

RTL8722DM

Build and Debug Environment Setup – IAR

This document illustrates how to build Realtek low power Wi-Fi software under IAR SDK environment.

Application Note

1 IAR Build Environment Setup

This chapter illustrates how to setup IAR development environment for Realtek Ameba-D SDK, including building projects, downloading images and debugging.

1.1 Requirement

1.1.1 IAR Embedded Workbench

IAR provides an IDE environment for code building, downloading, and debugging. Check "IAR Embedded Workbench" on <u>http://www.iar.com/</u>, and a trail version is available for 30 days.

Note: To support ARMv8-M with Security Extension (Ameba-D HS CPU, also called KM4), IAR version must be 8.30 or higher.

1.1.2 J-Link or RLX Probe

Application Note

If you need to download images or debug code for Ameba-D with IAR, then a J-Link adapter or a RLX Probe is necessary.

Note: For Ameba-D CPU, the J-Link version must be v9 or higher.

1.2 Hardware Configuration

The hardware block diagram of Ameba-D demo board is shown in Fig 1-1.

- USB TO UART: supply power and print logs, baud rate is 115200 bps.
- SWD: SWD interface, used for image downloading and debugging with IAR.
- Reset button: reset Ameba-D to run firmware after IAR completes downloading.



Fig 1-1 Ameba-D demo board

© REALTEK 2020. All rights reserved.

1.2.1 Antenna description

The DUT has three types of antennas, both of which are 2.4 & 5GHz dual band antennas. The information is as follows. PIFA & Dipole antennas are connected with module by IPEX.

- 1) PCB Onboard Antenna, 2.4G peak gain 4.1dbi, 5G peak gain 3.9dbi.
- 2) PIFA Antenna, 2.4G peak gain 3.5dbi, 5G peak gain 5dbi.
- 3) Dipole Antenna, 2.4G peak gain 3dbi, 5G peak gain 5dbi.

1.2.2 Connecting with J-Link

Refer to Fig 1-2 and Fig 1-3 to connect Ameba-D SWD interface with J-Link.



Fig 1-2 J-Link and SWD connection diagram



Fig 1-3 J-Link and Ameba-D SWD connection

1.2.3 Connecting with RLX Probe

Application Note

Refer to Fig 1-4 and Fig 1-5 to connect Ameba-D SWD interface with RLX Probe.

© REALTEK 2020. All rights reserved.



Fig 1-4 RLX Probe and SWD connection diagram



Fig 1-5 RLX Probe and Ameba-D SWD connection

1.3 How to Use IAR SDK?

1.3.1 IAR Project Introduction

Because Ameba-D is a dual-core CPU platform, two workspaces are provided to build for each core in project\realtek_amebaD_va0_example\EWARM-RELEASE.

- Project_lp_release.eww (KM0 workspace) contains the following projects:
- km0_bootloader
- km0_application
- Project_hp_release.eww (KM4 workspace) contains the following projects:
 - km4_bootloader
 - km4_application
 - km4_secure

Each project in KM4 workspace has different build configurations, as Table 1-1 shows.

	Table 1-1 Build configurations f	or KM4 project	
Project	Build Configuration	Configure TrustZone	Enable MP
km4_bootloader	km4_bootloader - is ¹	Ν	Ν
	km4_bootloader - tz ²	Y	Ν
km4_application	km4_application - is	Ν	Ν
	km4_application - tz	Υ	Ν

Table 1-1 Build configurations for KM4 project

Application Note

All information provided in this document is subject to legal disclaimers.

© REALTEK 2020. All rights reserved.

382REALTEK

	km4_application - is (mp ³)	Ν	Υ
	km4_application - tz (mp)	Y	Y
km4_secure	km4_secure - tz	Υ	Ν
	km4_secure - tz (mp)	Υ	Y

Note:

- 1. The configuration items with "-is" are ignore secure configuration, which are designed for applications that do not use TrustZone.
- 2. The configuration items with "-tz" are TrustZone configuration, which are designed for applications that use TrustZone.
- 3. The configuration items with "mp" are mass production configuration, which are designed for generating MP image.
- For applications that do not use TrustZone, users should apply ignore secure configurations as Table 1-2 shows. The km4_secure project which contains TrustZone-protected code, is not used.

Table 1-2 Configurations for project with/without TrustZone

• For applications that use TrustZone, users should apply TrustZone configurations as Table 1-2 shows.

Project	TrustZone	Normal Image	MP Image
km4_bootloader	Ν	km4_bootloader - is	km4_bootloader - is
	Υ	km4_bootloader - tz	km4_bootloader - tz
km4_application	Ν	km4_application - is	km4_application - is (mp)
	Υ	km4_application - tz	km4_application - tz (mp)
km4 secure	Υ	km4 secure - tz	km4 secure - tz (mp)

At the top of the Workspace window, there is a drop-down list where you can choose a build configuration for a specific project.



Fig 1-6 How to choose a build configuration

1.3.2 IAR Build

When building SDK for the first time, you should build both KM0 project and KM4 project. Other times, you only need to rebuild the modified project.

