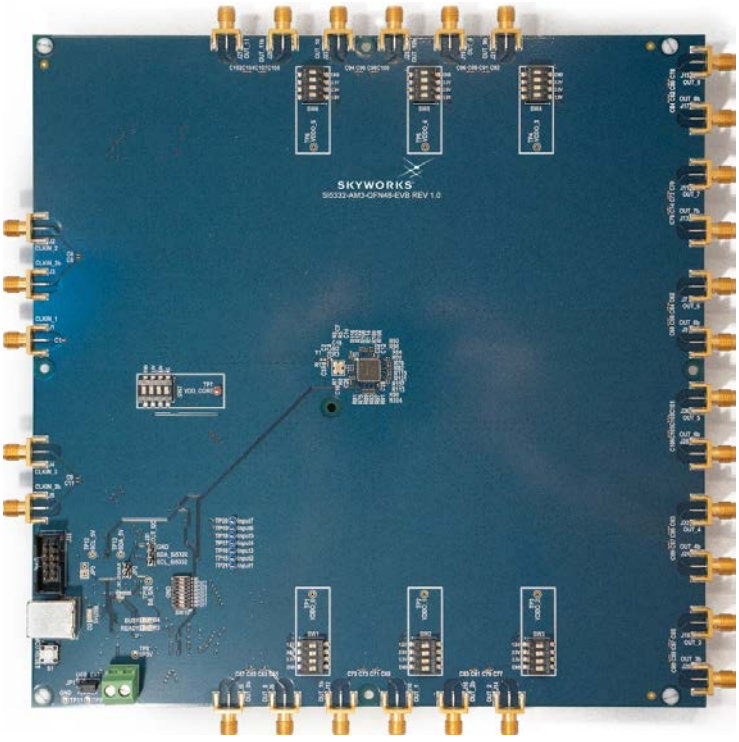
UG462: Si5332-12A-EVB User's Guide (Using Si5332-AM3-QFN48-EVB)

The Si5332-AM3-QFN48-EVB is used for evaluating the twelve output Automotive grade Si5332 Low Jitter Any-Frequency Clock Generator. The Si5332-AM3 device uses the patented Multisynth™ technology to generate up to twelve independent clock frequencies each with 0 ppm synthesis error. The Si5332-AM3-QFN48-EVB can use the on-board 25 MHz crystal as a reference or one of three independent input reference clocks. The Si5332-AM3-QFN48-EVB can be controlled and configured using the Skyworks Clock Builder Pro™ (CBPro™) software tool.



EVB FEATURES

- Powered from either USB port or external +5 V 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 clock output banks 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 on-board switches

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1. Functional Block Diagram

Below is a functional block diagram of the Si5332-AM3-QFN48-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.

