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Si535x-B20QFN-EVB

## Si5350/51 20-QFN EVALUATION BOARD USER'S GUIDE

Description

The Si535x-B20QFN-EVB is used for evaluating the Si5350/51 any-frequency, 0.0025–200 MHz CMOS clock generator + VCXO.

Features

- Fully-powered from a single USB port
- Onboard 27 MHz crystal for asynchronous operation
- SMA and test point hook for interfacing to an external clock reference
- Jumper-selectable VDD and VDDOx allows device to operate at 1.8 (VDDO only), 2.5, or 3.3 V
- Voltage supply jumpers provide easy access for use with external supplies

Functional Block Diagram
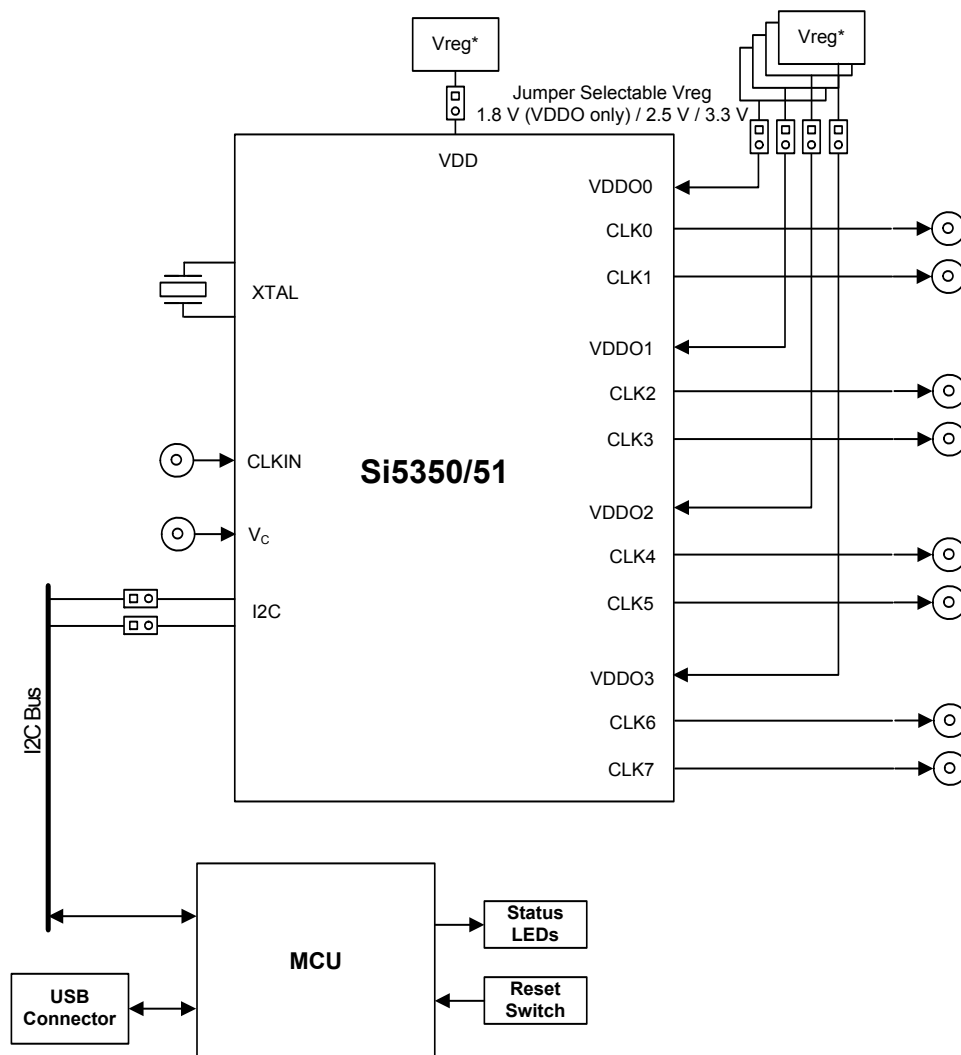
1. Functional Block Diagram

Figures 1 and 2 highlight the main features of the EVB. The onboard MCU is responsible for programming the Si535x timing IC, measuring the device's current consumption reported in the ClockBuilder™ Desktop, managing power, and controlling status LEDs. VDD and VDDO jumpers allow the option of choosing between 1.8 (VDDO only), 2.5, and 3.3 V or powering the device with external supplies (see Section "2. Jumpers" for details). I²C jumpers allow the Si535x to be disconnected from the I²C bus, allowing external control from another I²C master.

