

SiT6702DM Demo Board User Manual

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1 Introduction


The SiT6702DM is an I²C/SPI demonstration board used for evaluating the features of SiTime oscillators that have I²C/SPI interfaces for in-system programming of output frequency or pulling/tuning the frequency. The SiT6702DM board has a USB interface for connecting to the PC. The board is powered through the USB by default, but it can be configured to accept an external +5-V supply. TimeMaster™ clock configurator software is provided for controlling the board.

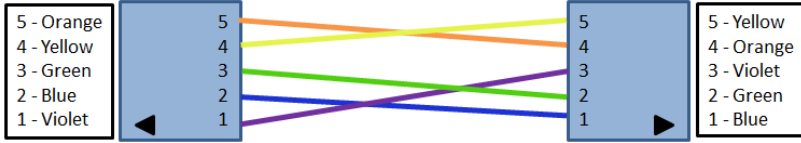

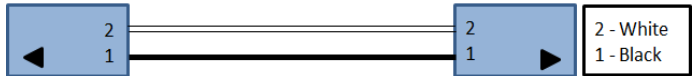

The SiT6702DM board is designed to be used in combination with the SiT6722EB, SiT6722SEB, or SiT6712EB evaluation boards (EVBs).

1. The SiT6722EB and SiT6722SEB EVBs support SiT5155/6/7, SiT5356/7, SiT5358/9 TCXO families with the DCO function enabled via I²C
2. The SiT6712EB EVB supports SiT3521 and SiT3522 I²C/SPI in-system programmable oscillators

2 SiT6702DM Package

Table 1: The SiT6702DM rev 1.01 shipment package includes:

Item	Image
SiT6702DM rev.1.01	

I²C interface cable for connection with SiT6722EB/SiT6722SEB	
I²C/SPI interface cable for connection with SiT6712EB	
OE control cable	
Power supply cable	

3 Board Features and Connections

The SiT6702DM board has the following connections (refer to [Figure 1](#)).

1. USB interface for connecting to the PC (USB Micro B connector)
2. USB power or external +5V power (resistor configurable)
3. I²C/SPI communication with SiTime devices
4. Hardware OE control
5. DUT VDD connector

External connections for the SiT6702DM are listed in [Table 2](#) and are shown in [Figure 1](#).

Table 2: SiT6702DM I/O

I/O	Description
USB	USB Micro B connector for connection to the PC. By default board is powered through this connector.
External Power	A two-pin connector (P3) for DC power supply to the SiT6702DM board. Pin polarity is identified on the silkscreen pattern near the connector (see Figure 1). Nominal voltage required is +5V.
I²C Interface	A five-pin connector (P4) is available for communicating with the SiT6712EB/SiT6722EB/SiT6722SEB boards via an I ² C interface. See Figure 2 and 3 for connection diagrams.
SPI Interface	A five-pin connector (P5) is available for communicating with the SiT6712EB

	board via an SPI interface. See Figure 4 for connection diagram.
OE Control	A two-pin connector (P6) is available for switching the output of the oscillator (it is effected only for PIN control option)
DUT VDD	A two-pin connector (P7) provides power to the SiT6712EB/SiT6722EB/SiT6722SEB boards

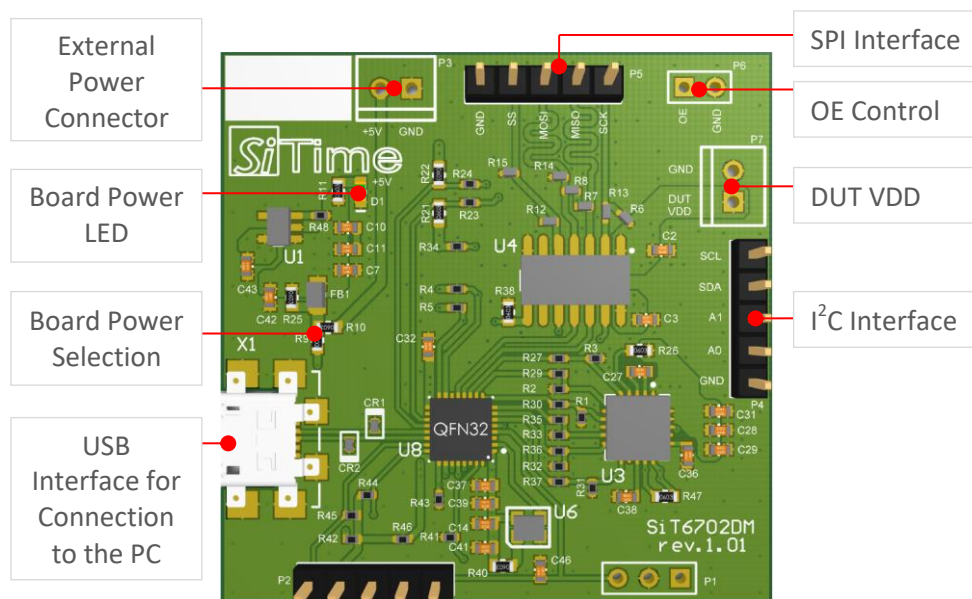


Figure 1: SiT6702DM main connections

The power source can be selected by changing the resistor assembly configuration. Table 3 shows the truth table for different configurations.

