Secret Level: Top-Secret ( ) Secret (√) Internal Data (√) Open ()

Document Number: (Chip Type) -ASR6501/ASR6502(English、Digital)

ASR6501_ASR6502_QA

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	Author:	ASR LoRa Design Team
	Start Date:	2018-5-16
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Version History

Version	Update date	Author	Update Description
V0.1	2018.05.16	ASR LoRa Design Team	Created
V0.2	2018.05.22	ASR LoRa Design Team	1. Add HW update by Shiduo Yang 2. Add SW update by Ruilin Hao

Table of Contents

1. How to Use ASR6501 Development Board

The development board released on June 21 has downloaded the software "image" in the chip, using the AT command to operate the chip.
Please refer to "Application note" and "AT-Commands-Introduction". "Application note" describes how to use the development board hardware. After the development board is powered on, ASR6501 chip is controlled by the AT command through the serial port, and some related tests are done.

2. Software SDK Problem

SDK 4.0 released on September 21 can operate the chip through the Cypress PSoC Creator development environment. Software SDK alpha version is uploaded on the github, path: https://github.com/asrlora/alios-asr-lora, and refer to the manual "ASR6501 SDK" to operate the chip.

3. SDK4.0 release note

The main updates of V4.0 include:

1. Add the CLASS B support;
2. Eliminate the warning information;
3. Add the UART upgrade function;
4. Add the function of triple encryption;
5. Add some AT commands, such as multicast, device key encryption, etc.
6. Repair and optimize the Bug;
   a) Modify the RTC timer to make the timing more accurate.
   b) Modify the low power mode and support UART, GPIO and Timer wake-up.
   c) Solve the occasional network access failure problem;
   d) Repair CN470 access related issues, such as channel mask, ABP, etc.

4. Development Environmental Issues

ASR6501 chip uses the Cypress PSoC Creator development environment. If users need the KEIL or IAR development environment, ASR will provide the reference for the transformation process from PSoC Creator to KEIL development environment. See the "Keil Engineering. zip"

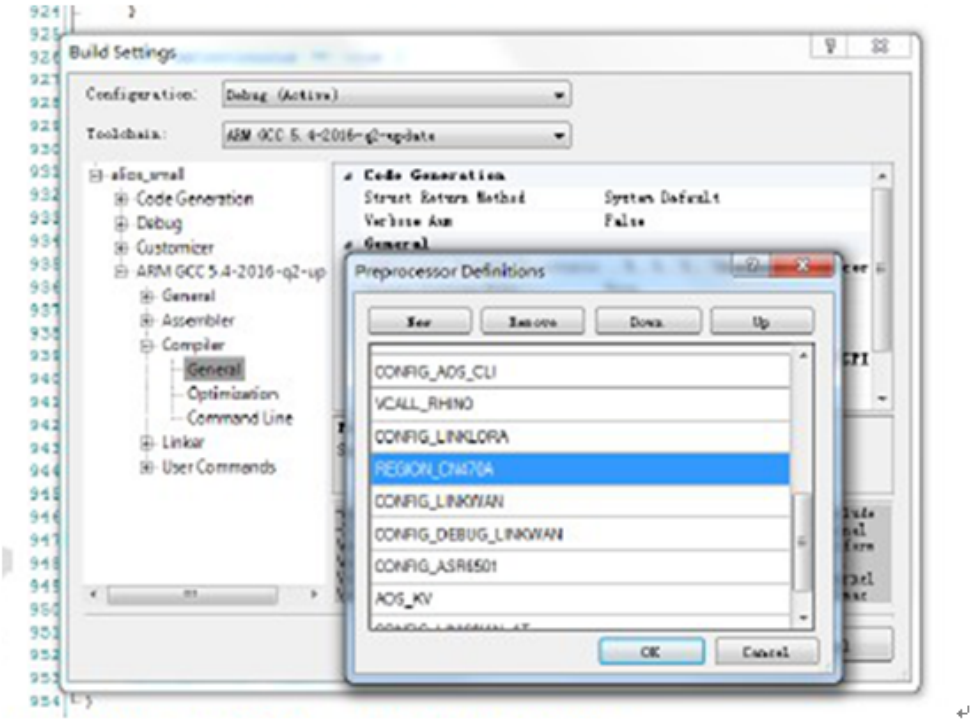
5. How to switch ASR SDK from LinkWAN to LoRaWAN

ASR SDK supports the standard LoRaWAN and Ali LinkWAN. The switching method is as follows:
Our protocol stack partially supports SDK 4.0 switching to LoRaWAN. Just change the macro of CN470A to CN470. The part of accessing needs to be modified by customers themselves. "SDK release note" also introduces the switching method.

