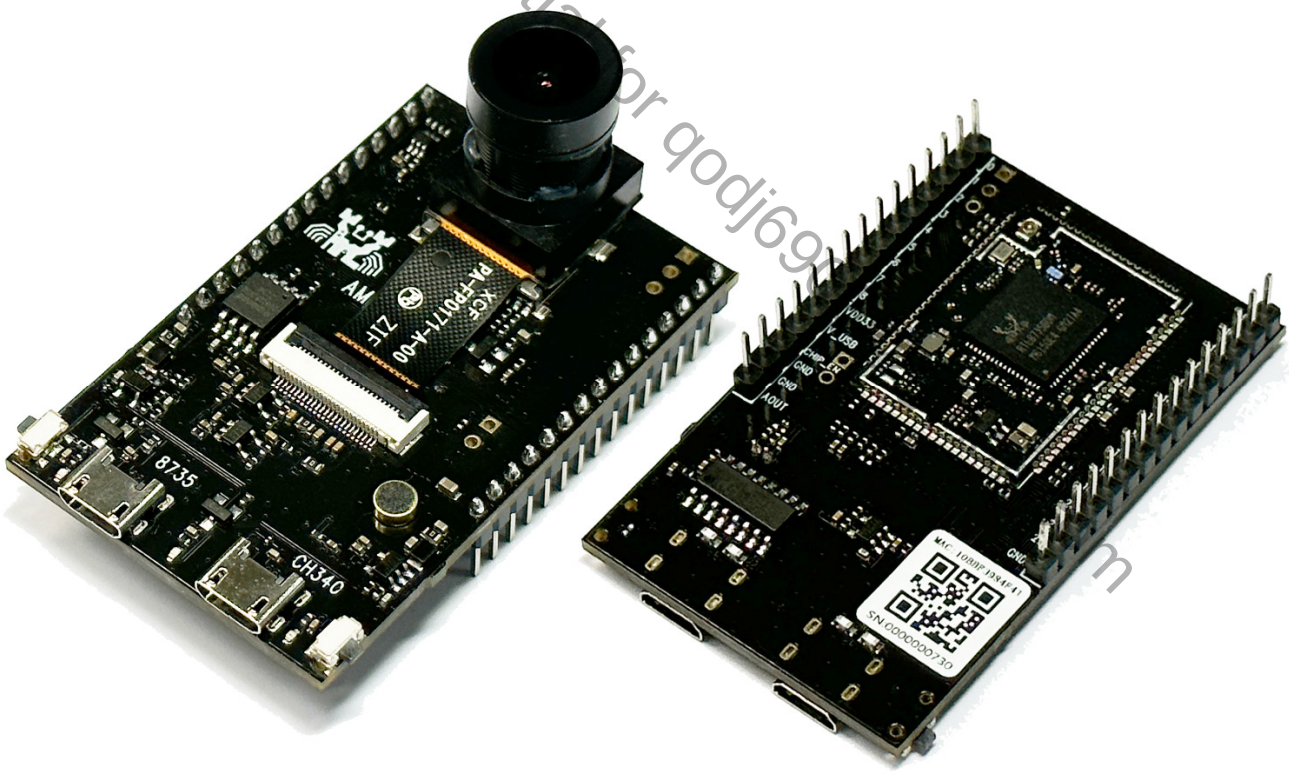
AMB82-MINI Board Hardware User Guide



Rev. 0.3
3 March 2023

ESD Protection

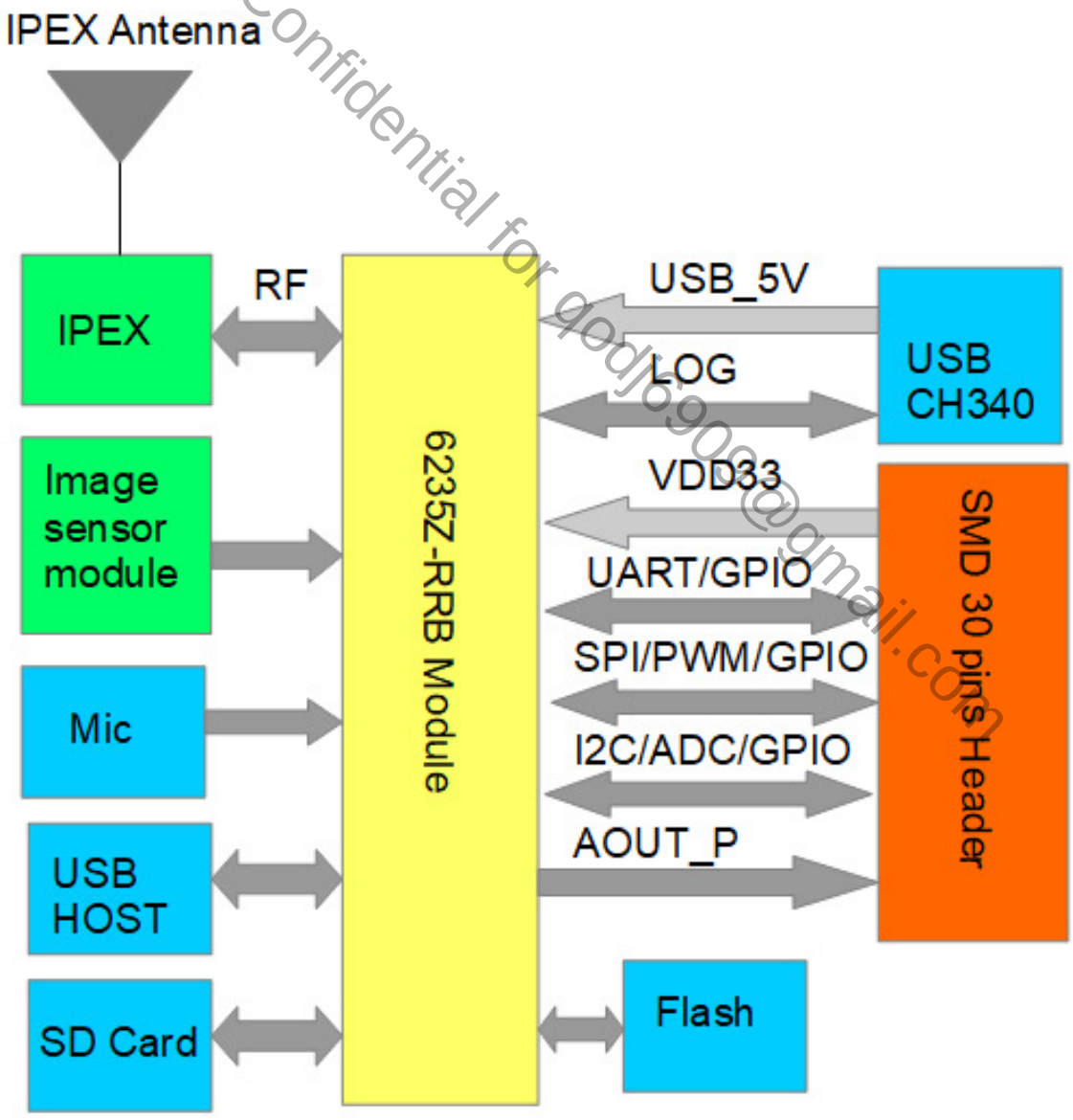
AMB82-MINI Development Board is electrostatic sensitive device, ESD protection measures should be taken when carrying.

