MPLAB Harmony Touch Library Help

Touch Library Help

This document is a Help for Touch Library Solution on MCU devices.

Introduction

This topic describes brief overview of Touch library and the associated contents.

Description

MPLAB Harmony 3 is an extension of the MPLAB® ecosystem for creating embedded firmware solutions for Microchip 32-bit SAM and PIC microcontroller and microprocessor devices. It helps the user to select and configure software components for Microchip MCUs. The touch component includes a Touch Configurator to simplify the touch application development.

Touch Library

Touch Library is a royalty-free software library for developing touch applications on 32-bit microcontrollers with Peripheral Touch Controller peripheral. Developers can use it to integrate touch-sensing capability into their applications. The library supports both self-capacitance and mutual-capacitance acquisition methods.

Touch Configurator

Touch Configurator offers innovative, intuitive and a graphical configuration to help designing you touch application. The user can add sensors and configure QTouch parameters represented in graphical ways to create touch project.

Data Visualizer

Data Visualizer is a PC software that provides a visual representation of touch debug data. It allows the user to plot touch signals in real time to help tuning the touch sensors. The touch library parameters are also displayed in the data visualizer software when the hardware kit is connected through edbg/medbg vritual com port.

Related Documents

Refer to the following link for more information on how to create touch projects using the MPLAB Harmony 3.

https://microchipdeveloper.com/touch:set-up-the-environment

Refer to the following link for more details on how to open and execute touch example projects.

http://microchipdeveloper.com/touch:open-and-execute-touch-example-projects

Please refer the QTouch Modular Library Userguide available in the link below for further information.

https://www.microchip.com/mymicrochip/filehandler.aspx?ddocname=en590454

Needed Configurations for Proper Operation

This topic describes brief overview of Clock configuration and the associated contents.

Description

For Touch library to work properly, the user needs to manually configure clocks. The touch project performs touch measurement using the Peripheral Touch Controller (PTC). This touch project also uses the Timer and UART peripherals.

Timer

Used to provide periodic interrupt on which touch measurement is initiated (touch measurement periodicity).

UART

Used to send touch debug data to PC (Data Visualizer software) when debug data is enabled.

The PTC, Timer, and UART peripherals require clock. Depending on the device, these clocks can be the same or different from the CPU clock.

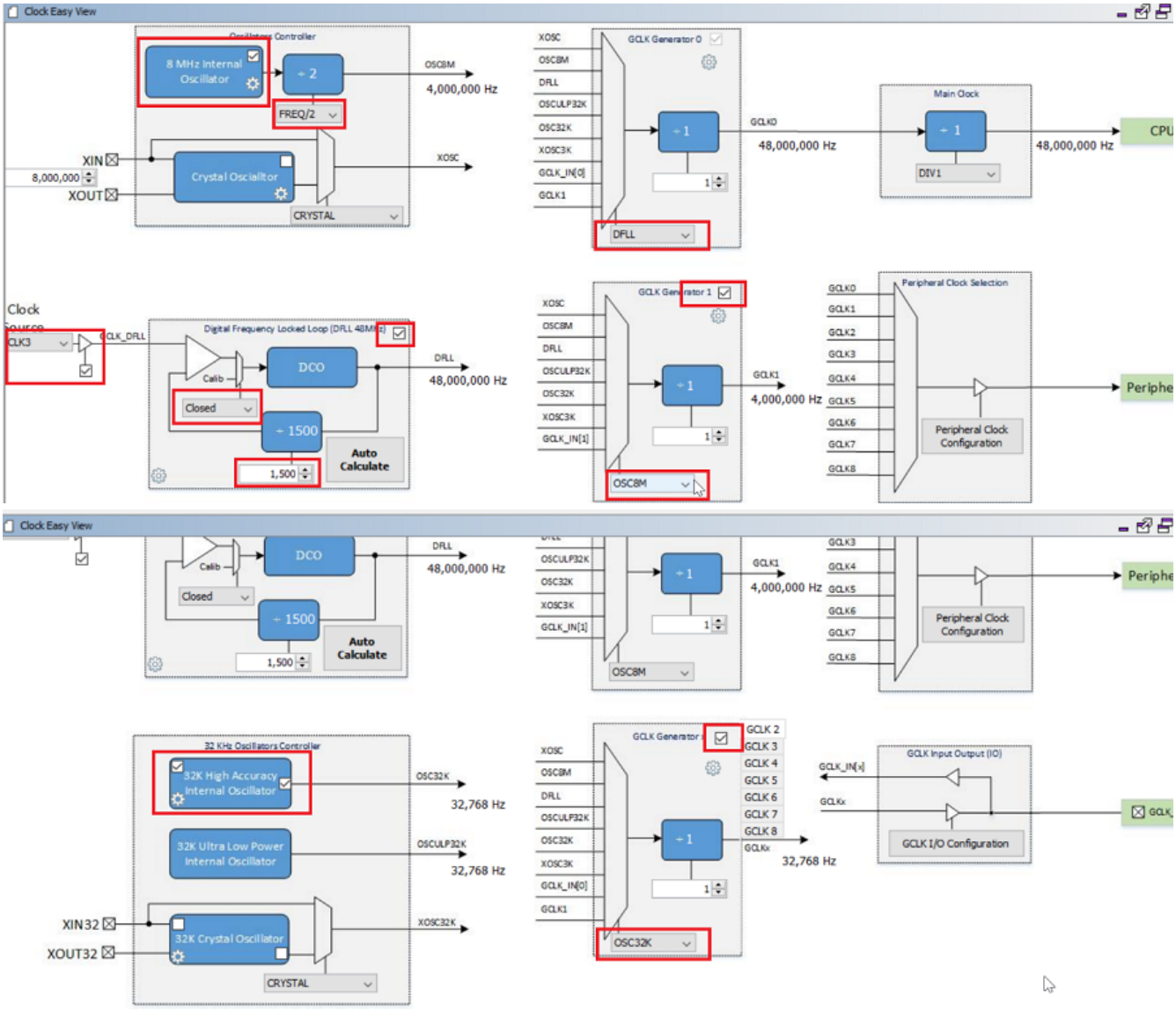
The recommended configurations for various set of devices is listed below.

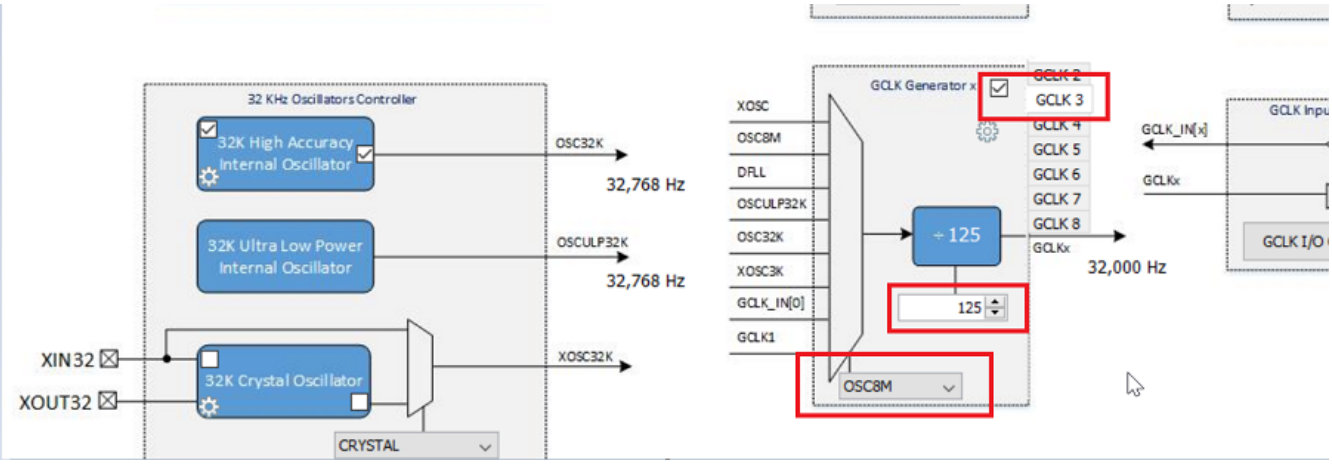
Clock_Configuration_SAMD20

This topic describes brief overview of SAMD20 Clock configuration and the associated contents.

Description

Clock Configuration for SAMD20 device:



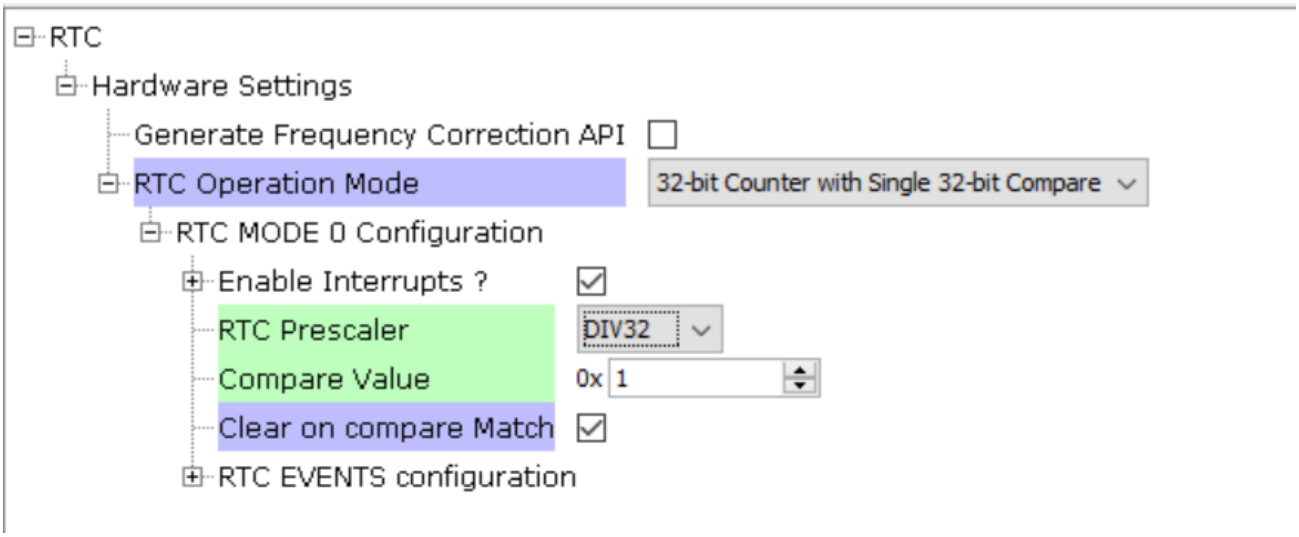


Peripheral Clock Configuration

Peripheral	Enable	Source	Peripheral Clock Frequency
PTC	☑	GCLK1	4,000,000 Hz
RTC	☑	GCLK2	32,768 Hz
SERCOM0_CORE	☐	GCLK0	--
SERCOM0_SLOW, SE...	☐	GCLK0	--
SERCOM1_CORE	☐	GCLK0	--
SERCOM2_CORE	☐	GCLK0	--
SERCOM3_CORE	☑	GCLK0	48,000,000 Hz
SERCOM4_CORE	☐	GCLK0	--
SERCOM5_CORE	☐	GCLK0	--
SYSCTRL_DFLL48	☑	GCLK3	32,768 Hz
SYSCTRL_FDPLL	☐	GCLK0	--
SYSCTRL_FDPLL32K	☐	GCLK0	--

