Si5356-EVB

Si5356 EVALUATION BOARD USER'S GUIDE

Description

The Si5356 evaluation board (EVB) is used for evaluating the Si5356 I^2C programmable, any frequency 1–200 MHz, quad frequency 8-output clock generator.

EVB Features

- Fully powered from a single USB port
- On-board 25 MHz XTAL allows standalone asynchronous operation
- GUI programmable V_{DD} supply allows device to operate from 3.3 V, 2.5 V, or 1.8 V (core)
- GUI programmable V_{DDO} supplies allows each of the four banks of outputs to have its own supply voltage selectable from 3.3 V, 2.5 V, and 1.8 V
- GUI controlled voltage, current, and power measurements of V_{DD} and all four V_{DDO} supplies.
- Voltage supply jumpers allows easy access for use of external supplies or current measurements.
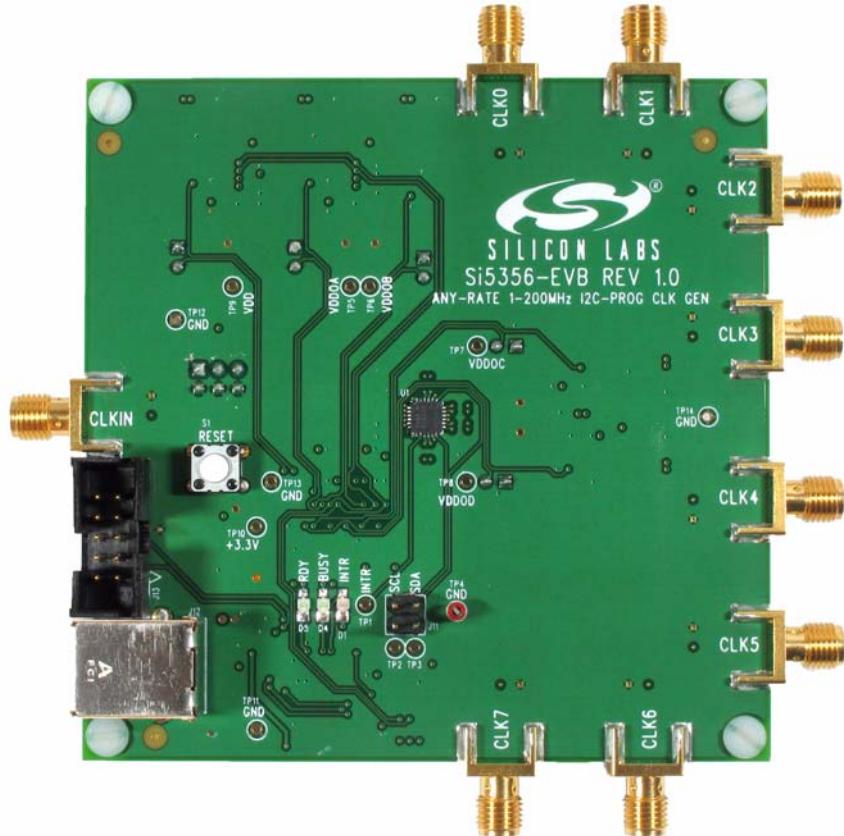

Figure 1. Si5356 Evaluation Board

Si5356-EVB

1. Quick Start

1. Install the Si5356 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 where the software was installed.
3. Leave the jumpers as installed from the factory and launch the Si5356 configuration software by clicking on **Start** → **Programs** → **Silicon Laboratories** → **ClockBuilder Desktop Software**.
4. Click on the "ClockBuilder Desktop" to configure the Si5356 using the graphical user interface.

2. Functional Description

A function block diagram of the EVB is shown in Figure 2. The MCU performs the USB to I^{2}C conversion, controls the voltage regulators, monitors the INTR pin, and controls the three status LEDs. There are five programmable voltage regulators (VDD, VDDOA, VDDOB, VDDOC, VDDOD), which supply power to the Si5356 device. VDD and VDDO jumpers allow the option of powering the device from external supplies or as a convenient point for measuring current. I^{2}C jumpers allow disconnecting the Si5356 from the I^{2}C bus to allow external control from another I^{2}C master.

