

Introduction

Some ABOV 32-bit MCUs provide the Configure option that allows users to configure the options for the MCUs using compiler tools during development.

This document describes how to set the Configure option for projects developed based on Keil or IAR IDE, and also provides the required precautions for setting the Configure option.

This document applies to the part numbers listed in Table 1.

Table 1. Applicable devices

Sub-family	Part name
A31G11x	A31G112CL, A31G112SQ, A31G112KN, A31G112KU, A31G112KY, A31G112GR, A31G112LU, A31G111KN, A31G111KU, A31G111GR, A31G111LU
A31G12x	A31G123ML, A31G123MM, A31G123RL, A31G123RM, A31G123RN, A31G123CL, A31G123SQ, A31G122ML, A31G122MM, A31G122RL, A31G122RM
-	A31R713ML, A31R713RT, A31R713CL
A31L12x	A31L123RL, A31L123CL, A31L123KN, A31L123KU, A31L123GR, A31L123LU, A31L122RL, A31L122CL, A31L122KN, A31L122KU, A31L122GR, A31L122LU
A31L21x	A31L214ML, A31L214RL, A31L214CL, A31L214KN, A31L214KU, A31L213ML, A31L213RL, A31L213CL, A31L213KN, A31L213KU
A31L22x	A31L222FR, A31L222FU, A31L222AR, A31L221FR, A31L221FU, A31L221AR
-	A31S134RL, A31S134CL, A31S134SN, A31S134KN

Reference document

The following documents are available on www.abovsemi.com.

- Datasheets for 32-bit MCUs in Table 1
- User's manuals for 32-bit MCUs in Table 1
- Example codes for 32-bit MCUs in Table 1

Contents

Introduction.....	1
Reference document.....	1
1. Configure option area.....	5
1.1 Read protection configuration	6
1.2 Extra user data	7
1.3 Watchdog timer configuration.....	7
1.4 Low voltage reset configuration	8
1.5 Configure option page Erase/ Write protection	9
1.6 Flash memory Erase/ Write protection.....	9
1.7 Data Flash Memory Erase/ Write protection	9
2. How to set the Configure option in Keil compiler	10
2.1 Configuration wizard 1	10
2.2 Configuration wizard 2	11
3. How to set the Configure option in IAR compiler	13
3.1 Configure option file	13
Revision history	15

List of tables

Table 1. Applicable devices	1
Table 2. Access type by Read protection level.....	6

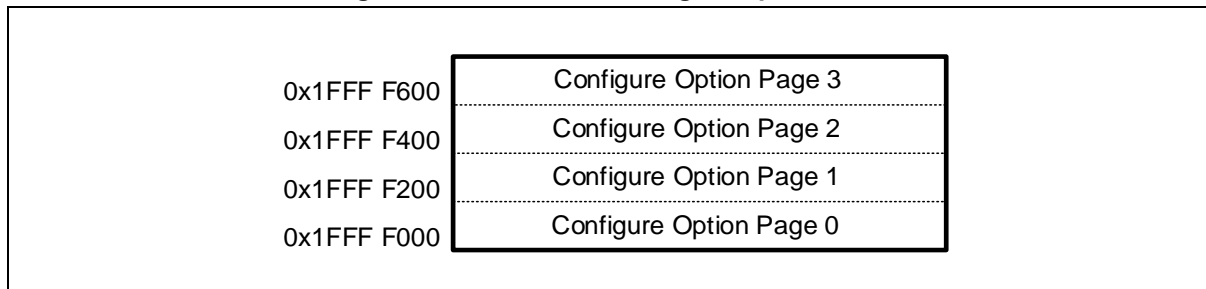
List of figures

Figure 1. Structure of Configure option area.....	5
Figure 2. Collapse all Configure options of option.s file in Keil project	10
Figure 3. Expand all Configure options of option.s file in Keil project.....	11
Figure 4. option.c file in workspace.....	13

1. Configure option area

The Configure option area consists of four pages in flash memory for storing system related trimming values, user options, user data 0, and user data 1. The size of the Configure option page depends on the device.