The Si5350 device on this board is a hybrid of the Si5350/51 A, B, and C variants. It can run in stand-alone asynchronous mode (Si5350/51A) using the onboard 27 MHz XTAL (Y1), or it can be synchronized to an external clock using the CLKIN SMA connector or test points (Si5350/51C). It can also accept a V_C input when in VCXO (Si5350/51B) mode.

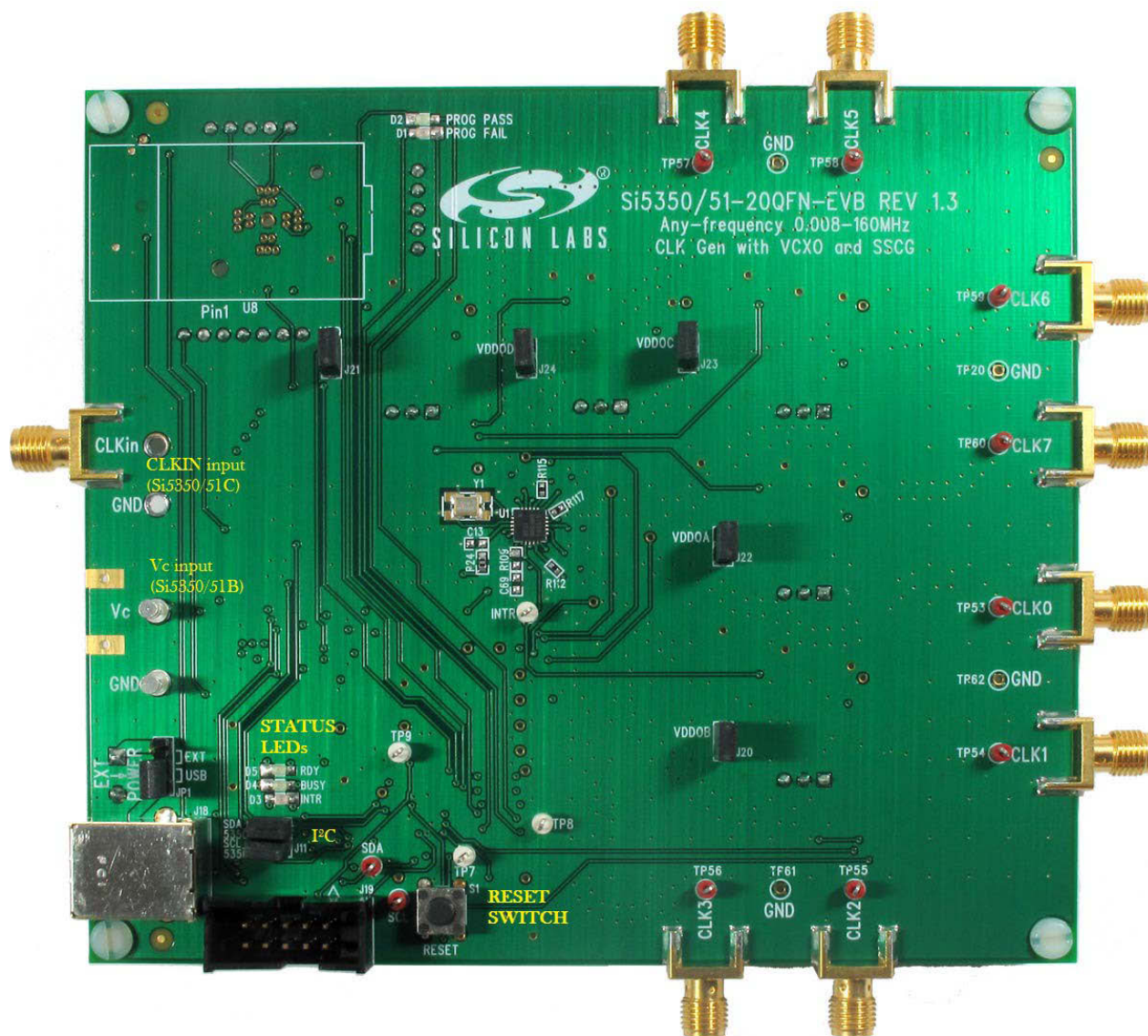**Note:** EVBs labelled "REV 1.1" or "REV 1.2" are populated with rev A devices.

