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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 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
- 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. See reference [1].

The choice is to do a daughter board with the chip CC2564 from Texas Instruments, 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 management software in the phone.

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

A first step will be to use it on 8088, 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 BTDB will give a BT2.1+ EDR 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 BT qualification
- A cost effective solution

1.3 External Interfaces

The interface signals are listed hereafter:

Pin N°	Name	Function	Type	Voltage
1	GND	Keep feet on the ground.	Power	0V
2	VDD_IO	Direct path supply for 1.8V I/O pads.	Power	1.8V
3	GND	Keep feet on the ground.	Power	0V
4	SLOW_CLK	32.768KHz +/- 250ppm	I	1.8V
5	GND	Keep feet on the ground.	Power	0V
6	HCI_RX	HS UART Receive up to 4Mbps	I /PU	1.8V
7	TX_DBG	TI internal debug messages. Not used.	O /PU	1.8V
8	HCI_CTS	HS UART flow control: data from BTDB to Host allowed when low	I /PU	1.8V
9	GND	Keep feet on the ground.	Power	0V
10	GND	Keep feet on the ground.	Power	0V
11	HCI_RTS	HS UART flow control: data from host to BTDB allowed when low	O /PU*	1.8V
12	HCI_TX	HS UART Transmit up to 4Mbps	O/PU*	1.8V
13	GND	Keep feet on the ground.	Power	0V
14	PCM_SYNC	Frame synchro for audio data	I/O /PD	1.8V
15	PCM_CLK	Clock for audio data	I/O /PD	1.8V
16	PCM_OUT	Output of audio data. Maybe in tristate	O /PD	1.8V
17	PCM_IN	Input of audio data	I	1.8V
18-23	GND	Keep feet on the ground.	Power	0V
24	ENABLE	Disables BT chip when low (Pull down) and performs internal reset of CC2564. Minimum low state duration: 5ms	I /PD	1.8V
25	GND	Keep feet on the ground.	Power	0V
26	VDD_IN	General supply	I	2.2V-4.8V
27	GND	Keep feet on the ground.	Power	0V

PU* : Pull-Up enabled only during ShutDown and DeepSleep phases (.

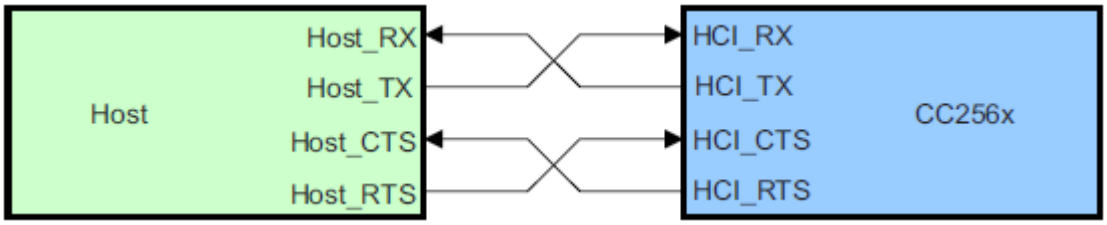
These correspond to the metal cut-holes. See chapter 7.4.3.

The VDD_IN pin can accept 2.2V to 4.8V. Typical value is 2.5V or 3.3V, but this depends on the motherboard.

Check the CC2564 datasheet for more information.

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



Check the CC2564 datasheet for more information.

This cabling supposes that the Host is in DTE mode. In case of DCE host, RTS and CTS are straight, and not crossed.