Figure 1. Structure of Configure option area



The four pages of the Configure option area are described below:

- Page 0
 - System related trimming values by manufacturing process
- Page 1
 - User options for Read protection
 - Watchdog timer
 - LVR voltage level, etc.
- Page 2:
 - User data 0 area
- Page 3:
 - User data 1 area

User options in the Configure option area include the following. For more information about user options, refer to the User's manual for each device.

- Read protection configuration
- Extra user data
- Watchdog timer configuration
- Low voltage reset configuration
- Configure option page Erase/ Write protection
- Flash memory Erase/ Write protection
- Data flash memory Erase/ Write protection

1.1 Read protection configuration

Read protection consists of three levels:

- Level 0
 - No restrictions for Read/ Erase/ Write
- Level 1
 - Not Readable/ Erasable/ Writable in “Debug”
 - Bulk Erasable only “Debug”
 - Readable/ Erasable/ Writable by “Instruction from flash memory and RAM”
- Level 2
 - Not Readable/ Erasable/ Writable by “Debug” or “Instruction from RAM”
 - Bulk Erasable only by “Debug” or “Instruction from RAM”
 - Readable Erasable/ Writable by “Instruction from flash memory”

Table 2. Access type by Read protection level

Read protection	Execution area	Read	Write	Erase	Bulk Erase
Level 0	Debug	Y	Y	Y	Y
	Instruction from flash memory	Y	Y	Y	N
	Instruction from SRAM	Y	Y	Y	Y
Level 1	Debug	N	N	N	Y
	Instruction from flash memory	Y	Y	Y	N
	Instruction from SRAM	Y	Y	Y	Y
Level 2	Debug	N	N	N	Y
	Instruction from flash memory	Y	Y	Y	N
	Instruction from SRAM	N	N	N	Y

1.2 Extra user data

An Extra user data consists of two 32-bit words for user's specific values. Each Extra user data can be set to a 16-bit value (Word0 and Word1) in the range of 0x0000 to 0xFFFF. The set of 16-bit values is converted to a 32-bit word in the Configure option area.

These data can be used for the user's ID number for operation.

For example, if the 16-bit value is 0xFF00, the 32-bit value is calculated as follows:

1. $0xFF00 \ll 16 = 0xFF000000$ (left-shift operation by 16 bits of the 16-bit value for 32-bit word conversion)
2. $0xFF00 \wedge 0xFFFF = 0x00FF$ (XOR calculation of the 16-bit value and 0xFFFF)
3. $0xFF000000 \vee 0x00FF = 0xFF0000FF$ (OR calculation of the left-shifted 16-bit value and the XOR result)

1.3 Watchdog timer configuration

There are four types of selections for the Watchdog timer:

- WDTRC Enable Selection
- Watchdog timer Clock Selection
- Watchdog timer Reset Enable Selection
- Watchdog timer Counter Enable Selection

For more information, refer to the User's manual for each device.

- WDTRC Enable Selection: Master configuration for Watchdog timer RC oscillation
 - By S/W (SCU→CLKSRCR Register)
 - The WDTRC oscillation is determined by the WDTRCEN in CLKSRCR register.
 - Enable but disable in Deep sleep mode
 - The master enables WDTRC but disables it in Deep sleep mode.
 - Always Enable
 - The master always enables WDTRC oscillation.
- Watchdog timer Clock Selection: Master configuration for Watchdog timer clock
 - By S/W (SCU→PPCLKSR register)
 - The Watchdog timer clock is defined by the WDTCLK in PPCLKSR register.

- WDTRC
 - The Watchdog timer RC oscillator (WDTRC) is selected as the Watchdog timer clock regardless of the WDTCLK in PPCLKSR register.
- Watchdog timer Reset Enable Selection: Master configuration for Watchdog timer reset enable
 - By S/W (WDT→CR Register)
 - Watchdog timer reset is decided by the RSTEN[5:0] in WDTCR register.
 - Enable WDT Reset
 - The master enables Watchdog timer reset regardless of the WDTCR register.
- Watchdog timer Counter Enable Selection: Master configuration for Watchdog timer counter enable
 - By S/W (WDT→CR Register)
 - Watchdog timer counter is decided by the CNTEN[5:0] in WDTCR register.
 - Enable WDT Counter
 - The master enables Watchdog timer counter regardless of the WDTCR register.

