it is advisable to use 6 Mb/s bus speed or less.

5.2.2. SPI 3-Wire Hardware Configuration

For 3-wire SPI communication, when connecting to an external DUT board, the following pins should be used from the MCU CBPROG-DONGLE.

CBPROG-DONGLE pins

- Pin 3: Serial Clock SCLK
- Pin 7: Serial Data SDIO for Data In and Out
- Pin 9: A0_CSB for Chip Select
- Pin 1: Ground

DUT PINS

- VDDA: The DUT should be externally powered. VDDA must be set to 3.3 V.
- VDD: The core voltage must be set to 1.8 V.

5.2.3. SPI 4-Wire Hardware Configuration

For 4-wire SPI communication, when connecting to an external DUT board, the following pins should be used from the MCU CBPROG-DONGLE.

CBPROG-DONGLE pins

- Pin 3: Serial Clock SCLK
- Pin 7: Serial Data SDIO for Data In to DUT (MOSI)
- Pin 5: A1_SDO for Data Out of DUT (MISO)
- Pin 9: A0_CSB for Chip Select
- Pin 1: Ground

DUT PINS

- VDDA: The DUT should be externally powered. VDDA must be set to 3.3 V.
- VDD: The core voltage must be set to 1.8 V.

5. After verifying the CBPROG-DONGLE to DUT connections as noted above, execute the following steps in the "**Burn NVM**" menu. This example assumes a DUT is configured with the host I²C interface operating in 3.3 V I/O mode with an I²C address of 0x6F, and an I²C bus speed of 100 kHz.

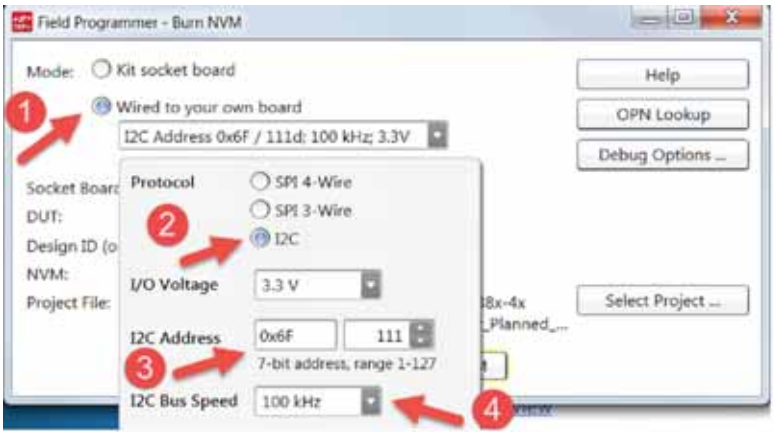


Figure 21. Selecting the I²C Configuration Options

Note: 100 kHz I²C bus speed is recommended to avoid programming errors. The CBPro burn tool will always read back the programmed NVM to verify the DUT was programmed correctly.

6. After entering in the fields noted above, select “**Scan”** to initiate detection of your target DUT.
7. Assuming your DUT was properly detected, the **Burn NVM** window will appear again, showing the presence of the DUT, its DESIGN_ID value, and the # of NVM banks available (in this case, there are no more NVM banks available to burn).

