

UG397: Si5332-6A-EVB Users' Guide (Using Si5332-AM1-QFN32-EVB)

The Si5332-6A-EVB is used for evaluating the six-output Automotive Grade Si5332 Low Jitter Any-Frequency Clock Generator. The Si5332-AM1 device uses the patented Multisynth™ technology to generate up to six independent clock frequencies each with 0 ppm synthesis error. The Si5332-6A-EVB has two independent input reference clocks or can use the on-board 25 MHz crystal as reference. The Si5332-6A-EVB can be controlled and configured using the Skyworks Clock Builder Pro™ (CBPro™) software tool.



KEY FEATURES

- Powered from either USB port or external +5V power supply.
- 25 MHz crystal reference or external input clock reference.
- Programmable device VDD supply for operation at 3.3 V, 2.5 V, or 1.8 V, controlled by CBPro[™] Software.
- Programmable VDDO supplies allow each of the 6 outputs to have its own power supply voltage selectable from 3.3 V, 2.5 V, 1.8 V, or 1.5 V (1.5 V LVCMOS only).
- CBPro[™] GUI-controlled voltage, current, and power measurements of VDD and all VDDO supplies.
- SMA connectors for all input and output clocks.
- External digital input functions emulated via onboard switches.

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1. Functional Block Diagram

Below is a functional block diagram of the Si5332-6A-EVB. This EVB can be connected to a PC via the main USB connector for configuration, control, and monitoring using Skyworks' CBPro software. The EVB's power can be supplied from the USB connection or external +5 V power source.

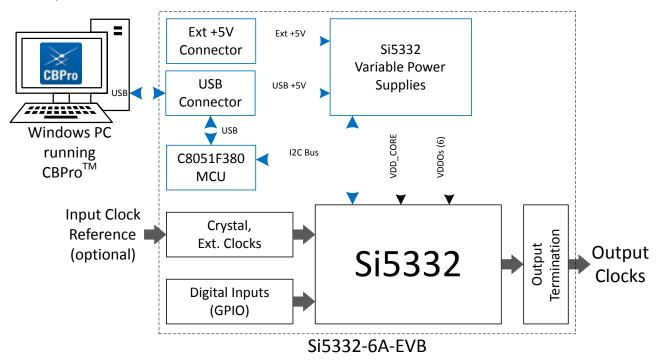


Figure 1.1. Si5332-6A-EVB Functional Block Diagram

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2. Si5332 CBPro[™] Overview

All Si5332 devices, and corresponding EVBs, are fully supported in Skyworks' ClockBuilder Pro (CBPro) software. Note that **CBPro** software is required to configure and use the Si5332-6A-EVB. Please download and install CBPro from the link shown below:

https://www.skyworksinc.com/en/Application-Pages/Clockbuilder-Pro-Software

With CBPro, users can perform the following:

- · Create full device configurations (frequency plans) including multi-profile configurations.
- · Get estimated power consumption and estimated operating junction temperature of the configuration.
- · Evaluate/Test configurations using a supported EVB.
- Create downloadable configuration files designed to be I²C, downloaded into target Si5332 device.
- Submit a configuration for creation of a custom, factory-programmed device with a unique orderable part number (no added cost).
- · Submit a request for a phase noise report of the specific configuration.

CB ClockBuilder Pro Wizard - Skyworks	– 🗆 X
 ClockBuilder Pro Wizard We Make Timing Simple 	SKYWORKS
Work With a Design	Quick Links
Create New Project	Skyworks Timing Solutions Knowledge Base
E Open Project	Custom Part Number Lookup
Convert Existing Project/NVM File	Applications Documentation 10/40/100G Line Card Whitepaper
ex Open Sample Project	Clock Generators for Cloud Data Centers Optimizing Si534x Jitter Performance
Evaluation Board Detected Si5332-AM1 EVB Open Default Plan EVB GUI	Selecting the Right Clocks for Timing Synchronization Applications PCIe Gen 4.0 Jitter Requirements Selecting a PCIe Reference Clock Source Making Accurate Clock Jitter Measurements
	ClockBuilder Pro Documentation <u>CBPro Overview</u> <u>CBPro Tools & Support for In-System Programming</u> <u>CLI User's Guide</u>
¢.,	Release Notes Version 4.1 Built on 9/22/2021

Figure 2.1. CBPro Start-up Window

3. Si5332-6A-EVB Operation

3.1 Initial Default Configuration

The Si5332-6A-EVB has power supply configuration DIP switches (SW1 – SW7) which are set at the factory to the OFF position. The EVB also has a programmable digital I/O (GPIO) configuration DIP switch (SW8) also with all switches set to OFF position. The required EVB **default** DIP switch settings are all switches OFF (as shown below) and these settings are required to allow the CBPro software to control and configure the EVB. In addition, JP1 jumper should be installed on the "USB" side (pins 1 & 2).