1.4 Low voltage reset configuration

It depends on the device, but typically there are 7 to 16 LVR voltage levels per device. There are two types of selections for LVR: LVR Operation Control Selection and LVR Voltage Selection.

- LVR Operation Control Selection: master configuration for LVR reset operation control
 - By S/W (SCU→LVRRCR Register): The LVR operation is determined by the LVREN[7:0] in LVRRCR register.
 - Always Enable: The master enables LVR operation.
- LVR Voltage Selection: Each device has 7 to 16 LVR voltage levels.

NOTE:

1. Do not select the LVR voltage level higher than the operating voltage of the MCU in a set and consider the margin of the LVR voltage level. For example, if the MCU's VDD is 3.0 V and the LVR voltage level is 3.55 V, the MCU cannot operate by LVR reset on VDD = 3.0 V.

1.5 Configure option page Erase/ Write protection

The Configure option page 0 is produced with the enable protection during the manufacturing process. However, the other Configure option pages (page 1, page 2 and page 3) allow users to select between the enable protection and the disable protection.

The size of the Configure option page depends on the device. For more information about the Configure option page, refer to the User's manual for each device.

- Configure option Page Erase/ Write protection
 - Enable Protection
 - Not erasable/ writable by instruction
 - Disable Protection
 - Erasable/ writable by instruction

1.6 Flash memory Erase/ Write protection

The flash memory can be protected from the unwanted erasing and writing processes. Each device has one or more word areas where the protection can be selected and can be set in units of sectors. For more information about the Erase and Write protection of the flash memory, refer to the User's manual for each device.

- Flash Memory Erase/ Write protection
 - Protect “flash memory sector erase/ write”
 - Permit “flash memory sector erase/ write”

1.7 Data Flash Memory Erase/ Write protection

The data flash memory can be protected from the erasing and writing processes. Some devices have areas where the protection can be selected in sector units. For more information about the Erase and Write protection of the data flash memory, refer to the User's manual for each device.

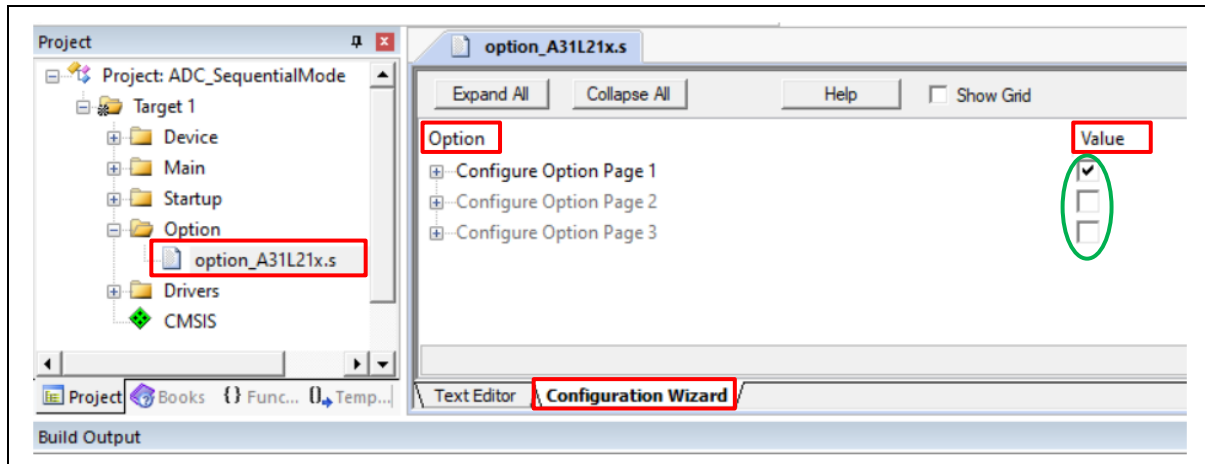
- Data Flash Memory Erase/ Write protection
 - Protect “data flash memory sector erase/ write”
 - Permit “data flash memory sector erase/ write”