Table of Contents

1. Product Overview

AMB82-MINI is a development board designed for 6235Z-RRB module. 6235Z-RRB is a dual-frequency Wi-Fi + Bluetooth SoC module based on RTL8735B chip.

RTL8735B (also named AmebaPro-II) is a highly integrated low power 802.11 a/b/g/n Wireless LAN (WLAN) and Bluetooth camera SoC. It combines ARM v8M MCUs (500MHz and 2.23 DMIPS/MHz), WLAN MAC, a 1T1R capable WLAN baseband, Bluetooth MAC, RF, audio codec, ISP and H264/H265 encoder in a single chip. It provides useful high speed connectivity interfaces, such as USB 2.0 host, SD host interfaces. It also provides a bunch of configurable GPIOs which are configured as digital peripherals for different application and control usage.



1.1. Characteristic

MCU Features

- Real-M500 (TM9) clock frequency up to 500MHz
- I-Cache 32KB/D-Cache 32KB
- eXecute In Place (XIP) on NOR flash
- Internal Memory
- Supports 768KB ROM
- Supports 512KB RAM
- Supports external flash interface
- Supports MCM embedded 64MB/128MB DDR2 Memory

ISP Features

- Advanced temporal and spatial noise reduction(3DNR)
- Support major brands of DOL-HDR or Staggered-HDR sensors
- Support MIPI CSI-2 data lane
- Support Auto Banding, Auto Exposure, Auto White Balance
- Black level compensation and dead pixel cancellation
- Lens shading compensation
- Advanced contrast adjustment and sharpness enhancement
- Programmable color matrix and gamma table
- Digital WDR
- Image enhancement(brightness, contrast, saturation, hue and sharpness)
- ISP tuning tool

Graphic Processing

- Digital resolution scaling down
- Multiple stream outputs and various formats: NV12, RGB888
- Each stream has individual OSD overlay
- Support motion detection and private mask

Video Encoding

- Max 5-megapixel resolution for H.264/H.265 encoding
- H.264 Baseline/Main/High profiles, levels 4.1
- H.265 Main and Main Still profiles, levels 4
- JPEG/MJPEG Baseline and Max 5-megapixel resolution for JPEG encoding
- Multiple streams real-time H.265/H.264/JPEG encoding
- H265 2M@30fps + H265 1M@30fps

- CBR/VBR rate control

Audio

- Built-in Audio Codec
- 1 way Audio analog output for earphone
- 1 way Audio analog input on board

WIFI Features

- 802.11 a/b/g/n compatible 1x1, 2.4GHz/5GHz
- 802.11e QoS Enhancement (WMM)
- Wi-Fi WEP, WPA, WPA2, WPA3, WPS. Open, shared key, and pair-wise key authentication services
- Supports low power Tx/Rx for short-range application
- Frame aggregation for increased MAC efficiency (A-MSDU, A-MPDU)
- Low latency immediate High-Throughput Block Acknowledgement (HT-BA)

Bluetooth Features

- Bluetooth Low Energy (BLE) 5.1
- Supports LE secure connections
- Supports LE scatternet
- Supports 1 Master/1 Slave
- Crypto engine: MD5, SHA-1, SHA2-224, SHA2-256, HMAC, AES
- ECDSA, ED25519
- RSA

SD Card Features

- Support SD version 3.0
- Support card capacity up to 2TB
- Support 3.3V and 1.8V operating voltage

Peripheral Interfaces

- Support UART、I2C、SPI interface for external device
- Support PWM interface with configurable duration and duty cycle from 0 ~ 100%
- Support ADC channel with 12-bit mode
- Maximum 59 programmable GPIOs