The Si5356 EVB is shipped with an on-board 25 MHz XTAL to allow stand-alone asynchronous operation. The Si5356 can be synchronized to an external reference using the CLKIN input and selecting the external reference using the ClockBuilder Desktop software.
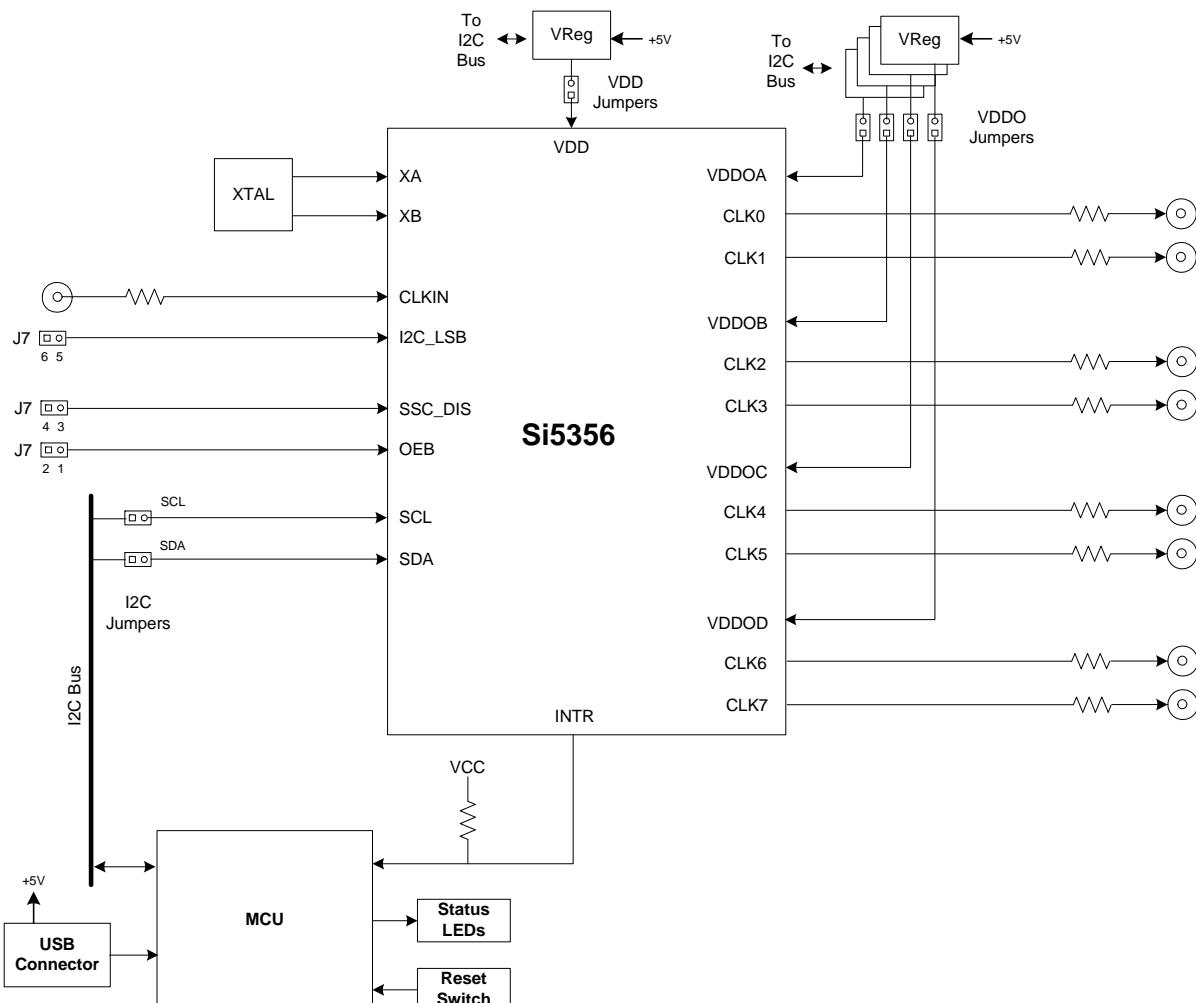

Figure 2. EVB Functional Block Diagram

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2.1. Status LEDS

There are three status LEDs on the EVB:

- **RDY** (Green) indicates that the EVB is operating as normal. This LED should always be on.
- **BUSY** (Green) lights when there is active communication between the PC, the MCU, and the Si5356.
- **INTR** (Red) indicates the MCU has detected that the interrupt pin of the Si5356 device is enabled. The most probable cause for an interrupt is because the Si5356 has lost its input signal or the PLL has lost lock. The "Status" tab of the GUI will identify the event that caused the interrupt to happen.

2.2. Inputs

The Si5356 EVB provides two reference options - using the on-board XTAL or an external reference.

Note: Si5356-EVB Rev 1.0 does not support synchronous operation using the CLKIN input. This feature will be supported in future revisions.

2.2.1. External Input reference

An SMA connector (CLKIN) is provided to receive an external single-ended CMOS signal. This input is dc-coupled to the device. The signal should have a minimum amount of dc bias to ensure that it never swings below ground level.

2.2.2. On-board XTAL

The on-board 25 MHz allows the Si5356 EVB to generate asynchronous clocks. To use this option, select the XTAL input from the Si5356 "ClockBuilder Desktop" software.

2.3. Outputs (CLK0-CLK7)

Each of the eight output clocks can be accessed using SMA connectors. The outputs are dc-coupled (no in-line dc blocking capacitors between the output pin and the SMA connector).

2.4. Control Pins

Header J7 located on the backside of the Si5356 EVB allows setting three Si5356 control pins: SSC_DIS, I2C_LSB, and OEB.

2.4.1. SSC_DIS

This pin allows disabling of the spread spectrum feature on the output clocks. Spread spectrum is disabled when the jumper is installed.

2.4.2. I2C_LSB

This pin is the least significant bit of the Si5356 I^2C address allowing up to two Si5356 devices to occupy the same I^2C bus. I^2C address of the Si5356 = 0x70 when the jumper is installed. I^2C address of the Si5356 = 0x71 when the jumper is not installed.

2.4.3. OEB

This pin allows disabling all output clocks. All outputs are enabled when the jumper is installed.

2.5. Voltage Regulators

The Si5356 EVB has five built-in programmable voltage regulators to allow setting of the VDD supply (to 3.3 V, 2.5 V, and 1.8 V) and the four VDDO supplies (to 3.3 V, 2.5 V, and 1.8 V). The voltage level on each of these supplies can be set independently.

2.6. Reset Switch

A reset switch is provided to reset communication between the PC and Si5356 EVB.

Si5356-EVB

3. ClockBuilder Desktop Software Installation

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

3.1. System Requirements

- Microsoft Windows 2000 or Windows XP
- USB 2.0
- 2 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.

3.2. 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:

http://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. Contact your system administrator for more details.

3.3. 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.

