A Getting Started to

AURIX™ TC3xx - Free Entry Tool Chain

AURIX family and AUDO Future, AUDO MAX

Integrated Development Environment for 32-bit AURIX and TriCore derivatives

This manual contains 43 pages.

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Introduction

This **Getting Started** document will help you to install and configure the Hardware and Software tools necessary to operate the Free TriCore Entry Tool Chain. At the end of the instructions described in this document, you will have a running environment that could be used as a starting point for further development or evaluation work.

This tutorial goes step-by-step through the necessary procedures in order to:

- Install the **Free TriCore™ Entry Tool Chain**.
- Set up a project.
- Configure the Evaluation Board and connect it to the PC.
- Debug your application.

If you need more information, please contact your nearest Infineon sale's office. Contact information is available on Infineon web site: **https://www.infineon.com**.

We wish you a lot of success with the Free TriCore Entry Tool Chain!

Note: "Starter Kit Evaluation Board", "Evaluation Board", "TriBoard" and "Target" terminology are used to denote Evaluation Boards as shown in Figure 15 to Figure 33.

Installing the AURIX TC3xx - Free Entry Tool Chain

Before you start

To execute this **Getting Started**, it is necessary to have a

- Microsoft Windows® compatible PC equipped with USB port
- Operating System Windows® 7, Windows® 8.1, Windows® 10 **64-bit**
- **Power user's** or **administrator rights** are mandatory to install the required programs
- **During installation a connection to the internet is required for license activation**

All the items below are included in the Starter Kit.

- Power Supply (AC/DC converter) (5.5V – 60V) for the Starter Kit Board (optional)
- TriCore Family Starter Kit Evaluation Board
- Free TriCore Entry Tool Chain installation package
- USB cable.

System Requirements

Before installing, make sure the following minimum system requirements are met:

	Minimum	**Recommended**
CPU	Intel Core i5™ 2.5 GHz and comparable	Intel Core i7™ 3.5 GHz and comparable
RAM	4 GByte	8 GByte
Free disk space	3 GByte HDD	8 GByte SSD
Display	SXGA	WUXGA
Operating System	Windows® 10 64-bit	Windows® 10 SP1 64-bit

Additional requirements

- On-line connection to the Internet
- Microsoft .NET™ Framework 4
- Adobe® Acrobat Reader 10 or higher
- Administrator permissions for the current login during installation.

Installation

1. From the installation package run the installer setup.exe. **Free TriCore Entry Tool Chain** dialog appears (Figure 1).

Figure 1 Free TriCore Entry Tool Chain Setup dialog

2. Select **Next** button. The License Agreement dialog appears. Please read carefully and agree or cancel the installation with Cancel button (Figure 2).

Figure 2 License Agreement dialog

3. Click **Next** button. It is recommended to choose the full installation with all components (Figure 3).

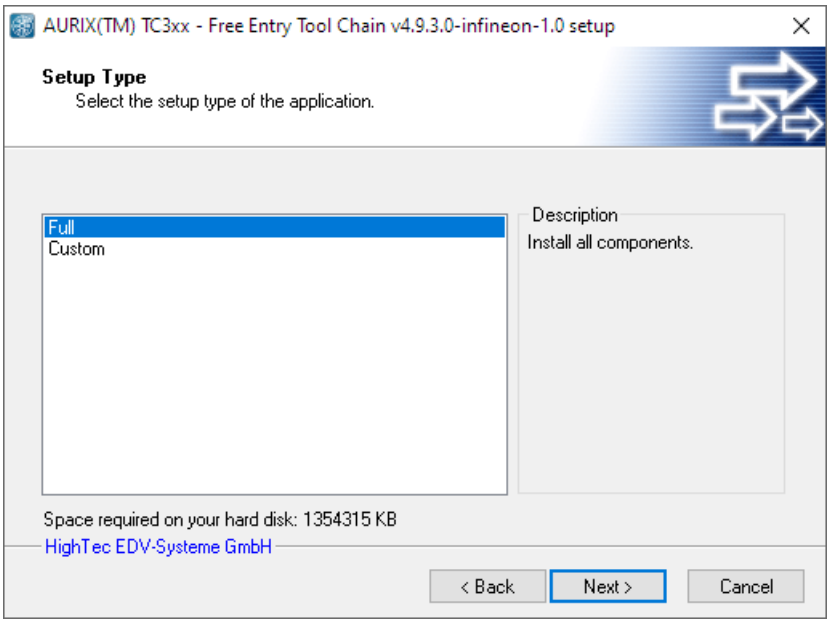


Figure 3 Setup Type selection

4. Click **Next** button. The dialog for selecting the installation directory appears (Figure 4). Use the default or select another installation directory.

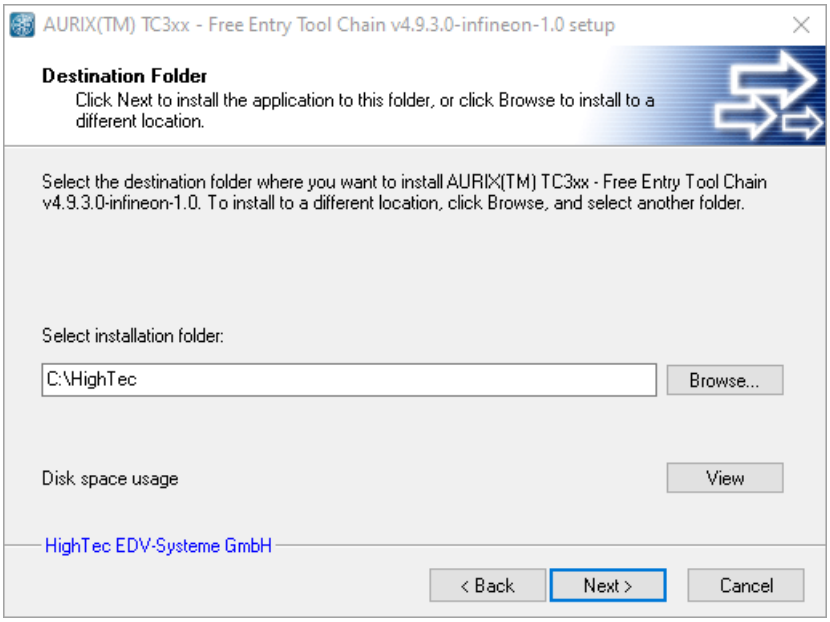


Figure 4 Free TriCore Entry Tool Chain Setup folder dialog

5. Click **Next** button. Select the name of the Program Group and

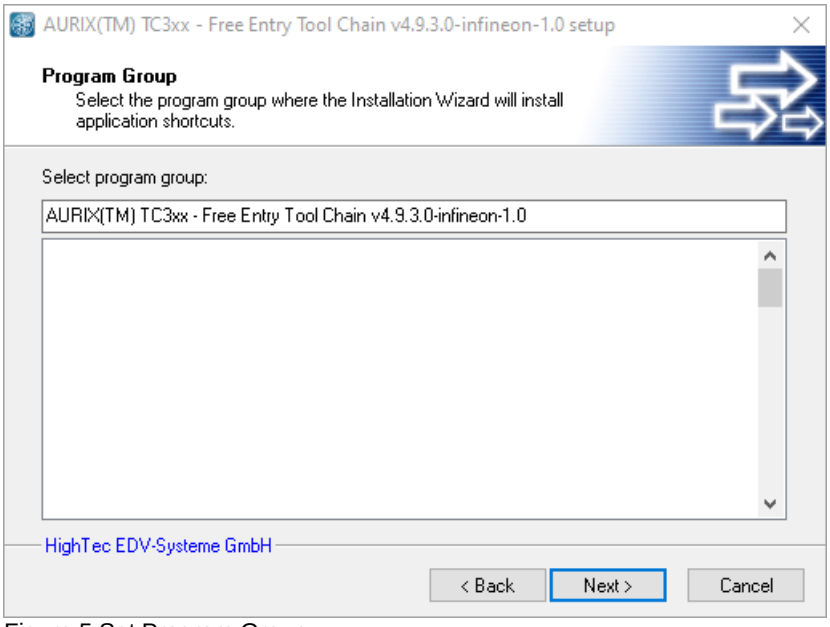


Figure 5 Set Program Group

6. Click **Next** button. (Figure 6)

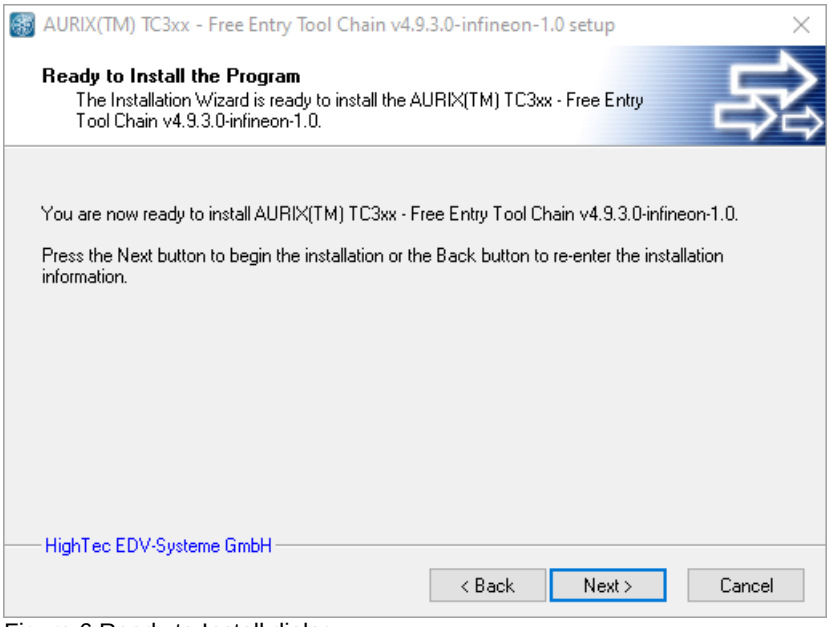


Figure 6 Ready to Install dialog

7. Click **Next**. Further dialogs inform you about the progress of installation.

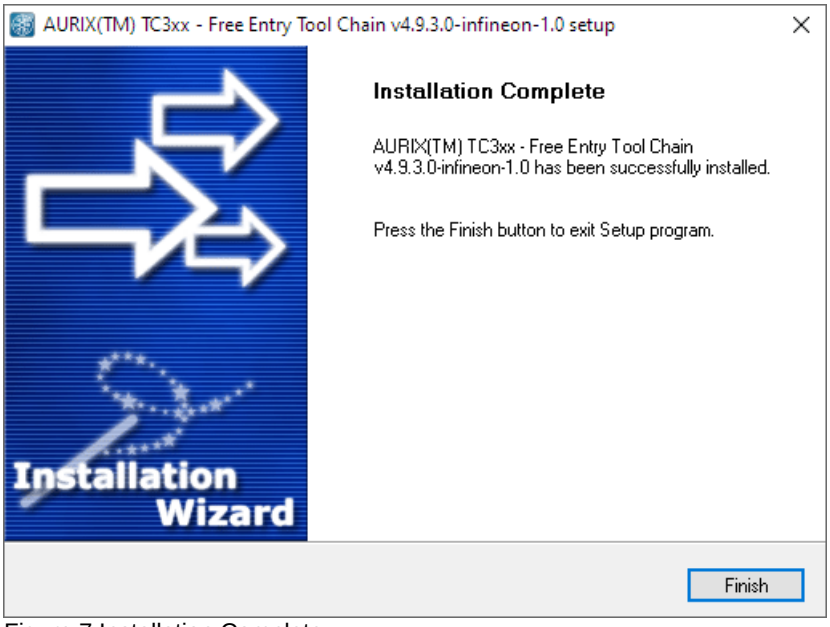


Figure 7 Installation Complete

Note: The Free TriCore Entry Tool Chain license is valid for at least one year. There are following restrictions of the Free TriCore Entry Tool Chain version in comparison to the professional version of UDE:
- Useable for TriCore evaluation boards with on-board wiggler only
- PCP assembler only
- Debugger:
  - No visualization functions at runtime available
  - MCDS support not available
  - Script support not available
  - GTM support not available.

Please contact **tctcsupport@pls-mc.com** for extending the license.

Please note: For commercial development you need the **professional version of TriCore Development Platform**.

First Starting of HighTec IDE

Starting HighTec IDE

1. From the Windows' **Start** menu, select **All Programs – AURIX(TM) TC3xx - Free Entry Tool Chain v4.9.3.0-infineon-1.0 – HighTec IDE** or use the Desktop icon **HighTec IDE**.
2. Now the Eclipse Launcher dialog appears (Figure 8).

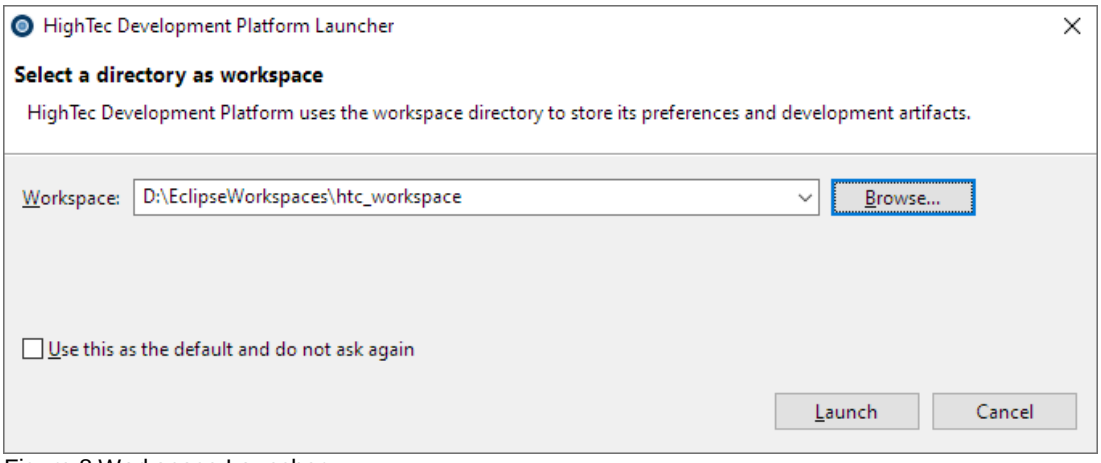


Figure 8 Workspace Launcher

3. Enter the path to the workspace directory e.g. `D:\EclipseWorkspace\htc-workspace`. If the directory doesn't exist, new directory will be created; otherwise existing directory will be used as eclipse workspace. New created projects will be saved in the selected workspace directory.
4. You can enable the option **Use this as the default and do not ask again**. By next start last used workspace will be used, skipping the **Eclipse Launcher** dialog. If you want to use other or new workspace. Select from the **File** menu **Switch Workspace**.
5. Click **OK** to proceed.

The **Welcome view** appears. Initially, the HighTec IDE opens with a workbench displaying the C/C++ perspective with only the Welcome view visible. This view provides some general information and alternative ways to access the online documentation.

HighTec IDE opens with the perspective which was last used before closing, except when starting up for the very first time showing the Welcome view. Click **Get to work** to close the Welcome Screen.

6. Click the **Get to Work** on the left side of the view to go to the workbench. Assuming first start of eclipse, **HighTec perspective** (Figure 9) appears, otherwise last saved workbench layout.

