

QCVS PinMuxing Tool User Guide



Contents

- Chapter 1 PinMuxing.....3**
- 1.1 Introduction..... 3
- 1.2 Preliminary background.....3
- 1.3 Working with PinMuxing tool..... 3
 - 1.3.1 Creating a project with PinMuxing component..... 4
 - 1.3.2 Using PinMuxing component..... 5
 - 1.3.2.1 Modules panel.....7
 - 1.3.2.2 Assigned Modules panel..... 7
 - 1.3.2.3 Eliminated Modules panel..... 8
 - 1.3.2.4 Toolbar buttons..... 8
 - 1.3.3 Adding a new PinMuxing component to a project..... 9
 - 1.3.4 Generating a PinMuxing report..... 10

Chapter 1

PinMuxing

This document describes the PinMuxing tool, which is a pin management tool for QorIQ-based system-on-chips (SoCs). This tool is part of the QorIQ Configuration and Validation Suite (QCVS) product.

This chapter contains the following sections:

- [Introduction](#) on page 3
- [Preliminary background](#) on page 3
- [Working with PinMuxing tool](#) on page 3

1.1 Introduction

The PinMuxing tool gives an overview of the SoC pins and their allocations to peripherals.

It is designed to help the board designers and low-level platform programmers to:

- Use the correct and optimal number of pins needed for a custom board design
- Program the platform (for example, reset configuration word (RCW)) in sync with the pins used in a board design

1.2 Preliminary background

This section explains the problem that led to the development of the PinMuxing tool.

A QorIQ SoC has a limited number of pins that can be used to implement various peripherals (for example, DUART, PCI Express, SDHC, and SATA). Each peripheral requires several signals (for example, DUART RX or DUART TX), each corresponding to a pin.

Usually (and especially in low-end SoCs), the number of pins is small as compared to the potential peripherals that could be implemented. In hardware, this limitation is translated into multiple peripheral signals being multiplexed (muxed) over the same pin. This muxing poses a series of problems for a board designer that needs to implement a set of peripherals within the SoC pin constraints.

In addition, the platform programming (such as, RCW) must be in sync with the pins being used by the peripheral signals. Therefore, the need arose for a tool that can manage all this without requiring to take a deep dive into several different documents.

1.3 Working with PinMuxing tool

The PinMuxing tool brings a user experience that is focused on what peripherals need to exist in a custom board design, hiding the underlying pin details.

At the same time, the user is prevented from making incorrect settings (for example, choosing peripherals that do not have enough free pins to be implemented). In addition, after each operation, the user gets the following information about the current pin allocations:

- All pins being used by an assigned peripheral
- Pins that can no longer be used (being used by some assigned peripherals)
- Pins that are being shared among multiple assigned peripherals

If required, the user can take a deep dive into the pin details to get the following information:

- Number of pins allocated for each assigned peripheral
- Pin properties (such as, package location, direction, and electrical properties)

This section contains the following subsections:

- [Creating a project with PinMuxing component](#) on page 4
- [Using PinMuxing component](#) on page 5
- [Adding a new PinMuxing component to a project](#) on page 9
- [Generating a PinMuxing report](#) on page 10

1.3.1 Creating a project with PinMuxing component

The PinMuxing tool is implemented as a component in QCVS; therefore, first you need to create a QCVS project with the PinMuxing component.

Follow the steps below to create a QCVS project with the PinMuxing component:

1. Launch QCVS.
2. Select **File > New > QorIQ Configuration Project**. The **New QorIQ Configuration Project** wizard starts, displaying the **Create a QorIQ Configuration Project** page.
3. Specify the project name in the **Project name** text box, as shown in the figure below.

