Model-Based Design Toolbox S32K3 Series

Quick Start Guide

Automatic Code Generation for the S32K3 Family of Processors
Version 1.6.0

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 flawless 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
Windows 11		X

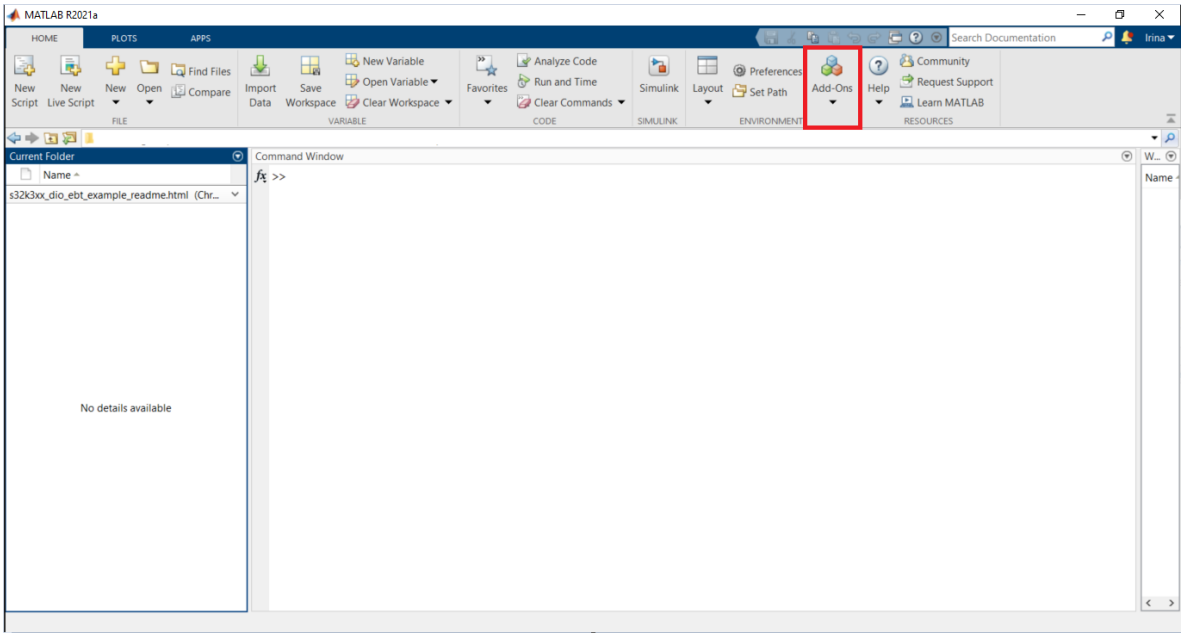
1.2 Installation Steps

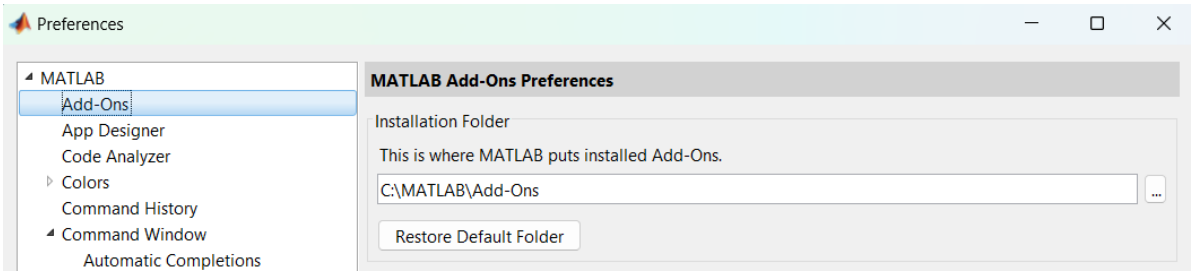
NXP's Model-Based Design Toolbox is delivered as MATLAB Toolbox Package that can be installed offline or online from MathWorks Add-ons.

1.2.1 Install NXP Support Package S32K3

This package will guide you through the download, installation, and activation process of the MBDT for S32K3. For demonstration purposes only, the 1.5.0 toolbox version have been used throughout the following steps. The same process applies to the current toolbox version **1.6.0**.

a. Go to MATLAB Add-Ons



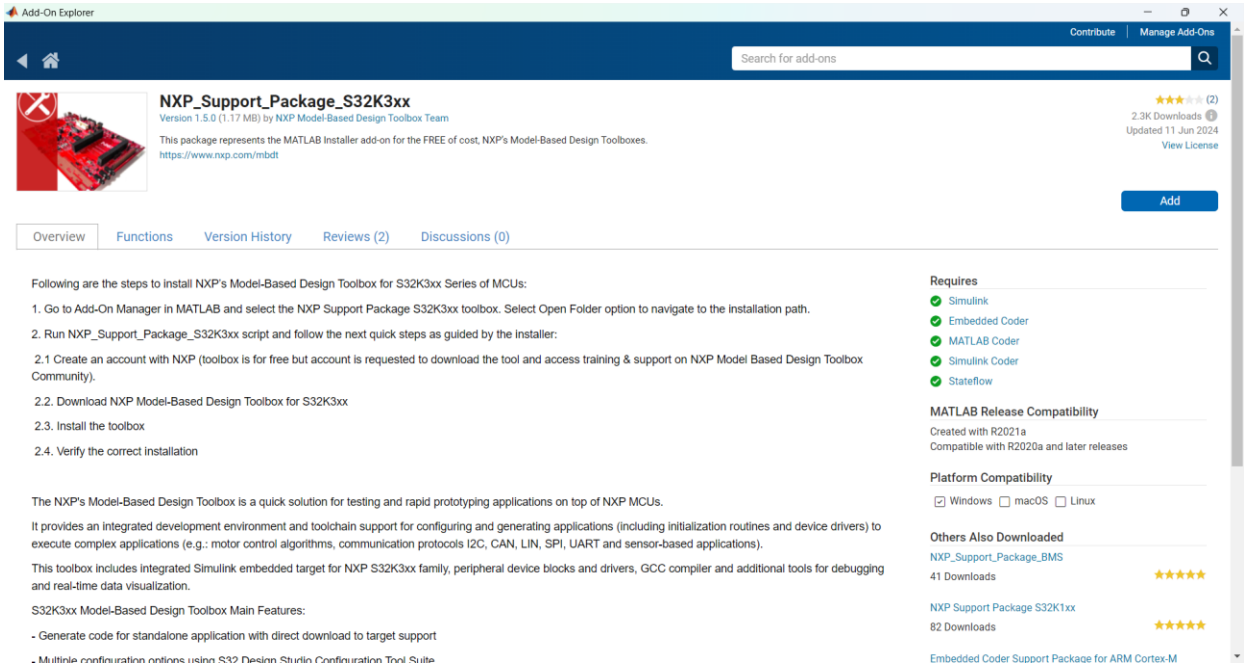


The default location can be changed before installation by changing the Add-Ons path from MATLAB Preferences.

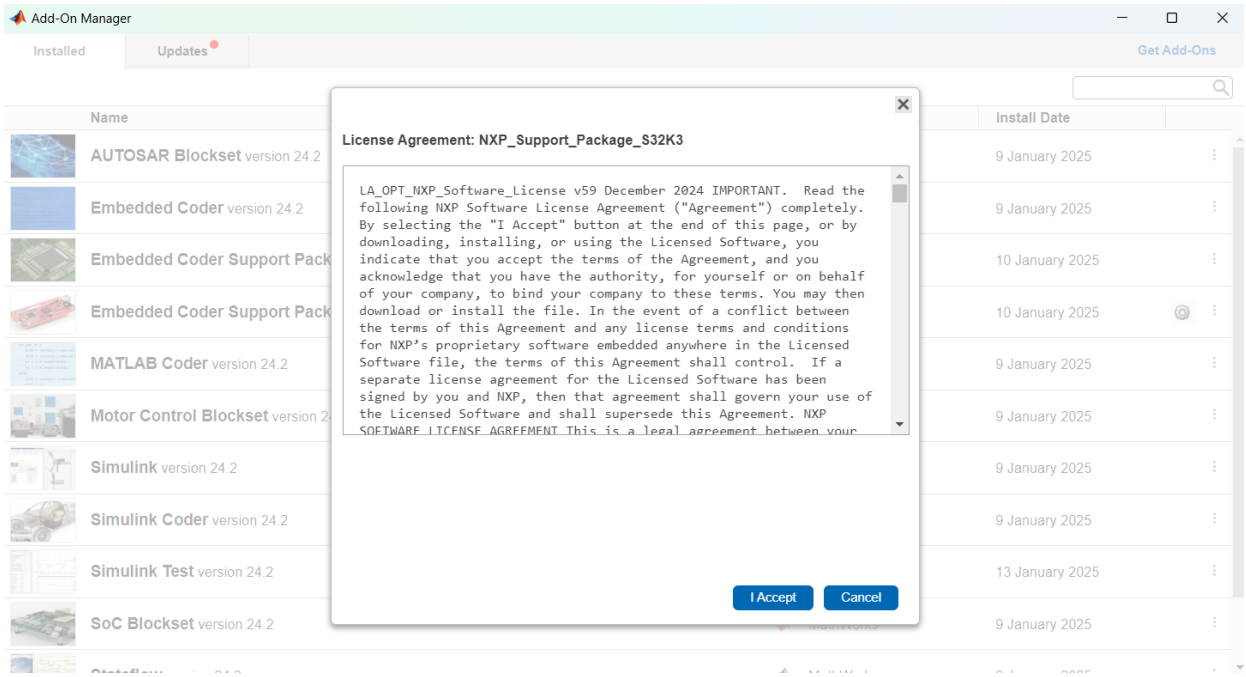
Important: It is recommended to install the MATLAB and NXP Toolbox into a location that does not contains special characters, empty spaces, or mapped drives. Also, consider choosing a short path like C:*/MATLAB/Add-Ons*

b. Search for the “NXP Support Package S32K3”

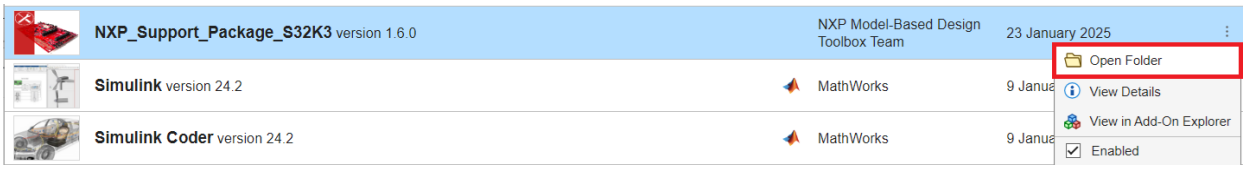
c. Install the “NXP Support Package S32K3” by pressing the **Add** button.