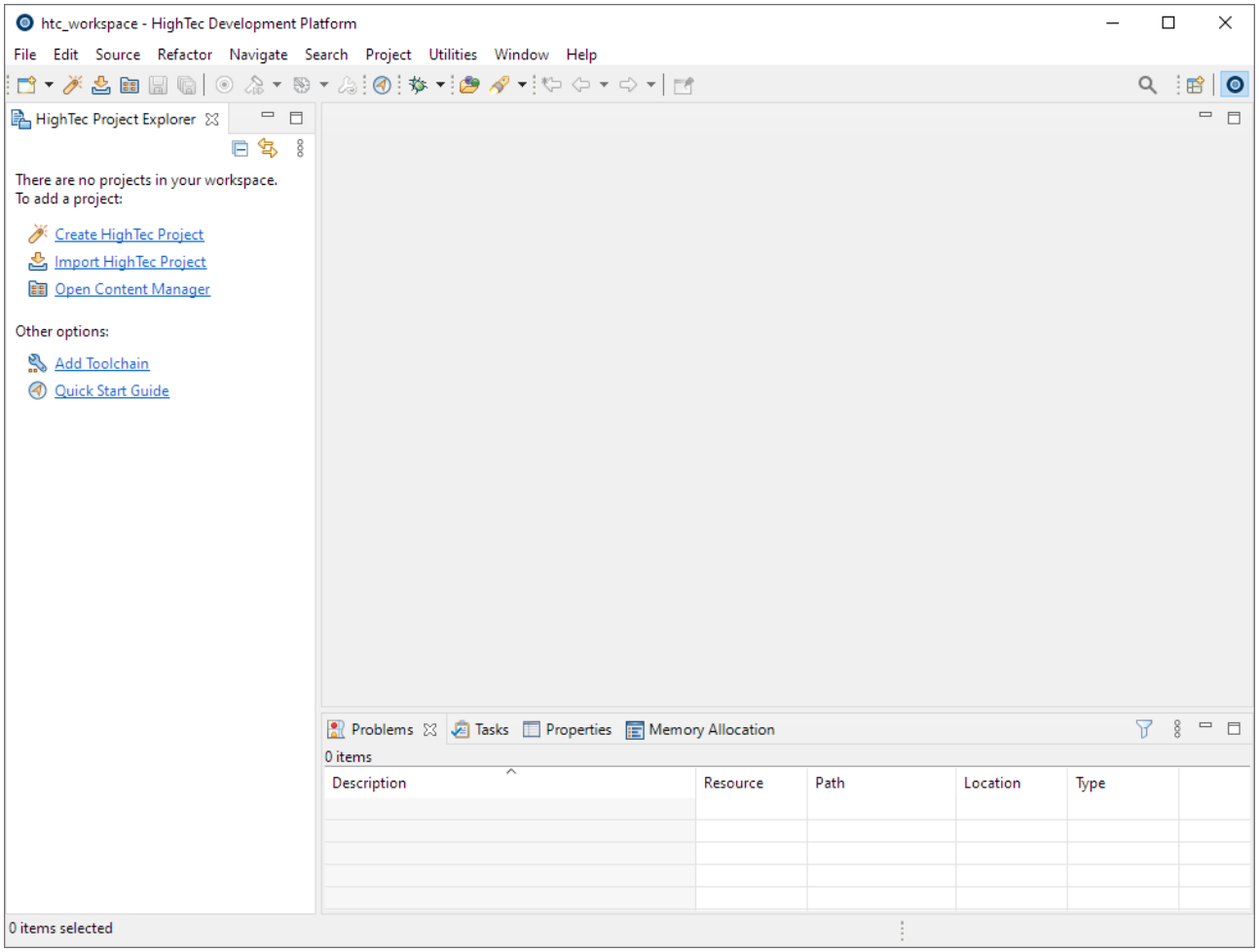


Figure 9 HighTec IDE perspective

Content Manager

The HighTec Content Manager provides easy access to the HighTec's resource cloud repository. You find there project examples, templates and other documents that help you to get up to the speed quickly. You can open the HighTec Content Manager as the separated window from the **HighTec Project Explorer** menu **Open Content Manager** (Figure 9).

HighTec IDE Documentation

The documentation about the HighTec IDE is available in the Eclipse menu **Help – Help Contents**.

Create an AURIX/TriCore Project

C/C++ Project wizard

This tutorial shows how to create an embedded software project with the AURIX/TriCore toolset. It lets you create your own project with an example of an analogue clock on the display of the AURIX application kit.

Set the HighTec C/C++ perspective

Before creating an AURIX/TriCore project, it is necessary to have the **HighTec C/C++** perspective on the workbench (Figure 10). By default, this should be the case when you start HighTec Development Platform, but if it is not, do the following.

To open the **HighTec C/C++** perspective

1. From the **Window** menu select **Open Perspective - Other... - HighTec**. The name of the perspective is displayed in the title bar of the workbench window.

Create new project

1. From the **HighTec Project Explorer** menu select **Create HighTec Project** (Figure 10). The **New Project Wizard** appears (Figure 11).

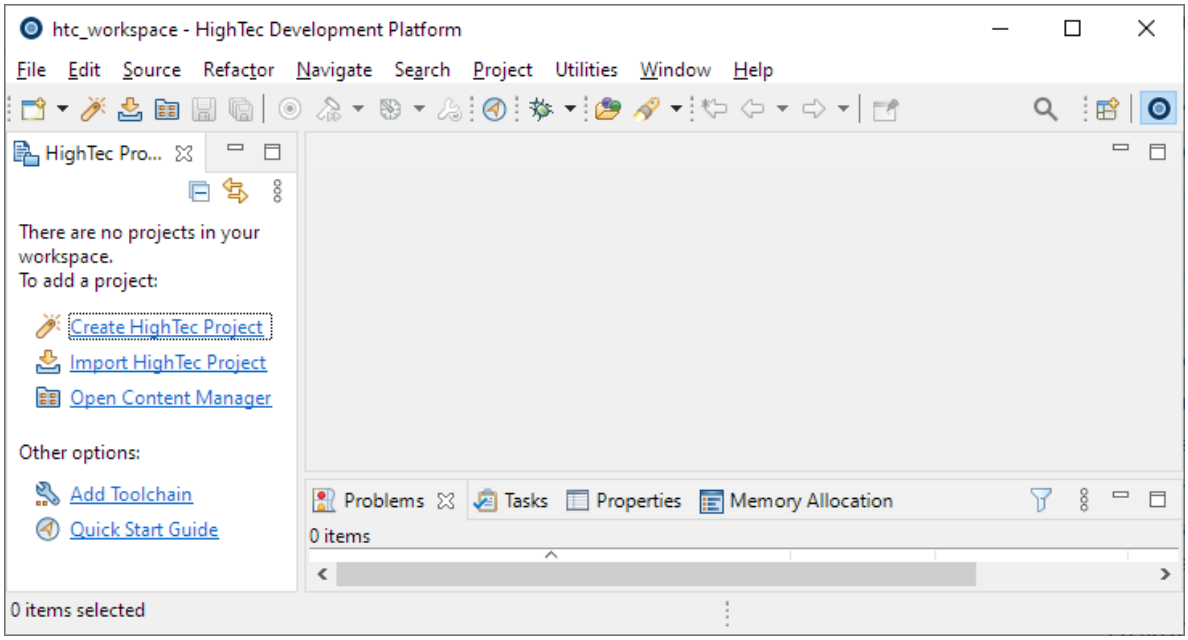


Figure 10 HighTec Project Explorer – Create HighTect Project

2. Select **Create advanced project** and press **Next**.

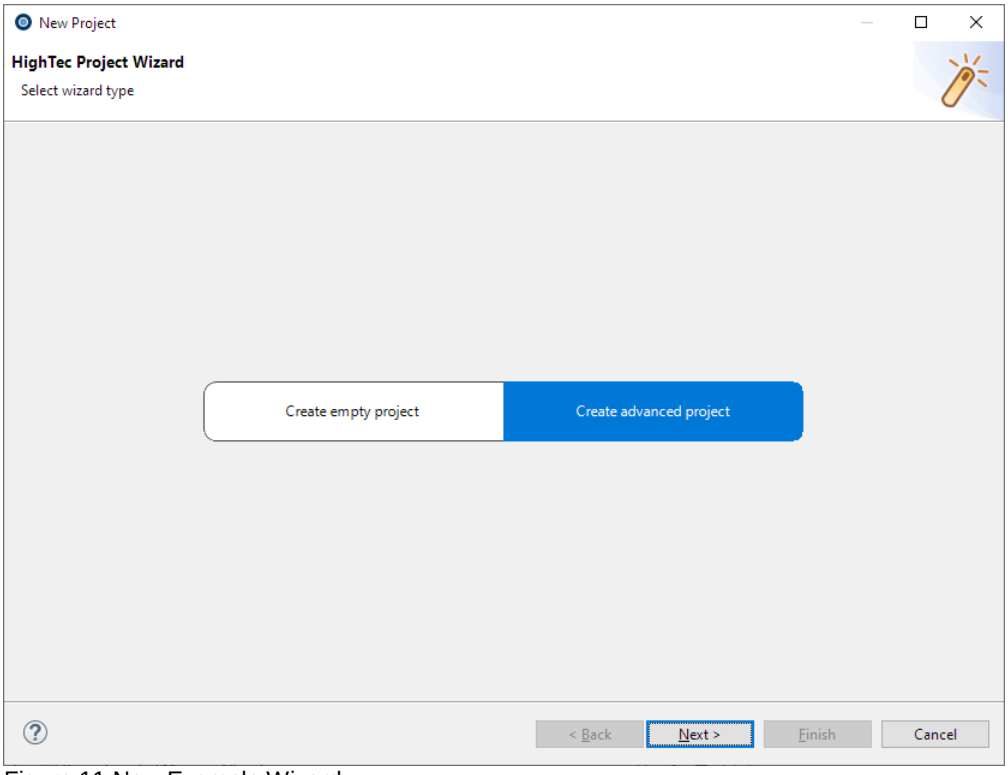


Figure 11 New Example Wizard

3. The next wizard page (Figure 12) shows a selection of examples containing the TriCore APPKIT boards supported by the toolchain. Select an example, e.g. **TC37x BSP example**. Press **Next**.

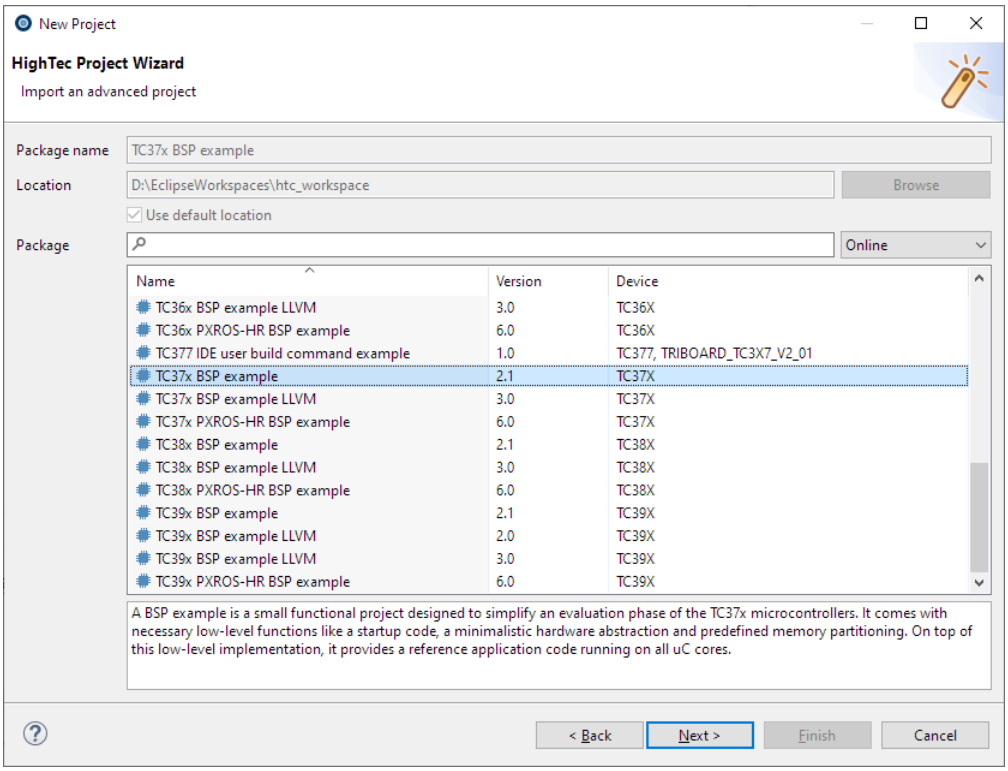


Figure 12 Example projects – Package Selection

4. The next wizard shows the overview about the selected package. Press **Finish**.
5. The selected example will be imported and a new projected created. Figure 13 shows HighTec perspective with the new created project. To see the generated project files you may need to expand the hello project structure on the left pane. To open one generated file double-click the file in the **src** folder of the project structure.

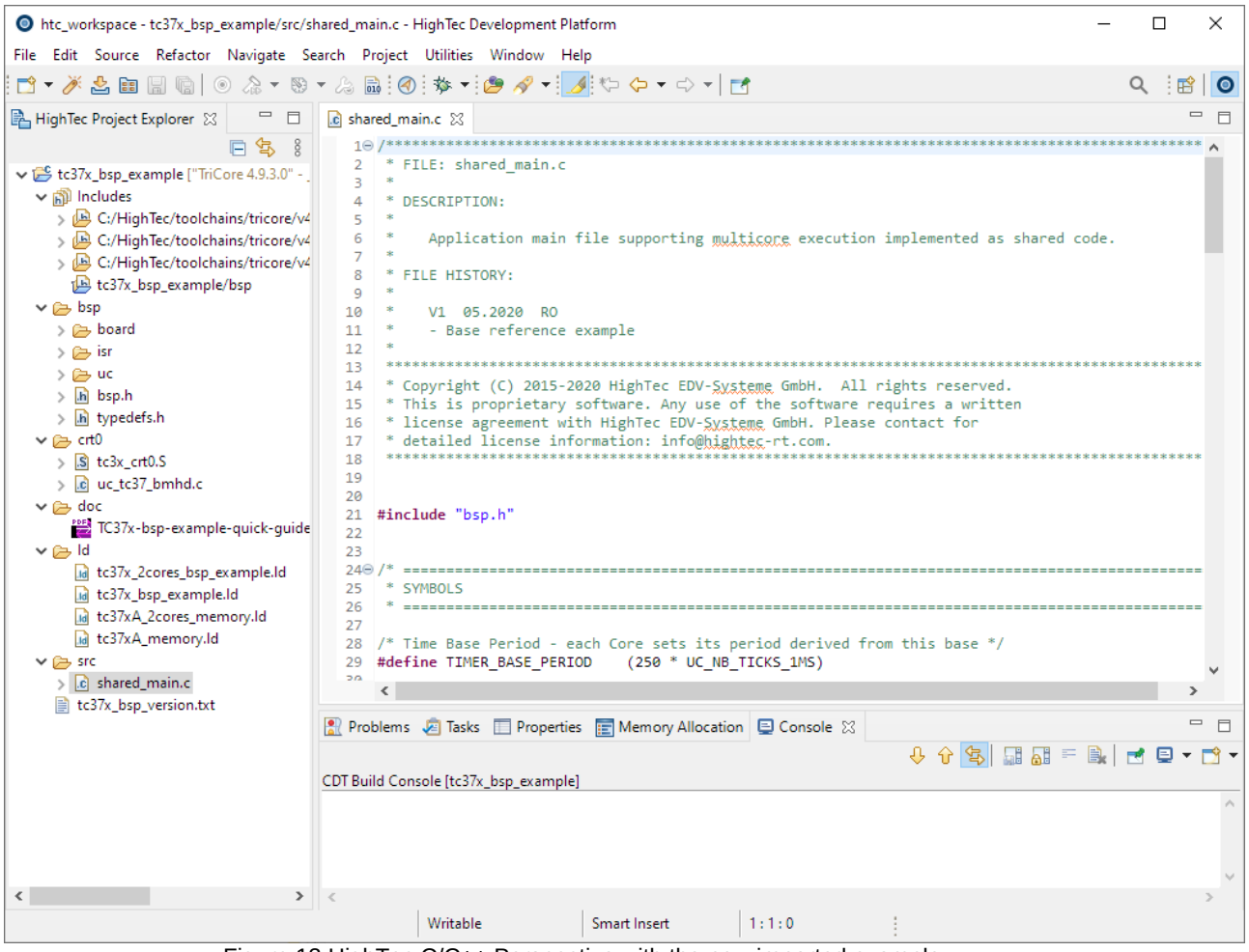


Figure 13 HighTec C/C++ Perspective with the new imported example

Start with an empty Project

Open the **HighTec Project Wizard** (Figure 11) and select an empty project. Follow the wizard for creating the empty project step by step.