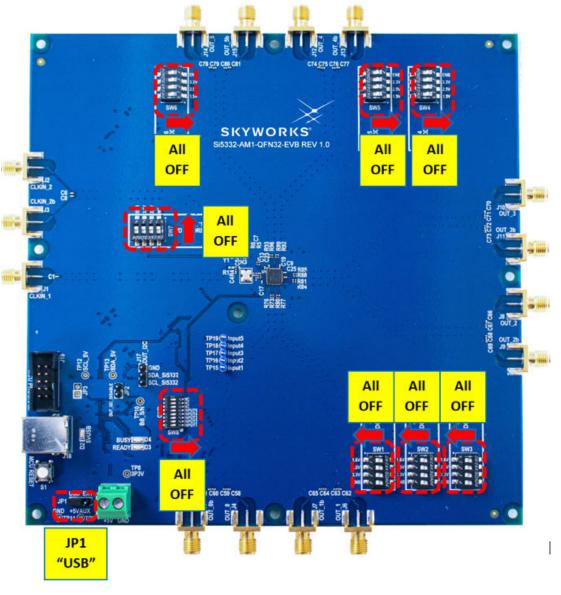


Figure 3.1. Si5332-6A-EVB Initial Default Configuration

3.2 DIP Switch Functions

The power supply DIP switches (SW1 – SW7) are intended to provide flexibility in cases when a pre-programmed Si5332-AM1 device is installed on the board and CBPro will not be used to configure the Si5332-AM1 device or to control the on-board power supply settings. Typically, the power supply DIP switches (SW1- SW7) will only be used if a configuration is burned into the Si5332-AM1's NVM by using the CBPro Field Programming Dongle or a pre-configured Si5332-AM1 (custom OPN) is installed on the EVB.

The programmable digital input (GPIO) signal configuration switch (SW8) will only be used to turn specific features on/off based on the CBPro configuration loaded into the Si5332-AM1 device. For example, a programmable digital input, such as an Output Enable (OE), can be assigned to Input 1. Once the Si5332-AM1 configuration with Input 1 assigned as OE is loaded, Input 1 on SW8 can be used to control this OE input signal by setting high/low. Input 1 switch OFF = 1, Input 1 switch ON = 0.

3.3 LEDs

The Si5332-6A-EVB has 3 indicator LEDs (D2, D3, D4) near the USB connector as shown and defined below.



Figure 3.2. Si5332-6A-EVB LED Locations

- D2: This Blue LED (+5VUSB) lights to indicate USB +5V is present.
- D3: This Green LED (Ready) lights to indicate the EVB's USB has enumerated with the host PC.
- D4: This Green LED (Busy) lights to indicate CBPro has successfully connected to the EVB.

3.4 Input Clocks

The Si5332-AM1 device can support 2 sources of input reference clock. One source is the crystal input on XA/XB pins. (XA can also be used as a single-ended external input if the crystal is removed, see Si5332-AM1 Data Sheet for more details.). The other input clock source is an external differential or single-ended clock on CLKIN_2/CLKIN_2b pins.

As shown in the schematic below, the Si5332-6A-EVB is pre-populated with a 25 MHz crystal on the XA/XB crystal input. The CLKIN_2/ CLKIN_2b external clock inputs have 50-ohm terminations installed by default. The CLKIN1 input has "not-installed" ("NI") components to isolate the CLKIN1 input from the crystal circuit when the crystal is installed.

Input Clocks & Crystal

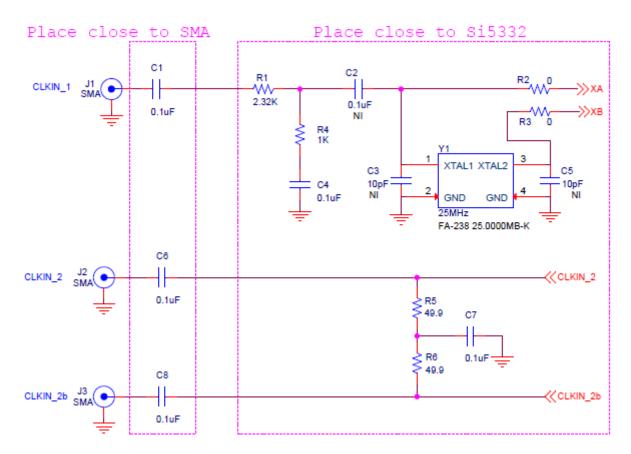


Figure 3.3. Si5332-6A-EVB Input Clock Circuit

3.5 Output Clocks

The Si5332-AM1 device can support up to 6 differential pair outputs, or 6 pairs of LVCMOS outputs (12 total LVCMOS outputs). Each output pair has an output termination circuit as shown in figure below. The default output termination is AC coupled outputs from Si5332-AM1 device with no other termination.