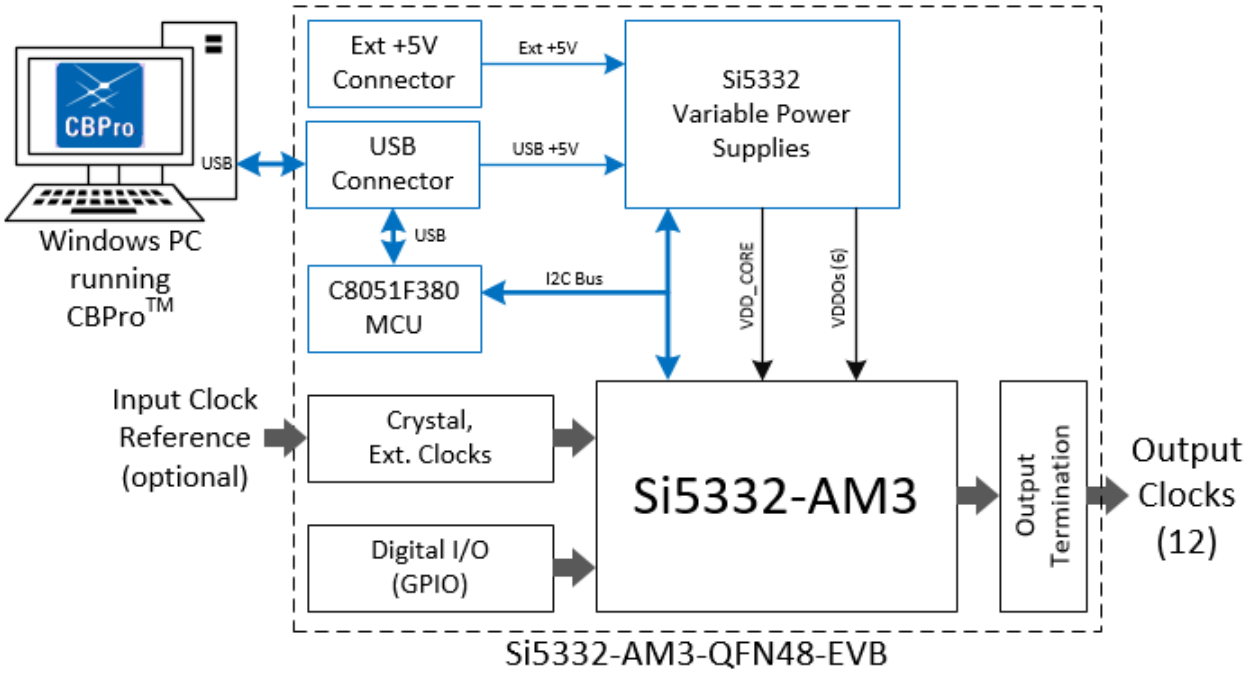


Figure 1.1. Si5332-AM3-QFN48-EVB Functional Block Diagram

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-AM3-QFN48-EVB. Download and install CBPro from here.

With CBPro, users can perform the following:

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

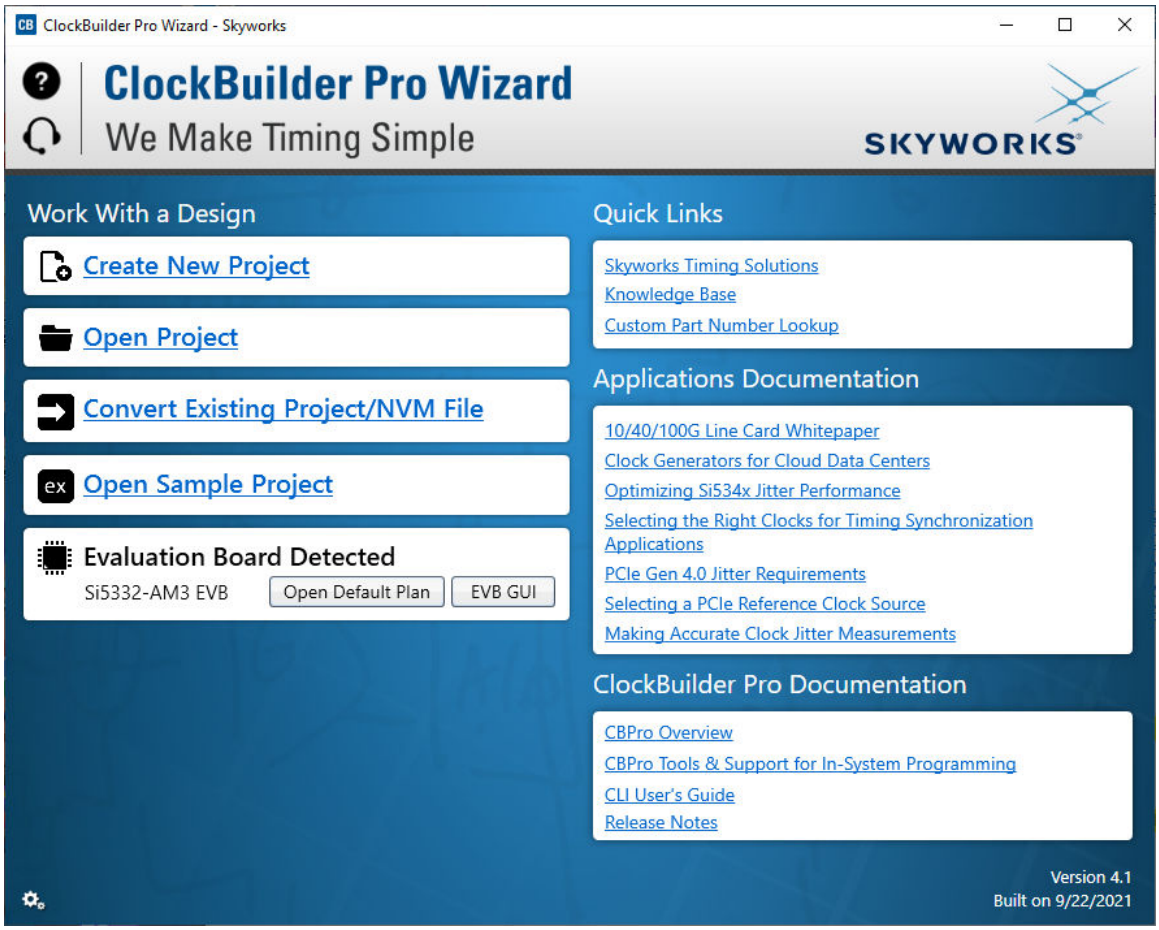


Figure 2.1. CBPro Start-up Window

3. Si5332-AM3-QFN48-EVB

3.1 Initial Default Configuration

The Si5332-AM3-QFN48-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 input (GPIO) configuration DIP switch (SW10), also with all switches set to OFF position. The required EVB **default** DIP switch settings are all switched OFF (as shown below) and these settings are required to allow CBPro software to control and configure the EVB. In addition, JP1 jumper should be installed on “USB” side (pins 1 & 2).