Build the Project

When you build an AURIX/TriCore C/C++ project in HighTec Development Environment, the HighTec TriCore compiler, assembler and linker are used to compile and link all the source code and the libraries associated with the project.

The wizard generates different build targets like **iROM** (default). You can choose a build configuration by clicking the arrow of the build icon and build a target by clicking the build icon when available.

Meaning of build targets

- **iROM** Code will be located in the internal flash (default)

During the build process the sources belonging to the project will be compiled and linked. The messages occurring during the build process are displayed in the **Console window** (Figure 14). The build process should terminate without giving any errors or warnings.

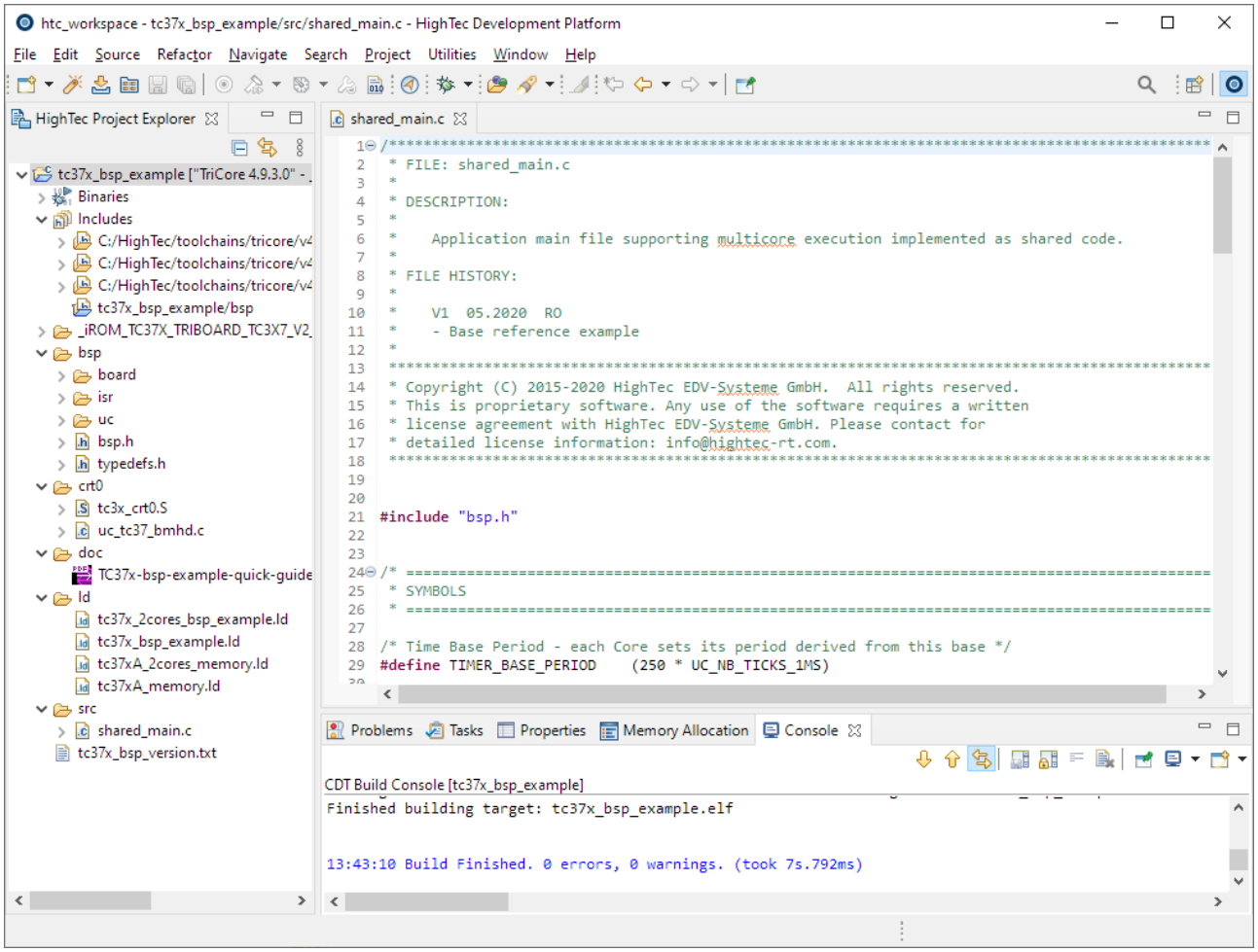


Figure 14 HighTec C/C++ Perspective: Build button and Console window

Connecting the Target

TriBoard with mounted TC38xA, TC39xA, TC39xB processor

1. Configure the DIP switches (1,2,3=OFF **4=ON** but for A step (!) **1=ON** 2,3,4=OFF)
2. Connect a DC power supply (5.5V – 60V) to the TriBoard.
3. Connect the TriBoard to the PC via a Micro-USB cable (a cable is supplied with the Starter Kit).
4. Three **Power LEDs** should be on.
5. Press the **RESET button** (see picture below).

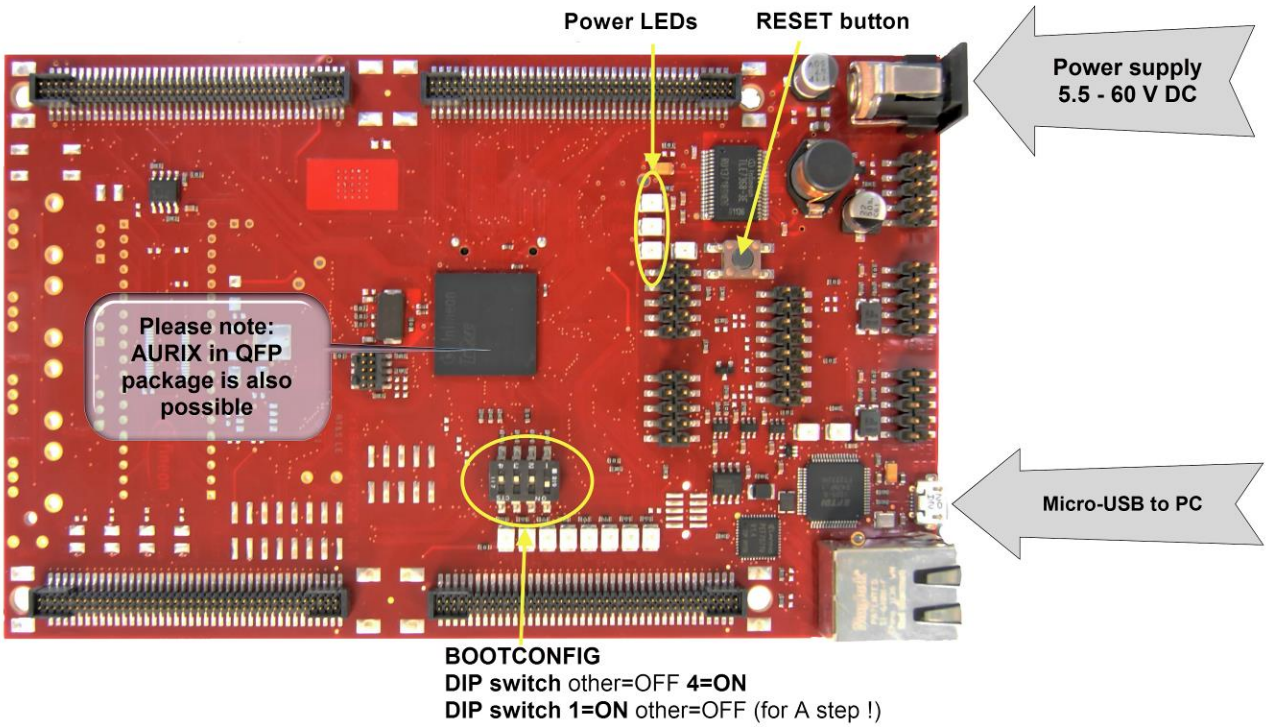
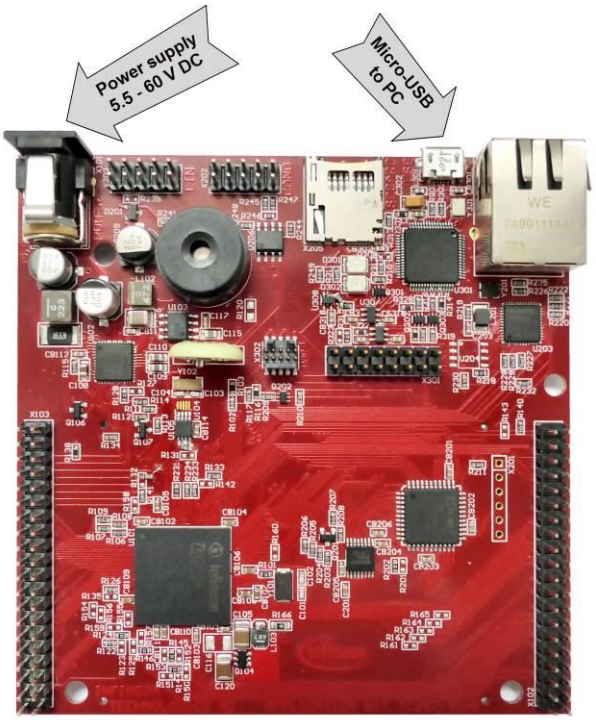
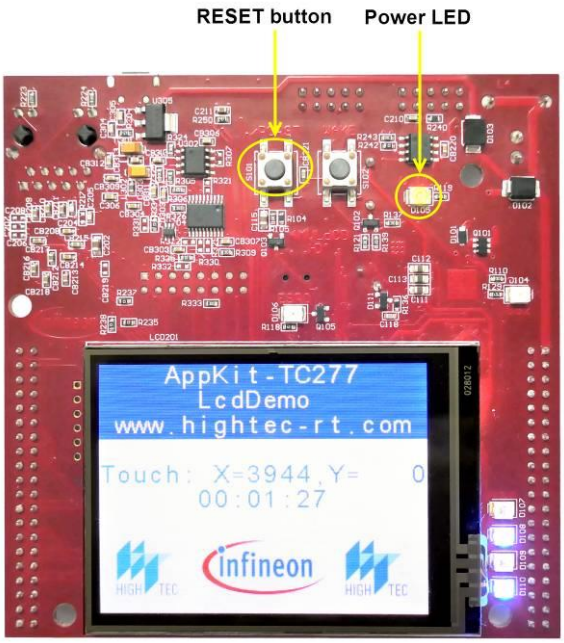


Figure 15 AURIX – TriBoard

1. Connect a DC power supply (5.5V – 60V) to the Application Kit.
2. Connect the Application Kit TC397 to the PC via a Micro-USB cable (a cable is supplied with the Starter Kit).
3. The **Power LED** should be on.
4. Press the **RESET button** (see picture below).



Back side



Top side

Figure 16 AURIX Application Kit TC397 TFT

AURIX Radar Baseboard TC35x 60GHz

1. Connect a V_{Batt} DC power supply (12V) to the AURIX Radar Baseboard.
2. Connect the Radar Baseboard to the PC via a Micro-USB cable (a cable is supplied with the Starter Kit).
3. The **Power LEDs** on the backside should be on.

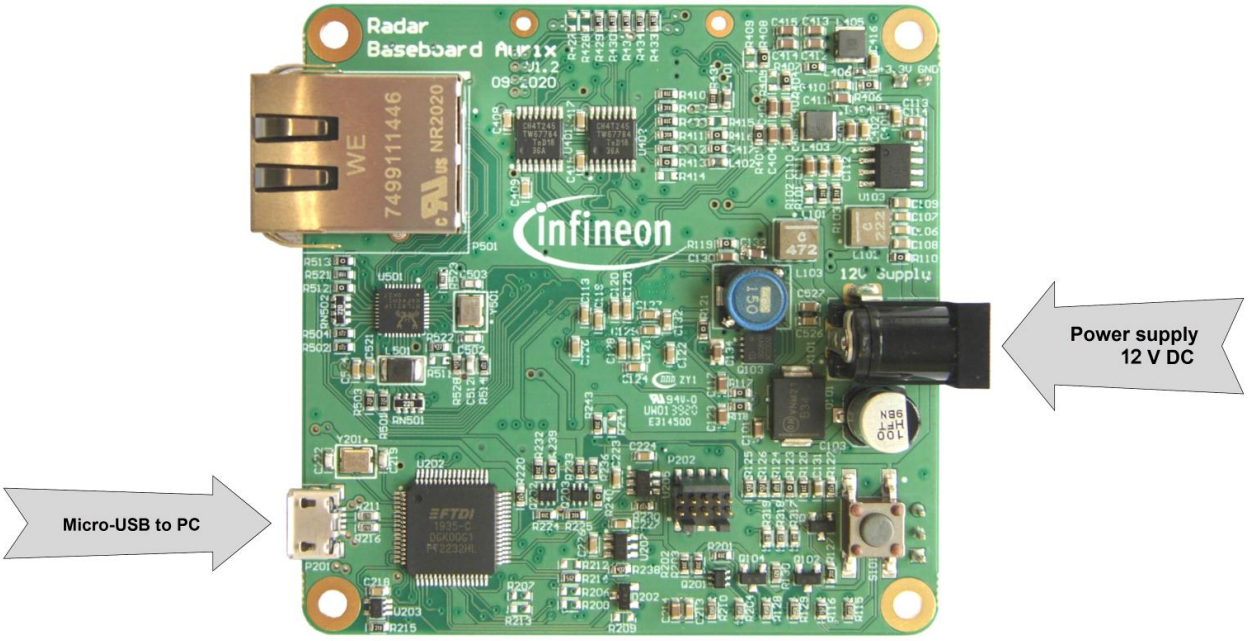


Figure 17 AURIX Radar Baseboard

AURIX Lite Kit V2 with mounted TC265, TC275, TC365, TC375 processor

1. Connect a DC power supply (5V – 40V) to the AURIX Lite Kit V2.
2. Connect the AURIX Lite Kit to the PC via a Micro-USB cable (USB 3.0 recommend, a cable is supplied with the Starter Kit).
3. The **Power LED** should be on.
4. Press the **RESET button** (see picture below).

