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Simulink Block Set for Infineon AURIX

DRAFT

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User Manual

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Document Change History			
Date	**Version**	**Changed By**	**Change Description**
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1 Introduction

The first release of the Free AURIX Simulink Block Set shall be considered a work in progress. Functionality shall be added over time as new releases are made.

Although the free version is designed for the ShieldBuddy which is in turn Arduino compatible, it is not the intention to make this another Arduino platform. The aim is to build a new platform that may expand to other Infineon AURIX variants and target boards including custom HW designs.

Hitex (UK) Ltd. can offer engineering resources for both custom hardware and software based around the Infineon AURIX microcontroller for industrial and automotive applications with or without safety requirements. For further information please contact us.

The Simulink block set AURIX is only available for 64-bit Windows versions of MATLAB. Certain add-ons as detailed below are required to use this block set.

1.1 MATLAB Version

This target has been tested to operate with the following version/s of MATLAB:

R2015b – 64bit

1.2 MATLAB Add-Ons

The following Add-Ons are mandatory to use this block set:

- Simulink
- Embedded Coder
- MATLAB Coder
- Simulink Coder

The following Add-Ons are optional but may be useful:

- Stateflow

1.3 Compiler

An AURIX compiler is required. The block set currently only supports the HighTec GNU-TC compiler. A free version of this is available from the following location:

http://free-entry-toolchain.hightec-rt.com/

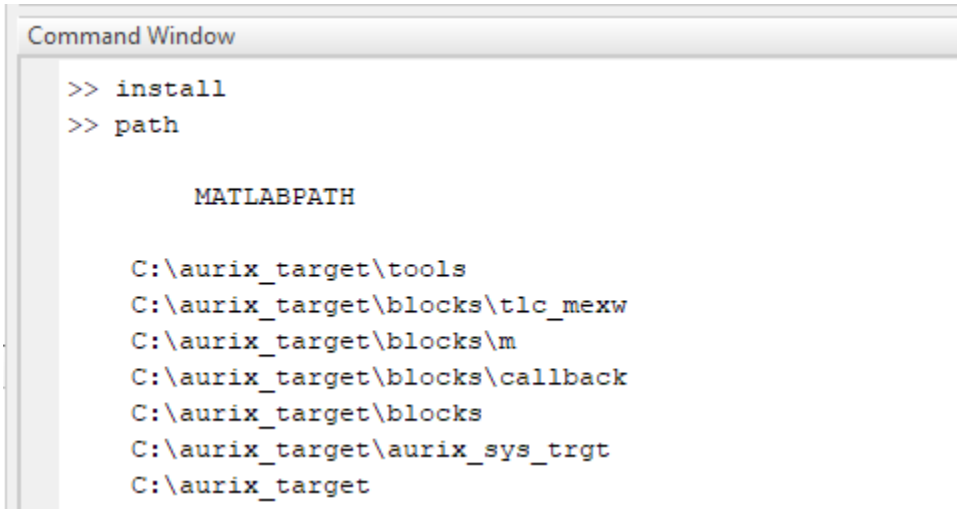
Please complete the instructions and download the installer.

2 Block-Set Installation

2.1 Simulink Target

The Simulink target comes supplied in a zip file with a name similar to SimulinkAURIXDist_201804271045. Unzip the file and place the aurix_target folder in a location of your choice on your PC.

Open MATLAB and navigate to the location of your aurix_target folder. Select the file install.p and press F9 to run the script. This will add the necessary folders to your path. Type path to verify that this has been done correctly, typically the following additions will have been made:



In order to further validate the installation, open the Simulink library browser and the “Hitex AURIX Support Package” should be seen. You may need to press F5 to refresh the library browser.

2.2 Debugger

In order to run and debug applications you will need a debugger for the AURIX device such as the PLS UAD2pro. With a debugger you can load an .elf file which contains the application as well as debug symbols.

If you only want to run applications without a debugger then please us Memtool.

2.3 Memtool installation

If you want to use automatic download then the Infineon Memtool is required to be installed. This may be downloaded from http://www.infineon.com/memtool.

Note that only version 4.7 of Memtool has been tested with this block set.

2.4 License Management

The license for using the block-set is node-locked to your PC. It cannot be transferred to another PC.