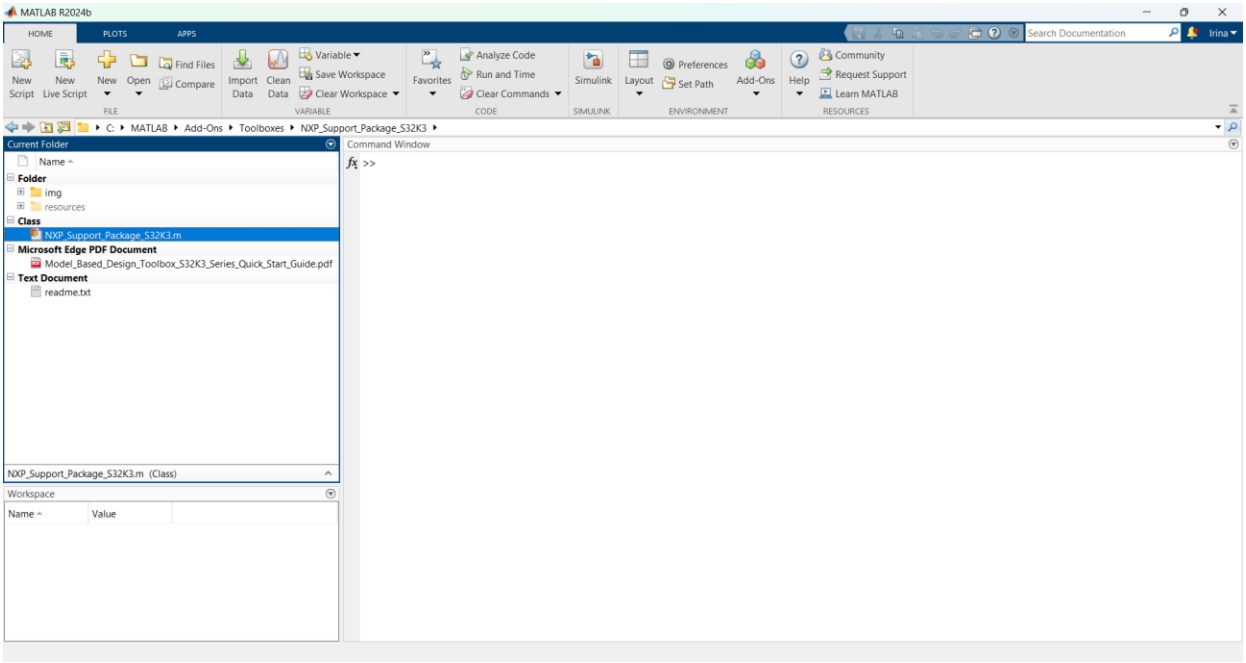
d. Read the License Agreement and press **I Accept.**



e. Once the process is successful, press the **Open Folder** button.

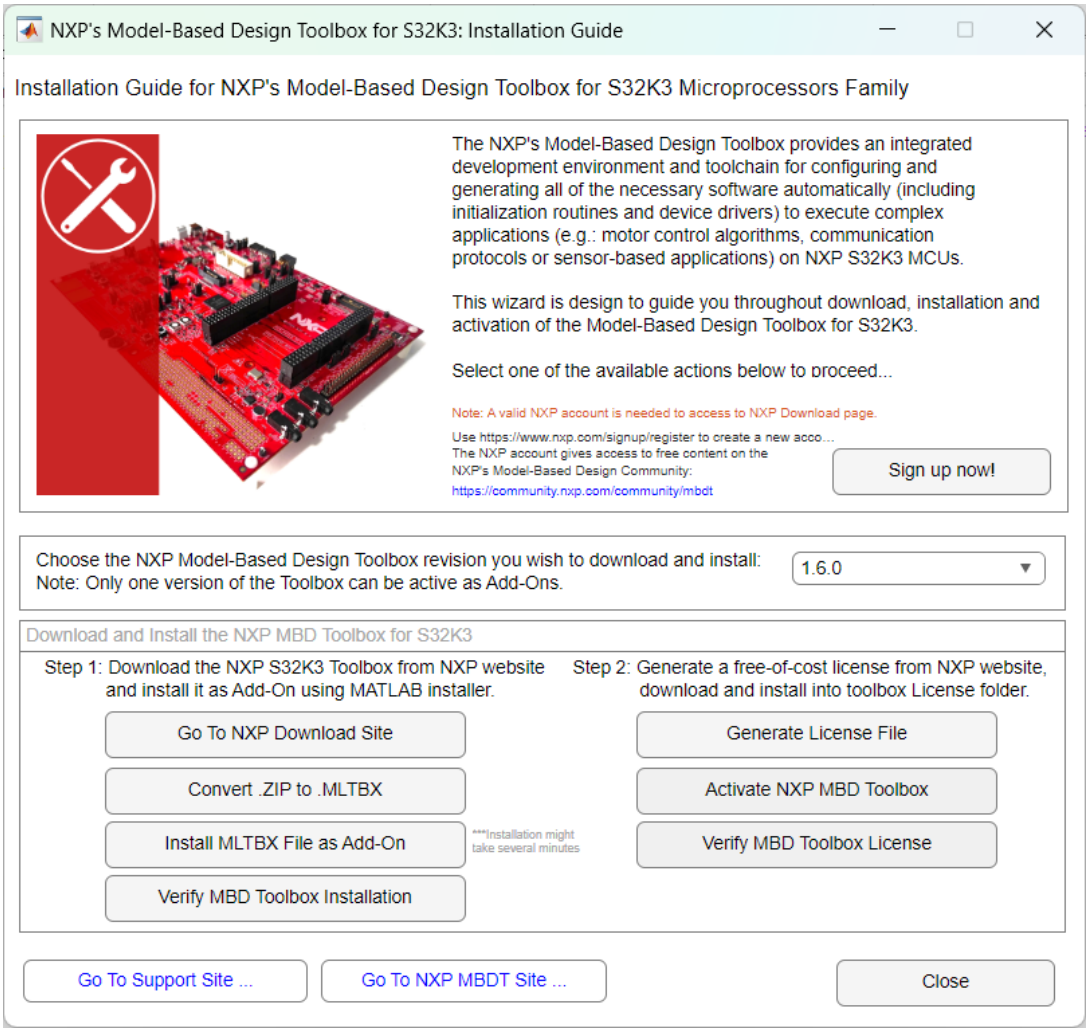


f. Run the **NXP_Support_Package_S32K3.m** script to start the NXP Support Package for S32K3.



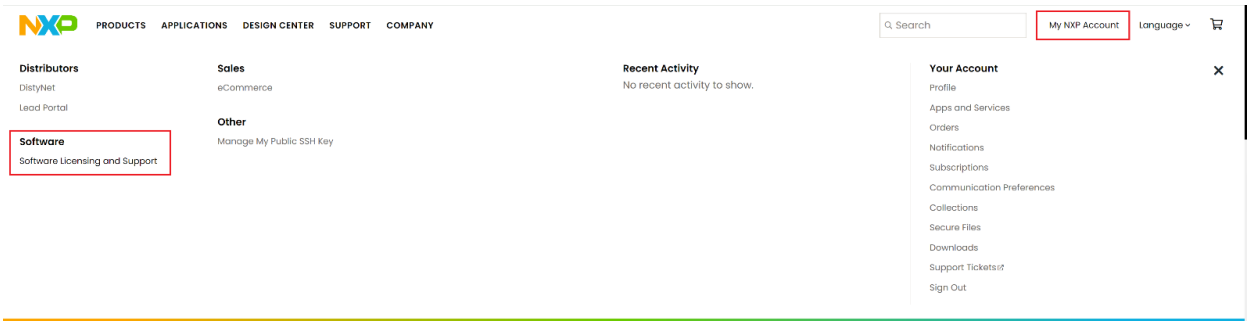
1.2.2 Install NXP Model-Based Design Toolbox for S32K3

NXP Support Package for S32K3 is a graphical user interface guide that helps to download and install the Model-Based Design Toolbox, and also generate and install the free-of-cost license from NXP website.

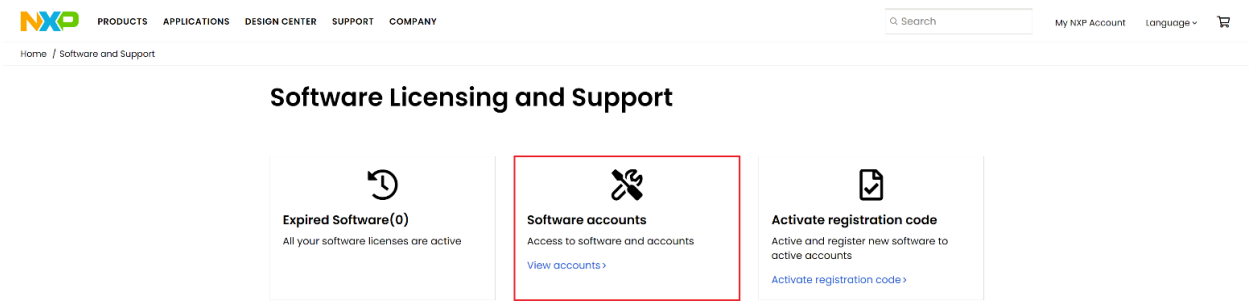


1. Press **Go to NXP Download Site** Button. In the newly opened window, Review the Terms and Conditions as you scroll down, and press **I Agree** Button.

