

Model-Based Design Toolbox S32K1xx Series

Quick Start Guide

**An Embedded Target for the S32K1xx Family of Processors
Version 4.3.0**

Target Based Automatic Code Generation Tools
For MATLAB™/Simulink™/Stateflow™ Models working with Simulink Coder™ and Embedded Coder®



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1 Installation

Installing the Model-Based Design Toolbox is the first step in setting up and running automatic C code generation from MATLAB/Simulink for NXP's embedded target processors and development boards.

1.1 System Requirements

For a flowless development experience the minimum recommended PC platform is:

- *Windows® OS*: any x64 processor
- At least 4 GB of RAM
- At least 6 GB of free disk space.
- Internet connectivity for web downloads.

Operating System Supported

	SP Level	64-bit
Windows 7	SP1	X
Windows 10		X

1.2 Installation Steps

NXP's Model-Based Design Toolbox is delivered as MATLAB Toolbox Package that can be installed offline or online from MathWorks Add-ons. This document shows how to install the offline package, assuming you have already downloaded the file from NXP's official web page.

To have the toolbox installed and configured properly the following actions should be executed:

1. Run the MATLAB toolbox package file `*.mltbx` downloaded from [NXP's Model-Based Design Toolbox web page](#)
2. Register and install the toolbox license file into `..\MATLAB\Add-Ons\Toolboxes\NXP_MBDToolbox_S32K1xx\lic`
3. Set the Target Compiler Environment Variables
4. Setup the MATLAB path for Model-Based Design Toolbox

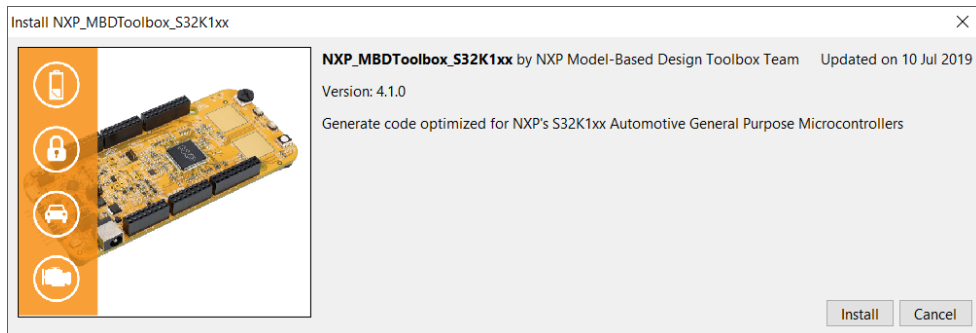
Each of these actions is explained in the following sub-chapters.

1.2.1 Run Add-on installer

Install the NXP's Model-Based Design Toolbox by double-clicking the *.mltbx file. This will activate the MATLAB Add-ons installer that will automatically start the installation process.

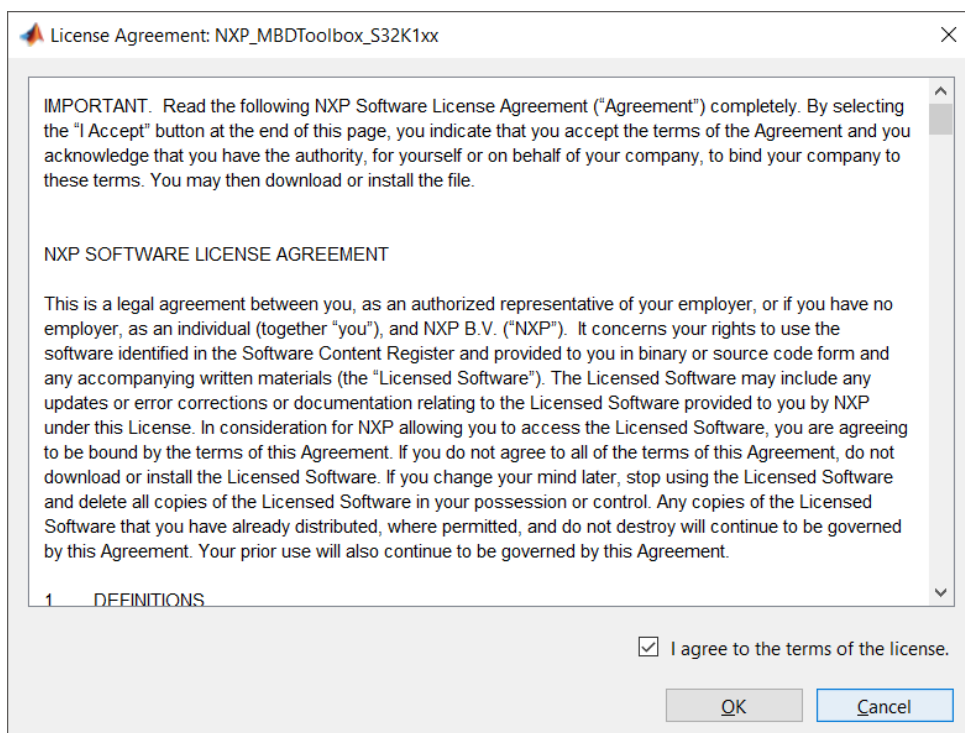
After the MATLAB opens, you will be prompted with the following options:

1. The NXP's Model-Based Design Toolbox Installation Wizard dialog will appear. Click "Install" to proceed.



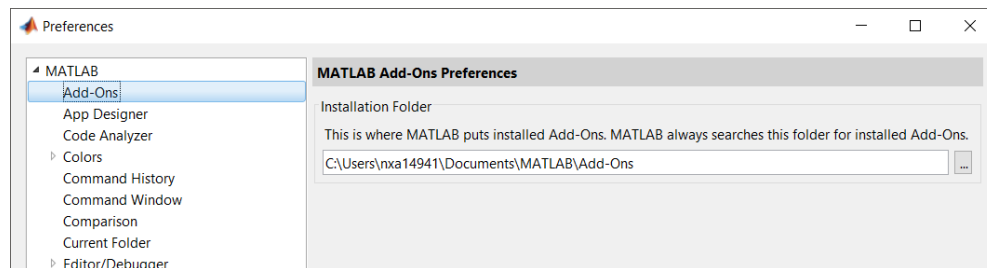
Note: Depending on the MATLAB version used to install the MLTBX files, this dialogue might be visible or not

2. Indicate acceptance of the NXP Software License Agreement by selecting "I agree to the terms of the license" to proceed.



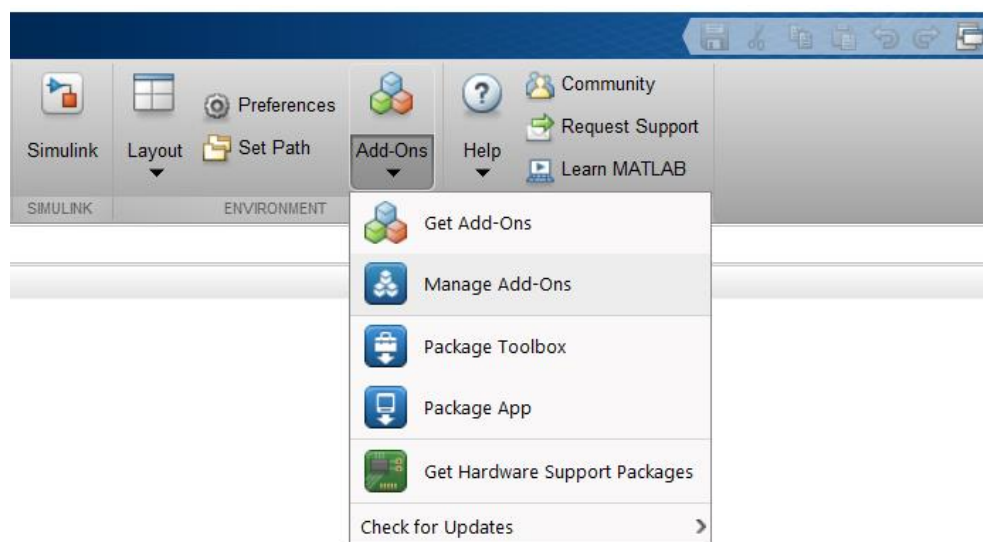
3. Click “OK” to start the MATLAB installation process. The rest of the process is silent and under MATLAB control. All the files will be automatically copied into default Add-Ons folder within the MATLAB

The default location can be changed before installation by changing the Add-Ons path from MATLAB Preferences