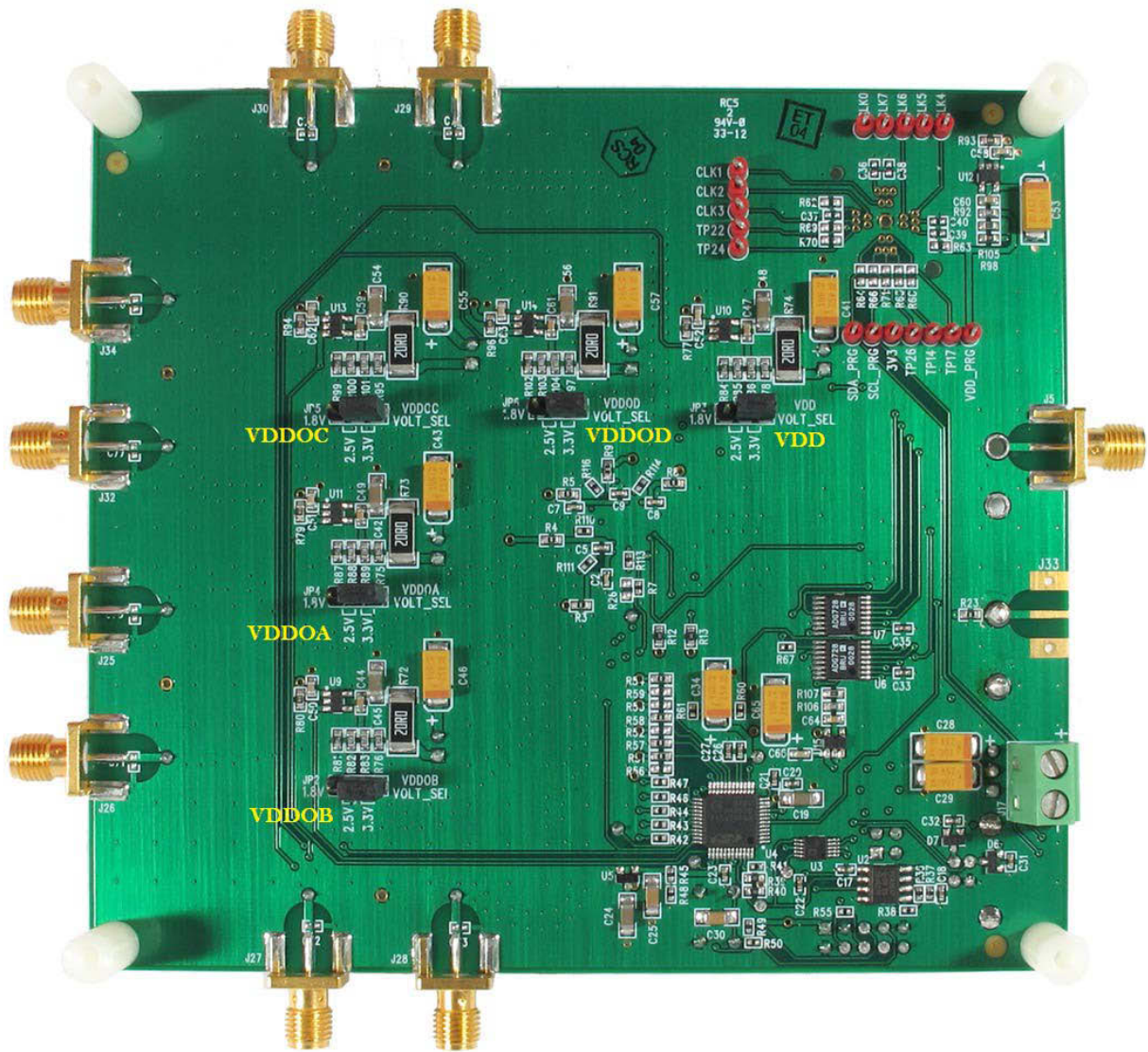**Figure 1. EVB Features (Front)**

Figure 2. EVB Features (Back)

