

RTL8710AF Quick Start Guide

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Table of Contents

Realtek Ameba RTL8710AF board	3
1. About Ameba RTL8710AF	3
2. Quick overview of Ameba RTL8710AF	4
3. Pre-Preparation	6
3.1 Software Preparation	6
The following are the software installation required:	6
3.2 Hardware Preparation:	8
4. Start Up	9
4.1 Connect the RTL8710AF board	9
4.2 Install mbed driver for Ameba	9
4.3 Arduino IDE1	0
4.4 Using module RTL-00 independently1	9
5. Shortcut on list of items to download2	0
6. Ameba further references	0

Realtek Ameba RTL8710AF board

1. About Ameba RTL8710AF

Ameba RTL8710AF is a highly integrated single-chip with low power consumption mechanism for IoT (Internet of Things). It combines an ARM®Cortex[™]-M3 MCU, Wi-Fi and provide a bunch of configurable GPIOs which are configured as digital peripherals for different applications and control usage.

RTL8710AF also integrates internal memory and flash to minimize IoT endproduct size and reduce your development cost.

Ameba RTL8710AF Wireless Development Board is a convenient development kit for makers. It separate into 2 boards, **RTL8710AF WiFi base Board** is the main mother board with all functions included, and the other **RTL-00 module** is a smaller form factor, which if user wishes to go to development mode- there is a CMSIS-DAP mode and J-LINK debugger mode development interface provided. Otherwise, RTL-00 module can be used independently from the main board, and the occupied space is smaller. When the RTL-00 module is charge via the Micro USB interface, the result should be the same with the result that it is connected to the main board.





RTL8710AF Wireless Development board

RTL-00 module

2. Quick overview of Ameba RTL8710AF

- CPU : 32-bit ARM Cortex M3, up to 83MHz
- Memory : 1MB ROM, 512KB SRAM and 1MB flash
- Integrated with 802.11 b/g/n 1x1 Wi-Fi
- Hardware SSL engine
- Maximum 17 GPIOs
- 1 SPI Interfaces and support both master and slave mode
- 3 UART Interfaces including two HS-UART and one log UART
- 2 I2C Interfaces and support both master and slave mode
- 4 PWM interfaces



RTL-00 module (small board) pinout:



Close up view of RTL-00



3. Pre-Preparation

3.1 Software Preparation

The following are the software installation required:

1. Arduino IDE

Arduino IDE can be downloaded on the Arduino website: <u>https://www.arduino.cc/en/Main/Software</u>

Please use Arduino IDE with version 1.6.5 or later. (From version 1.6.5, Arduino IDE supports third-party hardware. Therefore, we can use Arduino IDE to develop applications on Ameba, and the examples of Arduino can run on Ameba too.)

For new users, we will recommend to install the latest IDE version version 1.8.5 (accurate as of June 2018) as directed in the above URL link.

On the right side of the webpage as shown on the Arduino website, select the appropriate OS to suit your laptop/computer.



2. Mbed driver

If this is the first time you are connecting Ameba to your laptop/computer, USB driver for Ameba needs to be installed. Ameba uses the standard Arm BED CMIS DAP driver. Go to

https://developer.mbed.org/handbook/Windows-serial-configuration

Download the driver "mbedWinSerial_16466.exe" in "Download latest driver" from MBED website.

Kindly download the driver, and wait for the board that will be given during the workshop for installation. You will need the Ameba board to install the driver.

arm MBED	Mbed OS	Mbed Cloud	Partner Portal								Searc
		OS Home	Hardware 🕶	Code	Documentation -	Questions	Forum	1	Compiler	Log in/Sign u	ip
		Handbook »	Windows serial co	nfiguration							
		Minde			figuration					Recent changes	
		vvinuo	JVVS SELIA		ingui atioi	1				Getting Started mbed	
		A Mbed C	OS 2 and Mbed 0	DS 5				0 T	able of Contents	 Export to offline toolchain , gcc , 	
		This is the ha	ndbook for Mbed (or the latest inform	OS 2. If you' ation abou	re working with Mbed (Serial, please see The)	DS 5, please see t Vindows Serial D	he new Driver.	1. 1 n	L Download the nbed Windows serial port driver	GCC problem , IAR , IAR problem kell , kell problem ,	,
		The mbed serial port works by default on Mac and Linux, but Windows needs a driver. These							offline toolchain , problem , toolchain		
		Windows.	xpiain now to setup	ine mbeu	viici ocontroner to use t	ne oso senar po	it on			DAPLink	
		1. Dov	wnload t	he m	bed Wind	ows ser	ial po	ort d	driver	mbed SDK porting	
		Download the	installer to your P	C, e.g. your	desktop.					Firmware FRDM K22F	
	_ C	Download late	est driver							Firmware FRDM K64F cmsis , K64F-Firmware	
Important Information for this	Arm	2. Run	the inst	aller						uvision ulink2 and mcb1700	
website		With your mbe	ed plugged in , and	d no explor	er drive windows open,	run the installer:				sprint	

