Table of Content

1 Generalities

1.1 Introduction

1.1.1 Overview

The main objectives for this board, discussed also with the marketing are:

- Get lowest cost solution to enable BT and WLAN for a maximum of IP terminals
- Enable new usages like
  - The phone is seen as a carkit for a smartphone
  - The phone can exchange phonebook with a smartphone
  - The phone can support tags through BT Low Energy
  - The phone can support WLAN
- From R&D point of view:
  - The board must be small enough to be integrated easily into our ID.
  - The board must integrate the antenna to avoid a re-certification for each phone which would use it.

For this project, a pre-study has been done.

The choice is to do a daughter board with the module from AMPAK, with an integrated antenna on the layout (Printed antenna).

1.1.2 Aim of the document

A pre-study has been done, in order to define the best choices for the whole solution, going from antenna to the BT and WLAN management software in the phone.

This document is intended to give all the technical inputs in order to make a BTWDB daughter board which will be used on the Alcatel-Lucent Enterprise IP Phones.

A first step will be to use it on Pleiades phone, but we should care to make it possible to be used also on nextgen phones.

1.2 Services provided by the feature or equipment

The BTWDB will give a BT5.0 and WIFI connectivity to the product where it is mounted into. The main reasons of this daughter board are to have:

- A common function usable on several phones without the need of RF expertise and full Bluetooth + WLAN qualification
- A cost-effective solution

1.3 External Interfaces

The interface signals are listed hereafter:

Pin num	Pin Name	Type	Description	Voltage
1	GND	G	Ground connections	
2	VBAT	P	Main power voltage source input	3.3V
3	WL_REG_ON	I	Power up/down internal regulators used by WiFi section	
4	WL_INT	O	WLAN to wake-up HOST	
5	SDIO_DATA_2	I/O	SDIO data line 2	1.8V
6	SDIO_DATA_3	I/O	SDIO data line 3	1.8V
7	SDIO_DATA_CMD	I/O	SDIO command line	1.8V
8	GND	G	Ground connections	
9	SDIO_DATA_CLK	I/O	SDIO clock line	1.8V
10	GND	G	Ground connections	
11	SDIO_DATA_0	I/O	SDIO data line 0	1.8V
12	SDIO_DATA_1	I/O	SDIO data line 1	1.8V
13	GND	G	Ground connections	
14	VDDIO	P	I/O Voltage supply input	1.8V
15	GND	G	Ground connections	
16	BT_CLK	I	External Low Power Clock input (32.768KHz)	1.8V
17	GND	G	Ground connections	
18	BT_REG_ON	I	Power up/down internal regulators used by BT section	1.8V
19	BT_WAKE	I	HOST wake-up Bluetooth device	1.8V
20	BT_INT	O	Bluetooth device to wake-up HOST	1.8V
21	GND	G	Ground connections	
22	GND	G	Ground connections	
23	PCM_OUT	O	PCM Data output	1.8V

24	PCM_CLK	I/O	PCM clock	1.8V
25	GND	G	Ground connections	
26	PCM_IN	I	PCM data input	1.8V
27	PCM_SYNC	I/O	PCM sync signal	1.8V
28	GND	G	Ground connections	
29	UART_RTS_N	O	Bluetooth UART interface	1.8V
30	UART_TXD	O	Bluetooth UART interface	1.8V
31	UART_RXD	I	Bluetooth UART interface	1.8V
32	UART_CTS_N	I	Bluetooth UART interface	1.8V
33	GND	G	Ground connections	

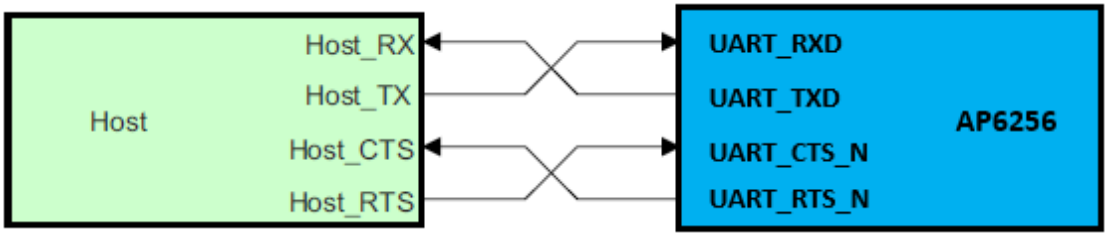
The VBAT pin can accept 3.3V +/- 5%. Typical value is 3.3V, but this depends on the motherboard.

Mainboard through UART bus to send HCI commands to activate Bluetooth function.

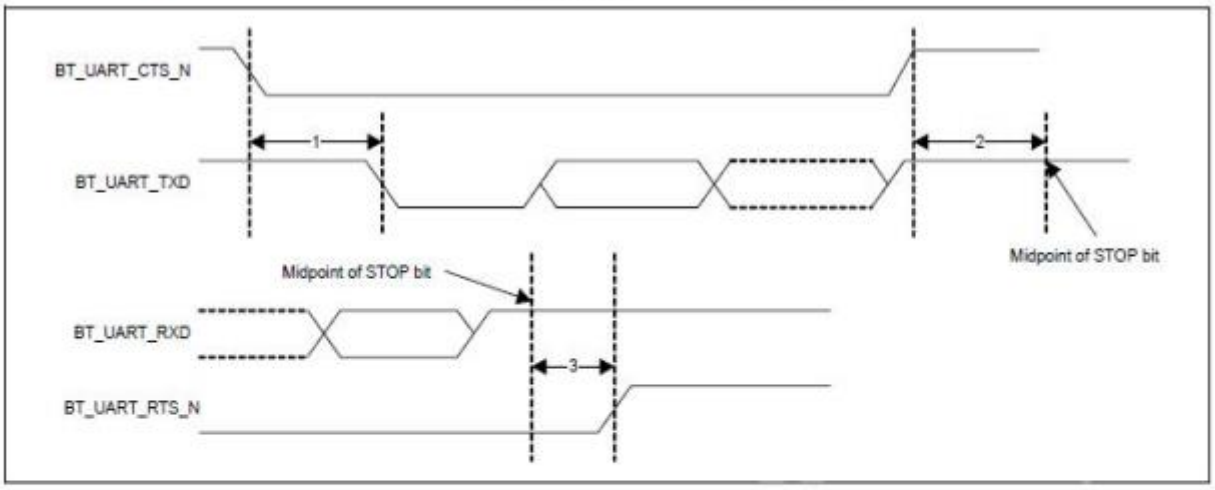
The UART is a standard 4-wire interface (RX, TX, RTS, and CTS) with adjustable baud rates from 9600 bps to 4.0 Mbps. The interface features an automatic baud rate detection capability that returns a baud rate selection. Alternatively, the baud rate may be selected through a vendor-specific UART HCI command

The UART has by default the following characteristics (can be reprogrammed to up to 4Mbps)

Parameter	Value
Bit rate	115.2 kbps
Data length	8 bits
Stop-bit	1
Parity	None



UART Timing



UART Timing Specifications

Ref	Characteristics	Min.	Typ.	Max.	Unit
1	Delay time, BT_UART_CTS_N low to BT_UART_TXD valid	–	–	1.5	Bit periods
2	Setup time, BT_UART_CTS_N high before midpoint of stop bit	–	–	0.5	Bit periods
3	Delay time, midpoint of stop bit to BT_UART_RTS_N high	–	–	0.5	Bit periods

The PCM bus is for audio data.

The PCM Interface on the AP6256 can connect to linear PCM Codec devices in master or slave mode. In master mode, the AP6256 generates the PCM_CLK and PCM_SYNC signals, and in slave mode, these signals are provided by another master on the PCM interface and are inputs to the AP6256.

The configuration of the PCM interface may be adjusted by the host through the use of vendor-specific HCI commands.

SDIO interface is for WLAN function.

BTWDB module supports SDIO V3.0 for all 1.8V 4-bit UHSI speeds: SDR50(100Mbps), SDR104(208MHz) and DDR50(50MHz, dual rates) in addition to the 3.3V default speed(25MHz) and high speed (50 MHz). It has the ability to stop the SDIO clock and map the interrupt signal into a GPIO pin. This 'out-of-band' interrupt signal notifies the host when the WLAN device wants to turn on the SDIO interface. The ability to force the control of the gated clocks from within the WLAN chip is also provided.