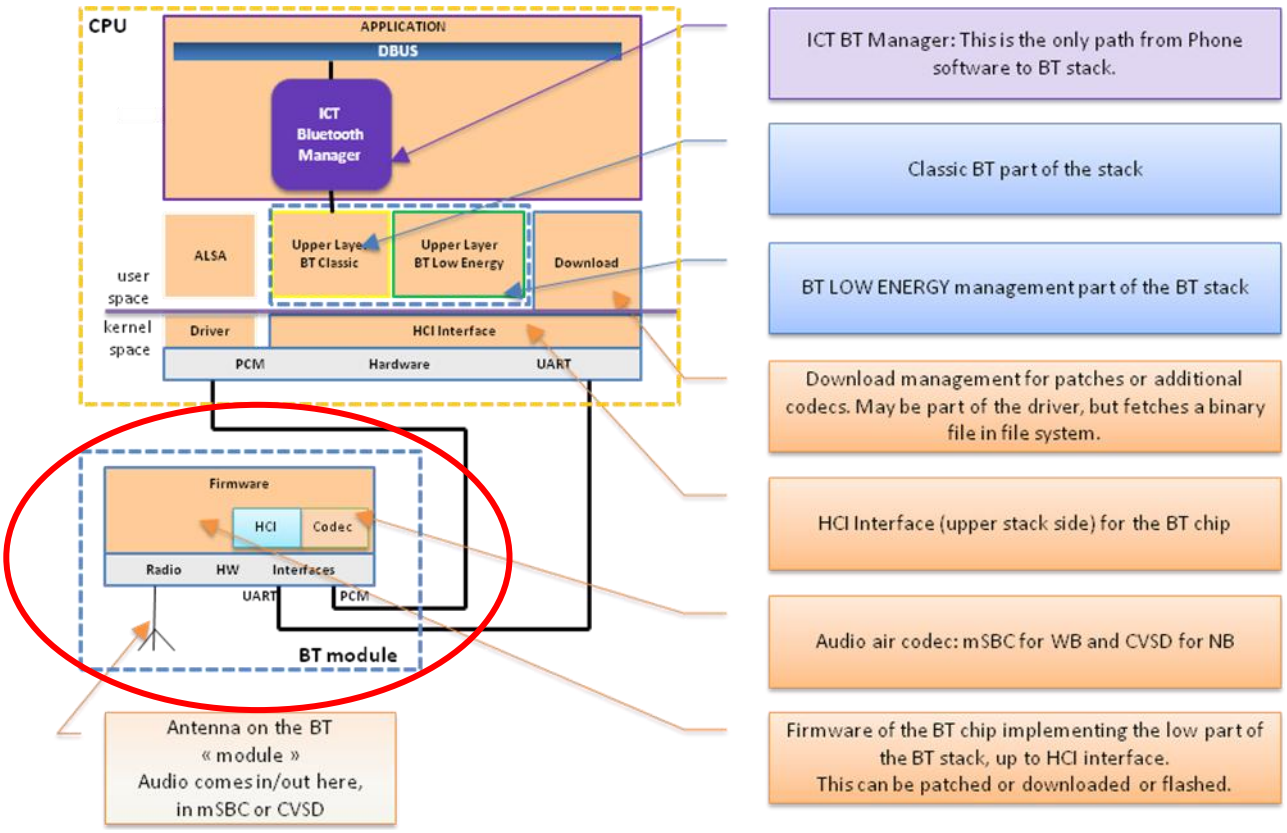
1.4 Terminology / Abbreviations

BTDB: BlueTooth Daughter Board

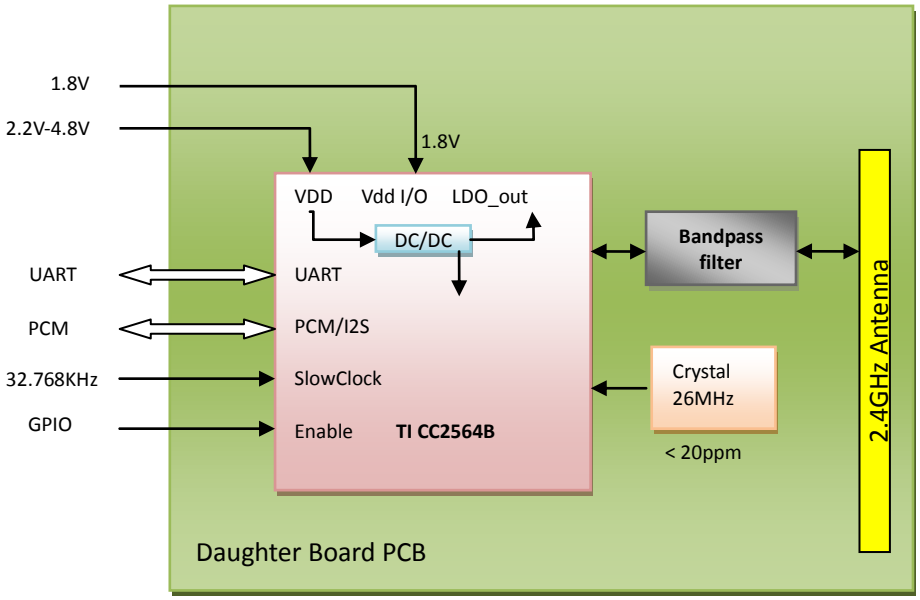
BT: BlueTooth

2. General Description

2.1 BT function global logical bloc diagram

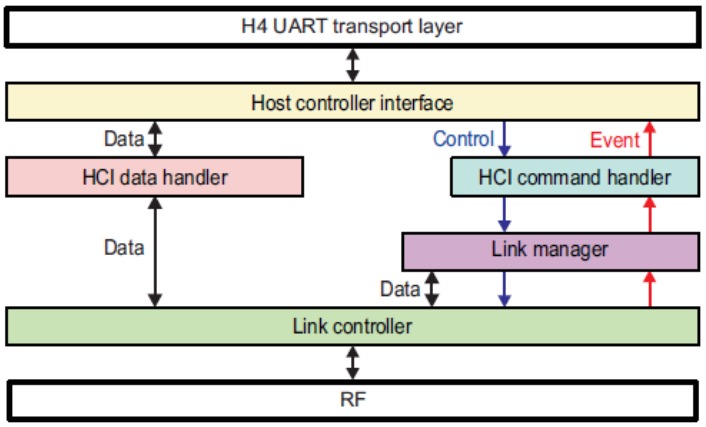


2.2 BT daughter board bloc diagram



The CC2564 communicates with a standard HCI through the UART interface.