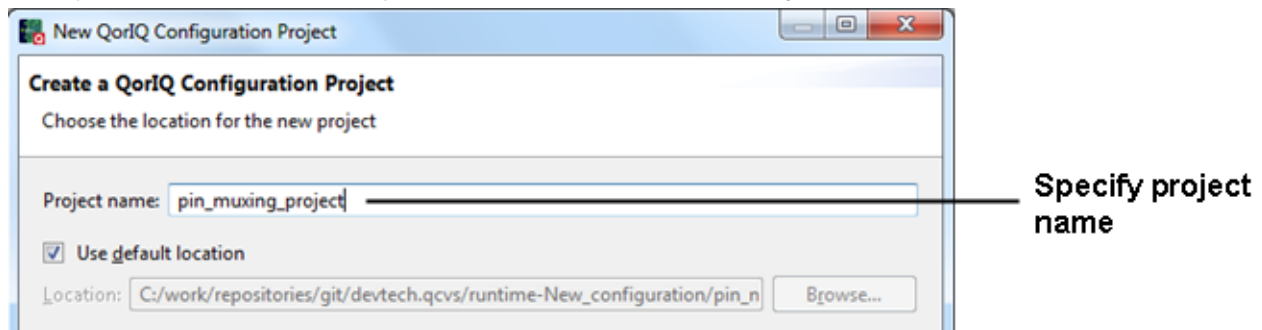


Figure 1. Specify project name

4. Click **Next**. The **Devices** page appears.
5. Choose a device (an SoC) to work with, as shown in the figure below.

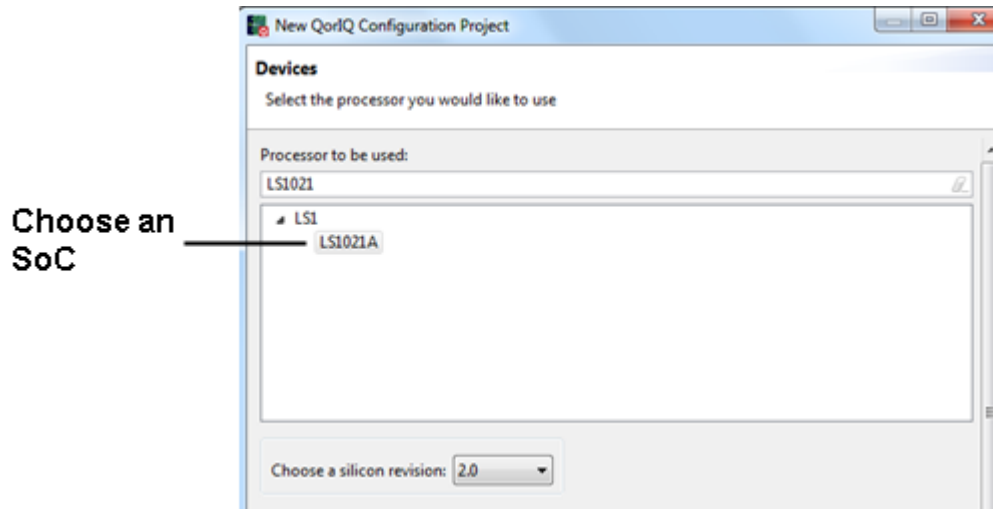


Figure 2. Choose a device

NOTE

See QCVS Release Notes for details on which QorIQ SoCs are supported by the PinMuxing tool.

6. Choose a device revision. If only one revision is available, it is automatically chosen.
7. Click **Next**. The **Toolset selection** page appears.
8. Select **Pin Muxing Configuration**, as shown in the figure below.