- Function 0 Standard SDIO function (Max Block Size / Byte Count = 32B)
- Function 1 Backplane Function to access the internal System On Chip (SOC) address space (Max Block Size / Byte Count = 64B)
- Function 2 WLAN Function for efficient WLAN packet transfer through DMA (Max Block Size/Byte Count=512B)

SDIO Pin Description

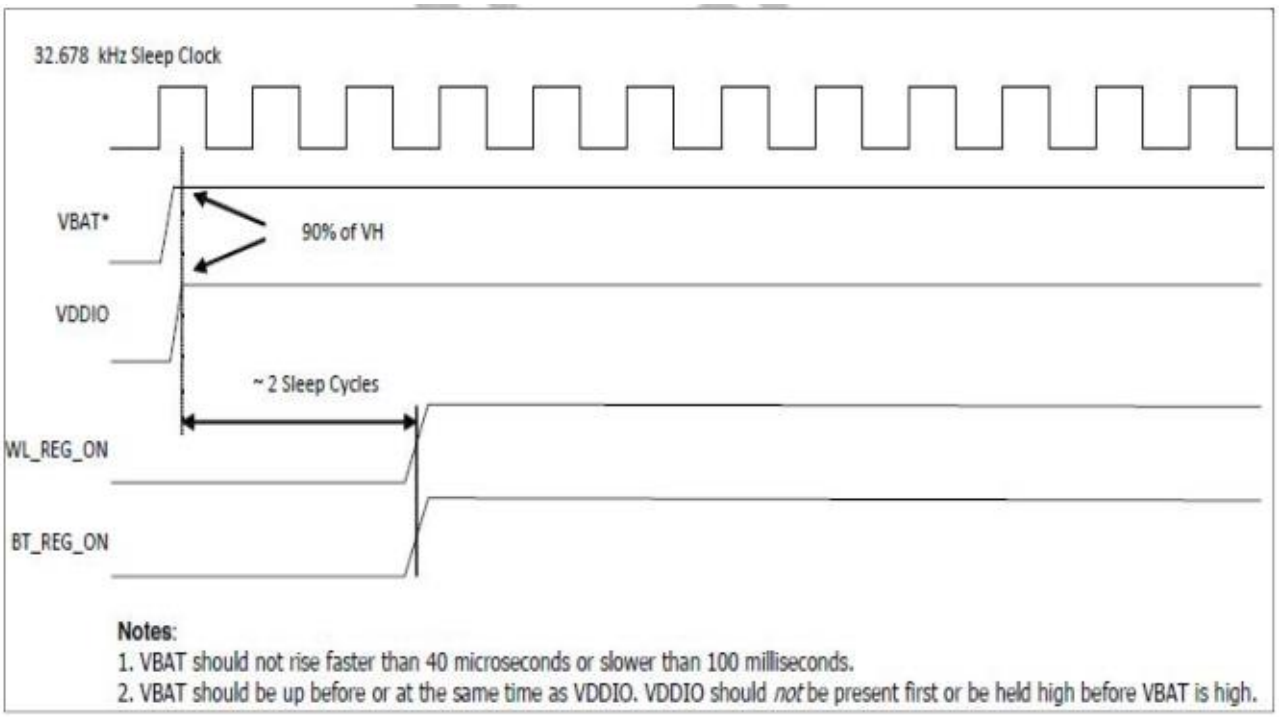
SDIO 4-Bit Mode	
DATA0	Data Line 0
DATA1	Data Line 1 or Interrupt
DATA2	Data Line 2 or Read Wait
DATA3	Data Line 3
CLK	Clock
CMD	Command Line

Check the AP6256 datasheet for more information.

The module has signals that allow the host to control power consumption by enabling or disabling the Bluetooth, WLAN and internal regulator blocks. These signals are described below. Additionally, diagrams are provided to indicate proper sequencing of the signals for carious operating states. The timing value indicated are minimum required values: longer delays are also acceptable.

WL_REG_ON: Used by the PMU to power up or power down the internal regulators used by the WLAN section. When this pin is high, the regulators are enabled and the WLAN section is out of reset. When this pin is low the WLAN section is in reset

BT_REG_ON: Used by the PMU to power up or power down the internal regulators used by the BT section. Low asserting reset for Bluetooth. This pin has no effect on WLAN and does not control any PMU functions. This pin must be driven high or low (not left floating)



WLAN=ON, Bluetooth=ON

1.4 Terminology / Abbreviations

BTWDB: BlueTooth WLAN Daughter Board

BT: BlueTooth

1.5 Related Documents

Document		Reference number
Alcatel documents		
[1]	PLEIADES HLA for the new range .docx	OD-401314
[2]		
External documents		
[3]	AP6256 datasheet_V2.5_03022020.pdf	
[4]		

1.6 Features

The board must provide the following features:

WLAN:

- TX and RX low-density parity check (LDPC) support for improved range and power efficiency.
- Single-stream spatial multiplexing up to 433.3 Mbps data rate.
- Supports 1 antenna with one for WLAN & Bluetooth shared port
- 20, 40, 80 MHz channels with optional SGI (256 QAM modulation)
- Supports standard SDIO v3.0 HOST interfaces.

Bluetooth:

- Give dual mode BT connectivity (Classic & Low Energy)
- Complies with Bluetooth Core Specification Version 5.0 with provisions for supporting future, With Bluetooth Class2 transmitter operation.
- Supports extended synchronous connections (eSCO), for enhanced voice quality by allowing for retransmission of dropped packets
- Adaptive frequency hopping (AFH) for reducing radio frequency interference.
- Interface to the motherboard with UART and PCM, UART up to 4Mbps.
- Integrate PCB antenna, which will be shared Bluetooth and WLAN

2 General Requirements

2.1 Standards

2.1.1 BT related certification

On the Bluetooth.org website, the existing certifications of BT solutions are listed.

The certification strategy will be as follows:

- Make a certification for the board, with embedded low part of the BT stack, and antenna
- Make BTWDB a module certification, where we can take benefit of the module certification

Requested certifications:

Generic Certification of BT&WLAN Module		Standards
Radio/Modular approval	Europe	ETSI EN 300 328 V2.2.2 (2019-07) - (2,4 GHz ISM band)
		ETSI EN 301 893 V2.1.1 (5 GHz RLAN)
		ETSI EN 300 440 V2.2.1 (5.725-5.875 GHz RLAN)
	FCC	FCC 47 CFR Part 15 Subpart C (2,4 GHz ISM band)
		FCC 47 CFR Part 15 Subpart E (5 GHz RLAN)
		FCC grant of equipment authorization / FCC Identifier (TCB Service)
	Canada	RSS-Gen issue 5 + RSS-247 issue 2
		IC Registration - Record in Radio Equipment List (REL)
	Australia/NZ	AS/NZS 4268:2017
	Bluetooth qualification	test report : Bluetooth (Classic and low energy) version 5.0 Profiles supported : To be difined
		product listed at Bluetooth SIG **under ALE International company**
	Wi-Fi compliance	Connectivity a/b/g/n/ac/ax Security WPA2/WPA3 (TBC) WMM - Wi-fi Multimedia (TBC)
	Japan Radio module certification	GITEKI
	China Radio module certification	CMIIT

	Brazil Radio module certification	Anatel
	Korea Radio module certification	KCC
	Mexico Radio module certification	IFETEL
	Taiwan Radio module certification	NCC
Human exposure for Bluetooth	**US**	FCC 47CFR 2.1091 (at least 20 cm between transmitter and the body) Refer to FCC KDB Publication 447498 D01 : SAR test exclusion
	EUROPE/AUS/NZ	EN 62311:2008
	Canada	RSS-102 Issue 5
	Australia/NZ	ARPPANSA : Maximum Exposure Levels to Radiofrequency Fields — 3 kHz to 300 GHz
Human exposure for WLAN	**US**	FCC 47CFR 2.1091 (at least 20 cm between transmitter and the body) Refer to FCC KDB Publication 447498 D01
	EUROPE/AUS/NZ	EN 62311:2008
	Canada	RSS-102 Issue 5
	Australia/NZ	ARPPANSA : Maximum Exposure Levels to Radiofrequency Fields — 3 kHz to 300 GHz
ECO-DESIGN	**Persistent Organic Pollutants**	European Regulation : N° 2019/1021
	EU ROHS	EU Directive 2011/65/EU including Commission delegated directive 2015/863
	REACH	European regulation : N° 1907/2006 - Certificate + list of SVHC

This will qualify:

- The hardware, radio parts (included Bluetooth and WLAN)
- The Lower part of the BT stack (below HCI interface) located in the BT chip
- The Upper part of the BT stack, which runs on the Host processor.
- RF exposure

This is why, if we re-use this board, a big part of the certification does not need to be done.

2.2 Environmental requirements

These are the same as for the terminal for which this board is intended. The tests are made on the daughter board assembled or mounted in a final product, so they are part of the product qualification.