Here is a representation of the lower part of the stack, which is inside the CC2564:



This means that the upper part of the stack must be hosted in the mother board cpu.

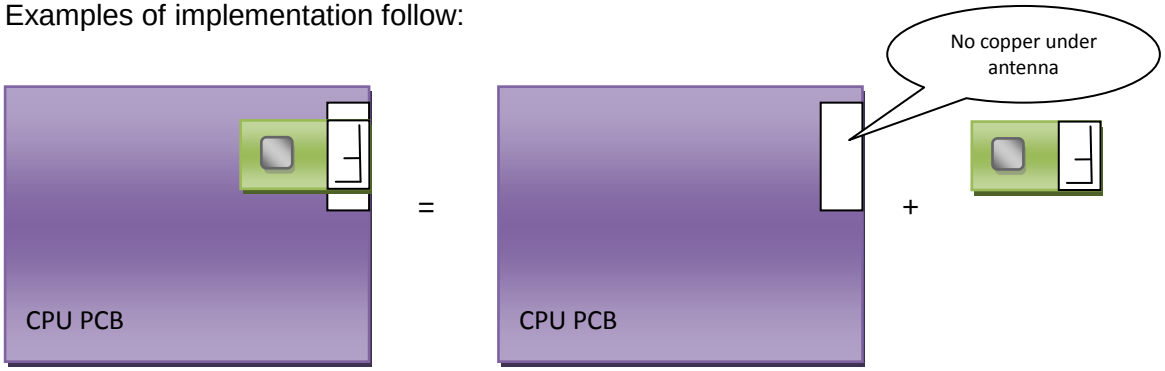
2.3 Mechanical aspects and integration

This board will be mounted on a IP Phone CPU board or BT handset CPU board.

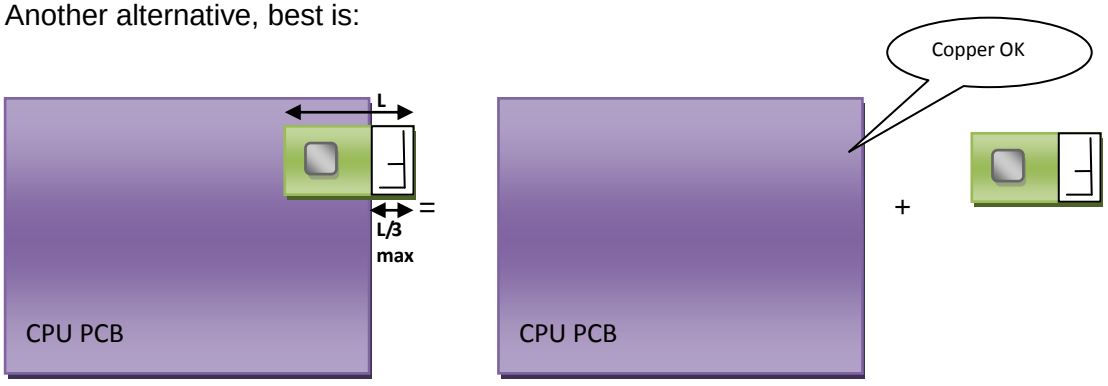
For radiofrequency propagation reasons, the antenna area must not cover any copper plane.