2. Jumpers

The following jumpers are available on the evaluation board:

- **VDD—**Connects the Si5350/51 pin to the VDD voltage regulator (normally installed).
- **VDD VOLT_SEL**—Allows user to select a VDD voltage of 2.5 V or 3.3 V (default 3.3 V).
- **VDDOA**—Connects the Si5350/51 pin to the VDDOA voltage regulator (normally installed).
- **VDDOA VOLT_SEL**—Allows user to select a VDDOA voltage of 1.8 (jumper removed), 2.5, or 3.3 V (default).
- **VDDOB**—Connects the Si5350/51 pin to the VDDOB voltage regulator (normally installed).
- **VDDOB VOLT_SEL**—Allows user to select a VDDOB voltage of 1.8 (jumper removed), 2.5, or 3.3 V (default).
- **VDDOC**—Connects the Si5350/51 pin to the VDDOC voltage regulator (normally installed).
- **VDDOC VOLT_SEL**—Allows user to select a VDDOC voltage of 1.8 (jumper removed), 2.5, or 3.3 V (default).
- **VDDOD**—Connects the Si5350/51 pin to the VDDOD voltage regulator (normally installed).
- **VDDOD VOLT_SEL**—Allows user to select a VDDOD voltage of 1.8 (jumper removed), 2.5, or 3.3 V (default).
- **SCL**—Connects the Si5350/51 SCL pin to the I^{2}C bus from the MCU. Removing the jumper breaks the connection to the MCU and allows the user to feed in an external I^{2}C signal to the device.
- **SDA**—Connects the Si5350/51 SDA pin to the I^{2}C bus from the MCU. Removing the jumper breaks the connection to the MCU and allows the user to feed in an external I^{2}C signal to the device.
- **EXT POWER**—Allows user to select between 5 V USB supply and 5 V external supply on J17. See Figure 1 for jumper locations.

3. Status LEDs

There are three status LEDs on the evaluation board:

- RDY (Green)—Indicates that the EVB is operating normally. This LED should always be on.
- BUSY (Green)—Indicates that the on-board MCU is communicating with the device and/or the USB host.
- INTR (Red)—Indicates device or EVB fault condition (also on when DUT hasn't been programmed).

4. Clock Inputs

The EVB can operate in asynchronous mode using the onboard 27 MHz crystal, synchronous mode using an external CMOS clock source, or both modes. An SMA connector and test points are provided to interface an external clock source to CLKIN. Additionally, in the Si5350/51B mode, V_C input can be applied to either the V_C test point or SMA connection.

5. Clock Outputs

Outputs can be measured using either SMA cables attached directly to an oscilloscope (recommended) or with high impedance probes at the output clock test loops (TP53-TP60).

Clock voltage levels can be 1.8, 2.5, or 3.3 V depending on the VDDOx VOLT_SEL jumper selection.

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6. Software Guide

The evaluation kit software toolset can be downloaded from www.silabs.com/Si5351-EVB. The toolset consists of the following two applications:

- ClockBuilder Desktop—Used to set up and evaluate the part and to save custom register map files.
- Register Programmer—Used to program individual registers on the evaluation board DUT.

6.1. Quick Start

1. Install the ClockBuilder™ Desktop software and driver (assumes that Microsoft .NET Framework 1.1 is already installed).
2. Connect a USB cable from the EVB to the PC.
3. Leave the jumpers as installed from the factory, and launch the software by clicking on Start → Programs → Silicon Laboratories → ClockBuilder Desktop. Click on one of the shortcuts in the group.

6.2. ClockBuilder Desktop Software Installation

The following sections describe how to install and use the software. There is a readme.txt file with the installation files as well as a software user guide installed with the software.