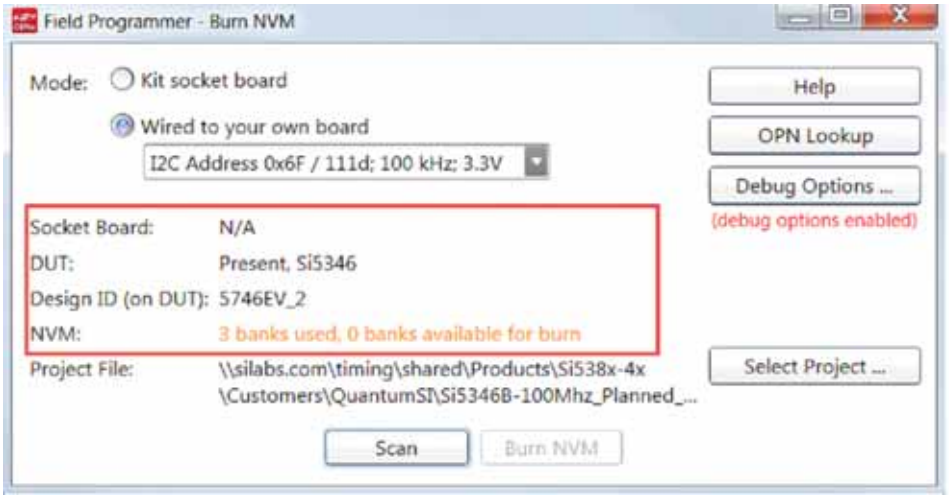


Figure 22. Board Information and NVM Burn Banks Available

8. Navigate to and select your CBPro project file in the Windows file browser.

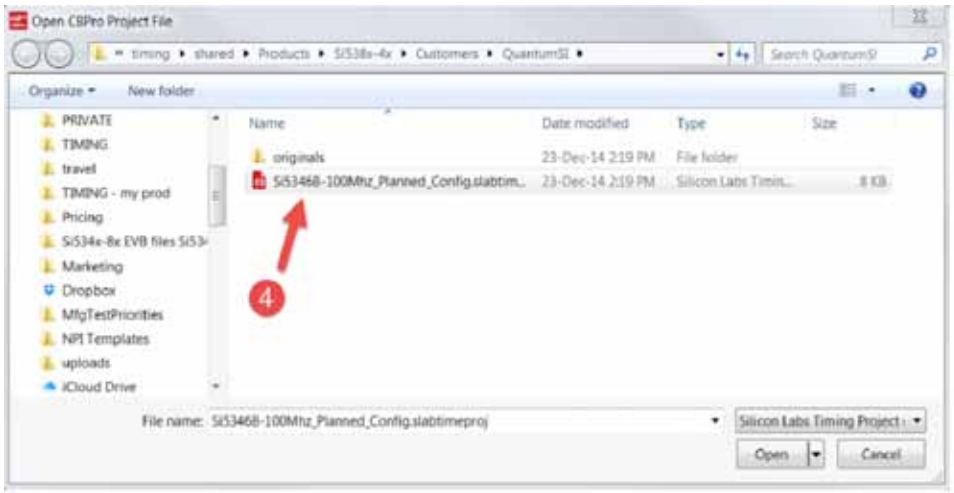


Figure 23. Navigating to CBPro Project File

9. After selecting the project file, select “**Burn NVM**” as shown:

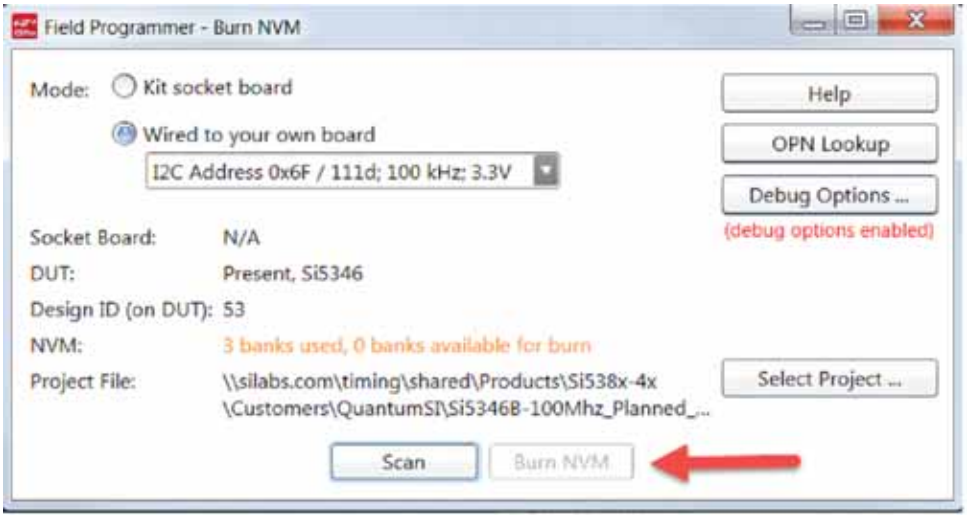


Figure 24. Select Burn NVM if Fewer than 3 Banks Burned

5.3. In-System Volatile Register Programming and Register Debug

This workflow allows users to use the full CBPro configuration Wizard and EVB GUI to make volatile changes to a device's configuration and inspect the state of various status registers. There are two ways you can interact with your PCB-based DUT using the field programmer:

- Use CBPro Wizard to edit your device configuration, and write out changes directly to your DUT.
- Launch the EVB GUI, to inspect registers

All of the relevant CBPro features available when working with a Silicon Labs EVB will be available to you, with these exceptions:

- There is no voltage regulator control or voltage/current readings of any kind
- You must configure the host interface settings so that CBPro can use the DUT correct communication scheme/wire out.
- If you write out your design/project file, all registers configured via the "Host Interface" section of the wizard are written to the DUT (these registers are skipped when writing a design to a Silicon Labs EVB).

5.3.1. Using the CBPro Wizard with Your PCB-Based DUT

When you launch the CBPro wizard, instead of clicking the NVM Burn Tool, open your existing project file:

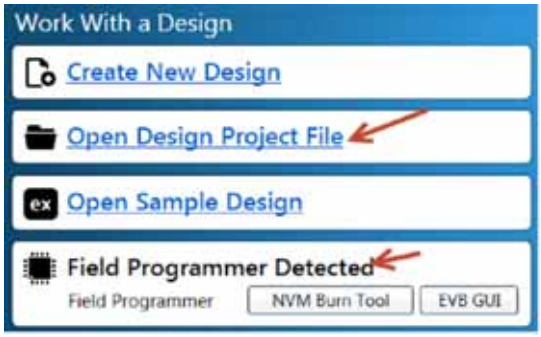


Figure 25. Open Design Project File, and see Field Programmer Detected

In the design dashboard, you will see a pulldown to configure the host interface between the CBPROG-DONGLE and your PCB:

Figure 26. Pull Down Menu for Communication Options

Click the pulldown and configure the interface:

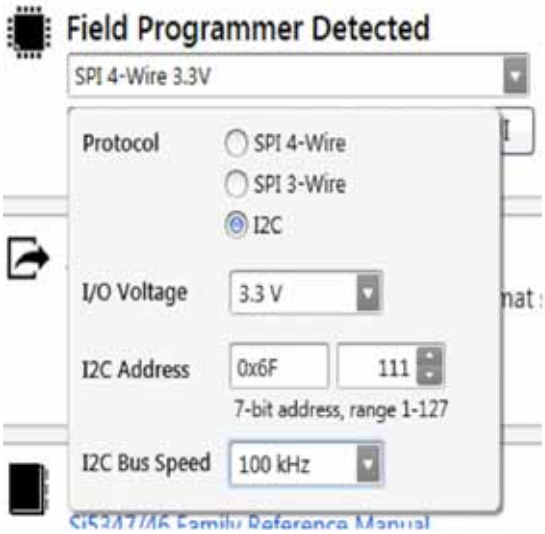


Figure 27. Communication Configuration Window

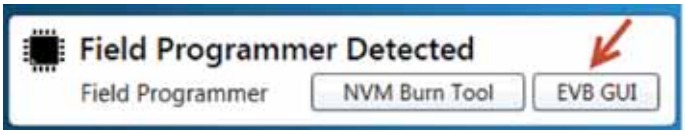
Once configured, you can write out your design to DUT using the button on the dashboard:

Or on any configuration page in the wizard:

5.3.2. Using the EVB GUI with your PCB-Based DUT

You launch the EVB GUI that same way you would when working with a Silicon Labs EVB:

1. From the CBPro wizard home page:



2. From the CBPro wizard design dashboard (you have opened a project file):

3. From the EVB GUI shortcut on the desktop or Windows Start Menu.

Similar to the dashboard and burn tool, you must configure the host interface options. These are available in a panel in the upper right hand corner of the EVB GUI window.

