

## Si5350/51 EVALUATION BOARD USER'S GUIDE

### Description

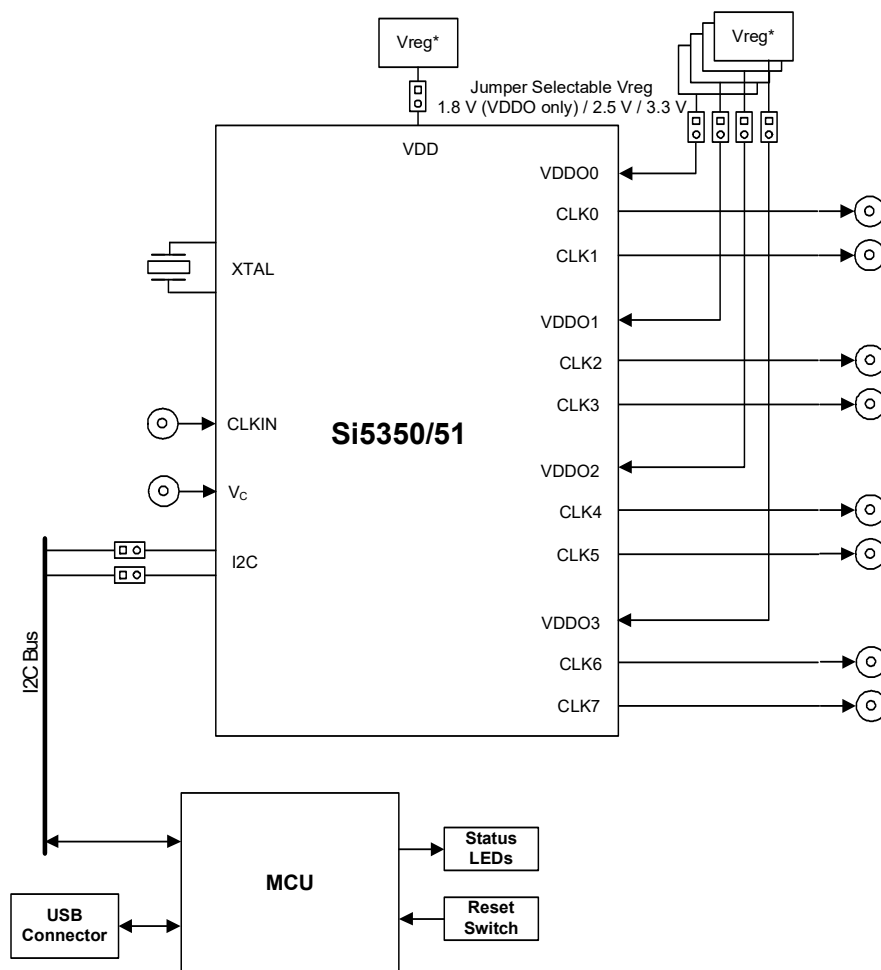
The Si535x-B20QFN-EVB is used for evaluating the Si5350/51 any-frequency, 0.0025–200 MHz CMOS clock generator + VCXO.

The pre-soldered 20-QFN device can be configured using ClockBuilder Pro to emulate all available Si5350/51 package options, including 10-MSOP, 16-QFN, and 20-QFN.

### Features

- **ClockBuilder Pro** configurable, allowing quick frequency plan analysis
- 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 V (VDDO only), 2.5, or 3.3 V
- Voltage supply jumpers provide easy access for use with external supplies

### Functional Block Diagram



# Si535x-B20QFN-EVB

## 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™ Pro EVB GUI, 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). I<sup>2</sup>C jumpers allow the Si535x to be disconnected from the I<sup>2</sup>C bus, allowing external control from another I<sup>2</sup>C master.

The Si5350 device on this board is a hybrid of the Si5350/51 A, B, and C variants. It can be configured to emulate a 10-MSOP, 16-QFN, or 20-QFN device. 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<sub>C</sub> input when in VCXO (Si5350/51B) mode.