Firstly you will need to submit information regarding your PC's physical address by running LicGetMAC.exe. This application may be found in the License folder of your block installation. Running it will show a screen similar to this:

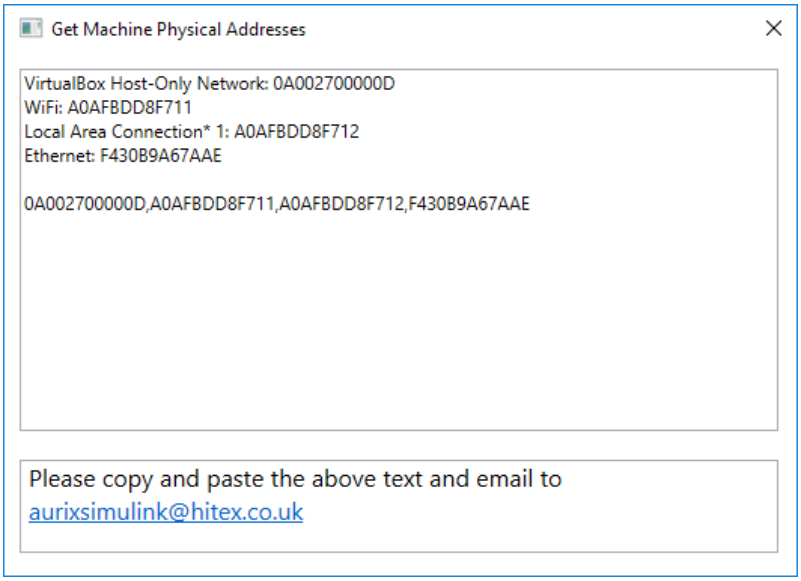


Figure 1 Acquiring Machine Physical Address

Please paste this into your email client and send to aurixsimulink@hitex.co.uk. You will receive a license file allowing the free version of the block set to be used for one year. You may request a new free license when the current one has expired.

The license file will need to be copied into the License folder. Please ensure only one license file (.lic) exists in this folder. The other executable (.exe) files should be left in the folder.

3 Project and Model Setup

It is recommended to build the model as part of a project as detailed below. This makes switching between projects easier and also ensures that the output from the model build is always in the same folder, rather than the current folder. This is particularly important if using an external debugger that will expect the build output to always be in the same place.

3.1 Create Project

Navigate to the folder where you want to store your project, and then use the menu command Home->New->Simulink Project->Blank Project. Type your project name and then click the Create button.

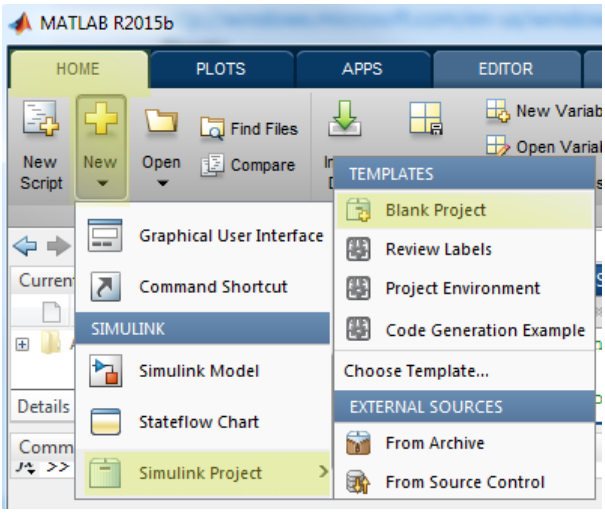


Figure 2 Create Project Command

Now we need to setup the startup and shutdown scripts for the project; these are run when the project is opened and closed respectively.