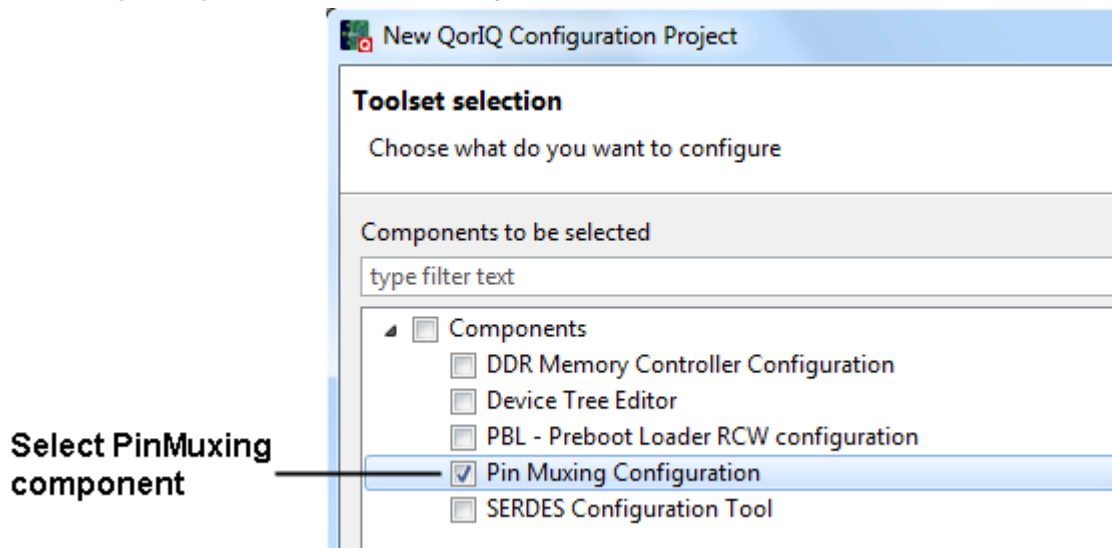


Figure 3. Select PinMuxing component

9. Click **Finish** to create the project.

1.3.2 Using PinMuxing component

After creating the project, you can use the PinMuxing component to perform pin management.

The PinMuxing component also stores the pin settings. Follow these steps to use the PinMuxing component:

1. Select in **Project Explorer** the QCVS project you just created.

- Expand the **Components** node in the **Components** view.
- Right-click the PinMuxing component and choose **Inspector** from the shortcut menu, as shown in the figure below.

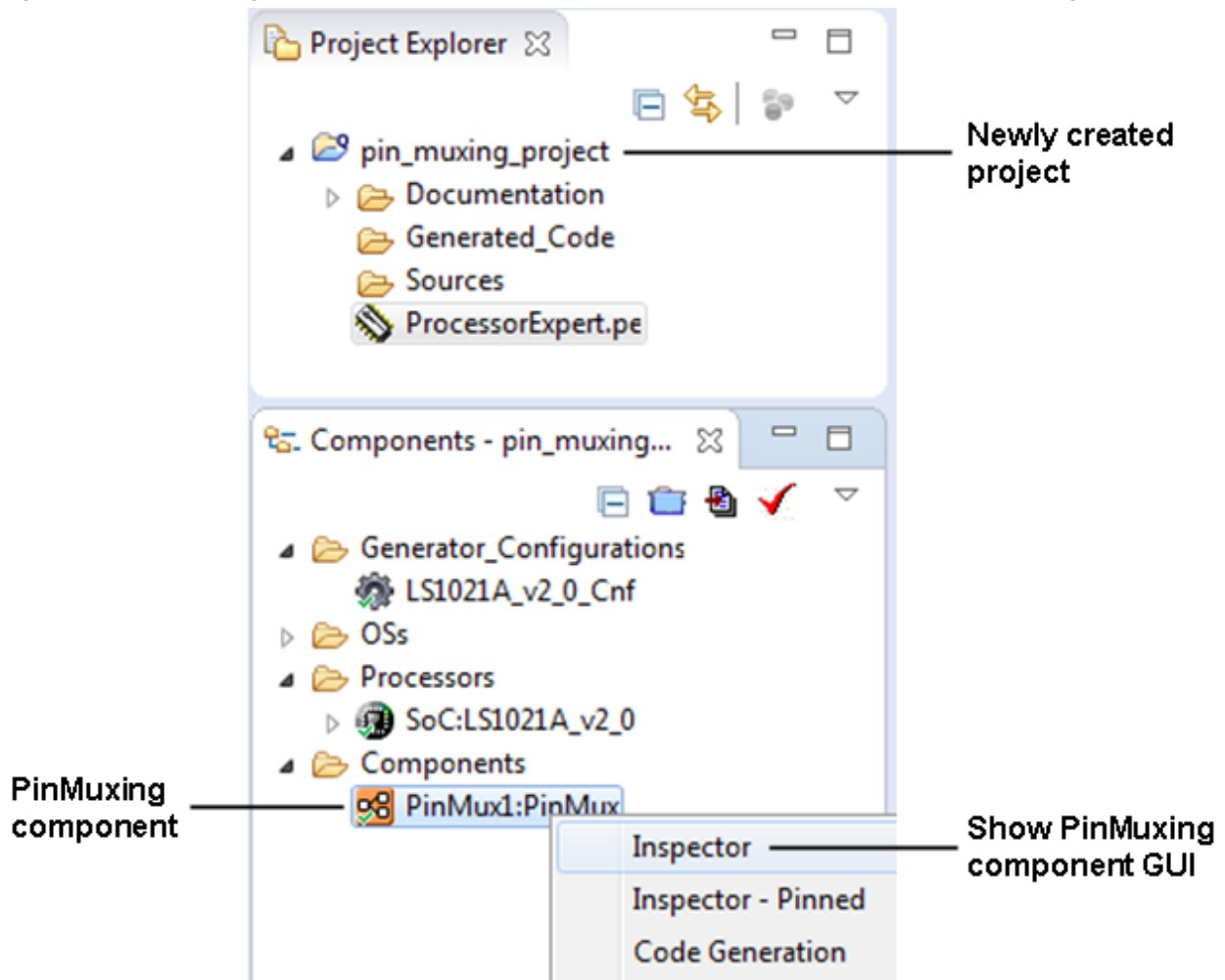


Figure 4. Open PinMuxing component

The **Component Inspector** view opens, showing the graphical user interface (GUI) of the PinMuxing component, as shown in the figure below.