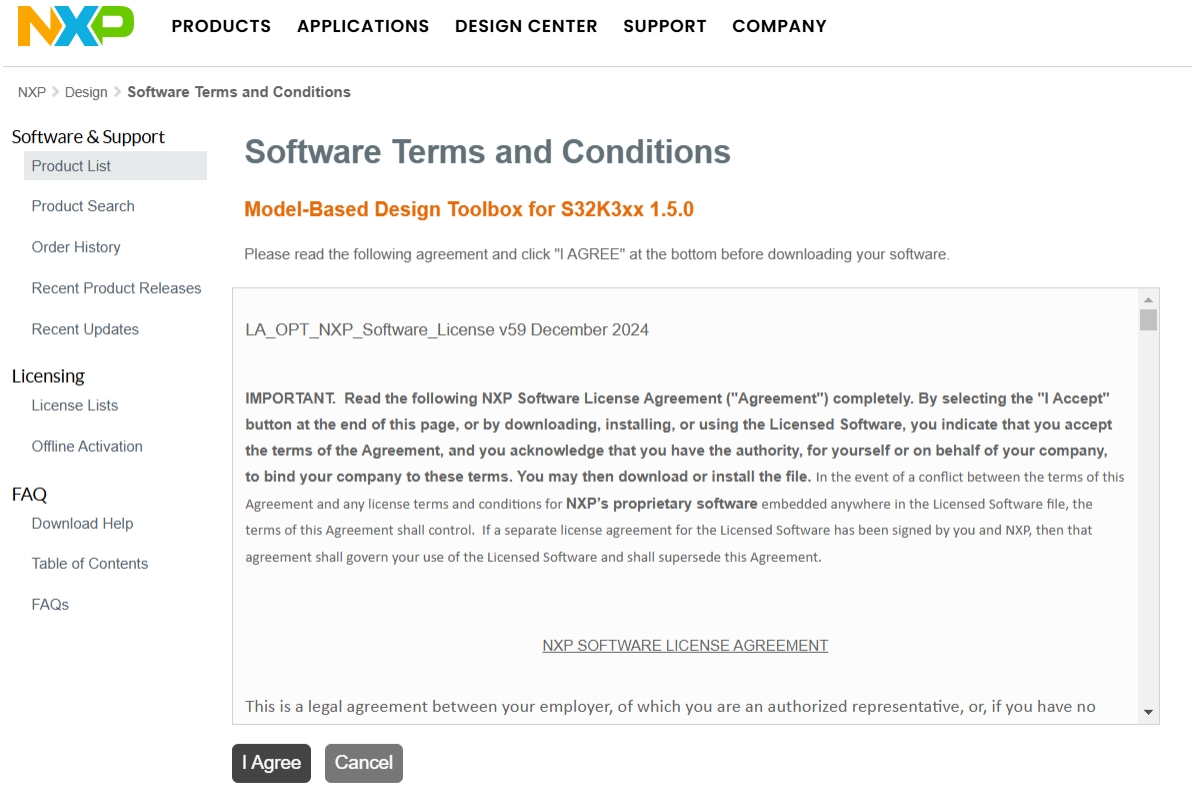
   Note: If the page is not displayed as below, please go to the nxp.com website, log into your account (or make one for free). Acces **My NXP Account** -> **Software Licensing and Support**:



For the next step go to **Software accounts** -> **View accounts**

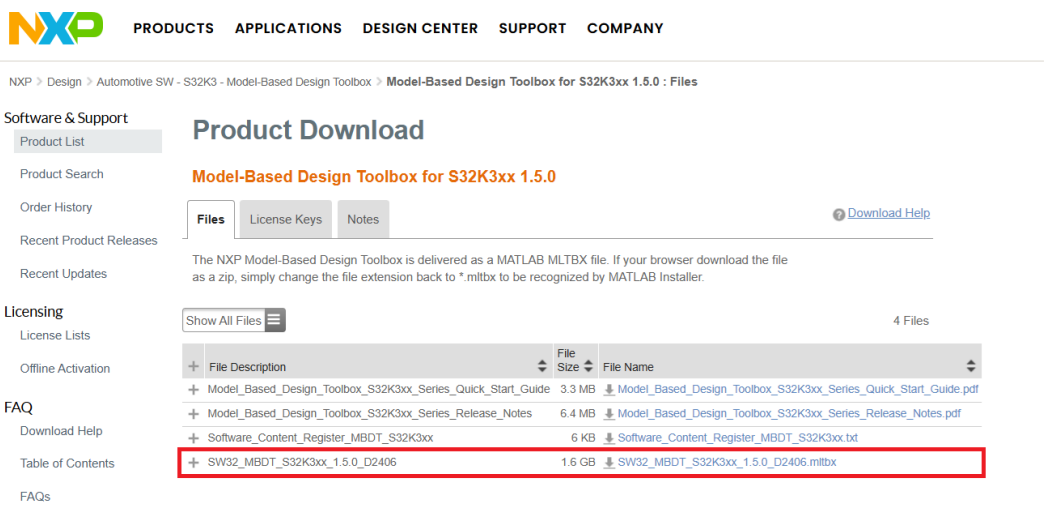


You will find a Product list on the next page from which you should select **Automotive SW – S32K3 Standard Software.** Go to **Automotive SW - S32K3 - Model-Based Design Toolbox** and select the latest release available.

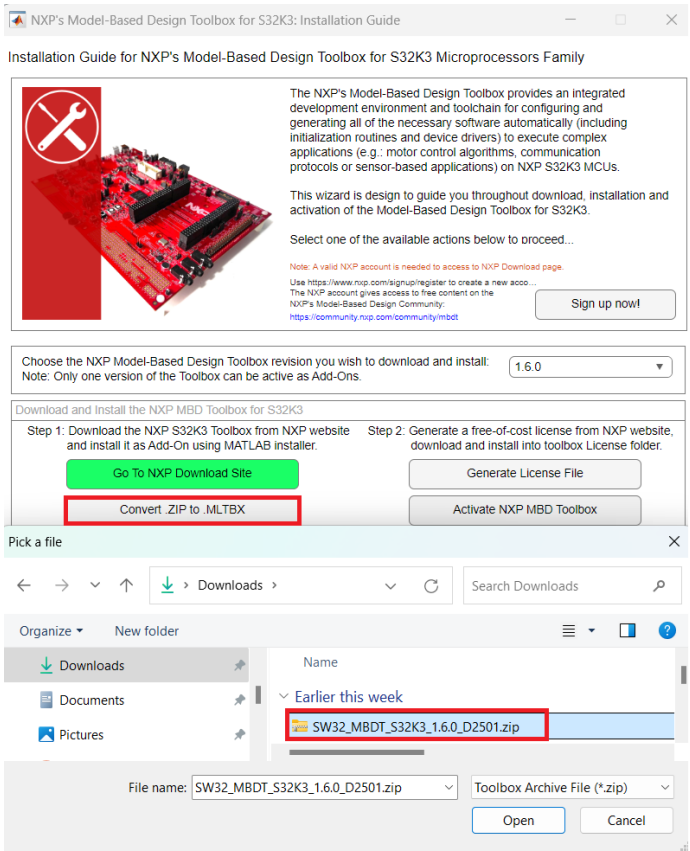


2. Download the **SW32_MBDT_S32K3_x.x.x_DYYMM.mltbx** file.

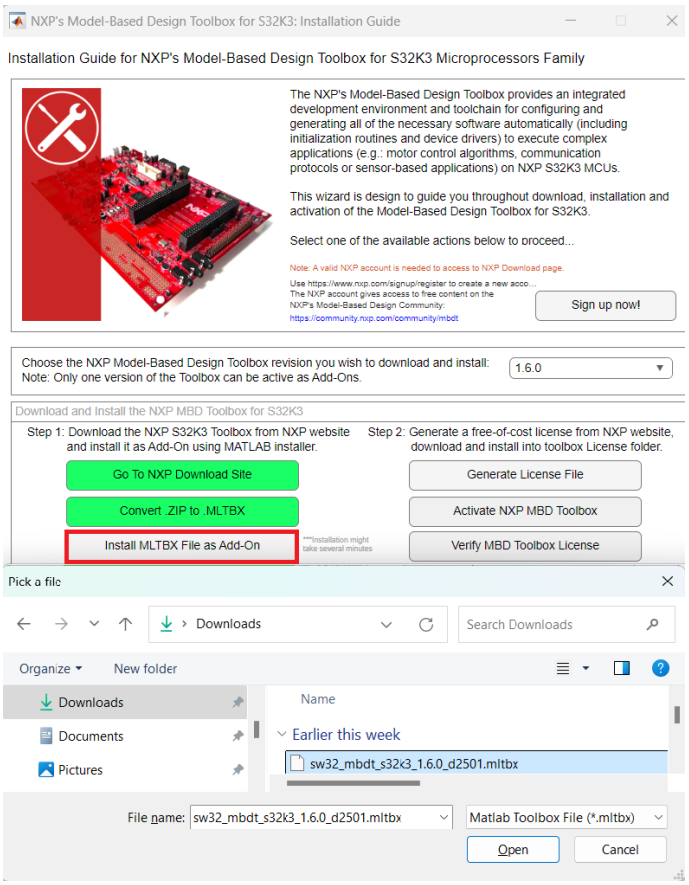
   Note: The downloaded file has the **.zip** extension instead of **.mltbx**. The next step helps to convert to the right format. Please note that in the screenshot below the older naming convention for the toolbox is used. Please download the **SW32_MBDT_S32K3_x.x.x_DYYMM.mltbx** file.



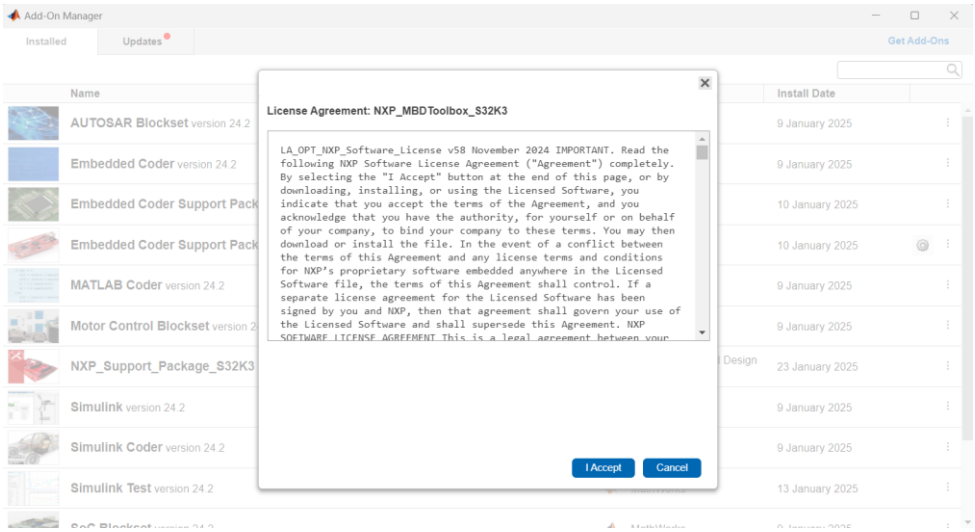
3. Go back to **NXP Support Package for S32K3** and press the **Convert .ZIP to .MLTBX** button. In the newly opened Browsing window, select the file downloaded and press **Open.**



4. Go back to **NXP Support Package for S32K3** and select the **Install MLTBX File as Add-On** button. In the newly opened window, browse for the MLTBX file and press **Open.**

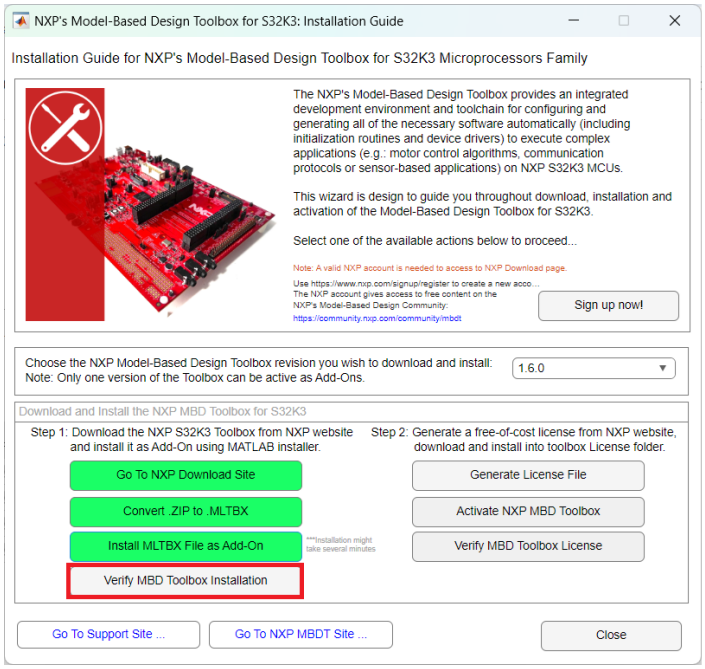


5. In the MATLAB Add-On Manager, Review the Terms and Conditions as you scroll down, and press **I Accept** Button. This action starts MBDT for S32K3 Toolbox installation process.