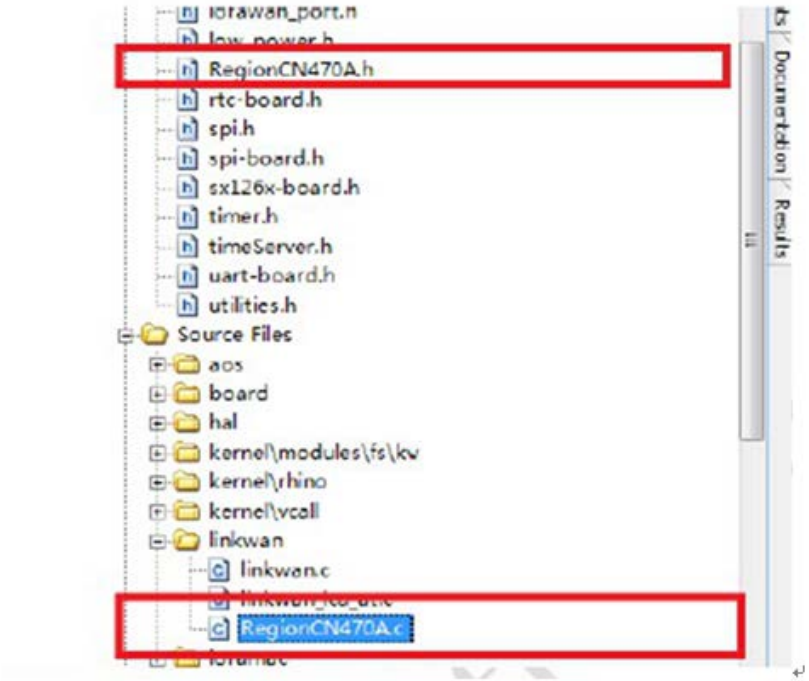
3) How to use the standard LORAWAN

ASR650X supports Ali LinkWan by default. If supporting the standard LoRaWan, please refer to the following steps:

■In the macro definition of Project_› Build Setting, Change REGION_CN470A to REGION_CN470:



■Remove CN470A files and add CN470 files in the project



■Remove CONFIG_LINKWAN in the macro definition of Project_› Build Setting

The “CN470.c” file is found in the following directory.

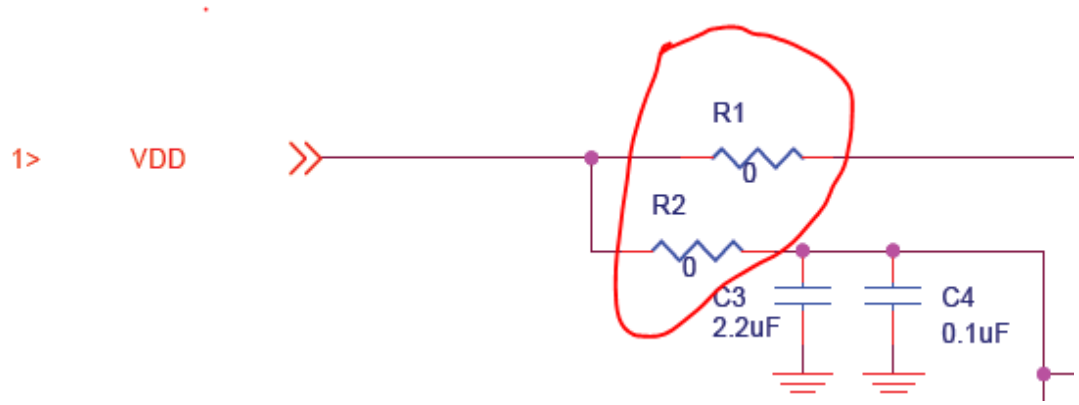
\platform\mcu\cy8c4147\aos\
\platform\mcu\cy8c4147\runapp\
\kernel\modules\fs\kv\
\kernel\vcall\aos\
\tools\cli\
\include\aos\
\board\asr6501\
\kernel\rhino\core\
\kernel\rhino\common\
\example\lorawan\loraRun\
\kernel\protocols\lorawan\linkwan\
\kernel\protocols\lorawan\linkwan\region\
\kernel\protocols\lorawan\lora\system\crypto\
\kernel\protocols\lorawan\lora\mac\
\kernel\protocols\lorawan\lora\mac\region\
\kernel\protocols\lorawan\
\kernel\protocols\lorawan\lora\system\
\board\asr6501\inc\
\kernel\protocols\lorawan\linkwan\include\
\device\lora\sx126x