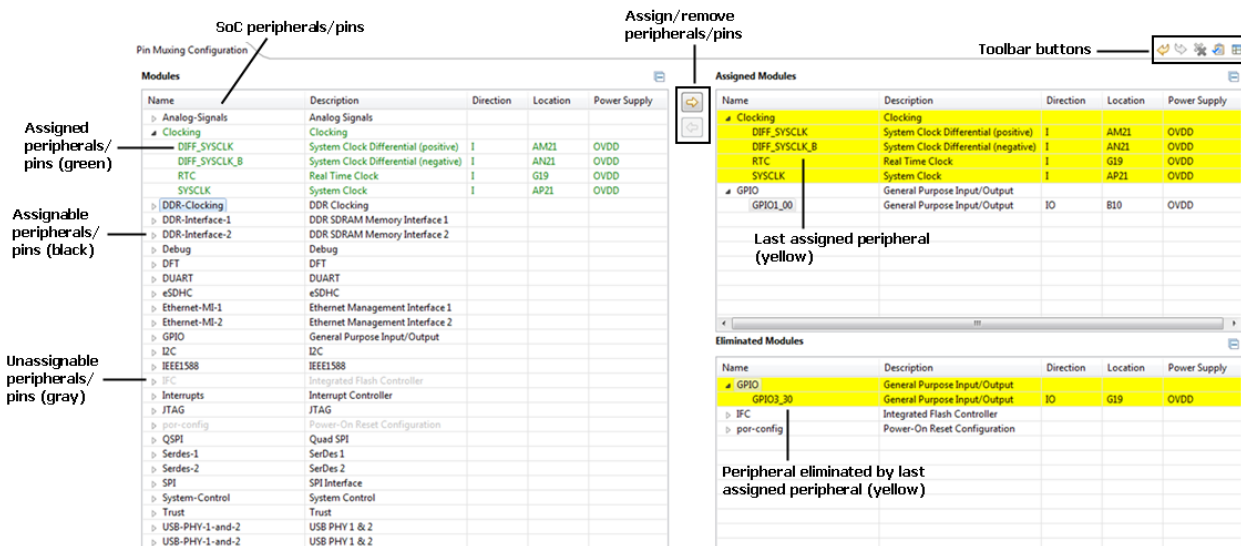


Figure 5. Parts of PinMuxing component GUI

The subsections below describe the major parts of the PinMuxing component GUI:

- [Modules panel](#) on page 7
- [Assigned Modules panel](#) on page 7
- [Eliminated Modules panel](#) on page 8
- [Toolbar buttons](#) on page 8

1.3.2.1 Modules panel

This panel provides a list of all the peripherals that use the pins of the chosen SoC.

Some of the peripherals may be using shared pins; whereas, others may have dedicated pins. Using the right and left arrow buttons (shown in [Figure 5. Parts of PinMuxing component GUI](#) on page 7), you can assign or remove peripherals from this list. You also have the option to add or remove pins by double-clicking their names. This seems to be more user friendly. The pins can be assigned as an entire module or as individual signals.

When you assign or unassign a peripheral (see the Assigned Modules panel), the color of the peripheral changes, as follows:

- **Black:** The peripheral can be assigned, it means, all the pins needed by the peripheral signals are available
- **Green:** The peripheral has been assigned and can be found in the Assigned Modules list (see the Assigned Modules panel)
- **Gray:** The peripheral cannot be assigned as some of the pins it requires are being used by other assigned peripherals. This is the point where PinMuxing actually comes into action: a pin can be used only once. The gray-colored peripherals can be found in the Eliminated Modules list (see the Eliminated Modules panel).

1.3.2.2 Assigned Modules panel

This panel provides a list of peripherals that have been assigned.