Note: Installation might take several minutes.

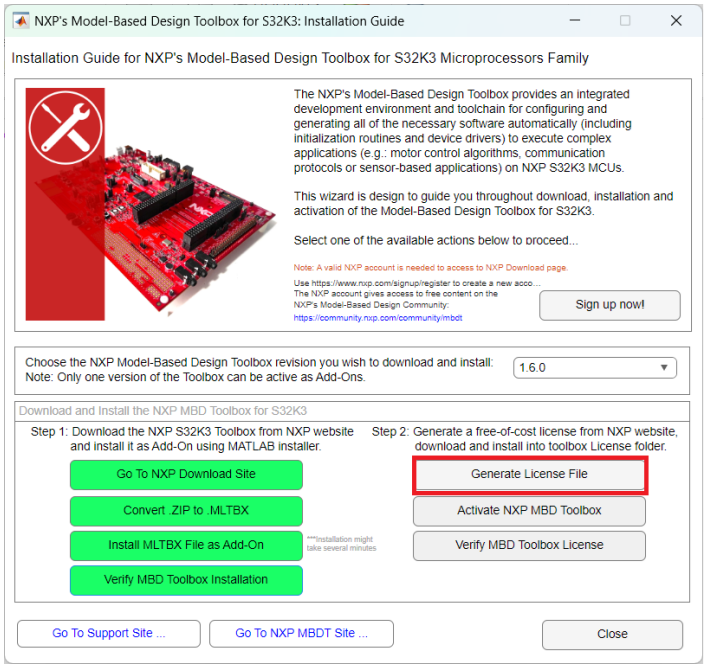
6. Once the installation is complete, go back to **NXP Support Package for S32K3** and press the **Verify MBD Toolbox Installation button**.



1.2.3 Generate and Activate NXP MBDT for S32K3 license

Even the MBDT for S32K3 is free-of-charge, users still need to generate and install a free license. The following steps guides you on how to achieve such license.

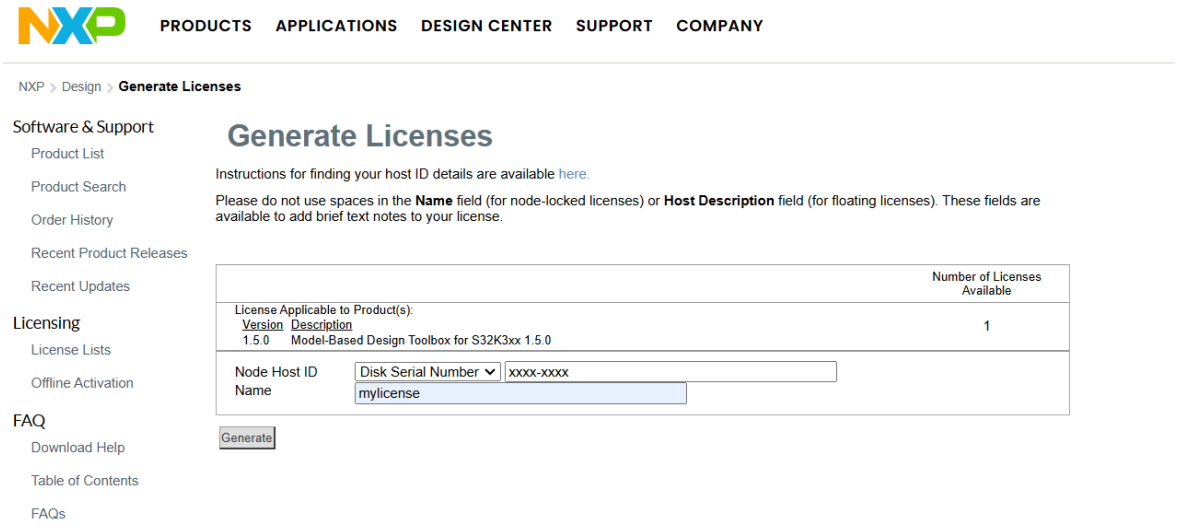
1. Press the Generate License File in the **NXP Support Package for S32K3.**



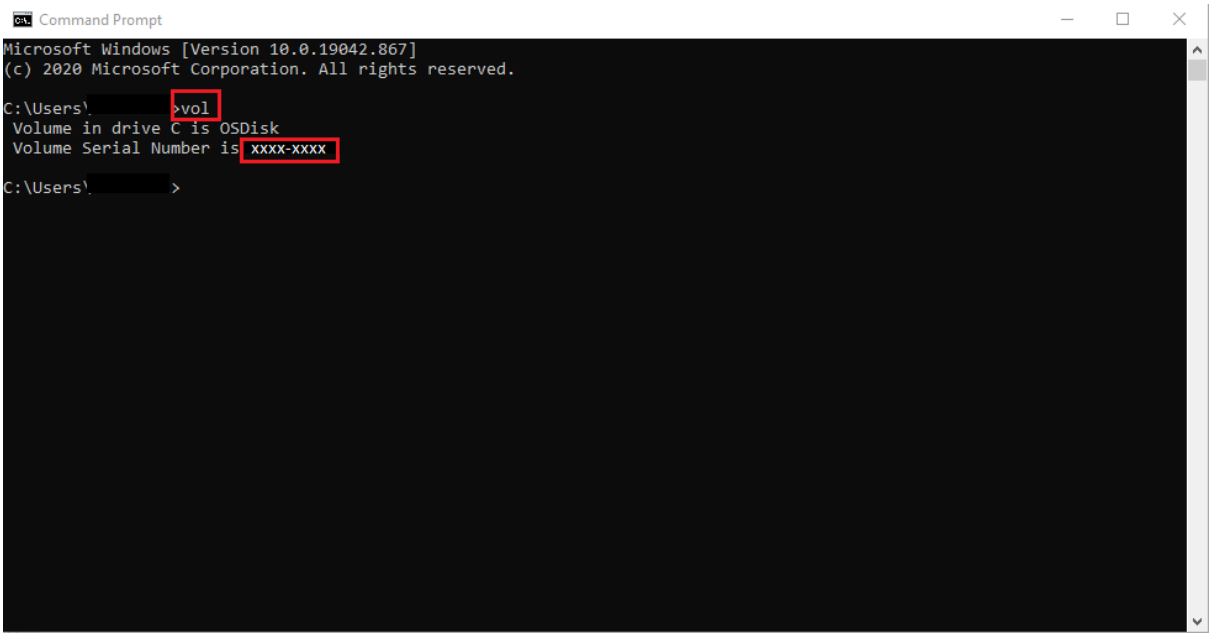
2. In the newly opened webpage, select the checkbox as shown below, and press the generate button.

   Note: If a similar webpage as shown below is not being displayed, please go to the same page as described in the **Note** mentioned at step **1**, in section **1.2.2**. After selecting the latest available release, navigate to the **License Keys** tab.

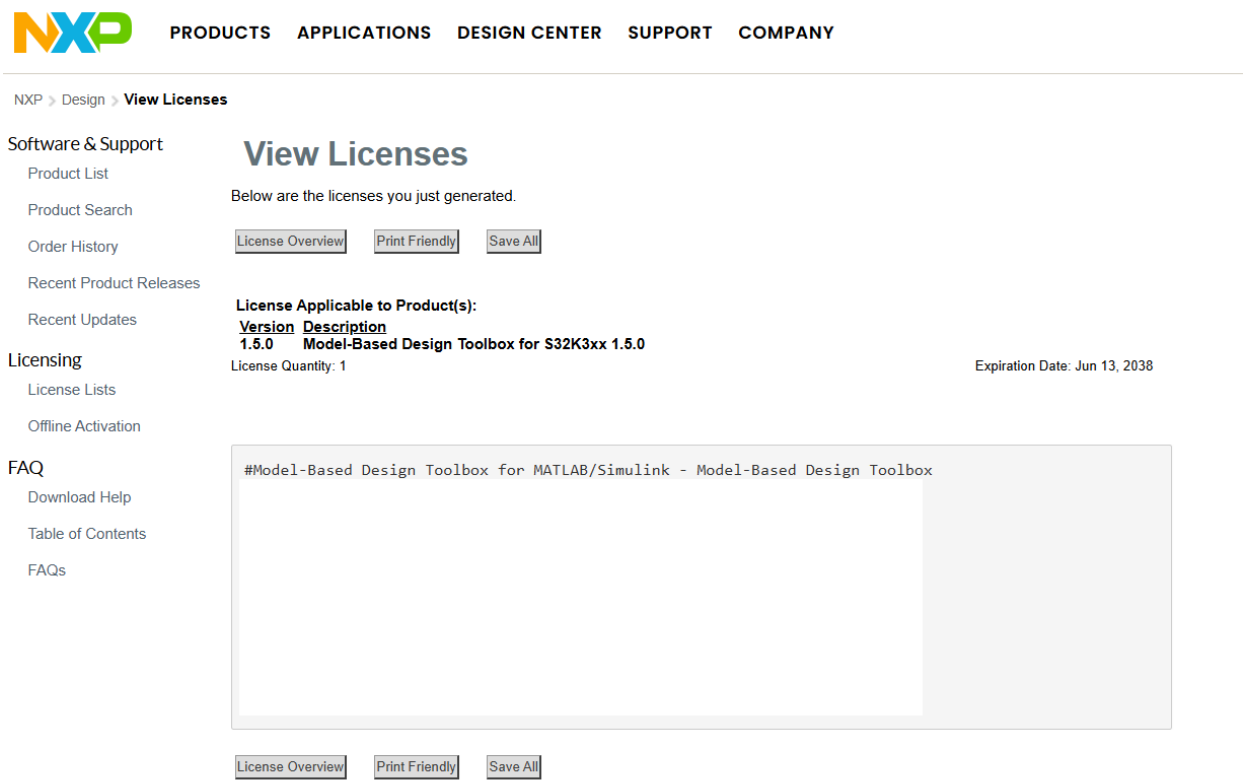
3. Select Disk Serial Number, and type the host id number. Give a name to the license, and press the Generate button.