6. Difference between LinkWAN and LoRaWAN

a. Differences in node frequency planning: LinkWAN divides 470-510 bands into 16 groups, specifying the configuration of the same-frequency and different-frequency nodes.
b. The rate specifies that the nodes work in DR2-DR5. Except for special nodes, DR0 and DR1 are not recommended.
c. LinkWAN specifies the process of node access, giving the priority to existing band scanning. If it is unsuccessful, the default band (1A2) scanning is used. If it is still unsuccessful, then multi-band scanning is used.
d. Specify a maximum length of 51 bytes for business packages.

7. Can users bypass the internal MCU of Cypress and use the external MCU to control LoRa?

Users can bypass the MCU, and remove R1 and R2 from the module to cut off the MCU power.



8. Difference between ASR6501 and ASR6502

ASR6501 and ASR6502 are only the difference of package size and pin number, and there is no difference in product performance. The differences in the number of pins between ASR6501 and ASR6502 are listed below. ASR6502-1 and ASR6502-2 are the same chip, the difference is whether SPI is configured.

	ASR6501	ASR6502-1	ASR6502-2
GPIO	5	13	9
ADC	1	3	3
SPI	0	0	1
UART	1	2	2
I2C	1	1	1
Total	48	60	60
PKG	6*6 QFN48	7*7 QFN60	7*7 QFN60

9. Can users operate the register of SX1262?

This part of SX1262 is sealed, but users can call the interface.

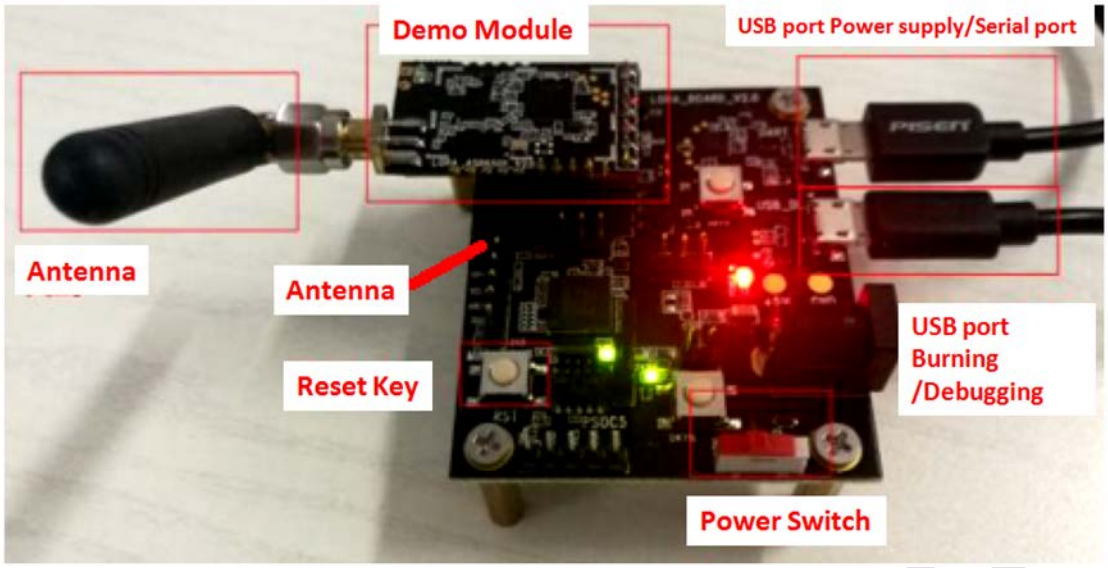
```
void SX126xWriteRegister( uint16_t address, uint8_t value );

/*!
 * \brief Read a single byte of data from the radio memory
 *
 * \param [in]  address      The address of the first byte to write in the radio
 *
 * \retval      value        The value of the byte at the given address in radio's
memory
 */
uint8_t SX126xReadRegister( uint16_t address );
```

10. Differences between ASR6501 and ASR6502 development boards

ASR LoRa Chip Development Board includes the base board and sub-board. The base board is the download board

and the sub-board is the demo module, as shown in the figure below.