1.3.2.1 Building KM0 Project

The following steps show how to build KM0 project:

- (1) Open project\realtek_amebaD_va0_example\EWARM-RELEASE\Project_lp_release.eww.
- (2) Make sure km0_bootloader and km0_application are in Workspace. Click **Project** > **Options**, **General Options** > **Target** > **Processor Variant** > **Core**, verify the CPU configurations according to Fig 1-7.
- (3) Right click the project and choose "Rebuild All", as Fig 1-8 shows. The km0_bootloader and km0_application should compile in order.

Ameba-D Application Note

SZREALTEK

Application Note

Indiana Indiana Fano 9 D'Organi, In Johann -0 9 JULIA (1930) MALLET BALL	A A A	
The second secon	Campon Table Avanyan Sarther Checking Cather Checking Cather Checking Cather Fold Build Anton Partie Dates Fold Build Anton Partie Distage Biologen Cather Fold Biologen Cather Fold Biologen Cather Cather Distagen Biologen Distagen Biologen Bio	Aller from 1 Alle 1.000 Kile 1.000
West Apr 23 2819 16 2817 WP Endow	= 10	Distance in the second s

Fig 1-7 KM0 processor options



Fig 1-8 Building KM0 project

© REALTEK 2020. All rights reserved.

Note: After building each project, IAR will pop up a command prompt window to execute post-build action to generate images from executable files. This may takes several seconds. Don't stop it while it is in progress. After post-build action is completed, the window would disappear automatically.



(4) After compile, the images km0_boot_all.bin and km0_image2_all.bin can be seen in project\realtek_amebaD_va0_example\EWARM-RELEASE\Debug\Exe\km0_image.

1.3.2.2 Building KM4 Project

Application Note

The following steps show how to build KM4 project:

- (1) Open project\realtek_amebaD_va0_example\EWARM-RELEASE\Project_hp_release.eww.
- (2) Refer to 1.3.1 and choose the build configurations for each project according to your application.
- (3) Click Project > Options, General Options > Target > Processor Variant > Core, verify the CPU configurations according to Fig 1-9.

Project by means 145	Emissibul Workburdt IDE	-Arm 8:203	1,913
DOLLO IN A	the bay years to \$1010.0		10.43
rodupas Industrian 1 Film	Options for tools "boot ag	alater (example)	
Construction of the second of	Terrami Funda Andrea Austras Checking Of a + Domptio Automation Calcular Doment W Calcular Doment M Ca	Laborat Series I Killer I 2006 Killer 2008 Twor begel Littery Collapsenies Laborat Series Frances result Constant Series Constant Series	
Onemer (Ind.ambreen) Ind.ambreen Log The Say IS, 2717 (b)	UKE UKELDAR UKELDAR UKELDAR UKELDAR UKELDAR NULA III mm M-134 UKELDAR	bolas soli 8 Deda 10 Deda 1	
+ .		(K) (Seed	J

Fig 1-9 KM4 processor options

© REALTEK 2020. All rights reserved.

%REALTEK

(4) Right click the project and choose "Rebuild All", as Fig 1-10 shows. The km4_bootloader, km4_secure and km4_application should compile in order.

the last year brand the	en fant Marden Hern			
DOUGHAL	0.000	14.6	145-0-08 SOCOUPERS	
Film				
IS Different Department				
-d Carri, taxtonimi i	Carlors			
	Dorogity			
0	Avauld All			
	- tieat			
	C-STAT Basic Analysis	2		
	New Build			
	AM	84		
Orener fort.estime	Names .			
Canada Latin	Weissien Darmed Barmer	1.	•	
Tha Segration of the second	Open Containing Router His Incognition		ingen File (di 247 Symeric) staddol Woldard I Nampro	in the
	for as holds			
*i		_		C.C.
Bally behaving				
Desir and make the oriented prope	4		there's having the	

Fig 1-10 Building KM4 project

Note:

Application Note

- When TrustZone is enable, the km4_secure project must be built before the km4_application project. When TrustZone is not used, there is no need to compile the km4_secure project.
- After building each project, IAR will pop up a command prompt window shown in the figure below to execute post-build action to generate images from executable files. This may takes several seconds. Don't stop it while it is in progress. After post-build action is completed, the window would disappear automatically.

C/Workew/Apineti2_cellare	
te_lew = 1 vtart = 20000000, and = 200000000, here = 20000000 layer file start 0 costs size 0	*
start = 198055888, and = 19817174, hass = 100000000 Angest file slass 022000 report file slass 022000	
start - simestab, and - siddladd, kain - simestan Drynn film thar 1 20640 Start sime 30500	
chars - 20000000, and - 20000000, base - 20000000 Inget File size: 0	3
Belong Goo Keet, Longe Setg, Jongs I. p. Min Belong Koo Keet, Longe Sena, J. p. Min	
Relace the long strengt strengt to the Relation in the long strength of the statement in the long strength of the statement is the statement of the statement	
Relang Size Soul, Inage Soul, Inage 2, all, him Relang Size Soul, Inage Soul, Inage 2, all, him 1973	
148 E57 Linkey 98.38.1.114.402 For alls	
the second state and a second state	

(5) After compile, the images km4_boot_all.bin and km0_km4_image2.bin can be seen in **project\realtek_amebaD_va0_example\EWARM-RELEASE\Debug\Exe\km4_image**. For MP configurations, the km0_km4_image2_mp.bin would be generated instead.