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3.4. ClockBuilder Desktop Software Uninstall Instructions

Close all the programs and help files before running the uninstaller to ensure complete removal of the software. The driver software must be uninstalled separately. See "3.6. USBXpress Driver Installation" for details.
To uninstall the software, use the Add and Remove Programs utility in the Control Panel, as shown in Figure 3.
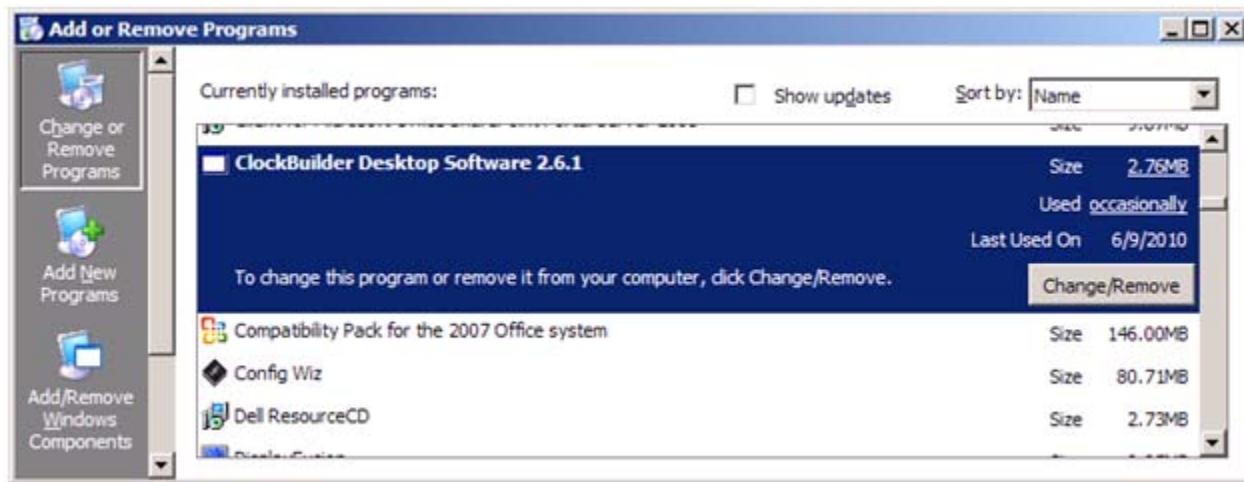
Figure 3. Uninstall in Add and Remove Programs

3.5. ClockBuilder Desktop Software Description

There are several programs to control the Si5356 device. These are available by clicking
Start → **Programs** → **Silicon Laboratories** → **ClockBuilder Desktop Software X.X**, where X.X is the software version number. There is a detailed user guide accessible here and in the **Help** → **Help Menu** option of the software.

Table 1. Programs

Program	Description
ClockBuilder Desktop	This automatically programs the necessary registers based on the customer's desired frequency plan for the Si5356 device.
Bit Field Programmer	This utility provides access to each bit field in the register map of the device; no masking and shifting is required to decode each setting or control in the register map.
Register Programmer	This provides low-level control of the device with individual 8-bit register accesses.

3.6. USBXpress Driver Installation

The EVB uses the Silicon Laboratories' USBXpress driver to allow the EVB to communicate with the computer via USB.

The driver is installed after the EVB software is installed. Click **Install** to run the driver installation. Clicking **Cancel** will not install any files, and the EVB will not work with the software.

Figure 4. Driver Installer Dialog

Note: If the driver has already been installed on the computer before, it will not be reinstalled, and a message box will appear as shown in Figure 5.
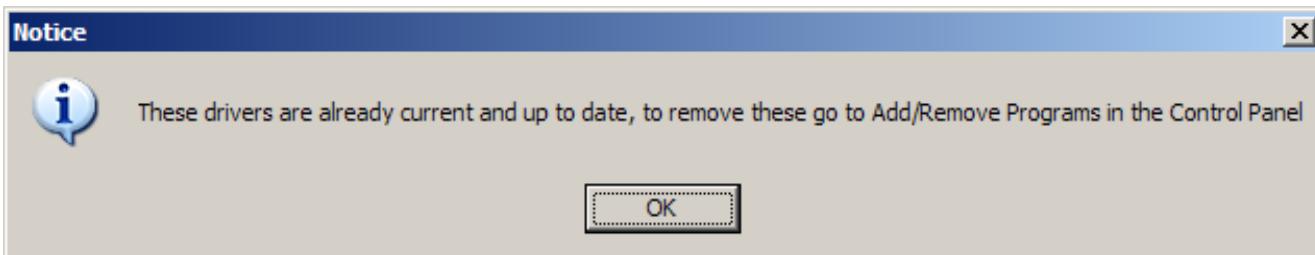