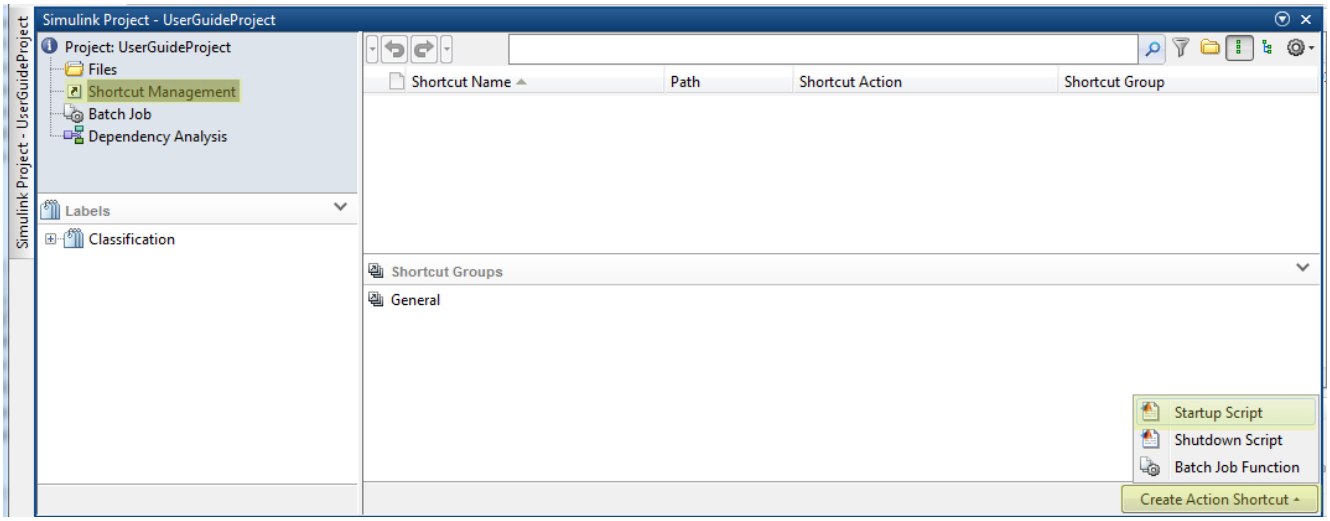


Figure 3 Create Project Script

In the project viewer go to Shortcut Management and then click the Create Action Shortcut and select Startup Script. Give the script a meaningful name such as Startup and then click Save.

You can use this to enter any custom start script you want, however at the minimum add a call to projsetup.

```
% This script defines a project shortcut.
%
% To get a handle to the current project use the following function:
%
% project = simulinkproject();
%
% You can use the fields of project to get information about the currently
% loaded project.
%
% See: help simulinkproject

projsetup();
```

Figure 4 Minimal Startup Script

Similarly create a shutdown script and add a call to projreset.

```
% This script defines a project shortcut.
%
% To get a handle to the current project use the following function:
%
% project = simulinkproject();
%
% You can use the fields of project to get information about the currently
% loaded project.
%
% See: help simulinkproject

projreset();
```

Figure 5 Minimal Shutdown Script

Once these are complete, save and close the project, then reopen the project and the Startup script will run. You will see two new folders are created, “code” and “cache”.

3.2 Create & Setup Model

We can use the project folder to save the Simulink models we want to work on. Create a new model in the folder, and name it appropriately (UserGuideModel1 in this example).

Once created, the model needs to be setup to use the AURIX target:

1. Select the Model Configuration Parameters from the Simulation menu
2. In the Code Generation pane, Browse the System Target File and select AURIX Target, Figure 6, and click OK. (Note if this target isn’t shown then it may not have been installed, see section 2)
3. The details in the code generation pane will have changed to match the new target
4. Select Code Generation -> Hitex Aurix Target Options, Figure 7
5. Select the Target board (ShieldBuddy_TC275 may be the only target available)
6. Select the compiler location. The location of your HighTec compiler may be entered manually or you can click the Select Compiler Location button to navigate to the compiler folder. Please select the folder that **contains the bin** folder

7. Set whether you want to use automatic download of the application after build using Memtool

8. If you do want automatic download, then you will also have to specify the location of the Infineon Memtool. As with the compiler location, this may be entered manually or click the button below to navigate. This will be the folder containing “IMTMemtool.exe”

9. Now select the Solver pane, Figure 8

10. As this is for a real target, then the Type of solver must be Fixed-step and for the same reason the Solver must be discrete

11. The Fixed-step size should be left at auto, this allows Simulink to calculate the best scheduler timing

The basic model setup is now complete and ready to build an application.