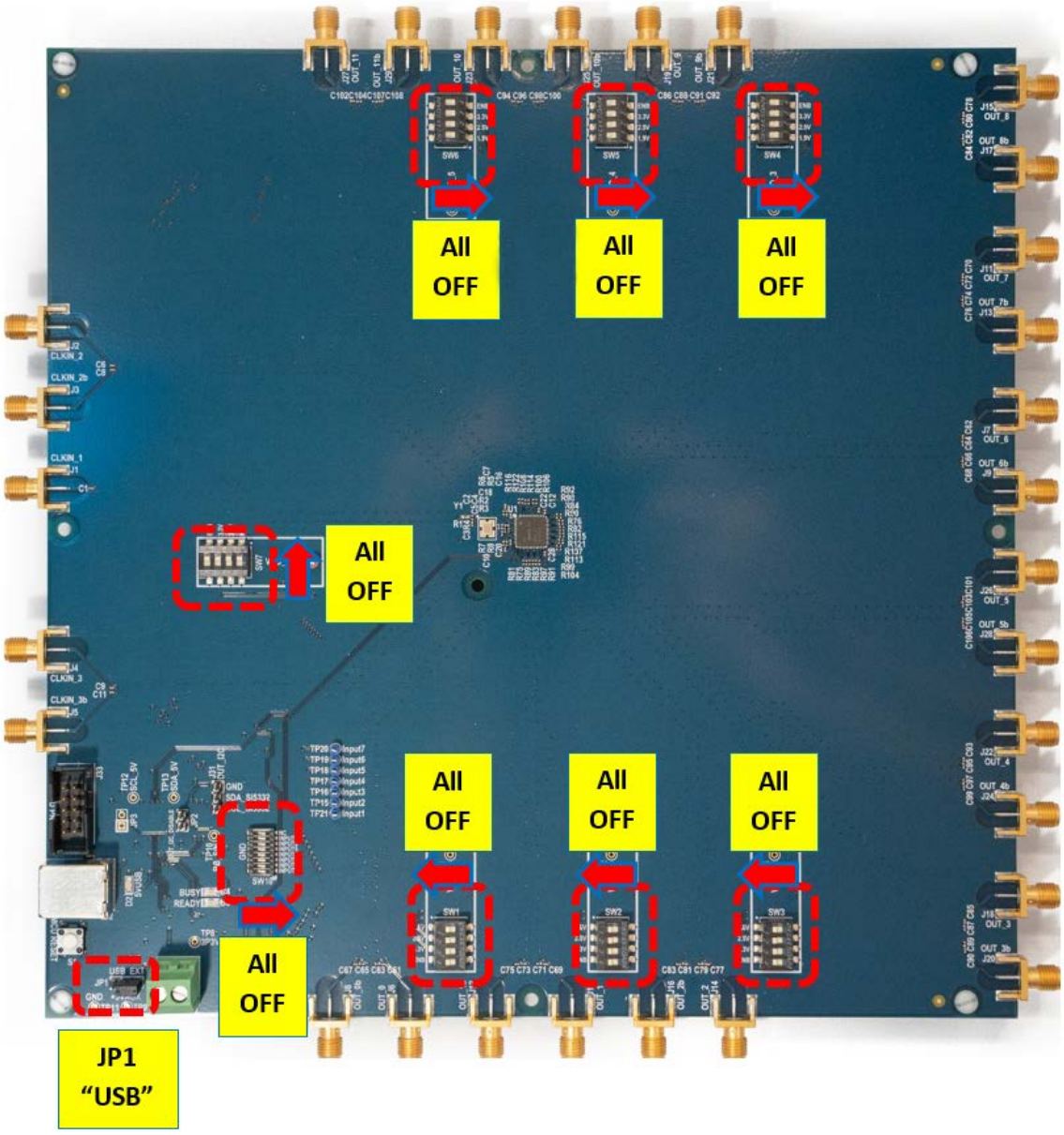


Figure 3.1. EVB Default DIP Switch Settings in the OFF Position

3.2 DIP Switch Functions

The power supply DIP switches (SW1 – SW7) are intended to provide flexibility in cases when a pre-programmed Si5332-AM3 device is installed on the board and CBPro will not be used to configure the Si5332-AM3 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-AM3's NVM by using the CBPro Field Programming Dongle or a if pre-configured Si5332-AM3 (custom OPN) is installed on the EVB.

The programmable digital input (GPIO) signal configuration switch (SW10) will only be used to turn specific features on/off based on the CBPro configuration loaded into the Si5332-AM3 device. For example, a programmable digital input, such as an Output Enable (OE), can be assigned to Input 1. Once the Si5332-AM3 configuration with Input 1 assigned as OE is loaded, Input 1 on SW10 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-AM3-QFN48-EVB has three indicator LEDs (D2, D3, D4) near the USB connector as shown and defined below.

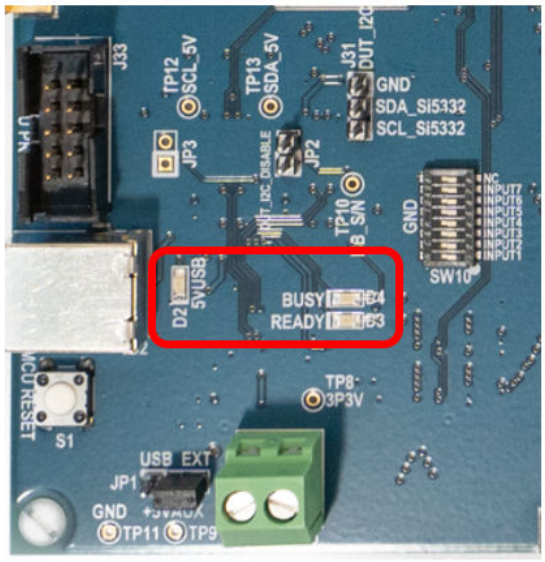


Figure 3.2. Si5332-AM3-QFN48-EVB LED Locations

D2: This Blue LED (+5VUSB) lights to indicate USB +5 V 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-AM3 device can support three sources of input from the 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 the Si5332-AM3 data sheet for more details.). The other two are separate external input clock sources which can be either differential or single-ended clocks.

As shown in the schematic below, the Si5332-AM3-QFN48-EVB is pre-populated with a 25 MHz crystal on the XA/XB crystal input. Both differential external clock inputs have 50 Ω 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.