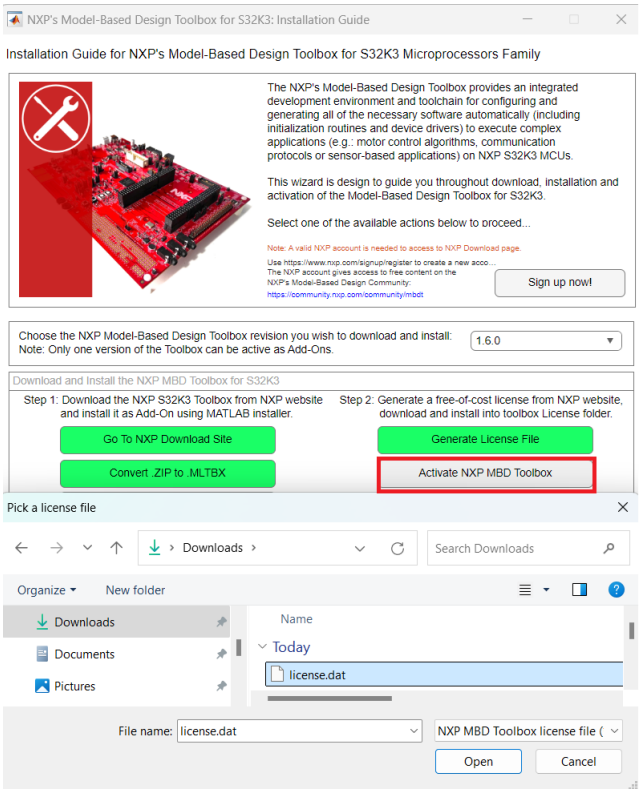
4. To find the host ID for your hard drive, please open a Windows Command Prompt and execute the “vol” command.



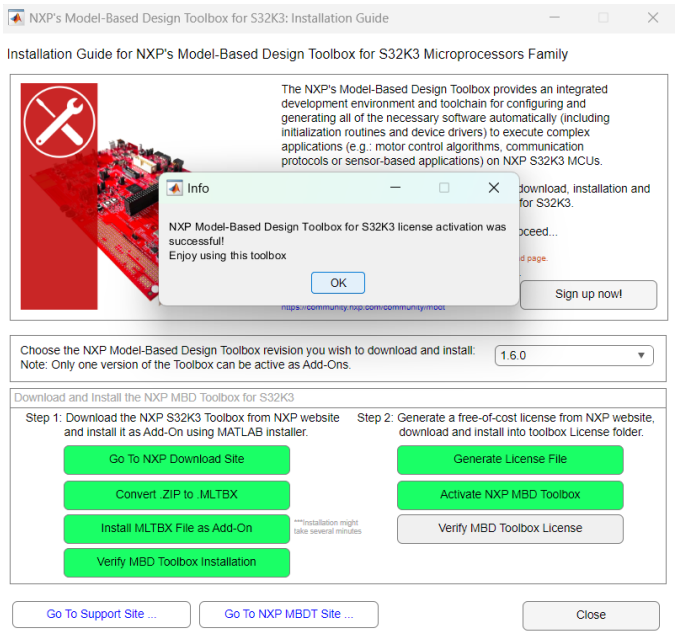
5. Now that the license has been successfully generated, press the Save all button.



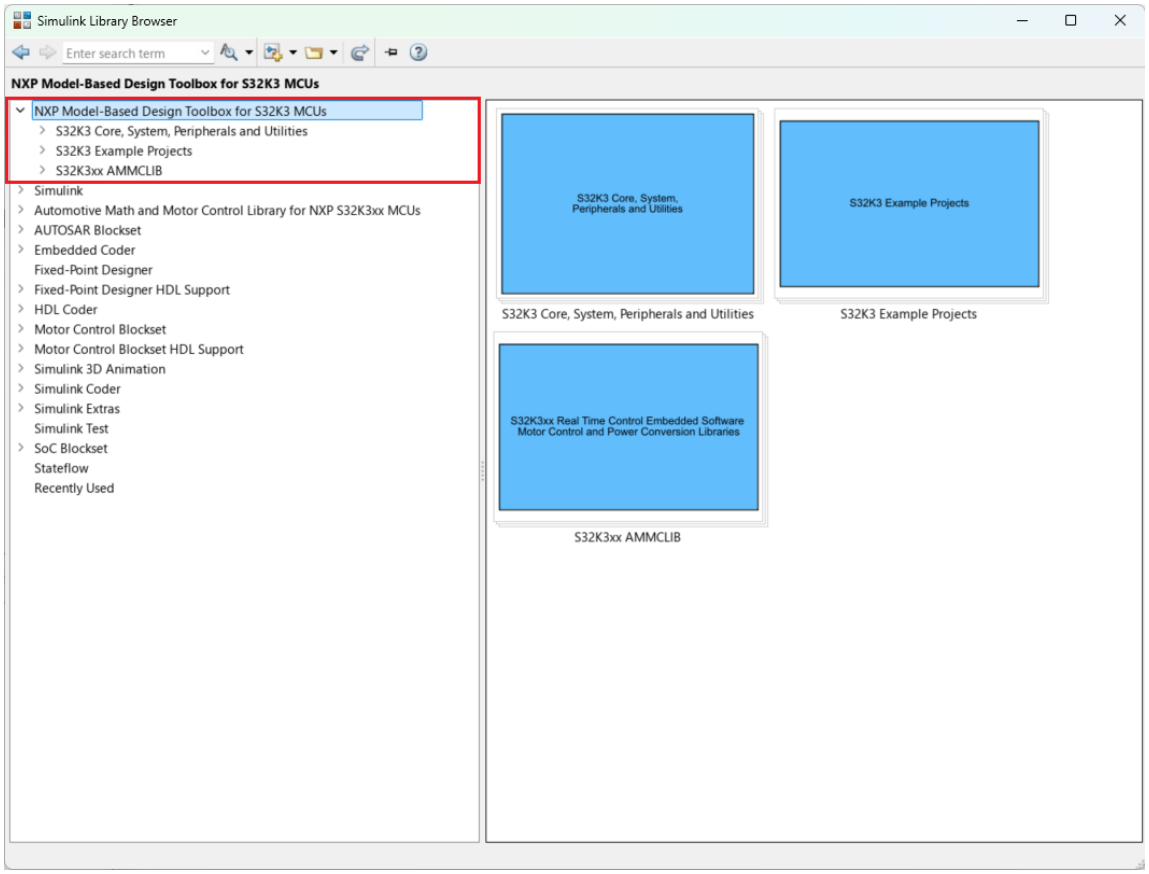
6. Back to **NXP Support Package for S32K3,** press the **Activate NXP MBD Toolbox** button. In the newly opened window, Browse for the downloaded *license.dat* or *license.lic* file, and press Open.



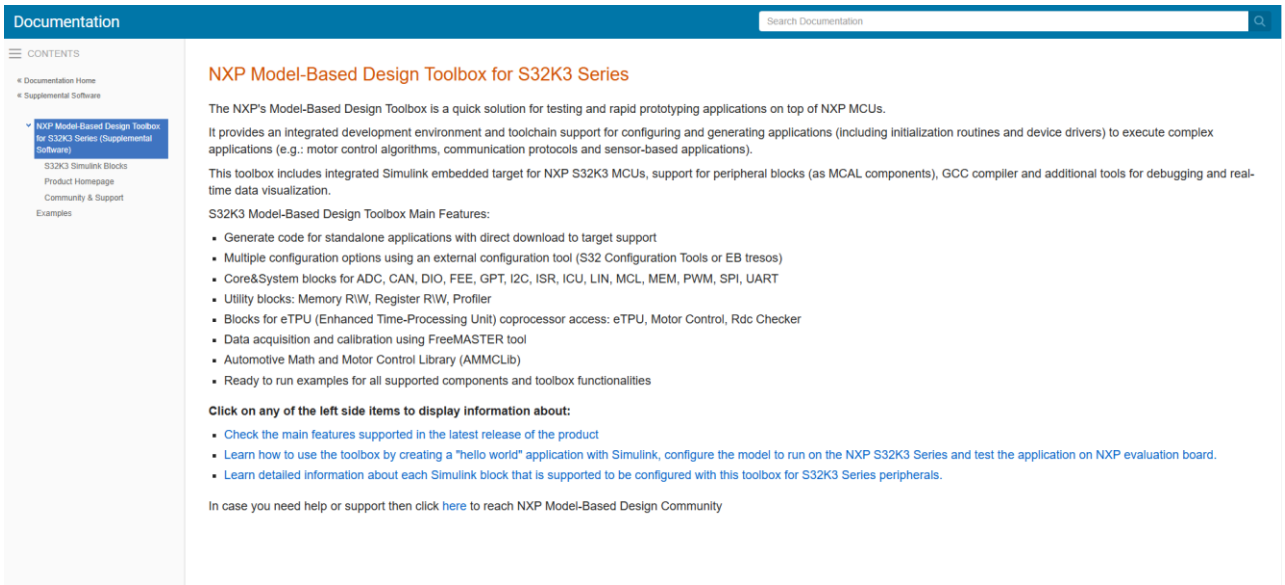
7. Final step is to check the license activation status, by pressing the **Verify MBD Toolbox License** button. If everything went well, a similar popup window as below will be displayed.