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2. How to set the Configure option in Keil compiler

2.1 Configuration wizard 1

Figure 2. Collapse all Configure options of option.s file in Keil project



Follow the steps below to display the screen in Figure 2:

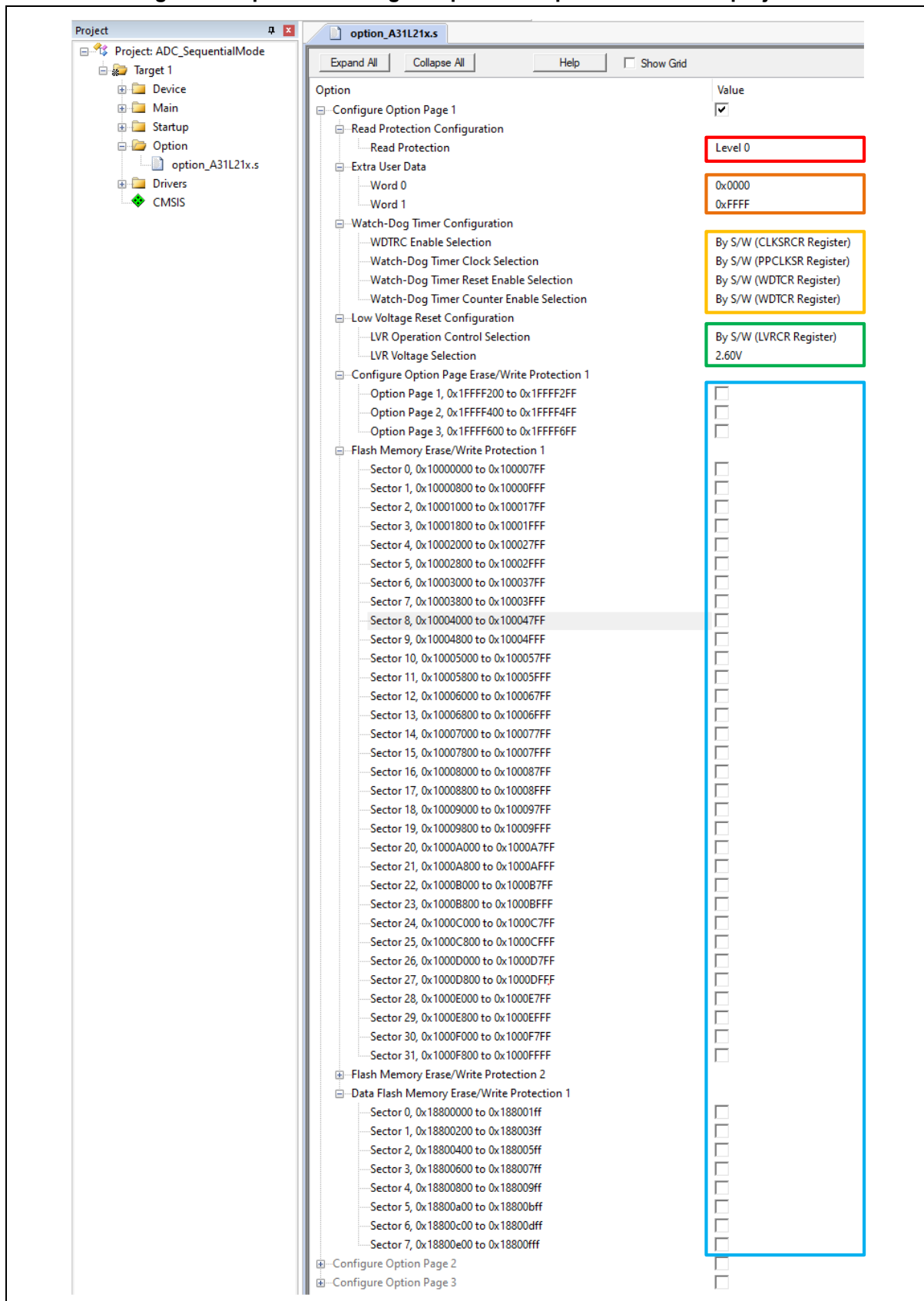
1. Click the option folder in project.
2. Click the option_*.s file (* is device's sub-family name).
3. Select 'Configuration wizard'.