ASR6501 and ASR6502 share one base board, sub-boards are different. Therefore, the reference schematic diagram of the sub-board is given separately.

11. SDK 4.0 Compiler Failed

After opening the project, the compiler prompts the following error:

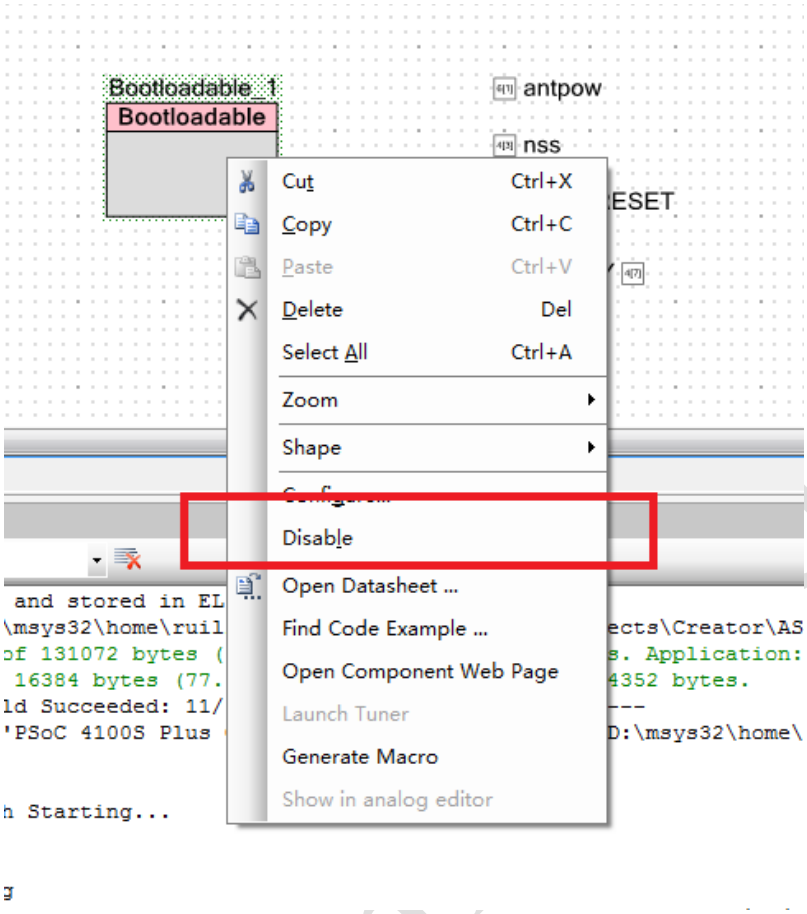
	Description	File	Error Location	Project
1	pft.M0086:Error in component: Bootloadable_1. The referenced Bootloader is invalid. Verify the Bootloader dependency is correct in the Bootloadable Component, then build project. Invalid bootloader hex file. Unable to read the hex file (D:\msys32 \home\ruilinhao\new_git\new\alios-lora\projects\Creator\ASR6501\alios_small.cydsn\bootloader.cydsn\CortexM0p\ARM_GCC_541 \Debug\bootloader.hex). The path does not exist.	TopDesign.cys...	Instance:Bootl...	alios_small
2	pft.M0086:Error in component: Bootloadable_1. The referenced Bootloader is invalid. Verify the Bootloader dependency is correct in the Bootloadable Component, then build project. Invalid bootloader elf file. Unable to read the elf file (D:\msys32 \home\ruilinhao\new_git\new\alios-lora\projects\Creator\ASR6501\alios_small.cydsn\bootloader.cydsn\CortexM0p\ARM_GCC_541 \Debug\bootloader.elf). The path does not exist.	TopDesign.cys...	Instance:Bootl...	alios_small
3	fit.M0050:The fitter aborted due to errors, please address all errors and rebuild.			alios_small

This is because SDK 4.0 adds bootloader, which requires compiling bootloader before compiling the alios_small project.