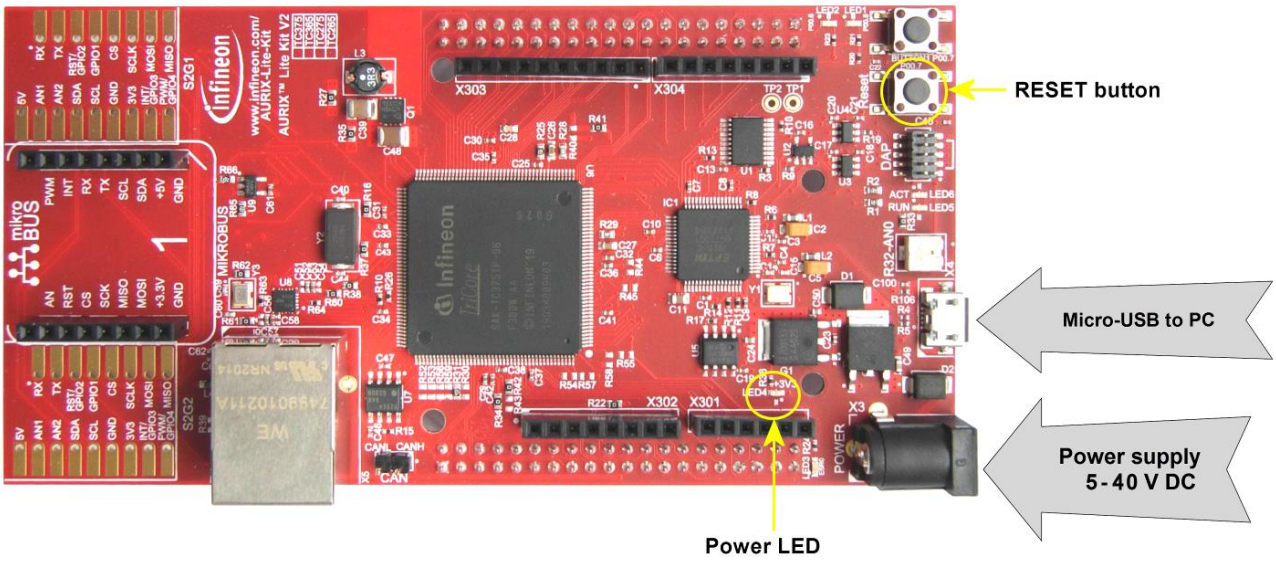


Figure 18 AURIX Lit Kit V2

TriBoard with mounted TC2D5T, TC21xA, TC22xA, TC23xA, TC26xA, TC26xB, TC27xA, TC27xB, TC27xC, TC27xD, TC29xA, TC29xB processor

1. Configure the DIP switches (1,2,3=OFF **4=ON** but for A step (!) **1=ON** 2,3,4=OFF)
2. Connect a DC power supply (5.5V – 60V) to the TriBoard.
3. Connect the TriBoard to the PC via a Micro-USB cable (a cable is supplied with the Starter Kit).
4. Three **Power LEDs** should be on.
5. Press the **RESET button** (see picture below).

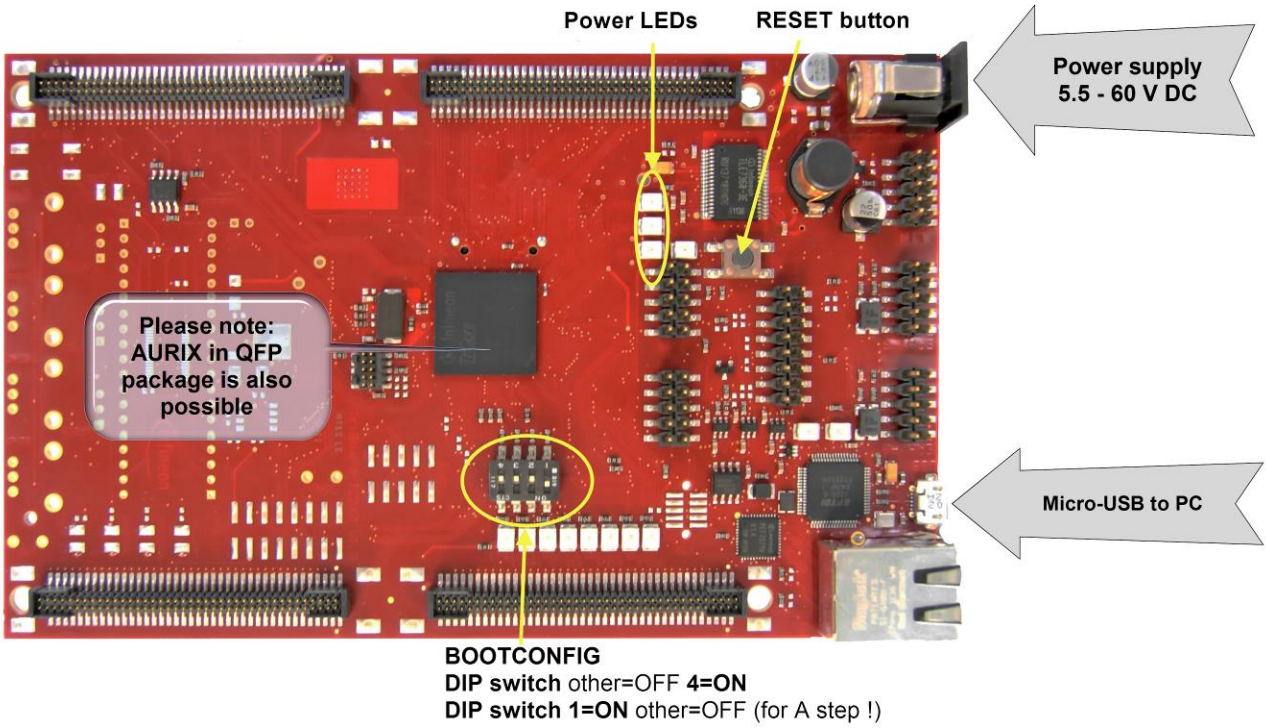
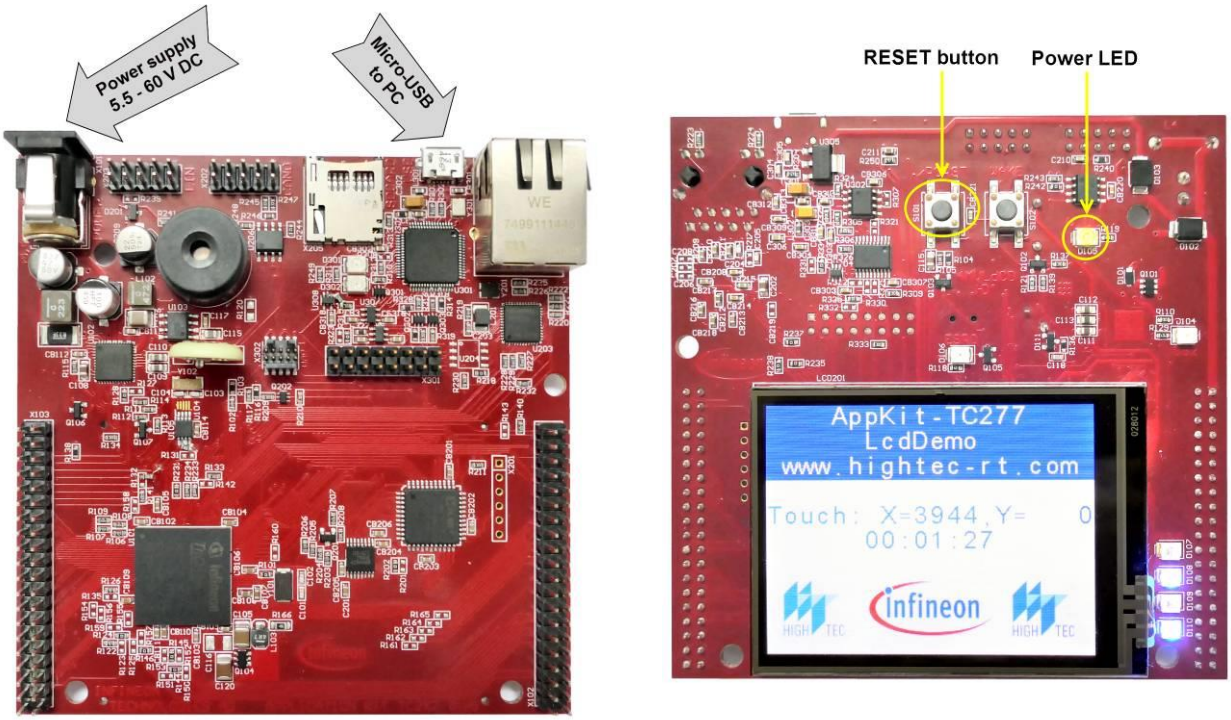


Figure 19 AURIX – TriBoard

Application Kit AURIX TC2X4 TFT with TC224, TC234 (TLF35584A, TLF35584B, TLF35584C)

1. Connect a DC power supply (5.5V – 60V) to the Application Kit.
2. Connect the Application Kit TC2X4 to the PC via a Micro-USB cable (a cable is supplied with the Starter Kit).
3. The **Power LED** should be on.
4. Press the **RESET button** (see picture below).

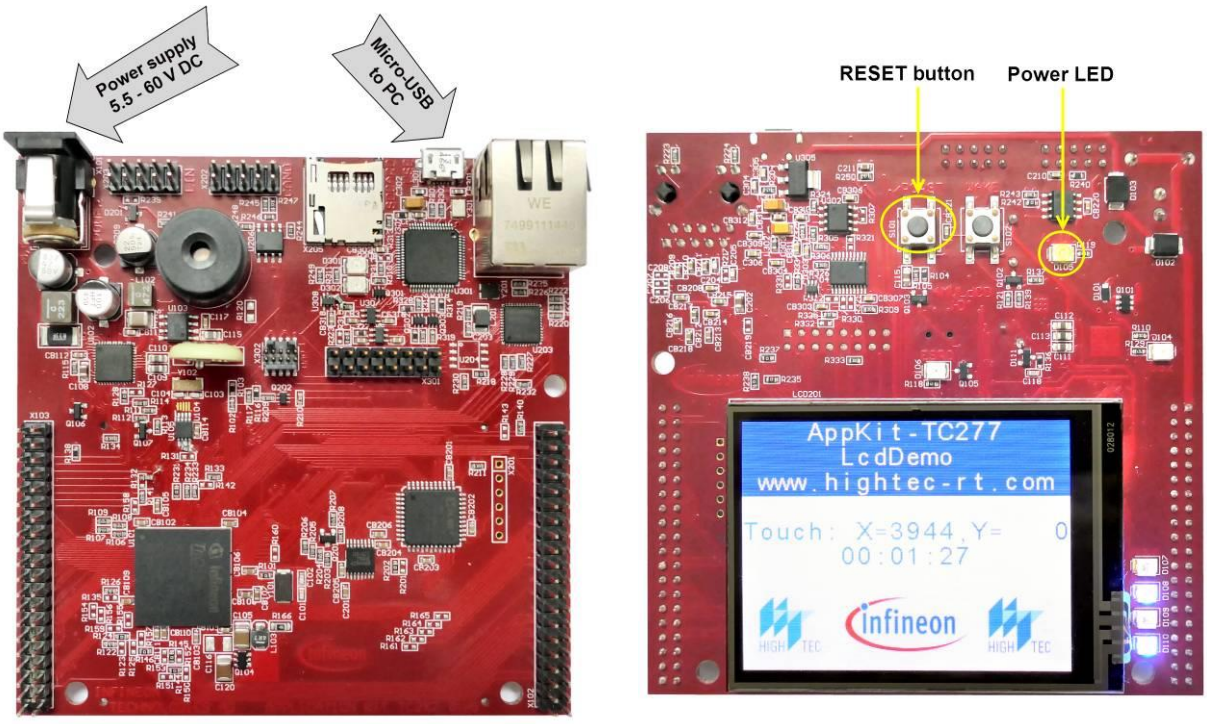


Back side Top side

Figure 20 AURIX Application Kit TC2X4 TFT

Application Kit AURIX TC2X5 TFT with TC265B, TC275A, TC275B, TC275C

1. Connect a DC power supply (5.5V – 60V) to the Application Kit.
2. Connect the Application Kit TC2X5 to the PC via a Micro-USB cable (a cable is supplied with the Starter Kit).
3. The **Power LED** should be on.
4. Press the **RESET button** (see picture below).



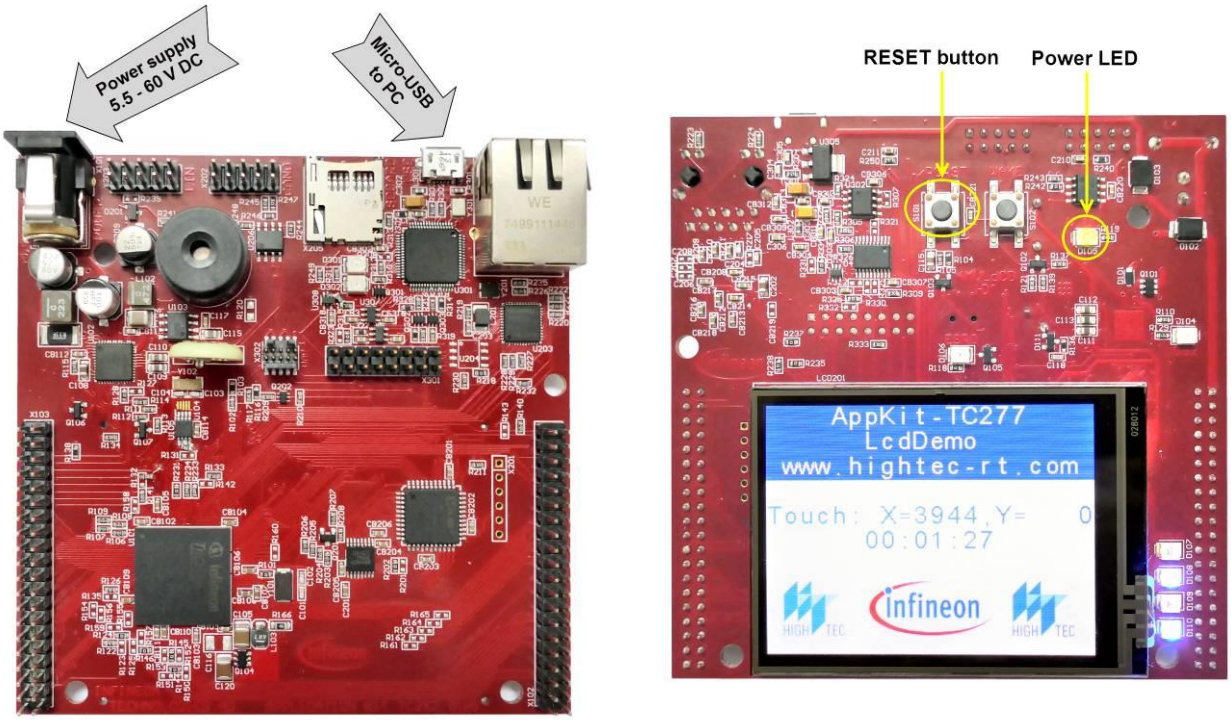
Back side

Top side

Figure 21 AURIX Application Kit TC2X5

Application Kit AURIX TC2X7 TFT with TC237, TC267B, TC277C, TC277D, TC297B

1. Connect a DC power supply (5.5V – 60V) to the Application Kit.
2. Connect the Application Kit TC2X7 to the PC via a Micro-USB cable (a cable is supplied with the Starter Kit).
3. The **Power LED** should be on.
4. Press the **RESET button** (see picture below).



Back side

Top side

Figure 22 AURIX Application Kit TC2X7

1. Configure the Power Supply Jumper to VUSB.
2. Connect the ShieldBuddy to the PC via a Micro-USB cable (USB 3.0 recommend, a cable is supplied with the Starter Kit).
3. Three **Power LEDs** should be on.
4. Press the **RESET button** (see picture below).