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

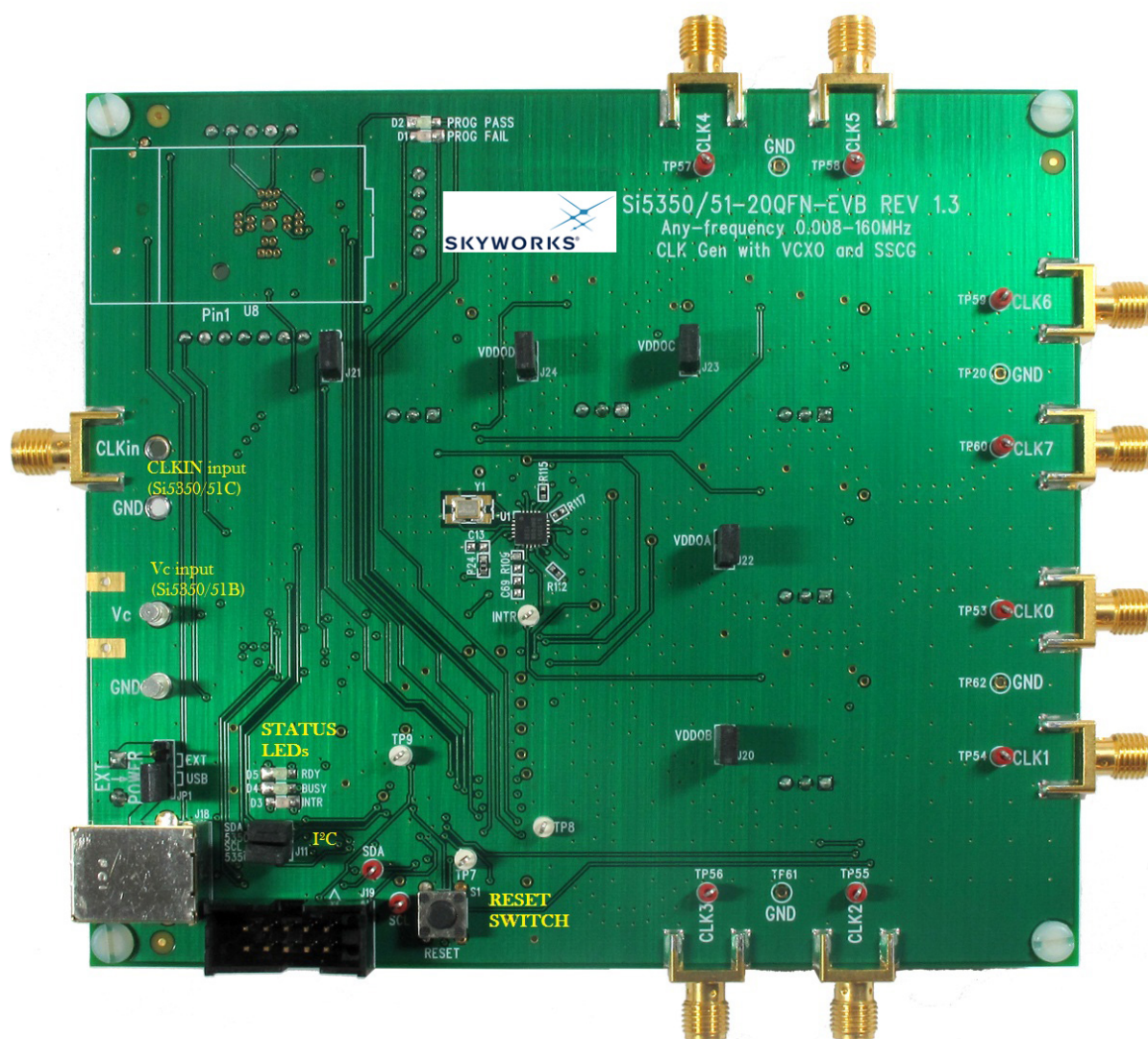


Figure 1. EVB Features (Front)