Figure 5. Driver Already Installed

The installer will copy the necessary driver files and update the operating system. However, for every different EVB connected to the same computer, the hardware installation wizard will run to associate this driver with the new EVB. Let the wizard run with its default settings. Figure 6 shows a successful driver installation.
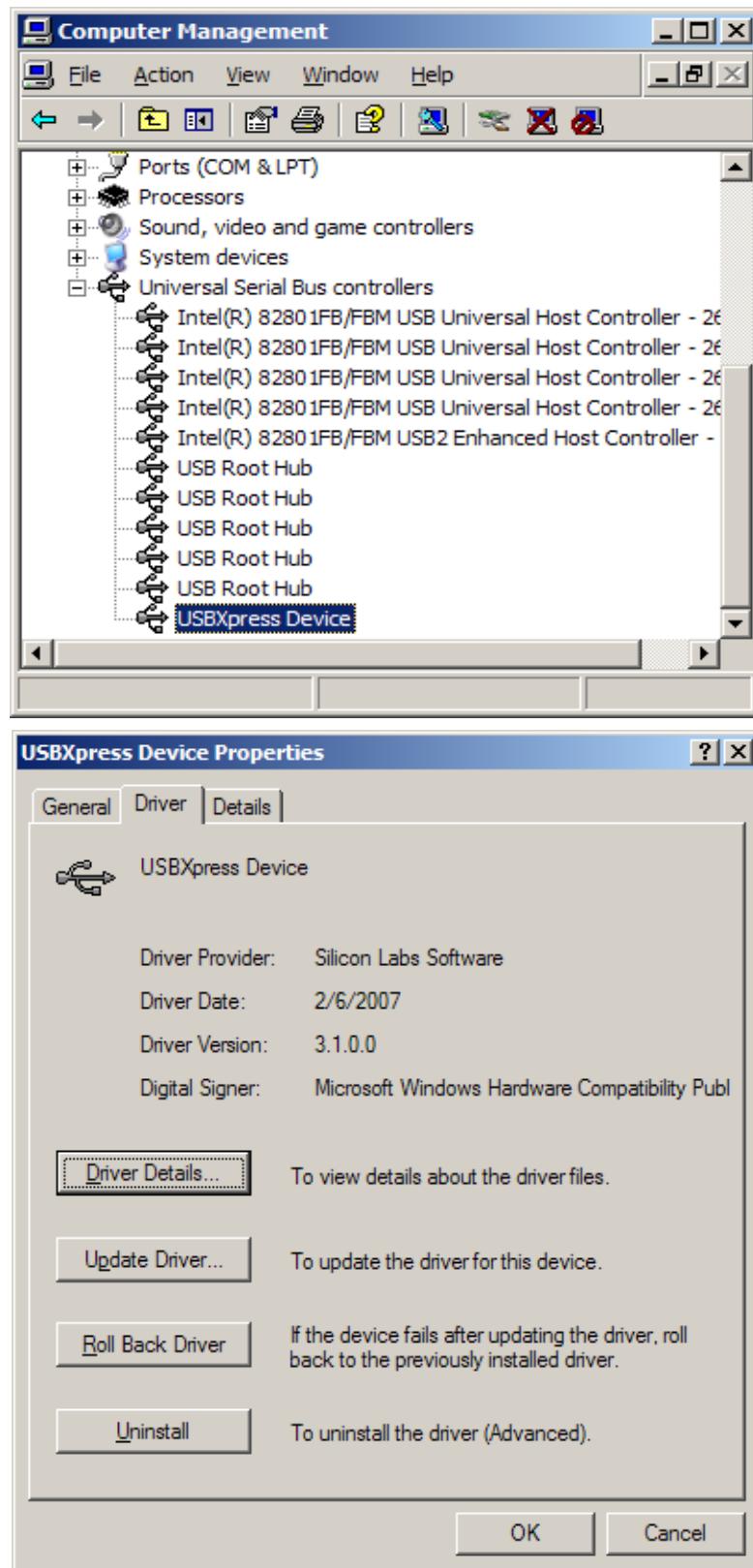
Figure 6. Successful Driver Installation

The USBXpress driver may be removed via the Add and Remove Programs utility in the Control Panel. Locate the entry called Silicon Laboratories USBXpress Device. Click the button, and it should show the version and location of what it will remove.
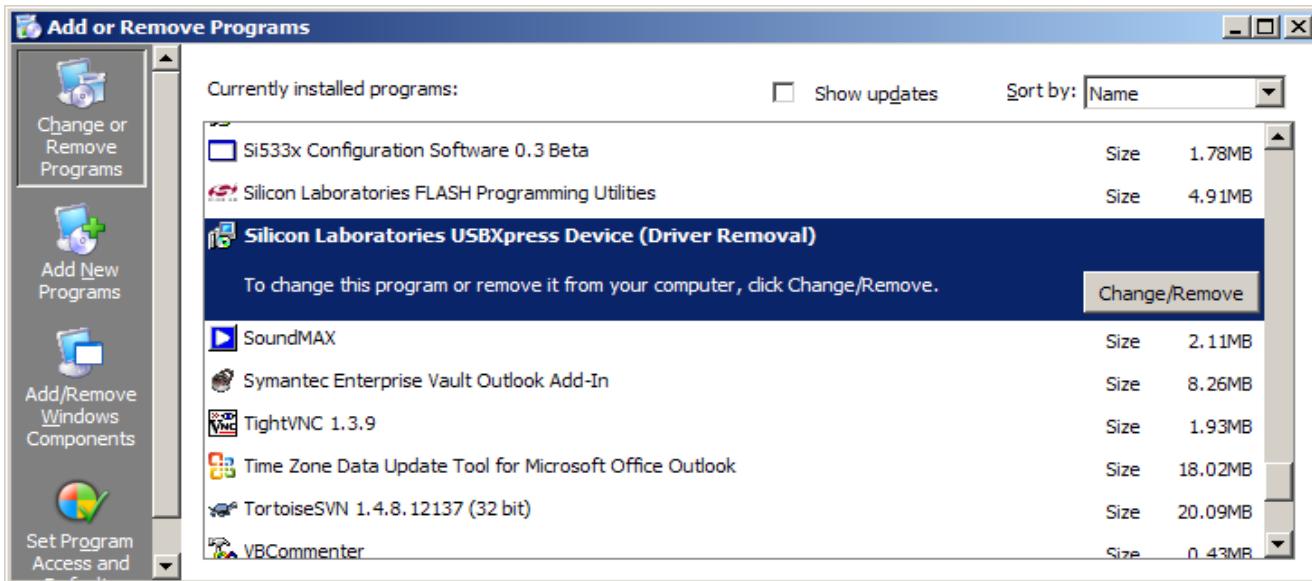