12. How to turn debugging on or off?

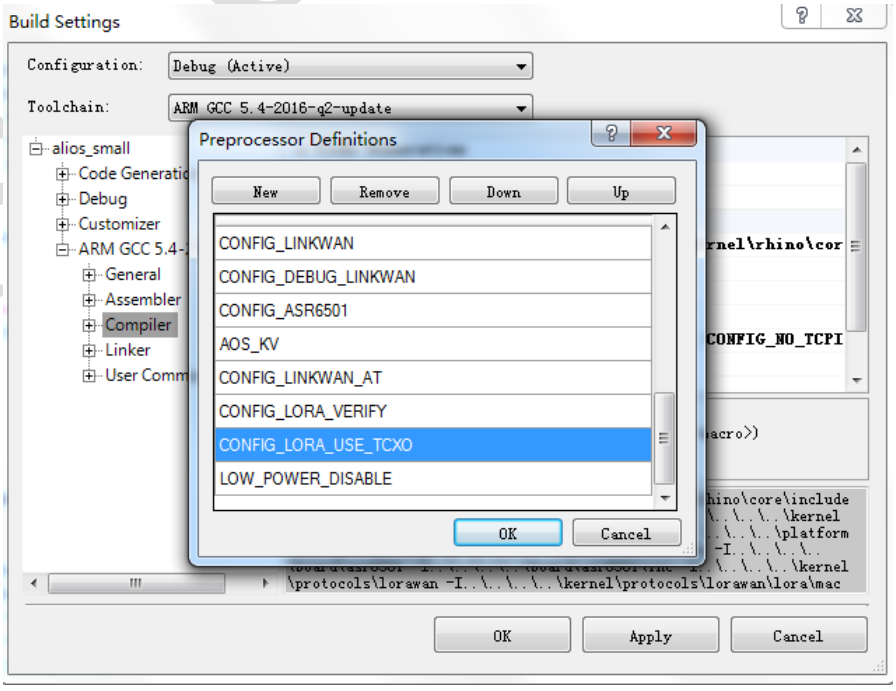
The debugging settings are shown below. The SWD option is to open debugging and the GPIO option is to close debugging.

In SDK V4.0, UART bootloader is added. When debugging, it is necessary to disable the Bootloadable first, and comment out the call to Bootloadable_1_Load() in “asr_board.c”.



13. How to modify SDK to support XO crystal oscillator?

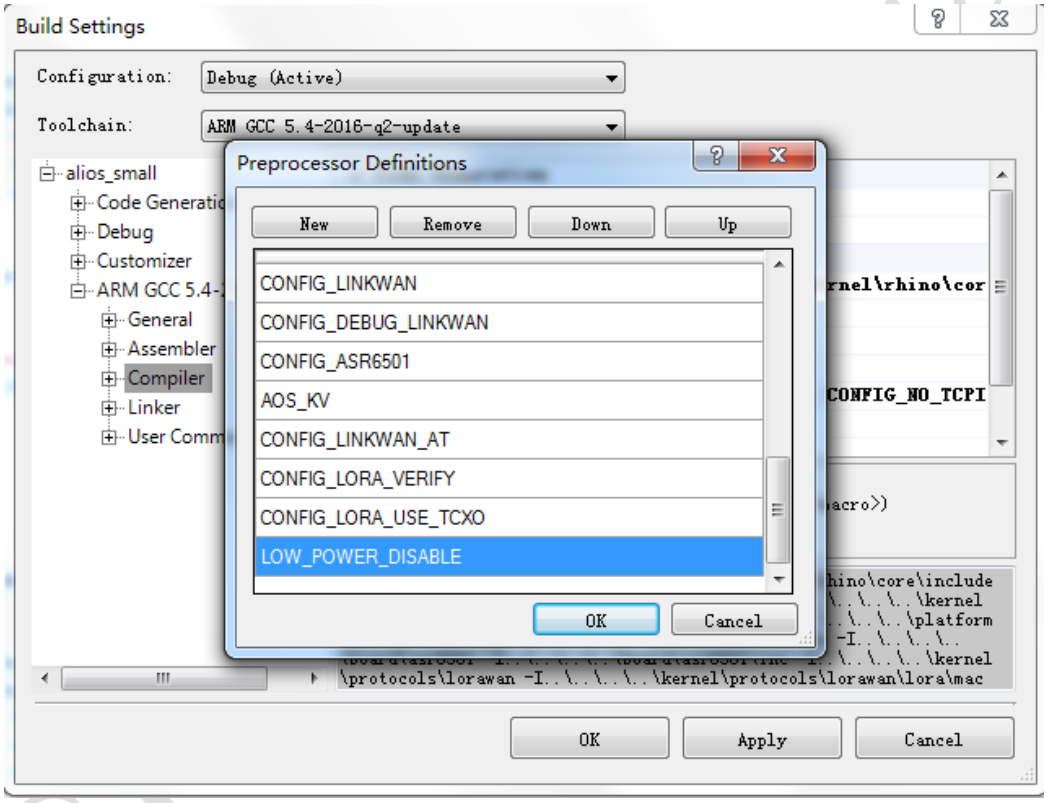
ASR650X uses the TCXO crystal oscillator by default. If users want to use the XO crystal oscillator, please remove CONFIG_LORA_USE_TCXO from the macro definition of Project->Build Settings.