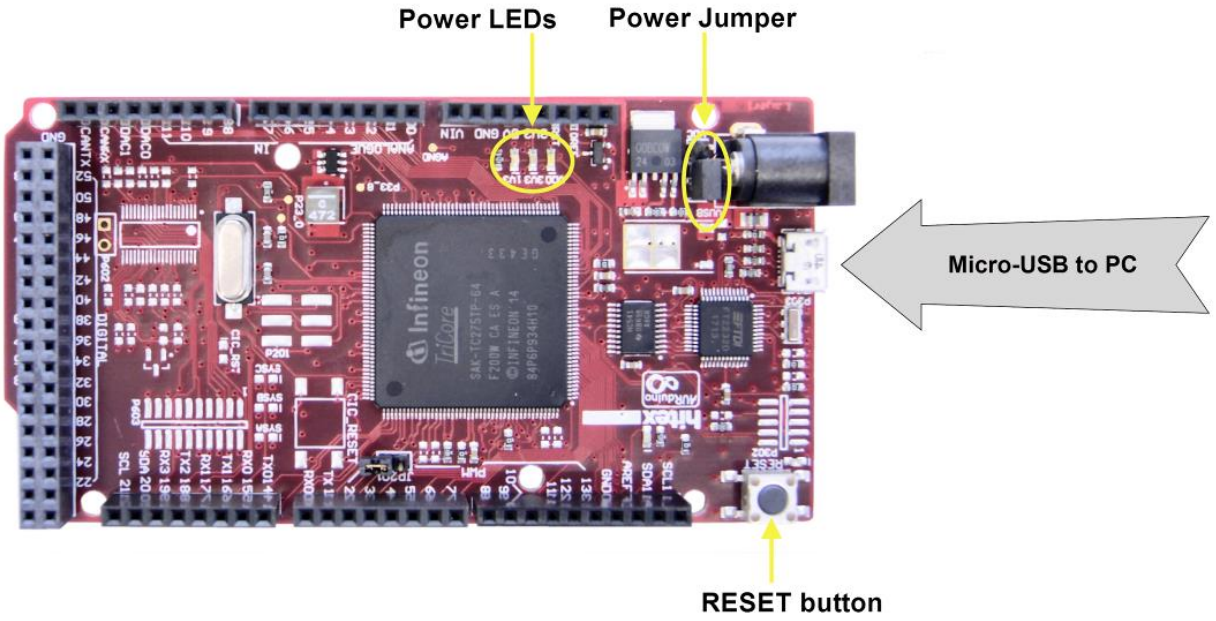


Figure 23 ShieldBuddyTC275

1. Connect a DC power supply (5.5V – 60V) to the baseboard
2. Connect the baseboard to the PC via a Micro-USB cable (a cable is supplied with the Starter Kit).
3. The **Power LED** should be on.
4. Press the **RESET button** (see picture below).

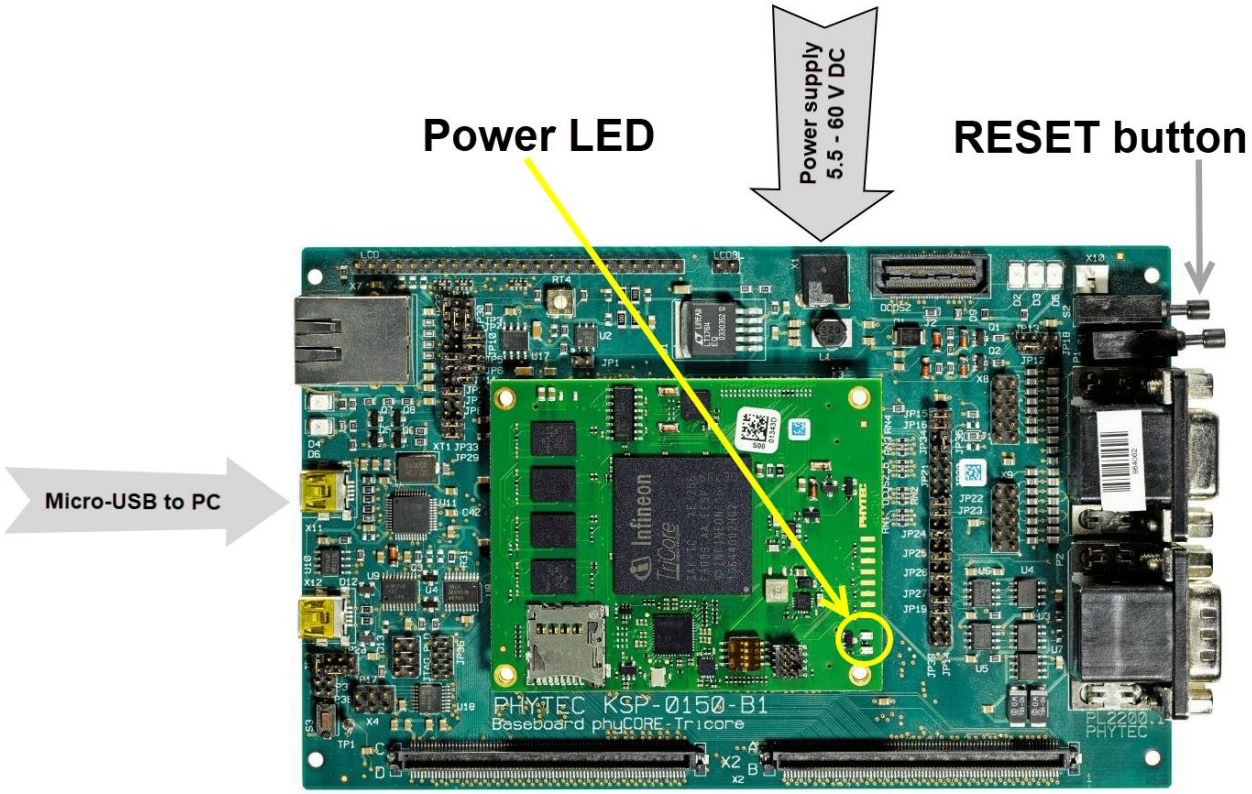


Figure 24 phyCORE – TC29xB with Baseboard

phyCORE-TC39xB with Baseboard

1. Connect a DC power supply (5.5V – 60V) to the baseboard
2. Connect the baseboard to the PC via a Micro-USB cable (a cable is supplied with the Starter Kit).
3. The **Power LED** should be on.
4. Press the **RESET button** (see picture below).

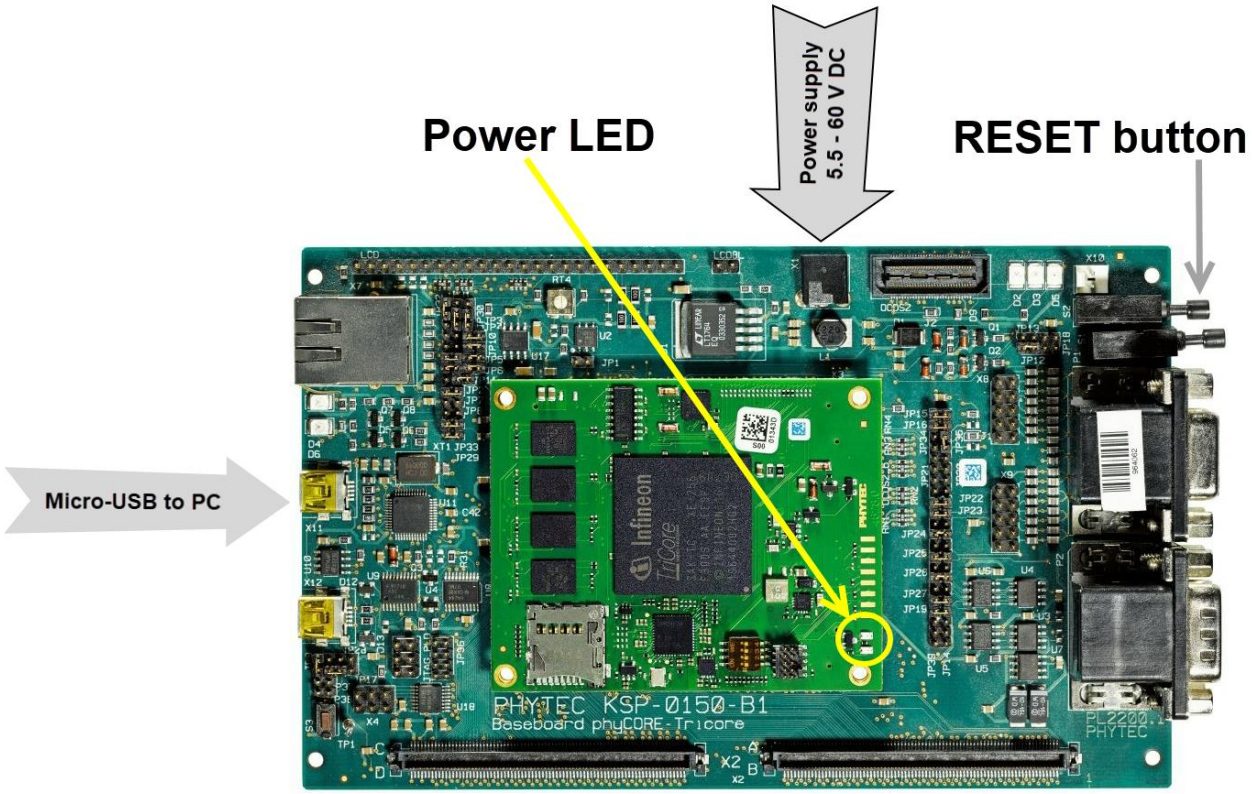


Figure 25 phyCORE – TC39xB with Baseboard

TriBoard with mounted TC1767 processor

5. Configure the DIP switches (default all OFF - boot from internal flash)
6. Connect a DC power supply (5.5V – 60V) to the TriBoard.
7. Connect the TriBoard to the PC via a USB cable
   (a cable is supplied with the Starter Kit).
8. Three **Power LEDs** should be on.
9. Press the **RESET button** (see picture below).

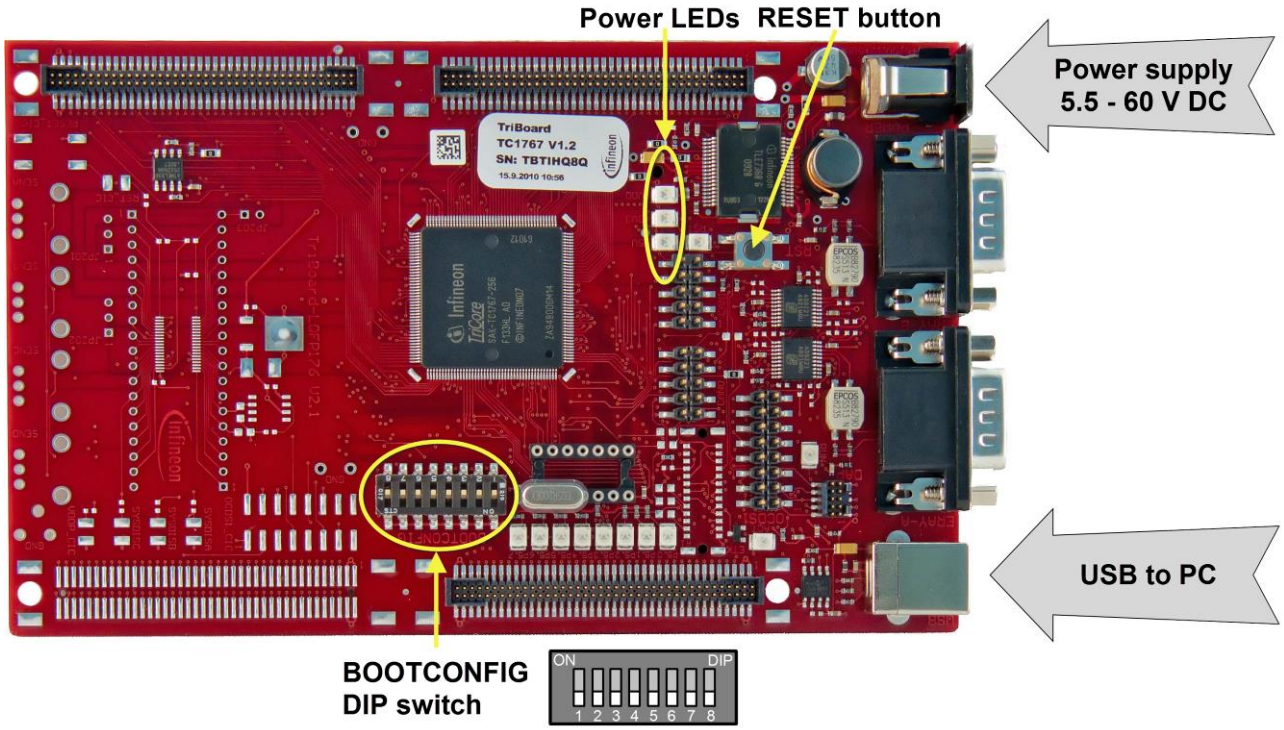


Figure 26 TC1767 - TriBoard

TriBoard with mounted TC1797 processor

1. Configure the DIP switches (default all OFF - boot from internal flash)
2. Connect a DC power supply (5.5V – 60V) to the TriBoard.
3. Connect the TriBoard to the PC via a USB cable
   (a cable is supplied with the Starter Kit).
4. Three Power Supply PS-LEDs should be on.
5. Press the **RESET button** (see picture below).

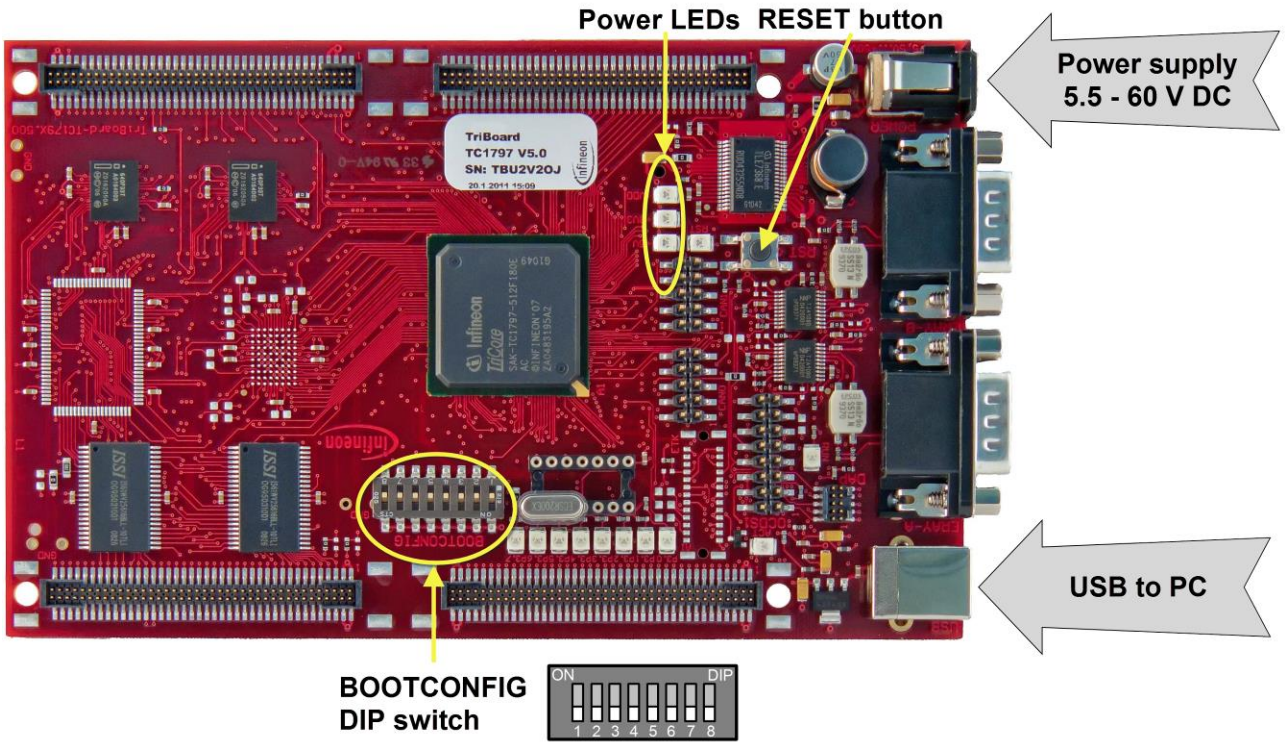


Figure 27 TC1797 - TriBoard

TriBoard with mounted TC1782 processor

1. Configure the DIP switches (default all OFF - boot from internal flash)
2. Connect a DC power supply (5.5V – 60V) to the TriBoard.
3. Connect the TriBoard to the PC via a USB cable
   (a cable is supplied with the Starter Kit).
4. Three Power Supply PS-LEDs should be on.
5. Press the **RESET button** (see picture below).