Table 3: Power options

Power Option	R9	R10	Comment
USB (default)	0 Ω	Do not stuff	Board is powered from USB
External	Do not stuff	0 Ω	Board is powered from external supply connected to P3

Figures 2-4 show connection diagrams between the SiT6702DM board and SiT6722EB/SiT6722SEB EVBs ([Figure 2](#)) and SiT6712EB ([Figure 3](#), [Figure 4](#)) for I²C and SPI interface usage respectively. The SiT6722EB/SiT6722SEB boards use an I²C interface only.

Two interface cables are supplied with the SiT6702DM: one is intended for connecting to the I²C interface of the SiT6722EB/SiT6722SEB EVBs and the second is intended for connecting to the I²C/SPI

interface of the SiT6712EB EVB. Follow the coloring scheme as shown in Figures 2-4 for selecting the proper cable connection.

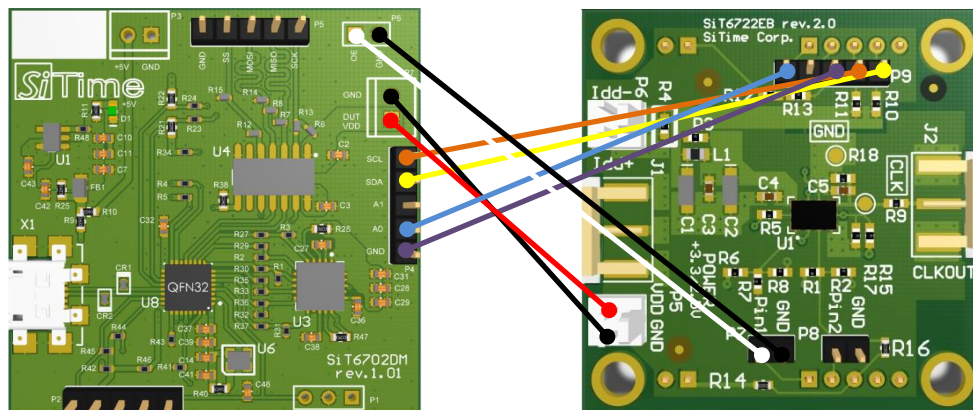


Figure 2: SiT6702DM to SiT6722EB/SiT6722SEB connections, I²C

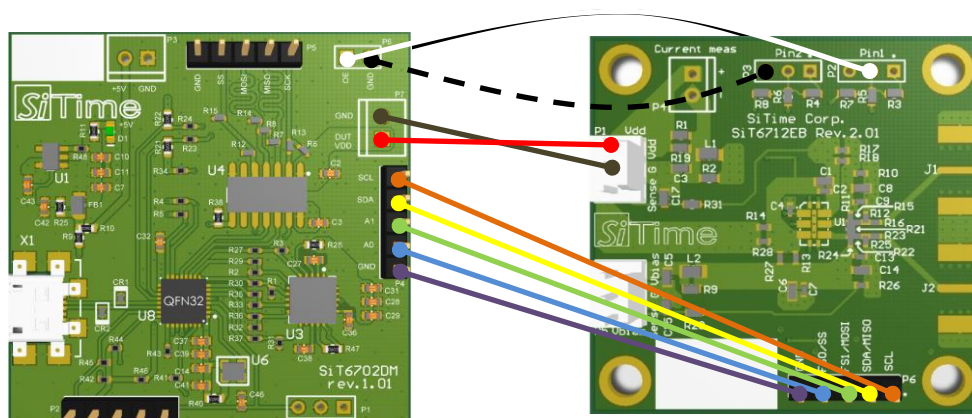


Figure 3: SiT6702DM to SiT6712EB connections, I²C

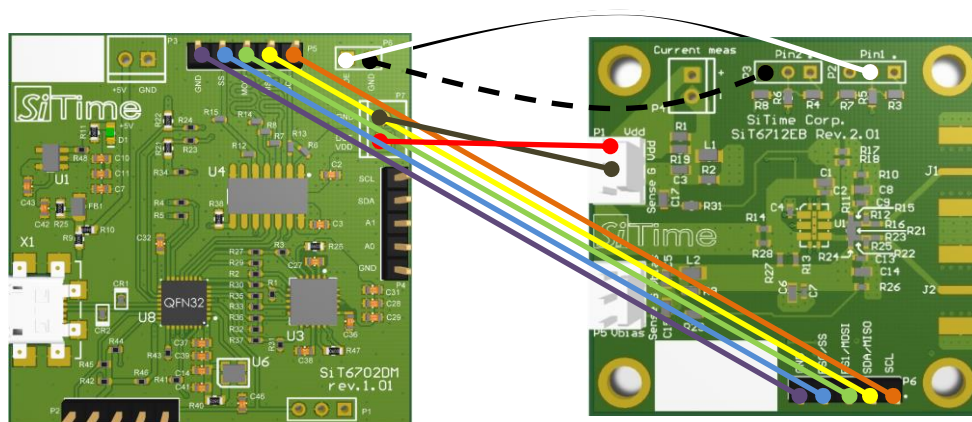


Figure 4: SiT6702DM to SiT6712EB connections, SPI

4 PC Connection and Clock Configurator Software

The SiT6702DM board connects to the PC with a USB interface. TimeMaster clock configurator software is supplied with the board and is compatible with Microsoft Windows-based systems: Windows 7 and Windows 10. After the connection, board will be identified by the system automatically and the standard Windows drivers will be installed.