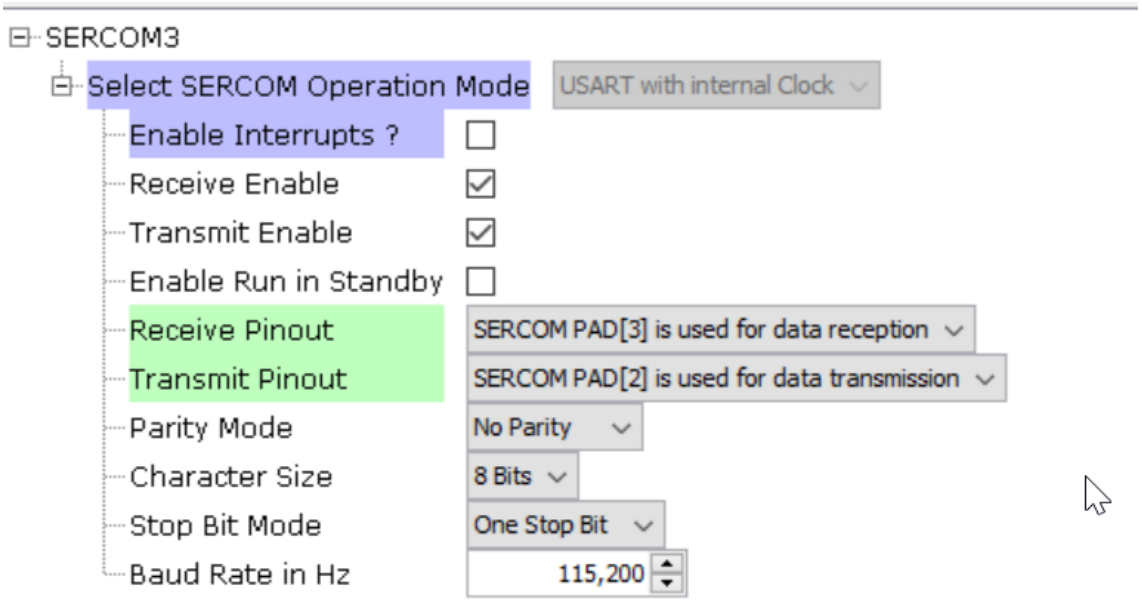
Close

RTC Configuration:

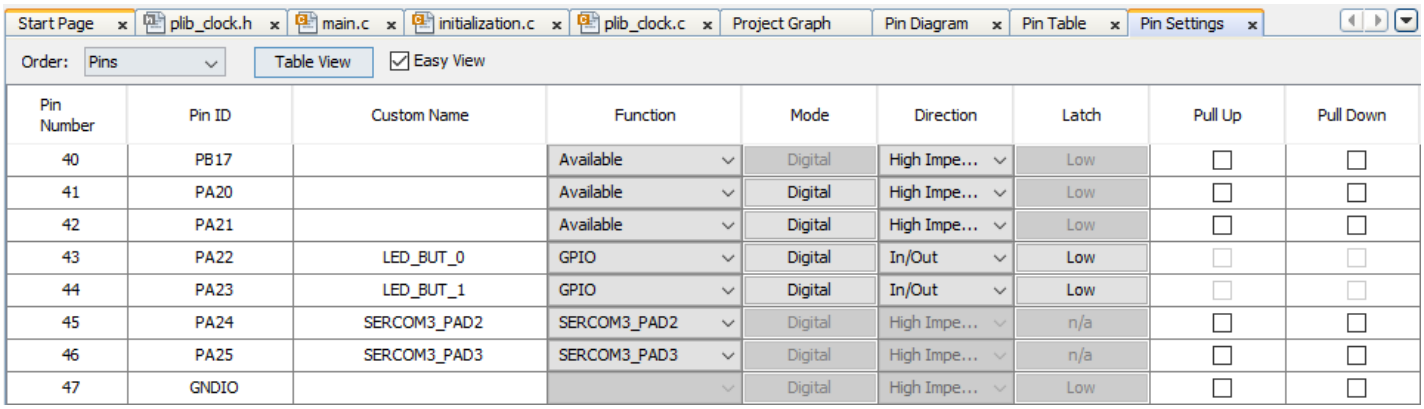


SERCOM Configuration:

Note: This configuration is for the Xplained Pro boards. You can choose the SERCOM as per the board design. Refer to Xplained Pro's user guide to know which SERCOM to use.



Pin Configuration:

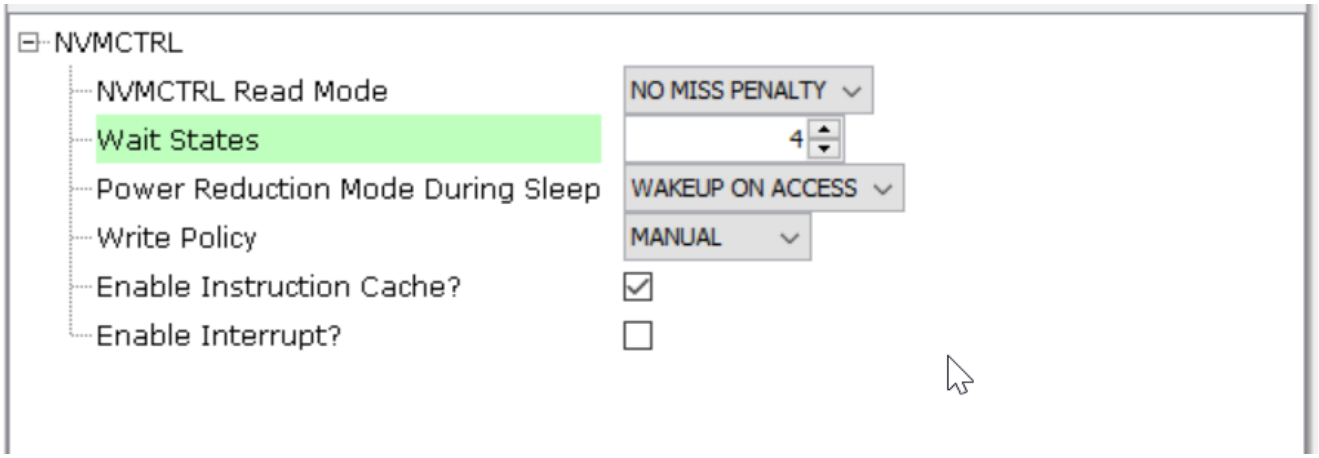


Pin Number	Pin ID	Custom Name	Function	Mode	Direction	Latch	Pull Up	Pull Down
40	PB17		Available	Digital	High Impe...	Low	☐	☐
41	PA20		Available	Digital	High Impe...	Low	☐	☐
42	PA21		Available	Digital	High Impe...	Low	☐	☐
43	PA22	LED_BUT_0	GPIO	Digital	In/Out	Low	☐	☐
44	PA23	LED_BUT_1	GPIO	Digital	In/Out	Low	☐	☐
45	PA24	SERCOM3_PAD2	SERCOM3_PAD2	Digital	High Impe...	n/a	☐	☐
46	PA25	SERCOM3_PAD3	SERCOM3_PAD3	Digital	High Impe...	n/a	☐	☐
47	GNDIO			Digital	High Impe...	Low	☐	☐

Manually configuring Wait States

The flash waits states needs to be configured based on the CPU clock frequency. This information is available in “NVM Characteristics” section of device data sheet. By default, the number of wait states is set to 0. To adjust the number of flash wait states, the following code should be altered manually within the Clock initialization routine.

Reference : Register description section 20.8.2 http://ww1.microchip.com/downloads/en/DeviceDoc/60001504B.pdf