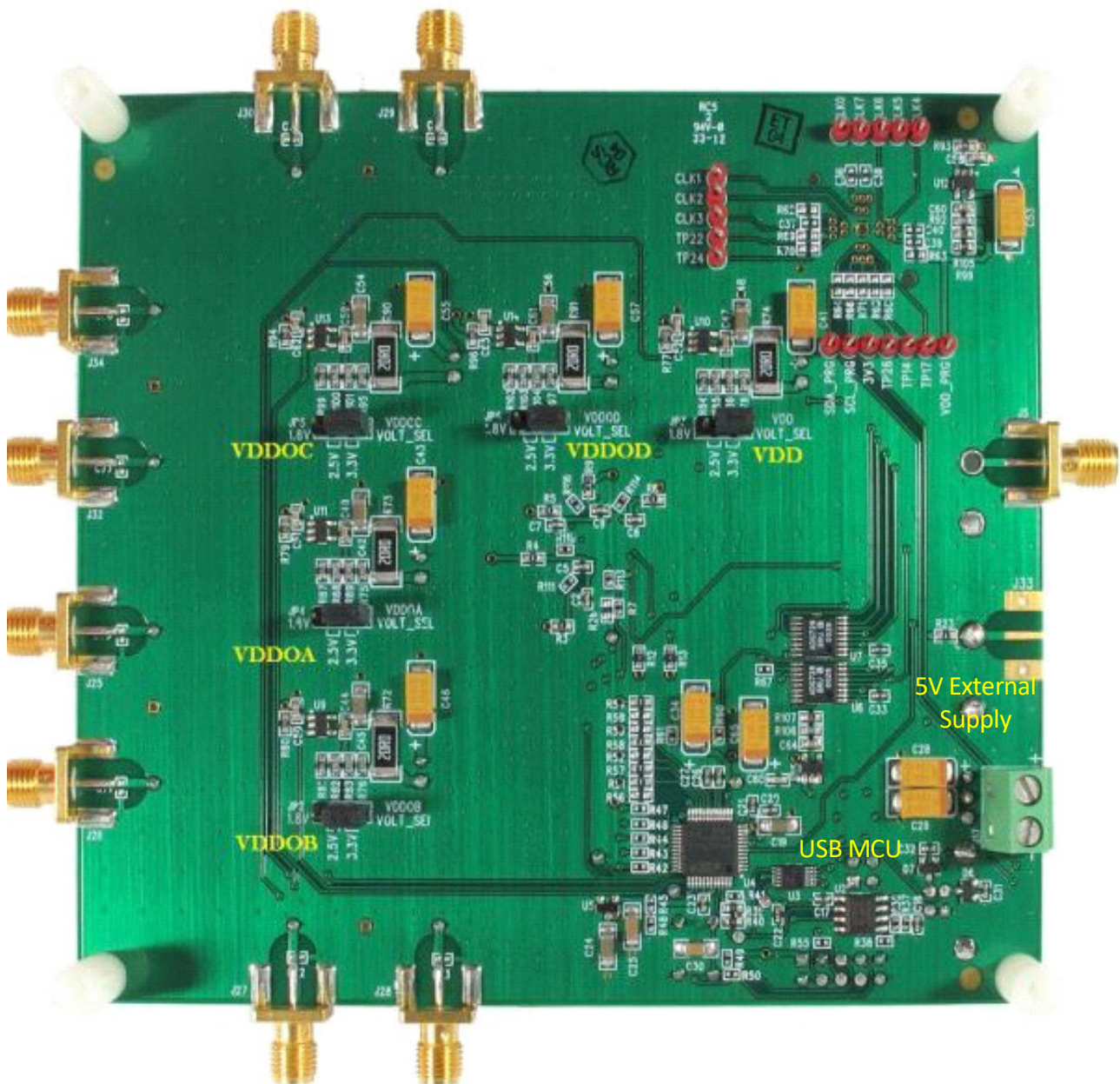


Figure 2. EVB Features (Back)

# Si535x-B20QFN-EVB

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## 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<sup>2</sup>C bus from the MCU. Removing the jumper breaks the connection to the MCU and allows the user to feed in an external I<sup>2</sup>C signal to the device.
- **SDA**—Connects the Si5350/51 SDA pin to the I<sup>2</sup>C bus from the MCU. Removing the jumper breaks the connection to the MCU and allows the user to feed in an external I<sup>2</sup>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<sub>C</sub> input should be applied to either the V<sub>C</sub> test point or SMA connection.