© REALTEK 2020. All rights reserved.

1.3.3 IAR Download

The generated images can be downloaded in two ways:

- IAR J-Link or RLX Probe SWD (introduced in the next section)
- Ameba-D ImageTool, refer to Image Tool User Guide for more information.

Ameba-D demo board supports using J-Link and RLX Probe SWD to download and debug. Image of each project can be download individually.

Note: Considering KM4 is powered-on by KM0, you should make sure that KM0 has boot up already before downloading images to KM4. Otherwise, for J-Link, J-Link can't connect to KM4 and show the error message as Fig 1-11 shows. For RLX probe, RLX Probe driver can't be opened under KM4.

	10.04	14.0.2.5.4.6.0.0.0.8.8.8.0.1.2.4.2
Plane 4 - Charles Martin Constrained 	Text Instants	Constitutions find cores to Coresign codes About defining resource
mailes		*3
Log Tro-Bay 05, 2018 164	1234 JAP Entredated Work	anak 8 38 1 42 din georg Pilon (1893) Byrken of Federal And Starkhowski 8 Transmislan

Fig 1-11 J-Link cannot find KM4

As a result, if the Flash memory is empty, the sequence to download images is:

- (1) Download for km0_bootloader and km0_application projects
- (2) Click Reset button on demo board to make KM0 boots up
- (3) Download for km4_bootloader and km4_application projects

During development, if Flash memory is not empty and KM0 can boot up successfully, then you can download updated images to KM4 directly, and there is no need to re-download for KM0.

The following steps show how to download image for the target project with IAR. If there is an error like Fig 1-24 displayed in IAR window, refer to 1.3.4.3.

- (1) Choose the target project display in Workspace window, for example, km4_bootloader as Fig 1-12 shows.
- (2) If using J-link debugger, check whether the J-link debugger setting is correct.
 - a) Click Project > Options > Debugger > Setup > Driver, and choose "J-Link/J-Trace", as Fig 1-13 shows.
 - b) Click **Debugger** > **J-Link/J-Trace** > **Connection** > **Interface**, and choose "SWD", as Fig 1-14 shows.

O Print No. or an I will be	1-1-1-1-1		10310.00.00
Trans I in annual list for the last the man inset in D, C in D =			
105 adulto (106 partoso forgana 109 109			
The second secon		annand a thu it's fully an under a fairly and the second second second second second second second second second	

Fig 1-12 Switching to the target project view

est mainten Ditter	Carrow hit man Terra		
Personal for exercise 	Entrype Innyn llatten 1995 Antoine Harfor Danisog Crise Langele Harford Danisog Harford Danisog Harford Danisog Harford Harmon Har Har Har Har Har Har Har Har Har Har	From Differ Tom Tomm Tom Tomm Tom Tomm Tom Tom Tom Tom Tom Tom Tom Tom Tom Tom Tom	Lise

Fig 1-13 J-Link debugger setup

Application Note

Discussion Sector Pro- Trans Trans Discussion Trans <t< th=""><th>Provide and and any sector any se</th><th>ten tall then Propert 1814</th><th>Task memory take</th><th></th><th></th></t<>	Provide and and any sector any se	ten tall then Propert 1814	Task memory take		
Al. All Difference fording Prove Difference fording Of Control for provide Difference fording Of Control for provide Difference fording Of Control fording Difference fording <tr< th=""><th>Al America Forder Pro-</th><th>DOMP HILES</th><th>Link. Roll</th><th>LAG- 0 - 0.8 (10.4 - 1 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2</th><th></th></tr<>	Al America Forder Pro-	DOMP HILES	Link. Roll	LAG- 0 - 0.8 (10.4 - 1 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2	
Al Annager Al Ann	Al Learner (Index The Second			Local Division of the	
Image: Image: <th>Statute Statute Statute Statute</th> <th>N. ANTONIO - Debra</th> <th>Distory for nom 'bad,</th> <th>and any second</th> <th></th>	Statute Statute	N. ANTONIO - Debra	Distory for nom 'bad,	and any second	
Manager Tropied Task	Manager (1994)	Pres 2 Project by junction 1 - 4 4 4y4 - 4 4 4 4y4 - 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	Tanges Same Dollars Said Andrea Said	Linearity and a second	
through the first test test test test test test test t	Manager (1964)	· · · · · · · · · · · · · · · · · · ·	Indian Don		
		Unsager	1.05	CLAIR LORA	(Jee