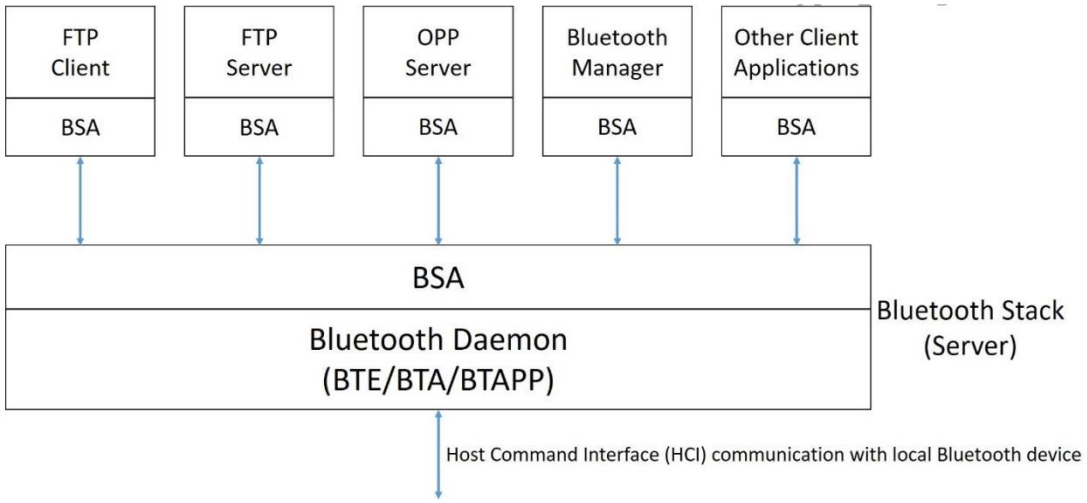
For details see for example PLEIADES HLA for the new range

3 General Description

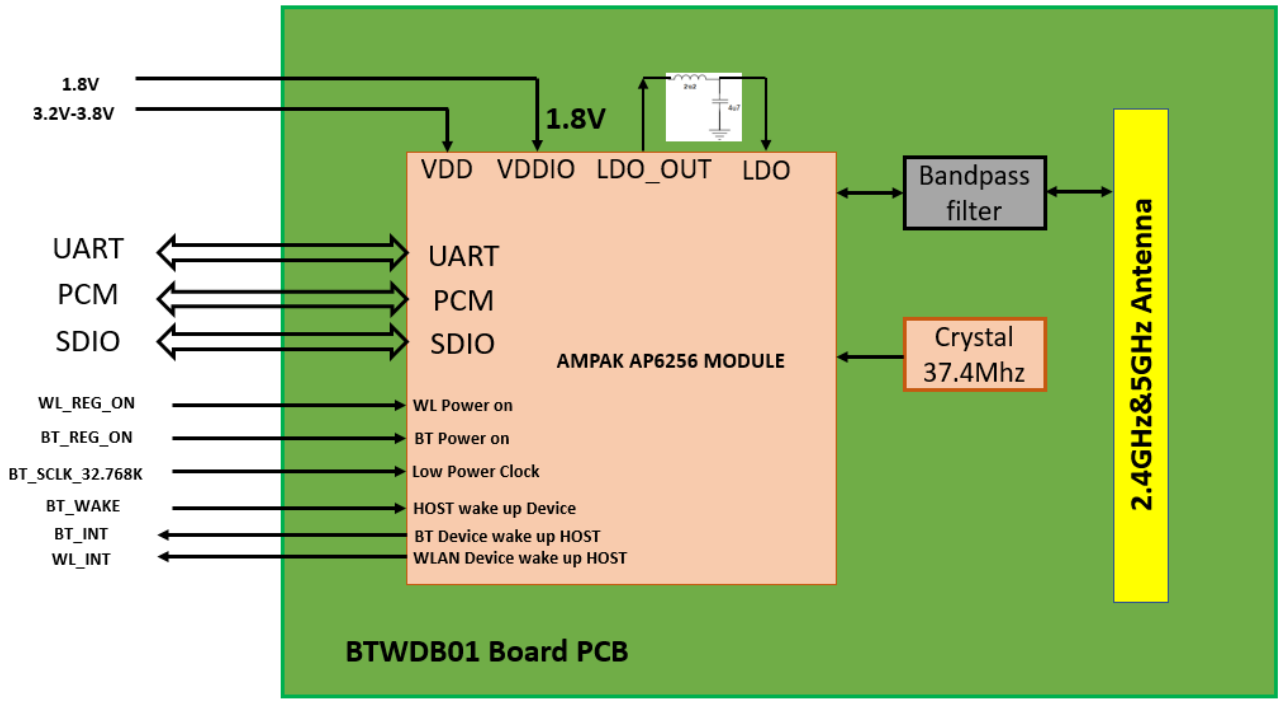
3.1 Bluetooth WLAN daughter board BT stack diagram

Broadcom's Bluetooth Simple API (BSA) is a host software stack solution designed to simplify Bluetooth applications development for a wide range of embedded platforms. Based on a client/server model, the BSA Bluetooth daemon (server) runs the Broadcom Bluetooth stack (protocols and profiles) and drives the UART/USB HCI-supported Bluetooth module. Client applications connect to the server for Bluetooth services and profiles such as FTP, AG, A2DP, etc.

AP6256 uses BSA Stack, and communicates with a HCI through the UART interface.



3.2 Bluetooth WLAN daughter board bloc diagram



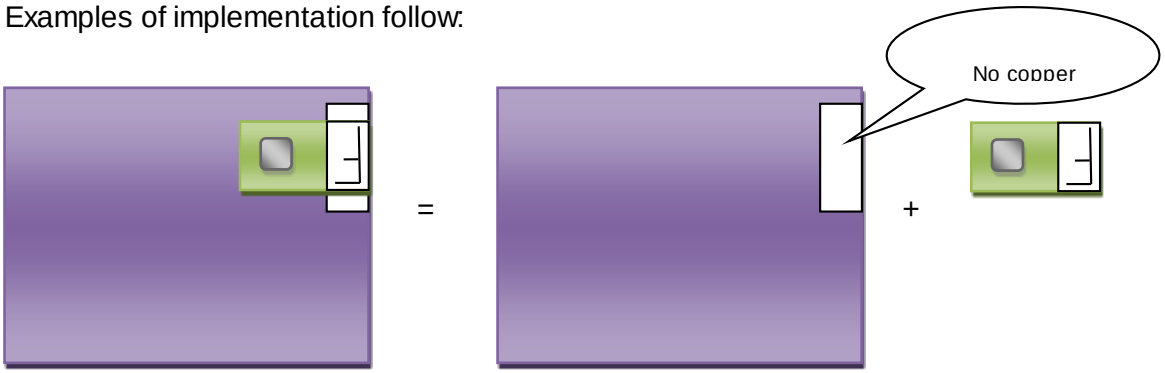
3.3 Mechanical aspects

This board will be mounted on other boards. So we can make it with a dongle or directly mounted on board.

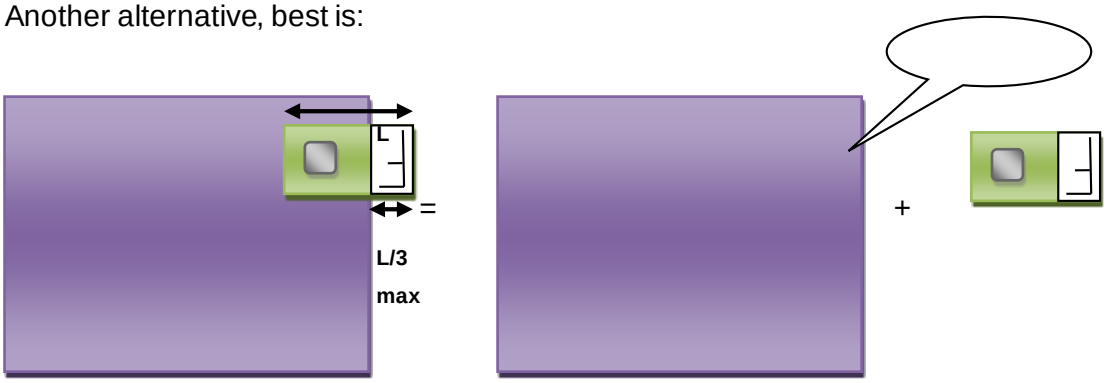
For radiofrequency propagation reasons, the antenna area must not cover any copper plane.

For industrial reasons, the board must lay on the CPU board on at least 2/3 of it's surface.