## 5. Clock Outputs

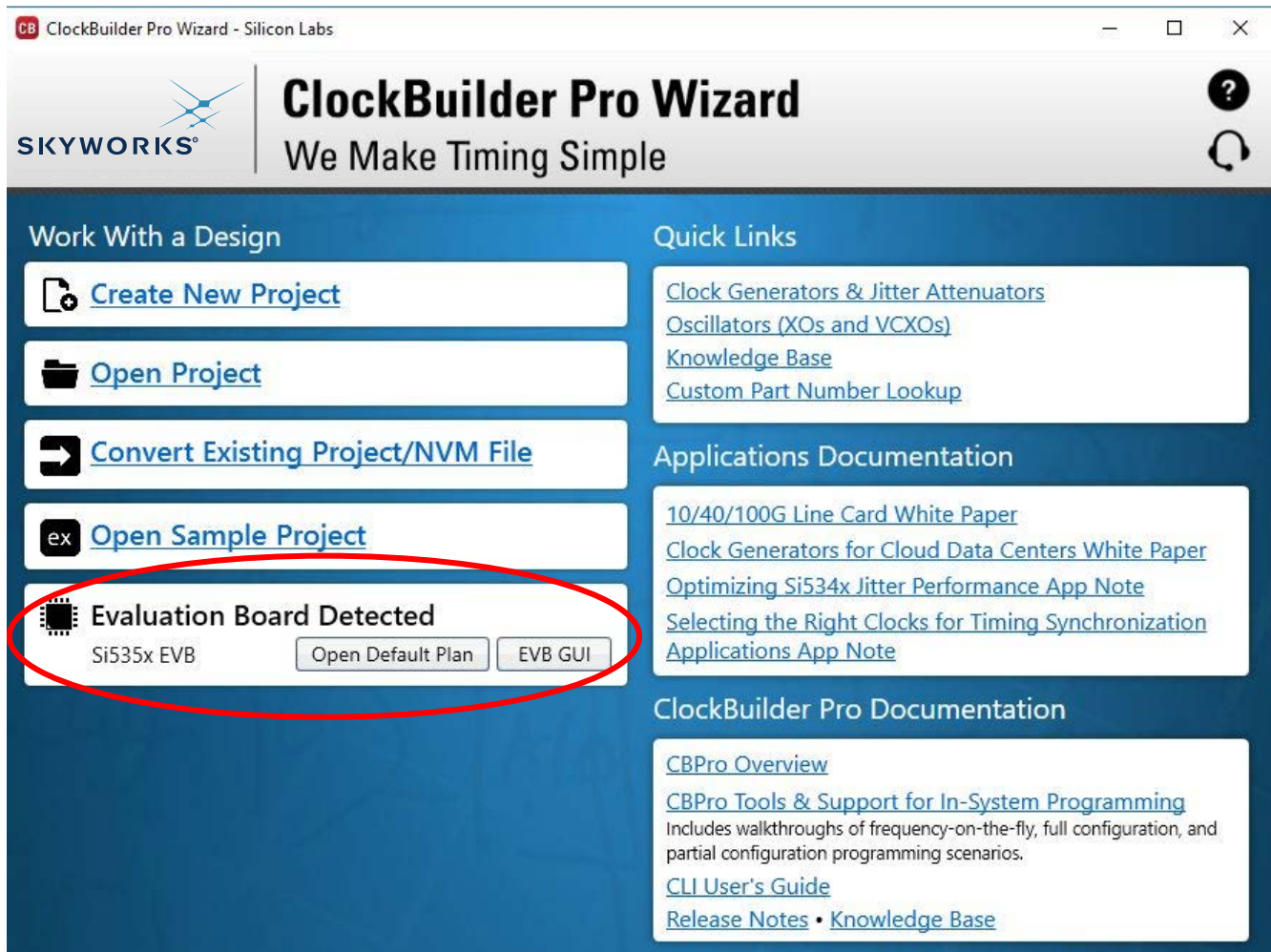
Outputs can be measured using either SMA cables attached directly to a high-input impedance oscilloscope (recommended) or with high impedance probes at the output clock test loops (TP53-TP60).