Figure 7. Driver Uninstall Location

The USBXpress installation files are located with the ClockBuilder Desktop Software. The driver files for the EVB may be reinstalled from this location or by running the install software.
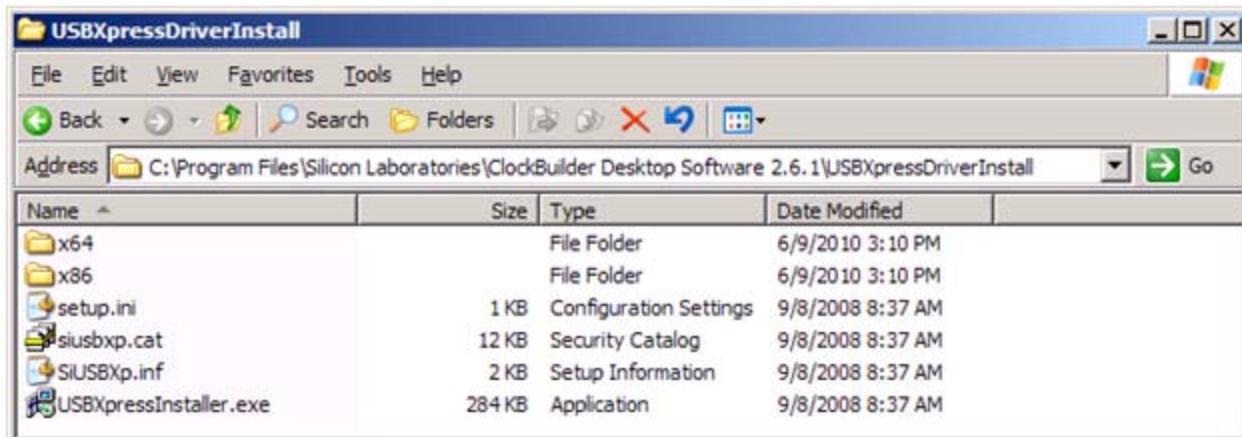
Figure 8. Driver Installation Files