Examples of implementation follow:



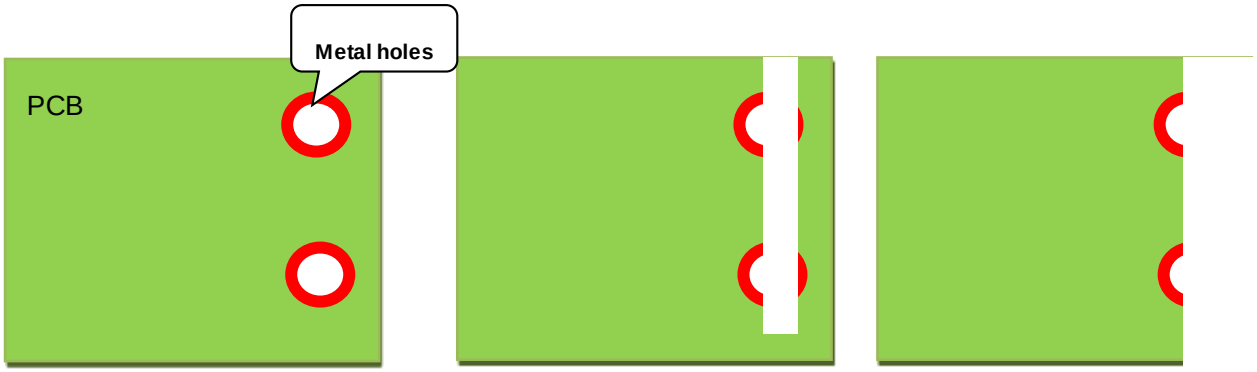
Another alternative, best is:



Connections:

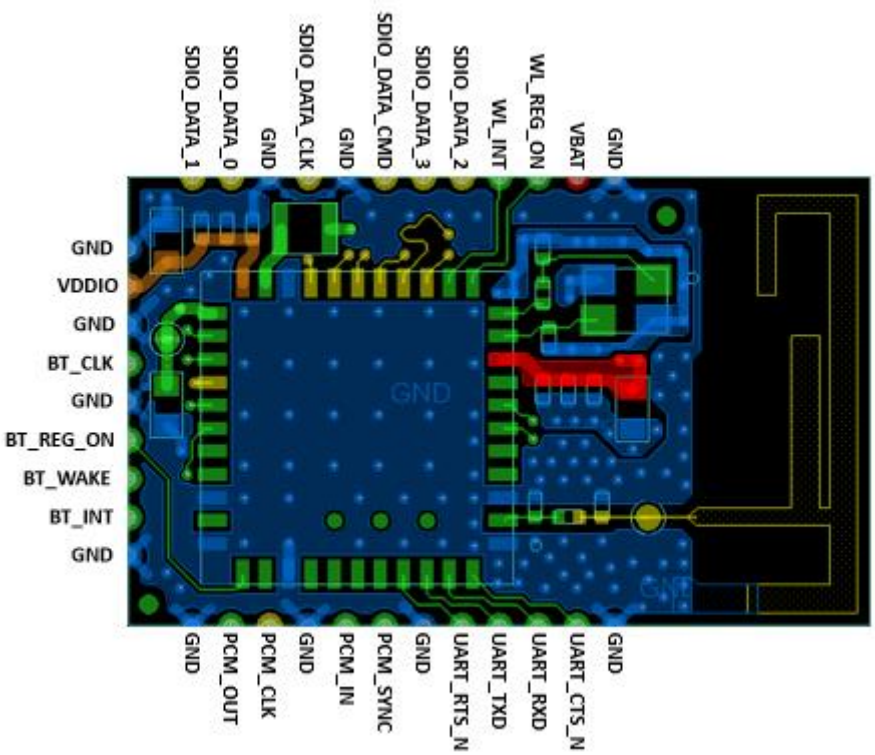
To reduce cost, we want to avoid a board to board connector.

The daughter board will use the technique of the cut metal holes on the board edge (top view):



Before milling During milling Resulting connections

The connections number is 33, spread over three sides of the board as following:

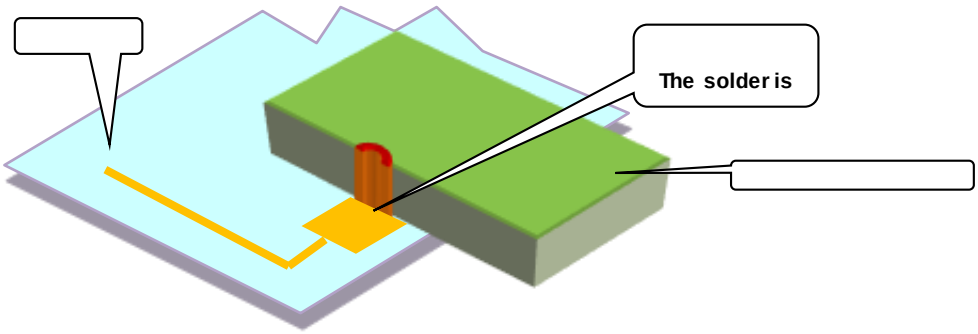


Mounting on boards

The daughter board is mounted flat directly on the other boards.

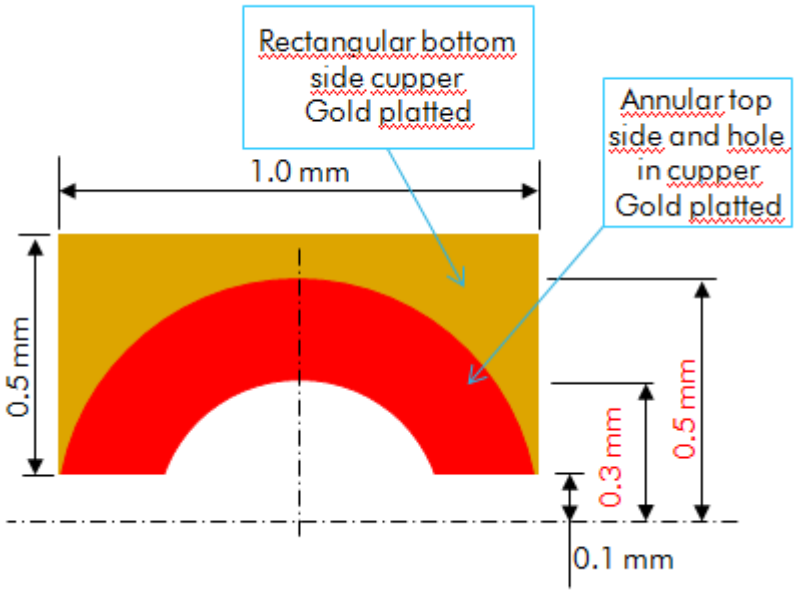
This means that:

- There is no component on the bottom side of the BTWDB
  - Also signal vias shall be prohibited to avoid risks of short-circuit with main board GND.
- There is no component on top of the mainboard

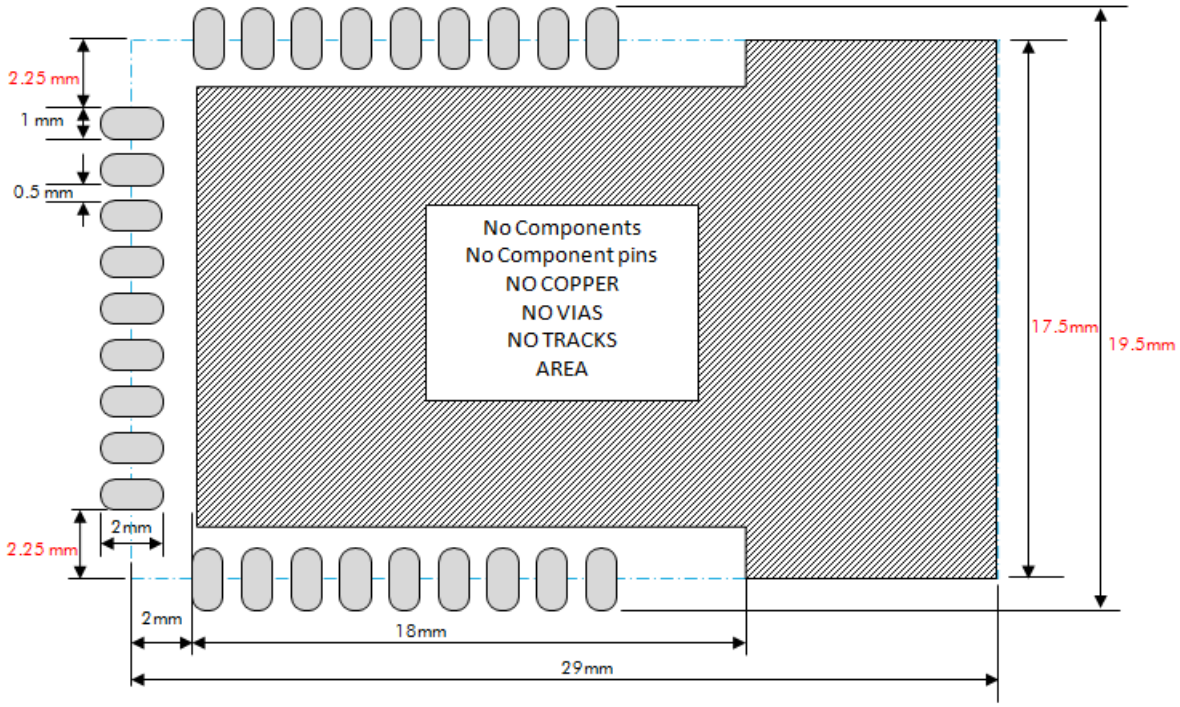


Care must be taken in order to equilibrate the layout, to avoid that the PCB becomes curved during soldering process (due to differential thermal expansion of the copper layers).