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

## 6. Software Guide

The Si535x-B20QFN-EVB is fully compatible with [ClockBuilder Pro](#). This software can be used to program the pre-soldered hybrid Si5350/51 device to emulate any type of Si5350/51 part, including A/B/C variants, in 10-MSOP, 16-QFN, or 20-QFN packages.

To program the device, just connect the Si535x-B20QFN-EVB to a computer running ClockBuilder Pro using the provided USB Cable. With the ClockBuilder Pro software opened and the EVB connected, a "Si535x EVB" will show up on the main ClockBuilder Pro Wizard page.



**Figure 3. ClockBuilder Pro Wizard with the Si535x EVB Connected**

From this page, either open a default EVB plan, open an existing Si535x A/B/C ClockBuilder Pro project file using the Open Project button, or create a new Si535x A/B/C project file using the Create New Project button. Once a project file is opened, it can be written to the EVB in the Design Dashboard. When a 10-MSOP or 16-QFN project is written to the EVB, an additional GUI will pop-up to show which CLK outputs on the EVB apply to that package type.

Once a configuration has been finalized, a project file can either be used to create a custom-orderable Si5350/51 part number, or the register file can be exported for easy in system volatile programming.

The ClockBuilder Pro EVB GUI can also be used to view or modify individual Si5351 registers as well as monitor the device's power consumption.