3. Serial Monitor(Terminal Emulator) Program

You may choose to use Arduino IDE serial monitor or your own preferred serial monitor. Eg: Tera Term, Coolterm etc.

4. MQTT Client

Mobile phone app -This is for running of MQTT examples via a mobile MQTT client app. For this workshop purpose, you may like to install the below to experience the example that we will be using for the workshop

For Andriod users – at google playstore -> search for mqtt client -> select Mqtt Client app by Dariel Kroth:

https://play.google.com/store/apps/details?id=br.com.bintechnology.mq ttclient

MQTT.RN	Matt Client Surfac Kools Taula B: © This age is comparison with all of poor devices	wialof
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1	Applied by	
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Angel San Chan Angel	In the second se	
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4 0 0 4 0 0

For iphone users – please download Mqttt app: https://itunes.apple.com/in/app/mqttt/id1217080708?mt=8

App Store Preview



5. IFTTT

This is required for running of IFTTT examples. If you have not set up an IFTTT account, kindly create an account with IFTTT. Go to <u>https://ifttt.com</u> to signup for an account.

3.2 Hardware Preparation:

- 1. 1 x Laptop/Computer: Windows XP/7/8/10 or MAC OS
- 2. WiFi
- 3. 1 x Ameba RTL8710AF Wireless Development Board
- 4. 1x Micro USB Cable
- 5. Your mobile phone to download the mobile app to test the example
- 6. For the DHT11 sensor example you will need 1x DHT11 sensor, connectors and 3x connecting wires



4. Start Up

4.1 Connect the RTL8710AF board

- 1. Ensure the orientation for the RTL-00module small board is correct as shown below.
- 2. Connect RTL8710AF to the computer via Micro USB (on the board: locate CON2 and connect this to USB of your PC/laptop.



4.2 Install mbed driver for Ameba

Ameba uses the standard Arm MBED CMSIS DAP driver.

1. As described in section 3.1, if this is the first time that you are using Ameba, you will need to install the USB driver for Ameba. You can get the installation file and related information at the following website: <u>https://developer.mbed.org/handbook/Windows-serial-configuration</u>

Download and install "mbedWinSerial_16466.exe" in "Download latest driver".

2. When installation is completed, "mbed Serial Port" will be seen under "Device Manager" -> "Ports" in your laptop/computer.



4.3 Arduino IDE

- 1. Open Arduino IDE which has been installed in your laptop/computer.
- To set up Ameba correctly in Arduino IDE, go to "File" -> "Preferences"

💿 sketch_jan06a	Arduino 1.6.13	
File Edit Sketch	Tools Help	
New	Ctrl+N	
Open	Ctrl+O	
Open Recent	•	
Sketchbook	,	
Examples	,	to run once:
Close	Ctrl+W	
Save	Ctrl+S	
Save As	Ctrl+Shift+S	
Page Setup	Ctrla Shifta P	> run repeatedly:
Print	Ctrle P	
	curr	
Preferences	Ctrl+Comma	
Quit	Ctrl+Q	
		·

3. Setting up Ameba

3.1 Paste the following URL into "Additional Boards Manager URLs" field:

https://github.com/Ameba8195/Arduino/raw/master/release/package_realt
ek.com ameba index.json

3.2 Moreover, if you use IDE version earlier than 1.6.7, please make sure the IDE language is set to English to avoid problem. In version 1.6.7, Arduino has resolved the language problem.