14. How to turn on low power consumption?

After entering the low power consumption, it is necessary to wake up before testing. In order to test conveniently, SDK turns off the low power function by default. Please remove LOW_POWER_DISABLE from the macro definition of Project->Build Setting.

After the device enters the low power consumption, it can use any character to wake up the device. However, when transmitting over 40 kbps, the UART initial partial bytes may be transmitted by mistake and the AT command will return an error. It is recommended to use "000000000D0A " (hexadecimal system). After waking up, the AT+CLPM command can be used to make the device enter the deep sleep status again.



15. How to configure automatic networking?

For testing convenience, configure with AT command by default. There are two ways to access the network automatically after powered-on:

- AT command configuration

  AT+CJOIN=1,1,8,8

  Using the command “AT+CJOIN” can access the network automatically. The specific parameter is described in the AT command document.

- Code modification

  Modify “LWAN_DEV_CONFIG_DEFAULT” in the function “init_lwan_configs” of “linkwan.c”.

16. How to change the device information in the code?

- AT command configuration
  OTA mode uses the commands “AT+CDEVEUI”, “AT+CAPPEUI” and “AT+CAPPKEY”, ABP mode uses the commands “AT+CDEVADDR”, “AT+CNWKSKEY” and “AT+CAPPSKEY”.
- Code modification
  For device triple information, please modify “LWAN_DEV_KEYS_DEFAULT” in the function “init_lwan_configs”.

17. How to use ABP mode?

- AT command configuration
  Use the commands “AT + CDEVADDR”, “AT + CNWKSKEY” and “AT + CAPPSKEY” to modify the device information, and use the command “AT + CJOINMODE” to modify the access mode.
- Code modification
  Modify “LWAN_DEV_CONFIG_DEFAULT” and “LWAN_DEV_KEYS_DEFAULT” in the function “init_lwan_configs”

18. How to configure the same-frequency and different-frequency nodes?

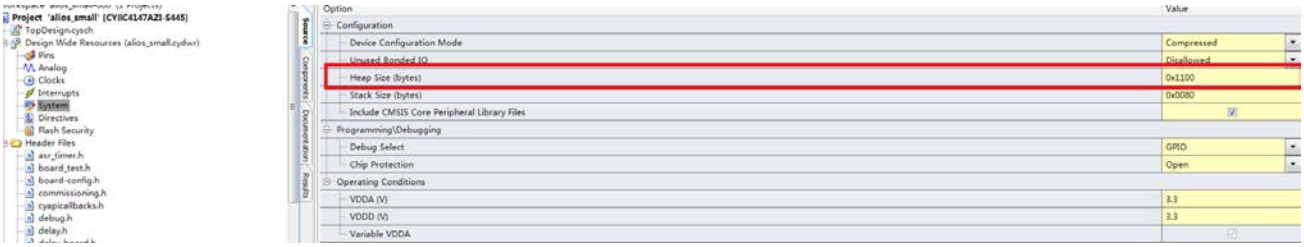
- AT command configuration
  AT+CULDLMODE=2
- Code modification
  Modify “LWAN_DEV_CONFIG_DEFAULT” in the function “init_lwan_configs”.

