SmartRF Development Module

V 1.0

SmartRF is a 2.4Ghz RF module development kit that can help you to prototype your RF based wireless communication products within a few lines of C code.

Based on nRF24L01+ radio and ATmega324P, the board is packed with many exciting features & functions in this tiny little development module at a very affordable price.
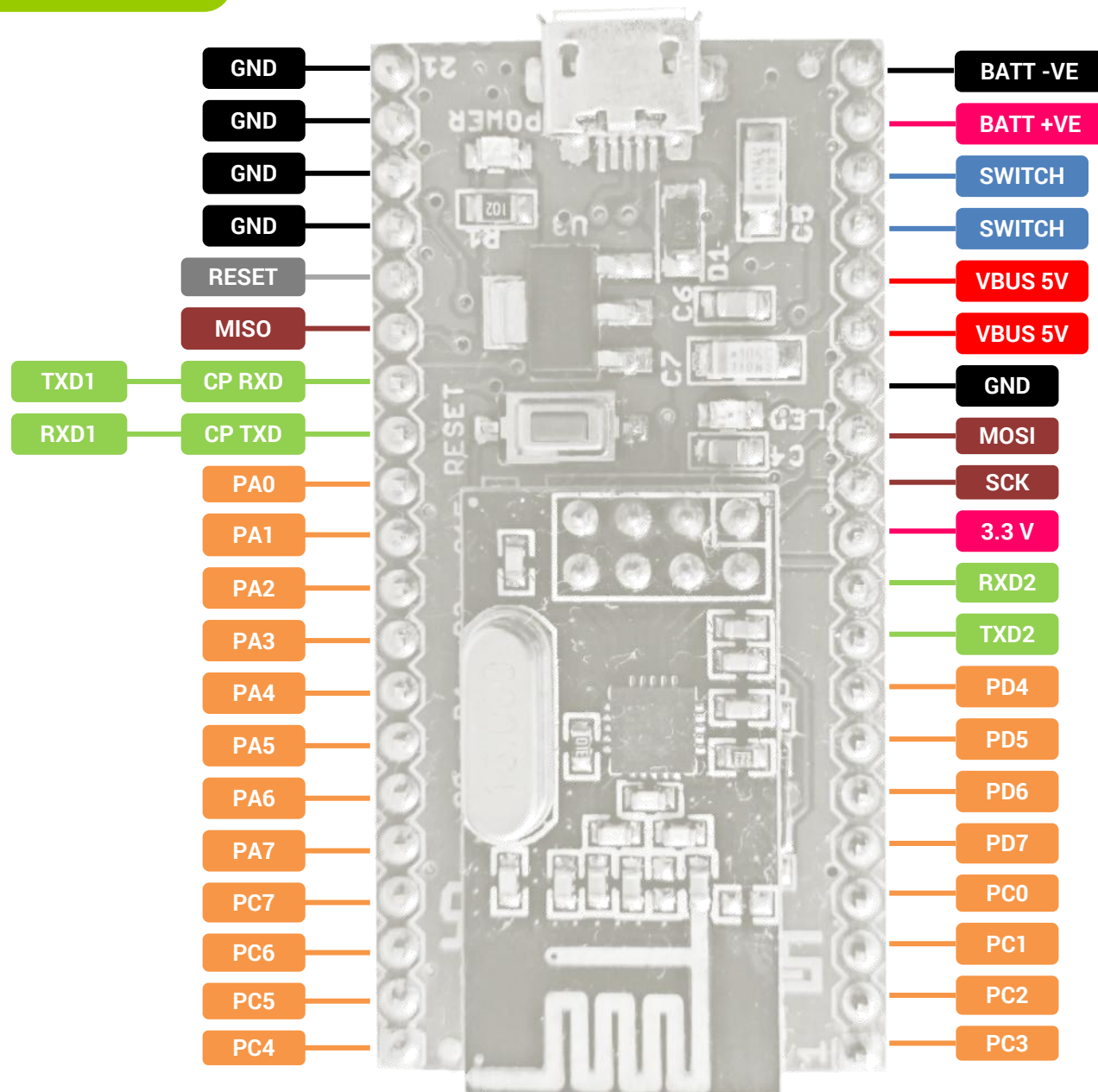
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FEATURES

- **2.4GHz RF radio**: nRF24L01+ can be configured for 127 channels from 2.4GHz with band gap of 1MHz

- **Max 2 Mbps data throughput:** The module can work in 3 speed modes of 250Kbps, 1Mbps and 2Mbps.