Fig 1-14 J-Link interface setup

- (3) If using RLX Probe, check whether the RLX Probe setting is correct.
 - a) Click Project > Options > Debugger > Setup > Driver, choose "GDB Server" and don not choose "Run to", as Fig 1-15 shows.
 - b) Click **GDB Server** > **GDB Server**, and put correct value in "TCP/IP address or hostname", as Fig 1-16 shows. The value should be: *localhost, port number*.
 - KM4: The default port numbers is 3333, which is set in project\realtek_amebaD_va0_example\EWARM-RELEASE\probe\cm4\rlx_probe0.cfg.
 - KM0: The default port numbers is 2331, which is set in project\realtek_amebaD_va0_example\EWARM-RELEASE\probe\cm0\rlx_probe0.cfg.

c) Open RLX Probe in **project\realtek_amebaD_va0_example\EWARM-RELEASE\probe\cm4\cm4_RTL_Probe**, as Fig 1-17 shows. **Note**: The board must be reset before opening the RLX Probe, otherwise the connection may fail.

Carloris for rank fight	AND A REAL PROPERTY OF A REAL PR	
A La una a A La	Anter Lange Anter Anter States Anter Anter Angel Anter	
With States and States		

Fig 1-15 RLX Probe setup

Andres Co.	Ourmen for cash fight,	and the set		
11001 (2.000 • 000000000 • 000000 • 000000 • 000000 • 00000 • 000000 • 00000 • 000000 • 00000 • 000000 • 00000 • 000000 • 00000000 • 0000000 • 000000000 • 0000000000		of low- house the	, Anna Salara	
C Bits B Bits Bits B Bits B Bits Bi	Service Relationship Calcillenship Calcillenship Calcillenship Calcillenship Calcillenship Calcillenship Calcillenship Calcillenship	107707 - 1409-004 or first faces 177 - 6. 1, 1000		
	Cardinage Autorities Totalage Social House Trans Trans	The constantion production by		~
749 Too or 16, 3010 1 Too or 16, 3010 1	171007401/00000 171000-007 -721000			1.00

Fig 1-16 RLX Probe interface setup

CW/rdsetures//cellar	The Part of the
This HCU supports the prafiling counterst Progrem flow prediction disabled?Instruction college enabled?Data and unit	F(#6 180
Tache is implemented at Issail 1, and is Separate Instruction & Date Each Level 1 1-tache information.	est
1-Centre supports Brite-Bash1	
1-Cache ones not support Write-Allocation? The processor's Incache mumber of sets is 1121	
The processor's 1-taske number of weigh is 21 The processor's 1-taske number of lineatize is 3 Words The opposition of 1-taske along is 10 KM	
Level 1 D-Cache Shfoeation: D-Cache supports Mrite-Throught	
U-Cache supports Marife-Mast/ U-Cache supports Mean-GLincation/	
D-Sache exports Write-Milocation! The processor's D-cashe mader of sets is MM	
The processor's Draste mader of wags is 27 The processor's Draste mader of linecize in Maruts	
(manufactorial a contract and a contract a c	
SUCCESS to Trigger Dis Cere	
/**************************************	

Fig 1-17 RLX Probe window

(4) Click Project > Download > Download active application, image downloading starts.
 When downloading, Ameba-D prints the log, as Fig 1-18 shows. You can check the log to see if download is successful.

S REALTEK

[F]ashIntt	inage_size fAE, link_address/B000000, flags:#
[FlashErase]	block_start;#, block_size:1000
[FlasTairlts]	block_start:0, offset_into block:0, count:f40
[FlashInlt]	image_size:E2000, link_address:B006800, flags:H
[FlashErase]	block start:6000, block size:1000
[F]ashErase]	block start:7000, block size:1000
[FlashErase]	block start: \$6668, block size: \$800
[FInstErase]	block_start(9980, block_size(1000
[F]#shErase]	block_start:a000, block_slaw:1000
[F]ashEnase]	block start:b000, block size:1000
Flasterase	block_start:c000, block_size:1000
[F]astErase]	block_start:d000, block_size:1000
[FlashErwse]	block startienen, block slaeiteen
FlashErase	block_start:f000, block_size:1000
[FIRSHEYASE]	block_start:10000, block_sl20:1000
FlashErasa	block_start:11000, block_size:1000
(Flasherite)	block_start16860, affiat_into_block10, count10800.
[f]ashErase]	block_start:12000, block_size:1000
(FlashErase)	block_start:13000, block_s120:1000
[#IashErase]	block_start:14800, block_size:1000
(FlashErase)	Block_start:13800, block_site:1000
(flashtrase)	block_start:10000, block_size:1000
[FlashErase]	Block_start:17000, block_size:1000
[FIMSHErms#]	block_start:18000, block_size:1000
(FlashErase)	block_start:19000, block_\$110:1000
[FlashErase]	block start:1e000, block size:1000
(FlashErase)	block_start:16000, block_s119:1000
(FlashDrase)	block_start:1c000, block_wlre:1000
[FlashErase]	Block_start:10000, block_sliw:1000
[Viashirits]	block_start:12000, offsat_ints_block:8, count:c000
[FlashErase]	block_start:1e000, block_size:1000
[Flashirase]	block_start:1f000, block_size:1000
[FlashEriase]	bluck_start:20000, block_size/1000
[FlashErase]	block start:21000, block size:1000
(FlashErase)	block start:22000, block size:1000
FFLastifrase	Block start:23000, block size:1000
TEL APPERTUNE	Black start-land, black site land

Fig 1-18 Downloading log

(5) You can also erase all parts of the Flash memory if necessary.