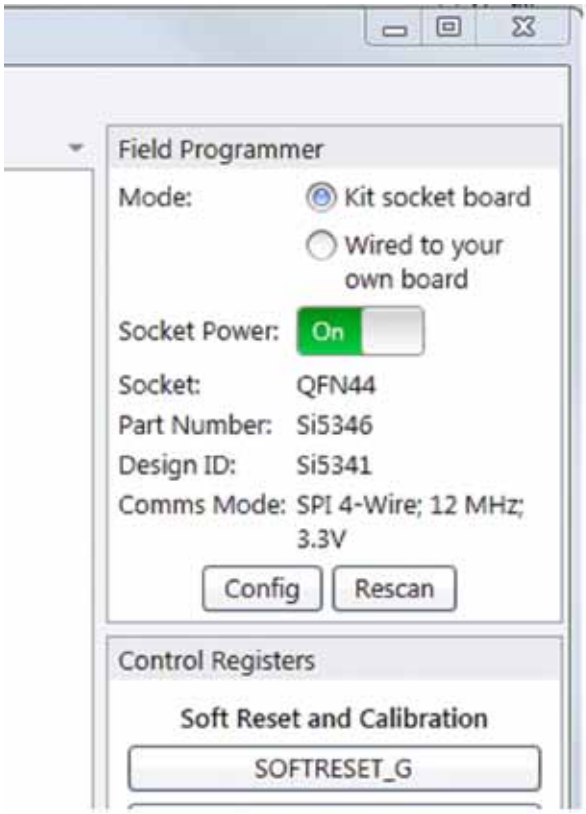


Figure 28. Socket or In-System Programming Options

First select either the Kit socket board if the socket is attached. Otherwise select “Wired to your own board”.

Click the Config button to modify the host interface options.

Once configured, you can then turn on the socket power to do the following:

- Write a project file to the device (File menu)
- Inspect DUT status registers
- Peek/poke arbitrary DUT registers

Click the “Rescan” button to update the configuration options to the last command selected.

5.3.3. Socket Detection in EVB GUI

Putting the device into the socket in the wrong orientation will not ruin the device, and the software does detect an orientation error. The first two images on the left show wrong orientation. The image on the right shows the proper orientation. The software automatically keeps the power off if it detects that the device is in an orientation that could damage the chip and won’t allow the socket power to be turned on.

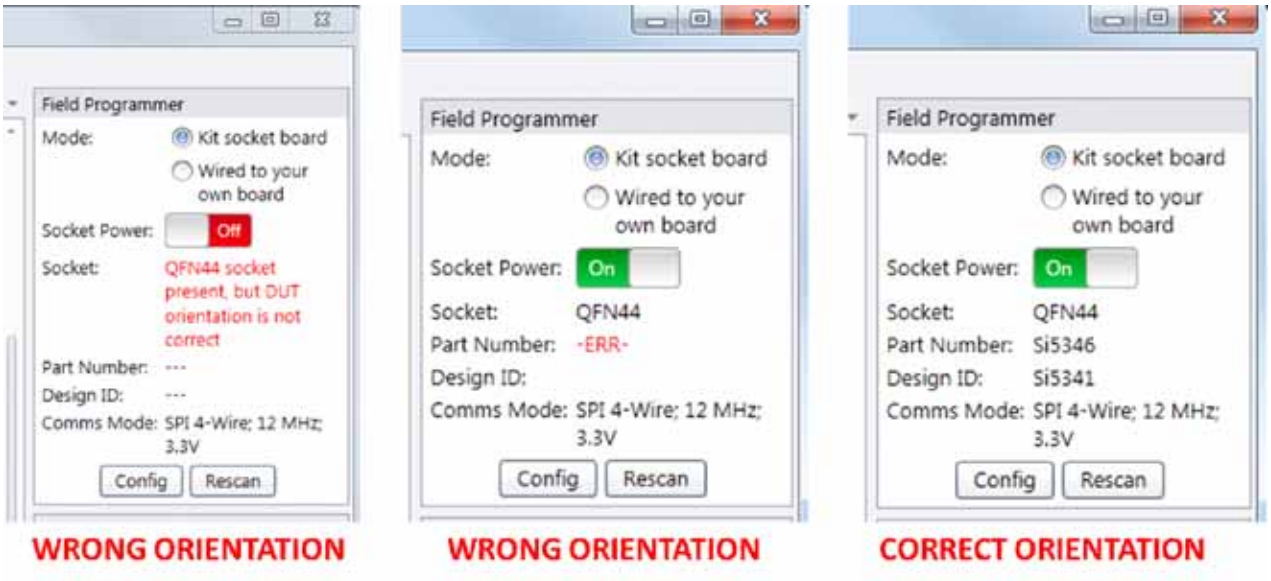


Figure 29. Socket Detection Results with Part in Different Orientations

It is advised to review the socket orientation and chip to ensure everything is correct. Make sure that the smaller dot on the chip is lined up in the corner where the U1 is located on the socket as shown below.

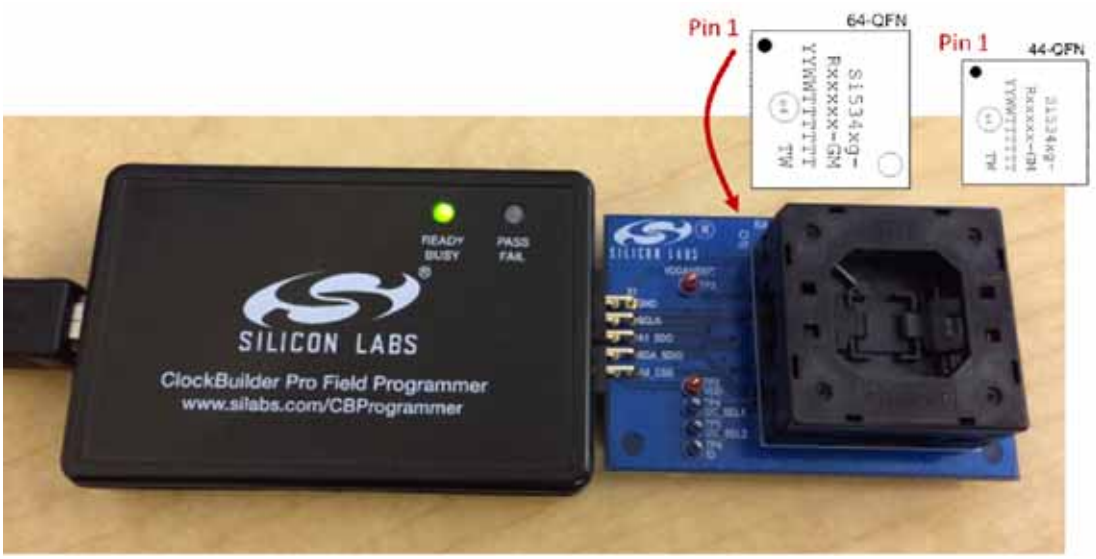


Figure 30. Correct Orientation of Device in Socket

5.4. In-Socket Volatile Register Programming and Register Debug

This workflow allows users to use the full CBPro configuration Wizard and EVB GUI to make volatile changes to a device's configuration and inspect the state of various status registers. There are two ways you can interact with your PCB-based DUT using the field programmer:

- Use CBPro Wizard to edit your device configuration, and write out changes directly to your DUT.
- Launch the EVB GUI, to inspect registers

All of the relevant CBPro features available when working with a Silicon Labs EVB will be available to you, without any exceptions. The details of this workflow are the same as above. The IO voltage is set to 3.3 V within the hardware appropriately, and does not require any external configuration.