The default output termination components (0 Ω & 0.1 μ F) combined with the "NI" (not installed) component sites on the EVB can be used as locations to create the desired output termination configuration. For example, if DC output termination is required, the 0.1 μ F caps can be replaced with 0 Ω resistors. Note that not all possible termination schemes can be supported by the circuit below and in some cases external components may be required.

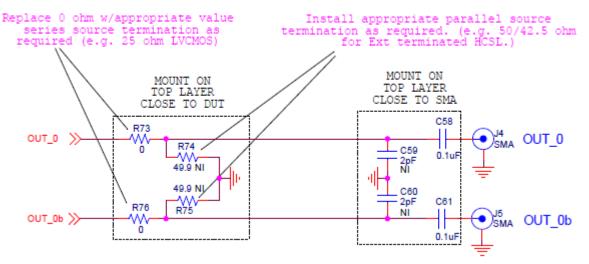


Figure 3.4. Si5332-6A-EVB Single Pair Output Clock Termination Circuit

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4. Using CBPro[™] with Si5332-6A-EVB

Skyworks' CBPro software is required for using the Si5332-6A-EVB. It can be downloaded from Skyworks' download link: https://www.skyworksinc.com/en/Application-Pages/Clockbuilder-Pro-Software.

Once downloaded and installed, running CBPro should present the following window:

CB ClockBuilder Pro Wizard - Skyworks	– 🗆 X				
 ClockBuilder Pro Wizard We Make Timing Simple 	SKYWORKS				
Work With a Design	Quick Links				
Create New Project	Skyworks Timing Solutions Knowledge Base				
Dpen Project	Custom Part Number Lookup				
Convert Existing Project/NVM File	Applications Documentation <u>10/40/100G Line Card Whitepaper</u>				
ex <u>Open Sample Project</u>	Clock Generators for Cloud Data Centers Optimizing Si534x Jitter Performance Selecting the Right Clocks for Timing Synchronization				
Evaluation Board Detected Si5332-AM1 EVB Open Default Plan EVB GUI	Applications PCIe Gen 4.0 Jitter Requirements Selecting a PCIe Reference Clock Source Making Accurate Clock Jitter Measurements				
	ClockBuilder Pro Documentation <u>CBPro Overview</u> <u>CBPro Tools & Support for In-System Programming</u> <u>CLI User's Guide</u> <u>Release Notes</u>				
0.	Version 4.1 Built on 9/22/2021				

Figure 4.1. CBPro Start-up Window

If an evaluation board is connected via USB, the EVB should be detected and will be indicated as shown at the arrow in the above image. Multiple EVBs can be connected and individually selected in CBPro.

The EVB GUI is a useful tool as it will allow monitoring and control of EVB functions like the digital inputs and power supply voltage and current measurements. The EVB GUI can also be used to read and write on-chip registers and report other useful status information.

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4.1 CBPro™ EVB GUI

The EVB GUI is invoked by pressing the "EVB GUI" button from CBPro's main window. Across the top of the EVB GUI window, as shown below, are several tabs for selection of various useful informational pages, and pages for configuration, control, or monitoring of the EVB.

				~
CB Si5332-AM1 EVB - ClockBuilder Pro		-		×
File Help				
Info DUT Settings Editor DUT Register Editor Regulators GPIO Status Registers	-	Control Reg	isters	
Board Identification:		Reset	and Mod	es
Board ID Code: [1] (Si5332GM1-QFN-32 AM)			ive Mode	
Board SN: 00-00-1F-52-55-6A		Rea	ady Mode	
DUT ID Registers:			Reset	
DEVICE_PN_BASE Si5332				
DEVICE_REV:				
DEVICE_PACKAGE QFN_32_Automotive				
DEVICE_GRADE A				
OPN_ID 00000				
OPN_REVISION 0				
DESIGN_ID EX_BL				
TOOL_VERSION ClockBuilderPro v2.31.2.0				
Log				
Filtered 🔽 Auto Scroll: On 🔽 Insert Marker Clear Copy to Clipboard Pause				
Timestamp Source Message				
13:53:15.225 EVB Starting Read_Voltage_Level(regulator=VDDO_5)				
13:53:15.231 EVB Finished Read_Voltage_Level(regulator=VDDO_5) => V3P30	•			
Si5332QFN-32 AM	С	lockBuilder Pr	o v4.1 [20	21-09-22]

Figure 4.2. EVB GUI - Info Page

The "Info" tab shows information regarding EVB board and DUT device identification. Both the "Control Registers" and "Log" windows are shown in all EVB GUI tabs. The "Control Registers" are useful buttons to place Si5332 device in Active or Ready mode and well as Reset the device. (*Refer to follow-on description of "Status Registers" tab for important information on device mode and its effect on register accesses.*) The "Log" window is a log of all CBPro – EVB communications.