NXP’s Model-Based Design Toolbox layout and Simulink Library are shown below:



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:



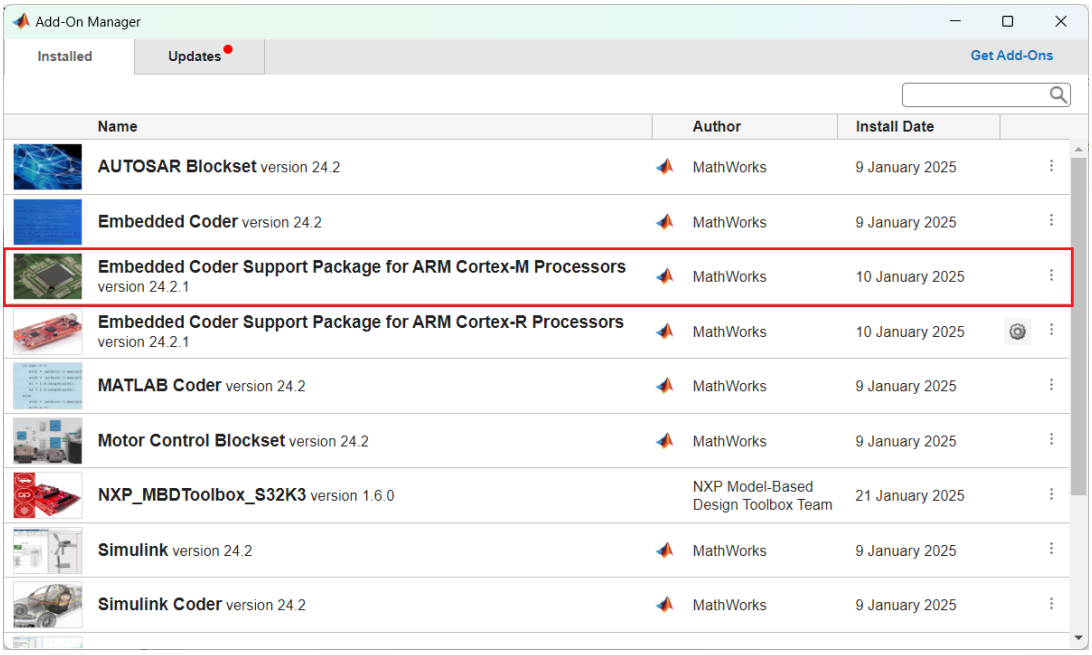
1.2.4 Setting the Path for Model-Based Design Toolbox and Toolchain Generation

The Model-Based Design Toolbox uses the Toolchain mechanism exposed by the Simulink to enable automatic code generation with Embedded Coder toolbox. By default, the toolchain is configured for the supported MATLAB versions **R2021a - R2024b**. For any other MATLAB release, the user needs to execute a toolbox m-script to generate the appropriate settings for his/her installation environment.

This is done by changing the MATLAB Current Directory to the toolbox installation directory (e.g.: `..\MATLAB\Add-Ons\Toolboxes\NXP_MBDToolbox_S32K3\`) and running the "`mbd_s32k3_path.m`" script.

```
>> mbd_s32k3_path
Treating 'C[…]\S32K3\src' as MBD Toolbox installation root.
MBD Toolbox path prepended.
Creating folders for the target 'NXP S32K3xx' in the folder
'C:\[…]\S32K3\src\mbdtbx_s32k3\codertarget\2021a'...
Creating the framework for the target 'NXP S32K3xx'...
Registering the target 'NXP S32K3xx'...
Done.
```

This mechanism requires users to install the Embedded Coder Support Package for ARM Cortex-M Processor as a prerequisite.

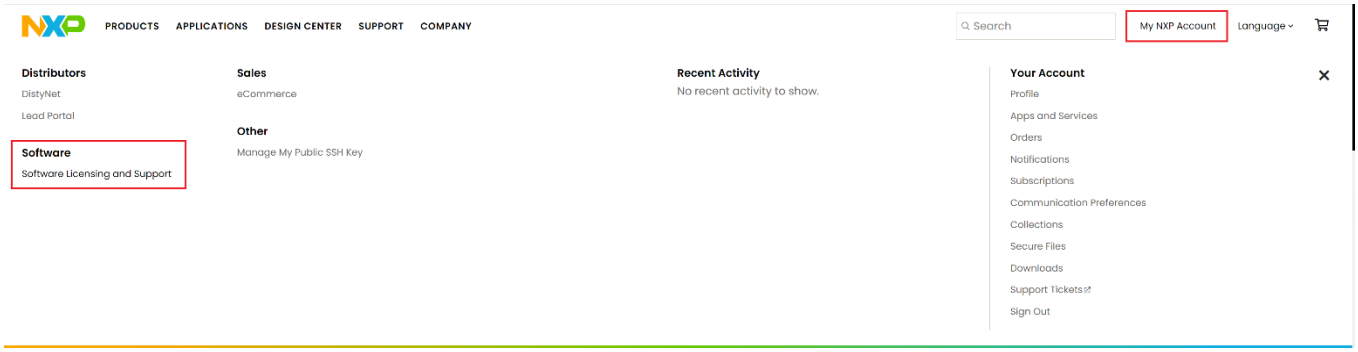


The "`mbd_s32k3_path.m`" script verifies the user setup dependencies and will issue instructions for a successful installation and configuration of the toolbox.

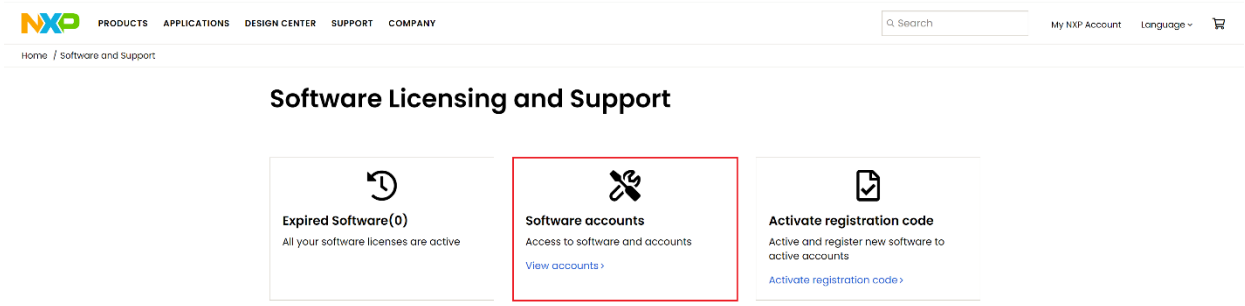
1.2.5 Installing EB tresos (optional step)

Model-Based Design Toolbox for S32K3 provides support for 2 external configuration tools – NXP's S32 Configuration Tools (which is made available directly through the mltbx installer and requires no additional installation) and EB tresos. To install this product, you will need to follow these instructions:

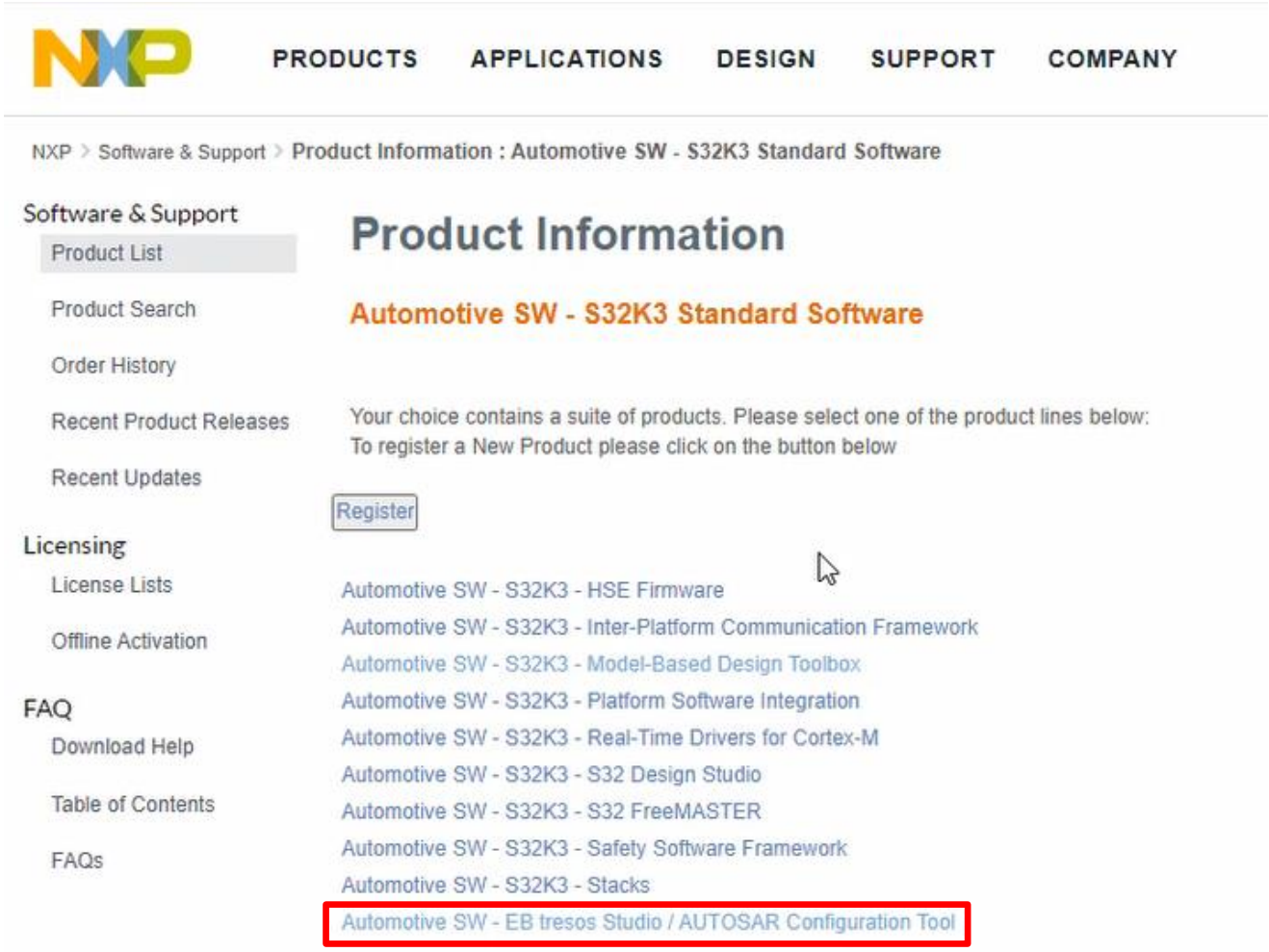
Go to the nxp.com website, log into your account (or make one for free). Then go to **My NXP Account** -> **Software Licensing and Support**:



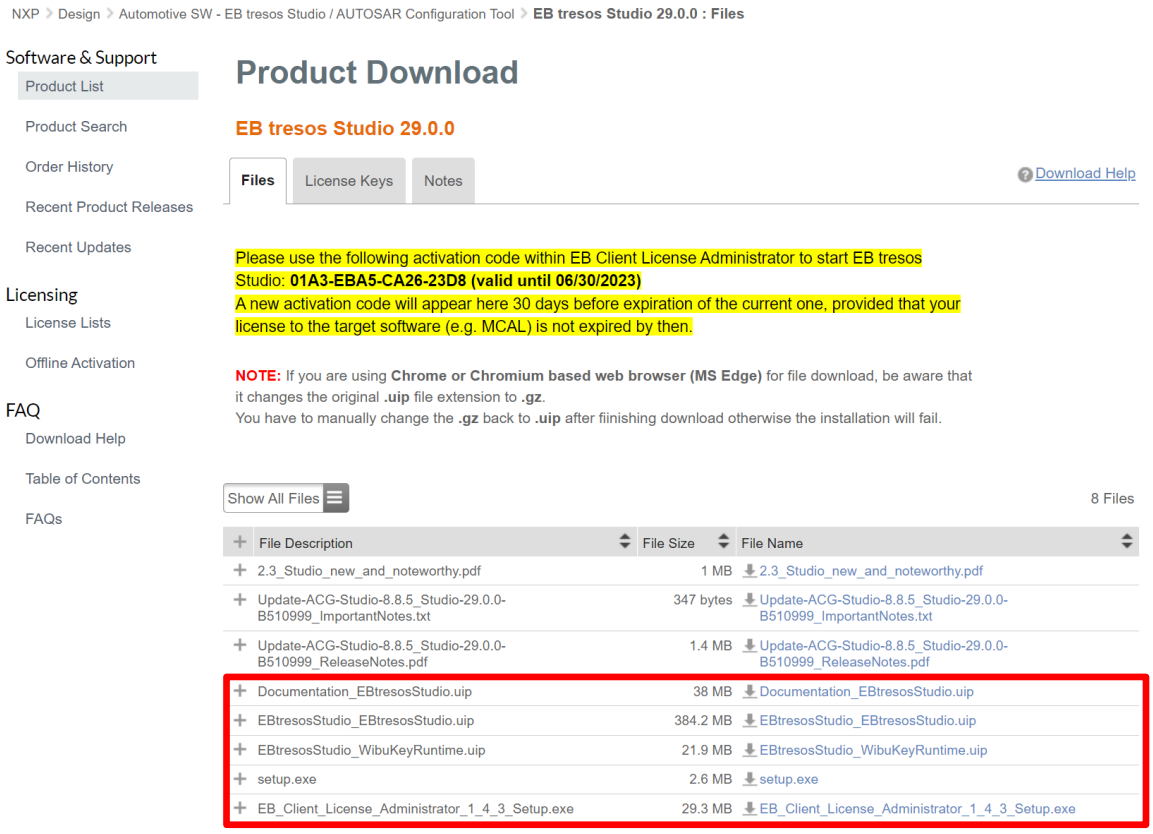
For the next step go to **Software accounts** -> **View accounts:**



You will find a Product list on the next page from which you should select **Automotive SW – S32K3 Standard Software.** From the Product Information page, you should find the item names **Automotive SW – EB tresos Studio / AUTOSAR Configuration Tool**.



From the next page, select **EB tresos Studio 29.0.0**. Read the Software Terms and Conditions on the following page and click on **I Agree**.

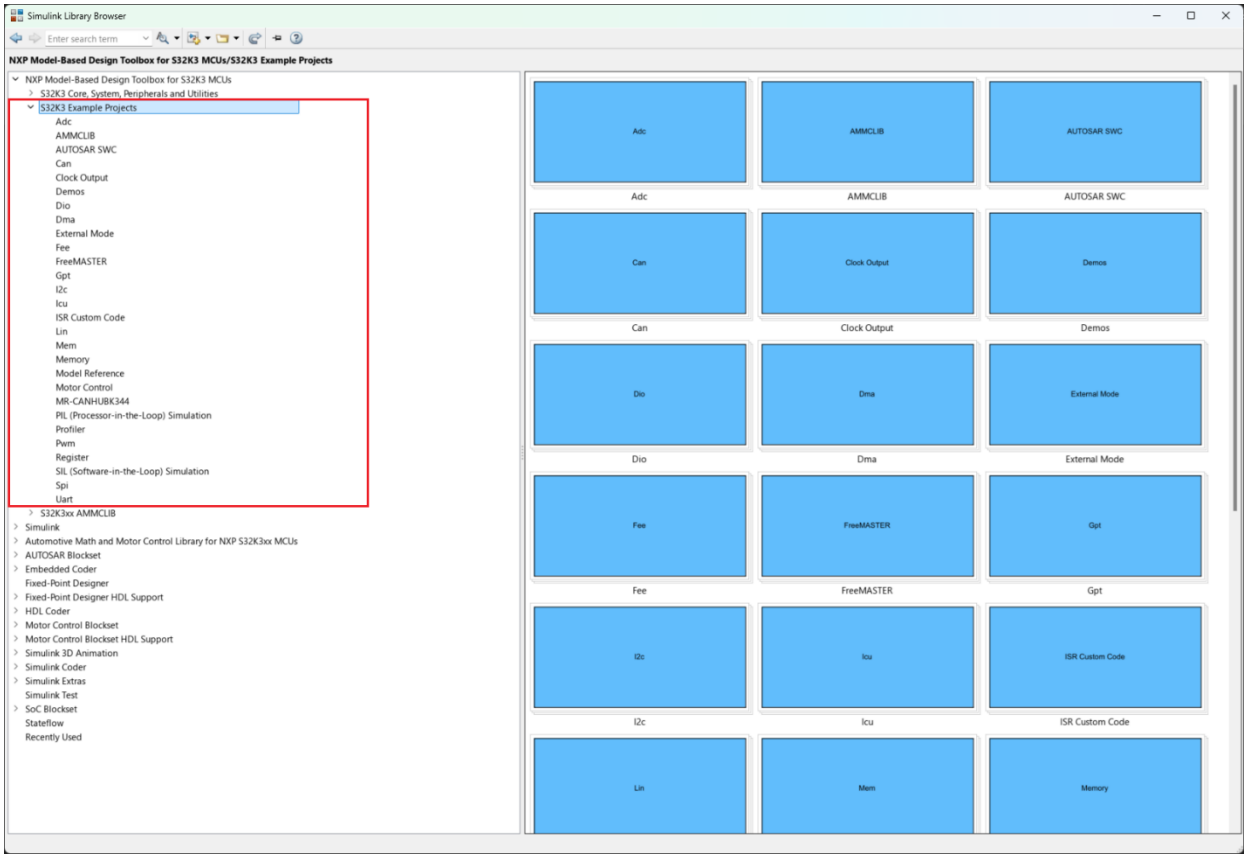


From this page, download (minimum) the files shown in the picture above. Note that when the download is complete, the .uip files might have been renamed to .gz or .zip. You will have to manually change the extensions of those files back to .uip, then simply run the **setup.exe** file. From that step, the EB tresos wizard will guide you through the installation. Additionally, you can download from the same location (shown in the picture above) the EB tresos installation guide (available in .pdf format). Note that you will require a license for this configuration tool, but it is made available on that same page (highlighted in yellow), for free.

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_s32k3_examples.slx` can be opened from "`{Model Based Design Install Directory}\S32K3_Examples` folder or directly from the `Simulink Library Browser` main window.

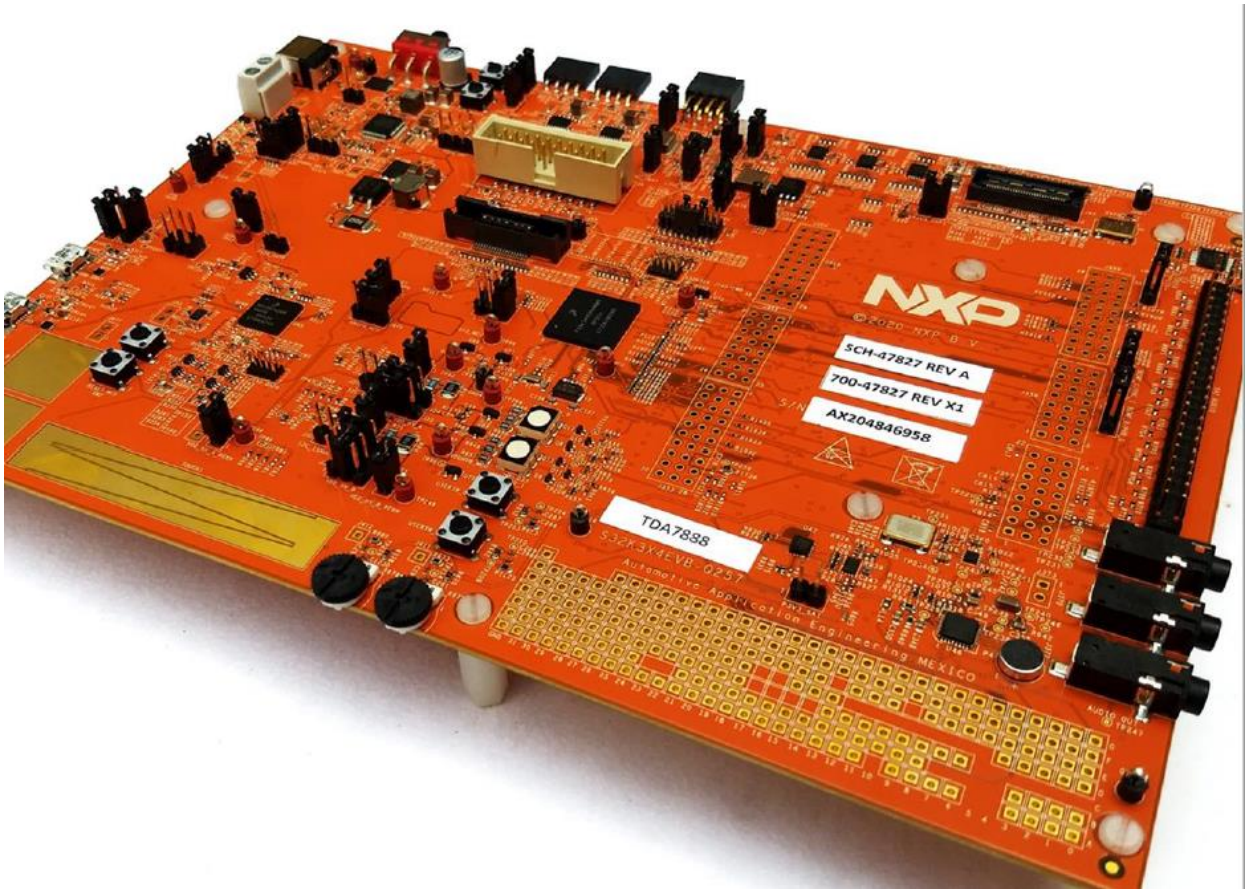
Each category contains multiple examples that showcase different Model-Based Design Toolbox capabilities that are categorized into different groups.