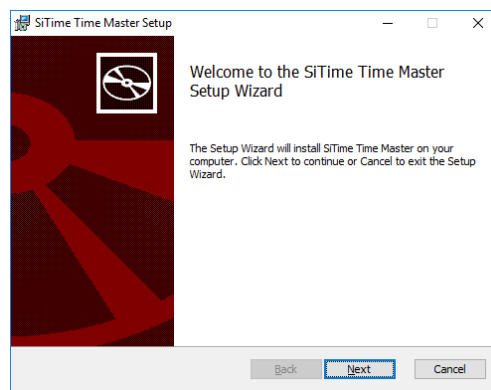
Note: TimeMaster software requires [.NET Framework 4.5](#) or higher to be installed on the PC.

TimeMaster software can be [downloaded](#) from the SiTime web site.

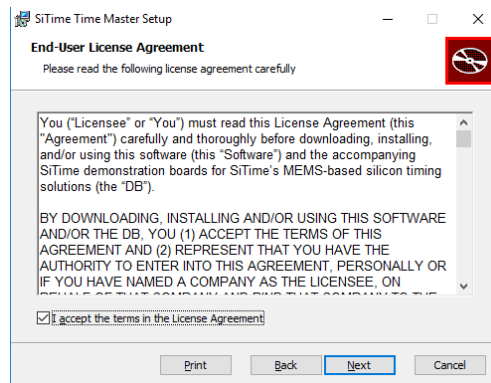
4.1 Software Installation

After the software is downloaded, the user needs to run *TimeMaster_rev.1.0.msi* and complete the following steps to finish installation:

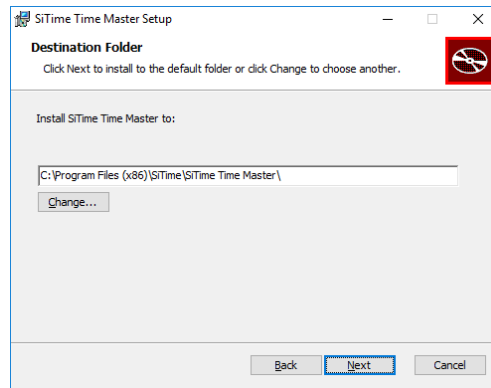
1. Click *Next* on the welcome window



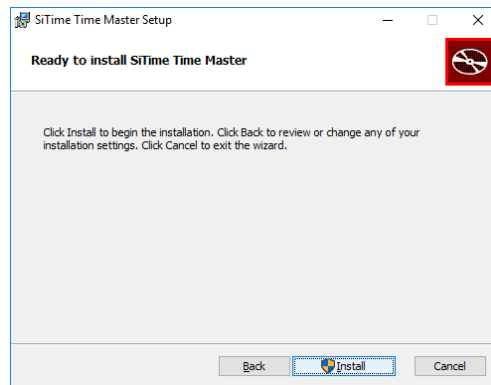
2. Select *I accept the terms in the License Agreement* and then click *Next*



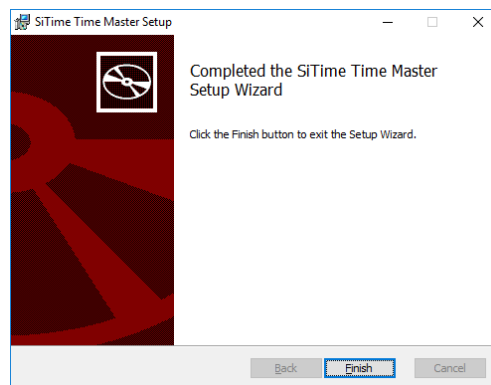
3. Select the destination folder and then click *Next*



4. Click *Install*



5. After the installation is complete, click *Finish* to close the installer window. Software installation will automatically add a shortcut on the desktop for quick software launch.



4.2 Software Operation

There are two GUI startup flows that are supported.

1. **Start with the board disconnected from the PC.** The GUI will open with a notice that the board is disconnected (see [Figure 5](#)). After the board is connected the user should go to the menu: *SystemCheck->Initialize* to initialize the system.
2. **Start with the board connected to the PC.** The software will ask the user to enter device options on startup (see [Figure 7](#) and [Figure 8](#)). A similar window is shown for the previous case after the board is connected and system initialization is launched.