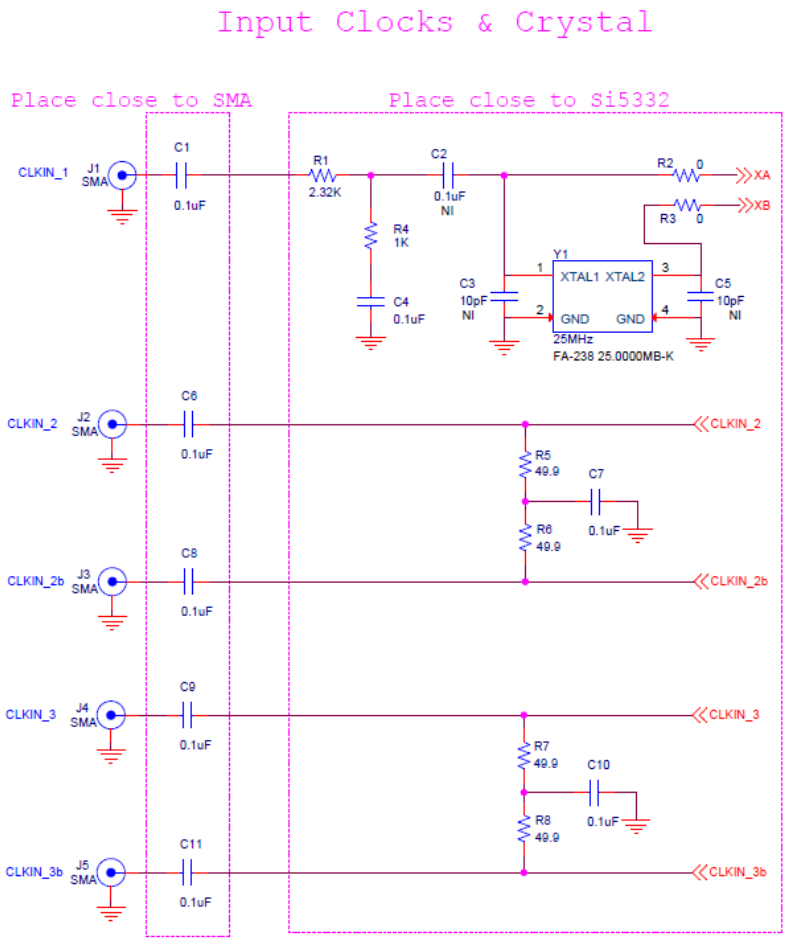


Figure 3.3. Si5332-AM3-QFN48-EVB Input Clock Circuit

3.5 Output Clocks

The Si5332-AM3 device can support up to 12 differential pair outputs or 12 pairs of LVCMOS outputs (24 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-AM3 device with no other termination.

The default output termination components (0 Ω and 0.1 µF) 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 µF 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.

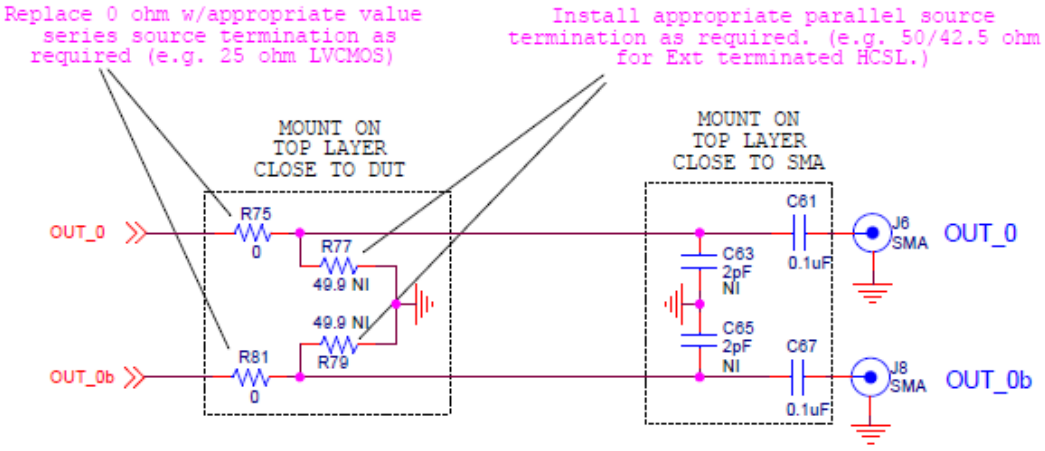


Figure 3.4. Si5332-AM3-QFN48-EVB Single Pair Output Clock Termination Circuit

4. Using CBPro with Si5332-AM3-QFN48-EVB

Skyworks' CBPro software is required for using the Si5332-AM3-QFN48-EVB. It can be downloaded from this Skyworks website link: https://www.skyworksinc.com/en/Application-Pages/Clockbuilder-Pro-Software

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

Figure 4.1. CBPro Opening Window

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

The EVB GUI is a useful tool as it allows monitoring and control of EVB functions such as digital inputs, 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.

4.1 CBPro EVB GUI

The EVB GUI is invoked by pressing the “EVB GUI” button from CBPro’s main window. A new EVB GUI window will be opened, as shown below. Across the top are several tabs for selecting various useful informational pages, and pages for configuration, control, or monitoring of the EVB.