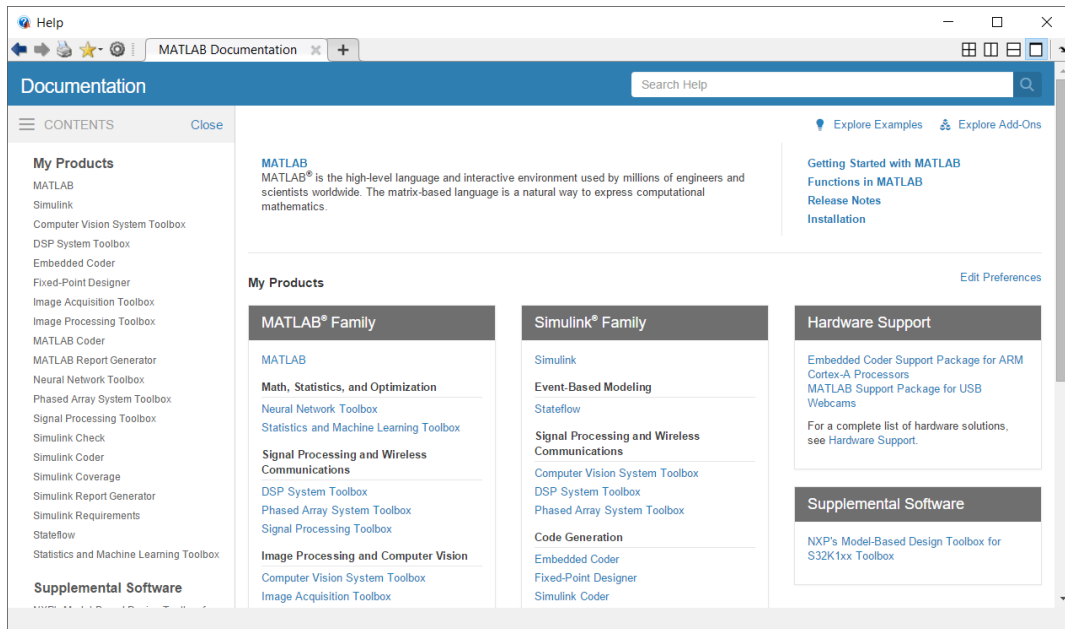


Note: It is recommended to install the MATLAB and NXP Toolbox into locations that do not contain special characters, empty spaces, or mapped drives.

4. After a couple of minutes (2-5min), the NXP’s Model-Based Design Toolbox should be visible as a new Add-ons.



5. NXP's Model-Based Design Toolbox documentation, help, and examples are fully integrated with the MATLAB development environment. Get more details by accessing the standard Help and **Supplemental Software** section

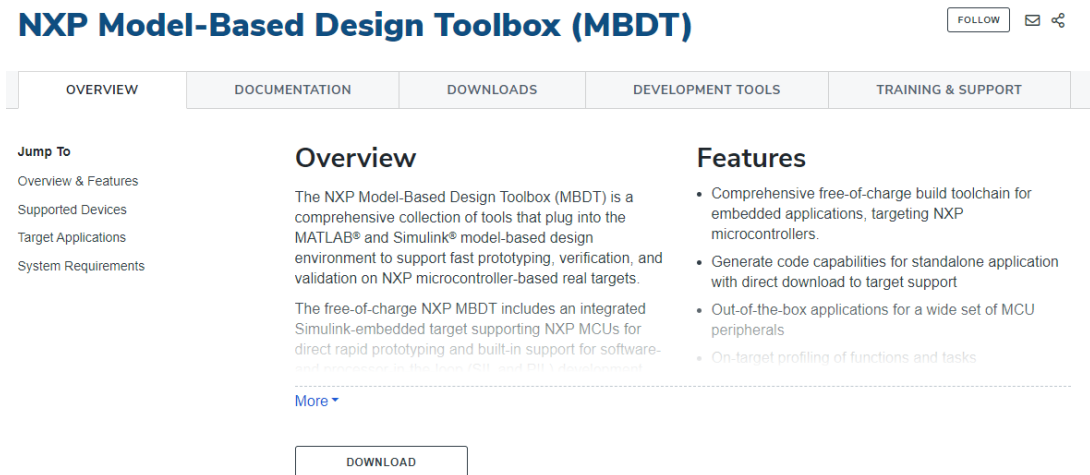


1.2.2 License Registration & Installation

The NXP's Model-Based Design Toolbox is available free of charge, however, a license is required. If you need to get a license it can be obtained by following the path outlined below. If you encounter issues getting a license please submit a ticket at <https://www.nxp.com/support/support:SUPPORTHOME> describing the issue.

Please perform the following steps to obtain your license:

1. Go to www.nxp.com/mbdt and click on “Download Eval”



2. Once you have logged in, the “Product Information” page for the Model-Based Design Toolbox appears.

Select the appropriate toolbox you wish you evaluate to bring up the Software Terms and Conditions page.