O hours build		Max Deciminant Strainbart 308	4+1	AMA INCIDENT	-
for last the	-	and little from Wesser In	۰.		
b d sa Ø matern Pers Pers		Add Text, Add Texter, Texter Texter, Add Texter, Add Texter Texter, Text Texter Texter,		The design of the second s	
	44	Research			
-OM projects		Course Rev Property.			
-414		later. in	oet:		
		Venime Control Samon			
-41 48 14		Plan	-		
-C il Alben	-	treate	÷.		
		Remaind 44			
Carecone		Sector and	14		
		1.000 Math. and an			
The local division of		11111111111111111111111111111111111111	2		
the second second		Contraction 1			
	2	Second and Cong 19			
The Asia EX.	Ľ	others to forming larger		THE D Process First of First Towner Concerned Westmen's Dispersion and the	-
		there is the dark (interagent)	÷		
		States States	۰.	The set of later states of the	
		Line Lucie	-	Description of the	_
Real Designed		010 100-00		frank manager	
trans all of party of t		CHES-Manager			

Fig 1-19 Erasing Flash memory

1.3.4 IAR Debug

You can debug or trace KMO and KM4 system individually with J-Link or RLX Probe SWD.

Note: Considering KM4 is power-on by KM0, you should make sure that KM0 has already boot up before debug KM4. For KM0, there is no such requirement because KM0 is power-on immediately after reset.

1.3.4.1 J-Link Debug

Follow the steps to debug and trace code of target project with IAR by J-Link:

- (1) Set the target project as active project and verify the debugger configurations as step (1) and (2).
- (2) Click Project > Download and Debug or Project > Debug without Downloading.
- Download and Debug: downloads the application and debug the project object file. If necessary, a make will be performed before download to ensure the project is up to date.
 - Debug without Downloading: debug the project object file
- (3) When starting IAR C-SPY to debug, it will firstly reset the target CPU and run to the main function, as Fig 1-20 shows.
- (4) Toggles a breakpoint at the statement or instruction that contains or is located near the cursor in the source window. The "Toggle Breakpoint" button is on the debug toolbar, as Fig 1-21 shows.

The begate		manu a	1	- Brill	
Files Files -4. M Augu -4.		1 wine 1 - mag as - 400, MAR, MAR, M, - ma, MARDAN, MAR, MAR, MAR, M, - mardanic man - mardanic mardanic - mardanic mardanic - mardanic mardanic - mardanic mardanic - mardanic mardanic - mardan	1000 1000 1000 1000 100000000	Disease Characteristic Canadras (15% Canadras (15%) Canadras (15%) Canadras (15%) Canadras (15%) Canadras (15%) Canadras (15%) Canadras (15%) Canadras (15%) Canadras (15%) Canadras (15%)	No Tao Setta Settan Bel Tao Setta Settan Settan Settan Settan Settan Settan Settan
and an and bootest	8-1 4-4, () ()	(5 Secolitical	4.4	* Second Second	1111 1.1
Log Thu April 64, 2018 110 13 Thu April 64, 2018 110 13 Thu April 64, 2019 110 13 Thu April 64, 2019 110 13 Intel , ample online, all up of	10 User Recet 40 Elsyma dow 40 Econteil orb 41 integr 211	Rocket (2011) (Arechard Rocket (2011) (Arechard) Rocket (2011) (Arechard) (2011)	anninessa	en er er en er	uriper di prografi
Test in the			_		10.2
The second second					

Fig 1-20 Running to main() when debug

Ameba-D Application Note

S&REALTEK

1.0			Ares 1	e Shara
• • • •	<pre>inter == -it2_ctrit_time(_jt_jmit inter == -it2_ctrit_time(_jt_jmit) inter == -it2_ctrit_</pre>	- 12 - 12 - 12	Concernence Interface for Interface for Inte	Ind The Annual Sectors Ind The Industry Ind The Industry Ind The Industry Indiana Indian Indio Indiana Indiana Indiana
Anial I & same		1.0 4		And and a second second
et revel Thatadi An (Anerica Aner) An (Cr)	(10) Haybini (100) Hil Schleiff, Hil Agerica Annolai , anni all 1997, an	يحتدونون	41245246-62	aport image
		Autor control and and anti- anti-anti-anti- anti-anti-anti- anti-anti-anti- anti-anti-anti- anti-anti-anti- anti-anti-anti-anti- anti-anti-anti-anti-anti-anti- anti- anti-anti-anti- anti-anti-anti- anti- anti-anti-anti- anti- anti-anti- anti- anti-anti- ant	Augustion and a second	A series of the

Fig 1-21 Toggle breakpoint

(5) You can trace code step by step with "Step Into" or "Go" until triggering a breakpoint. These function buttons are available on toolbar.