3.3 Click "OK"

Preferences	x
Settings Network	
Sketchbook location:	
Br	owse
Editor language: English (English)	
Editor font size: 12	
Show verbose output during: 💟 compilation 🔍 upload	
Compiler warnings: None 👻	
Display line numbers	
Enable Code Folding	
Verify code after upload	
Use external editor	
Check for updates on startup	
✓ Update sketch files to new extension on save (.pde -> .ino)	
Save when verifying or uploading	
Additional Boards Manager URLs: https://github.com/ameba-arduino/ameba-arduino/raw/master/release/package_realtek.com_ameba_index.	je 🗖
More preferences can be edited directly in the file	
C:\Users\william_lai\AppData\Local\Arduino15\preferences.txt	
(edit only when Arduino is not running)	
2	
"	
	ancel

- 3.4. If you have changed the language setting, please restart the Arduino IDE to activate the setting.
- 3.5. Next, go to "Tools" -> "Board" -> "Boards Manager". Click on the "Boards Manager"



The "Boards Manager" requires about 10~20 seconds to refresh all hardware files (if the network is in bad condition, it may take longer).

3.6 Find "Realtek Ameba Boards" in the list, click on it.

- 3.7 "Install" icon will appear.
- 3.8 Select the latest Arduino version from the drop down list (v2.0.4- the latest as of June 2018)
- 3.9 click "Install".

💿 Boards Manager	×
Type All Filter your search	
EMORO 2560 by Inovatic-ICT Boards included in this package: EMoRo 2560. Board based on ATmega 2560 MCU. <u>Online help</u> <u>More info</u>	
AMEL-Tech Boards by replaced by Arrow Boards Boards included in this package: SmartEverything Fox. Online help More info More info	
Realtek Ameba Boards (32-bits ARM Cortex-M3) by Realtek Boards included in this package: Ameba RTL8195A, Ameba RTL8710. Online help More info	E
20.	Close

After install button is clicked, the Arduino IDE starts installation and download the required files for Ameba.

3.10 Close the pop up screen when the installation is completed.

(Note: Every time the new hardware is connected, we need to reopen the Board Manager. So, we close the Boards Manager, and then open it again for such a case)

3.11 Finally, we select Ameba as current connected board in "tools" -> "Board" -> "Ameba RTL8710":



4 The development environment setting is completed and you are ready to compile, upload and run the examples.

4.3.1 Ready to go: Compile and Build

Arduino IDE provides many built-in examples, which can be compiled, uploaded and run directly on the boards. Here, we take the "ScanNetworks" example as the first example.

💿 ScanNetworks Arduino 1.8.5 💴						
File	File Edit Sketch Tools Help					
	New Open	Ctrl+N Ctrl+O				
	Sketchbook	,			_	
	Examples) () W		▲ 02.Digital		
	Close Save	Ctrl+W Ctrl+S		03.Analog 04.Communication	+ + 1	fied.
	Page Setup	Ctrl+Shift+S		05.Control 06.Sensors	*	
	Print	Ctrl+P		07.Display	•	
	Preferences	Ctrl+Comma		08.Strings 09.USB	*	
	Quit	Ctrl+Q	. :	10.StarterKit_BasicKit	•	
*/			:	11.ArduinoISP	•	
#in #in	clude <spi. clude <wifi< td=""><td>.h> i.h></td><td></td><td>Examples for any board Adafruit Circuit Playground Bridge</td><td>1</td><td>ConnectNoEncryption ConnectWithWEP ConnectWithWPA</td></wifi<></spi. 	.h> i.h>		Examples for any board Adafruit Circuit Playground Bridge	1	ConnectNoEncryption ConnectWithWEP ConnectWithWPA
voi	d setup()	[Ethernet		ScanNetworks
/ S W	/Initialize erial.begin hile (!Seri ; // wait	e serial and n(9600); ial) { for serial p		Firmata LiquidCrystal SD		SimpleWebServerWiFi WiFiChatServer WiFiUdpNtpClient
}				Stepper	1	WiFiUdpSendReceiveString
/ i	/ check for f (WiFi.sta	r the presenc atus() == WL_		TEMBOO TFT		WiFiWebClient WiFiWebClientRepeating

1. Under "File" -> "Examples" -> WiFi -> "ScanNetworks".

Arduino IDE opens a new window with the complete sample code.

This example prints the Wifi shield's MAC address, and scans for available Wifi networks using the Wifi shield. Every ten seconds, it scans again. It doesn't actually connect to any network, so no encryption scheme is specified.



 Next, compile the sample code. click "Sketch" -> "Verify/Compile" or you can also select the con on the top left as a shortcut icon to compile the code.