2. Main Parameters

Model	AMB82-MINI
Suitable modules	6235Z-RRB
Package	DIP-30(2.54 spacing standard row pin)
Size	60*37.4mm
WIFI Antenna	External 4th IPEX antenna
Spectrum Range	2400-2483.5MHz or 5180-5825MHz
WIFI	Supports 802.11 a/b/g/n
Bluetooth	BLE 5.1
Operation temperature	-20℃ ~ 85℃ , from main chip point of view
Storage environment	-40℃ ~ 105℃ , < 90%RH
Power supply	Supply voltage 5V current greater than 1000mA
Interfaces	UART/GPIO/ADC/PWM/IIC/SPI/ MIPI
Audio	Built-in Analog Microphone
Video	TDK MS-SA816988B01-R Image Sensor Module
SD Card	Support SD version 3.0
USB	One is RTL8735B USB 2.0 host, the other is debug log
Flash	SPI NOR Flash 16MB

2.1. Power supply selection

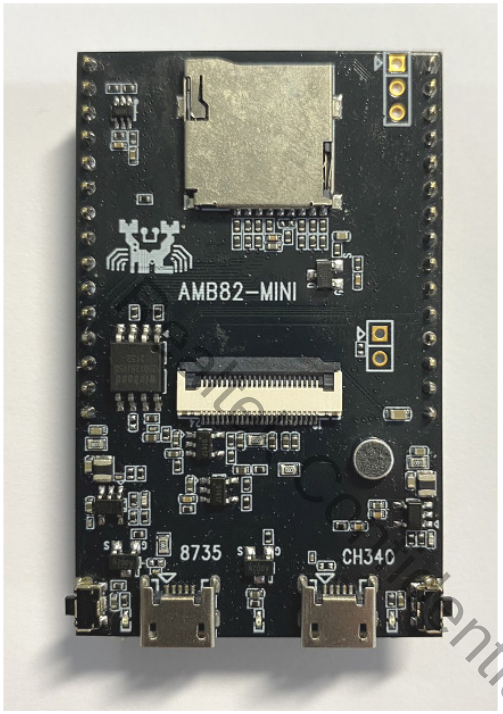
You can choose one of the following methods to supply power for AMB82-MINI:

- Micro USB interface power adapter, recommend the rated current ≧ 1A
- External 5V power supply on V_USB and GND pin.

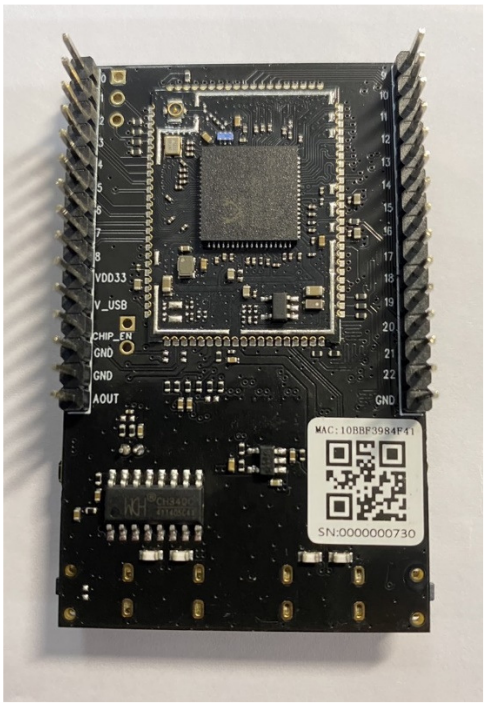
2.2. Electrical characteristics

Parameter	Symbol	Min	Typ.	Max	Units
5V Supply voltage	V_USB	4.75	5	5.25	V
Digital I/O voltage	-	3.135	3.3	3.465	V
Input-High Voltage	V_{IH}	2.0	-	-	
Input-Low Voltage	V_{IL}	-	-	0.8	V