They correspond to the green-colored items in the Modules panel list. An assigned peripheral can be put back into the Modules panel list (it means, it can be removed) by using the left arrow button.

NOTE

The last assigned peripheral is colored in yellow. In addition, the peripherals eliminated (see Eliminate Modules panel) by the last assigned peripheral are also colored in yellow.

The figure below shows an overview of the Assigned Modules panel.

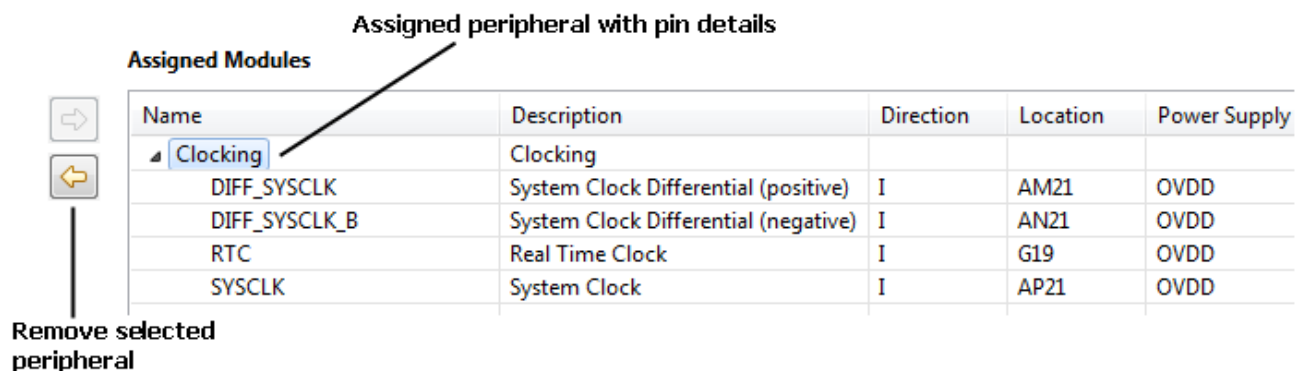


Figure 6. Assigned Modules panel

The PinMuxing tool not only allows you to assign/unassign peripherals, but also individual peripheral pins. To assign a pin of a peripheral, expand the peripheral node in the Modules panel and assign the pin similar to assigning a peripheral.

1.3.2.3 Eliminated Modules panel

This panel provides a list of peripherals that can no longer be assigned, as some of the pins they need to operate are being used by the assigned peripherals.

The eliminated peripherals correspond to the gray items in the Modules panel list. Place the mouse over an eliminated peripheral to find the assigned peripherals it conflicts with (it means, it needs pins that being used by assigned peripherals).

NOTE

The peripherals colored in yellow in the Eliminated Modules panel are the ones eliminated by the last assigned peripheral (see the Assigned Modules panel).

The figure below shows an overview of the Eliminated Modules panel.