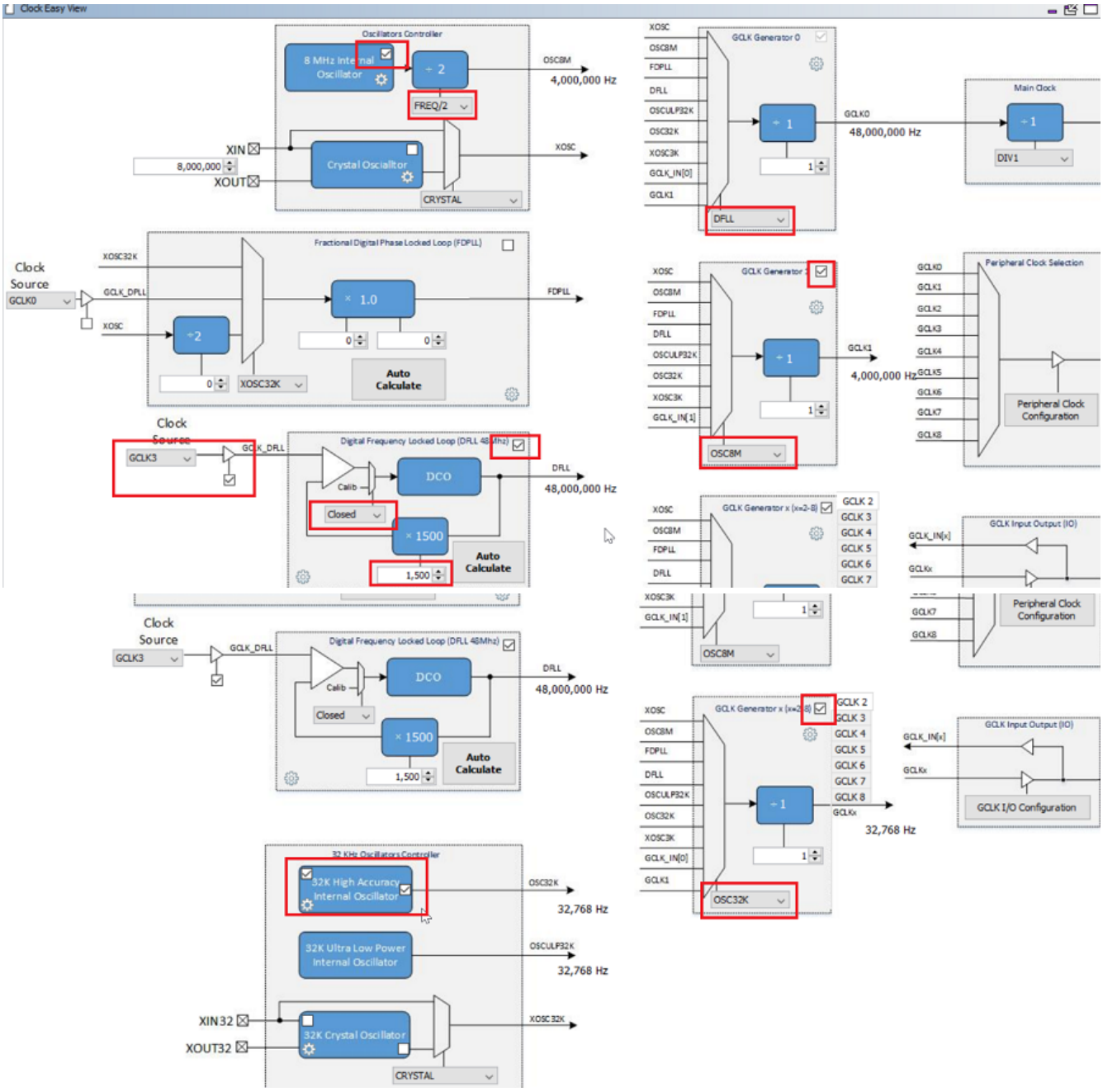


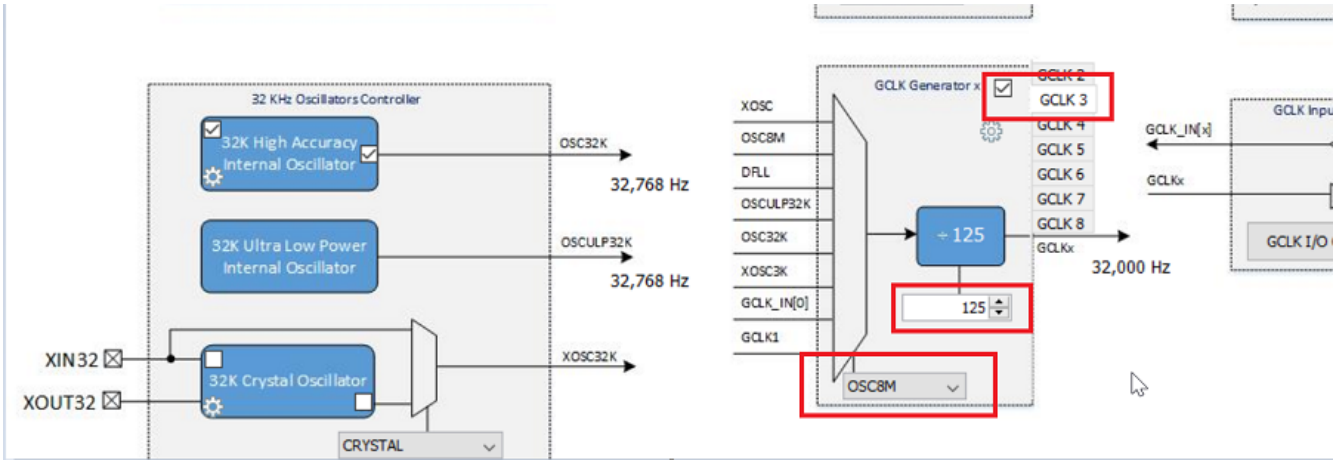
Clock_Configuration_SAMD21

This topic describes brief overview of SAMD21 Clock configuration and the associated contents.

Description

Clock Configuration for SAMD21 device:



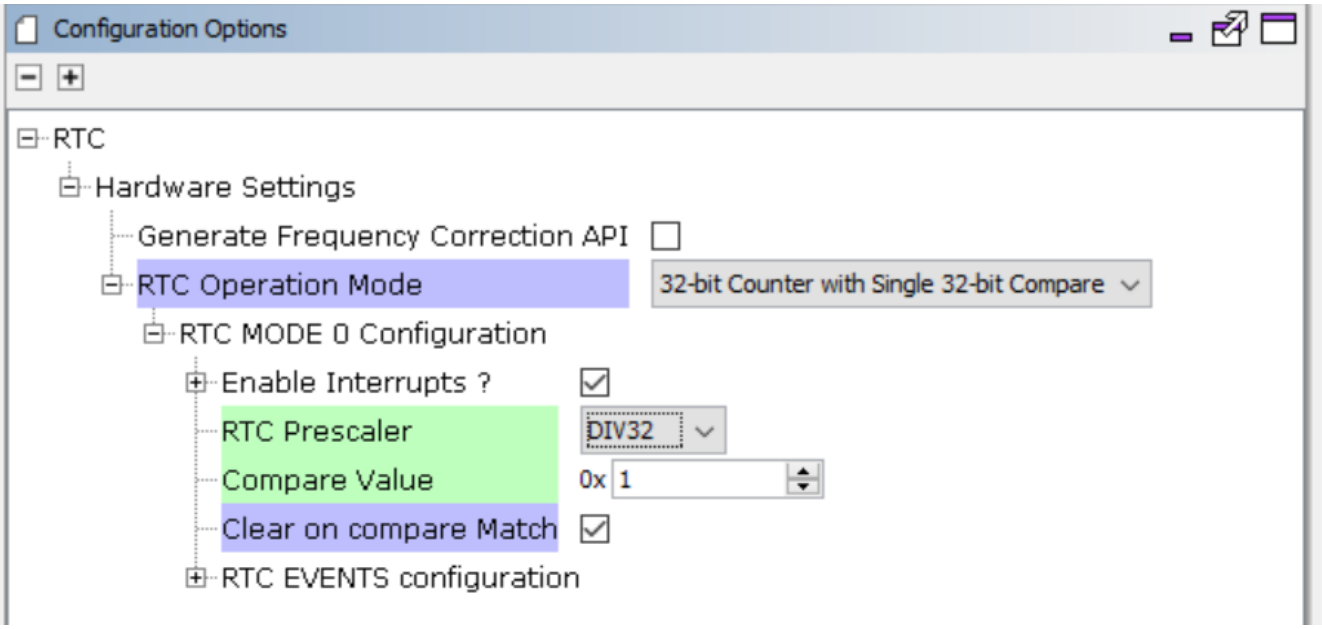


Peripheral Clock Configuration

Peripheral	Enable	Source	Peripheral Clock Frequency
I2S_1	☐	GCLK0	--
PTC	☑	GCLK1	4,000,000 Hz
RTC	☑	GCLK2	32,768 Hz
SERCOM0_CORE	☐	GCLK0	--
SERCOM0_SLOW, SE...	☐	GCLK0	--
SERCOM1_CORE	☐	GCLK0	--
SERCOM2_CORE	☐	GCLK0	--
SERCOM3_CORE	☑	GCLK0	48,000,000 Hz
SERCOM4_CORE	☐	GCLK0	--
SERCOM5_CORE	☐	GCLK0	--
SYSCTRL_DFLL48	☑	GCLK3	32,000 Hz
SYSCTRL_FDPLL	☐	GCLK0	--

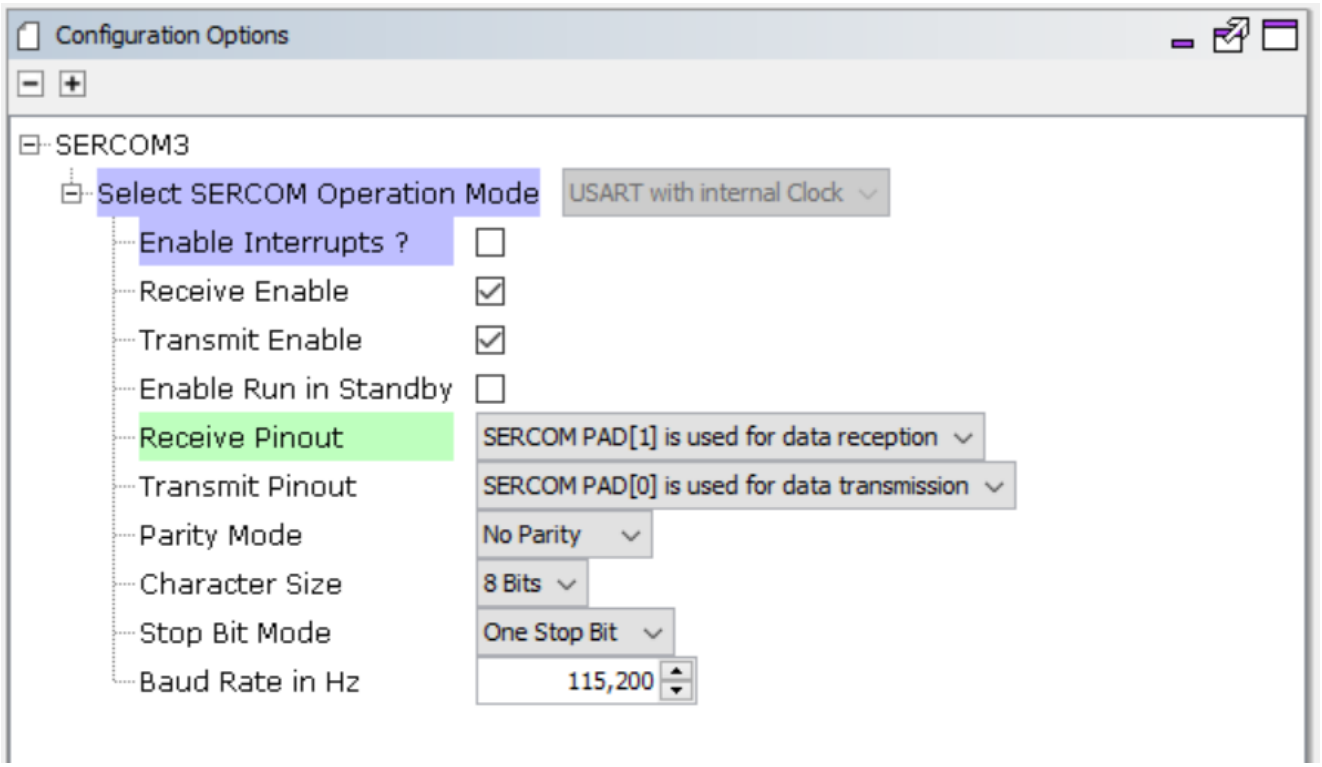
Close

RTC Configuration:

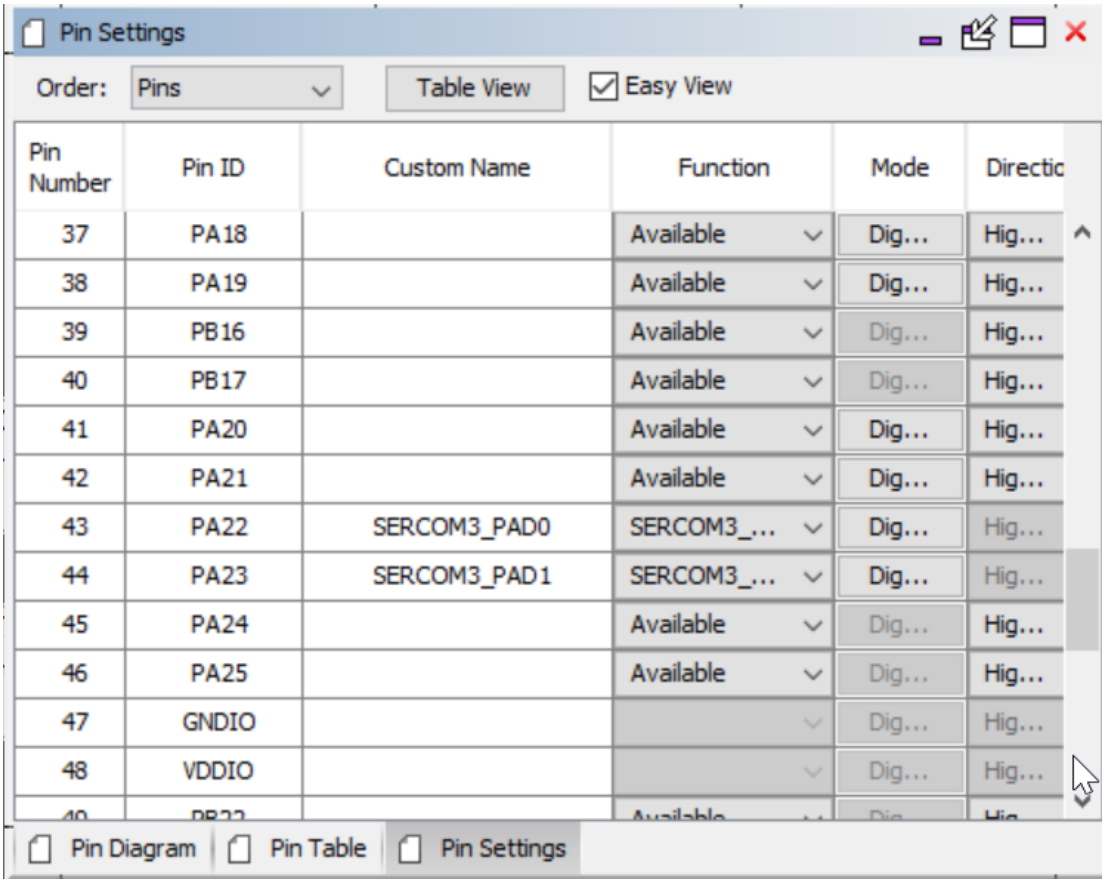


SERCOM Configuration:

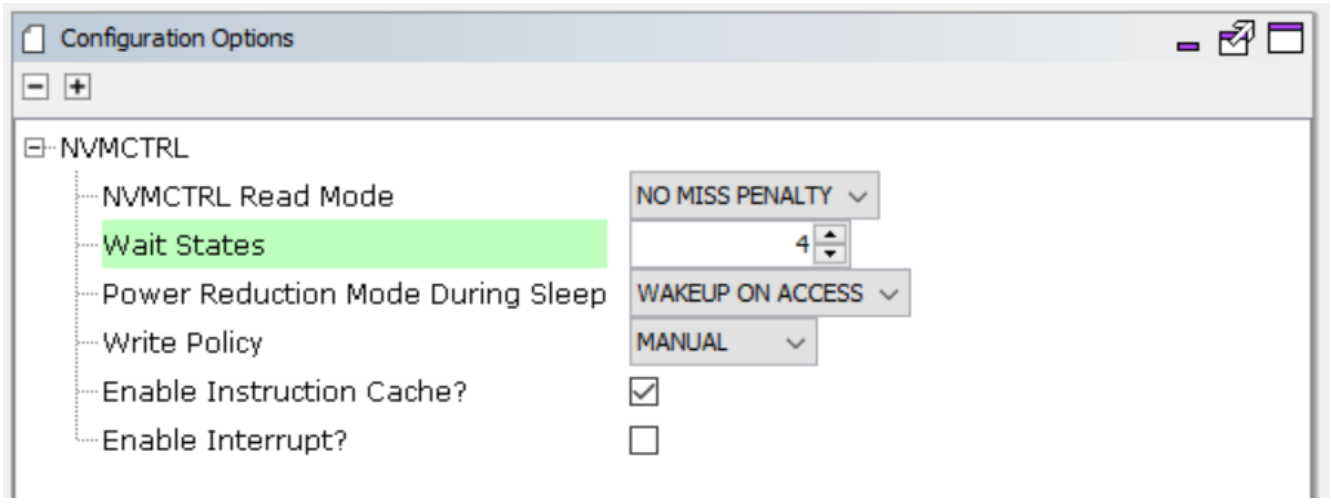
Note: This configuration is for the Xplained Pro boards. You can choose the SERCOM as per the board design.



Pin configuration:



NVMCTRL Configuration:

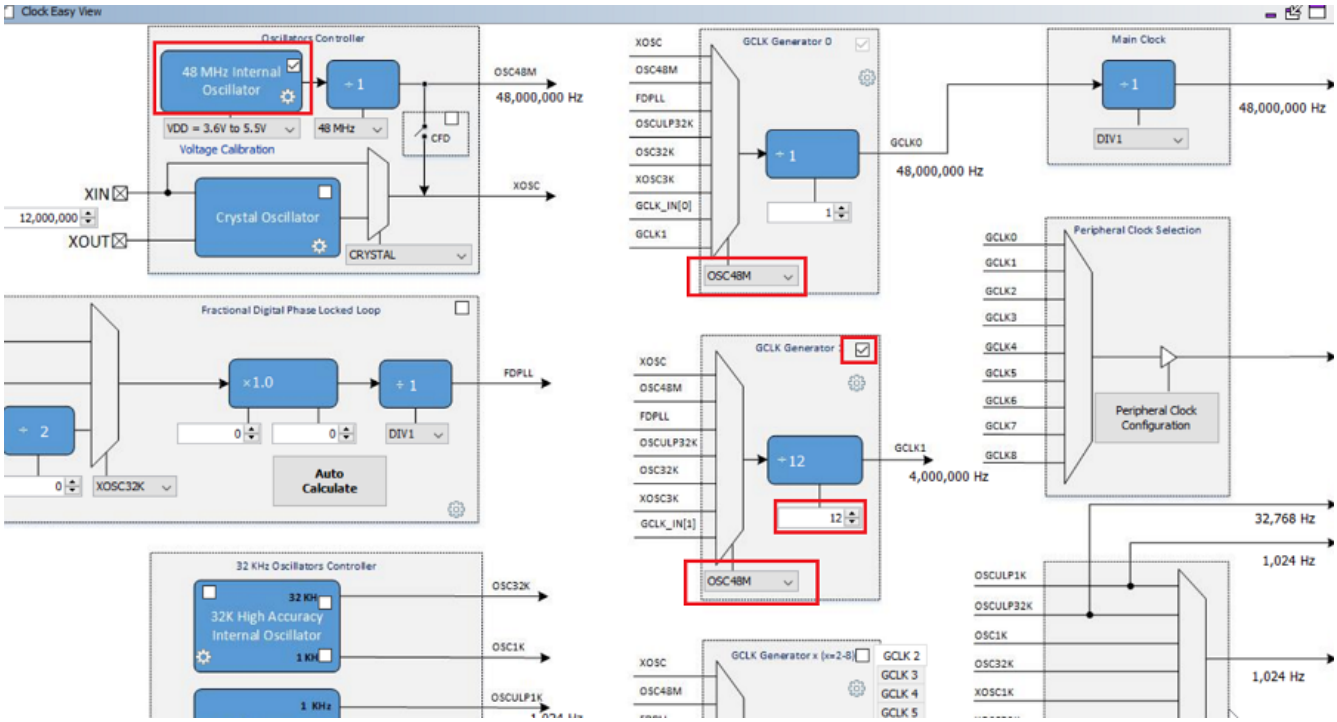


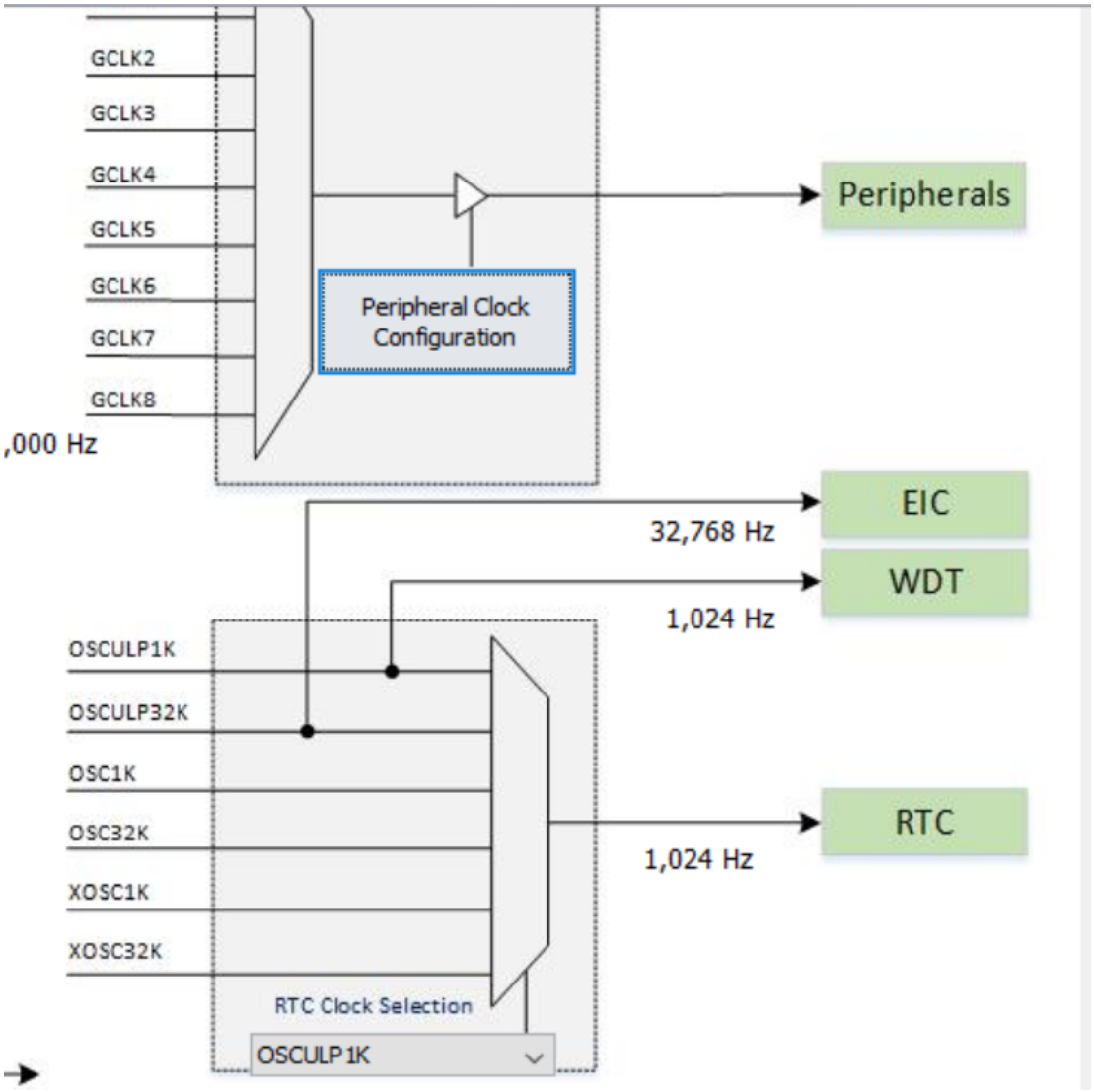
Clock_Configuration_SAMC20_SAMC21

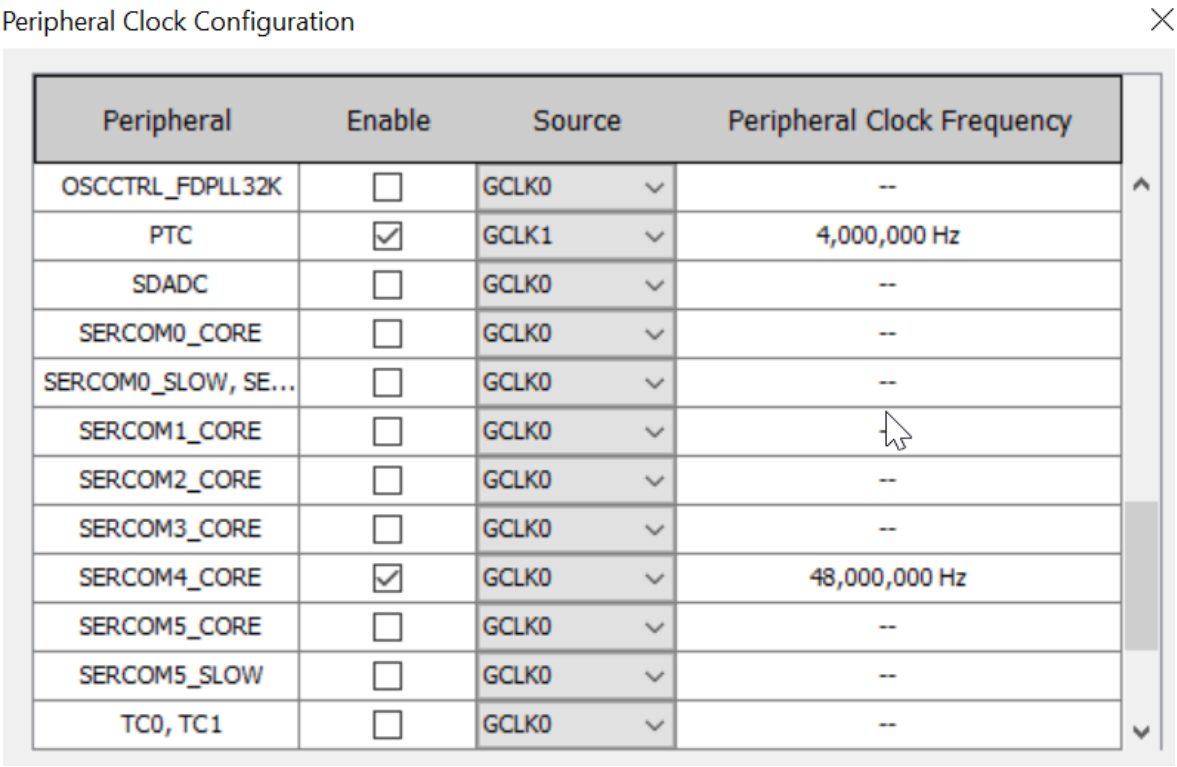
This topic describes brief overview of SAMC20, SAMC21 Clock configuration and the associated contents.

Description

Clock Configuration for SAMC20, SAMC21 device:

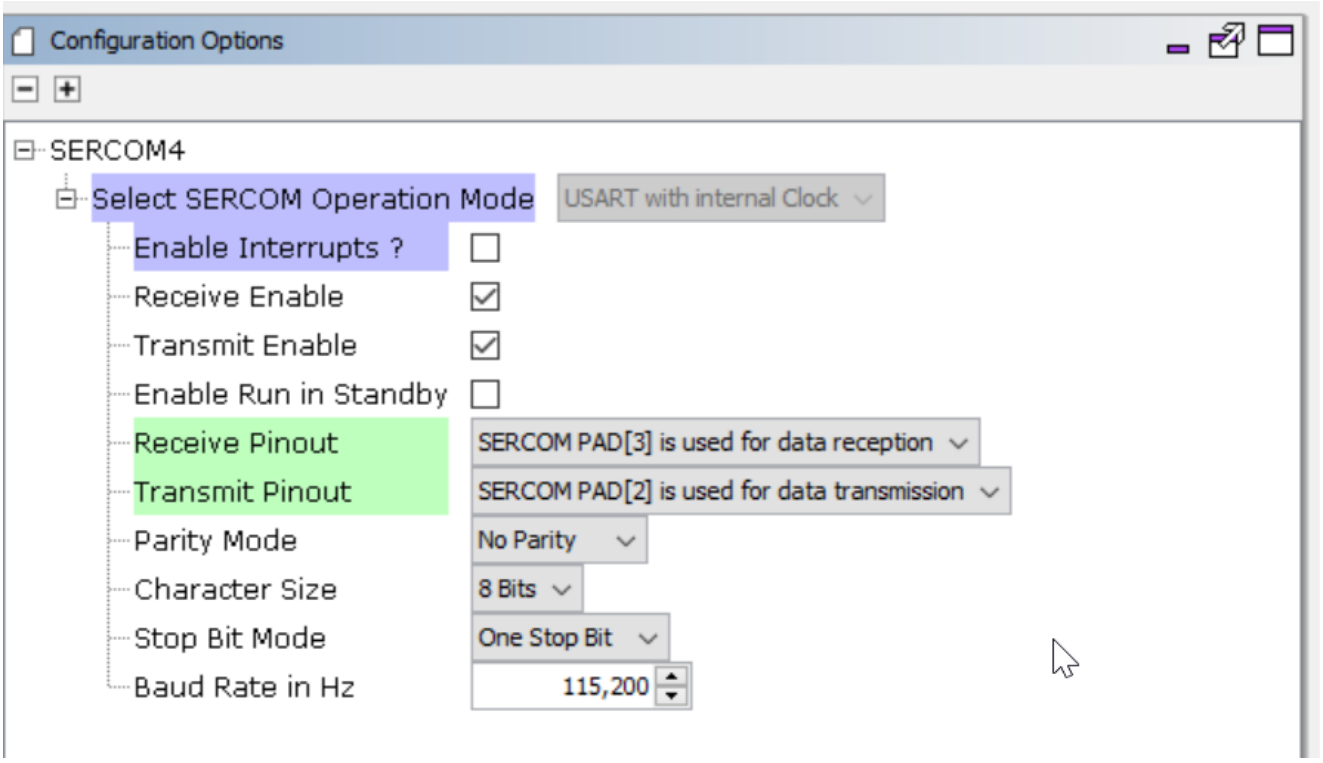



GCLK2
GCLK3
GCLK4
GCLK5
GCLK6
GCLK7
GCLK8
,000 Hz
Peripherals
Peripheral Clock Configuration
EIC
32,768 Hz
WDT
1,024 Hz
OSCULP1K
OSCULP32K
OSC1K
OSC32K
XOSC1K
XOSC32K
RTC
1,024 Hz
RTC Clock Selection
OSCULP1K

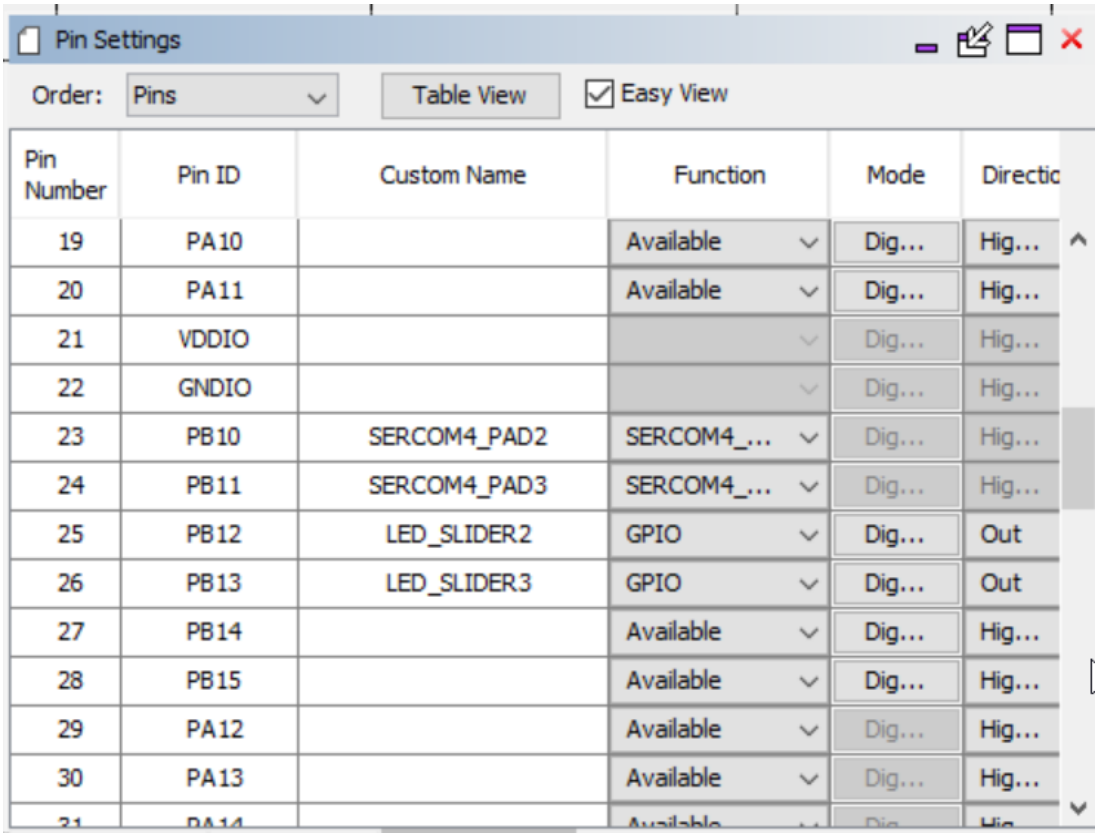


SERCOM Configuration:

Note: This configuration is for the Xplained Pro boards. You can choose the SERCOM as per the board design.