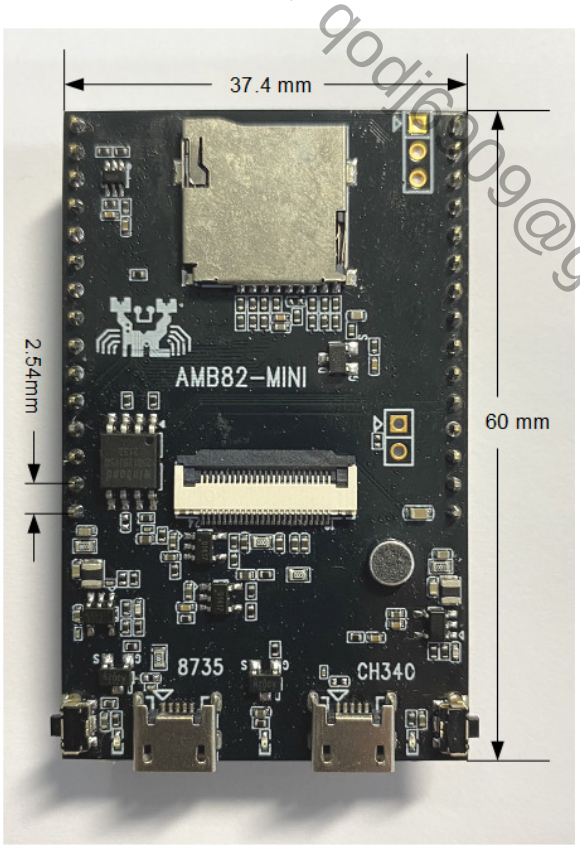
3. Appearance size



Front Side



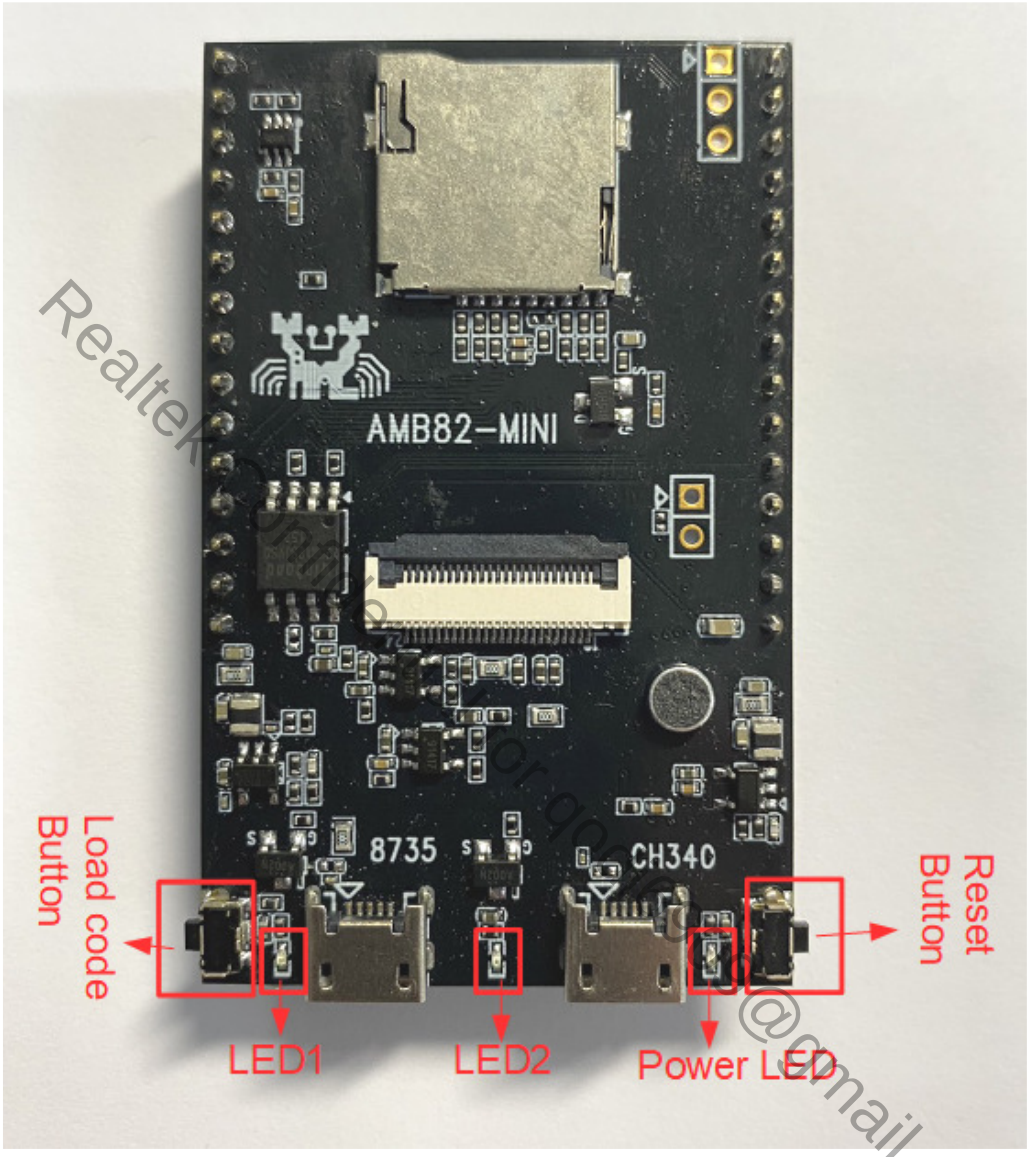
Back Side



Board Size

4. Led indicator and button description

There are three LED indicators and two buttons on AMB82-MINI, as shown in following figure:



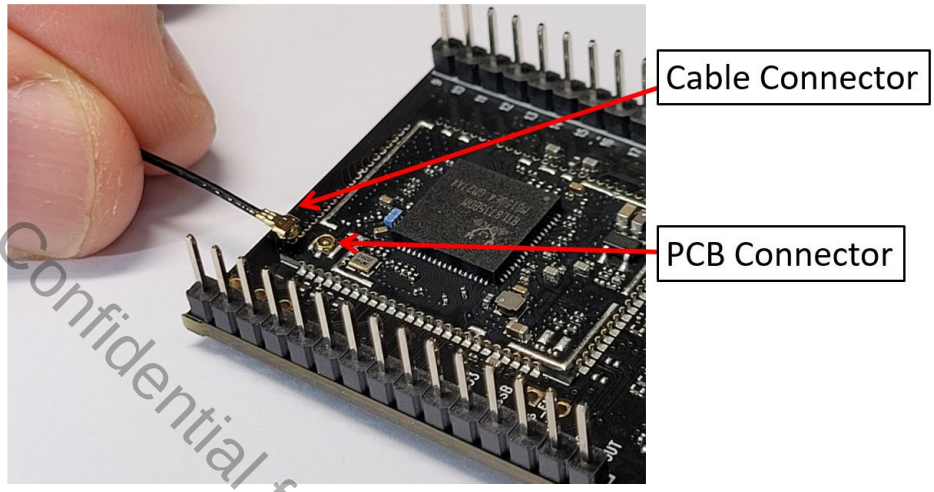
Led indicator and button	LED status or button function	Remarks
Power LED	5V power indicator	When 5V power is supplied, the LED is on.
LED1	Blue LED by user defined	Controlled by PF9
LED2	Green LED by user defined	Controlled by PE6
Reset Button	Reset system	/
Load code Button	Set system to load code mode	Press Button into load code mode.