The cut-hole size must be defined big enough in order to get a solid solder area, and to avoid that the copper of the hole is snatched during milling process.



On Main board, the recommended footprint is as follows:



The GND pins must be connected to the GND plane as short as possible, with enough vias. Dotted line is the board outline.

3.4 Specification

Model Name	BTWDB01
Product Description	1Tx/1Rx 802.11 ac/a/b/g/n Wi-Fi + BT 5.0 Module
Dimension	L x W: 29 x 17.5(Typ.)mm、H：2.45 (Max.) mm
WiFi Interface	SDIO V3.0
BT Interface	UART / PCM
Operating temperature	-5°C to 45°C
V_{BAT} type	3.3 Volts
V_{DDIO} type	1.8 Volts

Bluetooth specification:

Feature	Description
General Specification	
Bluetooth Standard	BDR(1Mbps)、EDR(2、3Mbps)、LE(1Mbps、2Mbps)
Host Interface	UART
Frequency Band	2402 MHz ~ 2480 MHz
Number of Channels	79 channels for classic、40 channels for BLE
Modulation	GFSK, π/4-DQPSK, 8DPSK
RF Specification	
	MAX (dBm)
BDR Output EIPR Power	6
EDR Output EIPR Power	6
LE Output EIPR Power	6

WLAN RF specification

Feature	Description
WLAN Standard	IEEE 802.11b/g/n & Wi-Fi compliant
Frequency Range	2.400 GHz ~ 2.4835 GHz (2.4GHz ISM Band)
Number of Channels	2.4GHz: Ch1 ~ Ch13
Modulation	802.11b : DQPSK、DBPSK、CCK
	802.11 g/n : OFDM /64-QAM、16-QAM、QPSK、BPSK
Output Power , tolerance ± 1.5 dB The transmit EVM quality & spectrum mask are compliant with IEEE 802.11 standard	
802.11b	18 dBm
802.11g	18 dBm
802.11n 20MHz	18 dBm
Note: The specifications of RF output power are subject to change to fulfill the safety regulation and requirements in end-user product.	

Feature	Description
WLAN Standard	IEEE 802.11a/n/ac & Wi-Fi compliant
Frequency Range	5.15~5.35GHz、5.47~5.725GHz、5.725~5.85GHz (5GHz UNII Band)
Number of Channels	5.18~5.35GHz: Ch36 ~ Ch64
	5.5~5.72GHz: Ch100 ~ Ch144
	5.745~5.825GHz: Ch149 ~ Ch165
Modulation	802.11a : OFDM /64-QAM、16-QAM、QPSK、BPSK
	802.11n : OFDM /64-QAM、16-QAM、QPSK、BPSK
	802.11ac : OFDM /256-QAM、OFDM /64-QAM、16-QAM、QPSK、BPSK
Output Power , tolerance ± 1.5 dB The transmit EVM quality & spectrum mask are compliant with IEEE 802.11 standard	
802.11a	18dbm
802.11n 20MHz	18dbm
802.11n 40MHz	18dbm
802.11ac 20MHz	18dbm
802.11ac 40MHz	18dbm
802.11ac 80MHz	18dbm
Note: The specifications of RF output power are subject to change to fulfill the safety regulation and requirements in end-user product	

4 Detailed Technical Description

4.1 Electronic

4.1.1 RF solution to be implemented

The chosen AMPAK AP6256 Module which is a total solution for a combination of Wi-Fi + BT technologies.

For WI-FI, it supports 802.11a/b/g/n/ac

For Bluetooth, it complies with Bluetooth core specification V5.0

Bluetooth power level is class 2:

BDR output power is 6dBm

EDR output power is 6dBm

LE output power is 6dBm

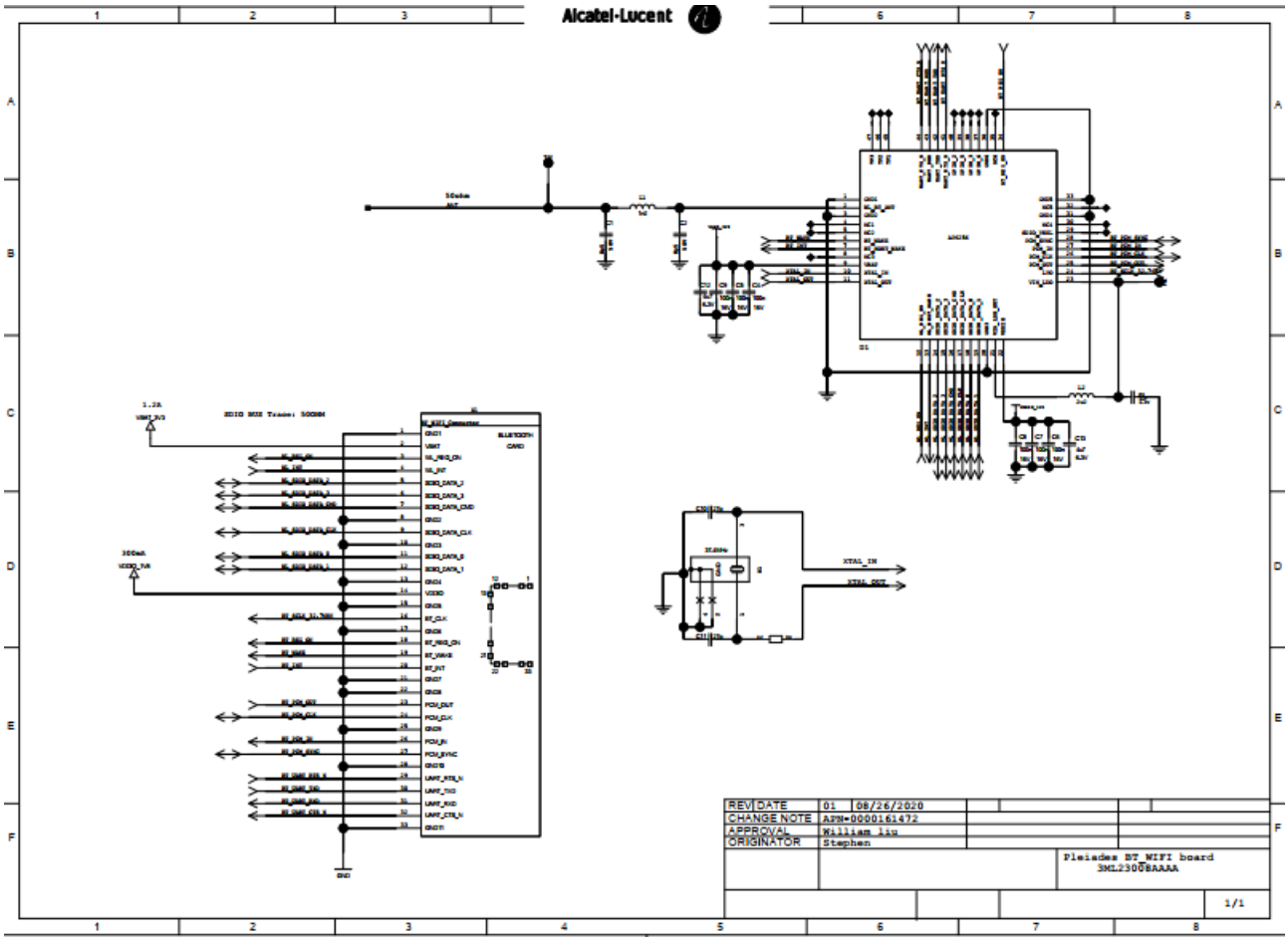
This module integrates the baseband, the RF amplifier, and power regulator.

It needs externally:

- a bandpass filter + antenna
- an accurate 37.4MHz source (crystal with less than 20ppm initial+ temperature + aging)
- A standard slow clock at 32.768 KHz for low power modes (+/-30ppm), which will be provided by the CPU. This clock MUST stay active continuously, even in SLEEP mode, where it is mandatory to wake up.
- Some passive components.