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:



2.4 Specification

Parameter	Value	
Standard support	Bluetooth 2.1 + EDR	
Host interface	HCI UART	
V_{BAT} Min, Max	2.2 Volts, 4.8 Volts	
V_{DD_IO} Min, Max	1.62 Volts, 1.92 Volts	
Temperature range (board)	-5 to +45°C	
Frequency range	2402 MHz to 2480 MHz	
Transmit power GFSK	+10 dBm min, +12 dBm typ	
Transmit power EDR	+6dBm min, +8 dBm typ	
RX Sensitivity BR	-91.5 dBm, GFSK at 0.1% BER	Max
RX Sensitivity EDR	-81 dBm, 8DPSK at 0.01% BER	Max
Full throughput current	42 mA, GFSK or EDR	Max
SCO link HV3	15 mA	Max
Idle current BR and EDR	5 mA	Max
Shutdown current	10 uA	Max

3. Industrial Considerations

3.1 Manufacturing

Trimming

The radio has an auto-calibration feature. This means that once the radio parameters have been defined by engineering, and stored in the chip, there is **no need of trimming in manufacturing.**

During engineering, care must be taken to define the right RF level output taking into account the losses in the bandpass filter and potential impedance adaptation cells.

3.2 Requirements

The module is considered as a component for the manufacturing, and must be stores in a reel, in vacuum packing until is mounted on the mother board.

3.3 Mechanical assembly / Industrial feasibility

3.3.1 Board outline

The board must be as small as possible.

Nevertheless, this depends on the antenna type implemented, and to routing optimizations that could be done. This size may be changed if smaller.

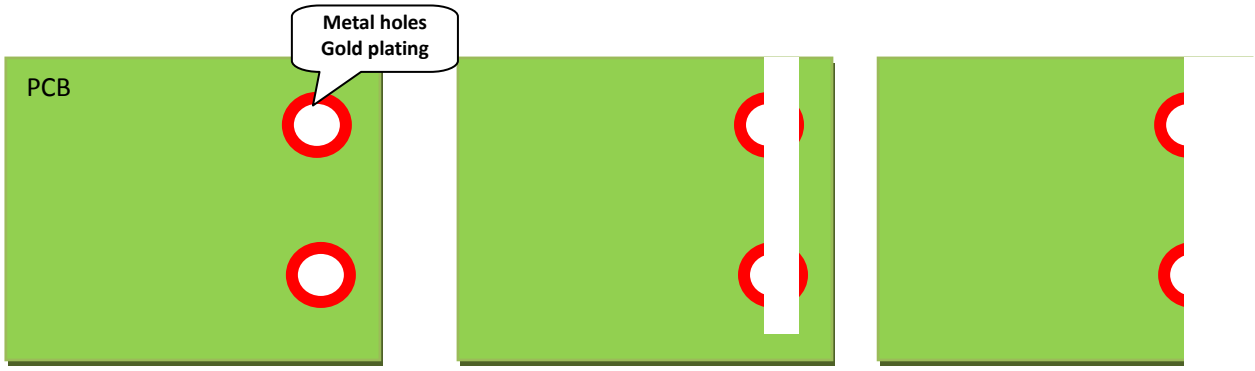
Provision is also made for a soldered shield, in case of high interferers.

See chapter 3.3.3 for size of the module.