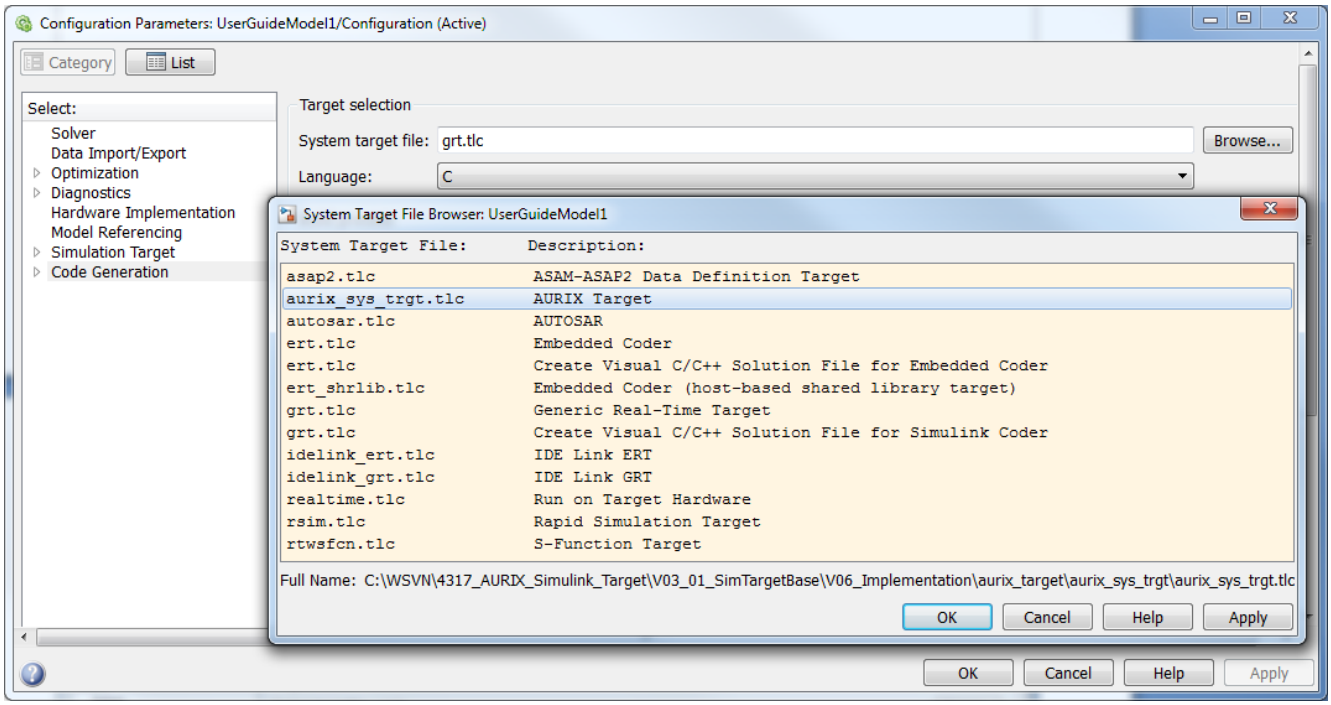


Figure 6 Selecting the AURIX Target

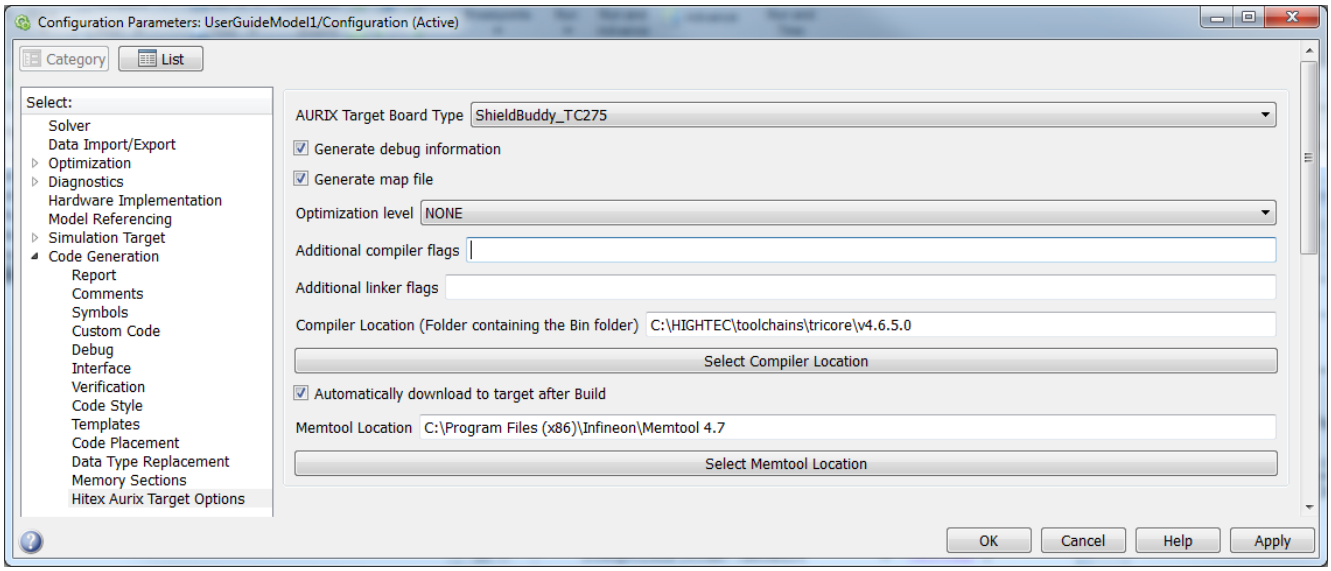


Figure 7 AURIX Target Code Generation Options

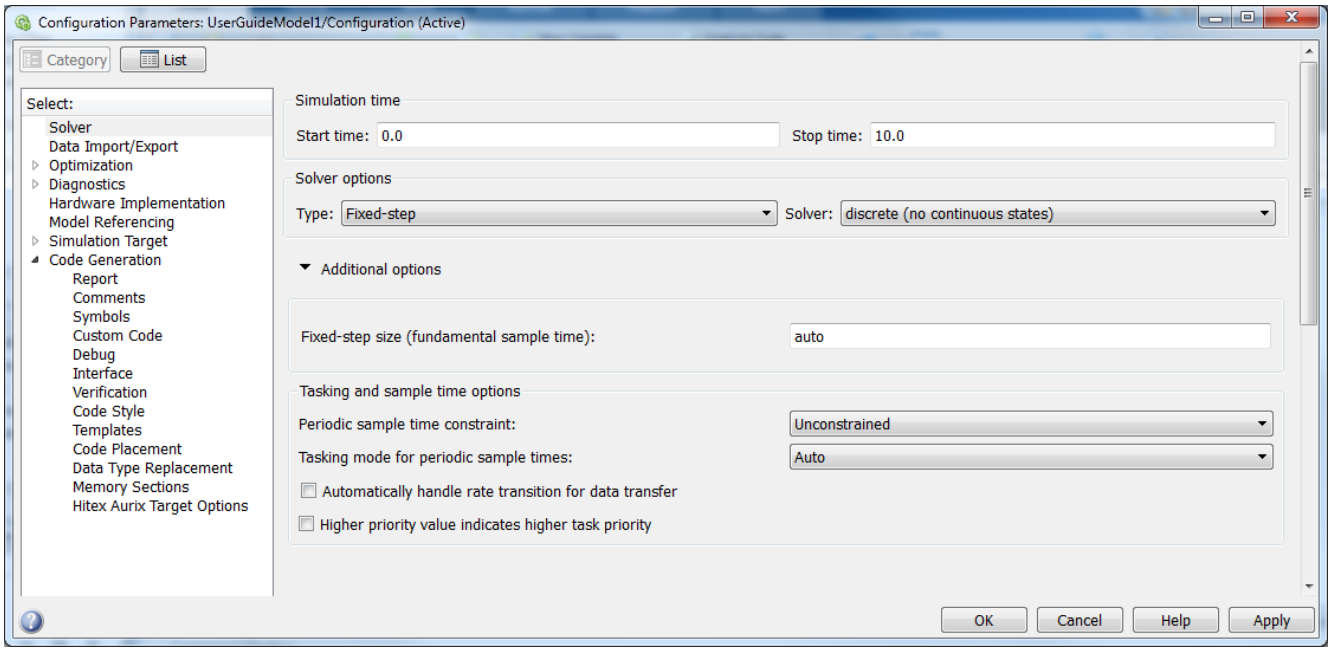


Figure 8 Solver Pane Settings

3.3 First Blinky Application!

We are using the ShieldBuddy TC275 as the target. This has