3. Click “I Agree” to consent to the software license agreement.
4. If you need to download the tool, click on the linked file name. Otherwise, click on the “License Keys” tab.
5. Verify the correct tool is identified and click on “Generate”.
6. Enter your Disk Serial Number as the Host ID. If you do not know your Disk Serial Number, go to “Locating the Host ID” in the document **Model-Based Design Toolbox S32K1xx Series Licensing Guide** to learn how to locate your Disk Serial Number, which is needed to generate your license.
7. Click “Generate”
8. Either click on “Save All” or copy and paste the file into a text editor and save the file as “license.lic” to the folder “..\MATLAB\Add-Ons\Toolboxes\NXP_MBDToolbox_S32K1xx\lic”

1.2.3 Setting up the Target Compilers

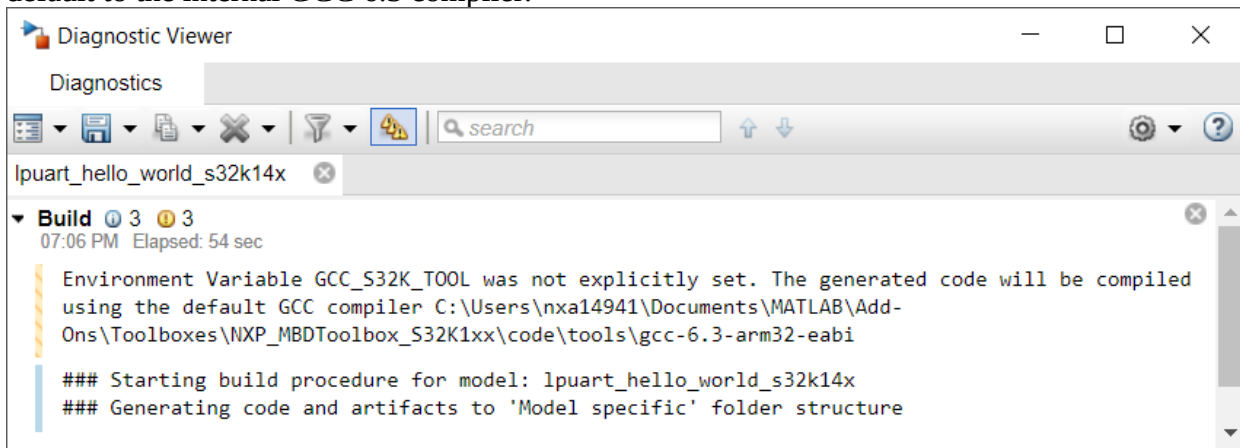
The target compiler for the Model-Based Design Toolbox needs to be configured. Use the notation below to setup these compiler environmental variables. Ensure a system environment

variable called <COMPILER_STRING>_TOOL, corresponding to the compiler(s) you have installed, is defined to compiler path value as shown below:

```
GCC_S32K_TOOL = {Toolbox installation path}\tools\gcc-6.3-arm32-eabi
IAR_TOOL = {IAR installation path}/IAR Systems/Embedded Workbench 7.3
GHS_TOOL = {GHS installation path}/multi517
```

Note: Paths shown are for illustration, your installation path may be different. Once environmental variables are setup you will need to restart MATLAB for the IDE environment to see these system variables.

In case there is no compiler installed, the NXP's Model-Based Design Toolbox is going to default to the internal GCC 6.3 compiler.



1.2.4 Setting the Path for Model-Based Design Toolbox

If the toolbox installation as Add-ons was successful, then the MATLAB will automatically detect the NXP's Model-Based Design Toolbox. Nonetheless, in special circumstances, you might need to run a special script to instruct the MATLAB to recognize the NXP's Model-Based Design Toolbox. This is done by changing the MATLAB Current Directory to the toolbox installation directory (e.g.: ..\MATLAB\Add-Ons\Toolboxes\NXP_MBDToolbox_S32K1xx\) and running the “mbd_s32k_path” script.

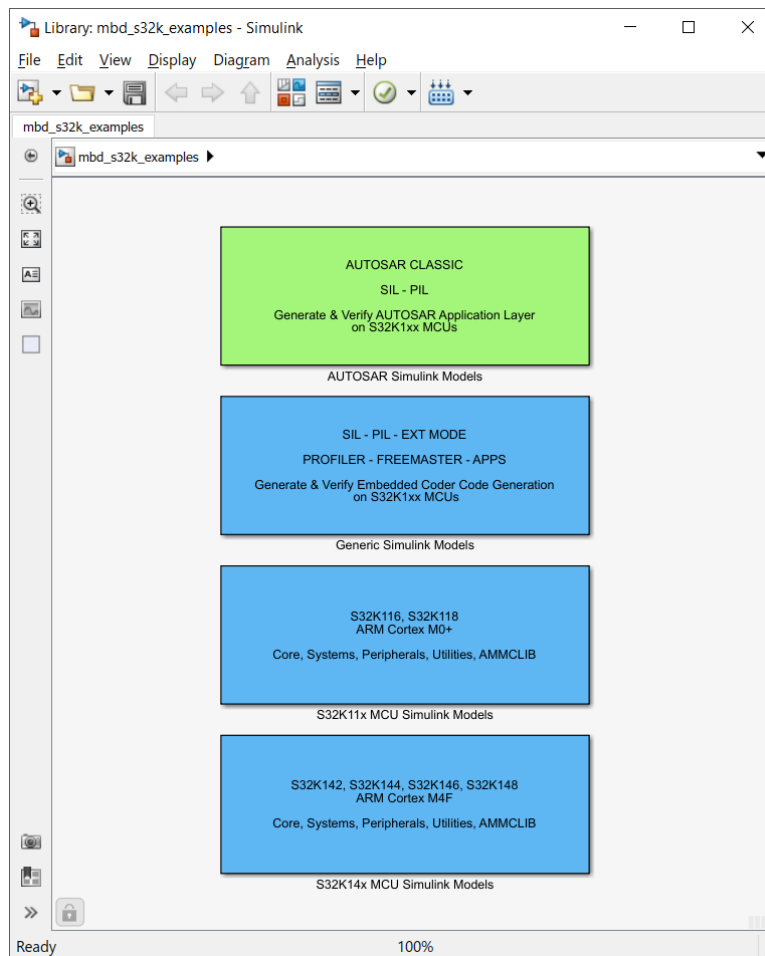
```
>> mbd_s32k_path
Treating 'C:\Users\b21307\Documents\MATLAB\Add-Ons\Toolboxes\NXP_MBDToolbox_S32K1xx\code' as MBD Toolbox installation root.
MBD Toolbox path prepended.
Successful.
>>
```