6. Schematics

6.1. CBPROG-DONGLE Schematic

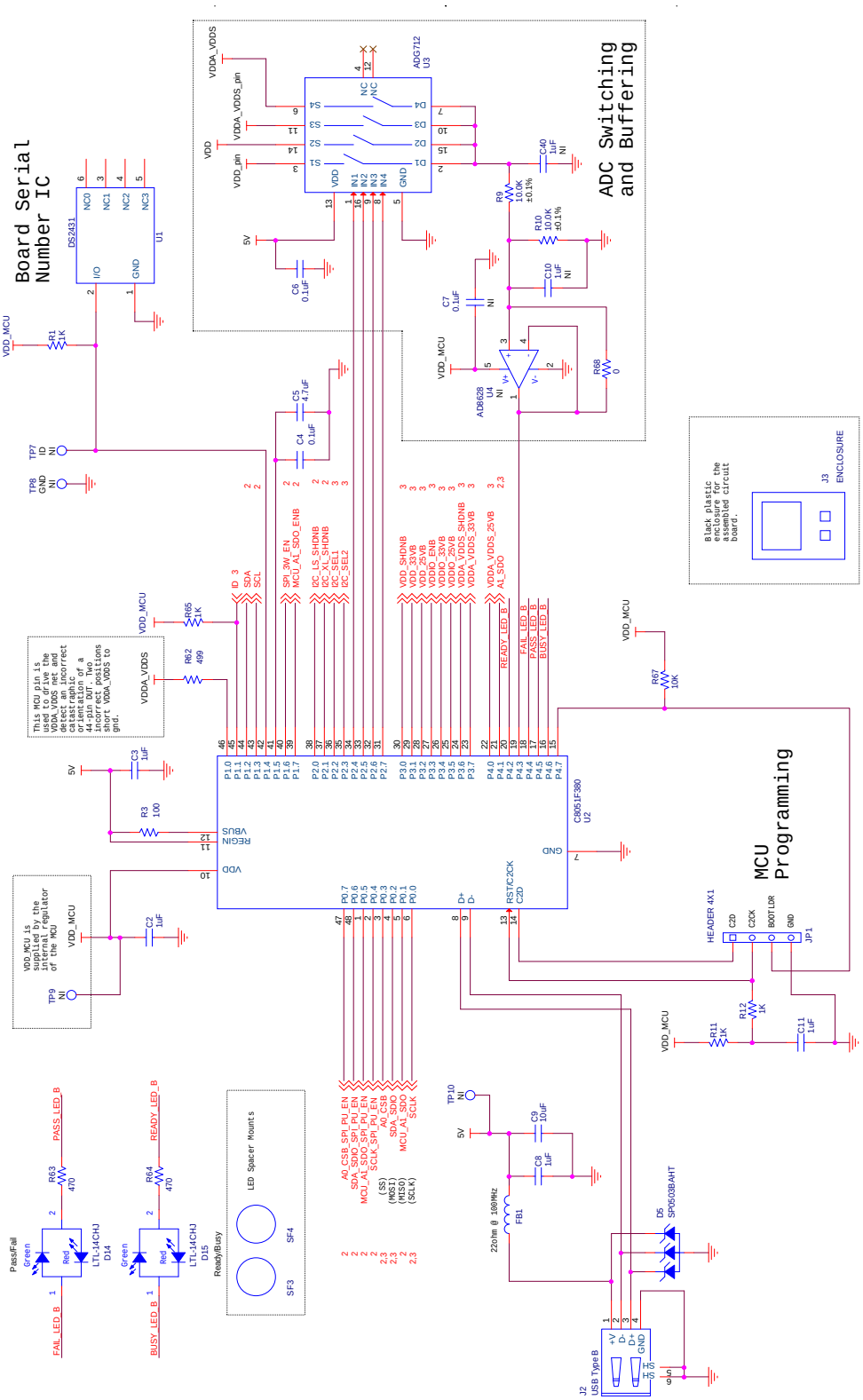


Figure 31. CBPROG-DONGLE Schematic (1 of 3)