- **Powerful 8 bit microcontroller onboard:** The module has an ATmega324P on board. 2KB RAM and 32KB with dual USART (serial ports).

- **Direct USB access** through virtual com port driver.

- On board single cell LiPo battery charger.

- **No programmer required:** smartRF has pre-programmed bootloader, no need of external programmer.

- **Multiple uses:** The module has nRF24L01+, ATmega324P, serial to USB converter as well as 3.7V LiPo battery charger.

TECHNICAL SPECIFICATIONS

- 8 x Analog inputs and14 x digital IOs, 1 x USART (second USART used with USB bridge).

- 3.3V operation, can be directly powered from USB, no separate power supply needed.

- 3.7V LiPo operation enabled along with 500mA battery charger inbuilt.

- Compact size: 25.4mm x 50.8mm (2" x 1") Double sided PCB with robust and compact assembly.

- Provision for external battery along with on/off switch.

- Uses micro-USB cable for connectivity which is commonly available.

- Production ready module with direct integration capabilities.

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GND
GND
GND
GND
RESET
MISO
TXD1 — CP RXD
RXD1 — CP TXD
PA0
PA1
PA2
PA3
PA4
PA5
PA6
PA7
PC7
PC6
PC5
PC4

BATT -VE
BATT +VE
SWITCH
SWITCH
VBUS 5V
VBUS 5V
GND
MOSI
SCK
3.3 V
RXD2
TXD2
PD4
PD5
PD6
PD7
PC0
PC1
PC2
PC3

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Special Pins	Description
PA0 − PA7	8 x 10bit analog / digital GPIO
PC2 − PC7	Digital GPIO
PC1 − PC0	Digital GPIO / I^{2}C
PD4 − PD7	Digital GPIO
TXD2, RXD2	Digital GPIO / USART

- 8 ADC pin at internal 2.56V or external 3.3V reference (10 bit ADC)

Jumper	Description	Default
J1	MCU TXD1 to CP RXD	Connected
J2	MCU RXD1 to CP TXD	Connected

- MCU RXD & MCU TXD are connected to USB bridge, to use them separately on module pins, J1 and J2 should be removed

Other parameters	Absolute max
VBUS supply / USB header	5.5 V
Battery voltage	3.7 V LiPo [4.2V max]
Max current through 3.3V rail	500 mA
GPIO voltage levels	3.3 V
Battery charging current	500 mA max
Bootloader speed	38400 bps

NRF Pins	Description
PB2	NRF-IRQ
PB3	NRF-CE
PB4	NRF-CSN
PB5	MOSI
PB6	MISO
PB7	SCK

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In order to use smartRF V1.0 properly, you will need a few softwares and utilities installed. List of these packages is given below along with respective download link.