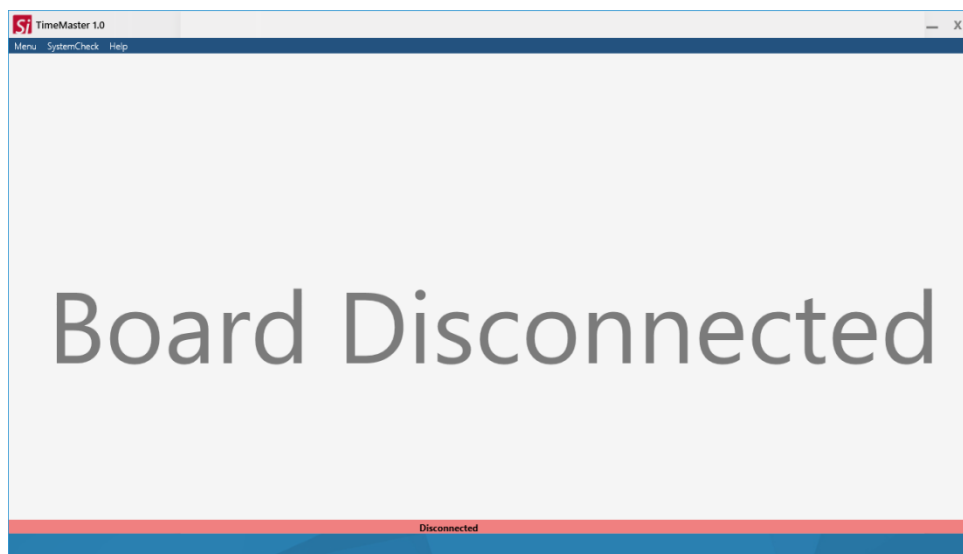
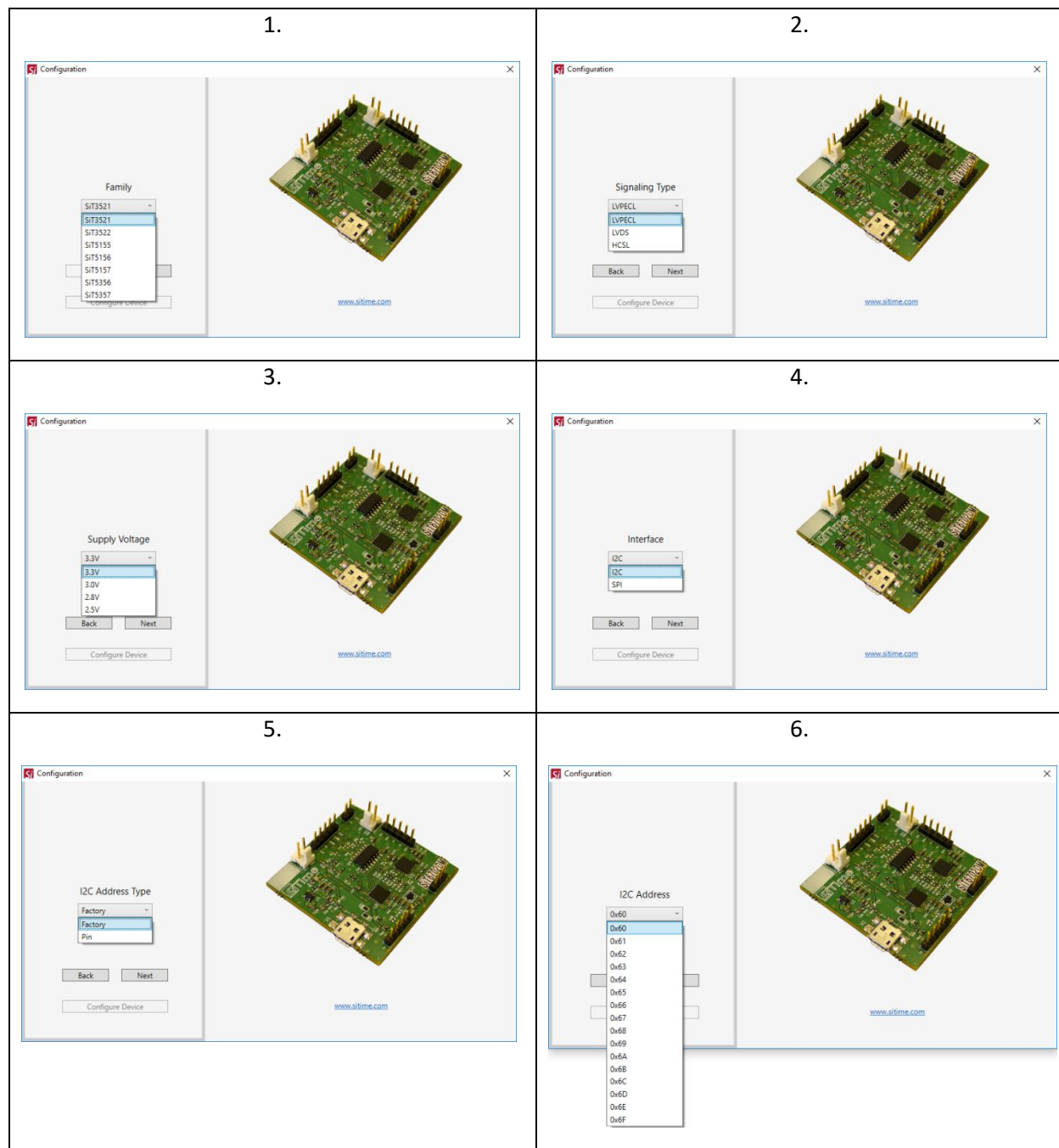


Figure 5: Startup GUI appearance when the board is disconnected

The software will start with the window shown on [Figure 6](#) and the following options should be specified to initialize the GUI.