6.2.1. System Requirements

- Microsoft Windows® 2000, XP, Vista, 7
- USB 2.0
- 3 MB of free hard drive space
- 1024 x 768 screen resolution or greater
- Microsoft .NET Framework 1.1
- USBXpress 3.1.1 driver

Note: USBXpress 3.1.1 driver is provided and installed with the software. Newer or older versions of USBXpress available from other EVB kits or online have not been tested with this software.

6.2.2. Microsoft .NET Framework Installation

The Microsoft .NET Framework is required before installing and running the software. Details and installation information about the .NET Framework are available via a shortcut in the NETFramework directory or at the following web site:

www.microsoft.com/downloads/details.aspx?FamilyId=262D25E3-F589-4842-8157-034D1E7CF3A3&displaylang=en

There are multiple versions of the .NET Framework available from Microsoft, and they can be installed side-by-side on the same computer. The software requires Version 1.1 but can run under other versions. Contact your system administrator for more details.

6.2.3. ClockBuilder Desktop Software Installation

The ClockBuilder Desktop Software is installed from the ClockBuilderDesktopSwInstall.exe file.

1. Double-click the install file to start the wizard.
2. Follow the wizard instructions to complete the installation for both the software and the driver. Use the default installation location for best results.
3. After the installation is complete, click on Start → Programs → Silicon Laboratories → ClockBuilder Desktop Software. Select one of the items in the menu including the User Guide to get more details on how to run the software.

6.2.4. ClockBuilder Desktop Software Uninstall Instructions

Close all the programs and help files before running the uninstaller to ensure complete removal of the software. To uninstall the software, use the Add and Remove Programs utility in the Control Panel or click Start → Programs → Silicon Laboratories → ClockBuilder Desktop → Uninstaller