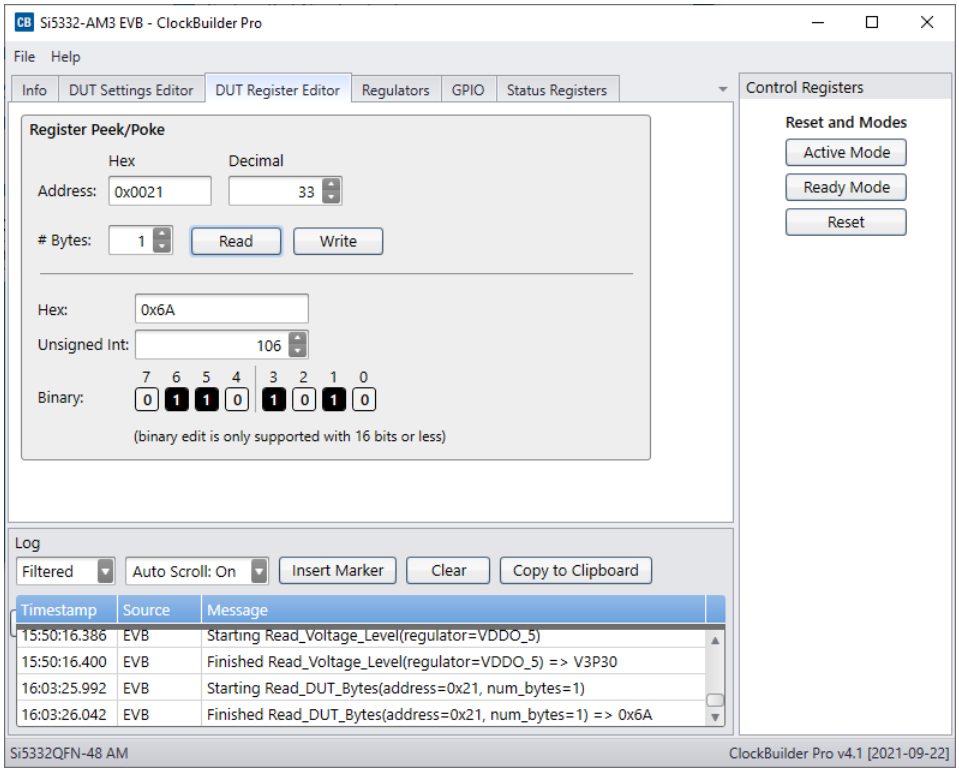


Figure 4.2. EVB GUI - Info Page

The “Info” tab shows information regarding the 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 the Si5332 device in Active or Ready mode or to reset the device. Refer to the “Status Registers” tab for important information on device modes and their effects 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.

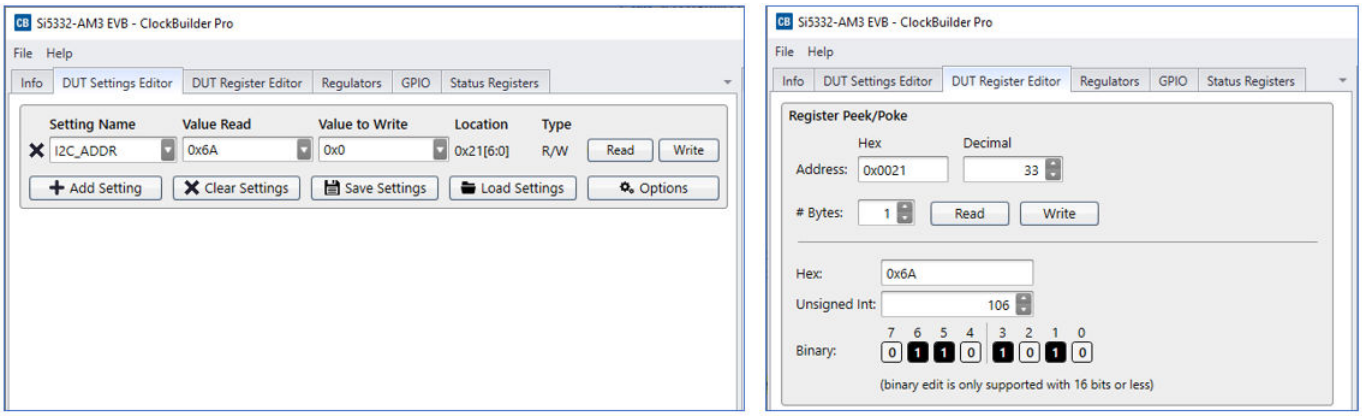


Figure 4.3. EVB GUI - DUT Settings / DUT Register Editors

The “Regulators” tab allows reading the voltages and currents for each on-board power supply. Each regulator may be switched on/off or have the voltage changed as necessary. Similarly, the “GPIO” tab allows for monitoring and control of the Si5332 programmable digital inputs.