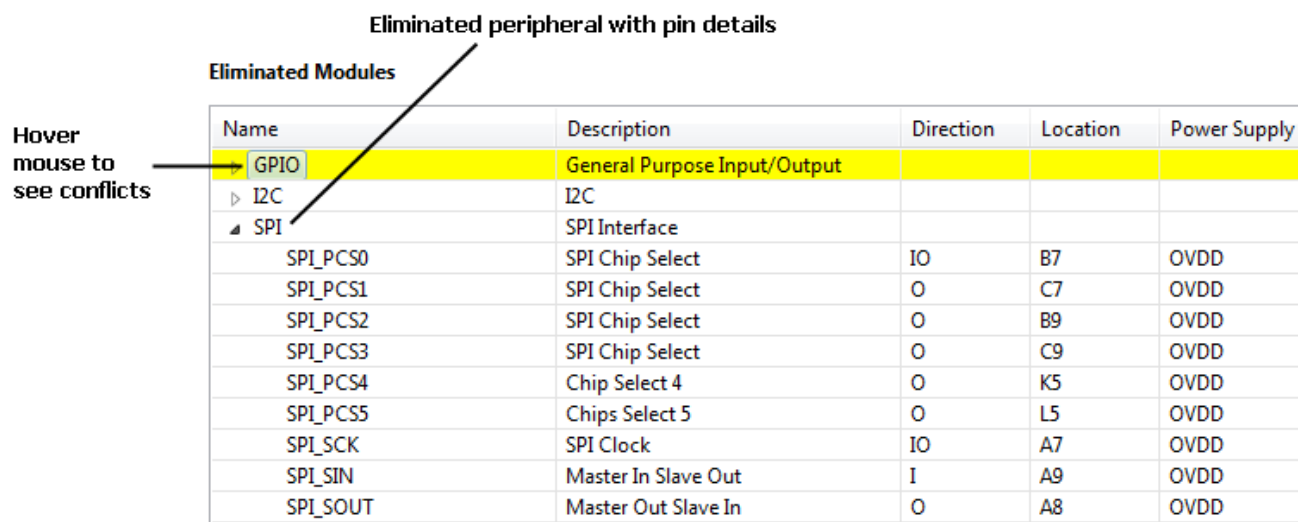


Figure 7. Eliminated Modules panel

1.3.2.4 Toolbar buttons

The PinMuxing component GUI has a toolbar that contains buttons for performing various actions on the GUI.

The actions include:

- Undo/redo the last operation
- Remove all the assigned peripherals. Clicking the button resets the peripherals to the selectable state.

NOTE

This action resets the undo/redo operations (it means, you will not be able to undo or redo the last operation).

- Generate a PinMuxing report. Clicking the button generates in XML format a report showing all the pins used by the assigned peripherals.
- Change the peripheral view mode. Clicking the button performs switching between short and extended peripheral names.

The figure below shows an overview of the toolbar buttons of the PinMuxing component GUI.

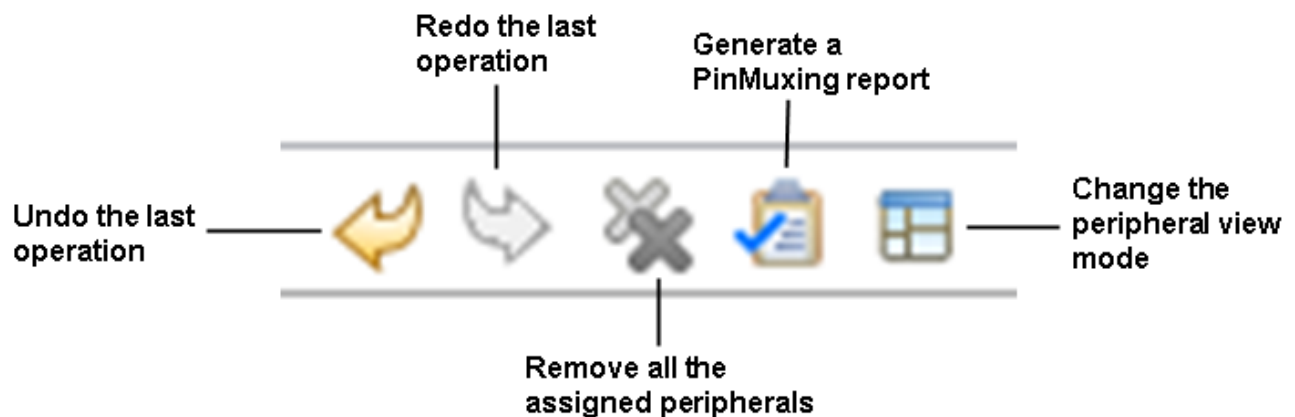


Figure 8. Toolbar buttons

NOTE

In each of the Modules, Assigned Modules, and Eliminated Modules panels, you can expand a peripheral node and see the details of each pin associated with the peripheral (such as pin name, description, direction, location, and power supply). The pin details displayed in these panels can be changed using the View Mode toolbar button (last button in the figure above).

1.3.3 Adding a new PinMuxing component to a project

This section explains how to add a new PinMuxing component to an existing QCVS project.

You can work in parallel with multiple PinMuxing components (note that only one PinMuxing component can be active at a time). To add a new PinMuxing component to an existing QCVS project, follow the steps below:

1. Open the **Components Library** view by choosing **Window > Show View > Components Library** from the Eclipse IDE menu bar.
2. Right-click the PinMuxing component and choose **Add to project** on the **Categories** or **Alphabetical** page, as shown in the figure below.