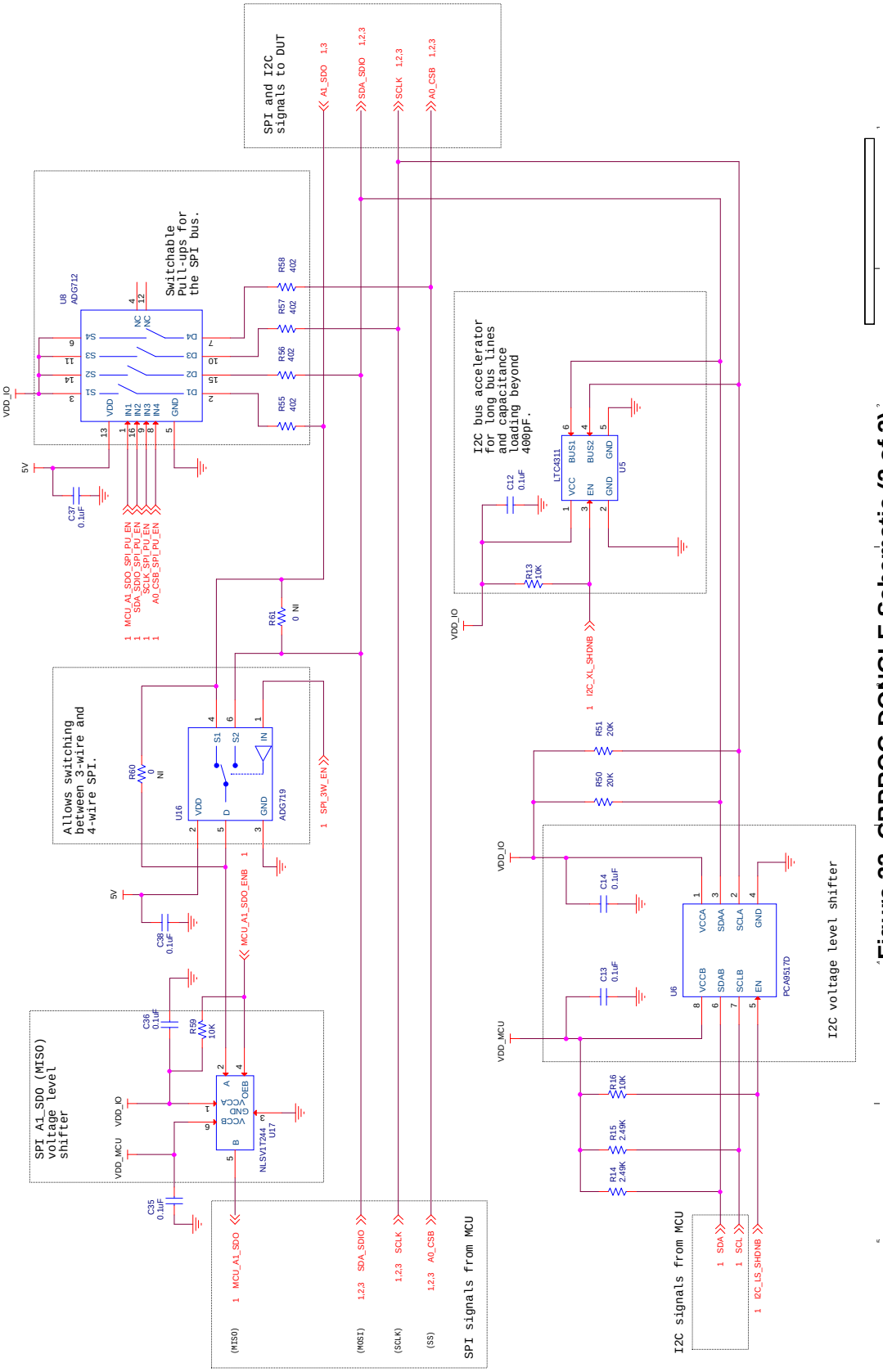


Figure 32. CBPROG-DONGLE Schematic (2 of 3)

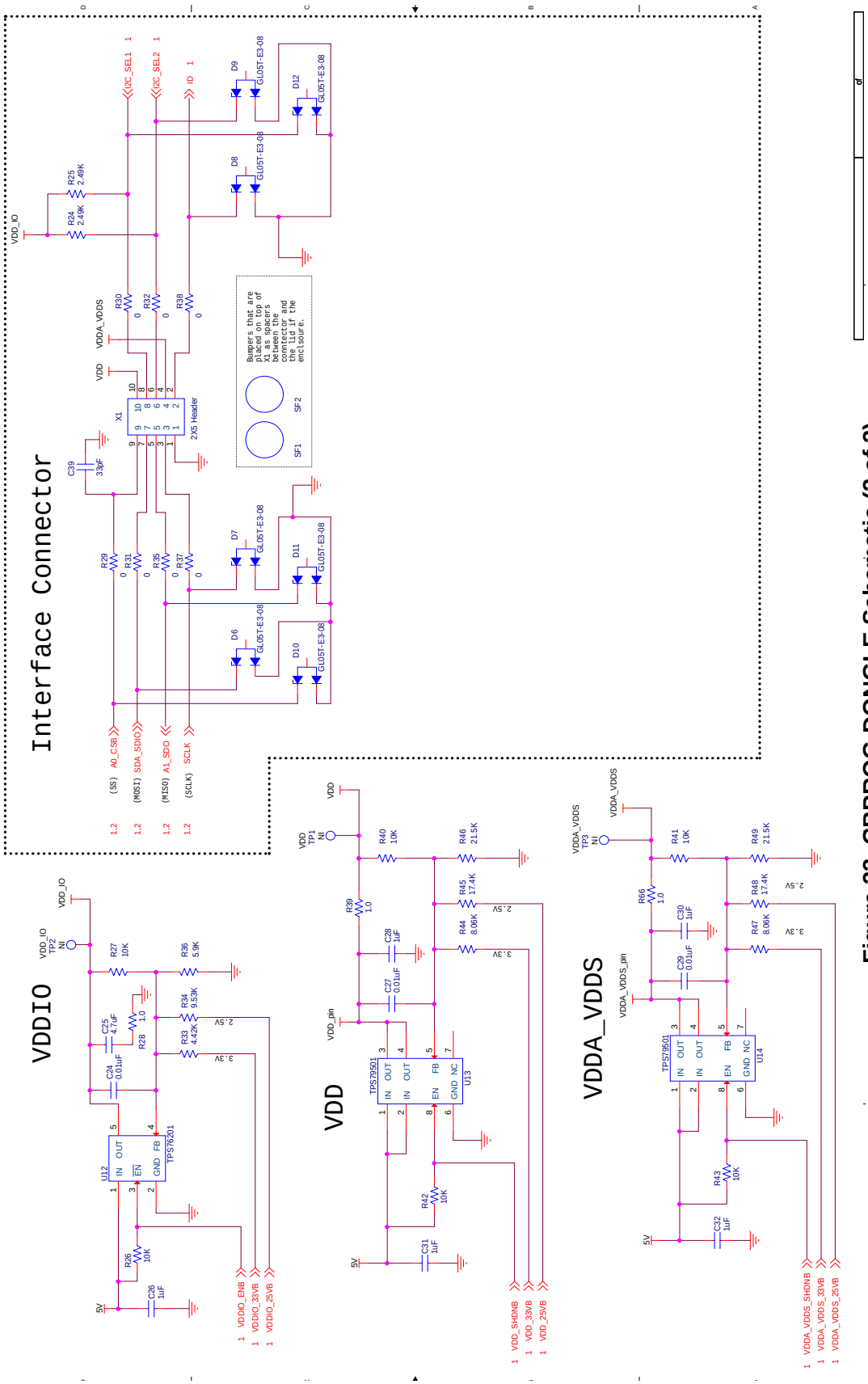


Figure 33. CBPROG-DONGLE Schematic (3 of 3)