2 Run Models

2.1 Examples Library & Help

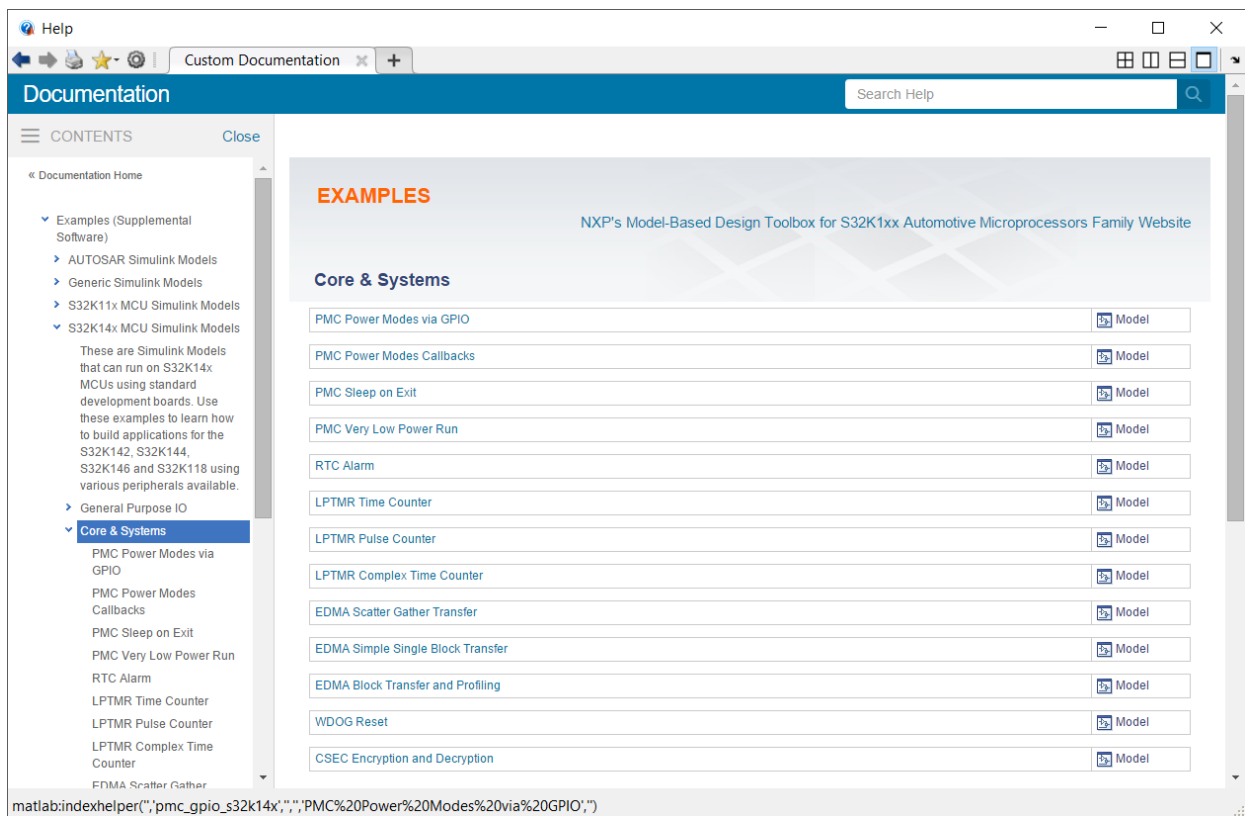
NXP's Model-Based Design Toolbox comes with an Examples Library collection that lets you test different MCU on-chip modules and run complex applications.