In the Figure 2,

- Option: Displays the device properties, which can be displayed in a tree structure
- Value: Sets the option value. It can include controls to encapsulate data in predefined drop-down lists.
- Check box in green circle: Determines whether to generate code at compile time.
 - Check: Generates the code of the selected property.
 - Uncheck: Does not generate the code of the non-selected property.

2.2 Configuration wizard 2

Figure 3. Expand all Configure options of option.s file in Keil project



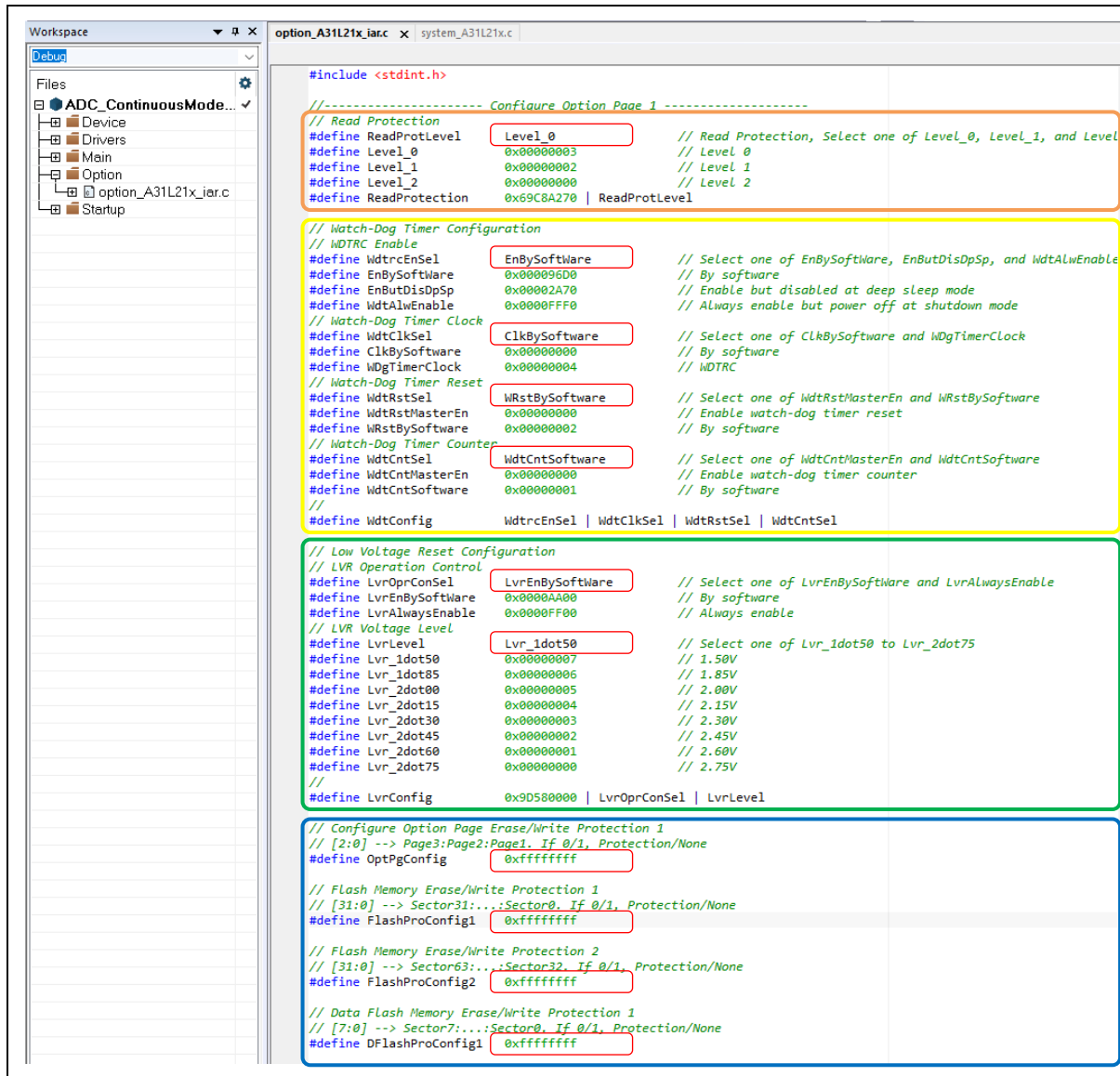
As shown in Figure 3, user can set device options using the graphical controls.