# Si535x-B20QFN-EVB

## 7. Si535x-B20QFN-EVB Schematics

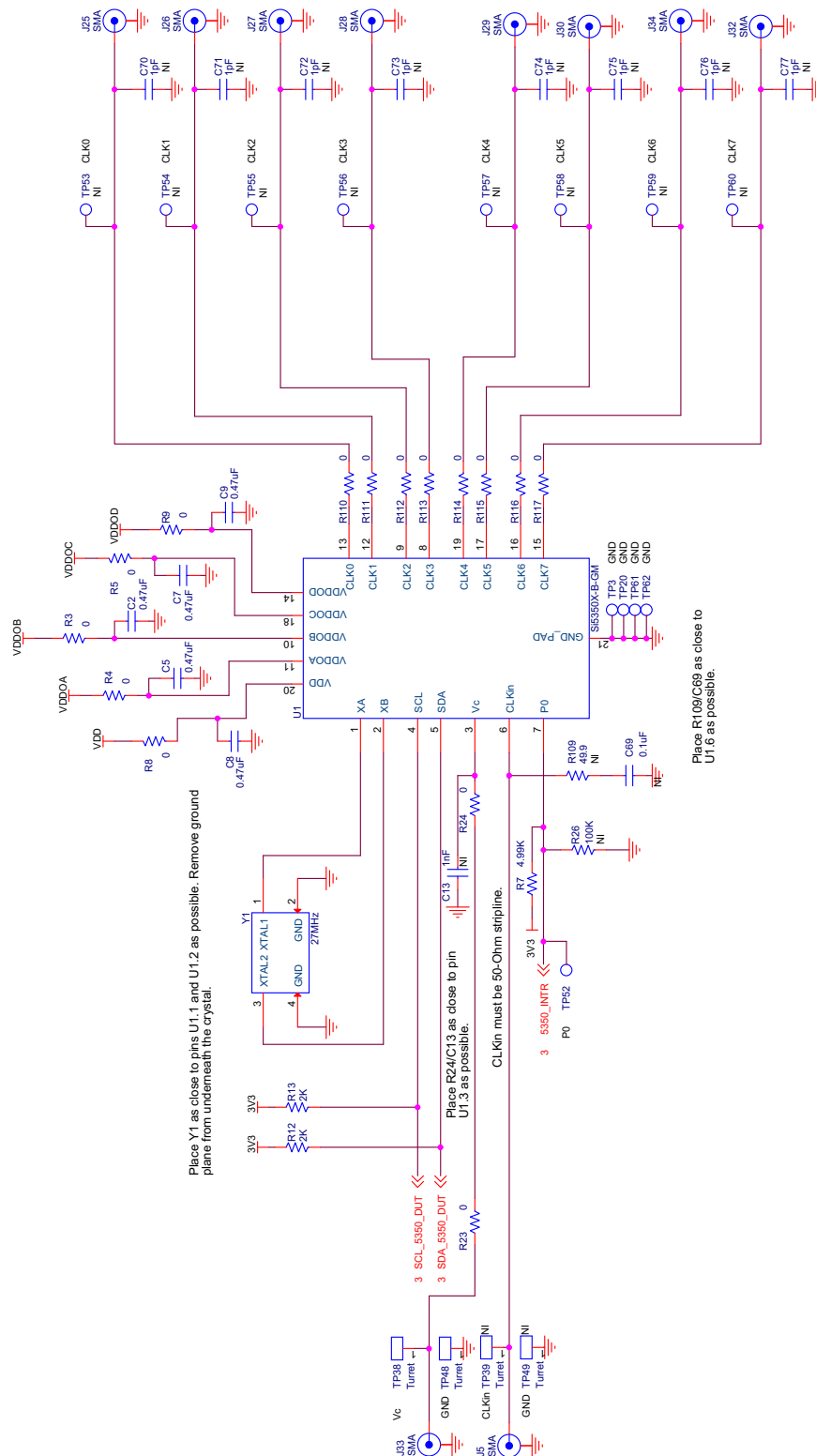


Figure 4. Si5350/51 Main

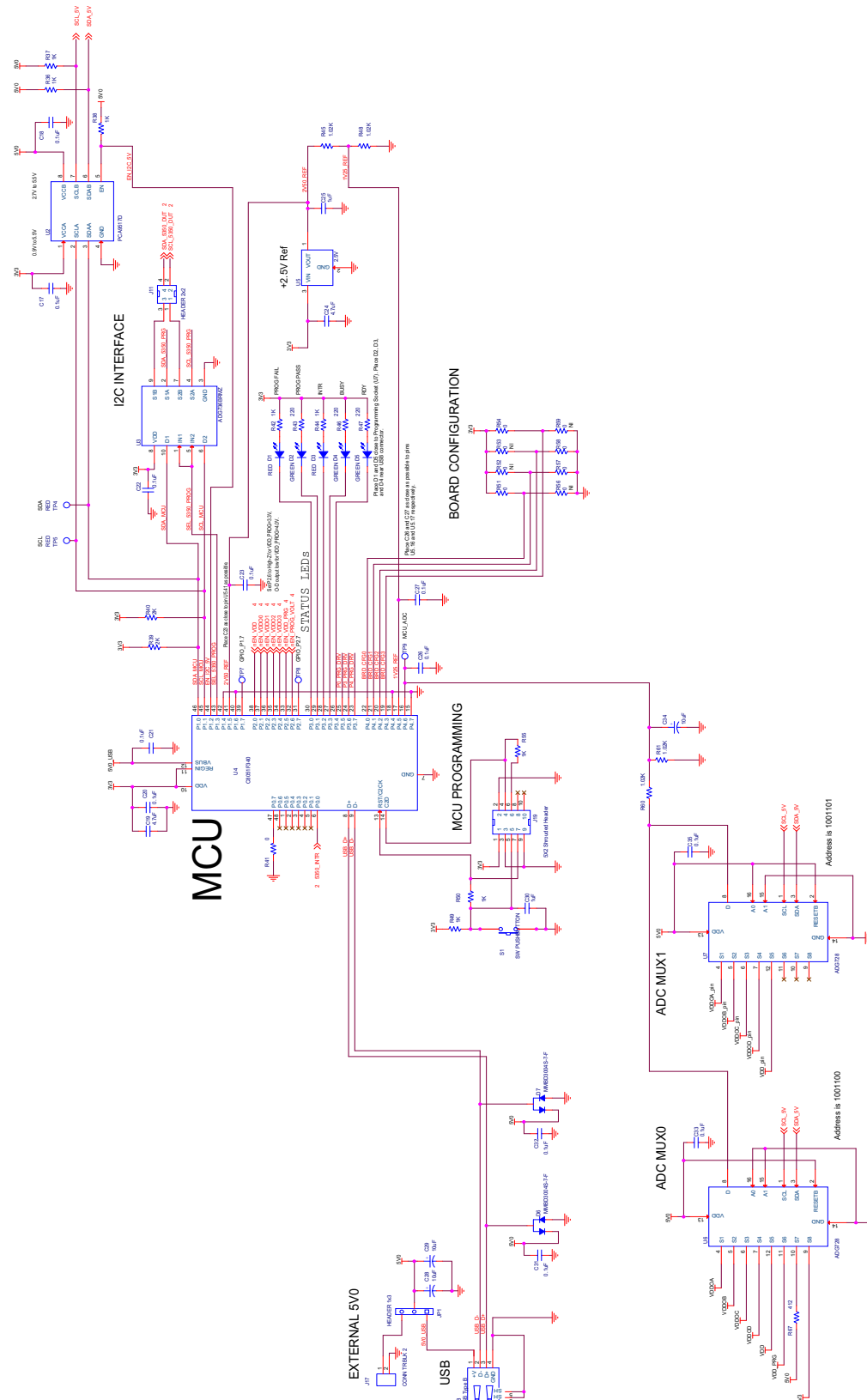
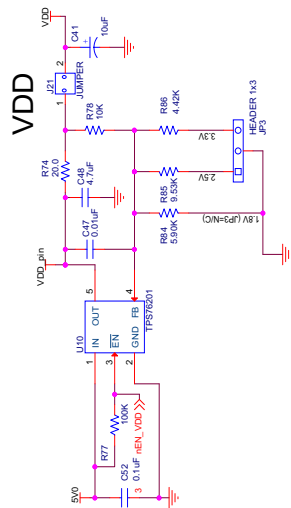