1. Atmel's AVR Studio 6.2 + : download link

2. CP2102 USB to serial drivers : download link

3. WinAVR package : download link

4. AVRdude software : download link

5. AVRdude updated configuration file : download link

6. AVRdude batch file utility : download link

7. nRF24L01+ library v1.0 : download link

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COM8
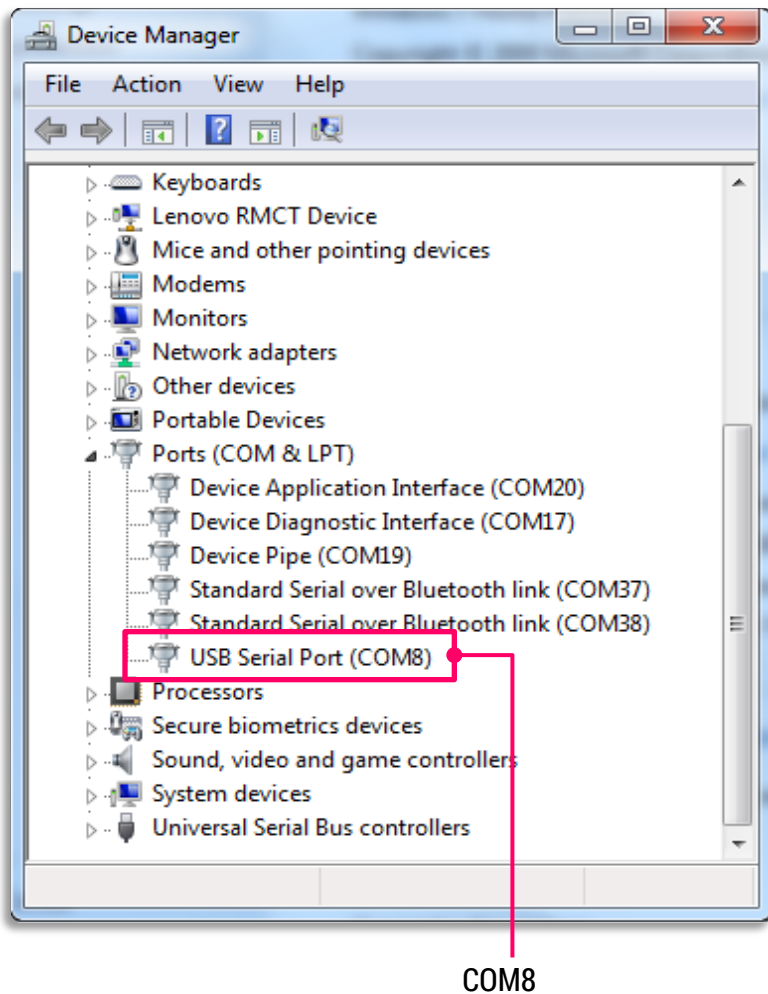
smartRF comes with CP2102 chip for Serial-USB conversion & corresponding drivers must be installed before using Serial-USB feature. Download these drivers before proceeding.

Unzip downloaded files into a separate folder and connect the board using USB cable. It will ask for drivers (if not already installed). Point the installer unzipped folder. System will install the driver from given files automatically.

Once the drivers are installed it would appear in device manager list as "USB Serial Port (COMx)". You can change the COM port number by right click of a mouse on the port-name and changing advance properties from 'Port Settings'; if needed.

This ensures that your board will always enumerate as same COMx port, whenever connected.

The same port can be used for PC ↔ smartRF communication.

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You can program the onboard master microcontroller with UART bootloader (over USB) which is pre-programmed into the device by default.

To transfer .hex file from a PC to MCU you need bootloader software AVRdude**.** This software should be extracted in a separate folder in C drive, preferably C:\WinAVR-20100110\bin. Download WinAVR package here: [download link](#).

Before you invoke bootloader, make sure smartRF board is connected to the PC using USB and you have identified corresponding port number. EEPROM file upload and Fuse value changes are not allowed with smartBoot bootloader.

NOTE:
- Bootloader gets activated during RESET / power on condition. During this, MCU checks for communication on USB-over-Serial port and if it is available, bootloader program starts. This check is done for approx. 1 second before the main application starts.
- Bootloader can be configured as an external command for Atmel Studio with single key execution. Contact us for configuration & procedure support.

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To upload the program…

1. Open the command prompt and type following command…

    <code>SRF001   m324P   COM8   38400   myProgram</code>

    Where

    - SRF001 = name of AVRdude batch file utility
    - m324P = type of microcontroller to be programmed (smartRF v1.0 has mega324P)
    - COM8 = USB com port number as identified during earlier installation
    - 38400 = bootloader speed in bps [38400 for smartBoot v2.1]
    - myProgram = name of the hex file of your program (no need to type .hex extension)