The Examples Library `mbd_s32k_examples.mdl` can be opened from “{Model Based Design Install Directory}\S32_Examples\” folder.



Each category contains multiple examples that showcase different Model-Based Design Toolbox capabilities that are categorized into different groups.

The examples are also available from standard MATLAB Help for NXP's Model-Based Design Toolbox Example



2.2 Hardware Setup

All examples provided with the Model-Based Design Toolbox were developed on S32K144EVB-Q100 as the primary target. Additional information about this development kit can be found on NXP official web page [here](#).



Before running any example on the S32K144EVB-Q100 a proper communication setup between the board and the host PC must be enabled. Please follow the next steps to ensure a working setup:

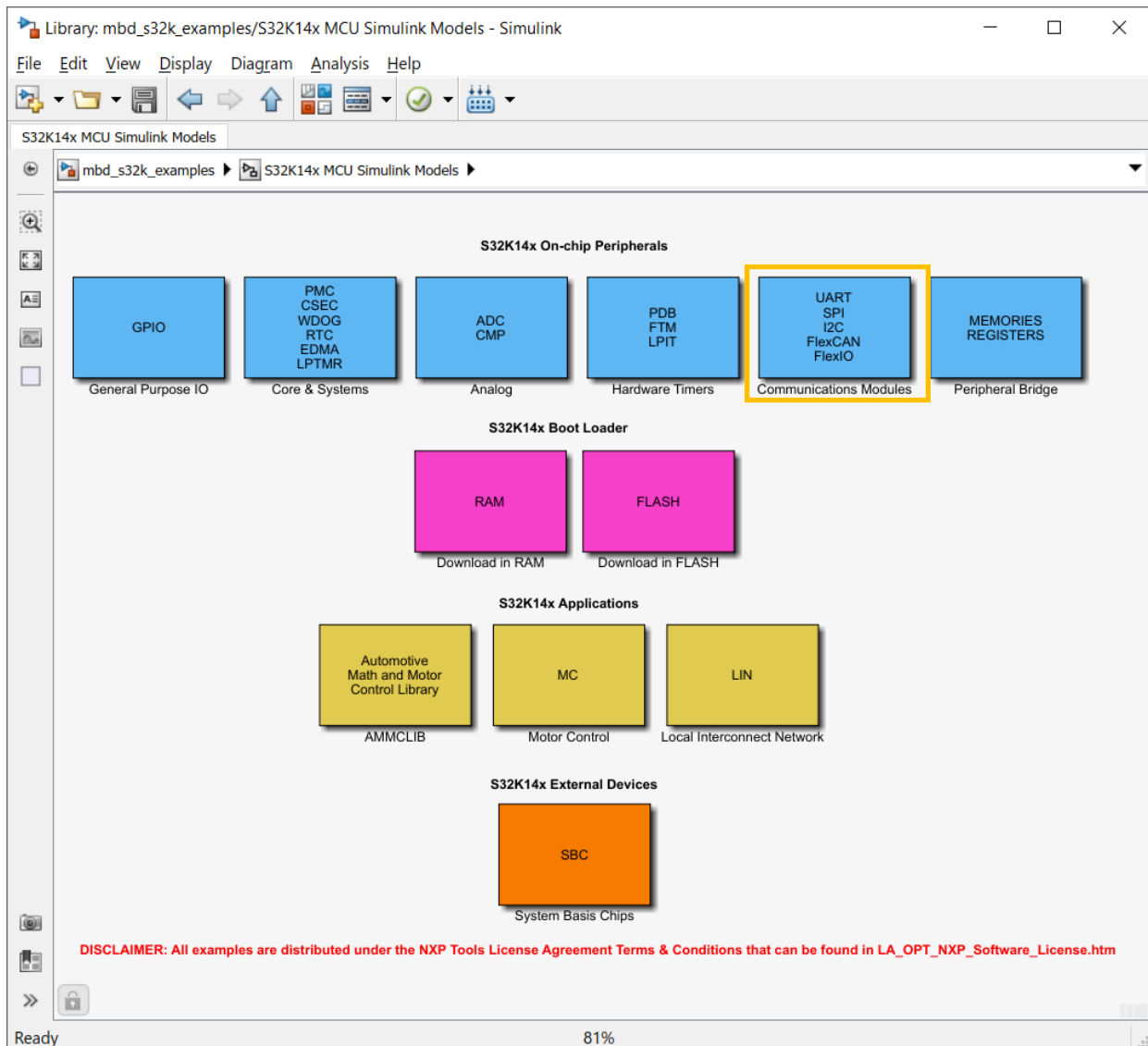
1. Place J107 jumper on positions 2-3 to power the S32K144EVB via the USB micro connector;
2. Place J104 jumper on positions 2-3 to enable the S12K144 MCU reset;
3. Connect the EVB micro USB connector J7 to a host PC USB connector using supplied USB cable;
4. Allow the PC to automatically configure the USB drivers if needed. Windows OS should automatically detect the S32K144 EVB and should assign a virtual COM port and a virtual mass storage device to the host;
5. When powered through USB, LEDs D2 and D3 should light green;
6. Once the board is recognized, it should appear as a mass storage device in your PC with the name EVB-S32K144;