We implement the reference design from AMPAK Instrument, and with minor adaptation to our needs (test probe headers, some filter capacitor…)

4.1.2 Schematic



4.1.3 BOM

Name	Concatenated Description	CRN
3ML22008AAAA	PLEIADES BT_WLAN MODULE PCB__	PB1
1AB144890041	RES-CHIP_THICK-FILM_0Ohm_0%_0402	R2
1AB088200009	CAP_CER-CM/L2_X7R_100nF_10%_16V_0402_550um	C4
1AB088200009	CAP_CER-CM/L2_X7R_100nF_10%_16V_0402_550um	C7
1AB088200009	CAP_CER-CM/L2_X7R_100nF_10%_16V_0402_550um	C9
1AB088200009	CAP_CER-CM/L2_X7R_100nF_10%_16V_0402_550um	C8
1AB088200009	CAP_CER-CM/L2_X7R_100nF_10%_16V_0402_550um	C6

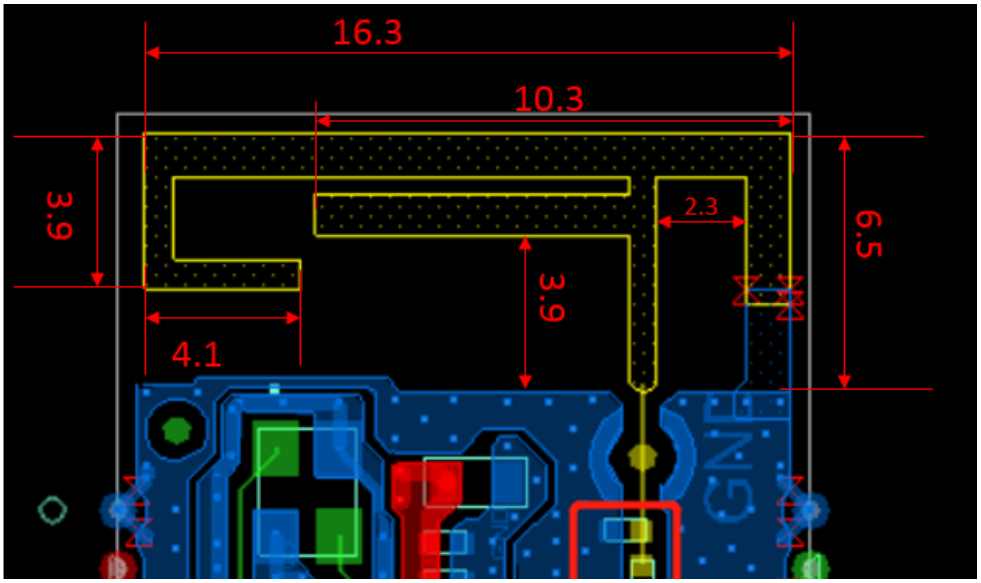
1AB088200009	CAP_CER-CM/L2_X7R_100nF_10%_16V_0402_550um	C5
1AB110830003	CAP_CER-CM/L1_C0G_27pF_5%_50V_0402_550um	C11
1AB110830003	CAP_CER-CM/L1_C0G_27pF_5%_50V_0402_550um	C10
1AB147730004	CAP_CER-CM/L2_X5R_4.7uF_10%_6.3V_0603_900um	C13
1AB147730004	CAP_CER-CM/L2_X5R_4.7uF_10%_6.3V_0603_900um	C3
1AB147730004	CAP_CER-CM/L2_X5R_4.7uF_10%_6.3V_0603_900um	C12
1AB150920003	INDUCTOR_RF_1.2nH_25%_300mA_100MHz/1GHz_UNSHLD_SM1005(0402)_ML	L1
1AB399060001	INDUCTOR_RF_2.2uH_20%_1.2A_SHLD_SM2520(1008)_ML	L2
1AB110820013	CAP_CER-CM/L1_C0G_500fF_+/- .25pF_50V_0402_550um	C2
1AB203820005	MMIC UWAVE_BT5.0_WIFI module_AP6256_PLCC44_shielding	D1
1AB226670015	XTAL_37.4MHz_16pF_initial 10ppm_temp 10ppm_2.5X2.0/4_-20C/75C	B1

4.2 Radio frequency

4.2.1 Antenna

We use PCB antenna to compatible with 2.4GHz and 5GHZ. This is a low-cost solution.

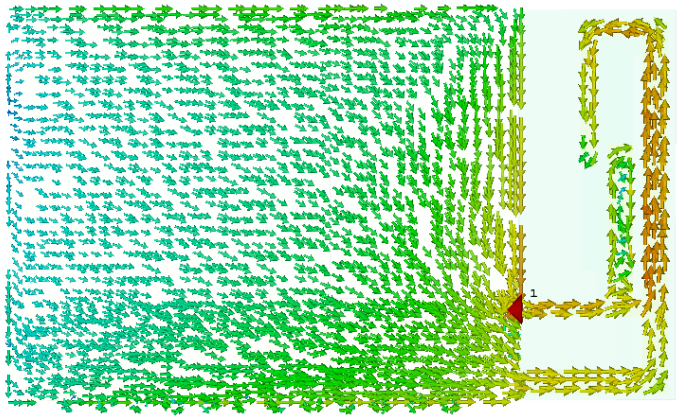
We choice the meandered inverted F antenna, which is a variant to have more compacity



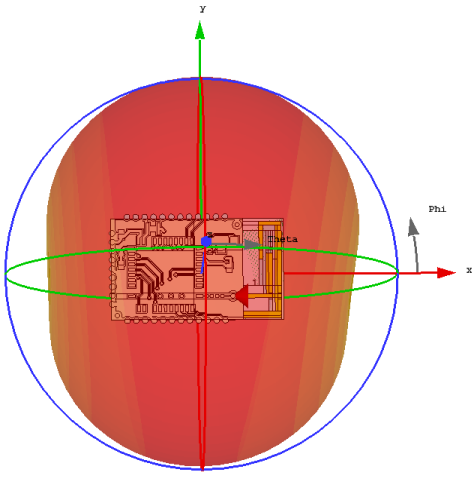
Width of wide Antenna trace: 1.1mm

Width of narrow Antenna trace: 0.7mm

simulation value for designed Antenna pattern efficiency:



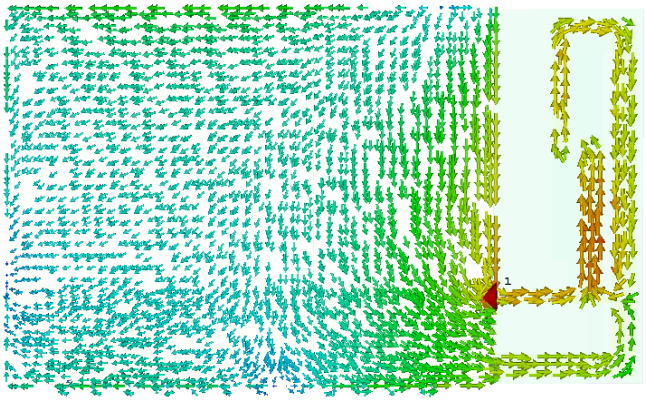
surface current (f=2.5) [1]
Frequency 2.5 GHz
Phase 0 °
Maximum 138.506 A/m



farfield (f=2.5) [1]

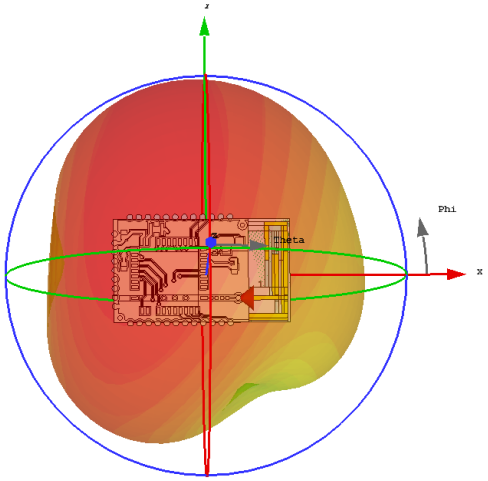
Type	Farfield
Approximation	enabled (kR >> 1)
Component	Abs
Output	Directivity
Frequency	2.5 GHz
Rad. Effic.	-0.8699 dB
Tot. Effic.	-1.920 dB
Dir.	1.948 dBi

5GHz current and radiation diagram simulation:



surface current (f=5.5) [1]

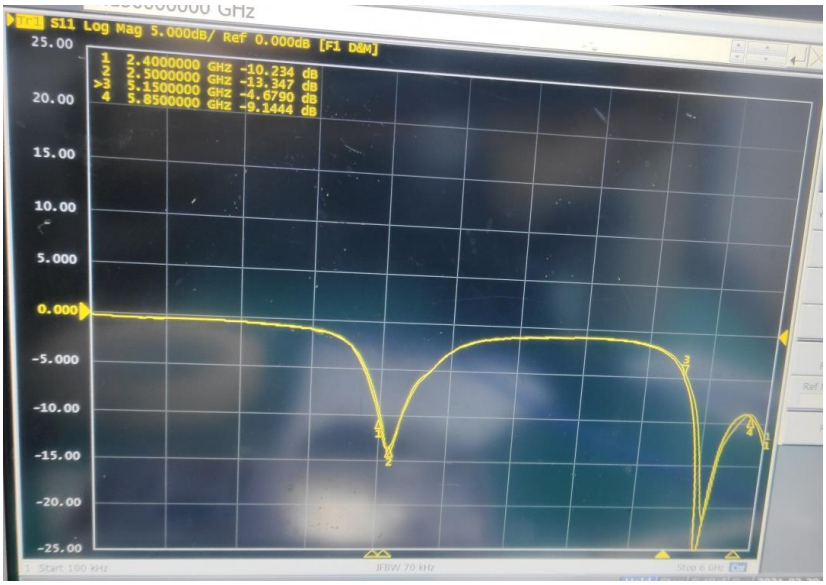
Frequency	5.5 GHz
Phase	0 °
Maximum	137.03 A/m



farfield (f=5.5) [1]