5. Assembly

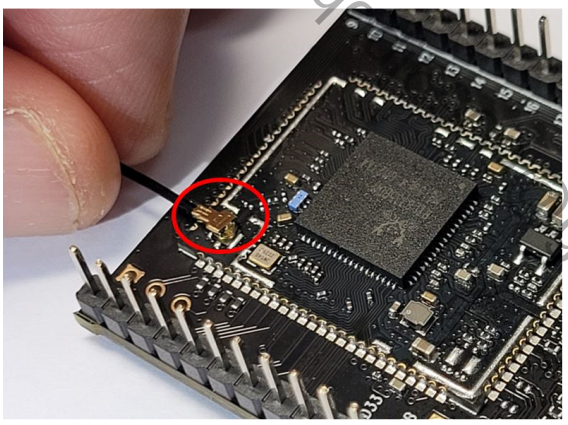
There are two accessories for AMB82-MINI, one is IPEX RF antenna and the other is image sensor module.

5.1. How to assemble IPEX RF antenna

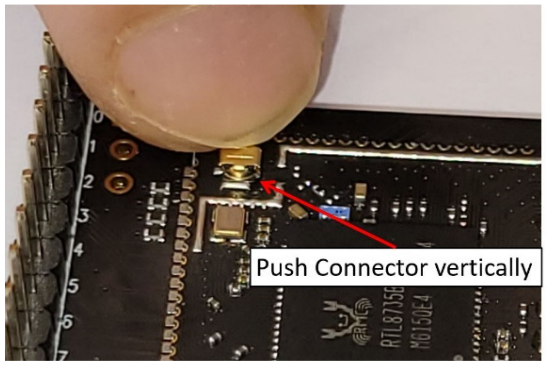
Step 1 : Keep AMB82-MINI at back side, hold the cable connector as shown in following figure:



Step 2 : Combine cable connector with PCB connector, please check they are set firmly.

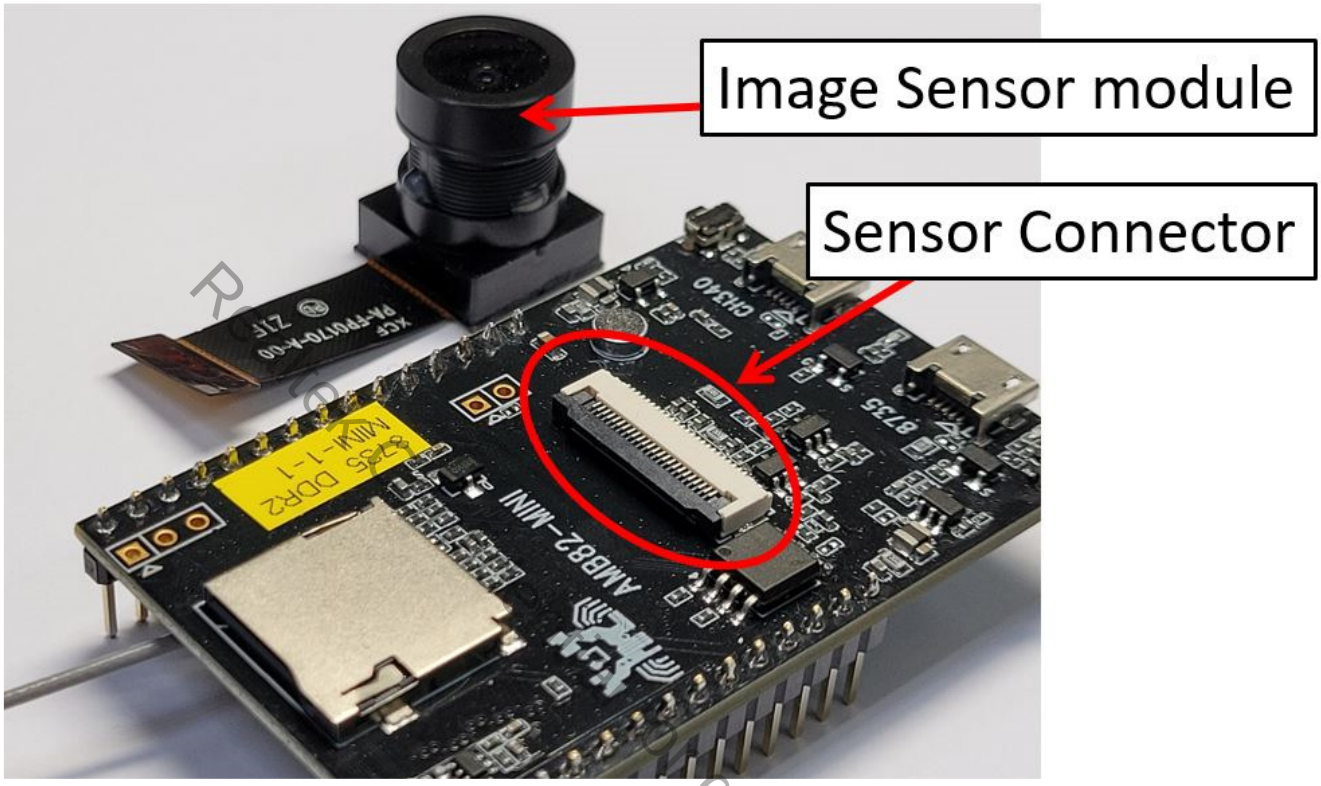


Step 3 : Push cable connector at center location vertically. The connectors mating action is completed when click sound could be heard.