1.3.4.2 RLX Probe Debug

Follow the steps to debug and trace code of target project with IAR by RLX Probe:

- (1) Set the target project as active project and verify the debugger configurations as step (1) and step (3).
- (2) Click Project > Attach to Running Target.
- (3) Set the target address.

When starting debug with RLX Probe, it will firstly reset the target CPU. If you want to run to a target address at first, you can set the PC address in **project\realtek_amebaD_va0_example\EWARM-RELEASE\probe\cm4\rlx_probe0.cfg.** The method is that uncomment "ew .pc = 0xxxxxxxxx" and change the address to the appointed value, as Fig 1-22 and Fig 1-23 shows.



Fig 1-22 Setting the target address

32/REALTEK



Fig 1-23 Running to the target address when debug

- (4) Toggles a breakpoint at the statement or instruction that contains or is located near the cursor in the source window. The "Toggle Breakpoint" button is on the debug toolbar, as Fig 1-21 shows.
- (5) You can trace code step by step with "Step Into", or "Go" until triggering a breakpoint. These function buttons are available on toolbar.

1.3.4.3 IAR Debug or Download Error

Because Ameba-D has two CPU cores, and a post-build script will be run after make, sometimes the debug or download thread cannot get the correct AXF file for debug or download, the error like Fig 1-24 happens.

First 0 +	- a lange	
ID Contrast, by dense ID Contrast, by dense	<pre>interference interference interference</pre>	
181	1	

Fig 1-24 IAR debug or download error

To avoid this error, you should build manually before debug or download, and disable auto-build from **Tools** > **Options** > **Project** > **Make before debugging**, as Fig 1-25 shows.



Fig 1-25 IDE options

1.3.5 IAR Memory Configuration

1.3.5.1 Configuring Memory from IAR IDE

In order to allow users to manage memory flexibly, there are some configurations to put some code into certain memory region. In IAR workspace, there are "@PSRAM" and "@SRAM" group. The code in "@PSRAM" group would be linked and loaded into PSRAM, and the code in "@SRAM" group would be linked and loaded into SRAM. The rest of code will be placed on Flash and execute in place.

Note: Considering only SRAM and PSRAM contains secure regions, the code in km4_secure project should be placed either in "@PSRAM" or in "@SRAM". It can't be placed outside these two groups.

Vorkspace	×
Linvî tappletal ni kiz	-
Lies .	۰ ب
🛛 🗖 -reject_ho_relesse	
1,1 🗣 km4 upplication is	4
= 0)-6-649	~
IN 🖷 QEDAM	*
li e aner i h	
101 🗰 11	
101 a in	
m in contracto e c	
H = 37-83-84	5
IN COFPAN	
Det vice The applicate. The host	

Fig 1-26 Memory location configuration

1.3.5.2 Configuring Memory from ICF File

IAR uses ICF (IAR Configuration File) to configure memory allocation, so users can configure memory allocation by ICF file.

ICF file of Ameba-D location:

- "project\realtek_amebaD_va0_example\EWARM-RELEASE\ rtl8721dhp_image2_is.icf" for ignore secure project
- "project\realtek_amebaD_va0_example\EWARM-RELEASE\ rtl8721dhp_image2_tz.icf" for TrustZone project

If having a good understand of the format of ICF, users can modify the section location in ICF file.

1.4 How to Build Sample Code?

The example source code is located in **project\realtek_amebaD_va0_example\example_sources**. To build sample code, you should copy the "main.c" file in the target example to **project\realtek_amebaD_va0_example\src\src_hp** and replace the original one.

For example, you can copy "main.c" from project\realtek_amebaD_va0_example\example_sources\I2C\mbed\i2c_int_mode\src to use i2c_int_mode example code, as Fig 1-27 shows.



Fig 1-27 Building sample code

1.5 Used Memory Size Calculation

This section explains how to calculate used memory size by users in IAR project, whose version is IAR 8.30.1 or higher. You can refer to "km4_application.map" to observe them after project build. This file can be found in the following folders:

- Project folder: project\realtek_amebaD_va0_example\EWARM-RELEASE\Debug\List\km4_application
- IAR GUI's folder: Output

Workquice	• 8.3
*	
Files	۰ ،
km4_application - is	
- COPSRAM	-
-E COSPAN	
-E map	12.15
-III application	
iii 🛍 eudio	
-m iii bluetooth	
-iii 📫 cmsis-dap	
-0.0 m drivers	
-E mbed	
-E misc	
-E de user	
-m mutities	
	4
- I km4_application av	
al km4_application map	

1.5.1 Memory Section

- A7 (PSRAM): This section is read-write data in PSRAM (0x2000000 to 0x23FFFFF).
- BTTRACE: This section is reserved for BTTRACE.
- A5 (XIP): This section is read-only data in XIP.

= 0x1007C000-1;

- A4 (SRAM): This section is read-write data in SRAM.
- P1 (SRAM): This is BSS section in SRAM.