1. Device family:
 - a. Select the device family and press *Next*
2. Signaling type:
 - a. Select signaling type and press *Next*
3. Supply voltage:
 - a. Select the DUT VDD and press *Next*
4. Interface:
 - a. Select the communication interface and press *Next*
5. I2C address type (**I2C Interface Only**):
 - a. Select the I2C address type and press *Next*
6. I2C address (**I2C Interface Only**):
 - a. Select the DUT I2C address and press *Next*
7. OE control:
 - a. Select the OE control type and press *Next*
8. Output frequency (**SiT51xx/53xx Only**):
 - a. Set the DUT frequency and press *Configure Device*

Important note: The software does not automatically detect the output signaling type so it is important to select the correct item in the *Signaling Type* menu. If the wrong signaling type is selected, the driver settings may be programmed incorrectly during the feature evaluation which will result in an incorrect output waveform. This applies when the SiT6712EB board with a SiT3521/2 device is used. For SiT51xx/SiT53xx device families, the output driver options are not controlled.



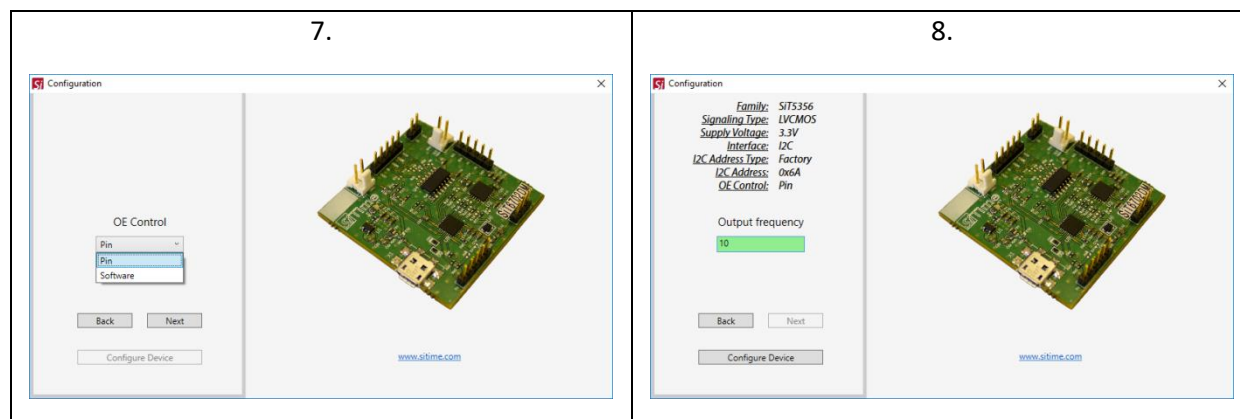


Figure 6: Device options selection window

Once all options are selected, the GUI will start the main window showing the board connection status (see Figure 7). The main GUI shows a simplified block diagram of the device with DCO and output enable blocks accessible to the user. Frequency and pull range values are displayed on the startup window and represent the current state of the DUT.

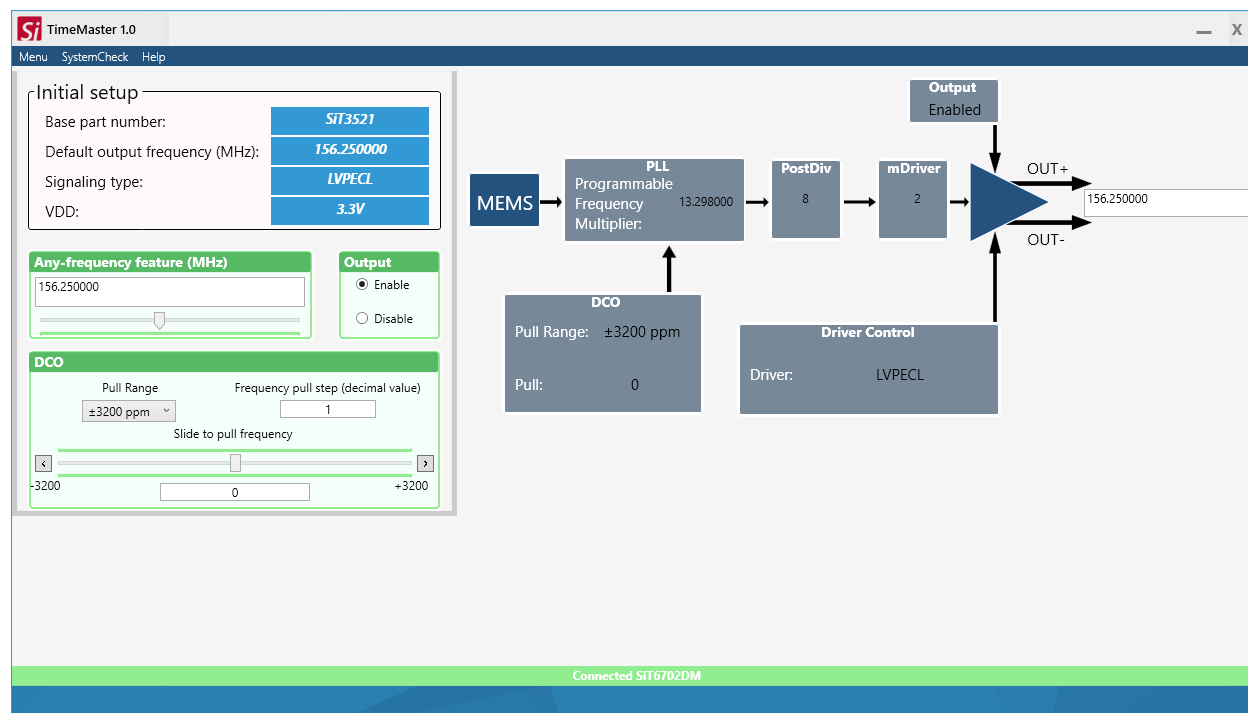


Figure 7: Startup GUI appearance when board is connected, SiT6712EB with SiT3521 device example