The "DUT Settings Editor" and "DUT Register Editor" tabs allow registers to be read/written by either the setting name or by direct hex byte access.

SI3332-AM1 EVB - ClockBuilder Pro	- 🗆 X	SIS332-AM1 EVB - ClockBuilder Pro	- 🗆 ×
File Help Info DUT Settings Editor DUT Register Editor Regulators GPIO Status Registers *	Control Registers	File Help Info DUT Settings Editor DUT Register Editor Regulators GPIO Status Registers	Control Registers
Setting Name Value Read Value to Write Location Type X I2C_ADDR Ox0 0x21(sc) R/W Read Write	Reset and Modes Active Mode Reset Reset	Register Peed/Pole Her. Decimal Address: 0-21 # Bytes: 1 Read Write Her: India Unsigned inte 7 # Binary: 7 # Binary: 1 Binary: 1	Reset and Mode Active Mode Ready Mode Reset
Log Filtered Auto Scrolt: On Cinsert Marker Clear Copy to Clipboard Pause		Log Filtered 📱 Auto Scroll: On 📱 Insert Marker Clear Copy to Clipboard Pause	
Timestamp Source Message 135521531 EV8 Starting Read OUT_Bytestaddress=0x21; num_bytes=1) *		Timestamp Source Message 135521551 EVB Starting Read_DUT_Bytestaddress=0x21, num_bytes=1) ************************************	
13:55:21:885 EVB Finished Read_DUT_Bytes(address=0x21, num_bytes=1) => 0x6A		13:55:21:585 EVB Finished Read_DUT_Bytes(address=0x21, num_bytes=1) => 0x6A	1
SI5332QFN-32 AM CK	ockBuilder Pro v4.1 (2021-09-22)	\$I5332QFN-32 AM	ClockBuilder Pro v4.1 [2021-09-22]

Figure 4.3. EVB GUI - DUT Settings / DUT Register Editors

The "Regulators" tab allows reading the voltages and currents for each on-board power supply. Each regulator may be switched on/off or voltage changed as necessary. Similarly, the "GPIO" tab allows for monitoring and control of the programmable digital inputs of the Si5332. Controlling regulators and GPIO functions within CBPro requires DIP switches on the EVB to be set to default positions (Off). See Section 3.1 Initial Default Configuration for more information.

CB 5i5332-AM1 EVB - ClockBuilder Pro	- 0 X	5/3332-AM1 EVB - ClockBuilder Pro	- 🗆 X
File Help		File Help	
Info DUT Settings Editor DUT Register Editor Regulators GPIO Status Registers	 Control Registers 	Info DUT Settings Editor DUT Register Editor Regulators GPIO Status Registers	Control Registers
Voltage Current Power V00 CORE 3.30V 0 3.30V 44 mA 14.5 mW Read V000 0 3.30V 0 3.283 V 1 mA 3 mW Read V000 1 3.30V 0 3.237 V 2 mA 7 mW Read V000 2 3.30V 0 3.277 V 2 mA 10 mW Read V000 3 3.30V 0 3.267 V 3 mA 10 mW Read V000 4 3.30V 0 3.267 V 1 mA 3 mW Read V000 5 3.30V 0 3.267 V 1 mA 3 mW Read V000 5 3.30V 0 3.267 V 1 mA 3 mW Read V000 5 3.30V 0 3.267 V 1 mA 3 mW Read L02 1.02 mW 1.02 mW Read 1.02 mW 1.02 mW Read	Reset and Modes Active Mode Resdy Mode Reset	Name McUPin Ribbon Fin Type ① State input1 36 0 Output 1 Read input3 32 0 Output 1 Read input4 31 0 Output 1 Read input5 30 0 Output 1 Read	Reset and Modes Active Mode Redy Mode Reset
Filtered Auto Scroit On Intert Marker Clear Copy to Clipboard Pause Timestump Source Mosspace Mosspace	A	Pittered Auto Scoti: On Insert Marker Clear Copy to Cipboard Pause Timestamp Source Mesope Insert Marker Insert Mesope Insert Mesope	
[13:58:16.680 EVB Finished Read_DUT_Signal(signal=Input5) => Logic1 [553320FN-32 AM	ClockBuilder Pro v4.1 [2021-09-22]	13:58:16:680 EV8 Finished Read_DUT_Signal(signal=input5) => Logic1	ClockBuilder Pro v4.1 [2021-09-22]

Figure 4.4. EVB GUI - Regulators and GPIO Monitoring/Control

4.2 Device Register Changes Using the CBPro™ EVB GUI

The last EVB GUI tab is the "Status Registers" tab which shows the present state of the device, in either "Active" or "Ready" mode.