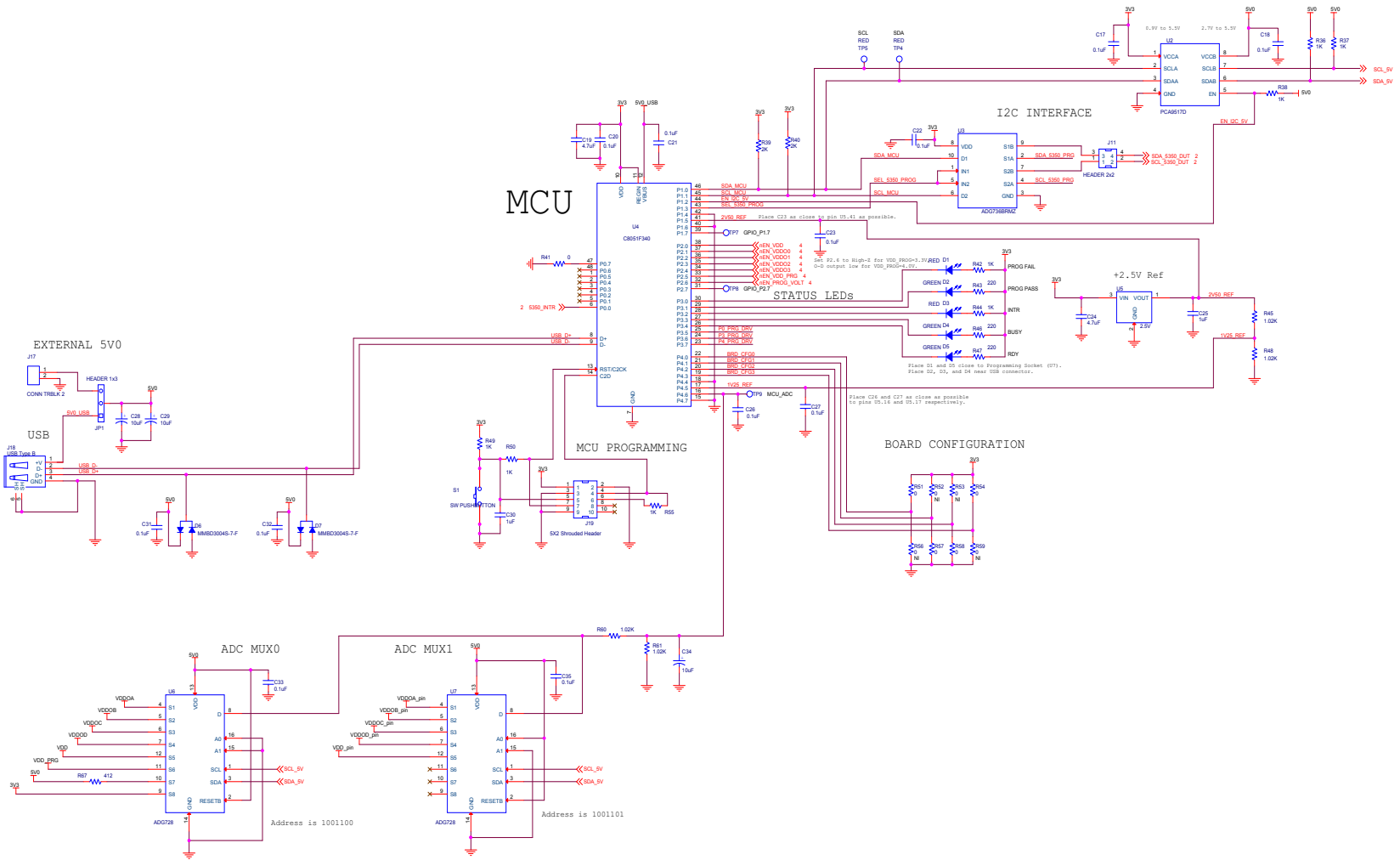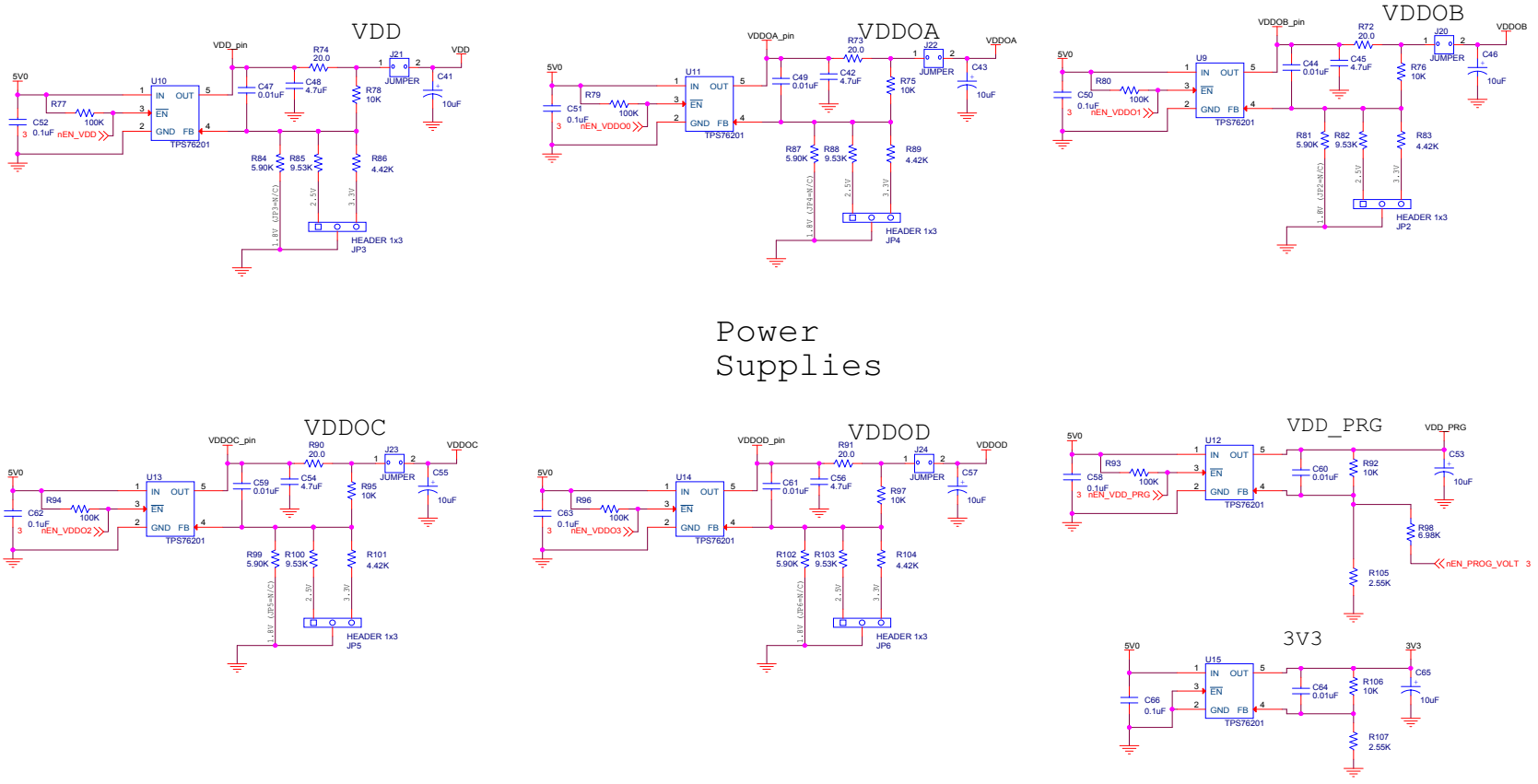**Note:** The driver software must be uninstalled separately.