3.3.2 Connections

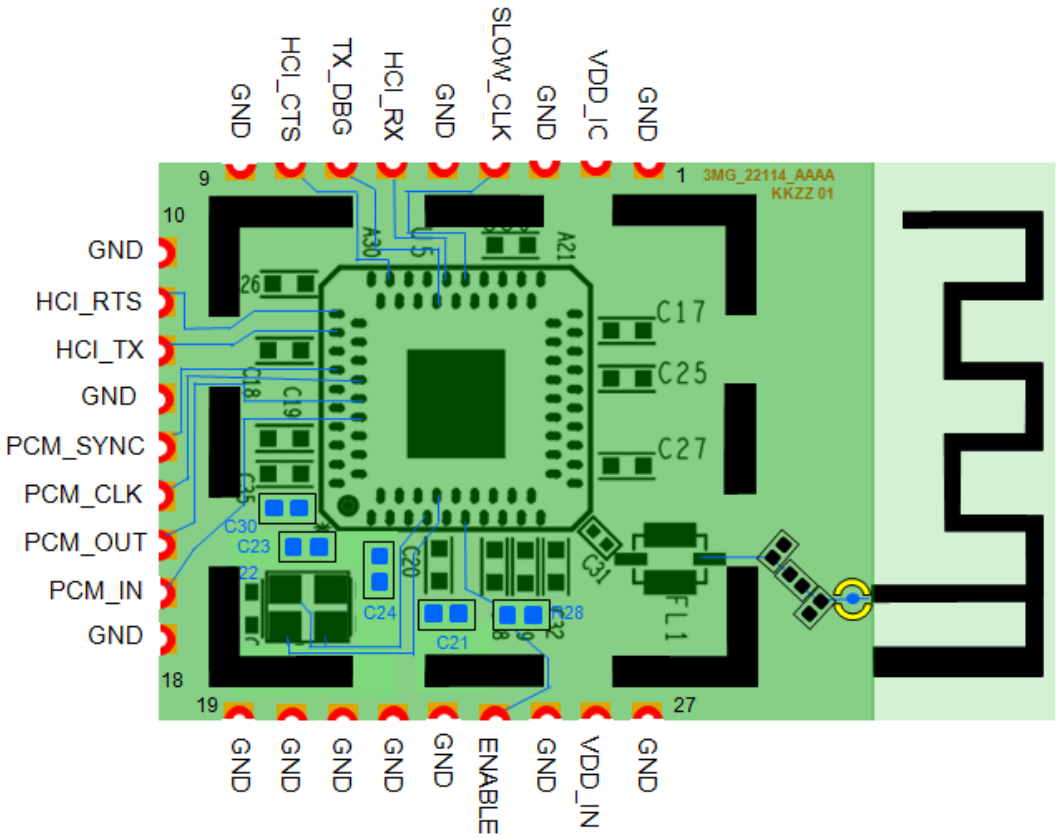
To reduce cost, we want to avoid a board to board connector.

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 27, spread over three sides of the board as following:

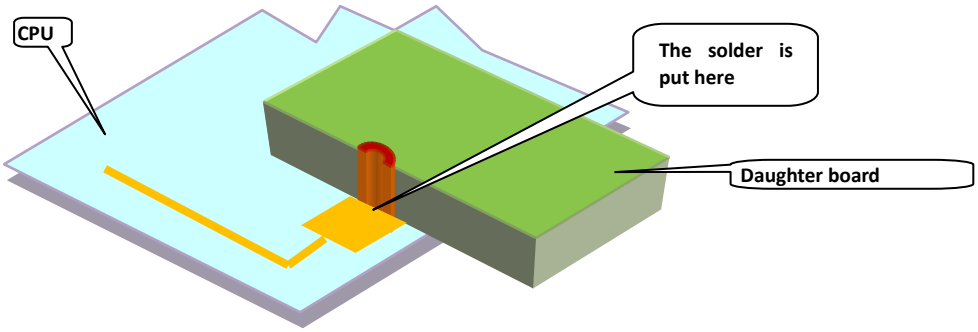


3.3.3 Mounting on the main board

The daughter board is mounted flat directly on the CPU board.