Pin configuration:



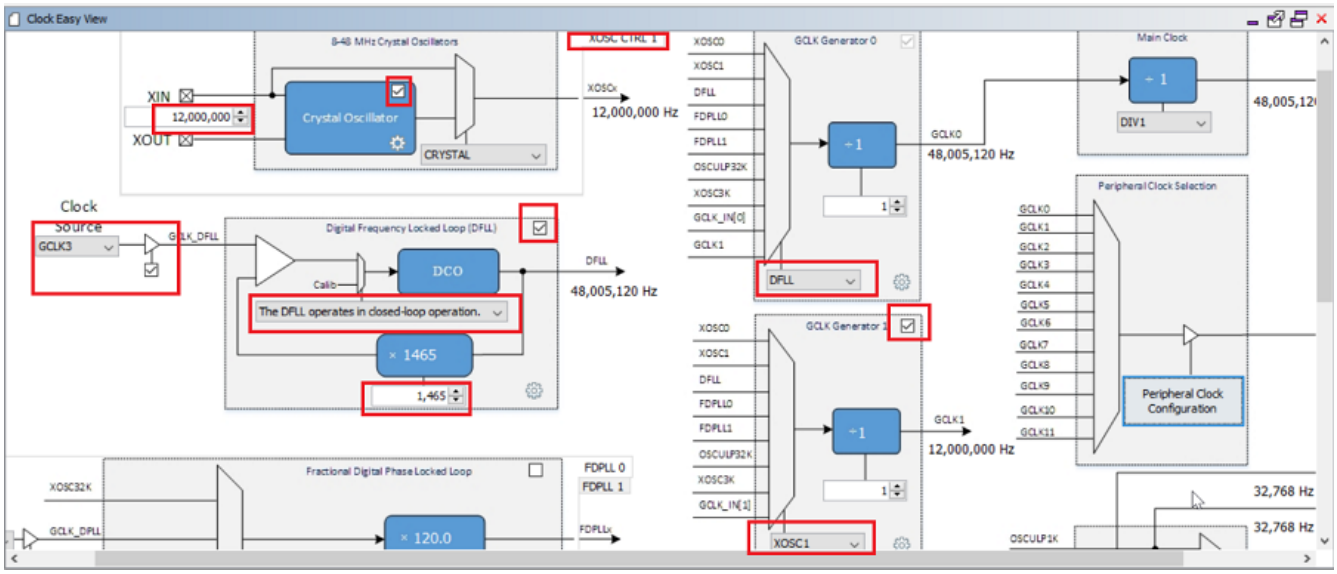
Pin Number	Pin ID	Custom Name	Function	Mode	Directic
19	PA10		Available	Dig...	Hig...
20	PA11		Available	Dig...	Hig...
21	VDDIO			Dig...	Hig...
22	GNDIO			Dig...	Hig...
23	PB10	SERCOM4_PAD2	SERCOM4_...	Dig...	Hig...
24	PB11	SERCOM4_PAD3	SERCOM4_...	Dig...	Hig...
25	PB12	LED_SLIDER2	GPIO	Dig...	Out
26	PB13	LED_SLIDER3	GPIO	Dig...	Out
27	PB14		Available	Dig...	Hig...
28	PB15		Available	Dig...	Hig...
29	PA12		Available	Dig...	Hig...
30	PA13		Available	Dig...	Hig...

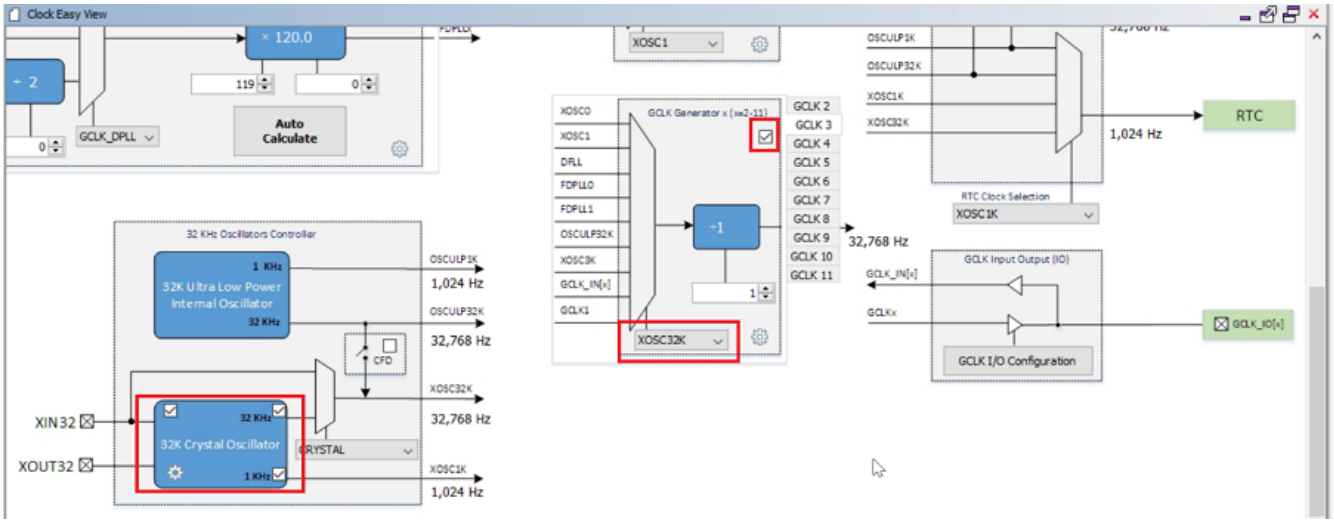
Clock_Configuration_SAME54_SAME53_SAME51_SAMD51

This topic describes brief overview of SAME54, SAME53, SAME51 and SAMD51 Clock configuration and the associated contents.

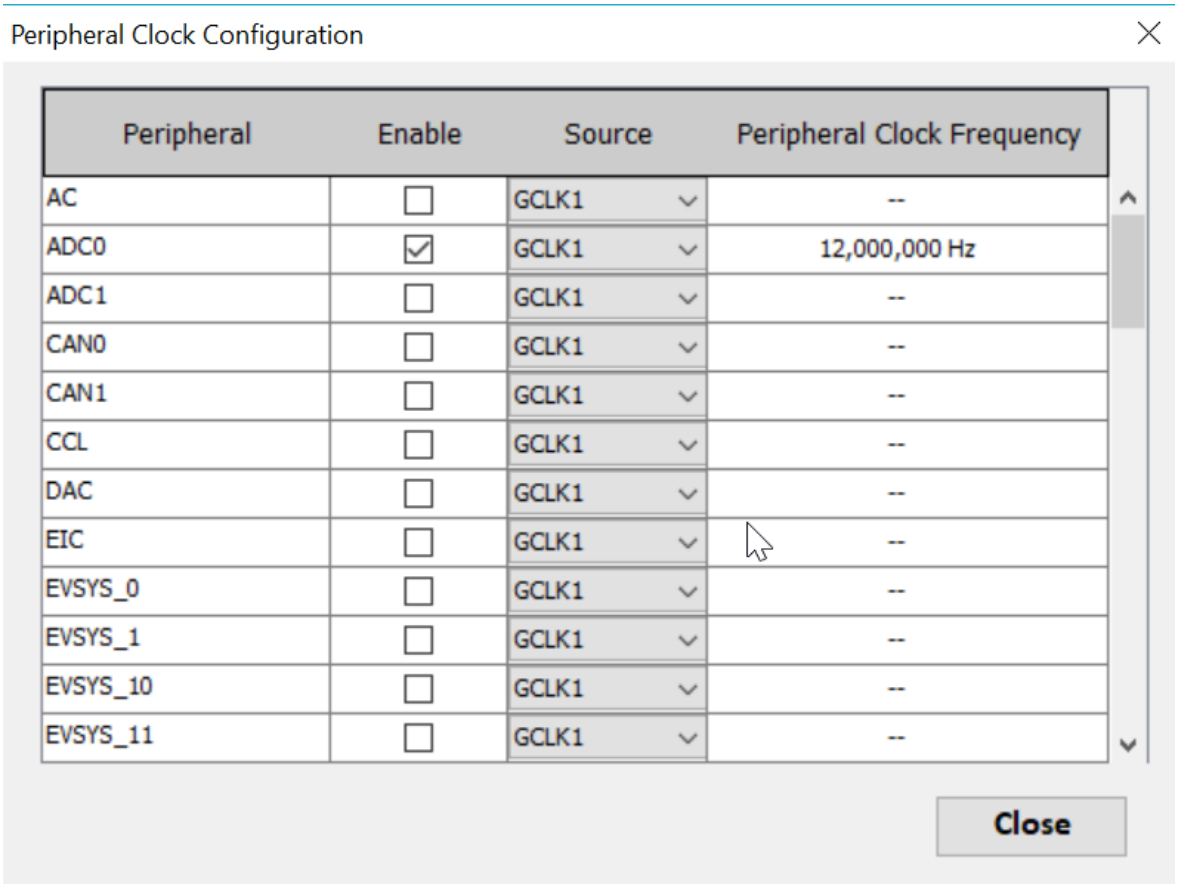
Description

Clock Configuration for SAME54, SAME53, SAME51, SAMD51 devices:



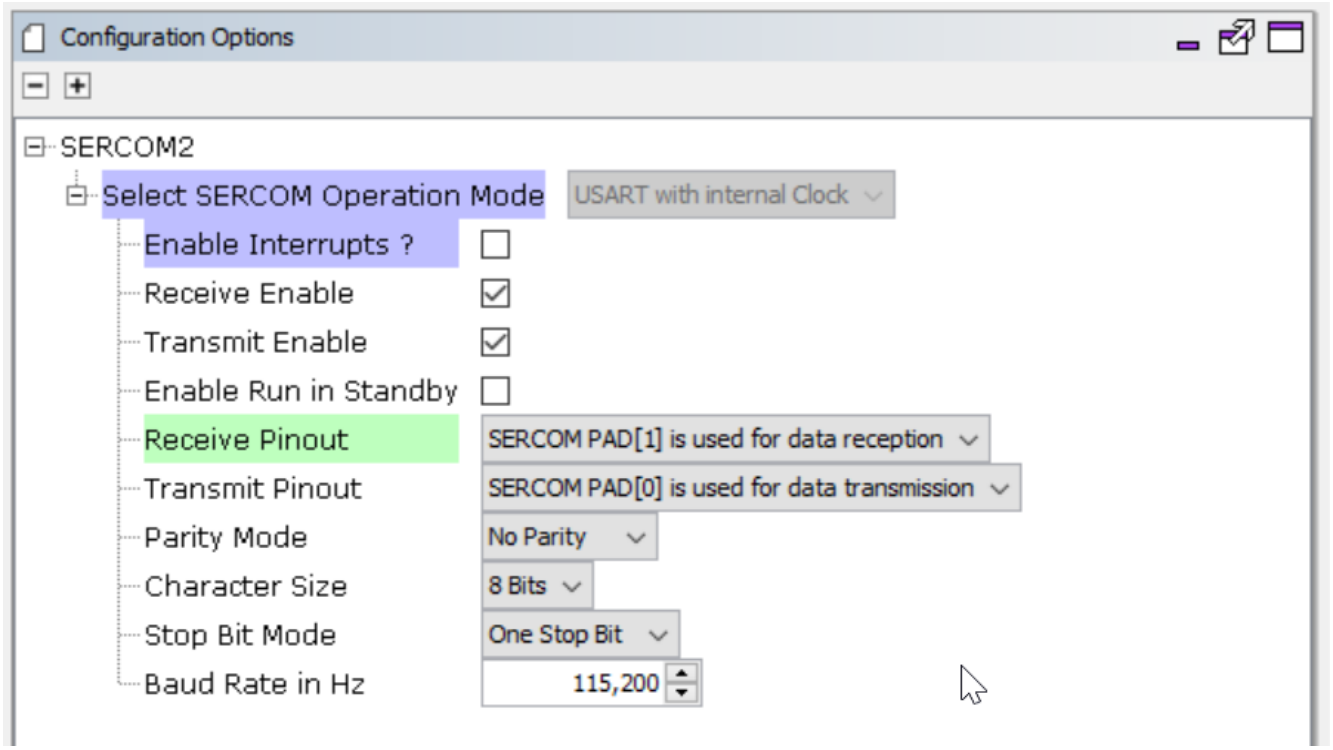


Main clock can be sourced from FDPLL also.

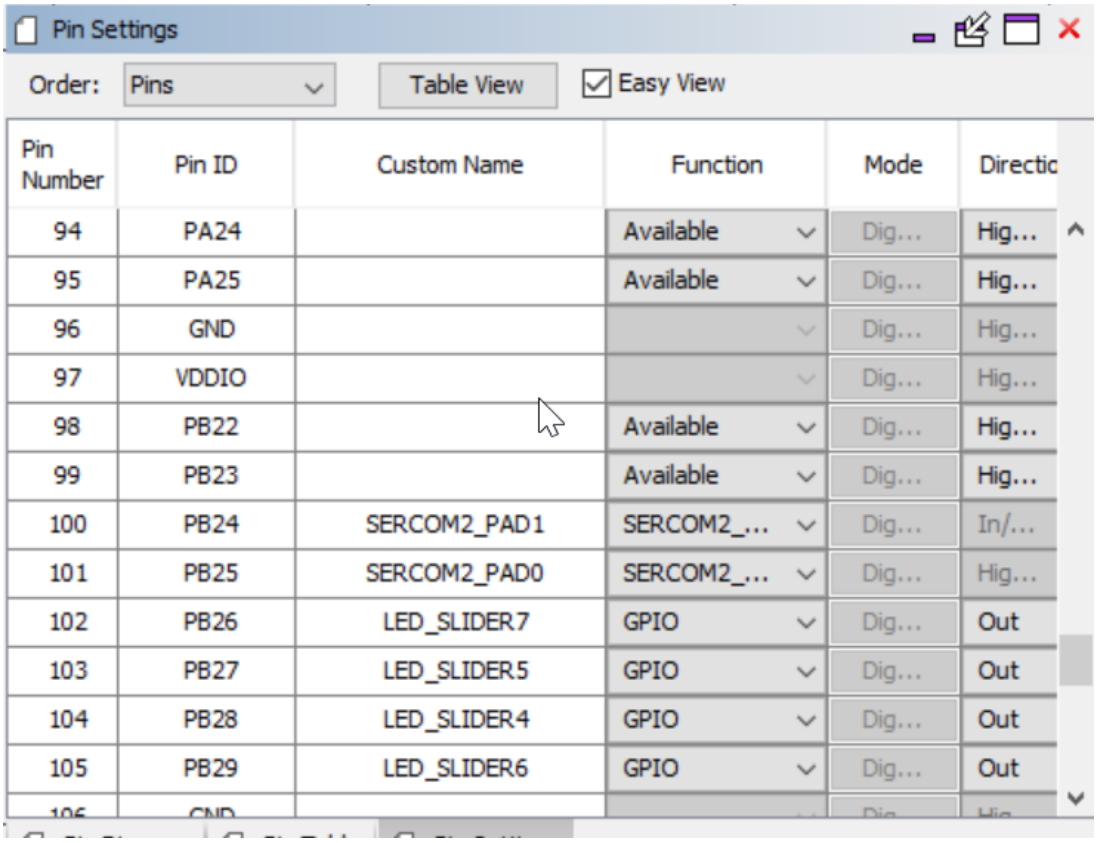


SERCOM Configuration:

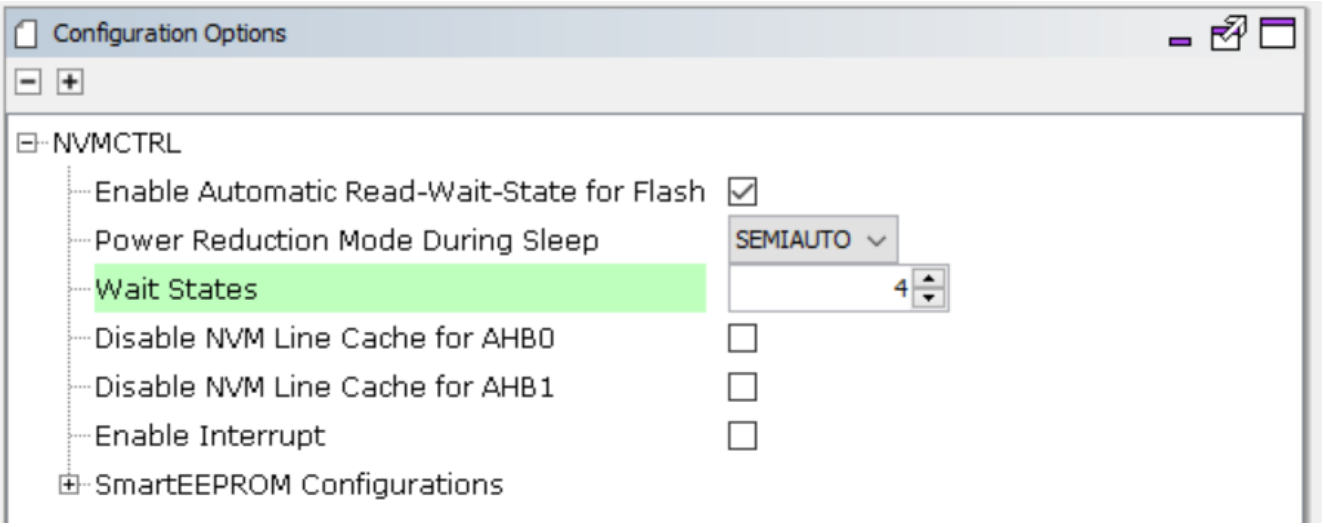
Note: This configuration is for the Xplained Pro boards. You can choose the SERCOM as per the board design.



Pin Configuration:



NVMCTRL Configuration:



Touch Driver Applications

This section provides help for the Touch applications available in MPLAB Harmony 3.

qt1_selfcap_xpro_board

SelfCap Example with QT1 Extension board

Description

This example demonstrates the basic touch application where the touch sensors are measured and the touch status is indicated using LED on the QT1 extenstion board. The touch library parameters are also displayed in the data visualizer software when the hardware kit is connected through edbg/medbg vritual com port.

Building The Application

This section provides information on how to build an application using the MPLAB X IDE.

Description

The parent folder for all the MPLAB X projects for this application is given below:

Application Path	\touch\apps\qt1_selfcap_xpro_board\firmware

To build the application, refer the following table and open the appropriate project file in the MPLAB X IDE.

Project Name	Description
sam_c21_xpro.X	SAM C21 Xplained Pro Evaluation Kit
sam_d20_xpro.X	SAMD20 Xplainedpro kit
sam_d21_xpro.X	SAMD21 Xplainedpro kit

MPLAB Harmony Configurations

This section provides information on the MHC configurations.

Description

Refer to the MHC project graph for the components used and the respective configuration options.

Hardware Setup

This section describes how to configure the supported hardware.

Description

1. **Project sam_c21_xpro.X.**
   - **Hardware Used**
     - SAMC21 Xplained Pro Evaluation kit
     - QT1 Xplained Pro Extension kit
   - **Hardware Setup**
     - Connect QT1 Xplained Pro to SAM C21 Xplained Pro Kit
     - Connect the Debug USB port on the board to the computer using a micro USB cable
2. **Project sam_d20_xpro.X.**
   - **Hardware Used**
     - SAMD20 Xplained Pro Evaluation kit

    - QT1 Xplained Pro Extension kit
  - **Hardware Setup**
    - Connect QT1 Xplained Pro to SAM D20 Xplained Pro Kit
    - Connect the Debug USB port on the board to the computer using a micro USB cable
3. **Project sam_d21_xpro.X**
  - **Hardware Used**
    - SAMD21 Xplained Pro Evaluation kit
    - QT1 Xplained Pro Extension kit
  - **Hardware Setup**
    - Connect QT1 Xplained Pro to SAM D21 Xplained Pro Kit
    - Connect the Debug USB port on the board to the computer using a micro USB cable

Running The Application

This section provides information on how to run an application using the MPLAB X IDE.

Description

1. Build and Program the application using the MPLAB X IDE.
2. The Button LEDs turns ON when touch made on the respective buttons
3. Open Atmel Data Visualizer software and set the config path to folder that contains th datastreamer scripts
   - **Scripts Folder:** \touch\apps\qt1_selfcap_xpro_board\firmware\src\config\sam_xxx_xpro\touch\datastreamer
4. Open serial port connection and connect to the target. Verify the connection is made successfully and the buttons touch status are displayed on the dashboard.
   - For more information, see the microchip developer page.

qt1_mutualcap_xpro_board

MutualCap Example with QT1 Extension board.

Description

This example demonstates the basic touch application where the touch sensors are measured and the touch status is indicated using LED on the QT1 extenstion board. The touch library parameters are also displayed in the data visualizer software when the hardware kit is connected through edbg/medbg vritual com port.

Building The Application

This section provides information on how to build an application using the MPLAB X IDE.

Description

The parent folder for all the MPLAB X projects for this application is given below:

Application Path	\touch\apps\qt1_mutualcap_xpro_board\firmware

To build the application, refer the following table and open the appropriate project file in the MPLAB X IDE.