Type	Farfield
Approximation	enabled (kR >> 1)
Component	Abs
Output	Directivity
Frequency	5.5 GHz
Rad. Effic.	-0.7333 dB
Tot. Effic.	-0.9237 dB
Dir.	3.518 dBi

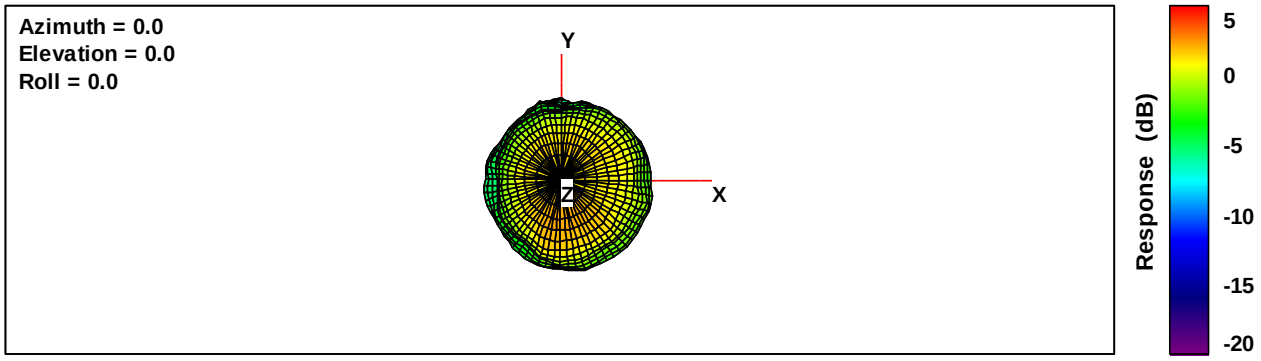
S11 diagram simulation:



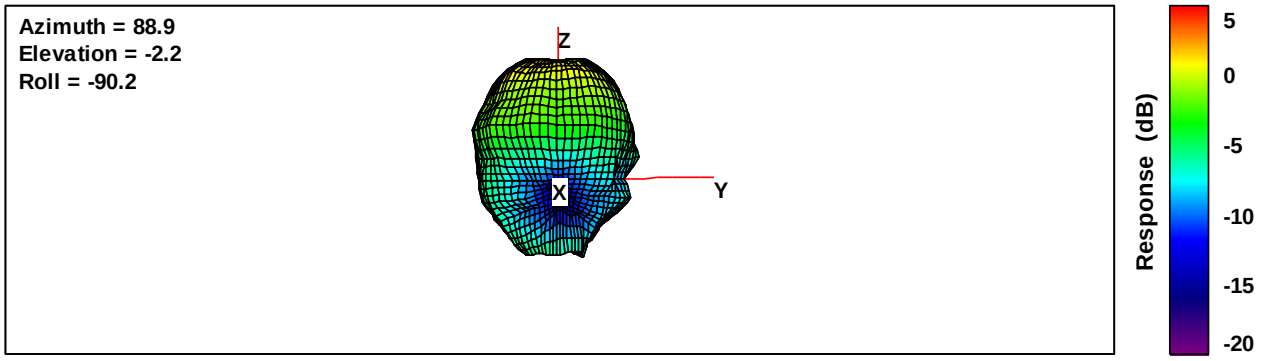
Real Antenna RF 3D Gain

2405-2800M 3D GAIN

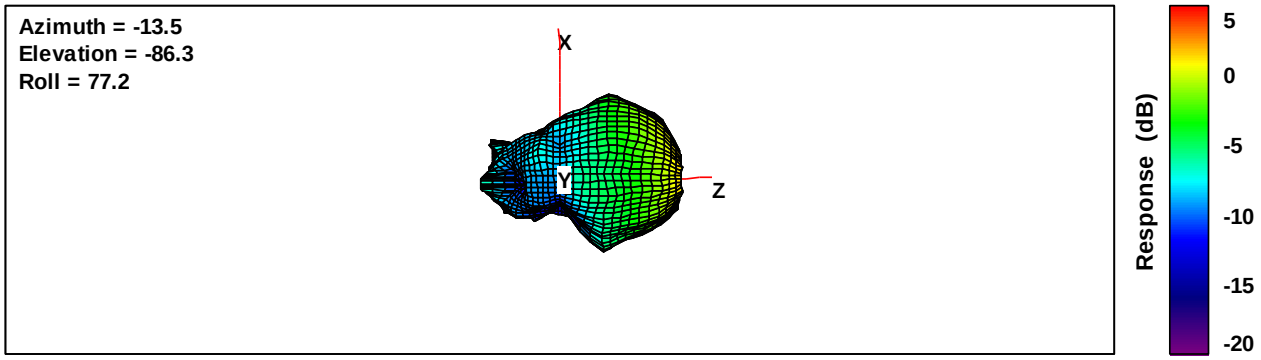
Total



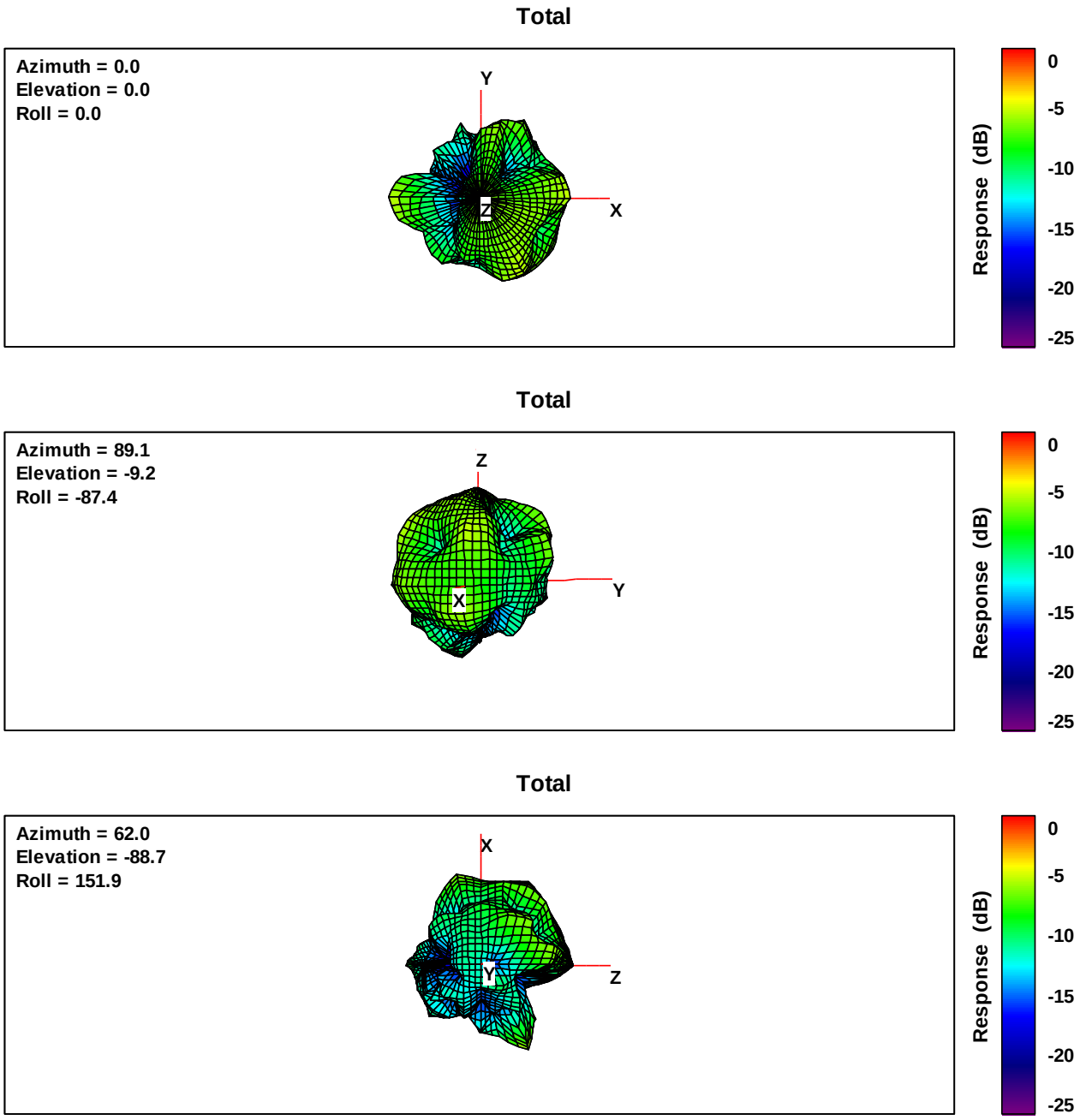
Total



Total



5100-5900M 3D GAIN



For real RF PCB antenna:

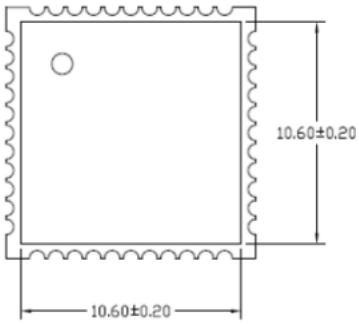
Max 2.4GHz antenna gain is: 3.16dbi

Max 5GHz antenna gain is: 3.00dbi

4.2.2 Immunity to external spurious and interferences

The RF radio can be perturbed by external high amplitude radiofrequency fields. In this case, the RF may show high bit error rate for example.