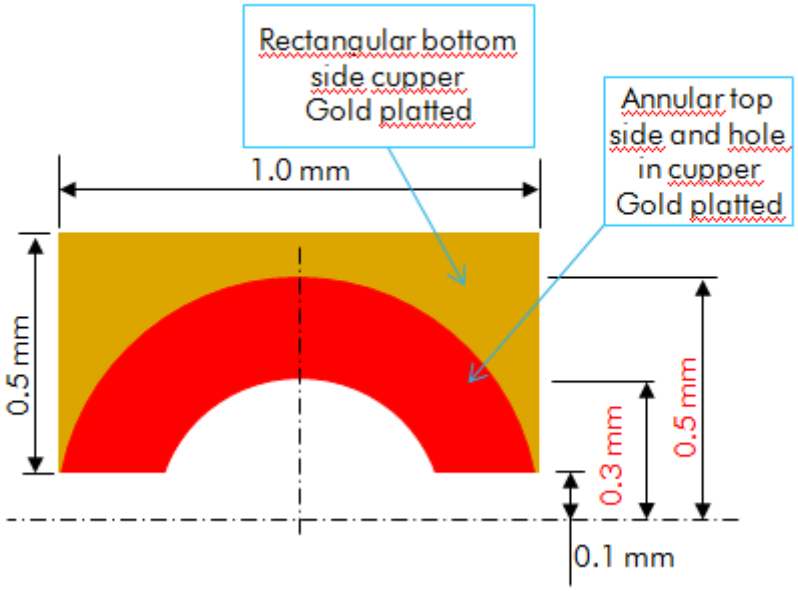
This means that:

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

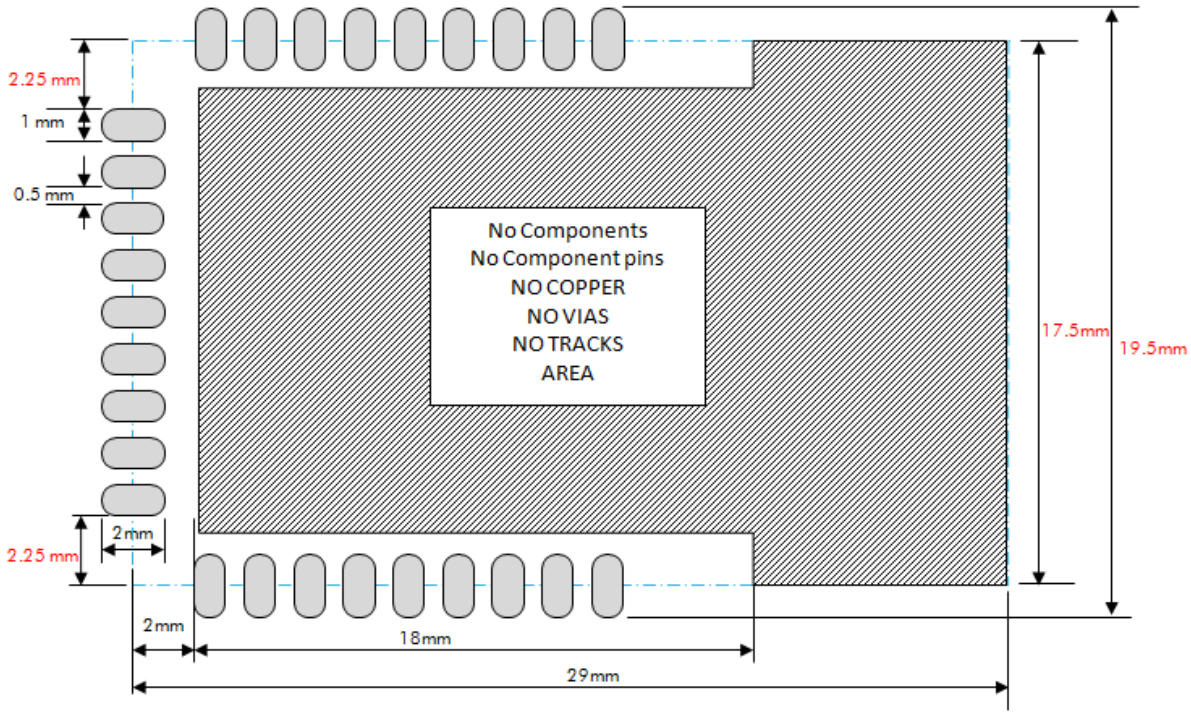


Care must be taken in order to equilibrate the layout, to avoid that the PCB becomes curved during soldering process (due to differential thermal expansion of the copper layers).