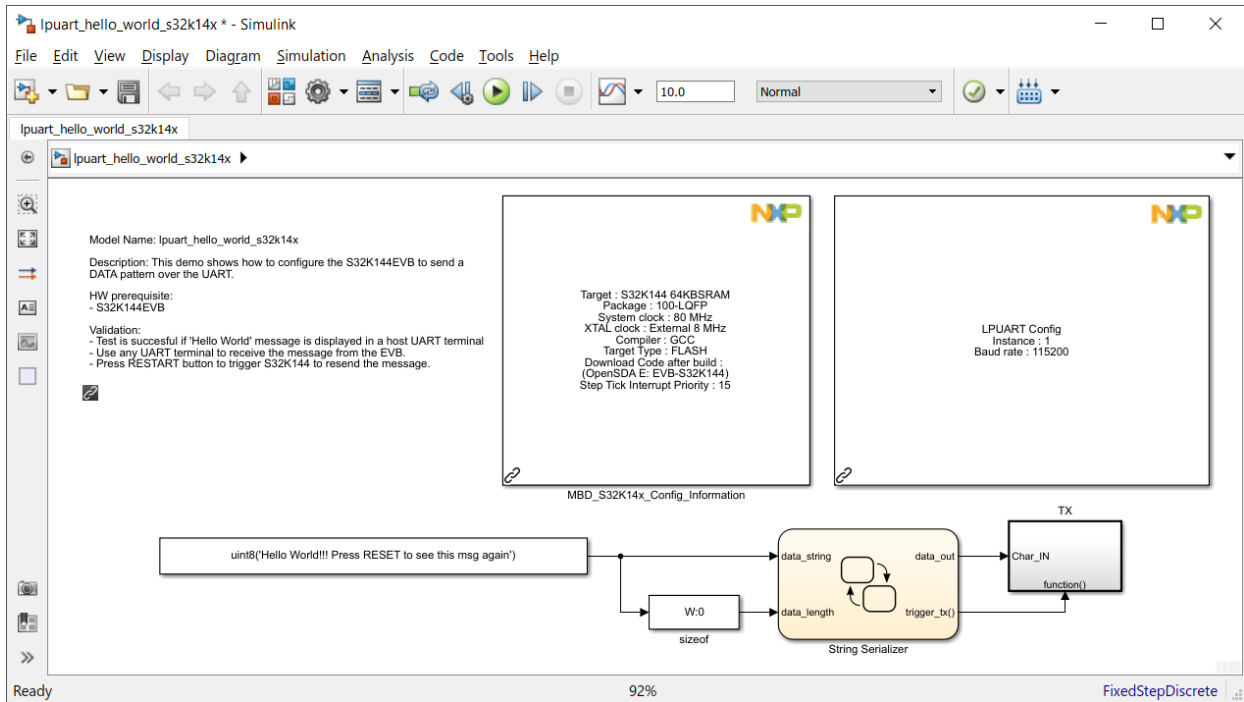
2.3 Hello World Example

If the hardware setup is completed successfully and a virtual COM port is created and visible in Control Panel -> Device Manager -> Port (COM & LPT) and a virtual mass storage device are present, then all ingredients for running a Model-Based Design Toolbox for S32K1xx Example.

Open the Examples Library and go to Communications Modules for S32K14x MCU and double click on UART Hello World block.



The Simulink `lpuart_hello_world_s32k14x.mdl` model will open. This model programs the S32K144 MCU to send a message over the UART.



Follow the next steps to run the example:

1. Double click on MBD_S32K1xx_Config_Information block and set up the Download Config parameters according to with your PC and HW setup.

Block Parameters: MBD_S32K14x_Config_Information

MBDTBX_EC_S32K (mask) (link)

Model-Based Design Toolbox Config block for S32K1xx family of processors.