Important Note: The Si5332 device must be in "Active" mode to output any clocks. While in "Active" mode *most* register write accesses will not be allowed and will be blocked by the device. The device must be in "Ready" mode to allow write access to many registers. While the device is in "Ready" mode the outputs are stopped. Once device is placed back in "Active" mode, the outputs will resume based on any register changes done while in "Ready" mode.

The only registers not requiring this process are Spread Spectrum enable/disable, Output Enable controls, Input Clock Selection, and the register placing the device into and out of Active or Ready mode. Do not rely on a Si5332 device being in "Active" mode to prevent inadvertent I²C write cycles from corrupting device registers.

The general process required to change register values (i.e., register writes) is shown below.

- 1. Place the device into "Ready" mode, at which time the outputs will stop and register changes can be made.
 - Press "Ready Mode" button, then "Refresh All" button to update Status.

Si5332-AM1 EV	/B - ClockB	uilder Pro					-		×
ile Help									
Info DUT Settin	ngs Editor	DUT Register Editor	Regulators	GPIO	Status Registers	Ŧ	Control Regist	ers	
Refresh All Auto Poll Registers 🕢						Reset an Active	d Mode Mode	s	
Status	Active	Ready					Ready	Mode	

- Confirm device is in "Ready" mode.
- 2. Perform any register updates as desired.
- 3. Place device back into "Active" mode for the register changes to take effect and outputs enabled.
 - Press "Active Mode" button, then "Refresh All" button to update Status.

File H	lelp						
Info	DUT Settings Editor	DUT Register Editor	Regulators	GPIO	Status Registers	Ŧ	Control Registers
1 1 1 1	efresh All Auto	Poll Registers 🔞					Reset and Modes

· Confirm device is now in "Active" mode.

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4.3 Creating a New Si5332-AM1 CBPro™ Configuration

- 1. To start a new Si5332-AM1 project, click on "Create New Project" from CBPro opening window.
- 2. From selection window click on "Clock Generators".

CB ClockBuilder Pro Wizard - Skyworks	C Create New Project - ClockBuilder Pro	- 🗆 X
 ClockBuilder Pro Wizard We Make Timing Simple 	ClockBuilder Pro Wizard We Make Timing Simple Filter Devices by Application	SKYWORKS
Work With a Design	Clock Generators	
Create New Project	Jitter Attenuators	ATATA
Concer Brainst	Network Synchronizers	
Den Project	SmartClock [™] Monitors	Show All Devices
Convert Existing Project/NVM File	Buffers Broadcast Video	
ex Open Sample Project	Oscillators (XO/VCXO)	N/53852
ex open sample risjeet	PCIe Gen1/2/3/4/5 Clocks and Buffers	
Evaluation Board Detected Si5332-AM1 EVB Open Default Plan EVB GUI	🕑 IEEE 1588 Modules 🖨 Automotive	Back Next > Fereth Cancel
		Cancel

3. Then Select Si5332-GM1 from list of devices.

CB Create New Project - ClockBuilder Pro

ereate riter ri	oject	erectour	act to				
ClockBuilder Pro 🗤 🗫							
Clock Generator Parts							
Filter using part number (Si5395, 5332, m88, etc.) or application (serdes,							
Part	Num PLLs	Num Inputs	Num Outputs	Input Frequency	Output Frequency	,	
Si5332-GM1/ AM1	1	2	6	16 MHz to 50 MHz, 10 MHz to 250 MHz	5 MHz to 312.5 MHz	•	