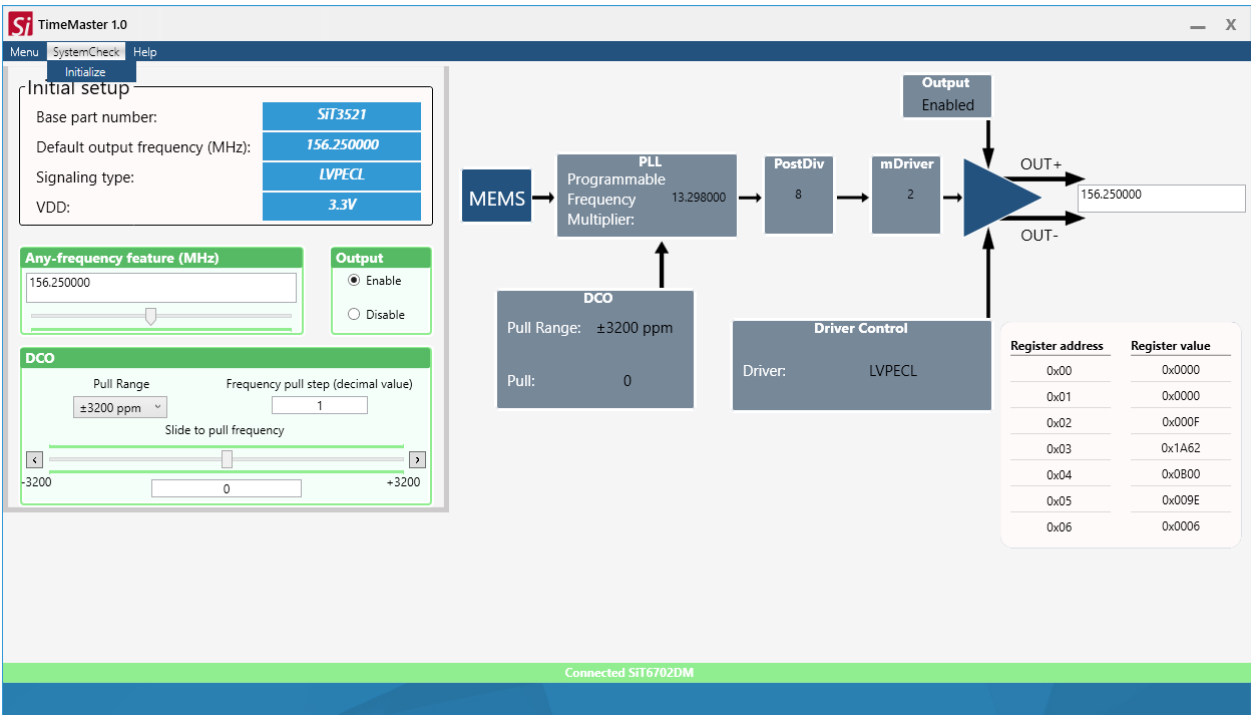


Figure 8: Startup GUI appearance when board is connected, SiT6712EB with SiT3521 device example, register content viewer enabled