MCU Build Toolchain **Target Connection** Diagnostics

Mode

☐ Processor-in-the-Loop (PIL) Mode Download

☒ **Download Code after Build**

Download settings

Delay before start of application (ms) 5000000

Download Interface OpenSDA

☐ Boot Assist Module (BAM) Restart Request

Serial

COM Port Custom Refresh

Custom COM Port COM1

Baud Rate 57600

OpenSDA

OpenSDA Drive Name E: EVB-S32K1 Refresh

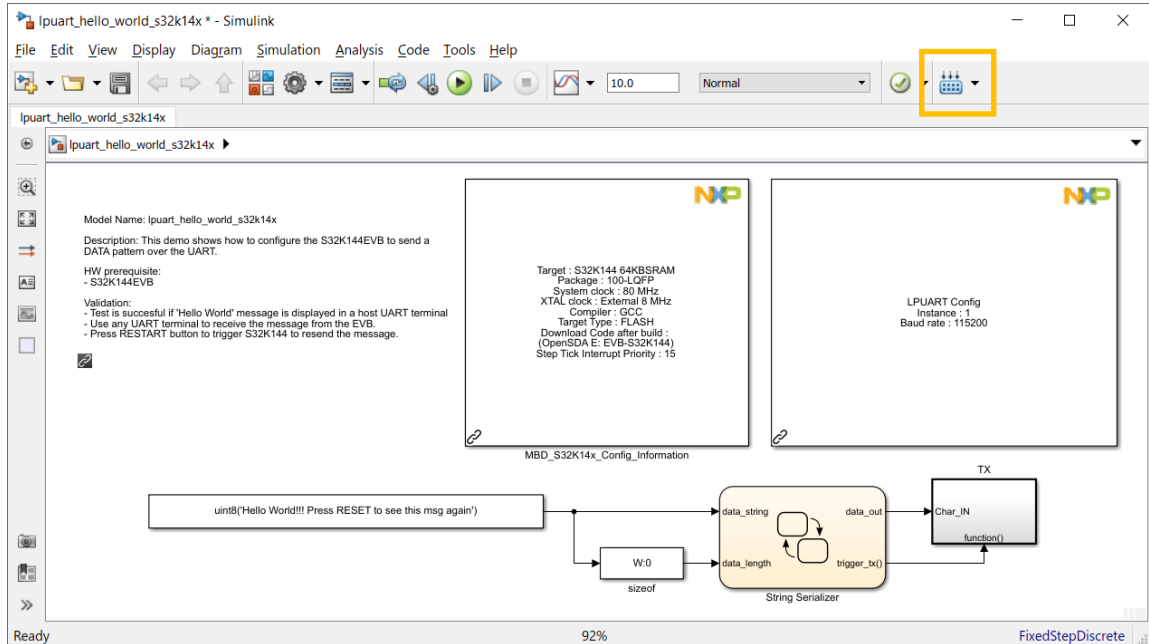
JTAG

Interface OpenSDA Embedded Debug

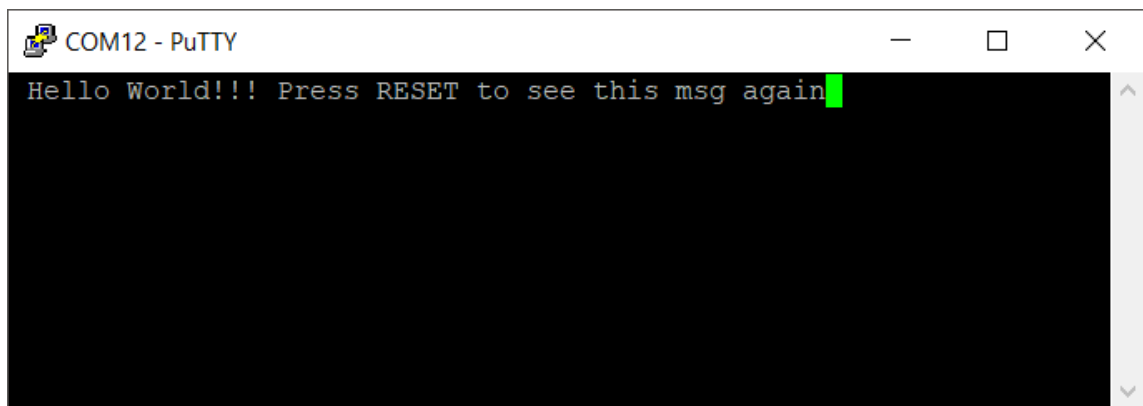
OK Cancel Help Apply

2. Apply and close this window.

- Press the Build Model button and wait until the code is generated, compiled, and downloaded to the evaluation board.



- Open any UART terminal for the virtual COM port assigned and set up the baud rate at 115200, data bits 8 and parity none.
- Press the reset button on the evaluation board.
- The S32K144 MCU sends “Hello World!!! Press RESET to see this msg again” message over the UART and the UART terminal should display it.



Congratulations! You succeeded with running your first example created with Model-Based Design Toolbox for S32K1xx

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