1.5.2 Memory Size

1.5.2.1 Memory Size in SRAM

There are two sections resident in SRAM, which are A4 and P1. As we can see from the map file, for standard SDK, these two sections use almost all of the memory space from SRAM (476KB).

• A4 has size 0x17ad7.

"A4"1		0x17ad7	
EMAGE2	0x1000*5000	Ds1Ted7	-OBLOCK>
.cam Imaged.entry	0x1000*5000	0x20	(Block)
.image7.entry.date re data	0s1000+5000	0101	stiffling app statt.+ [1]

P1 has size 0x5dfc8.

*B1*1			tetates.	- marci
.can hwap.data		0x1001*cwe0	0150000	<block></block>
.ram image2.hftram	-data			
		REIGG1*canG	0x50000	Glicko
.bfnram.data	uninit	Read * caref	0:0002:00	freertos heap5 config.o [1]

So totally 0x17ad7 + 0x5dfc8 = 470K bytes memory in SRAM is used.

The total SRAM space is defined in project/realtek_amebaD_va0_example\EWARM-RELEASE\rtl8721d_memory_layout_is.icf. define symbol ICFEDIT region HS BD RAM NS start = 0x10005000;

define	symbol	ICFEDIT_	_region_	HS	BD	RAM	NS	start
define	symbol	ICFEDIT	region	HS	BD	RAM	NS	end

For this case, the total size of SRAM is 0x1007C000 – 0x10005000 = 0x77000 = 476K bytes, there is still 6K (= 476K – 470K) bytes free SRAM space.

1.5.2.2 Memory Size in PSRAM

There is one section in PSRAM called A7, the memory space from PSRAM (4MB).

A7 has size 0x54800.

*A7*1			2::34800		
INC2 PERAM		0x200*0000	the 0	(Block)	
-pittem nn.hinn		02200*0000	0x54900	dincks	
-pingam_bigs		0x200*0000	0x54800	(Block)	
-ponan-bos	uninit	0x200*0000	0x54000	stw opt	nkbuf.o [1]

So totally 0x54800 = 338K bytes memory in PSRAM is used.

1.5.2.3 Memory Size in XIP

XIP can only place text section, so there is only one section called A5.

A5 has size 0x8afe8.

Application Note

*A5*1			OnBafe8	a second s
.slp image2.tent		05800*00480	0s8afe8	<h1ock></h1ock>
+text	and up the	03000*0020	Oxfc	app tank.u [1]
.text.or mog queue	create inter	C/A		
	po code	0xe00*011c	0x40	GE M90.0 [2]

So totally 0x8afe8 = 555K bytes memory in XIP is used.

1.5.2.4 Available Heap Size

When calculating total used memory size, available heap size after WLAN association and BT connection needs to be considered. In the above case, it is 56096 bytes.

	COM	6 - Tera	Term V	Ť		
File	Edit	Setup	Contr	of Wi	ndow	Help
operS	AC-		5	538	n	
trace_	TAU:			76	72	
ble_ce	d÷.	в÷.	\$1;	229	25	
oit_th	rea	в	5	780	21	
rte_in	ter	8	6	208	15	
rte_re	ev_	8	5	748	17	
LOCING	r_T	Б	5	2004	Z	
rtı _D an	u	B	5	216	18	
IMEMO	Aff bar <mark>e</mark>	le end, ave	ilable (n <mark>ap 5600</mark>	6	

Finally, you can use total SRAM 476K bytes to subtract these sections of memory to obtain totally free global memory and free heap in SRAM.

Formula is as below:

- SRAM free global memory: 476K "A4" "P1" = 476*1024 96983 384968= 5473 (bytes)
- Available heap: 56096 bytes.
- Totally free SRAM memory and heap: 5473 + 56096 = 61569 (bytes)
- Totally free PSRAM memory: 4*1024*1024 338 * 1024 (A7) = 3848192 (bytes)

1.6 warning

1.6.1 Federal Communication Commission Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does

Marealtek

cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that
- to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

IMPORTANT NOTE:

FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

This device and its antenna(s) must not be co-located with any other transmitters except in accordance with FCC multi-transmitter product procedures.

Refering to the multi-transmitter policy, multiple-transmitter(s) and module(s) can be operated simultaneously without C2PC.

This module is intended for OEM integrator. The OEM integrator is responsible for the compliance to all the rules that apply to the product into which this certified RF module is integrated.

Additional testing and certification may be necessary when multiple modules are used.

List of applicable FCC rules

This module has been tested and found to comply with part 22, part 24, part 27, 15.247 and 15.407 requirements for Modular Approval. The modular transmitter is only FCC authorized for the specific rule parts (i.e., FCC transmitter rules) listed on the grant, and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. If the grantee markets their product as being Part 15 Subpart B compliant (when it also contains unintentional-radiator digital circuity), then the grantee shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

USERS MANUAL OF THE END PRODUCT:

In the users manual of the end product, the end user has to be informed to keep at least 20cm separation with the antenna while this end product is installed and operated. The end user has to be informed that the FCC radio-frequency exposure guidelines for an uncontrolled environment can be satisfied. The end user has to also be informed that any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment. If the size of the end product is smaller than 8x10cm, then additional FCC part 15.19 statement is required to be available in the users manual: This device complies with Part 15 of FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.