- Read protection level: Allows you to select a level by clicking the value in the red box.
 - Level 0
 - Level 1
 - Level 2
- Extra user data: Can be set using a half word in the orange box.
- Watchdog timer configuration: Can be configured by clicking on a value in the yellow box.
 - WDTRC enable selection
 - By S/W
 - Enable but
 - Always Enable
 - Watchdog timer clock selection
 - By S/W
 - WDTRC
 - Watchdog timer reset enable selection
 - By S/W
 - Enable WDT Reset
 - Watchdog timer counter enable selection
 - By S/W
 - Enable WDT Counter
- Low voltage reset configuration: Can be configured by clicking on a value in the green box.
 - LVR operation control selection
 - By S/W
 - Always Enable
 - LVR voltage selection
 - Each device has different voltage levels and numbers.
- Erase/ Write protection: Can be protected by checking a box in the blue box.
 - Configure option page, flash memory, and data flash memory protections.
 - Checked: Protects data in the selected area from sector Erase/ Write instruction.
 - Unchecked: Permits data changes from sector Erase/ Write instruction.

3. How to set the Configure option in IAR compiler

3.1 Configure option file

Figure 4. option.c file in workspace



Follow the steps below to display the screen in Figure 4:

1. Click the option folder in workspace.
2. Click the option_*.iar.c file (* is device sub-family name.)

Users can set the Configure option in IAR compiler by the following the procedure below. It is a method of defining each option and coping one of the options.

- Read protection: Can be selected by copying to the position of a red circle in the orange box.
 - Level_0
 - Level_1
 - Level_2
- Watchdog timer configuration: Can be configured by copying to the position of a red circle in the yellow box. A comment on each line has a description of the defined abbreviation.
 - WDTRC Enable
 - Defined by EnBySoftWare, EnButDisDpSp, and WdtAlwEnable
 - Watchdog timer Clock:
 - Defined by ClkBySoftware and WDgTimerClock
 - Watchdog timer Reset:
 - Defined by WdtRstMasterEn and WRstBySoftware
 - Watchdog timer Counter:
 - Defined by WdtCntMasterEn and WCntSoftware
- Low voltage reset configuration: Can be configured by copying to the position of a red circle in the green box.
 - LVR Operation Control:
 - LvrEnBySoftWare
 - LvrAlwaysEnable
 - LVR Voltage Level: Each device has different voltage levels and numbers.
- Erase/ Write protection: Can be protected by defining the value of a red circle in the blue box.
 - Configure option page, flash memory, and data flash memory protections.
 - Defining the bit as 0: Protects data in the selected area from sector Erase/ Write instruction.
 - Defining the bit as 1: Permits data changes from sector Erase/ Write instruction.
 - For more information about the Erase/ Write protection, refer to the User's manual for each device.

Revision history

Revision	Date	Notes
1.00	May. 16, 2023	Initial release.
1.01	Dec. 2, 2024	Updated the disclaimer.

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