a yellow LED connected to pin 10.2 that we can use as a Heartbeat LED. This is also called Pin 13 on the ShieldBuddy.

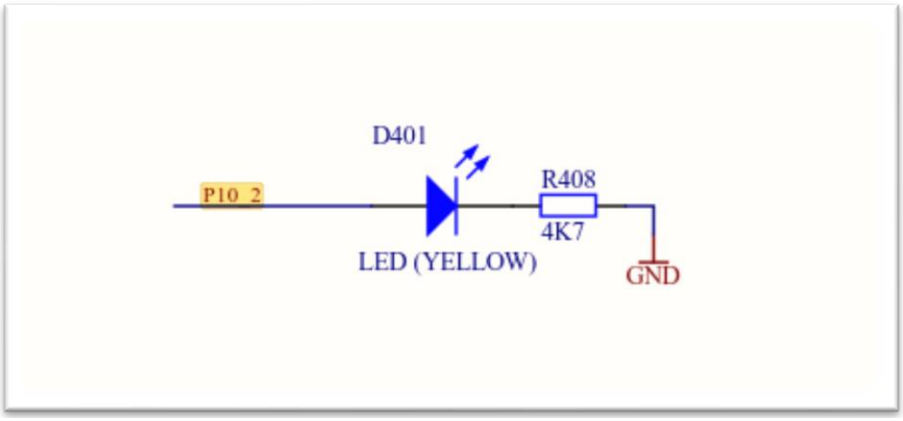


Figure 9 ShieldBuddy TC275 Heartbeat LED

1. Open the Simulink Library Browser and expand the Hitex AURIX Support Package and click on the Application Control sub library.