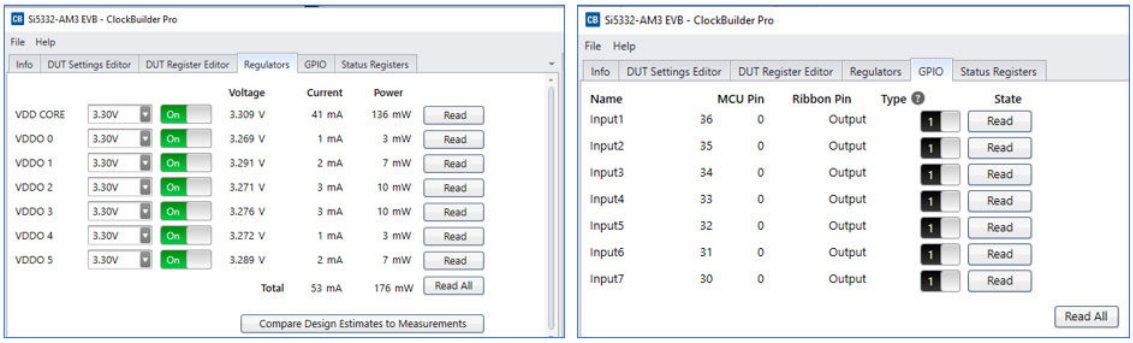


Figure 4.4. EVB GUI – Regulators and GPIO Monitoring/Control

4.2 Device Register Changes using the CBPro EVB GUI

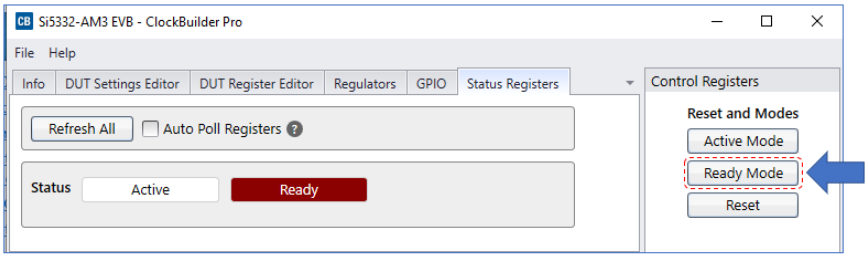
The last EVB GUI tab is the “Status Registers” tab, which shows the present state of the device in either “Active” or “Ready” mode.

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 the device is placed back in “Active” mode, the outputs will resume based on any register changes done while in “Ready” mode.

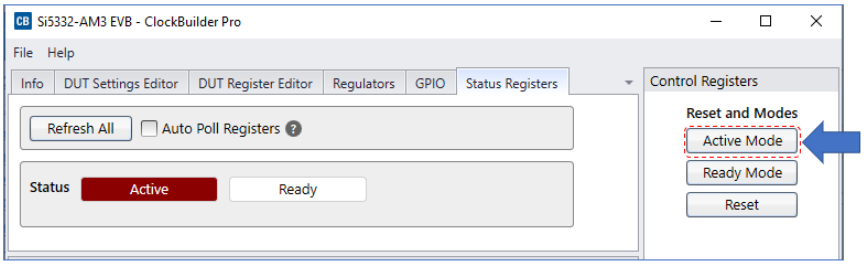
The only registers not requiring this process are Spread Spectrum enable/disable, Output Enable controls, Input Clock Selection, and the register controlling placement of the device into and out of Active or Ready mode. Do not rely on the device being in “Active” mode to prevent inadvertent I2C write 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.
   a. Press “Ready Mode” button, then “Refresh All” button to update Status.