4. Si5356-EVB Schematics
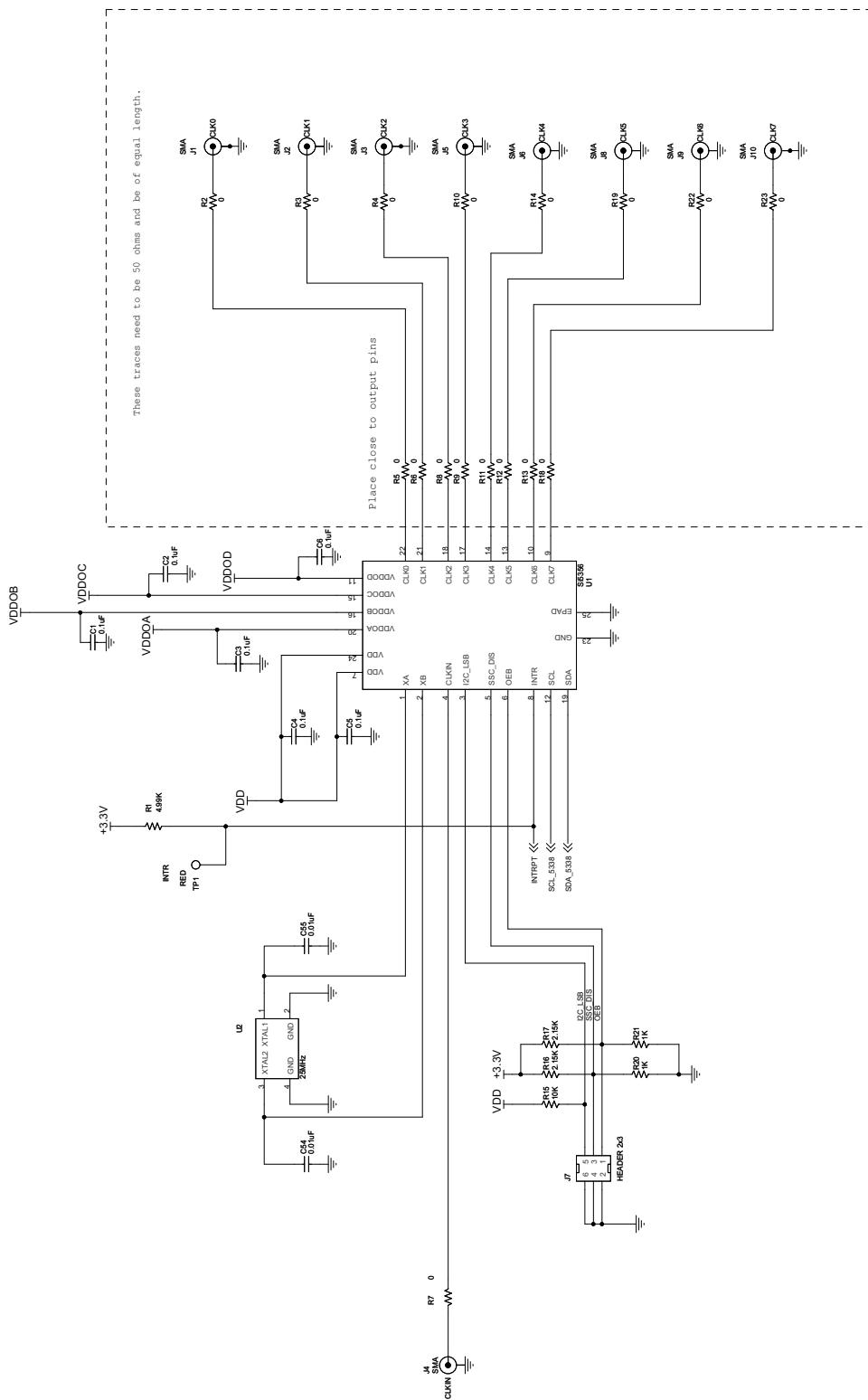
Figure 9. Si5356-EVB Schematic
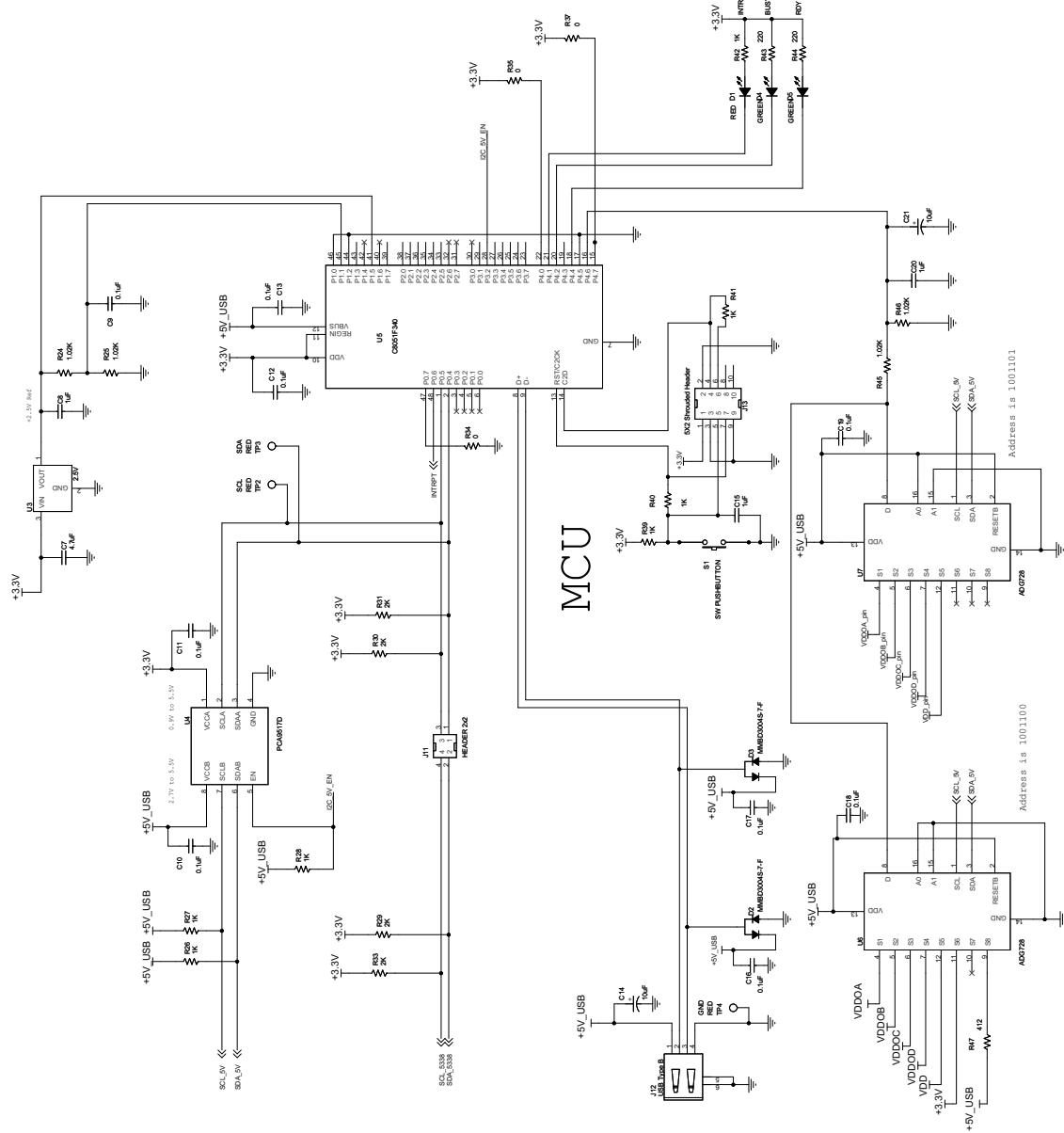
Figure 10. Si5356-EVB MCU Schematic
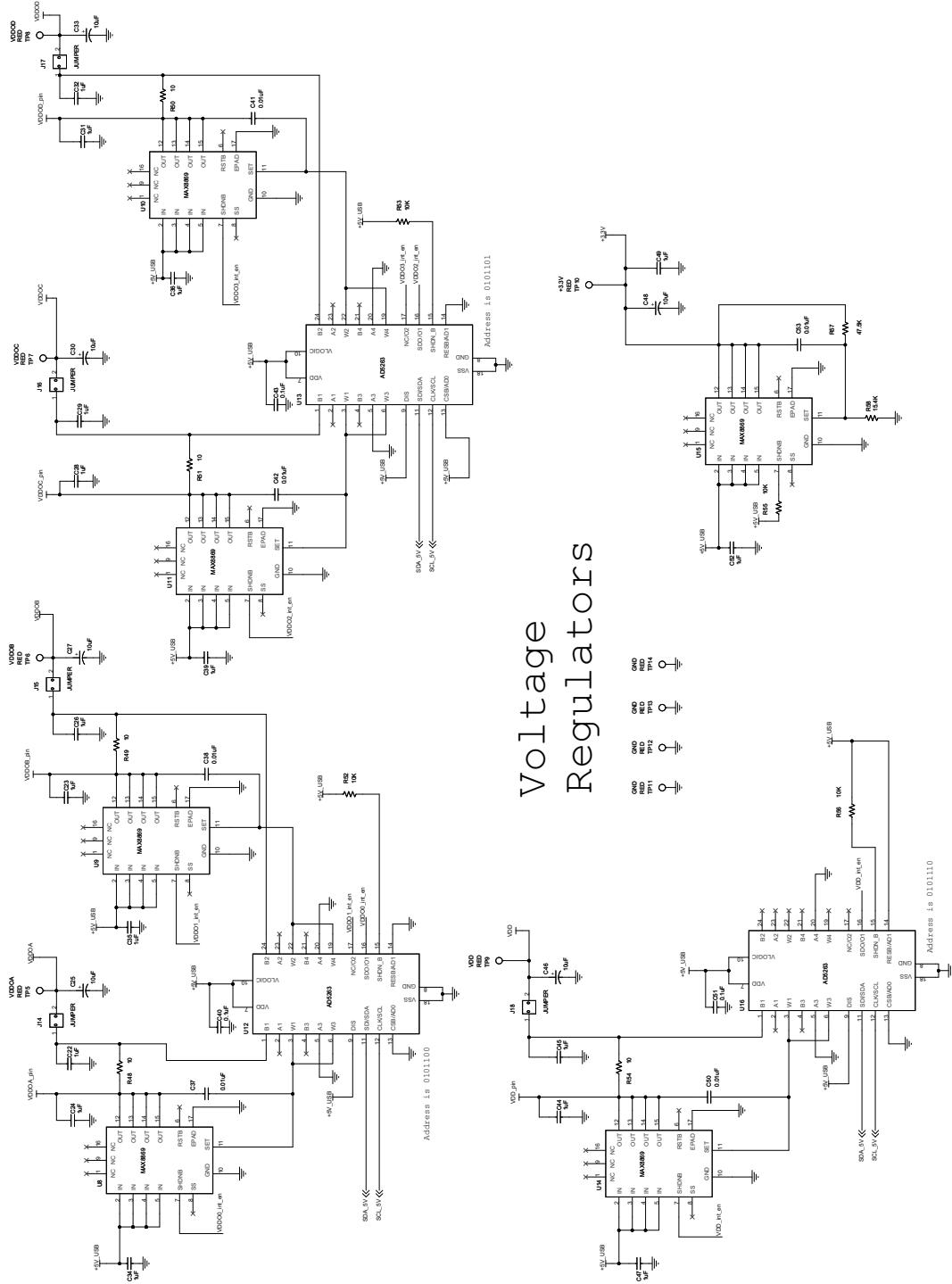
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Figure 11. Si5356-EVB Voltage Regulators Schematic