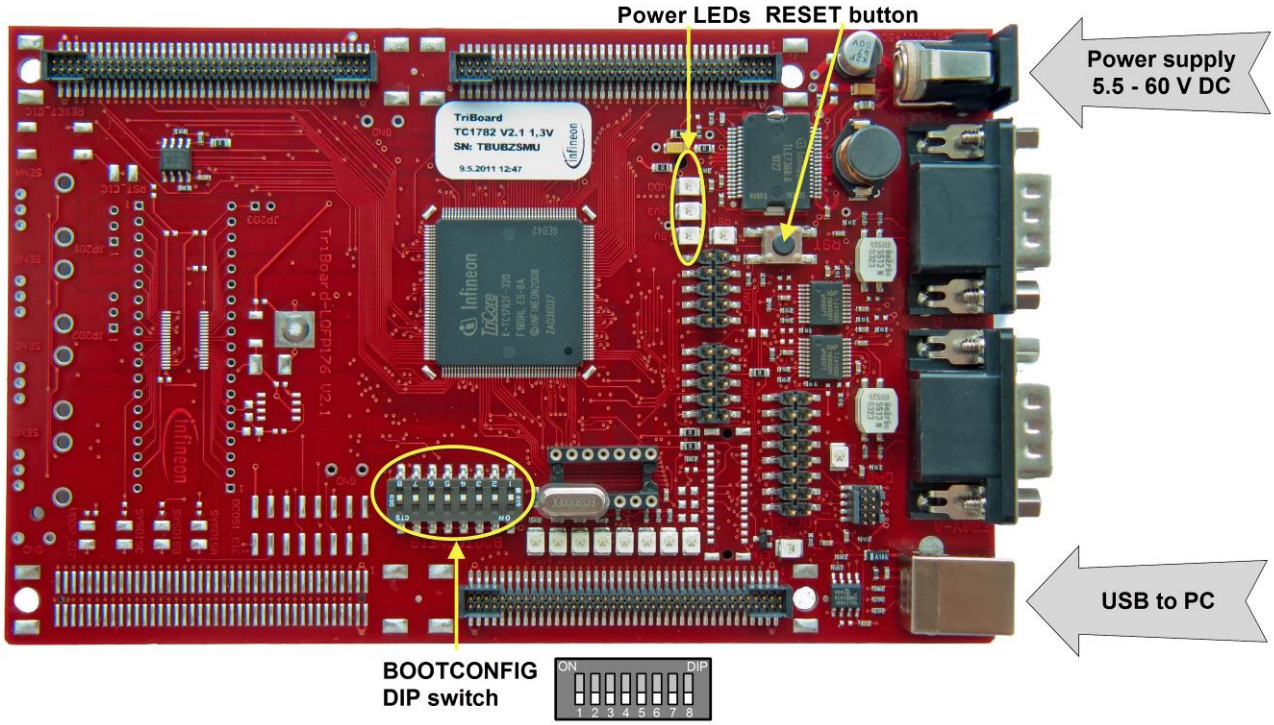


Figure 28 TC1782 - TriBoard

TriBoard with mounted TC1724 processor

1. Configure the DIP switches (default all OFF - boot from internal flash)
2. Connect a DC power supply (5.5V – 60V) to the TriBoard.
3. Connect the TriBoard to the PC via a USB cable
   (a cable is supplied with the Starter Kit).
4. Three Power Supply PS-LEDs should be on.
5. Press the **RESET button** (see picture below).

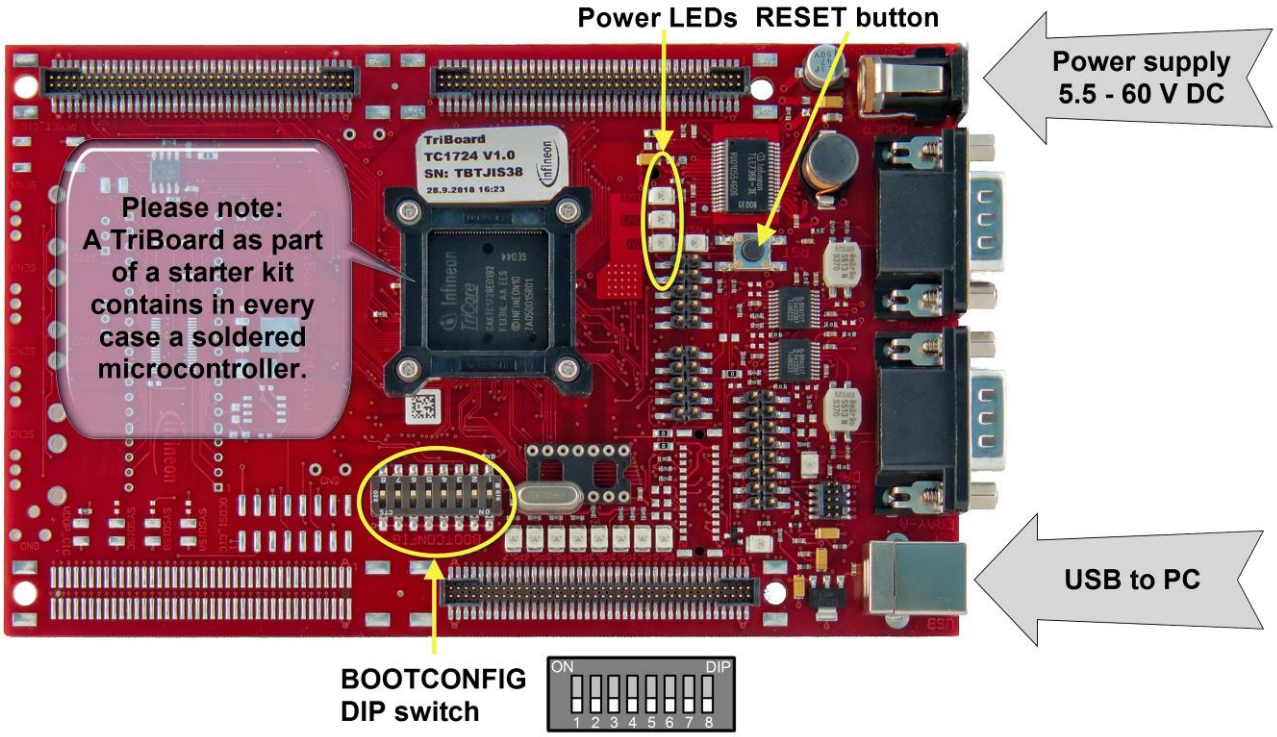


Figure 29 TC1724 - TriBoard

TriBoard with mounted TC1791 processor

1. Configure the DIP switches (default all OFF - boot from internal flash)
2. Connect a DC power supply (5.5V – 60V) to the TriBoard.
3. Connect the TriBoard to the PC via a USB cable
   (a cable is supplied with the Starter Kit).
4. Three Power Supply PS-LEDs should be on.
5. Press the **RESET button** (see picture below).

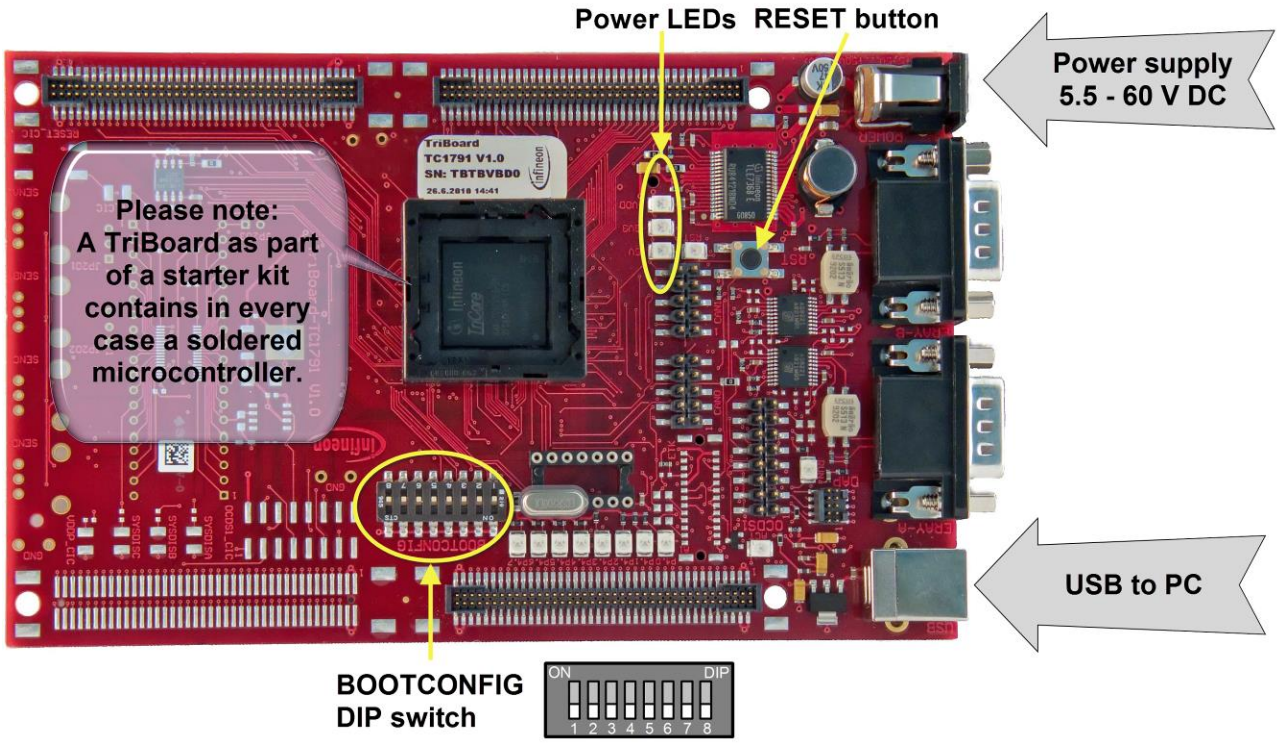


Figure 30 TC1791 - TriBoard

TriBoard with mounted TC1793 processor

1. Configure the DIP switches (default all OFF - boot from internal flash)
2. Connect a DC power supply (5.5V – 60V) to the TriBoard.
3. Connect the TriBoard to the PC via a USB cable
   (a cable is supplied with the Starter Kit).
4. Three Power Supply PS-LEDs should be on.
5. Press the **RESET button** (see picture below).

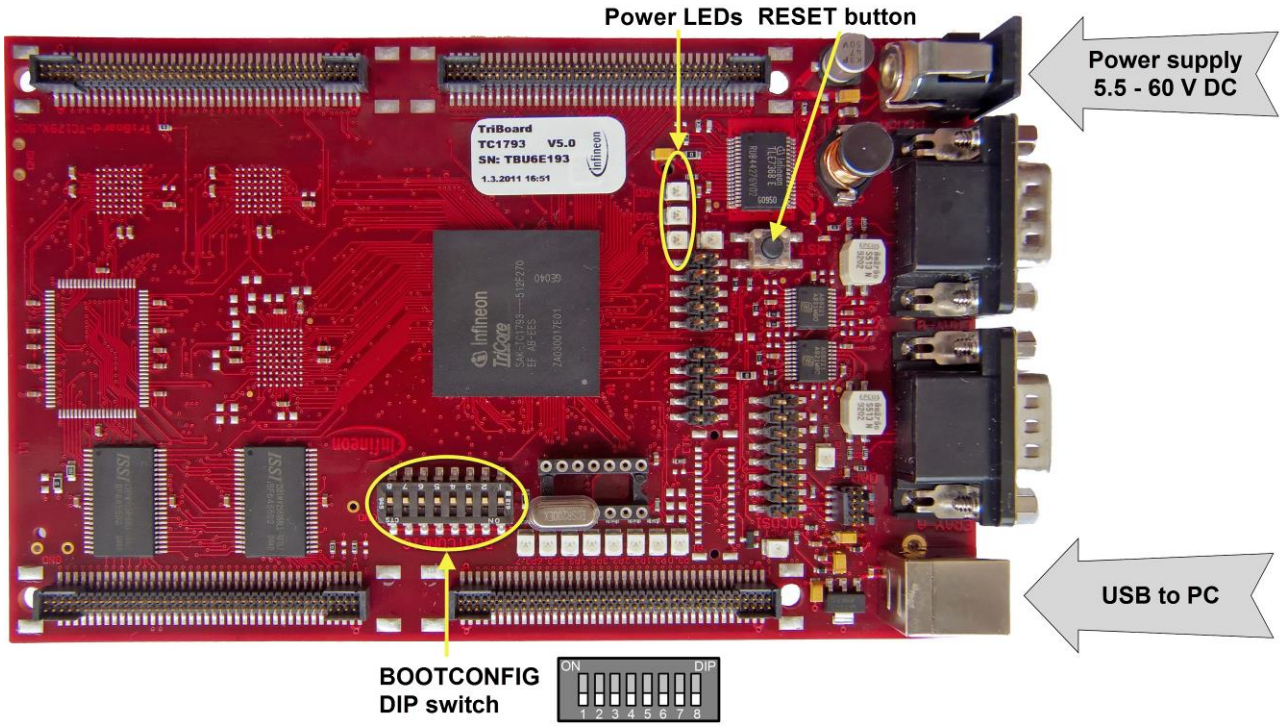


Figure 31 TC1793 - TriBoard

TriBoard with mounted TC1798 processor

1. Configure the DIP switches (default all OFF - boot from internal flash)
2. Connect a DC power supply (5.5V – 60V) to the TriBoard.
3. Connect the TriBoard to the PC via a USB cable
   (a cable is supplied with the Starter Kit).
4. Three Power Supply PS-LEDs should be on.
5. Press the **RESET button** (see picture below).