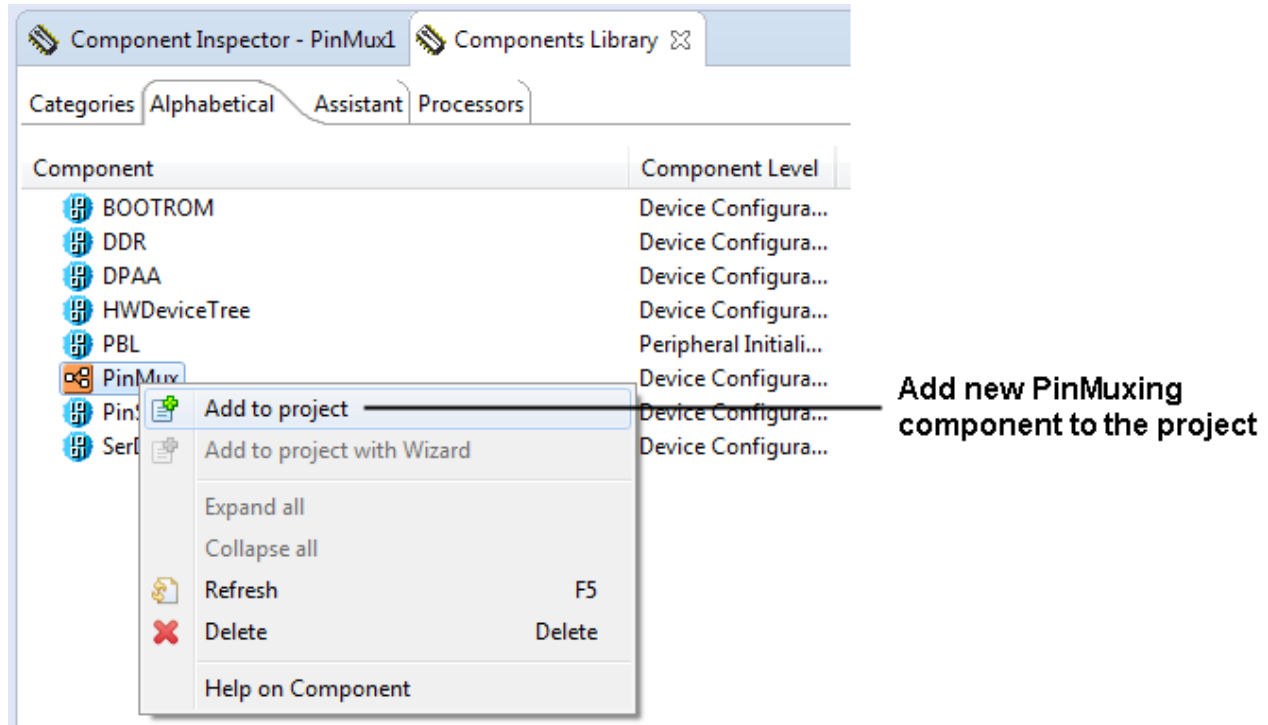


Figure 9. Add a PinMuxing component to an existing project

1.3.4 Generating a PinMuxing report

After you have assigned all the peripherals, you can generate a PinMuxing report.

To generate the PinMuxing report, click the second button from right in the PinMuxing component GUI toolbar. The generated PinMuxing report provides the following information:

- Assigned peripherals along with the associated pins and their properties (name, package location, direction)
- Eliminated peripherals along with the associated pins and their properties (name, package location, direction, power)

The PinMuxing report is generated in the following two formats:

- HTML: This format is more human readable
- XML: This format is useful for automatic processing

The figure below shows a sample PinMuxing report.

The screenshot shows the PinMuxing Configuration tool interface. On the left, a tree view lists available modules: Analog-Signals, Clocking, DDR-Interface-1, DFT, DUART, EC1, and EMI1. On the right, the 'Assigned Modules' list contains DFT, and the 'Eliminated Modules' list contains GPIO. Below the tool, a browser window displays the 'PinMux Report' with two tables.

Table 1: Assigned Modules

Module Name	Signal Details				
	Name	Description	Direction	Location	Power-supply
FTM2	FTM2_CH0	Channel 0	IO	58	O1VDD Open Drain
	FTM2_CH1	Channel 1	IO	63	O1VDD
	FTM2_CH2	Channel 2	IO	64	O1VDD
	FTM2_CH3	Channel 3	O	127	O1VDD
DFT	SCAN_MODE_B	Reserved	I	66	O1VDD

Table 2: Eliminated Modules

Module Name	Signal Details				
	Name	Description	Direction	Location	Power-supply
GPIO	GPIO_03	General Purpose Input/Output	IO	58	O1VDD

Figure 10. Sample PinMuxing report

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