Voltage Regulators

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5. Si5356-EVB Bill of Materials

Table 2. Si5356-EVB Bill of Materials

Item	Qty	Reference	Value	Voltage	Tol	PCB Footprint	Mfr	Mfr Part Number
1	18	C1,C2,C3,C4, C5,C6,C9,C10, C11,C12,C13, C16,C17,C18, C19,C40,C43, C51	0.1 µF	10 V	±10%	C0402	Venkel	C0402X7R100-104K
2	1	C7	4.7 µF	10 V	±20%	C1206	Venkel	C1206X7R100-475M
3	3	C8,C15,C20	1 µF	25 V	±10%	C1206	Venkel	C1206X7R250-105K
4	7	C14,C25,C27, C30,C33,C46, C48	10 µF	25 V	±20%	6032_EIAC	Kemet	B45196H5106M309
5	17	C22,C23,C24, C26,C28,C29, C31,C32,C34, C35,C36,C39, C44,C45,C47, C49,C52	1 µF	10 V	±10%	C0603	Venkel	C0603X7R100-105K
6	6	C37,C38,C41, C42,C50,C53	0.01 µF	10 V	±20%	C0402	Venkel	C0402X7R100-103M
7	1	D1	RED			LED-S-GW-KA	Panasonic	LN1271RAL
8	2	D2,D3	MMBD3004S-7-F	300 V		SOT23-AKC	Diodes Inc.	MMBD3004S-7-F
9	2	D4,D5	GREEN			LED-S-GW-AK	Panasonic	LN1371G
10	8	J1,J2,J3,J5,J6, J8,J9,J10	SMA			SMA-EDGE-5	Johnson Components	142-0701-801
11	1	J7	HEADER 2x3			CONN2X3	Samtec	TSW-103-07-T-D
12	1	J11	HEADER 2x2			CONN2X2	Samtec	TSW-102-07-T-D
13	1	J12	USB Type B			CONN-USB-B	Tyco	292304-1
14	1	J13	5X2 Shrouded Header			CONN2X5-4W	Tyco	5103309-1
15	5	J14,J15,J16, J17,J18	JUMPER			CONN-1X2	Samtec	TSW-102-07-T-S
16	1	R1	4.99 kΩ		±1%	R0402	Venkel	CR0402-16W-4991F
17	19	R2,R3,R4,R5, R6,R8,R9,R10, R11,R12,R13, R14,R18,R19, R22,R23,R34, R35,R37	0 Ω			R0402	Venkel	CR0402-16W-000
18	1	R15	10 kΩ		±1%	R0603	Venkel	CR0603-10W-1002F
19	2	R16,R17	2.21 kΩ		±1%	R0603	Venkel	CR0603-10W-2211F

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Table 2. Si5356-EVB Bill of Materials (Continued)

Item	Qty	Reference	Value	Voltage	Tol	PCB Footprint	Mfr	Mfr Part Number
20	2	R20,R21	1 kΩ		±1%	R0603	Venkel	CR0603-10W-1001F
21	4	R24,R25,R45, R46	1.02 kΩ		±0.1 %	R0402	Venkel	TFCR0402-16W-E-1021B
22	7	R26,R27,R28, R39,R40,R41, R42	1 kΩ		±5%	R0402	Venkel	CR0402-16W-102J
23	4	R29,R30,R31, R33	2 kΩ		±1%	R0402	Venkel	CR0402-16W-2001F
24	2	R43,R44	220 Ω		±5%	R0402	Venkel	CR0402-16W-221J
25	1	R47	412 Ω		±1%	R0402	Venkel	CR0402-16W-4120F
26	5	R48,R49,R50, R51,R54	10 Ω		±0.5 %	R2512	Venkel	CR2512-2W-10R0D
27	4	R52,R53,R55, R56	10 kΩ		±5%	R0402	Venkel	CR0402-16W-103J
28	1	R57	47.5 kΩ		±1%	R0603	Venkel	CR0603-10W-4752F
29	1	R58	15.4 kΩ		±1%	R0603	Venkel	CR0603-10W-1542F
30	1	S1	SW PUSHBUTTON	12 Vdc		SW-PB-MOM	Mountain Switch	101-0161-EV
31	1	TP4	Black			TESTPOINT	Kobiconn	151-203-RC
32	1	U1	Si5356	3.3 V		QFN24N4X4P0.5	SiLabs	Si5356-A-A-GM
33	1	U2	25 MHz			XTAL4N3.2X2.5-FA238	Epson	FA-238 25.0000MB
34	1	U3	2.5 V			SOT-23	Analog Devices	AD1582BRT
35	1	U4	PCA9517D			SO8N6.0P1.27	NXP	PCA9517D
36	1	U5	C8051F340	5.5 V		QFP48N9X9P0.5	SiLabs	C8051F340-GQ
37	2	U6,U7	ADG728	2.7–5.5 V		TSSOP16N6.4P0.65	Analog Devices	ADG728BRUZ
38	6	U8,U9,U10, U11,U14,U15	MAX8869			TSSOP16N6.5P0.65E	Maxim	MAX8869EUE50
39	3	U12,U13,U16	AD5263			TSSOP24N6.4P0.65	Analog Devices	AD5263BRUZ20
40	4						SPC Technology	2397
41	4						Richco	NSS-4-4-01
42	10	Jumpers					Sullins	SPC02SYAN
43	1	C21	10 µF	25 V	±20%	6032_EIAC	Kemet	B45196H5106M309