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:

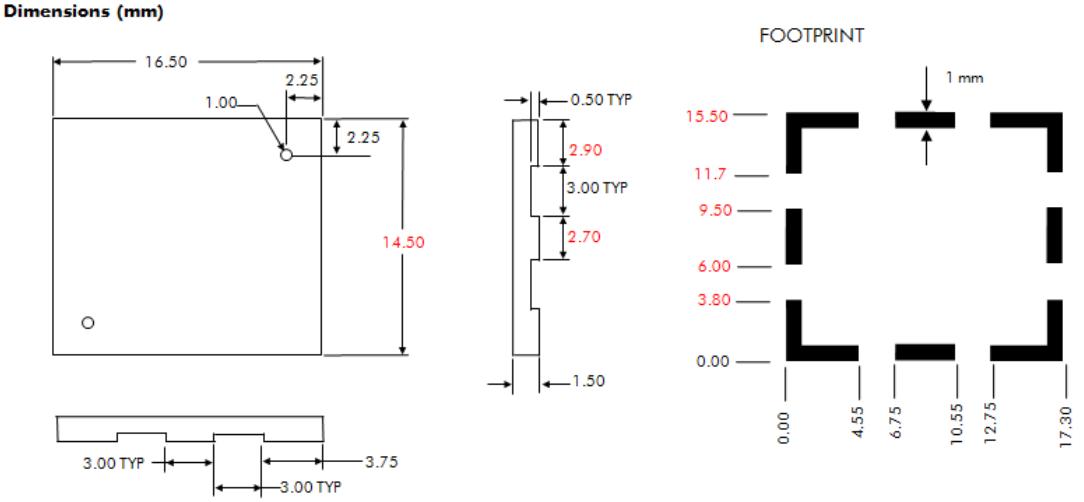


The GND pins must be connected to the GND plane as short as possible, with enough vias. Dotted line is the board outline.

3.3.4 Shielding Mounting

The target is to deliver a BTDB without shielding. All modules on the market have a shielding. It is required when the chip and sensitive RF parts are exposed to strong perturbations (WIFI, Cellular,..). It is not yet clear if our products using the BTHS will be exposed to such conditions. Also for full Bluetooth and RF certification of this board, the shield may be required.

Therefore we have foreseen provision to equip a one-piece surface mount shield. It is preferred to a two pieces part for manufacturing reasons. The following reference shall be used:



4. Regulatory Compliance

4.1 FCC statement:

This module has been tested and found to comply with the FCC Part15.
These limits are designed to provide reasonable protection against harmful interference in approved installations.
This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance the instructions, may cause harmful interference to radio communications.
However, there is no guarantee that interference will not occur in a particular installation.
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.

Modifications or changes to this equipment not expressly approved by Alcatel-Lucent Enterprise may void the user's authority to operate this equipment.
The modular transmitter must be equipped with either a permanently affixed label or must be capable of electronically displaying its FCC identification number

(A) If using a permanently affixed label, the modular transmitter must be labeled with its own FCC identification number, and, if the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains Transmitter Module FCC ID: OL3BTMOD01" or "Contains FCC ID: OL3BTMOD01."
(B) If the modular transmitter uses an electronic display of the FCC identification number, the information must be readily accessible and visible on the modular transmitter or on the device in which it is installed. If the module is installed inside another device, then the outside of the device into which the module is installed must display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains FCC certified transmitter module(s)."

4.2 IC statement:

The final end product must be labeled in a visible area with the following "Contains transmitter module IC: 1737D-BTMOD01"

This Class B digital apparatus complies with Canadian ICES-003.
Cetappareilnumérique de la classe B estconforme à la norme NMB-003 du Canada.

This device complies with RSS-210 of the Industry Canada 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.

Ce dispositif est conforme à la norme CNR-210 d'Industrie Canada applicable aux appareils radio exempts de licence. Son fonctionnement est sujet aux deux conditions suivantes: (1) le dispositif ne doit pas produire de brouillage préjudiciable, et (2) ce dispositif doit accepter tout brouillage reçu, y compris un brouillage susceptible de provoquer un fonctionnement indésirable.

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