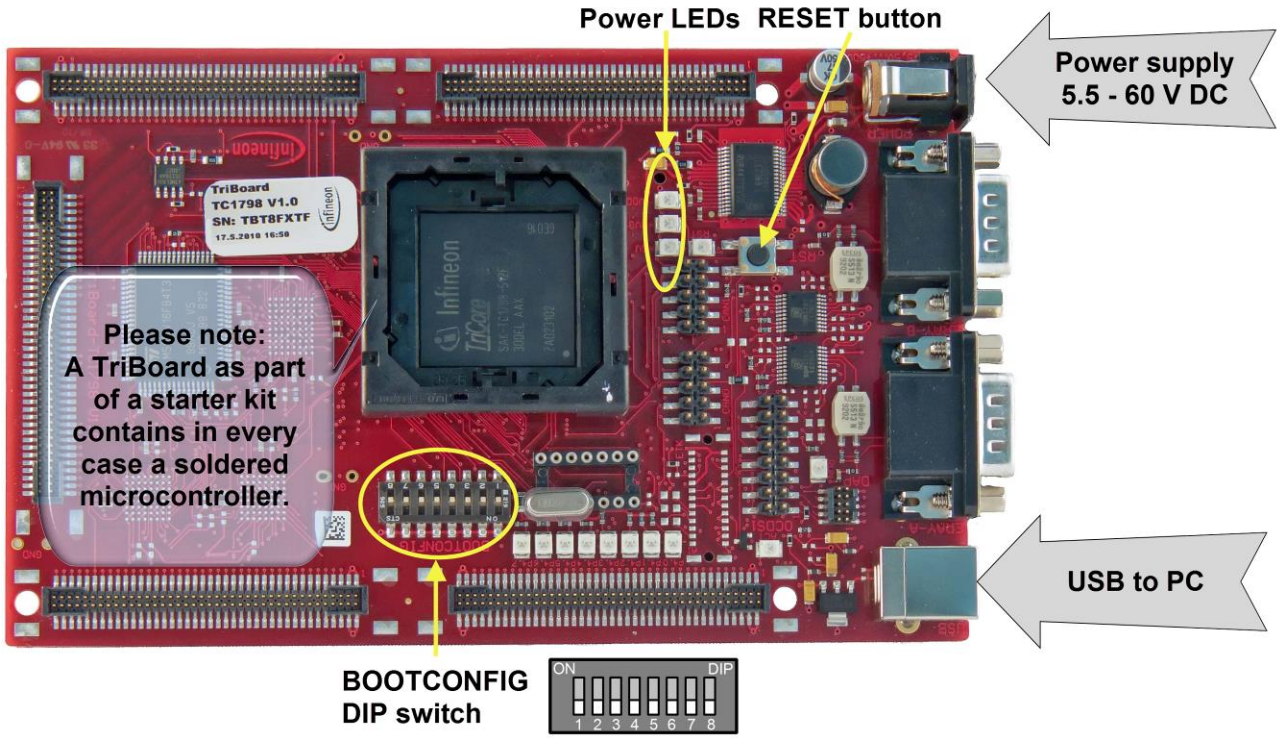


Figure 32 TC1798 - TriBoard

phyCORE-TC1793 with Baseboard

1. Connect a DC power supply (5.5V – 60V) to the baseboard
2. Connect the baseboard to the PC via a USB cable
   (a cable is supplied with the Starter Kit).
3. The Power Supply LED should be on.
4. Press the **RESET button** (see picture below).

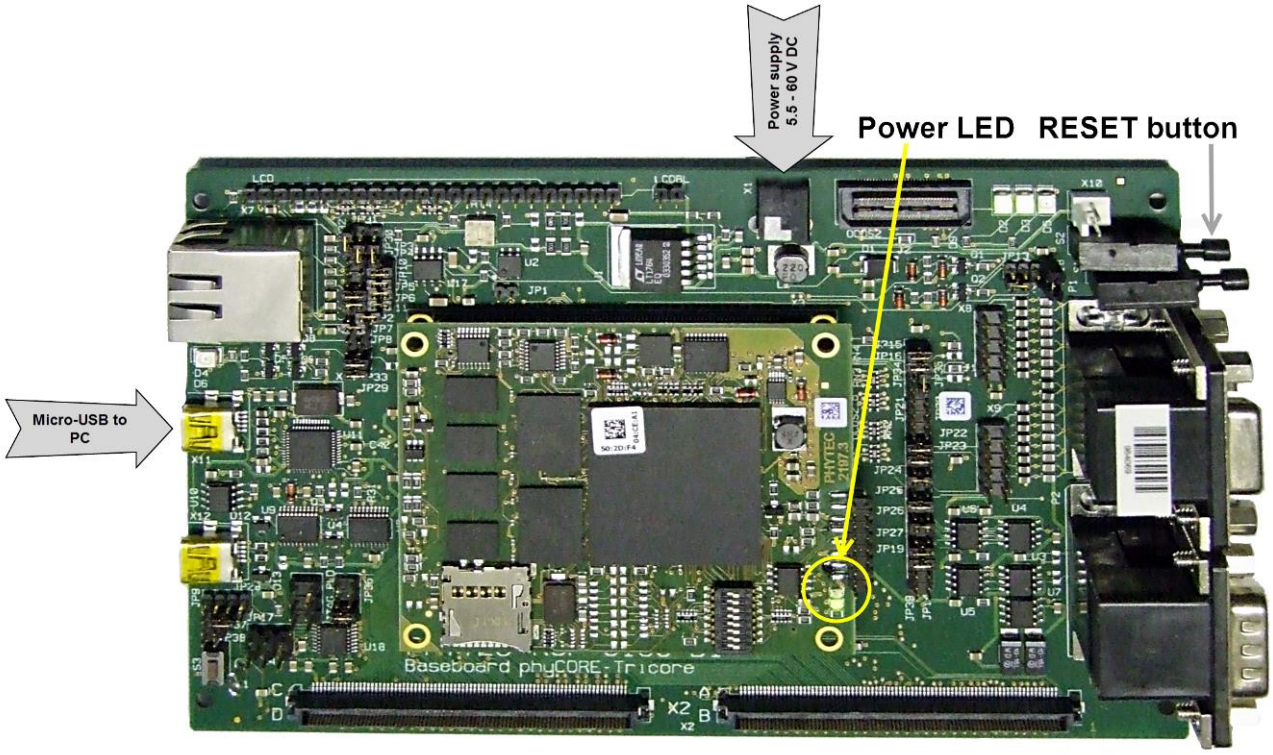


Figure 33 phyCORE - TC1793 with Baseboard

Debugging your Application

Start a Debug Session

1. Click at the debug button and select **Debug Configurations ...** (Figure 34).

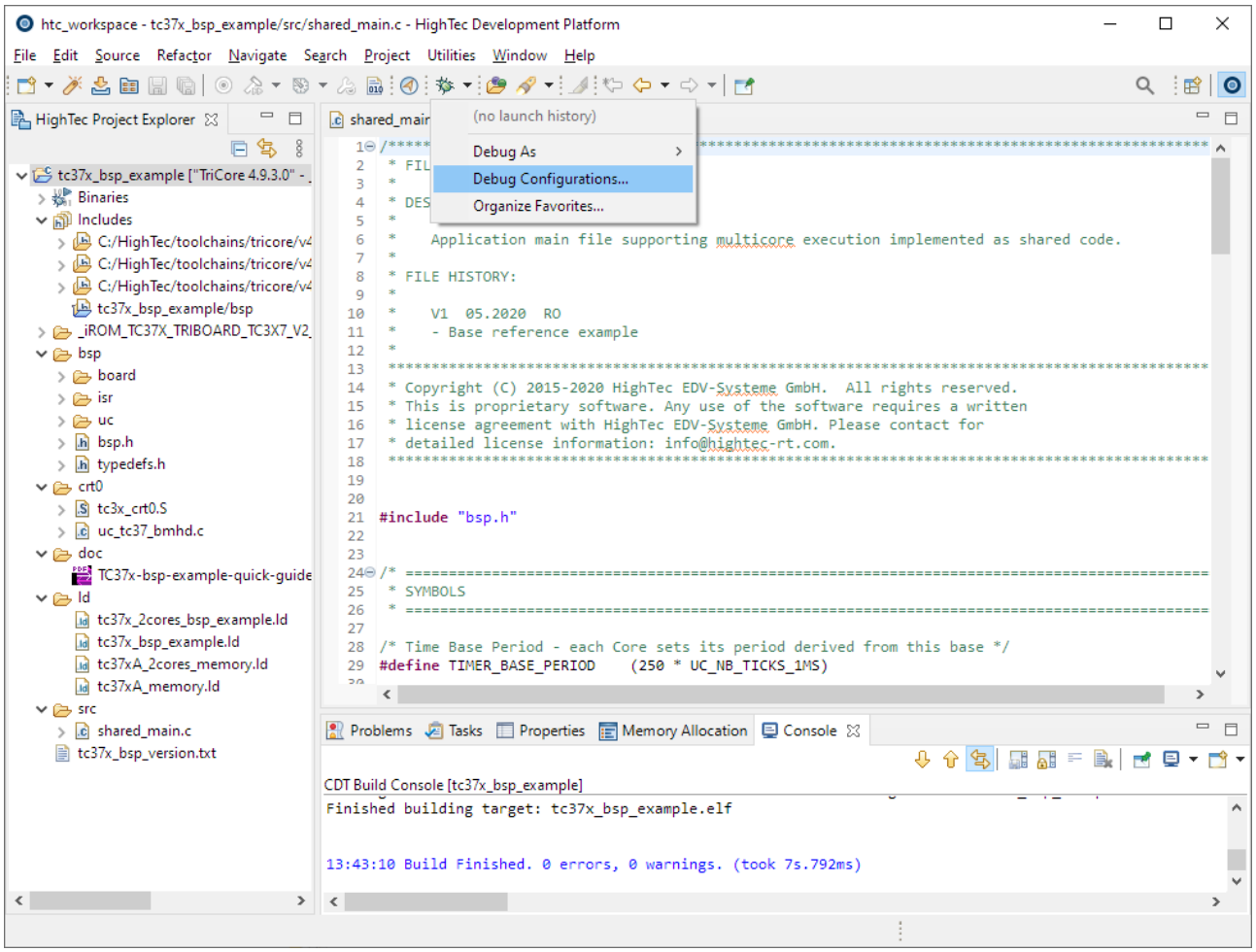


Figure 34 Select Debug Configurations dialog via Debug button

2. The **Debug Configurations** dialog appears. Select **Universal Debug Engine** as debug type (Figure 35).

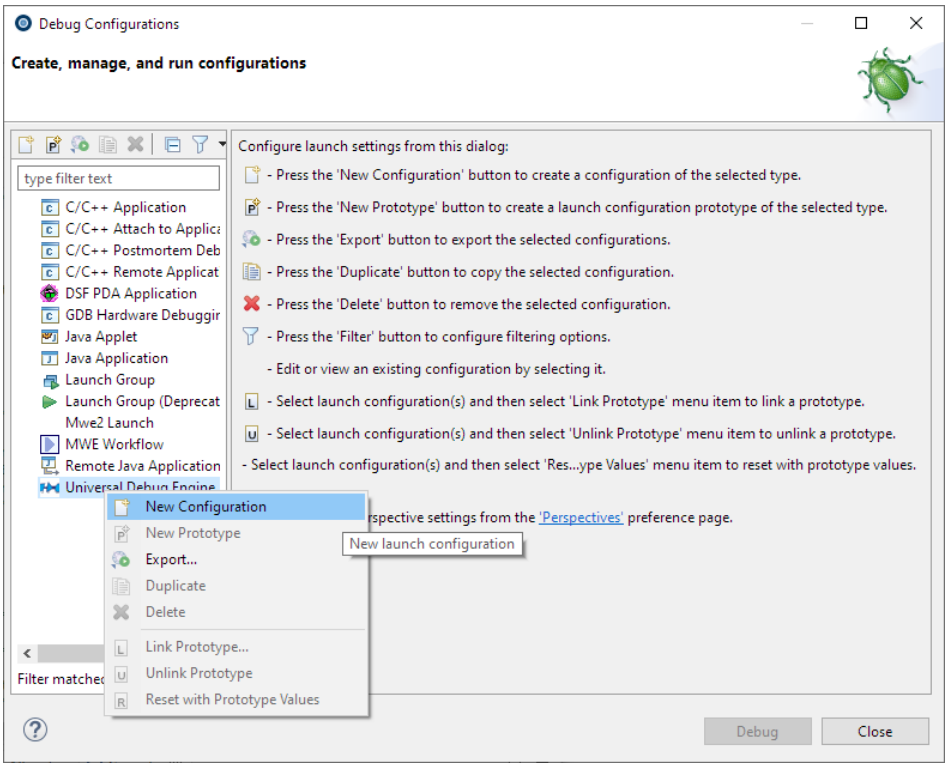


Figure 35 Debug Configurations dialog

3. Press the **New configuration** button to create a new debug launch configuration for Universal Debug Engine (Figure 36).

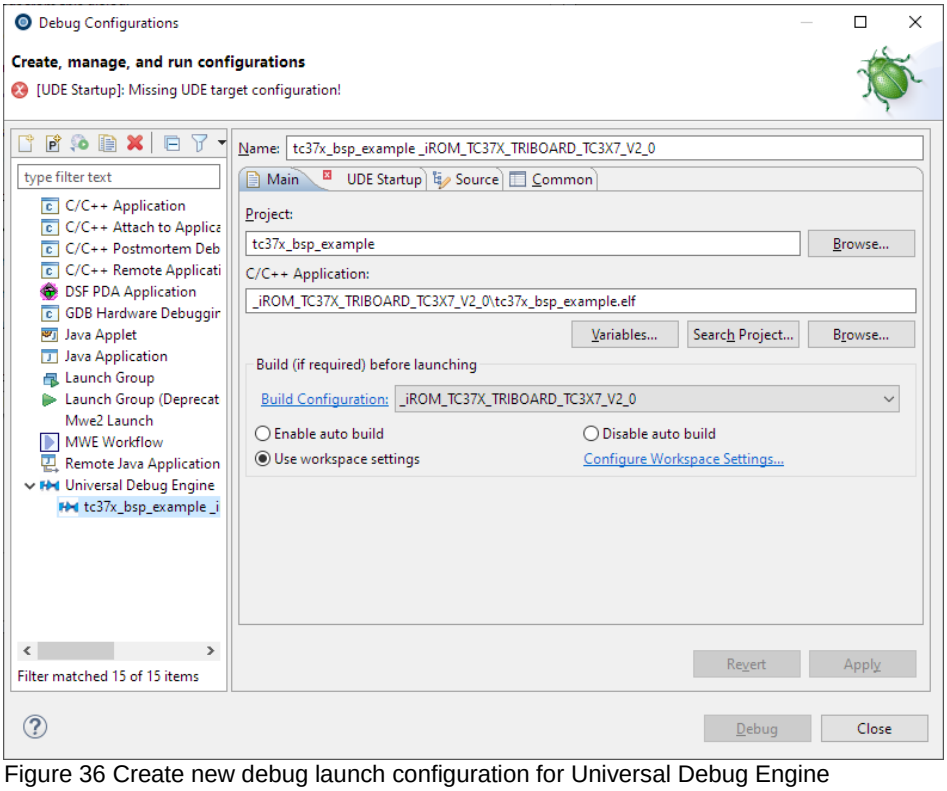


Figure 36 Create new debug launch configuration for Universal Debug Engine

4. A new debug configuration **tc37x_bsp_example_iRom** is created. All input fields are pre-filled with appropriate values (Figure 37).