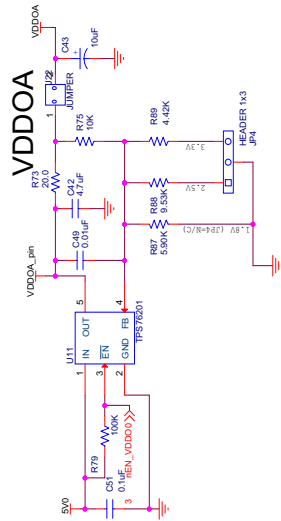
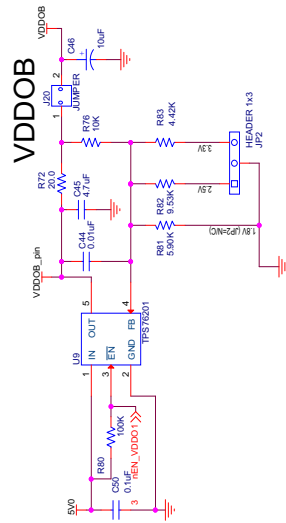
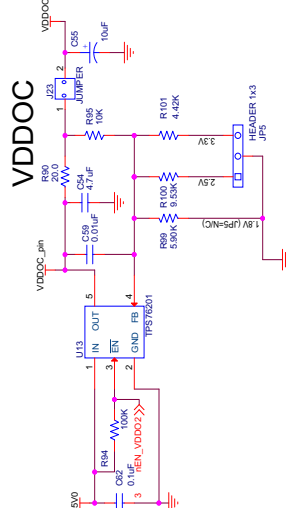
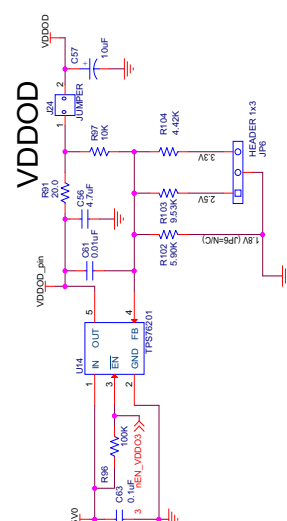
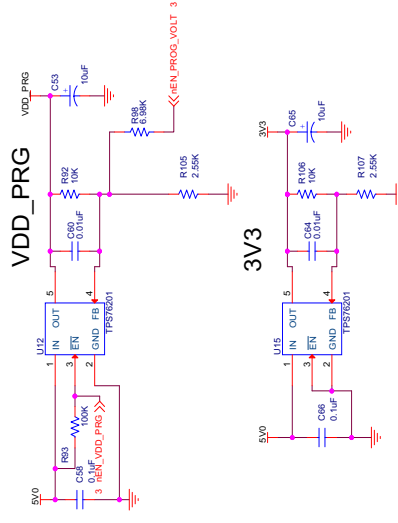