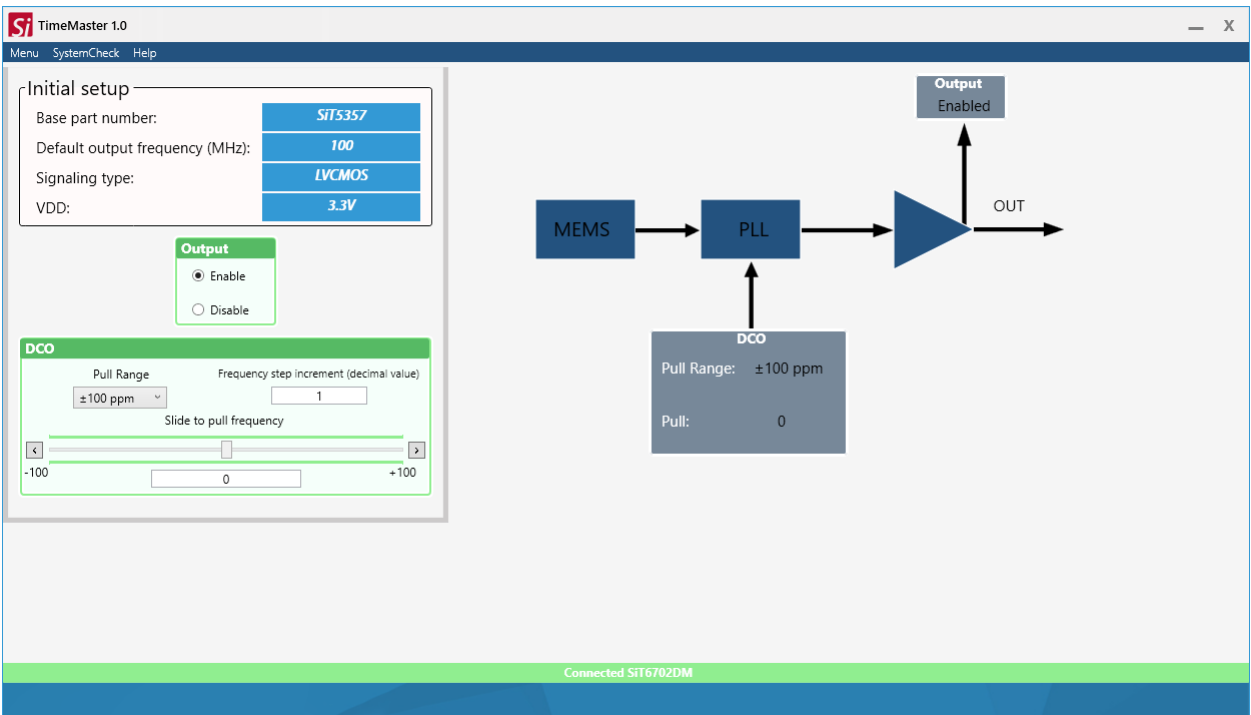


Figure 9: Startup GUI appearance when board is connected, SiT6722EB with SiT5356 device example

The controls enclosed in the green-colored blocks located on the left side of the GUI represent the user-accessible features of the SiTime device:

1. Any-frequency programming:
 - a. New frequency value in the range of 1 MHz to 340 MHz / 340 MHz to 725 MHz (for SiT3521/2 respectively, upper frequency limit for HCSL driver is 500 MHz) can be entered in edit box
Important note: Frequencies in the range from 300.6 MHz to 307.499 MHz and 601.201 MHz to 614.999 MHz are not supported.
 - b. Frequency value can be changed by swiping slider under the edit box
2. DCO pull range and frequency pull change:
 - a. Frequency pull range from 6.25 ppm*/25 ppm to 3200 ppm can be selected from the drop down menu
 - b. Frequency pull can be changed by swiping the slider or clicking on the buttons located to the left and right sides of slider
 - c. Step field defines the slider and button sensitivity. Step defines increment/decrement value of the frequency control word written to the device (Refer to section 8.2 of the SiT352x datasheet or the “DCTCXO-Specific Design Considerations” section of the SiT51xx/SiT53xx datasheet for the details)
3. OE control
 - a. Pulls the OE pin to high/low state in case of hardware OE pin control
 - b. Sends a command to enable/disable output to the device in case of software OE

*Pull Ranges from 6.25 ppm to 25 ppm are available for SiT51xx and SiT53xx devices only.

Note: After the new device frequency (SiT3521/2 only) or new pull range is selected, the software automatically changes the DCO frequency pull to 0.

The diagram located on the right side of the GUI shows a simplified block diagram with current values for the main blocks impacting output frequency. When evaluating SiT3521/2 oscillators, a text box near the output driver represents the nominal value of the frequency calculated based on the frequency, pull range, and frequency pull range values entered in the controls on the left side.

Note: If no evaluation board with a SiTime device is connected to the SiT6702DM board or any mistake is made when selecting device options (e.g. wrong device address specified), the GUI will display an error message shown in [Figure 10](#). In this case GUI re-initialization is required after connecting the evaluation board.

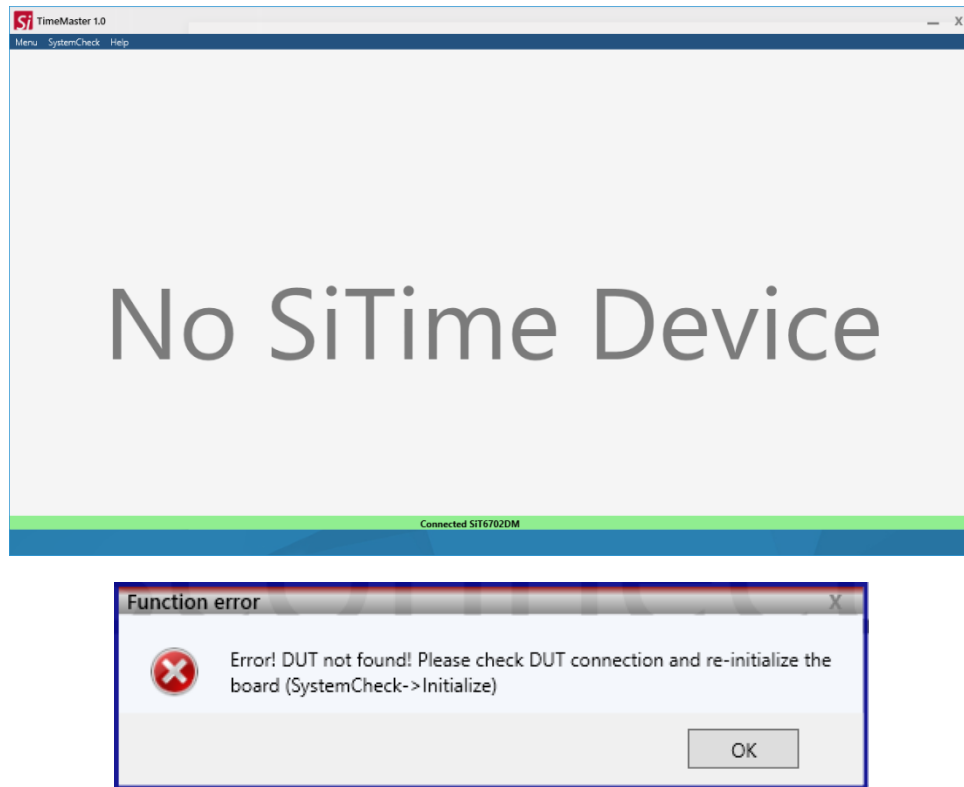
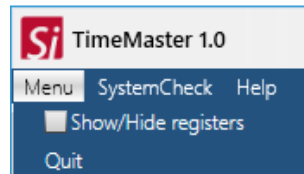