19. How to configure CLASS B nodes?

- AT command configuration
  Before joining, use the command “AT+CCLASS=1” to modify the device to CLASSB.
- Code modification
  Modify “LWAN_DEV_CONFIG_DEFAULT” in the function “init_lwan_configs”

20. How to configure Heap Size?

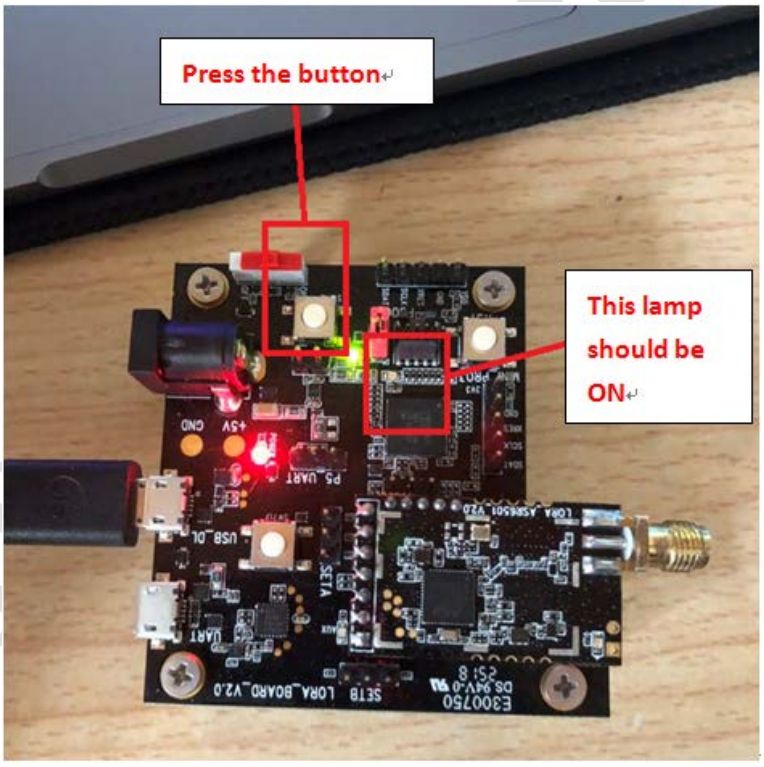
At present, the heap size is smaller. If more heap memory is used in the project, please increase the heap size here.



In addition, if users need to change all remaining RAM into heap, users can define the variable "_cy_heap_size" in "cm0plusgcc.ld", and then replace "CYDEV_HEAP_SIZE" in "g_mm_region" with "_cy_heap_size" in "soc_impl.c".

21. Can't burned the device?

When burning, the base board should normally turn on two green lights and one red light. If only one green light appears in the following picture, please press the "SW716" button to reset. Users can burn it when the green light is on.



22. How to encrypt triple information?

Please use the command "AT + CKEYSPROTECT" to encrypt triple information. See the AT command document for specific usage.

23. How to configure to join the network?

- Modify node device triple information

Use the commands “AT+CDEVEUI”,” AT+CAPPEUI” and “AT+CAPPKEY” to modify the device triple information

- Modify the node configuration of same-frequency and different-frequency(CN470A)
  Ali LinkWAN protocol specifies that nodes are divided into same-frequency nodes and different-frequency nodes, which can be configured by “AT+CULDLMODE”. The standard LoRaWAN CN470 does not need to be configured.
- Modify the frequency group mask of the node according to the gateway settings
  CN470 and CN470A can use “AT+CFREQBANDMASK” to configure the frequency group mask. Each bit of the mask is denoted by one frequency group (8 frequency points), up to 128 frequency points. Please refer to AT command documentation for detailed parameters.
- Use AT command to join the network
  Use the command “AT + CJOIN” to activate the joining.

24. What is the difference between AsrLib.a and AsrLib_small.a?

ClassB and AT test command code are removed from AsrLib_small.a, and the code size can be smaller.