Place Y1 as close to pins U1.1 and U1.2 as possible.
Remove ground plane from underneath the crystal.

Place R24/C13 as close to
pin U1.3 as possible.

CLKin must be 50-Ohm stripline.

Place R109/C69 as close
to U1.6 as possible.

Figure 3. Si5350/51 Main

Figure 4. MCU and Programming Socket

Figure 5. Power Supplies

8. Bill of Materials

Table 1. Si535x Bill of Materials

Item	Qty	Reference	Value	Manufacturer	Manufacturer Part Number
1	5	C2,C5,C7,C8,C9	0.47 µF	Venkel	C0402X5R100-474K
2	1	C13	1nF	Venkel	C0603X7R101-102K
3	12	C17,C18,C20,C21,C22,C23, C26,C27,C31,C32,C33,C35	0.1 µF	Venkel	C0402X7R100-104K
4	7	C19,C24,C42,C45,C48,C54, C56	4.7 µF	Venkel	C1206X7R100-475M
5	2	C25,C30	1 µF	Venkel	C1206X7R250-105K
6	10	C28,C29,C34,C41,C43,C46, C53,C55,C57,C65	10 µF	Kemet	B45196H5106M309
7	7	C44,C47,C49,C59,C60,C61, C64	0.01 µF	Venkel	C0603X7R160-103M
8	8	C50,C51,C52,C58,C62,C63, C66,C69	0.1 µF	Venkel	C0603X7R100-104K
9	8	C70,C71,C72,C73,C74,C75, C76,C77	1 pF	MuRata	GRM1555C1H1R2CA01D
10	2	D1,D3	RED	Panasonic	LN1271RAL
11	3	D2,D4,D5	GREEN	Panasonic	LN1371G
12	2	D6,D7	MMBD3004S-7-F	Diodes Inc.	MMBD3004S-7-F
13	6	JP1,JP2,JP3,JP4,JP5,JP6	HEADER 1x3	Samtec	TSW-103-07-T-S
14	10	J5,J25,J26,J27,J28,J29,J30, J32,J33,J34	SMA	Johnson Components	142-0701-801
15	1	J11	HEADER 2x2	Samtec	TSW-102-07-T-D
16	1	J17	CONN TRBLK 2	Phoenix Contact	1729018
17	1	J18	USB Type B	Tyco	292304-1
18	1	J19	5X2 Shrouded Header	Tyco	5103309-1
19	5	J20,J21,J22,J23,J24	JUMPER	Samtec	TSW-102-07-T-S
20	15	R3,R4,R5,R8,R9,R23,R24,R51 ,R52,R53,R54,R56,R57,R58, R59	0	Venkel	CR0603-16W-000
21	1	R7	4.99K	Venkel	CR0402-16W-4991F
22	4	R12,R13,R39,R40	2K	Venkel	CR0603-10W-2001F
23	1	R26	100K	Venkel	CR0603-10W-104J