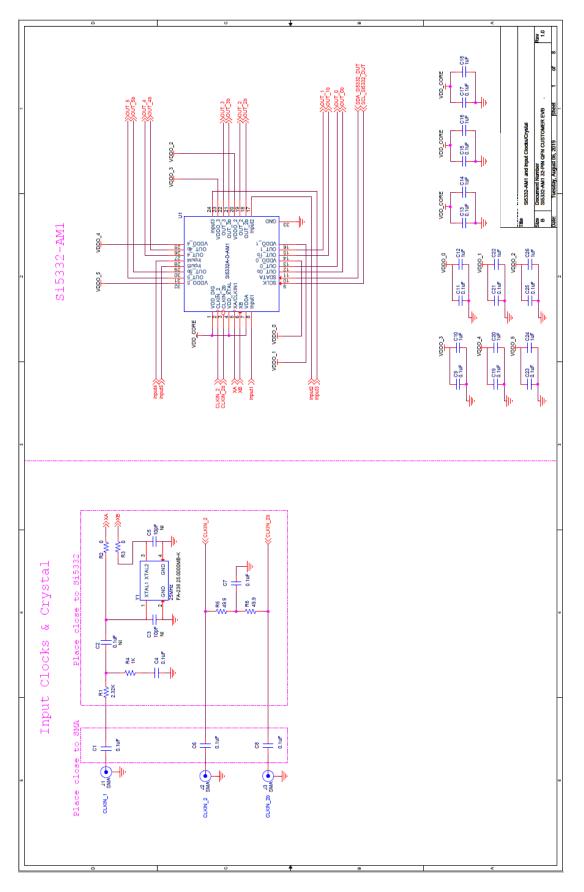
4. Complete the guided step-by-step configuration process being sure to select Automotive grade in Step 3.

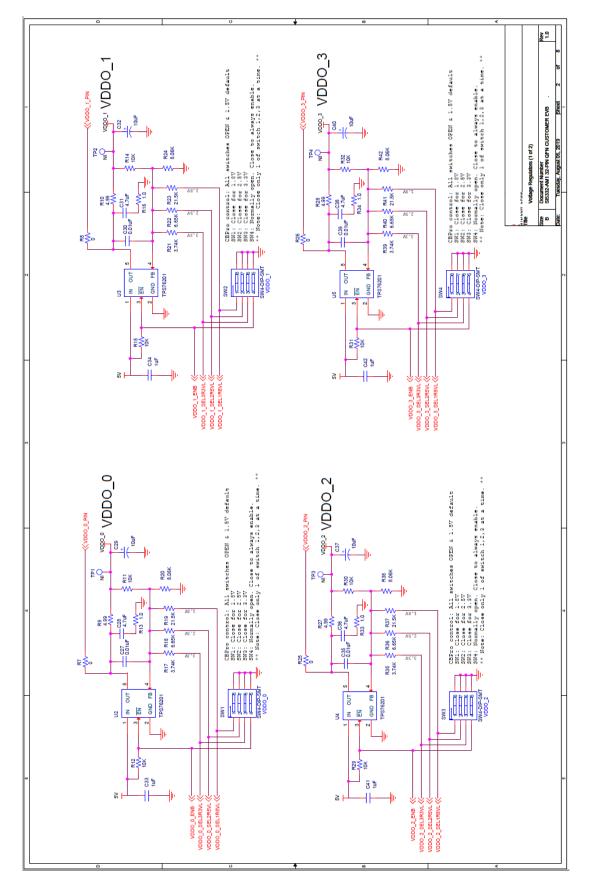
	CB New Si5332_GM1 Project - ClockBuilder Pro
(ClockBuilder Pro 🗤 🐝
:	Step 3 of 12 - Package Selection ▼
	Si5332-GM Any Reference (A, B, C, or D) An external crystal (XTAL) or oscillator (OSC) is supplied to XAXB.
	Si5332-AM Any Reference Automotive (Grades A, B, C, or D) An external crystal (XTAL) or oscillator (OSC) is supplied to XAXB.
	Si5332-GM Embedded Crystal (Grades E, F, G, H, or L) A 50 MHz crystal is included in the package.

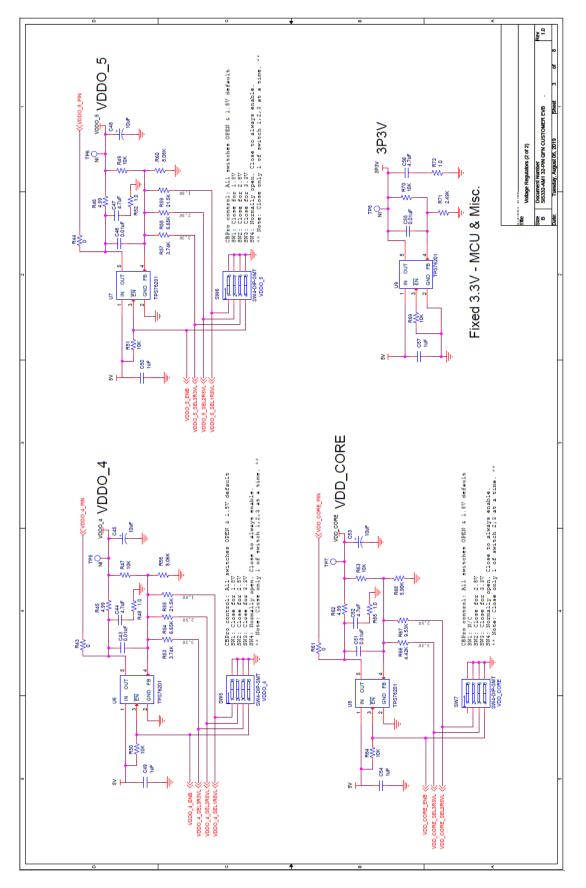
5. When complete with all steps, simply press the "Write to EVB" button to download the configuration to the connected EVB.