Table 2. Si5356-EVB Bill of Materials (Continued)

Item	Qty	Reference	Value	Voltage	Tol	PCB Footprint	Mfr	Mfr Part Number
44	1	J4	SMA			SMA-EDGE-5	Johnson Components	142-0701-801
45	1	R7	0			R0402	Venkel	CR0402-16W-000
46	13	TP1,TP2,TP3, TP5,TP6,TP7, TP8,TP9,TP10, TP11,TP12, TP13,TP14	RED			TESTPOINT	Kobiconn	151-207-RC

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DOCUMENT CHANGE LIST

Revision 0.1 to Revision 0.2

■ Changed "Any Rate Clock Generator" to "ClockBuilder Desktop" throughout.
■ Changed "MultiSynth Clock Programmer" to "ClockBuilder Desktop" throughout.
■ Updated Figure 3 on page 5.
■ Removed "Uninstaller Option" figure.
■ Updated Figure 8 on page 8.

ClockBuilder Pro

One-click access to Timing tools, documentation, software, source code libraries & more. Available for Windows and iOS (CBGo only).

www.silabs.com/CBPro
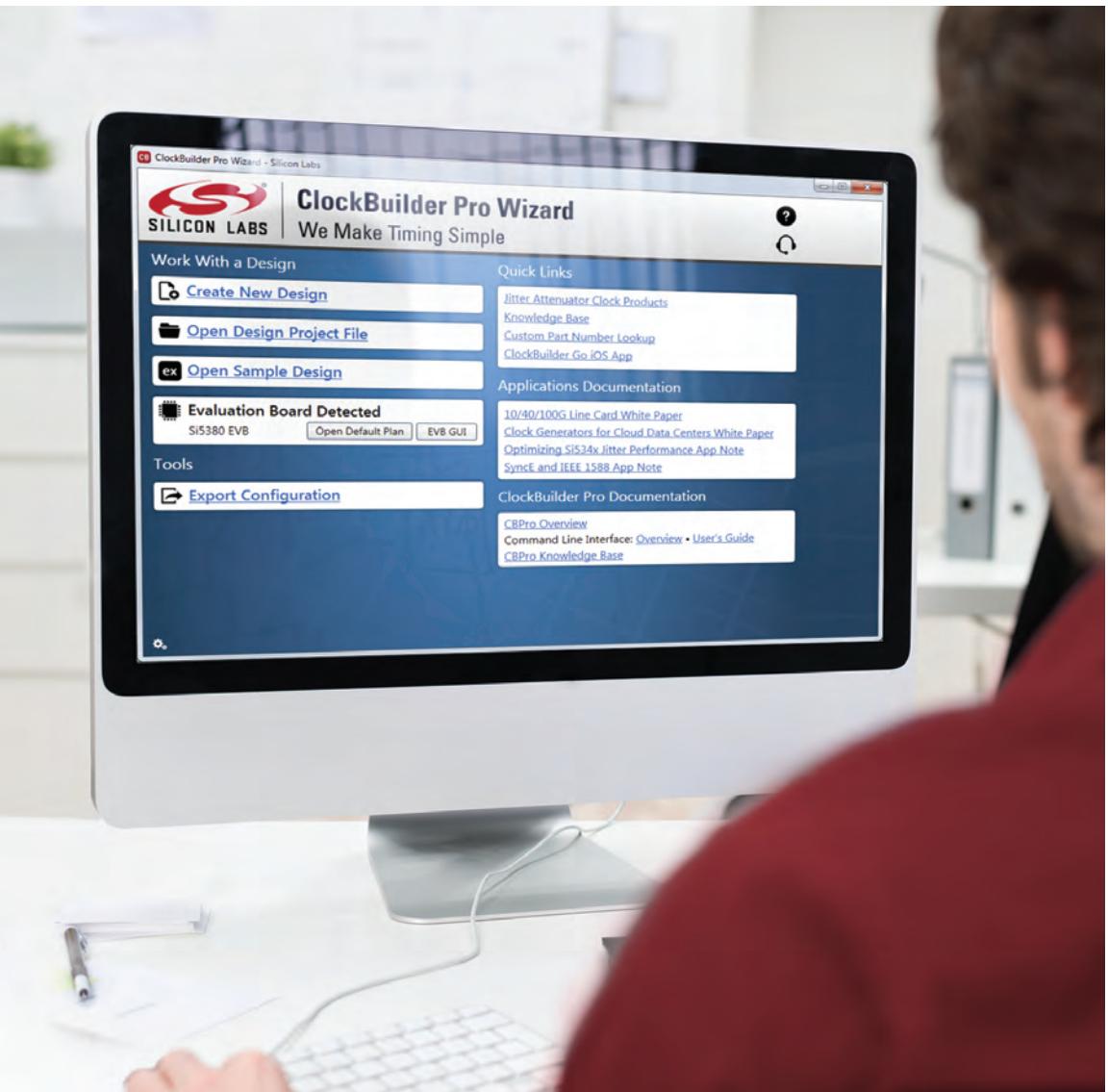
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