Figure 5. MCU and Programming Socket

# Si535x-B20QFN-EVB



## Power Supplies



### Figure 6. 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 $\mu$ F        | Venkel             | C0402X5R100-474K         |
| 2    | 1   | C13                                                            | 1nF                 | Venkel             | C0603X7R101-102K         |
| 3    | 12  | C17,C18,C20,C21,C22,C23,<br>C26,C27,C31,C32,C33,C35            | 0.1 $\mu$ F         | Venkel             | C0402X7R100-104K         |
| 4    | 7   | C19,C24,C42,C45,C48,C54,<br>C56                                | 4.7 $\mu$ F         | Venkel             | C1206X7R100-475M         |
| 5    | 2   | C25,C30                                                        | 1 $\mu$ F           | Venkel             | C1206X7R250-105K         |
| 6    | 10  | C28,C29,C34,C41,C43,C46,<br>C53,C55,C57,C65                    | 10 $\mu$ F          | Kemet              | B45196H5106M309          |
| 7    | 7   | C44,C47,C49,C59,C60,C61,<br>C64                                | 0.01 $\mu$ F        | Venkel             | C0603X7R160-103M         |
| 8    | 8   | C50,C51,C52,C58,C62,C63,<br>C66,C69                            | 0.1 $\mu$ F         | Venkel             | C0603X7R100-104K         |
| 9    | 8   | C70,C71,C72,C73,C74,C75,<br>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,<br>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,<br>R52,R53,R54,R56,R57,R58,<br>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          |

# Si535x-B20QFN-EVB

**Table 1. Si535x Bill of Materials (Continued)**

| Item | Qty | Reference                                               | Value         | Manufacturer       | Manufacturer Part Number |
|------|-----|---------------------------------------------------------|---------------|--------------------|--------------------------|
| 24   | 8   | R36,R37,R38,R42,R44,R49,<br>R50,R55                     | 1K            | Venkel             | CR0402-16W-102J          |
| 25   | 9   | R41,R110,R111,R112,R113,<br>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,<br>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<br>Switch | 101-0161-EV              |
| 39   | 4   | TP3,TP20,TP61,TP62                                      | BLACK         | Kobiconn           | 151-203-RC               |
| 40   | 10  | TP4,TP5,TP53,TP54,TP55,<br>TP56,TP57,TP58,TP59,<br>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  | Skyworks           | Si5350X-B-GM             |
| 44   | 1   | U2                                                      | PCA9517D      | NXP                | PCA9517D                 |
| 45   | 1   | U3                                                      | ADG736BRMZ    | Analog Devices     | ADG736BRMZ               |
| 46   | 1   | U4                                                      | C8051F340     | Skyworks           | 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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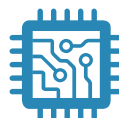
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