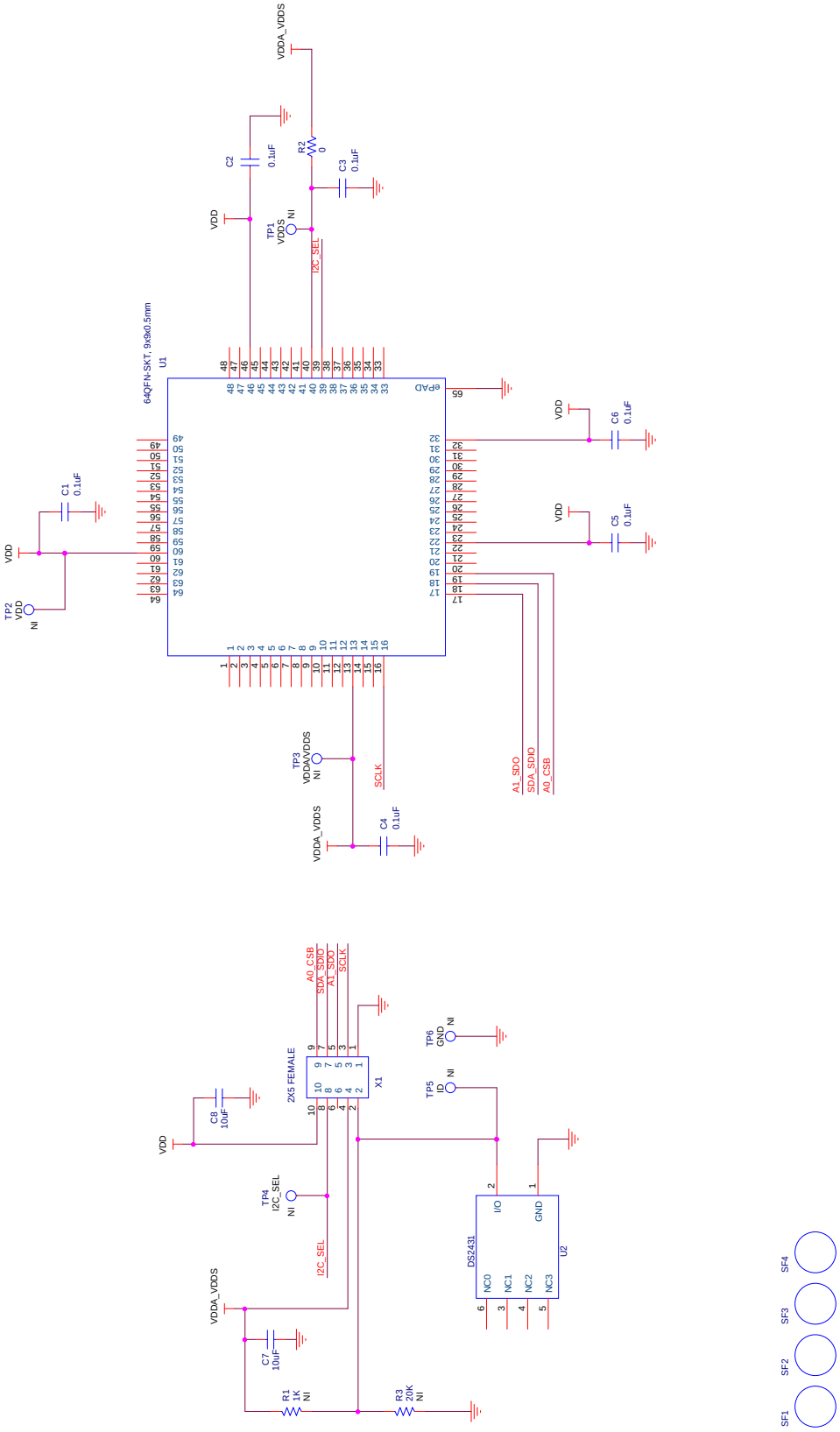


Figure 34. 64-Pin Socket Board Schematic

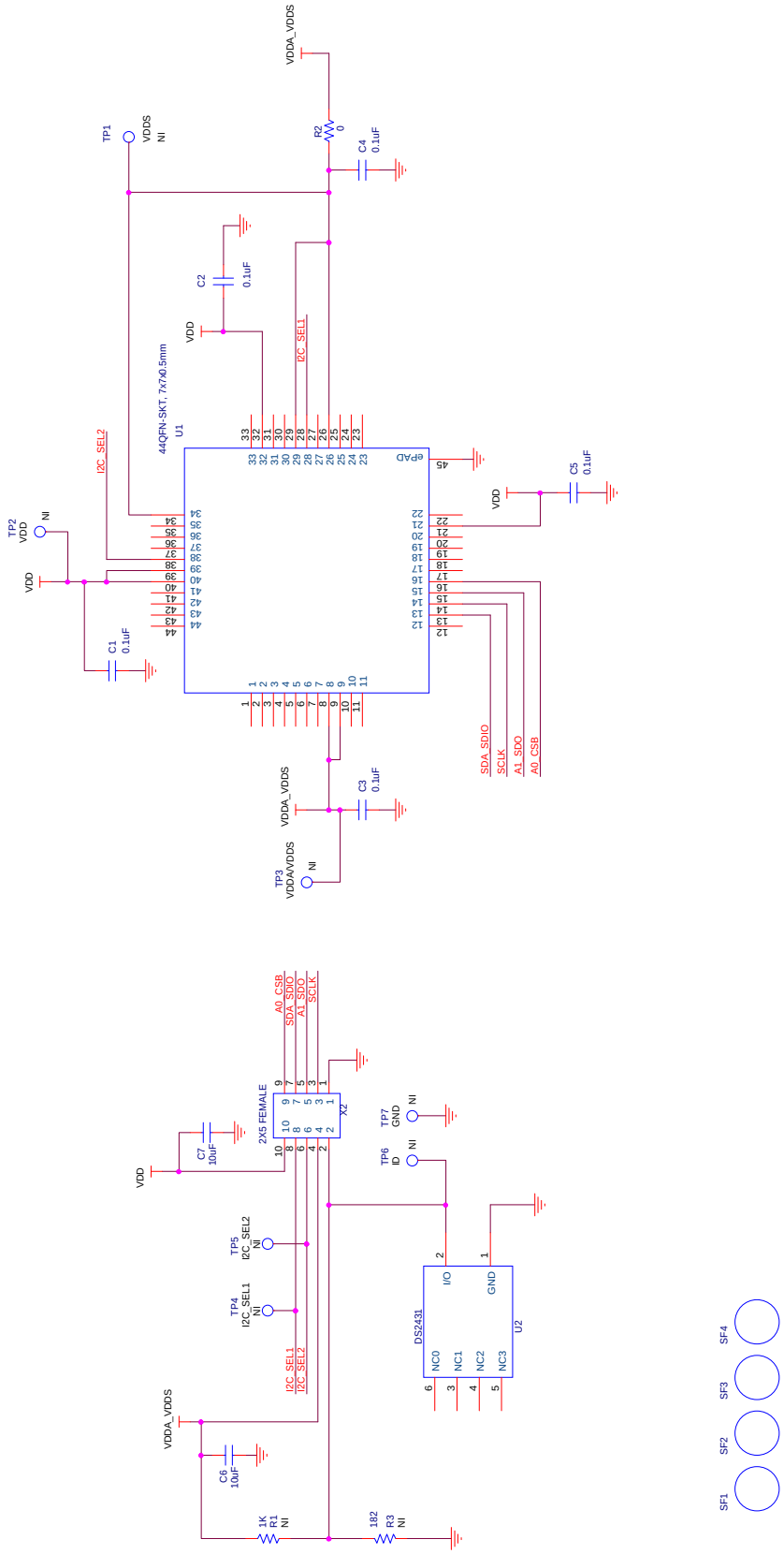


Figure 35. 44-Pin Socket Board Schematic

7. Bill of Materials

7.1. CBPROG-DONGLE Bill of Materials

NI	Quantity	Reference	Value	Rating	Voltage	Tolerance	Type	PCB_Footprint	ManufacturerPN	Manufacturer
	9	C2 C3 C8 C11 C26 C28 C30 C31 C32	1uF		16V	±10%	X7R	C0603	C0603X7R160-105K	Venkel
	3	C24 C27 C29	0.01uF		16V	±20%	X7R	C0603	C0603X7R160-103M	Venkel
	1	C39	33pF		25V	±10%	C0G	C0402	C0402C0G250-330K	Venkel
	9	C4 C6 C12 C13 C14 C35 C36 C37 C38	0.1uF		10V	±10%	X7R	C0402|C0402L	C0402X7R100-104K	Venkel
	2	C5 C25	4.7uF		10V	±20%	X7R	C1206	C1206X7R100-475M	Venkel
	1	C9	10uF		10V	±20%	X7R	C1206	C1206X7R100-106M	Venkel
	2	D14 D15	LTL-14CHJ	20mA				LED-T1-KK	LTL-14CHJ	LITE-ON TECHNOLOGY CORP
	1	D5	SP0503BAHT	300mW	20V		TVS	SOT143-AKKK|SOT143	SP0503BAHTG	Littlefuse
	7	D6 D7 D8 D9 D10 D11 D12	GL05T-E3-08	5A	11V		Dual Common Anode	SOT23-123	GL05T-E3-08	Vishay
	1	FB1	22 Ohm	6000mA			SMT	L0805	BLM21PG220SN1	MuRata
	1	J2	USB Type B				USB	CONN-USB-B	61729-0010BLF	FCI
	1	J3	ENCLOSURE					N/A	Emulator7045	Shanghai Zhongxingda Electronics
	4	R1 R11 R12 R65	1K	1/16W		±1%	ThickFilm	R0402	CR0402-16W-1001F	Venkel
	10	R13 R16 R26 R27 R40 R41 R42 R43 R59 R67	10K	1/16W		±1%	ThickFilm	R0402|R0402L	CR0402-16W-1002F	Venkel
	4	R14 R15 R24 R25	2.49K	1/16W		±1%	ThickFilm	R0402	CR0402-16W-2491F	Venkel
	1	R28	1.0	1/16W		±1%	ThickFilm	R0402	CR0402-16W-1R00F	Venkel
	8	R29 R30 R31 R32 R35 R37 R38 R68	0	1A			ThickFilm	R0402|R0402L	CR0402-16W-000	Venkel