Table 1. Si535x Bill of Materials (Continued)

Item	Qty	Reference	Value	Manufacturer	Manufacturer Part Number
24	8	R36,R37,R38,R42,R44,R49, R50,R55	1K	Venkel	CR0402-16W-102J
25	9	R41,R110,R111,R112,R113, R114,R115,R116,R117	0	Venkel	CR0402-16W-000
26	3	R43,R46,R47	220	Venkel	CR0402-16W-221J
27	4	R45,R48,R60,R61	1.02K	Venkel	TFCR0402-16W-E-1021B
28	1	R67	412	Venkel	TFCR0402-16W-E-4120B
29	5	R72,R73,R74,R90,R91	20	Venkel	CR2512-1W-20R0D
30	7	R75,R76,R78,R92,R95,R97, R106	10K	Venkel	CR0603-16W-1002F
31	6	R77,R79,R80,R93,R94,R96	100K	Venkel	CR0603-10W-1003F
32	5	R81,R84,R87,R99,R102	5.90K	Venkel	CR0603-16W-5901F
33	5	R82,R85,R88,R100,R103	9.53K	Venkel	CR0603-16W-9531F
34	5	R83,R86,R89,R101,R104	4.42K	Venkel	CR0603-16W-4421F
35	1	R98	6.98K	Venkel	CR0603-16W-6981F
36	2	R105,R107	2.55K	Venkel	CR0603-16W-2551F
37	1	R109	49.9	Venkel	CR0603-16W-49R9F
38	1	S1	SW PUSHBUTTON	Mountain Switch	101-0161-EV
39	4	TP3,TP20,TP61,TP62	BLACK	Kobiconn	151-203-RC
40	10	TP4,TP5,TP53,TP54,TP55, TP56,TP57,TP58,TP59, TP60	RED	Kobiconn	151-207-RC
41	4	TP7,TP8,TP9,TP52	WHITE	Kobiconn	151-201-RC
42	4	TP38,TP39,TP48,TP49	Turret	Mill-Max	2551-2-00-44-00-00-07-0
43	1	U1	Si5350X-B-GM	Silicon Labs	Si5350X-B-GM
44	1	U2	PCA9517D	NXP	PCA9517D
45	1	U3	ADG736BRMZ	Analog Devices	ADG736BRMZ
46	1	U4	C8051F340	SiLabs	C8051F340-GQ
47	1	U5	2.5V	Analog Devices	AD1582BRT
48	2	U6,U7	ADG728	Analog Devices	ADG728BRUZ
49	7	U9,U10,U11,U12,U13,U14,U15	TPS76201	TI	TPS76201DBV
50	1	Y1	27MHz	TXC	7M-27.000MEEQ-T

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9. Approved Crystals

The crystals listed in Table 2 have been approved for use with the Si5350/51 family of devices. Note that this device has on-chip load capacitors that can be configured for 0, 6, 8, and 10 pF. For crystals with any other rated load capacitance, external capacitors may be required to achieve the best absolute accuracy.

Table 2. Approved Crystals

Mfr	Part Number	Freq	Load Capacitance	Initial Accuracy	Stability over Temp	Web Site
Kyocera	CX3225SB25000D0FLJZ1	25 MHz	8 pF	±10 ppm	±15 ppm	http://global.kyocera.com/index.html
	CX3225SB27000D0FLJZ1	27 MHz				
Sunny	SP10115J6-25.000MHz	25 MHz	10 pF	±15 ppm	±30 ppm	http://www.sunny-usa.com/
	SP10115J6-27.000MHz	27 MHz				
NDK	NX3225GA-25.000M-STD-CRG-2	25 MHz	8 pF	±20 ppm	±30 ppm	http://www.ndk.com/en/
	NX3225GA-27.000M-STD-CRG-2	27 MHz				
Epson	FA-238 25.0000MB-K	25 MHz	10 pF	±50 ppm	±30 ppm	http://www.eea.epson.com/
TXC	7M-27.000MEEQ	27 MHz	10 pF	±10 ppm	±10 ppm	http://www.txc.com.tw

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