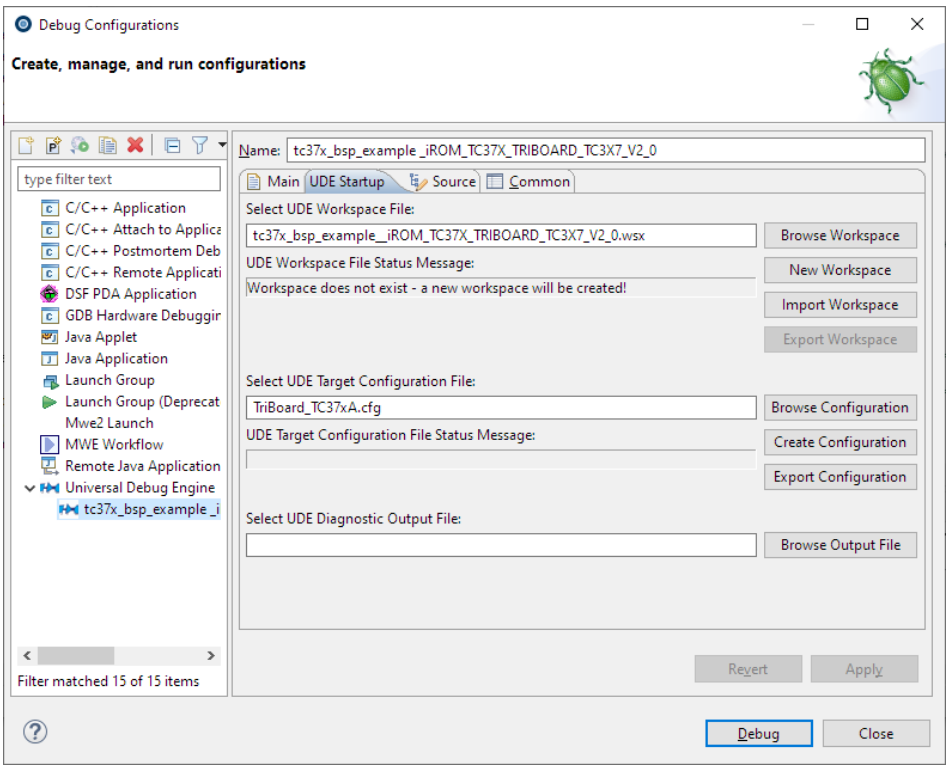


Figure 37 Create new debug launch configuration for Universal Debug Engine

5. Push **Debug** to start UDE perspective. Later you can use the Debug icon .
6. If you built an **iROM** version of your application, the **UDE Memory Programming Tool** will appear after launching the **UDE perspective** (Figure 38).

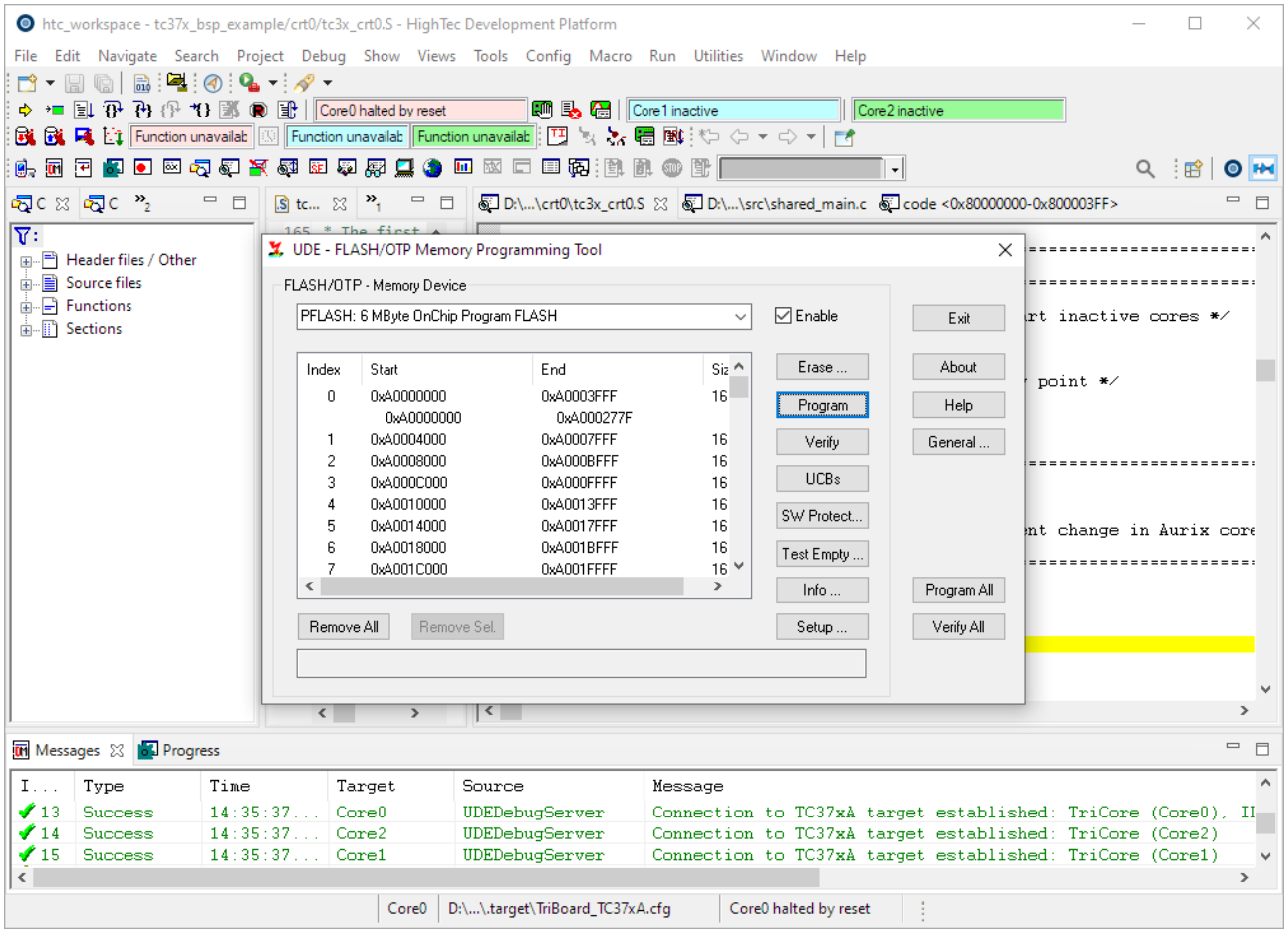


Figure 38 UDE Memory Programming Tool

7. Start flashing with the **Program** button. A progress dialog appears (Figure 39). After successful programming close both dialogs via **Exit**.

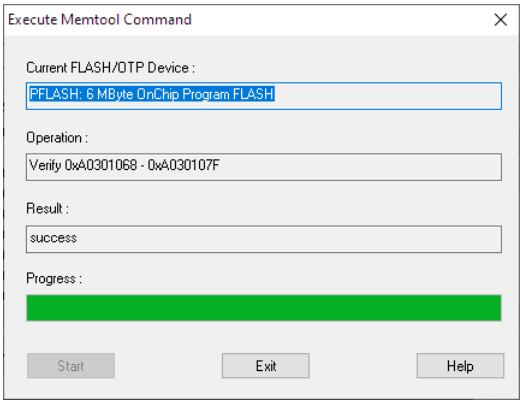


Figure 39 FLASH programming progress dialog

Note: If a **problem occurred** pop-up window appears, click **OK**, check the USB cable connection, reset the board with the reset button, and start again the Debug session.

8. From the **Debug** menu, select **Step over subroutine**, or click on the **Step over button** in the toolbar. At this moment your application is executing but stopped on the function `main()`. This means the C startup code has been executed completely. The Editor view shows the C source files of your application and a yellow arrow shows the line where the execution has stopped (Figure 40).

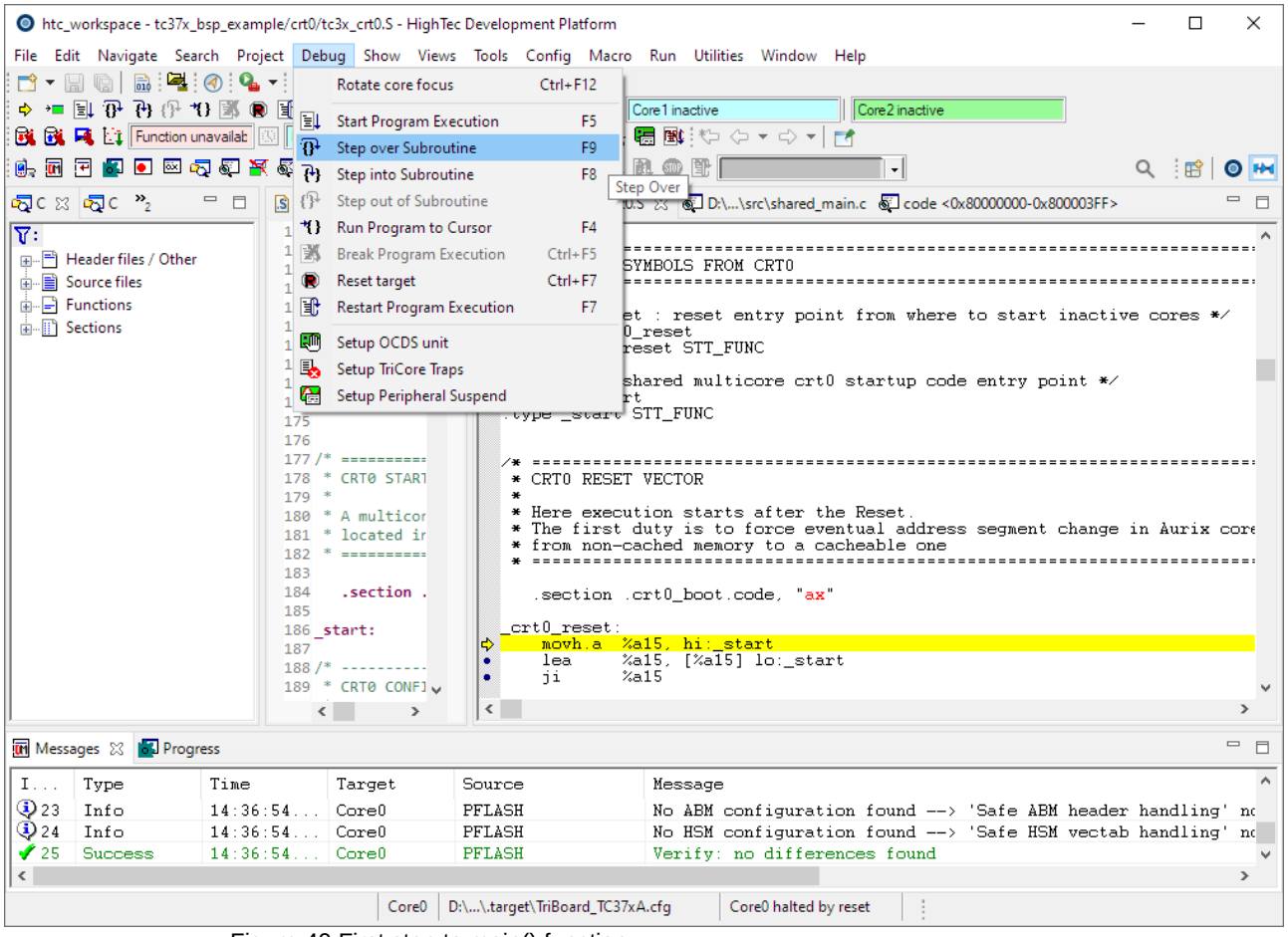


Figure 40 First step to main() function

Stepping through the Application

1. From the **Debug** menu select **Step over subroutine** or click on the **Step over** button  in the toolbar. The yellow arrow in the Program view moves to the next statement.
2. To set or clear breakpoints click on the markers in the info margin of program window.
3. To see watch or local variables please open the accordingly window via the **View** menu.
4. To run your application, select **Start Program Execution** from the **Debug** menu or click on the Start Program button  in the toolbar. **Now an analogue clock should be visible on the display of the application kit.**
5. To restart your application, select **Restart Program Execution** from the **Debug** menu, or press **F7** or click on the Restart button  in the toolbar.

Using the UDE debugger

The main() and further features of UDE are described in the UDE Manual, available via **UDE Welcome Page**. Open it via menu **Window - Show View - Other ... - Universal Debug Engine - UDE Welcome Page** and push the **UDE Manual** button.

Figure 41 shows an UDE example configuration with Peripheral Registers, Call stack, Watch window, and Memory window. All features are described in the **UDE Manual**.

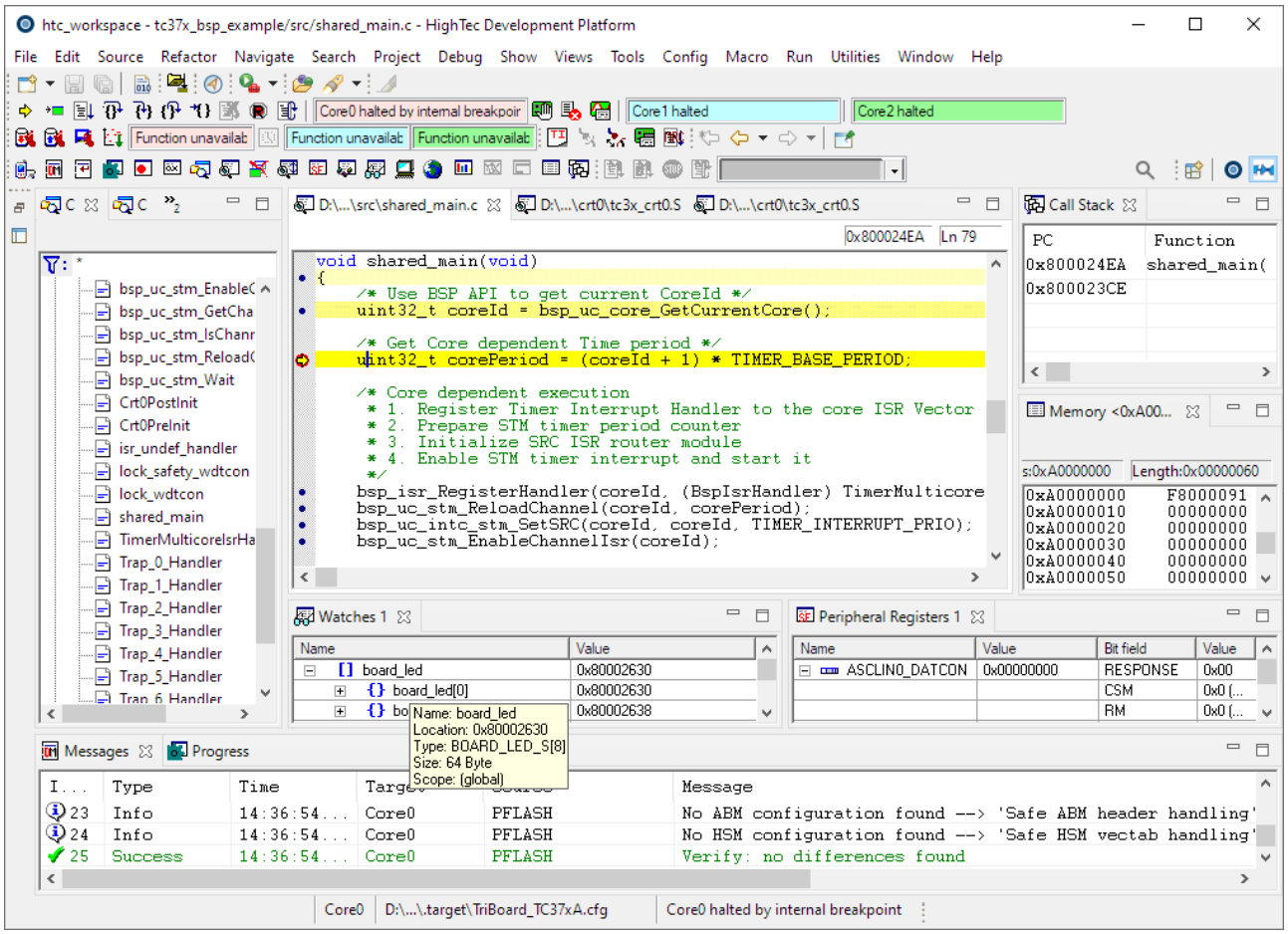


Figure 41 Universal Debug Engine perspective

End the Debug Session

From the **File** menu select **Close Workspace** or click on the Close Workspace  button in the toolbar. The current perspective is switched back to the HighTec C/C++ perspective.

Summary

Having followed the step-by-step instructions the development environment comprising AURIX TC3xx Free Entry Tool Chain and AURIX/TriCore Family Evaluation Board will have now been installed. After creating and compiling a simple program, it is successfully executed on the Evaluation Board.

You now have a running environment that could be used for further development or evaluation work.

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