Project Name	Description
sam_c21_xpro.X	SAM C21 Xplained Pro Evaluation Kit
sam_d20_xpro.X	SAMD20 Xplainedpro kit
sam_d21_xpro.X	SAMD21 Xplainedpro kit
sam_e54_xpro.X	SAM E54 Xplained Pro Evaluation Kit

MPLAB Harmony Configurations

This section provides information on the MHC configurations.

Description

Refer to the MHC project graph for the component used and the respective configuration options.

Hardware Setup

This section describes how to configure the supported hardware.

Description

1. **Project sam_c21_xpro.X.**
   - **Hardware Used**
     - SAMC21 Xplained Pro Evaluation kit
     - QT1 Xplained Pro Extension kit
   - **Hardware Setup**
     - Connect QT1 Xplained Pro to SAM C21 Xplained Pro Kit
     - Connect the Debug USB port on the board to the computer using a micro USB cable
2. **Project sam_d20_xpro.X.**
   - **Hardware Used**
     - SAMD20 Xplained Pro Evaluation kit
     - QT1 Xplained Pro Extension kit
   - **Hardware Setup**
     - Connect QT1 Xplained Pro to SAM D20 Xplained Pro Kit
     - Connect the Debug USB port on the board to the computer using a micro USB cable
3. **Project sam_d21_xpro.X**
   - **Hardware Used**
     - SAMD21 Xplained Pro Evaluation kit
     - QT1 Xplained Pro Extension kit
   - **Hardware Setup**
     - Connect QT1 Xplained Pro to SAM D21 Xplained Pro Kit

- Connect the Debug USB port on the board to the computer using a micro USB cable

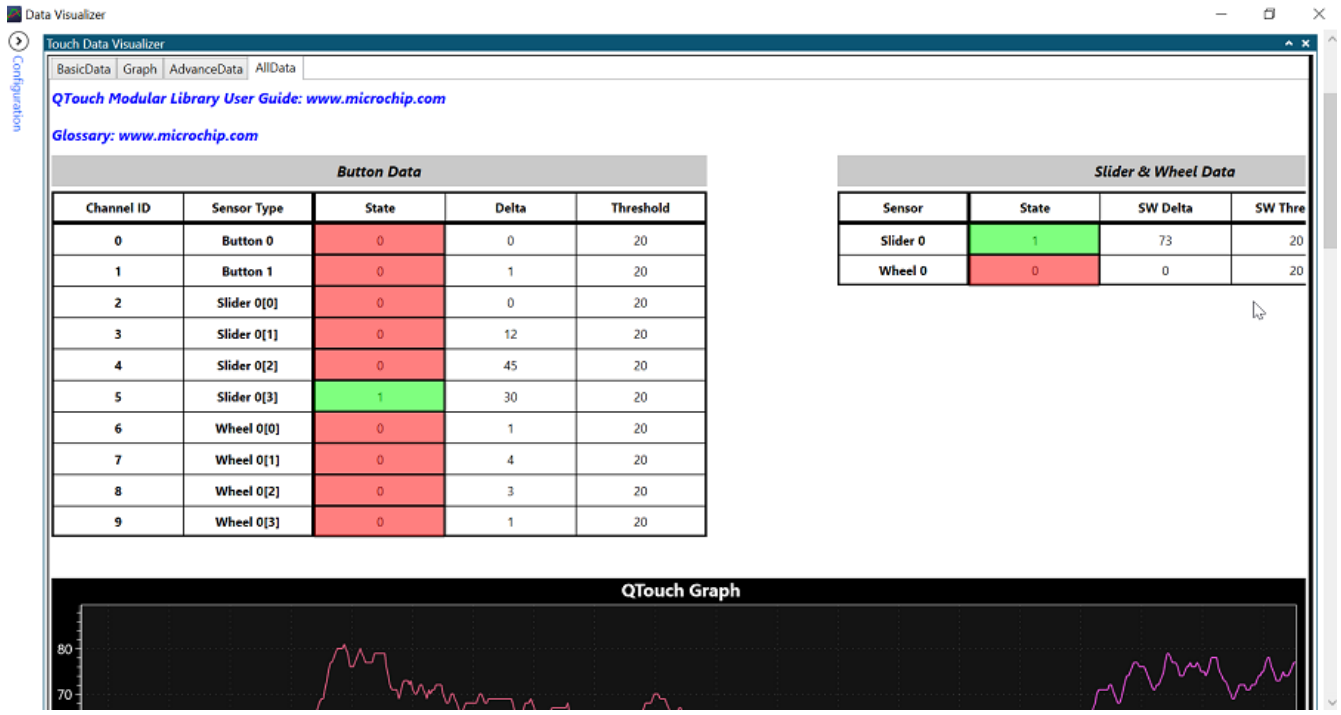
4. **Project sam_e54_xpro.X**
   - **Hardware Used**
     - SAME54 Xplained Pro Evaluation kit
     - QT1 Xplained Pro Extension kit
   - **Hardware Setup**
     - Connect QT1 Xplained Pro to SAM E54 Xplained Pro Kit
     - Connect the Debug USB port on the board to the computer using a micro USB cable

Running The Application

This section provides information on how to run an application using the MPLAB X IDE.

Description

1. Build and Program the application using the MPLAB X IDE.
2. The Button LEDs turns ON when touch made on the respective buttons
3. Open Atmel Data Visualizer software and set the config path to folder that contains th datastreamer scripts
   - **Scripts Folder:** touch\apps\qt1_mutualcap_xpro_board\firmware\src\config\sam_xxx_xpro\touch\datastreamer
4. Open serial port connection and connect to the target. Verify the connection is made successfully and the buttons touch status are displayed on the dashboard.
   - For more information, see the microchip developer page.



on_board_sensor

SelfCap Example with the on-board sensor present in the Xplained Pro board.

Description

This example demonstrates the basic touch application where the touch sensors are measured and the touch status is indicated using LED on the Xpro board. The touch library parameters are also displayed in the data visualizer software when the hardware kit is connected through edbg/medbg vritual com port.

Building The Application

This section provides information on how to build an application using the MPLAB X IDE.

Description

The parent folder for all the MPLAB X projects for this application is given below:

Application Path	\touch\apps\on-board_sensor\firmware

To build the application, refer the following table and open the appropriate project file in the MPLAB X IDE.

Project Name	Description
sam_e54_xpro.X	SAME54 Xplainedpro kit

MPLAB Harmony Configurations

This section provides information on the MHC configurations.

Description

Refer to the MHC project graph for the component used and the respective configuration options.

Hardware Setup

This section describes how to configure the supported hardware.

Description

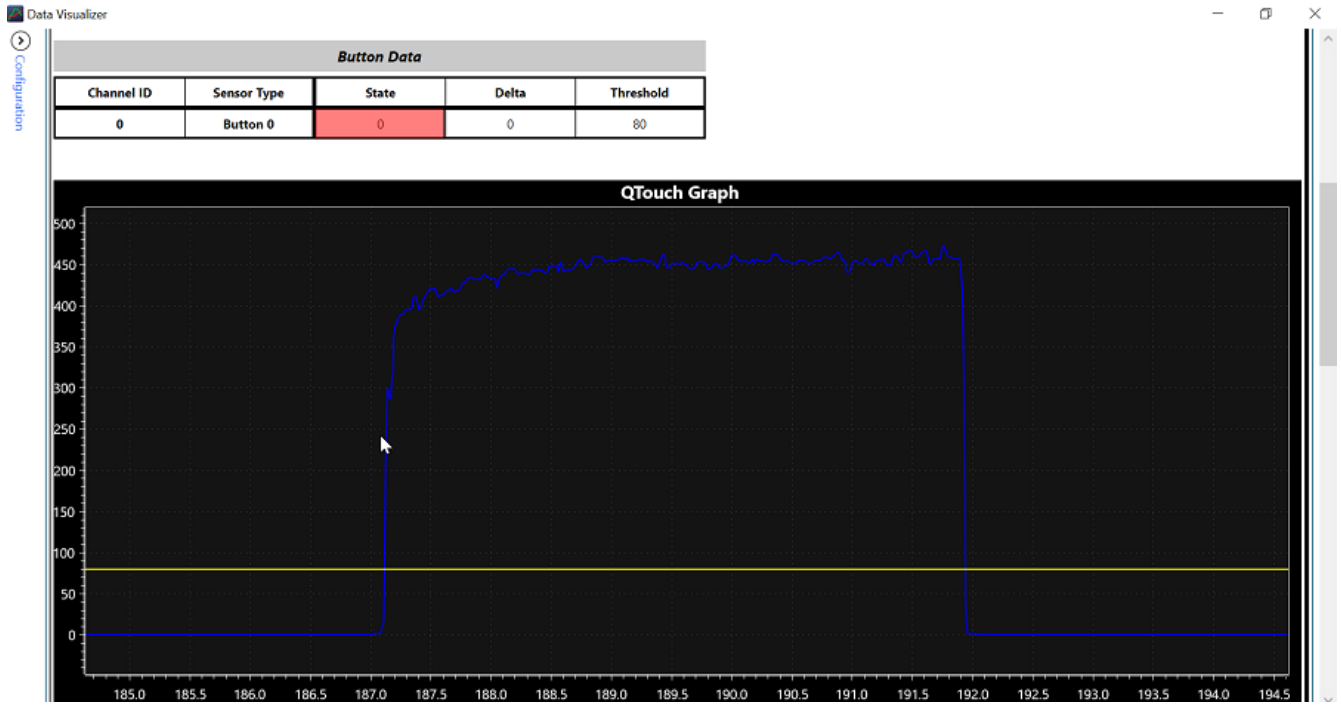
1. **Project sam_e54_xpro.X.**
   - **Hardware Used**
     - SAME54 Xplained Pro Evaluation kit
   - **Hardware Setup**
     - Connect the Debug USB port on the SAM E54 Xplained Pro Kit board to the computer using a micro USB cable

Running The Application

This section provides information on how to run an application using the MPLAB X IDE.

Description

1. Build and Program the application using the MPLAB X IDE.
2. The LED on the XPro turns ON when touch is made on the respective on-board button
3. Open Atmel Data Visualizer software and set the config path to folder that contains th datastreamer scripts
   - **Scripts Folder:** touch\apps\on-board_sensor\firmware\src\config\sam_e54_xpro\touch\datastreamer
4. Open serial port connection and connect to the target. Verify the connection is made successfully and the buttons touch status are displayed on the dashboard.
   - For more information, see the microchip developer page.


Data Visualizer
Configuration
Button Data
Channel ID
Sensor Type
State
Delta
Threshold
0
Button 0
0
0
80
QTouch Graph
500
450
400
350
300
250
200
150
100
50
0
185.0
185.5
186.0
186.5
187.0
187.5
188.0
188.5
189.0
189.5
190.0
190.5
191.0
191.5
192.0
192.5
193.0
193.5
194.0
194.5

Index