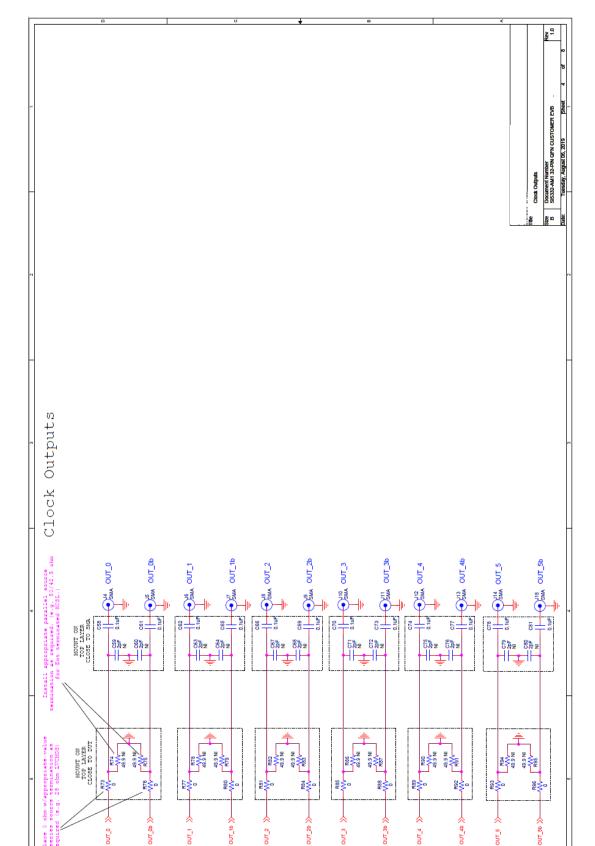
The configuration should now be actively running in the Si5332-6A-EVB.