ScanNetworks Arduino 1.8.5						
File Edit Ske	etch Tools Help					
ScanN /*	Verify/Compile Upload Upload Using Programmer Export compiled Binary	Ctrl+R Ctrl+U r Ctrl+Shift+U Ctrl+Alt+S				
This e scans Every connec	Show Sketch Folder Include Library Add File	Ctrl+K	ddress, and Wifi shield. t actually eme is specified.			
Circuit: * WiFi sh created 1 by dlf (M modified by Tom Ig */	nield attached 13 July 2010 Metodo2 srl) 21 Junn 2012 goe and Jaymes Dec					
<pre>#include < #include <</pre>	(SPI.h> (WiFi.h>					
<pre>void setup() { //Initialize serial and wait for port to open: Serial.begin(9600); while (!Serial) { ; // wait for serial port to connect. Needed for native USB port only ; } }</pre>						

Arduino IDE prints the compiling messages in the bottom area of the

IDE window. When the compilation is finished, you will get the similar messages shown below, stating "Done compiling".



3. After the compilation is done, upload the compiled code to Ameba.
With Ameba still connected to your computer, click "Sketch" ->
"Upload" or select icon on the top left as a shortcut icon for compilation.

Sketc	h Tools Help	
	Verify/Compile	Ctrl+R
	Upload	Ctrl+U
	Upload Using Programmer	Ctrl+Shift+U
	Export compiled Binary	Ctrl+Alt+S
	Show Sketch Folder	Ctrl+K
	Include Library	+
	Add File	

Again, during the uploading procedure the IDE prints messages at the bottom area of the IDE window. The uploading procedure requires a slightly longer time (about 30 seconds to 1 minute).

During the uploading process, D3 on the base board will be blinking/flashing in green.



4. When upload completed, D3 reverts to the original non flashing state. The "upload finish" message is printed.

Done uploading.	
<pre>opy "C:\Users\leegeklan\AppData\Local\Arduino15\packages\realtek\tools\ameba_tools\1.0.9\ram_all.bin" E: 1 file(s) copied.</pre>	
pload finish	

5. Open the serial monitor to view the logs. Reset the board, a list of network will be seen on the serial monitor log files. (list of networks has been purposely ommited in this picture)



4.4 Using module RTL-00 independently

RTL-00 module can be used independently from the main board. The detachable module also uses micro usb to charge and the pins on it are compatible with the board.



When you unplug this module and charges it via the Micro USB, the result seen on the serial monitor should be the same as what is seen when connecting to the main board.

To view the log files on RTL-00 module – select baud rate as 38400. You will see the same logs on the serial monitor/emulator terminal as what you have seen on the RTL8710AF Wireless Development board

Connection Options (Untitled_0)						
Serial Port Terminal Receive Transmit	Serial Port Serial Port Options Terminal Port: COM5 Receive Transmit Baudrate: 38400					
Miscellaneous	Data Bits: Parity:	8 none				
	Stop Bits: Flow Control:	1 TR				
	Initial Line Stat	XON es when Port opens: DTR Off RTS Off				
		Re-Scan Serial Ports				
		Cancel OK				

Note: For RTL-00 module - If you are unable to view the serial logs with the RTL-00 module, check that USB-SERIAL CH340 driver has been installed in your Operating System

5. Shortcut on list of items to download

1. Arduino IDE

https://www.arduino.cc/en/Main/Software

2. Mbed driver

https://developer.mbed.org/handbook/Windows-serial-configuration

3. Teraterm

https://download.cnet.com/Tera-Term/3000-2094_4-75766675.html

4. MQTT Client – Phone app

Android user <u>https://play.google.com/store/apps/details?id=br.com.bintechnology.mq</u> <u>ttclient</u>

Iphone user: https://itunes.apple.com/in/app/mqttt/id1217080708?mt=8

5. Set up IFTTT account

https://ifttt.com

6. Examples for the workshop

Clone or download from the Github repository below: <u>https://github.com/prashantrar/RTL8195AM-RTL8710AF-ARDUINO</u> You can find the Examples for the workshop in the "Examples" folder (Disclaimer: Above links of items 1-5 are for reference. Realtek is not responsible for the contents of the website.)

6. Ameba further references

- Website: https://www.amebaiot.com/en/
- Facebook: https://www.facebook.com/groups/AmebaloTWW/
- Forum: https://www.amebaiot.com/en/questions/