LABEL OF THE END PRODUCT:

The final end product must be labeled in a visible area with the following "Contains TX FCC ID: TX2-RTL8722DM ". If the size of the end product is larger than 8x10cm, then the following FCC part 15.19 statement has to also be available on the label: This device complies with Part 15 of FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.

1.6.2 Industry Canada Statement

This device complies with Industry Canada's licence-exempt RSSs. Operation is subject to the following two conditions:

(1) This device may not cause interference; and

(2) This device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

(1) l'appareil ne doit pas produire de brouillage, et

(2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement."

Radiation Exposure Statement

This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator & your body.

Déclaration d'exposition aux radiations:

Cet équipement est conforme aux limites d'exposition aux rayonnements ISED établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 20 cm de distance entre la source de rayonnement et votre corps.

RSS-247 Section 6.4 (5) (6) (for local area network devices, 5GHz)

The device could automatically discontinue transmission in case of absence of information to transmit, or operational failure. Note that this is not intended to prohibit transmission of control or signaling information or the use of repetitive codes where required by the technology.

The device for operation in the band 5150–5250 MHz is only for indoor use to reduce the potential for harmful interference to co-channel mobile satellite systems;

The maximum antenna gain permitted for devices in the bands 5250–5350 MHz and 5470–5725 MHz shall comply with the e.i.r.p. limit; and The maximum antenna gain permitted for devices in the band 5725–5825 MHz shall comply with the e.i.r.p. limits specified for point-to-point and non point-to-point operation as appropriate.

L'appareil peut interrompre automatiquement la transmission en cas d'absence d'informations à transmettre ou de panne opérationnelle. Notez que ceci n'est pas destiné à interdire la transmission d'informations de contrôle ou de signalisation ou l'utilisation de codes répétitifs lorsque cela est requis par la technologie.

Le dispositif utilisé dans la bande 5150-5250 MHz est réservé à une utilisation en intérieur afin de réduire le risque de brouillage préjudiciable aux systèmes mobiles par satellite dans le même canal;

Le gain d'antenne maximal autorisé pour les dispositifs dans les bandes 5250-5350 MHz et 5470-5725 MHz doit être conforme à la norme e.r.p. limite; et

Le gain d'antenne maximal autorisé pour les appareils de la bande 5725-5825 MHz doit être conforme à la norme e.i.r.p. les limites spécifiées pour un fonctionnement point à point et non point à point, selon le cas.

This device is intended only for OEM integrators under the following conditions: (For module device use)

1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and

2) The transmitter module may not be co-located with any other transmitter or antenna.

As long as 2 conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

Cet appareil est conçu uniquement pour les intégrateurs OEM dans les conditions suivantes: (Pour utilisation de dispositif module)

1) L'antenne doit être installée de telle sorte qu'une distance de 20 cm est respectée entre l'antenne et les utilisateurs, et

2) Le module émetteur peut ne pas être coïmplanté avec un autre émetteur ou antenne.

Tant que les 2 conditions ci-dessus sont remplies, des essais supplémentaires sur l'émetteur ne seront pas nécessaires. Toutefois, l'intégrateur OEM est toujours responsable des essais sur son produit final pour toutes exigences de conformité supplémentaires requis pour ce module installé.

IMPORTANT NOTE:

In the event that these conditions can not be met (for example certain laptop configurations or colocation with another transmitter), then the Canada authorization is no longer considered valid and the IC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate Canada authorization.

NOTE IMPORTANTE:

Dans le cas où ces conditions ne peuvent être satisfaites (par exemple pour certaines configurations d'ordinateur portable ou de certaines co-

localisation avec un autre émetteur), l'autorisation du Canada n'est plus considéré comme valide et l'ID IC ne peut pas être utilisé sur le produit final. Dans ces circonstances, l'intégrateur OEM sera chargé de réévaluer le produit final (y compris l'émetteur) et l'obtention d'une autorisation distincte au Canada.

End Product Labeling

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: "Contains IC:6317A-RTL8722DM".

Plaque signalétique du produit final

Ce module émetteur est autorisé uniquement pour une utilisation dans un dispositif où l'antenne peut être installée de telle sorte qu'une distance de 20cm peut être maintenue entre l'antenne et les utilisateurs. Le produit final doit être étiqueté dans un endroit visible avec l'inscription suivante: "Contient des IC: 6317A-RTL8722DM ".

Manual Information To the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

The end user manual shall include all required regulatory information/warning as show in this manual.

Manuel d'information à l'utilisateur final

L'intégrateur OEM doit être conscient de ne pas fournir des informations à l'utilisateur final quant à la façon d'installer ou de supprimer ce module RF dans le manuel de l'utilisateur du produit final qui intègre ce module.

Le manuel de l'utilisateur final doit inclure toutes les informations réglementaires requises et avertissements comme indiqué dans ce manuel.