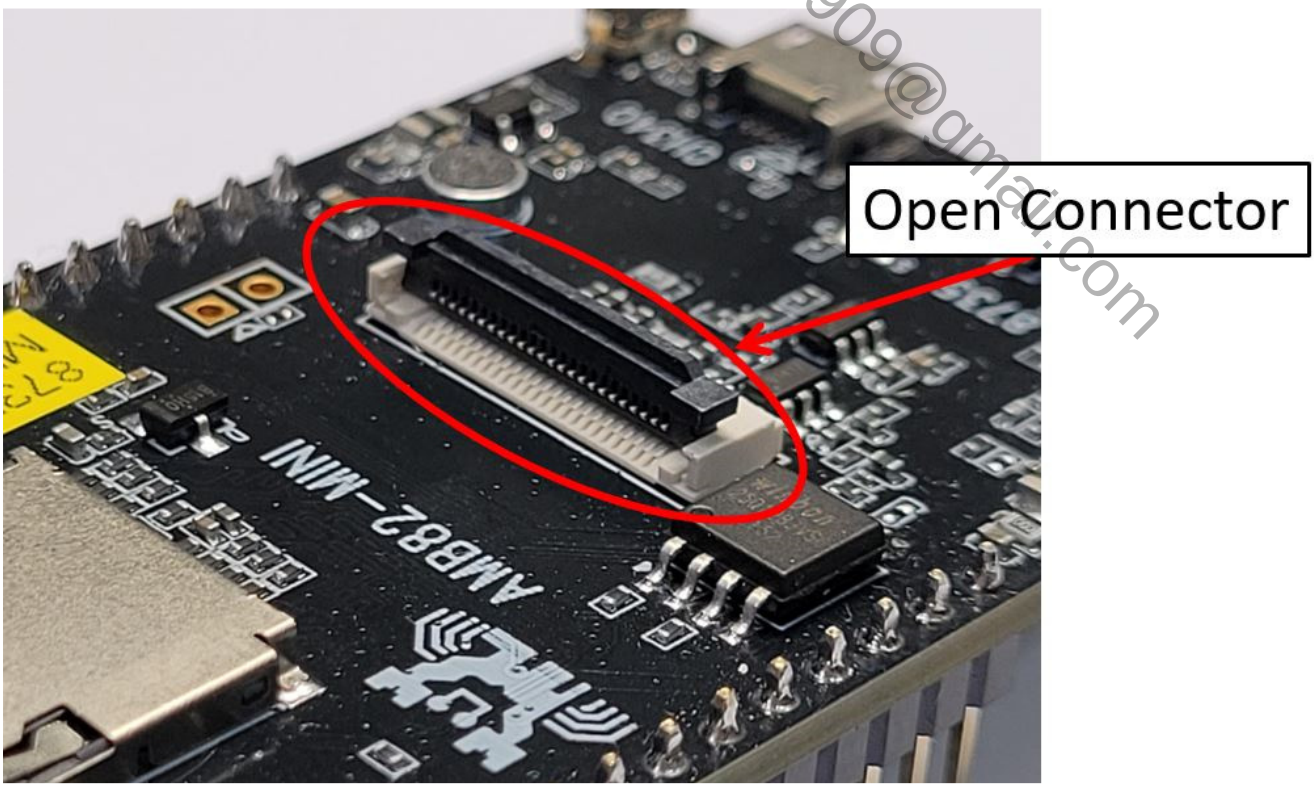


5.2. How to assemble image sensor module

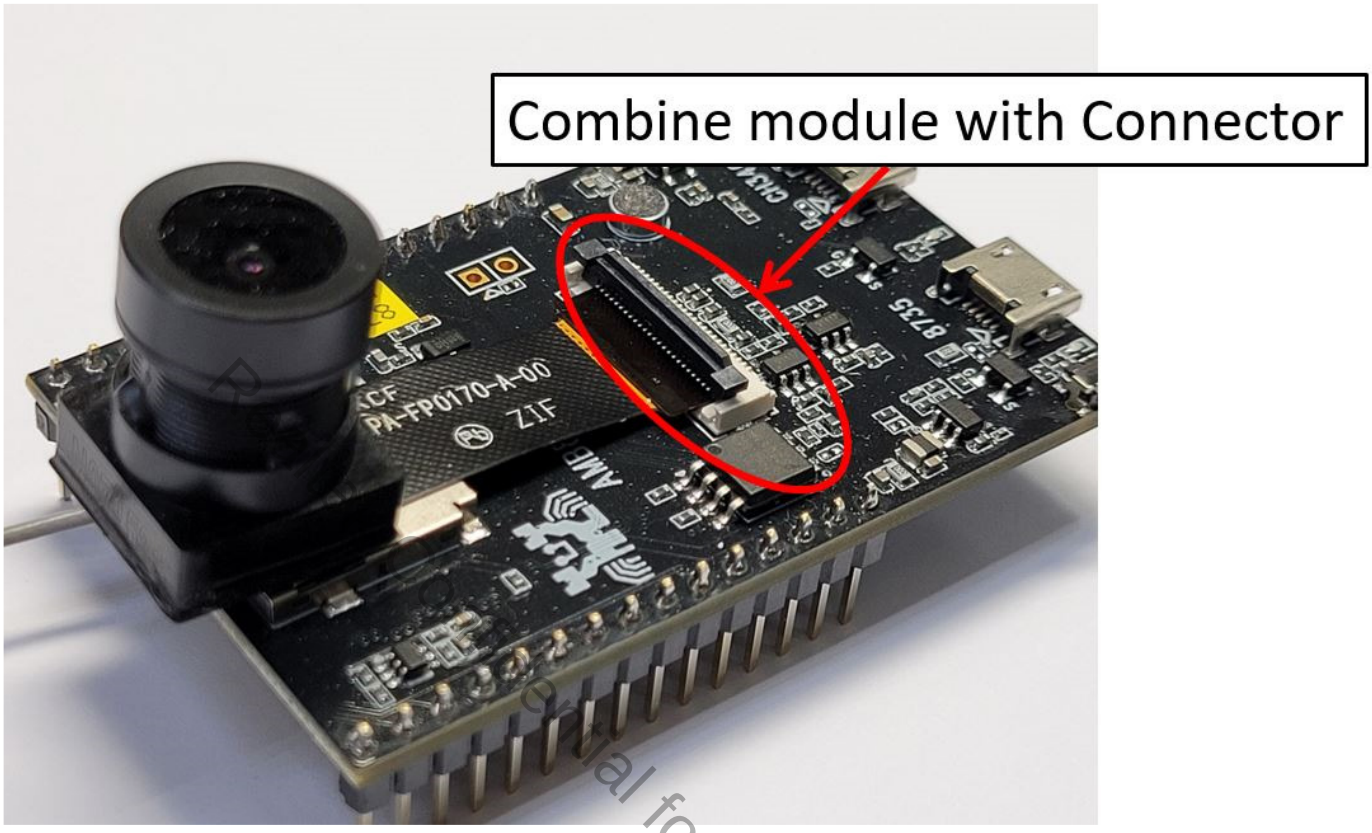
Step 1 : Keep AMB82-MINI at top side,