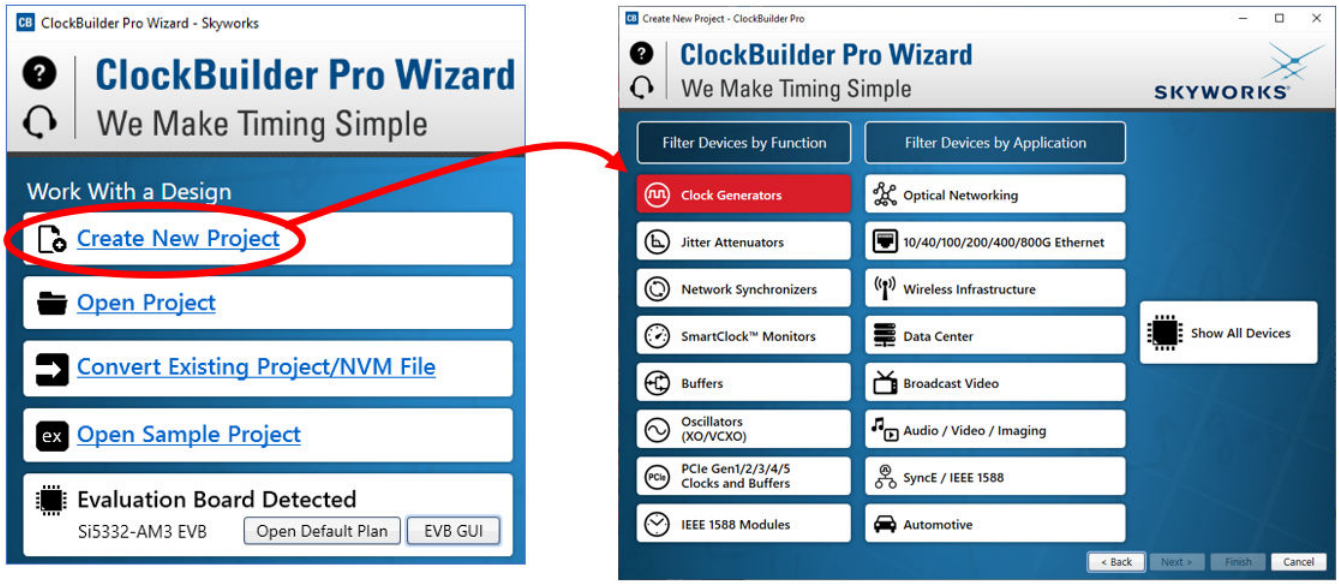
   b. Confirm device is in “Ready” mode.
2. Perform any register updates as desired.
3. Place device back into “Active” mode for the register changes to take effect and to enable outputs.
   a. Press “Active Mode” button, then “Refresh All” button to update Status.



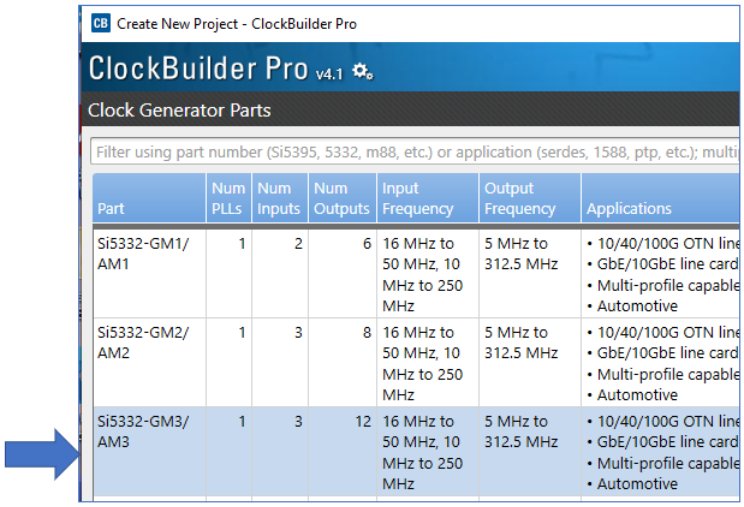
   b. Confirm device is now in “Active” mode.

4.3 Creating a New Si5332-AM3 CBPro Configuration

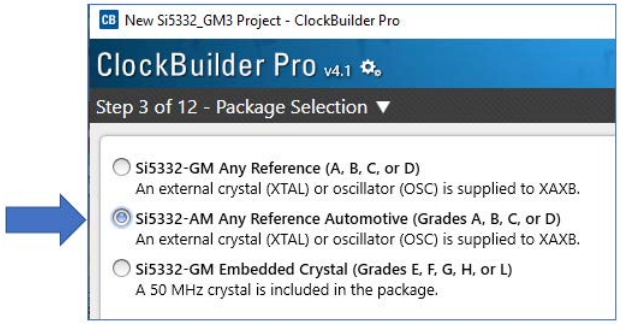
1. To start a new Si5332-AM3 project, click on “Create New Project” from the CBPro opening window.
2. From the selection window, click on “Clock Generators”.



3. Next, select Si5332-GM3/AM3 from the list of devices.



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



5. When you have completed all steps, press the “Write to EVB” button to download your configuration to the connected EVB. Your configuration now should be actively running in the Si5332-AM3-QFN48-EVB.

5. Si5332-AM3-QFN48-EVB Rev 1.0 Schematics

The Si5332-AM3-QFN48-EVB schematic, BOM, and layout information can be found at the following link:

https://www.skyworksinc.com/search?doc=Schematics%20and%20Layouts#documents