2. Place one each of the Core Initialise and Core Run Fcn blocks on the model.

3. These are function call blocks and so also place two copies of the Function-Call Subsystem block on the model. Connect the blocks as shown in Figure 10.

4. Delete the In and Out terminals from both Function-Call Subsystem blocks.

5. In the first subsystem for the Core Initialise, place a Config IO block.

6. Double click Config IO and change Pin 13 to Output, see Figure 11.

7. In the second subsystem for the Core Run Fcn, select the DigitalWrite block and place it on the model.

8. Double click the block and set up the parameters as shown in Figure 13. Click OK to close the parameter editor.

9. Build the model and compile the code by clicking the Build Model button 

10. If using a debugger, the output files are found in the code folder as shown in Figure 14. There is a subfolder which is named according to the Model name, in this case it is “UserGuideModel1_aurix_target”; in particular this contains the .elf and .hex files. This user guide does not cover the use of debuggers.

11. To use Memtool, the ShieldBuddy needs to be comected with a USB cable. After Memtool has completed flashing, press the reset button to run the program.

12. To modify the program, go back to the Core Run Function block, double click and change the Schedule Time to say 0.2. After build and download, the LED will flash faster.

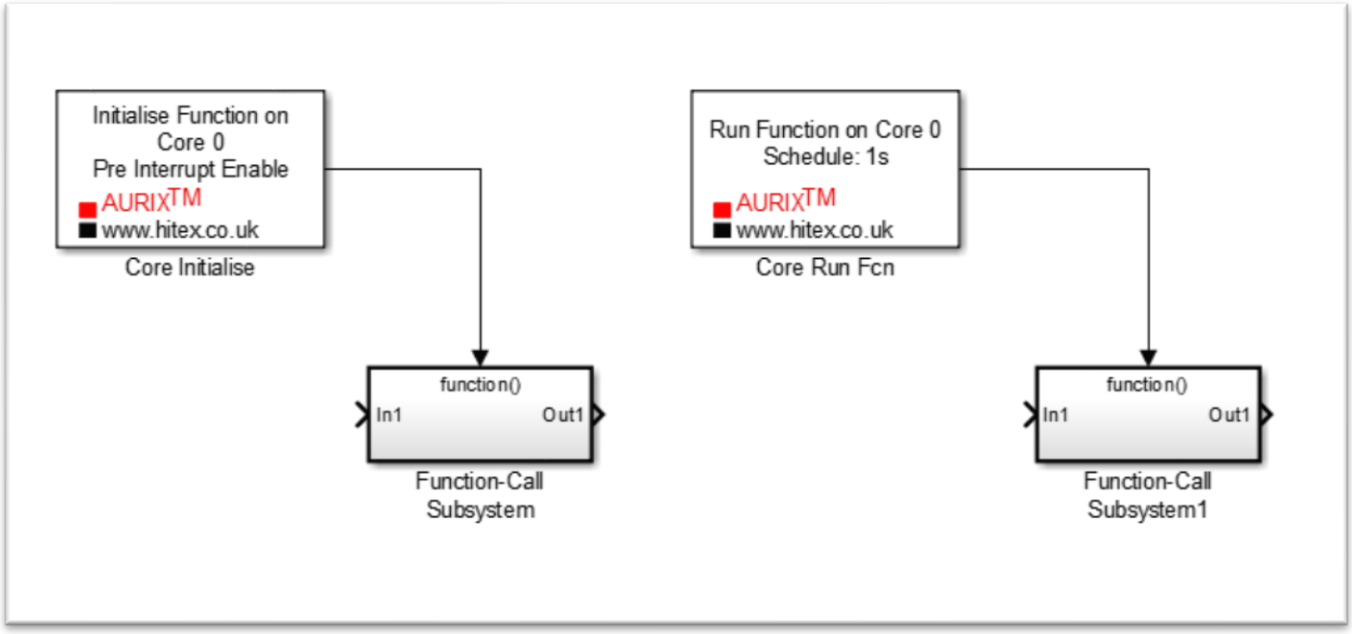


Figure 10 Blinky Application Top Level

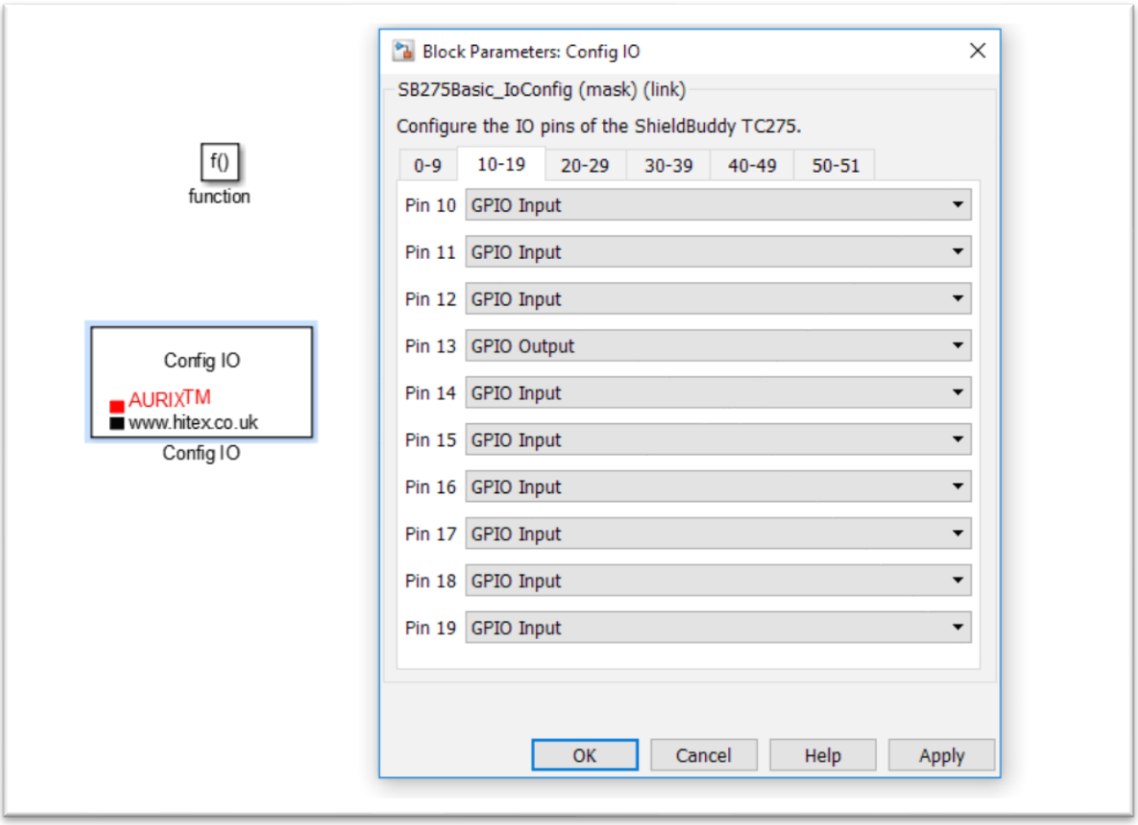


Figure 11 Config IO Setup

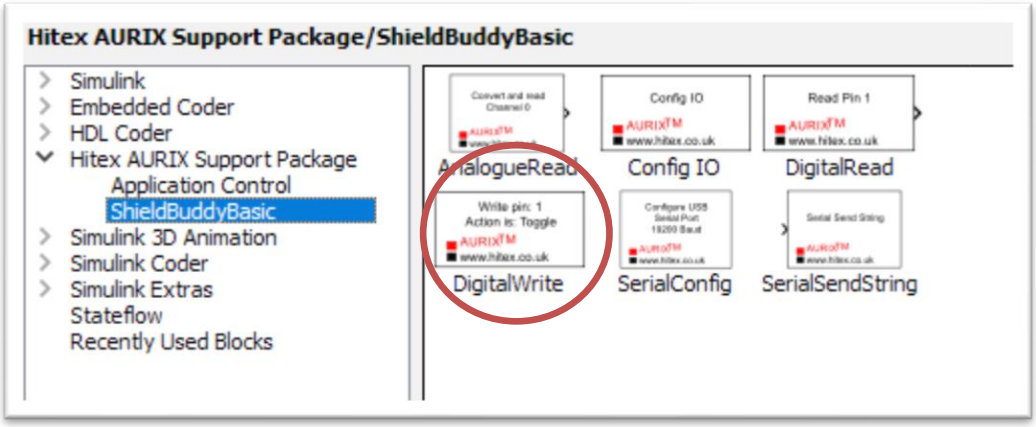


Figure 12 DigitalWrite Block

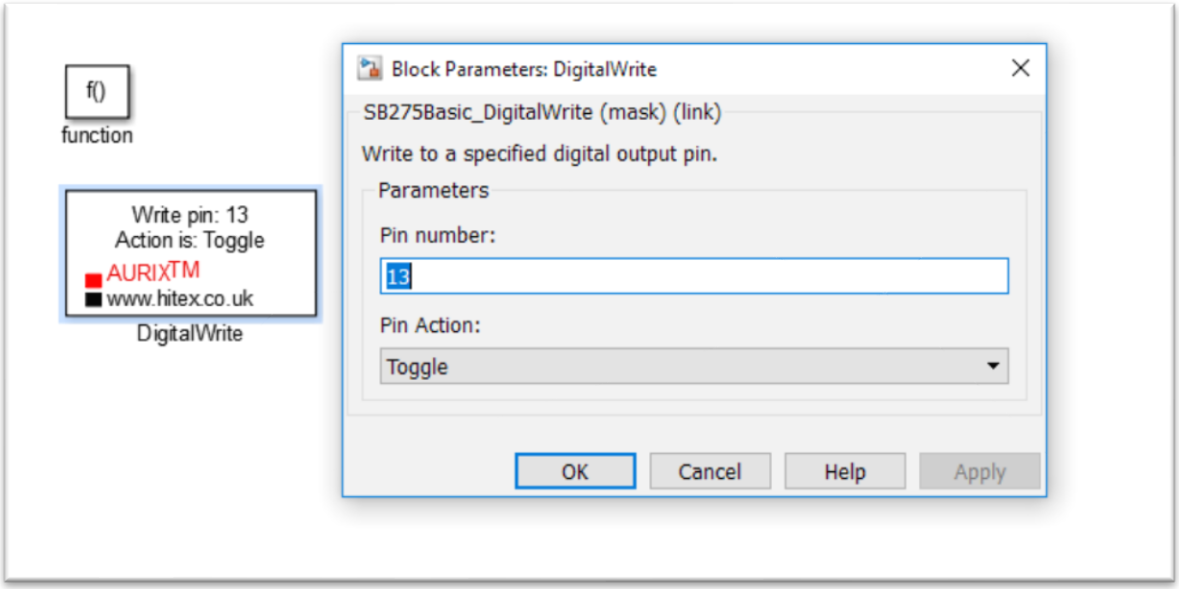


Figure 13 Configure DigitalWrite

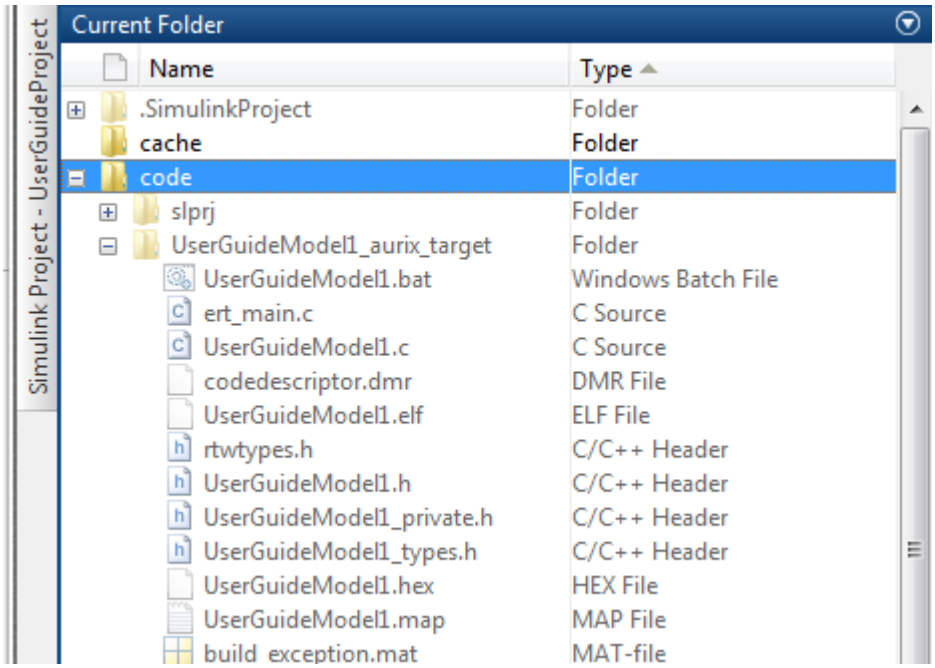


Figure 14 Output Files After Build

w w w . h i t e x . c o m

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