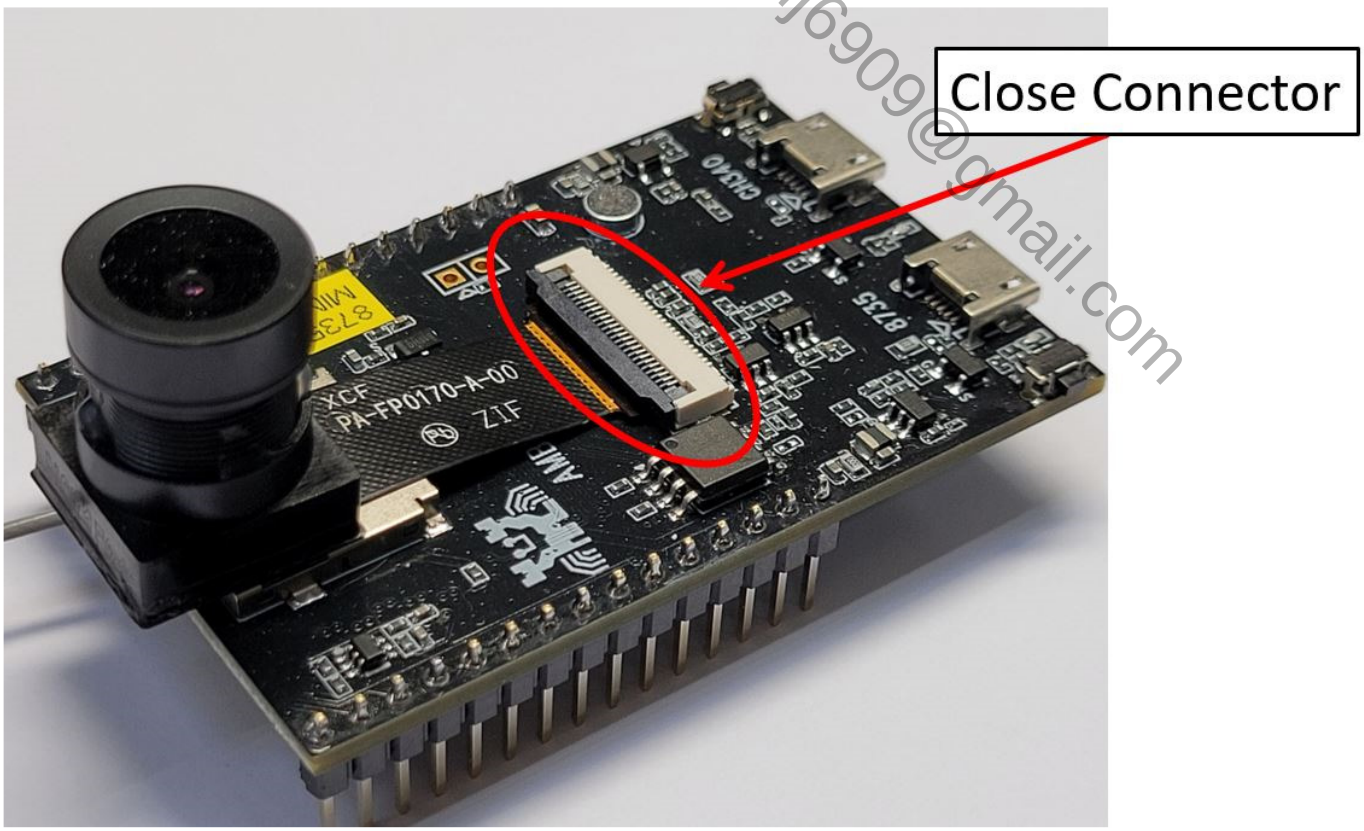
Step 2 : Open sensor connector carefully.



Step 3 : Combine Image sensor module with sensor connector, please check they are set firmly.