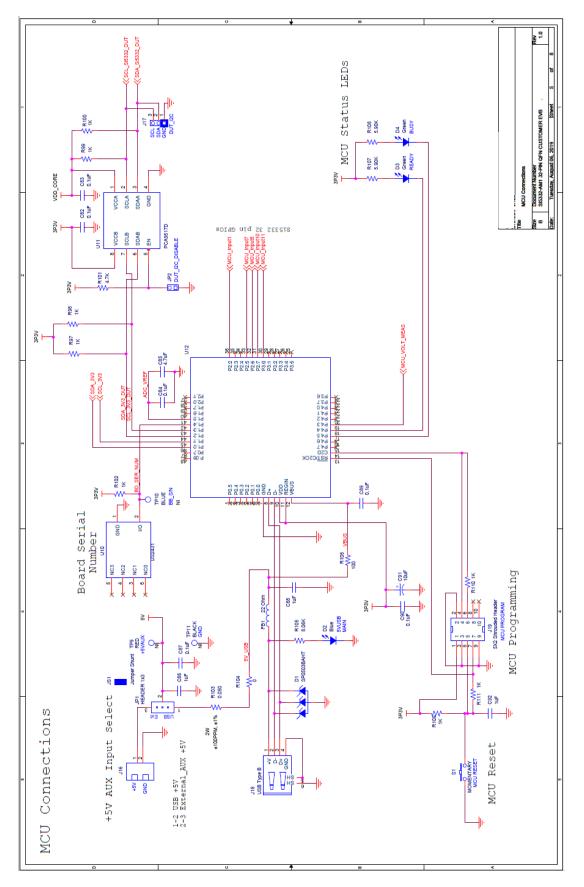
5. Si5332-6A-EVB Rev 1.0 Schematics

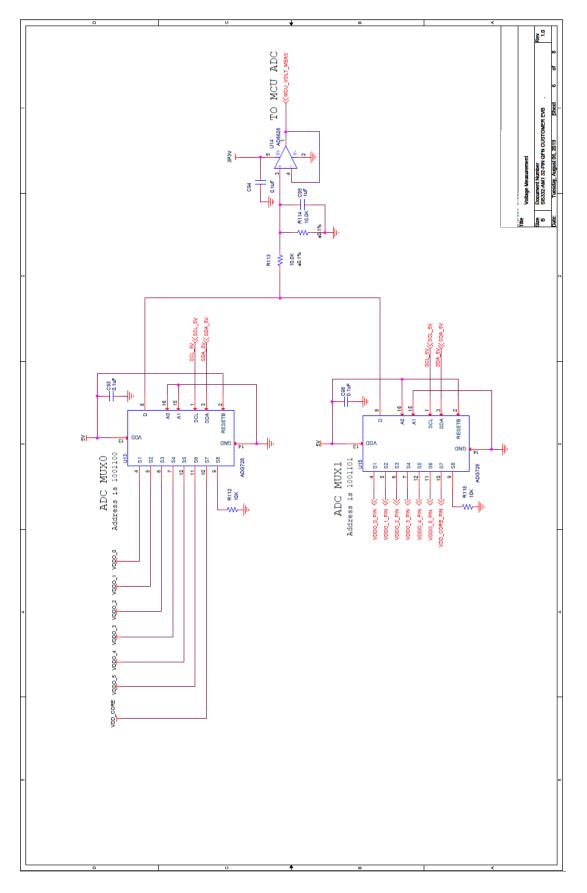


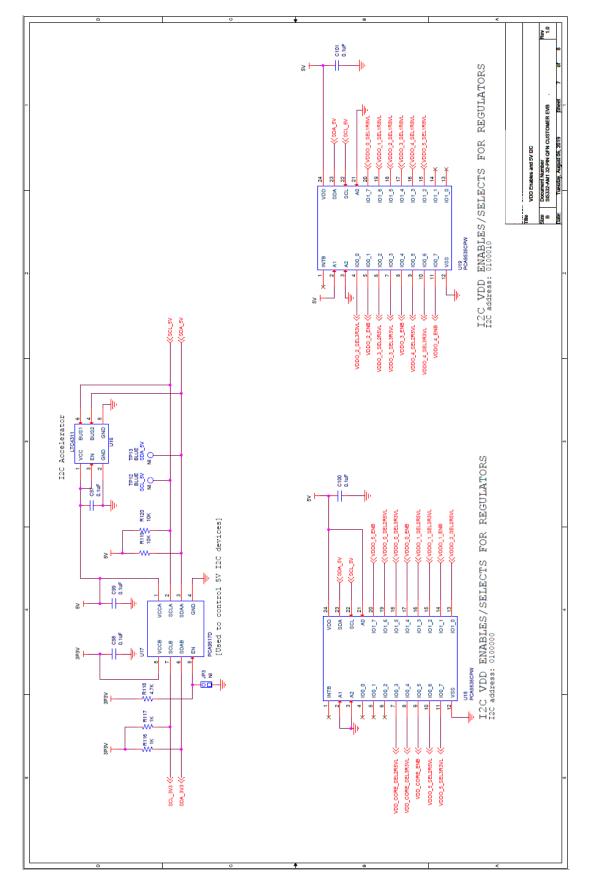


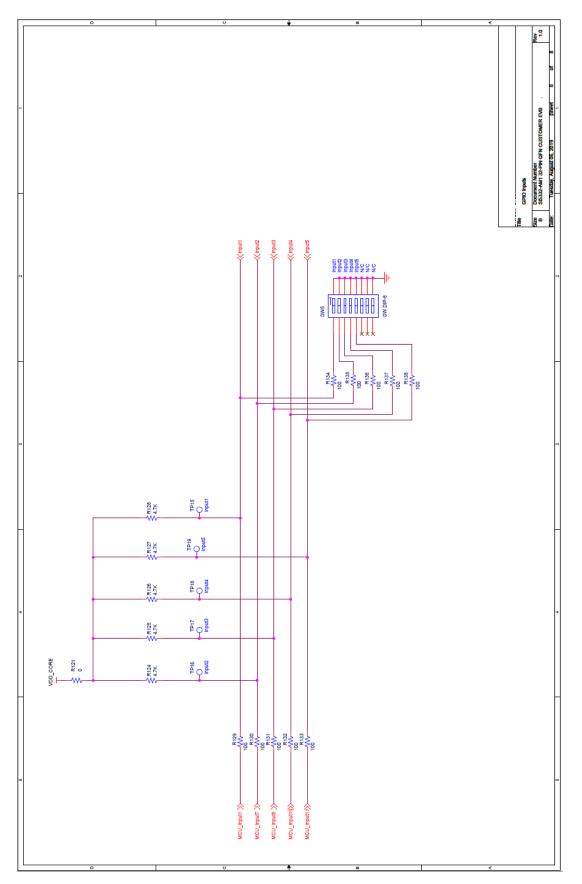












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One-click access to Timing tools, documentation, software, source code libraries & more. Available for Windows and iOS (CBGo only).

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