To improve the immunity, we choice AMPAK AP6256 chip, there is a shield to cover on RF chip and related RF circuit.



The shield dimension is 10.60x 10.60mm.

4.3 Layout

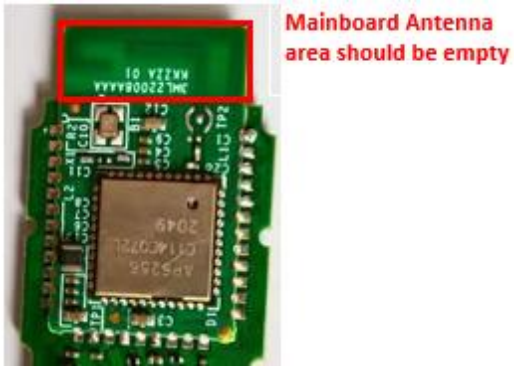
4.3.1 BTWDB layout

The layout recommendations from AMPAK Instructions must be followed.

4.3.2 Place requirements of BTWDB on mainboard

To make the BTWDB on mainboard has similar antenna resonant frequency as BTWDB alone, there are some BTWDB place requirements.

1. The under space of the BTWDB antenna need to be empty.
2. Metal material should be 1cm long away antenna

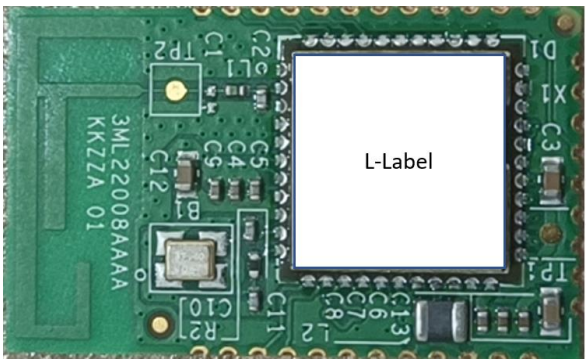


4.4 RF Module label: L-Label

4.4.1 L-Label characteristics

- Dimensions: (**10x10**) mm
- Label location: On TOP side of the module DB shell
- AL-E part-number: **3ML21086AAAA**

4.4.2 L-Label location



Shield size:10.6mm*10.6mm

Module dimension: L x W: 29 x 17.5(Typ.)mm、H : 2.45 (Max.) mm

4.4.3 L-Label content

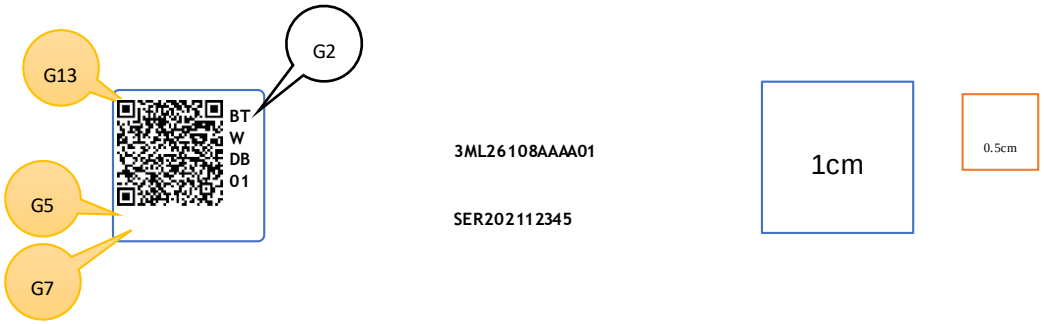
The information available on this label are:

- Product information: G2
- Manufacturing information: G5, G7, G13

The details for each kind of information is provided in the example of label hereafter.

L-Label content:

(yellow bullets (x) are contextual and need to be updated with product information's)



QR code contains:

3ML26108AAAA01;SER202112345;BD:AABBCCDDEEFF;MAC:AABBCCDDEEFF;FCC ID: OL3BTWDB01;IC: 1737D-BTWDB01;

FCC ID and IC number information is inserted inside the QR code. If want to check FCC ID or IC number, you can scan the QR code to get the information.

FCC ID: OL3BTWDB01

IC: 1737D-BTWDB01

FCC Statement

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.

NOTE: 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 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.

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

The device must not be co-located or operating in conjunction with any other antenna or transmitter.

1AA 00014 0004 (9007) A4

CAUTION

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that permitted for successful communication.

(i) the device for operation in the band 5,150 – 5,250 MHz is only for indoor use to reduce the potential for harmful interference to co-channel mobile satellite systems.

(ii) high-power radars are allocated as primary users (i.e. priority users) of the bands 5,250 – 5,350 MHz and 5,650 – 5,850 MHz and that these radars could cause interference and/or damage to LE-LAN devices.

IC Statement

This device complies with RSS247 of Industry Canada. Cet appareil se conforme à RSS247 de Canada d'Industrie. This device complies with Industry Canada license-exempt RSS standard(s). 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. appareils radio exempts de licence. Son fonctionnement est sujet aux deux conditions suivantes: (1) le dispositif ne doit pas produire de brouillage prejudiciable, et (2) ce dispositif doit accepter tout brouillage recu, y compris un brouillage susceptible de provoquer un fonctionnement indesirable.

RF exposure information:

This device complies with FCC and IC radiation exposure limits set forth for an uncontrolled environment.

Cet appareil est conforme aux limites d'exposition aux rayonnements de la FCC et de l'IC établies pour un incontrôlé environnement.

The device should be installed and operated with a minimum distance of 20cm between the radiator and your body.

L'appareil doit être installé et utilisé avec une distance minimale de 20 cm entre le radiateuet votre corps.

Module Statement

The **BTWDB01** module has received Federal Communications Commission (FCC) CFR47 Telecommunications, Part 15 Subpart C & E “Intentional Radiators” single-modular approval in accordance with Part15.212 Modular Transmitter approval. It‘s also has been certified for use in Canada under Innovation, Science and Economic Development Canada (ISED, formerly Industry Canada) Radio Standards Procedure (RSP) RSP-100, Radio Standards Specification (RSS) RSS-Gen and RSS-247. Single-modular transmitter approval is defined as a complete RF transmission sub-assembly, designed to be incorporated into another device, that must demonstrate compliance with FCC & IC rules and policies independent of any host. A transmitter with a modular grant can be installed in different end-use products (referred to as a host, host product, or host device) by the grantee or other equipment manufacturer, then the host product may not require additional testing or equipment authorization for the transmitter function provided by that specific module or limited module device.

The user must comply with all of the instructions provided by the Grantee, which indicate installation and/or operating conditions necessary for compliance.

The host product itself is required to comply with all other applicable FCC & IC equipment authorizations regulations, requirements and equipment functions that are not associated with the transmitter module portion. For example, compliance must be demonstrated: to regulations for other transmitter components within a host product; to requirements for unintentional radiators(Part 15 Subpart B & ICES-003), such as digital devices, computer peripherals, radio receivers, etc.; and to additional authorization requirements for the non-transmitter functions on the transmitter module (i.e., Suppliers Declaration of Conformity (SDoC) or certification) as appropriate (for example, Bluetooth and Wi-Fi transmitter modules may also contain digital logic functions).

LABELING AND USER INFORMATION REQUIREMENTS

The **BTWDB01** module has been labelled with its own FCC ID & IC number, and if the FCC ID & IC number is not visible when the module is installed inside another device, then the outside of the finished product into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wordings follows:

Contains Transmitter Module

FCC ID: OL3BTWDB01, IC: 1737D-BTWDB01

or

Contains FCC ID: OL3BTWDB01,

Contains IC: 1737D-BTWDB01

END OF DOCUMENT