	1	R3	100	1/16W		±1%	ThickFilm	R0402	CR0402-16W-1000F	Venkel
	1	R33	4.42K	1/16W		±1%	ThickFilm	R0402	CR0402-16W-4421F	Venkel
	1	R34	9.53K	1/16W		±1%	ThickFilm	R0402	CR0402-16W-9531F	Venkel
	1	R36	5.9K	1/16W		±1%	ThickFilm	R0402	CR0402-16W-5901F	Venkel
	2	R39 R66	1.0	3/4W		±1%	ThickFilm	R1210	CRCW12101R00FKEAHP	Vishay Dale
	2	R44 R47	8.06K	1/16W		±0.1%	±25PPM	R0402	TFCR0402-16W-E-8061B	Venkel
	2	R45 R48	17.4K	1/16W		±1%	ThickFilm	R0402	CR0402-16W-1742F	Venkel
	2	R46 R49	21.5K	1/16W		±1%	ThickFilm	R0402	CR0402-16W-2152F	Venkel
	2	R50 R51	20K	1/10W		±1%	ThickFilm	R0603	CR0603-10W-2002F	Venkel
	4	R55 R56 R57 R58	402	1/16W		±1%	ThickFilm	R0402	CR0402-16W-4020F	Venkel
	1	R62	499	1/16W		±1%	ThickFilm	R0402|R0402L	CR0402-16W-4990F	Venkel
	2	R63 R64	470	1/16W		±5%	ThickFilm	R0402	CR0402-16W-471J	Venkel
	2	R9 R10	10.0K	1/10W		±0.1%	±25PPM	R0603	ERA-3AEB103V	Panasonic
	2	SF1 SF2	BUMPER					RUBBER_FOOT_0.250"	SJ5382	3M
	2	SF3 SF4	SPACER					N/A	7363	Keystone Electronics
	1	U1	DS2431					SOJ6N4.45P1.27	DS2431P+	Maxim
	1	U12	TPS76201	100mA			LDO	SOT5N2.8P0.95	TPS76201DBV	TI
	2	U13 U14	TPS79501	500mA			LDO	DFN8N3.0P0.65E2.4X1.65	TPS79501DRBT	TI
	1	U16	ADG719					SOT6N2.8P0.95	ADG719BRTZ	Analog Devices
	1	U17	NLSV1T244		.9-4.5V		Buffer	UDFN6N1P0.4	NLSV1T244MUTBG	On Semi
	1	U2	C8051F380				MCU	QFP48N9X9P0.5	CF380P1104AGQ	SiLabs
	2	U3 U8	ADG712					TSSOP16N6.4P0.65	ADG712BRU	Analog Devices
	1	U5	LTC4311		5.5V			SC70-6N2.1P0.65	LTC4311CSC6#TRMPBF	Linear Technology
	1	U6	PCA9517D				I2C	SO8N6.0P1.27	PCA9517D	NXP
	1	X1	2X5 Header				Shrouded	CONN2X5-RA-SBH11	SBH11-PBPC-D05-RA-BK	Sullins Connector Solutions