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 and tested on the following hardware targets:

- S32K31XEVB-Q100
- S32K312EVB-Q172
- XS32K3X2CVB-Q172
- XS32K3X4EVB-Q257
- XS32K3XXEVB-Q172
- MR-CANHUBK344
- S32K3X4EVB-T172
- S32K344-WB
- XS32K3X8CVB-Q172
- S32K388EVB-Q289
- XS32K396-BGA-DC
- XS32K396-BGA-DC1

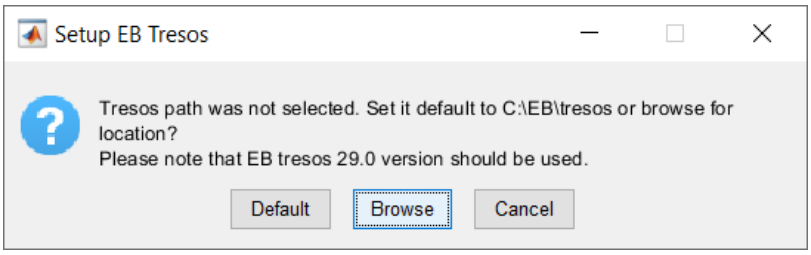


2.3 A “Hello World” Example

If the hardware setup is completed successfully, then all ingredients are present for running successfully the Model-Based Design Toolbox for S32K3 specific examples. The examples delivered by the toolbox are targeting the S32K311-Q100, S32K312-Q172, S32K342-Q172, S32K344-Q257, S32K344-Q172, S32K358-Q172, S32K388-Q172, S32K374-Q289, S32K376-Q289, S32K394-Q289, and S32K396-Q289 processors of the S32K3 family. Moreover, for the supported derivatives, the Model-Based Design Toolbox provides examples using both S32 Configuration Tools (**modelName_s32ct.mdl/slx**) and EB tresos (**modelName_ebt.mdl/slx**) to demonstrate the interaction with the configuration tools it provides integration with.

Navigate to “`\S32K3_Examples\dio`” folder and open the model according to the hardware used and the desired **configuration tool** (e.g `s32k3xx_dio_ebt.mdl`)

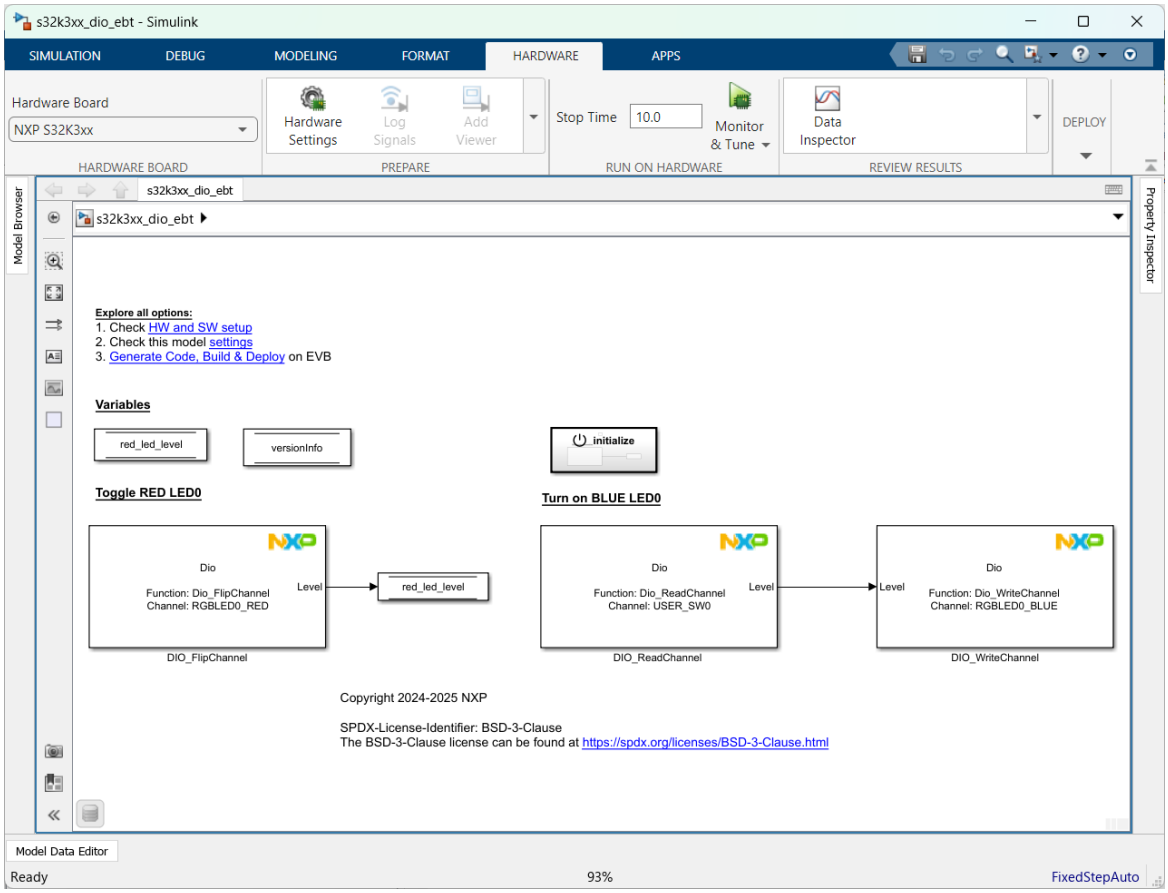
After you open the model, you will be prompted with a dialog box asking for the **EB tresos** path selection:



In case you have **EB tresos v29.0.0** installed you can choose its location by clicking either the **Default** or the **Browse** buttons. The later will open the Windows Explorer allowing to search for the installation folder.

In case you do not have EB tresos installed on your computer you can press the **Cancel** button. Installing EB tresos is an optional step. If you do not proceed with this external tool setup, you will still be able to build and deploy the `s32k3xx_dio_ebt.mdl` example on target.

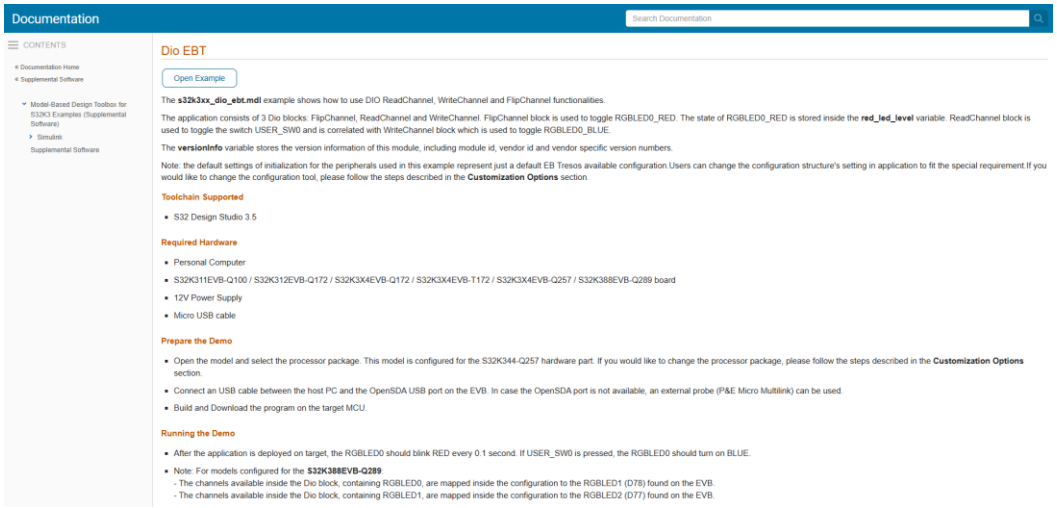
Please note that in case you would like to use the **EB tresos** configuration tool together with the Model-Based Design Toolbox ADVANCED mode capabilities, as they are described in **Chapter 4.1** of the **Model_Based_Design_Toolbox_S32K3_Series_Release_Notes** document, this tool’s installation will be required. Please consult the referenced chapter for more details.



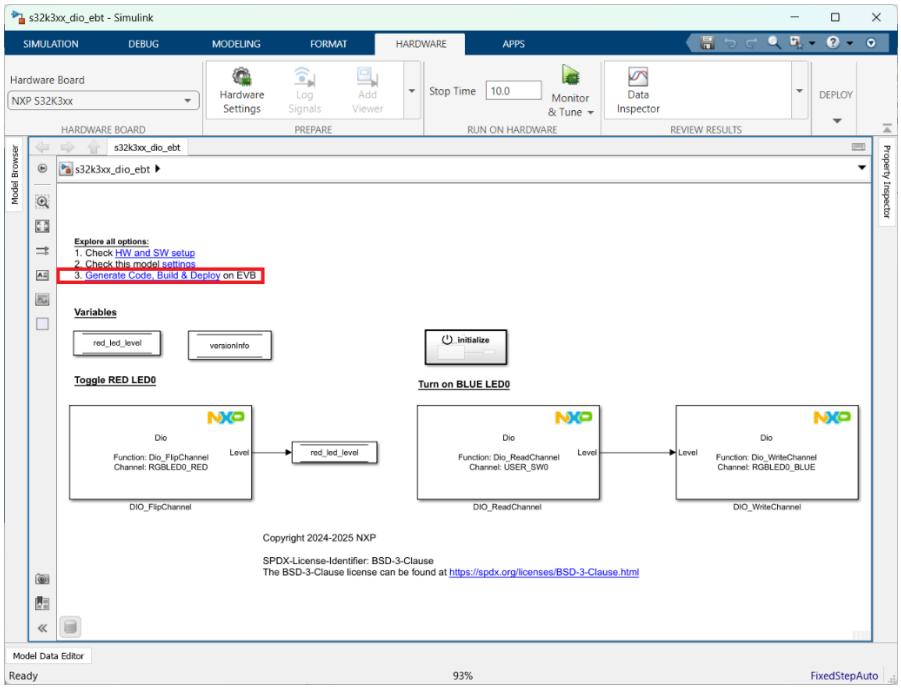
The `s32k3xx_dio_ebt.mdl` model programs the S32K3X4EVB-Q257 EVB to toggle the D33 red LED every 0.1 seconds. Additionally, if SW4 is pressed, the D32 blue LED should turn on.

Follow the next steps to run the example:

1. Open and README.html file to understand the hardware and software requirements for running the application



2. Press the `Build Model` button and wait until the code is generated, compiled, and downloaded to the evaluation board. Alternatively, you can press the **Generate Code, Build & Deploy** button in the model canvas to start the process automatically.



If you see the LEDs toggling, congratulations! You succeeded in running your first example created with

Model-Based Design Toolbox for S32K3

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