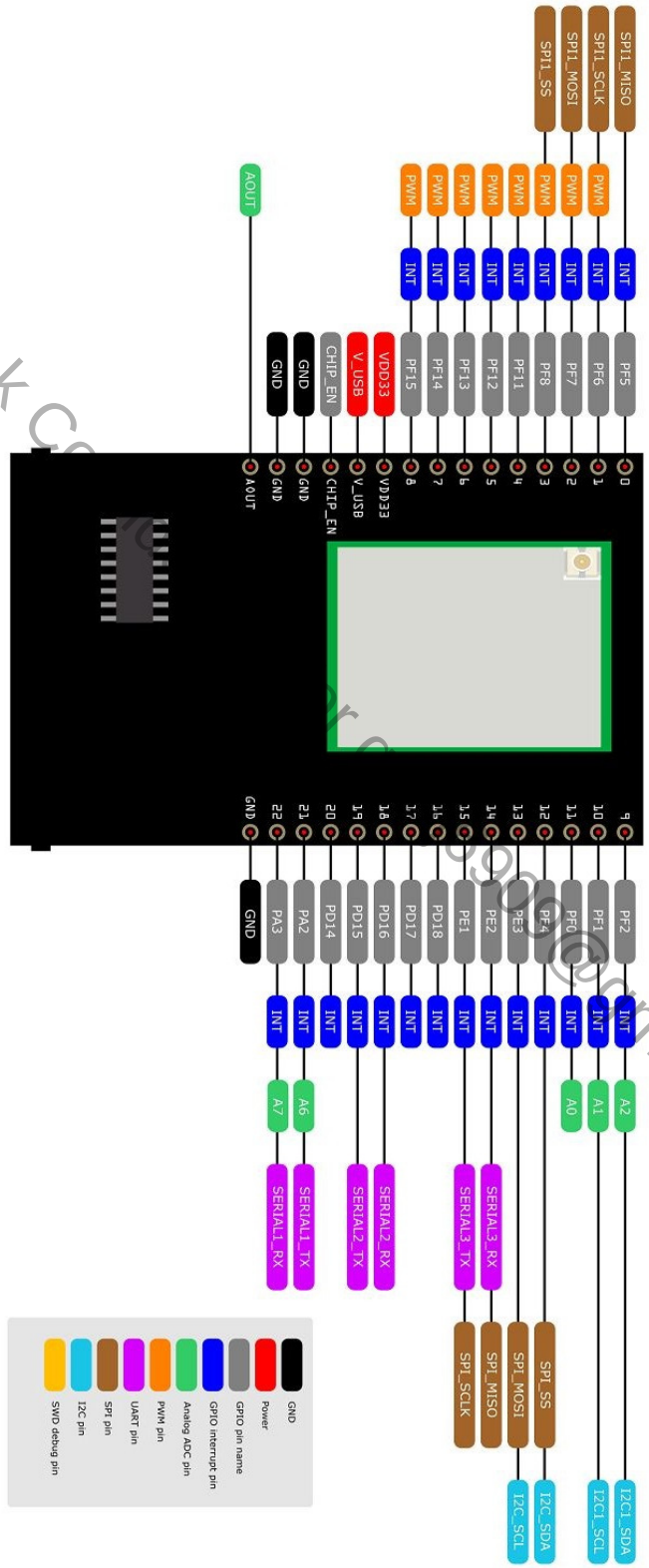


Step 4 : Close the connector carefully and make sure that the lens of sensor module is clear.

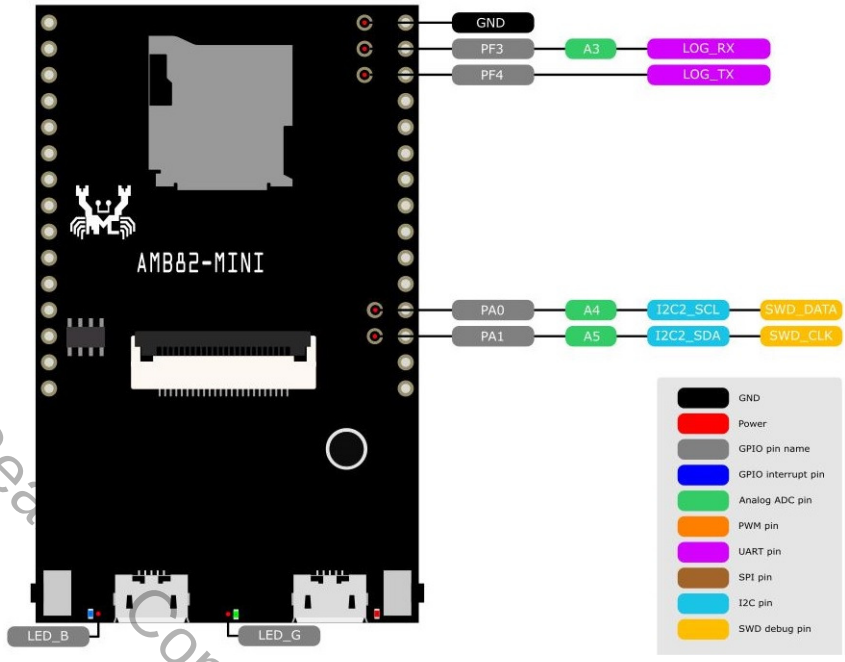


6. Pin definition

AMB82-MINI has 30 pin and 5 test point for user, as shown in the diagram of pins.



Back Side



Front Side

GPIO pin	GPIO INT	ADC	PWM	UART	SPI	I2C	Other
PF5	✓				SPI1_MISO		
PF6	✓		✓		SPI1_SCLK		
PF7	✓		✓		SPI1_MOSI		
PF8	✓		✓		SPI1_SS		
PF11	✓		✓				
PF12	✓		✓				
PF13	✓		✓				
PF14	✓		✓				
PF15	✓		✓				
PF2	✓	A2				I2C1_SDA	
PF1	✓	A1				I2C1_SCL	
PF0	✓	A0					
PE4	✓				SPI_SS	I2C_SDA	
PE3	✓				SPI_MOSI	I2C_SCL	
PE2	✓			SERIAL3_RX	SPI_MISO		
PE1	✓			SERIAL3_TX	SPI_SCLK		
PD18	✓						
PD17	✓						

PD16	✓			SERIAL2_RX			
PD15	✓			SERIAL2_TX			
PD14	✓						
PA2	✓	A6		SERIAL1_TX			
PA3	✓	A7		SERIAL1_RX			
PF9	✓		✓				LEB_B (blue)
PE6	✓						LED_G (green)
PF4	✓			LOG_TX			
PF3	✓			LOG_RX			
PA1	✓	A5				I2C2_SDA	SWD_CLK
PA0	✓	A4				I2C2_SCL	SWD_DATA
PF10	✓						
AOUT							Audio Output for earphones