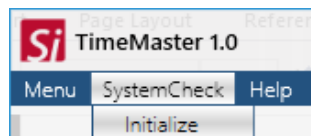
Figure 10: Error window reporting that device is not found

Menu options:

1. *Menu* tab:
 - a. *Checkbox*: displays the SiTime device register contents
 - b. *Quit*: exits the GUI



2. *SystemCheck* tab:
 - a. *Initialize*: initializes the GUI. Initialization must be run if:
 1. The board has been connected after the GUI start up
 2. The board was disconnected
 3. Any mistake was made when selecting device options



3. *Help* tab:
 - a. *View Manual*: opens user manual
 - b. *About*: shows information about the software and connected hardware

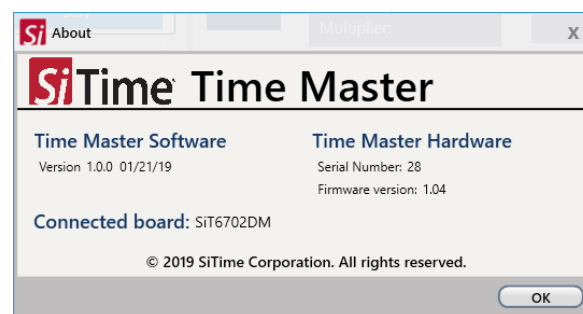
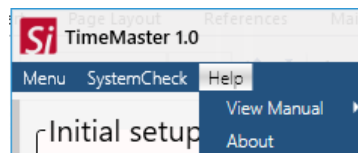


Figure A1: SiT6702DM rev. 1.01 schematic

Figure A1: SiT6702DM rev. 1.01 schematic



Table A1: Bill of Materials (BOM)

#	Reference Designators	Description	Qty	SMD Component Size	Value
1	R1, R2, R3, R31, R32, R33, R46	Resistor	7	0402	Not populated
2	R4, R5, R34, R41, R43, R44, R45, R48	Resistor	8	0402	10 k Ω
3	R6, R7, R8, R12, R14, R15	Resistor	6	0402	Not populated
4	R9, R10	Resistor	2	0603	0 Ω
5	R11, R16, R21, R22, R38, R40	Resistor	6	0603	1 k Ω
6	R13	Resistor	1	0402	30 Ω
7	R23, R24, R27, R29, R30, R35, R36, R37, R42	Resistor	9	0402	0 Ω
8	R25	Resistor	1	0603	10 Ω
9	R26, R47	Resistor	2	0603	10 k Ω
10	FB1	Ferrite bite	1	0805	10 μ H
11	C2, C3, C7, C37, C39, C41, C46	Ceramic capacitor	7	0603	0.1 μ F
15	C10, C28, C29, C31, C32, C36, C42	Ceramic capacitor	7	0603	10 μ F
13	C11, C27, C38	Ceramic capacitor	3	0603	0.01 μ F
14	C14	Ceramic capacitor	1	0603	4.7 μ F
15	C43	Ceramic capacitor	1	0603	2.2 μ F
16	CR1, CR2	ESD protection	2	SOD882	PESD5V0U1BL
17	D1	Green LED diode	1	0603	CMD17-21VGD

18	U1	300 mA, low voltage, low quiescent current LDO regulator	1	SOT23-5	MCP1824
19	U3	LDO voltage regulator	1	RGW(S-PVQFN-N20)	TPS7A8300
20	U4	Voltage-level translator	1	SOIC14_M	TXB0104DR
21	U6	SiTime 4-pin standard SE oscillator	1	2520	
22	U8	ARM MCU	1	UFQFPN32	STM32F042
23	P1	3-pin connector	1	Header 1x3 2.54 mm pitch	3-641215-3
24	P2, P4, P5	5-pin connector	1	Header 1x5 2.54 mm pitch	4-103185-0
25	P6	2-pin connector	1	Header 1x2 2.54 mm pitch	61300211121
26	P3, P7	2-pin connector	1	Connector 1x2 2.54 mm pitch	3-641215-2
27	X1	Molex cut In micro USB connector Type B	1	USB Micro B	Micro USB

Table A2: Digi-Key Part Number for Connectors

Connectors	Digi-Key Part Number	Digi-Key Part Number for Mating Connector	Digi-Key Part Number for Associated Products
USB	WM17142CT-ND	-	993-1070-ND 993-1294-ND
External Power	WM2701-ND	WM2001-ND	WM1114-ND
Vbias	WM2701-ND	WM2001-ND	WM1114-ND
SPI/I²C	732-5318-ND	A26967-ND	A25993-ND
OE	732-5315-ND	A26963-ND	A25993-ND

Table 4. Revision History

Version	Release Date	Change Summary
1.01	02/20/2019	Initial release

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