Not Installed Components

NI	Quantity	Reference	Value	Rating	Voltage	Tolerance	Type	PCB_Footprint	ManufacturerPN	Manufacturer
NI	2	C10 C40	1uF		16V	±10%	X7R	C0603	C0603X7R160-105K	Venkel
NI	1	C7	0.1uF		10V	±10%	X7R	C0402|C0402L	C0402X7R100-104K	Venkel
NI	1	JP1	HEADER 4X1				Header	CONN-1X4	TSW-104-07-T-S	Samtec
NI	2	R60 R61	0	1A			ThickFilm	R0603	CR0603-16W-000	Venkel
NI	5	TP1 TP2 TP3 TP9 TP10	RED				Loop	TESTPOINT	151-207-RC	Kobiconn
NI	1	TP7	BLUE				Loop	TESTPOINT	151-205-RC	Kobiconn
NI	1	TP8	BLACK				Loop	TESTPOINT	151-203-RC	Kobiconn
NI	1	U4	AD8628		5V		OPAMP	SOT23-5N	AD8628AUJ-R2	Analog Devices

7.2. Si538x4x-64SKT-DK Socket Board BOM

NI	Quantity	Reference	Value	Rating	Voltage	Tolerance	Type	PCB_Footprint	ManufacturerPN	Manufacturer
	6	C1 C2 C3 C4 C5 C6	0.1uF		10V	±10%	X7R	C0402|C0402L	C0402X7R100-104K	Venkel
	2	C7 C8	10uF		10V	±20%	X7R	C1206	C1206X7R100-106M	Venkel
	1	R2	0	1A			ThickFilm	R0402|R0402L	CR0402-16W-000	Venkel
	4	SF1 SF2 SF3 SF4	BUMPER					RUBBER_FOOT_SMALL	SJ61A6	3M
	1	U1	64QFN-SKT, 9x9x0.5mm				QFN	QFN64N9X9P0.5-SKT-WELLS-CTI	790-42064-101G	Sensata
	1	U2	DS2431					SOJ6N4.45P1.27	DS2431P+	Maxim
	1	X1	2X5 FEMALE				CONN	CONN2X5-FRA-SFH11	SFH11-PBPC-D05-RA-BK	Sullins Connector Solutions
Not Installed Components										
NI	Quantity	Reference	Value	Rating	Voltage	Tolerance	Type	PCB_Footprint	ManufacturerPN	Manufacturer
NI	1	R1	1K	1/16W		±1%	ThickFilm	R0402	CR0402-16W-1001F	Venkel
NI	1	R3	20K	1/16W		±1%	ThickFilm	R0402	CR0402-16W-2002F	Venkel
NI	3	TP1 TP2 TP3	RED				Loop	TESTPOINT	151-207-RC	Kobiconn
NI	2	TP4 TP5	BLUE				Loop	TESTPOINT	151-205-RC	Kobiconn
NI	1	TP6	BLACK				Loop	TESTPOINT	151-203-RC	Kobiconn

7.3. Si538x4x-44SKT-DK Socket Board Bill of Materials

NI	Quantity	Reference	Value	Rating	Voltage	Tolerance	Type	PCB_Footprint	ManufacturerPN	Manufacturer
	5	C1 C2 C3 C4 C5	0.1uF		10V	±10%	X7R	C0402|C0402L	C0402X7R100-104K	Venkel
	2	C6 C7	10uF		10V	±20%	X7R	C1206	C1206X7R100-106M	Venkel
	1	R2	0	1A			ThickFilm	R0402|R0402L	CR0402-16W-000	Venkel
	4	SF1 SF2 SF3 SF4	BUMPER					RUBBER_FOOT_SMALL	SJ61A6	3M
	1	U1	44QFN-SKT, 7x7x0.5mm				QFN	QFN44N7X7P0.5-SKT-WELLS-CTI	790-41044-101G	Sensata
	1	U2	DS2431					SOJ6N4.45P1.27	DS2431P+	Maxim
	1	X2	2X5 FEMALE				CONN	CONN2X5-FRA-SFH11	SFH11-PBPC-D05-RA-BK	Sullins Connector Solutions
Not Installed Components										
NI	Quantity	Reference	Value	Rating	Voltage	Tolerance	Type	PCB_Footprint	ManufacturerPN	Manufacturer
NI	1	R1	1K	1/16W		±1%	ThickFilm	R0402	CR0402-16W-1001F	Venkel
NI	1	R3	182	1/16W		±1%	ThickFilm	R0402	CR0402-16W-1820F	Venkel
NI	3	TP1 TP2 TP3	RED				Loop	TESTPOINT	151-207-RC	Kobiconn
NI	3	TP4 TP5 TP6	BLUE				Loop	TESTPOINT	151-205-RC	Kobiconn
NI	1	TP7	BLACK				Loop	TESTPOINT	151-203-RC	Kobiconn

Contact Information

Silicon Laboratories Inc.
400 West Cesar Chavez
Austin, TX 78701
Tel: 1+(512) 416-8500
Fax: 1+(512) 416-9669
Toll Free: 1+(877) 444-3032

Please visit the Silicon Labs Technical Support web page:
https://www.siliconlabs.com/support/pages/contacttechnicalsupport.aspx
and register to submit a technical support request.

Patent Notice

Silicon Labs invests in research and development to help our customers differentiate in the market with innovative low-power, small size, analog-intensive mixed-signal solutions. Silicon Labs' extensive patent portfolio is a testament to our unique approach and world-class engineering team.

The information in this document is believed to be accurate in all respects at the time of publication but is subject to change without notice. Silicon Laboratories assumes no responsibility for errors and omissions, and disclaims responsibility for any consequences resulting from the use of information included herein. Additionally, Silicon Laboratories assumes no responsibility for the functioning of undescribed features or parameters. Silicon Laboratories reserves the right to make changes without further notice. Silicon Laboratories makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Silicon Laboratories assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. Silicon Laboratories products are not designed, intended, or authorized for use in applications intended to support or sustain life, or for any other application in which the failure of the Silicon Laboratories product could create a situation where personal injury or death may occur. Should Buyer purchase or use Silicon Laboratories products for any such unintended or unauthorized application, Buyer shall indemnify and hold Silicon Laboratories harmless against all claims and damages.

Silicon Laboratories and Silicon Labs are trademarks of Silicon Laboratories Inc.
Other products or brandnames mentioned herein are trademarks or registered trademarks of their respective holders.