2. The RESET signal will be auto-generated and bootloader will start.

3. Hex file will be burned into MCU in a few seconds. Once upload is done – program would start running automatically.
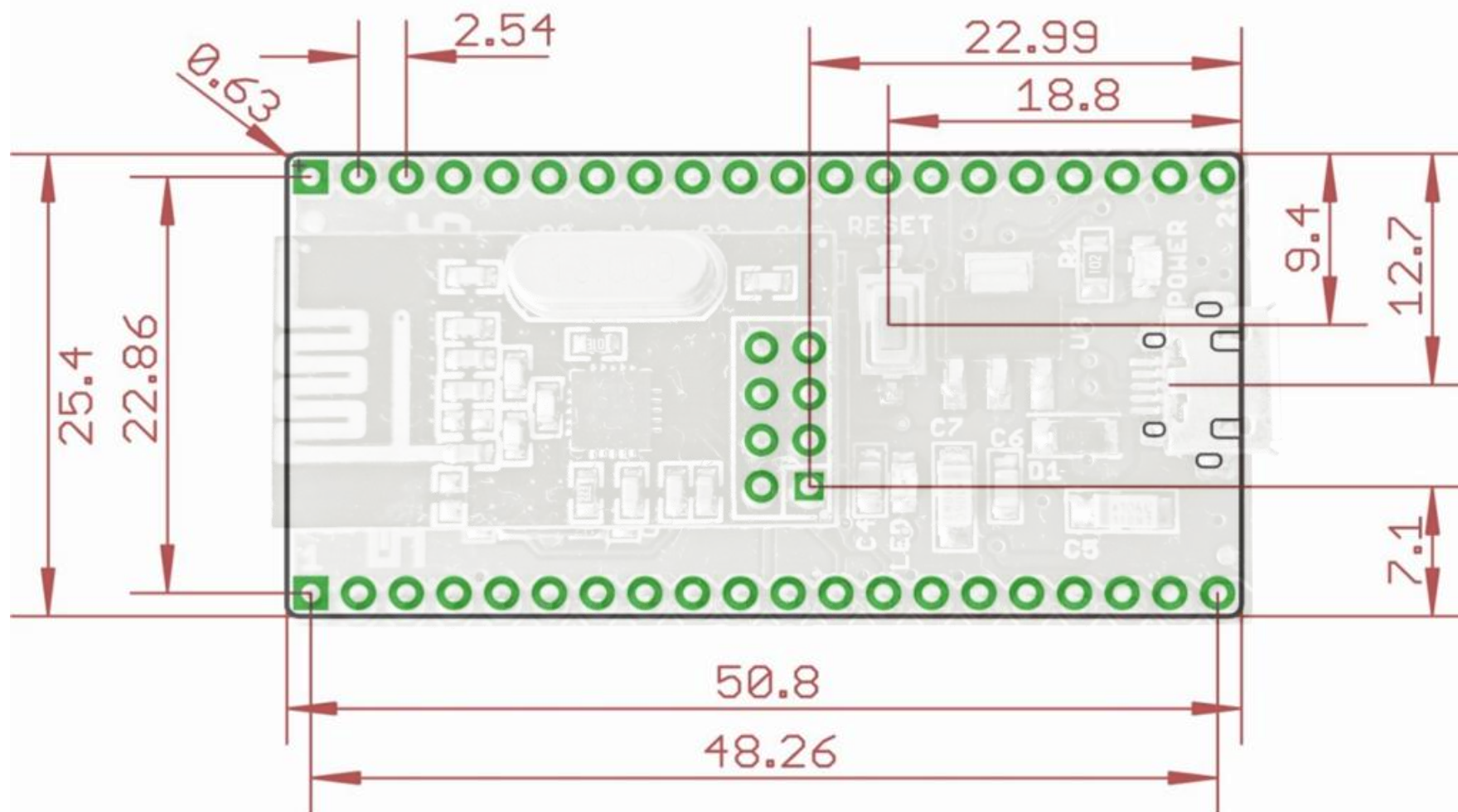
NOTES:

- The MCU can also be programmed with an external programmer. For this ISP pins of the module can be used.
- Note that the bootloader will get erased while using external programmer on ISP and you will have to re-flash the bootloader using same ISP port if you wish to use bootloader feature again.
- If bootloader program is accidently erased, you can upload it again using ISP programmer.
- Bootloader hex file can be downloaded from [this link](#).

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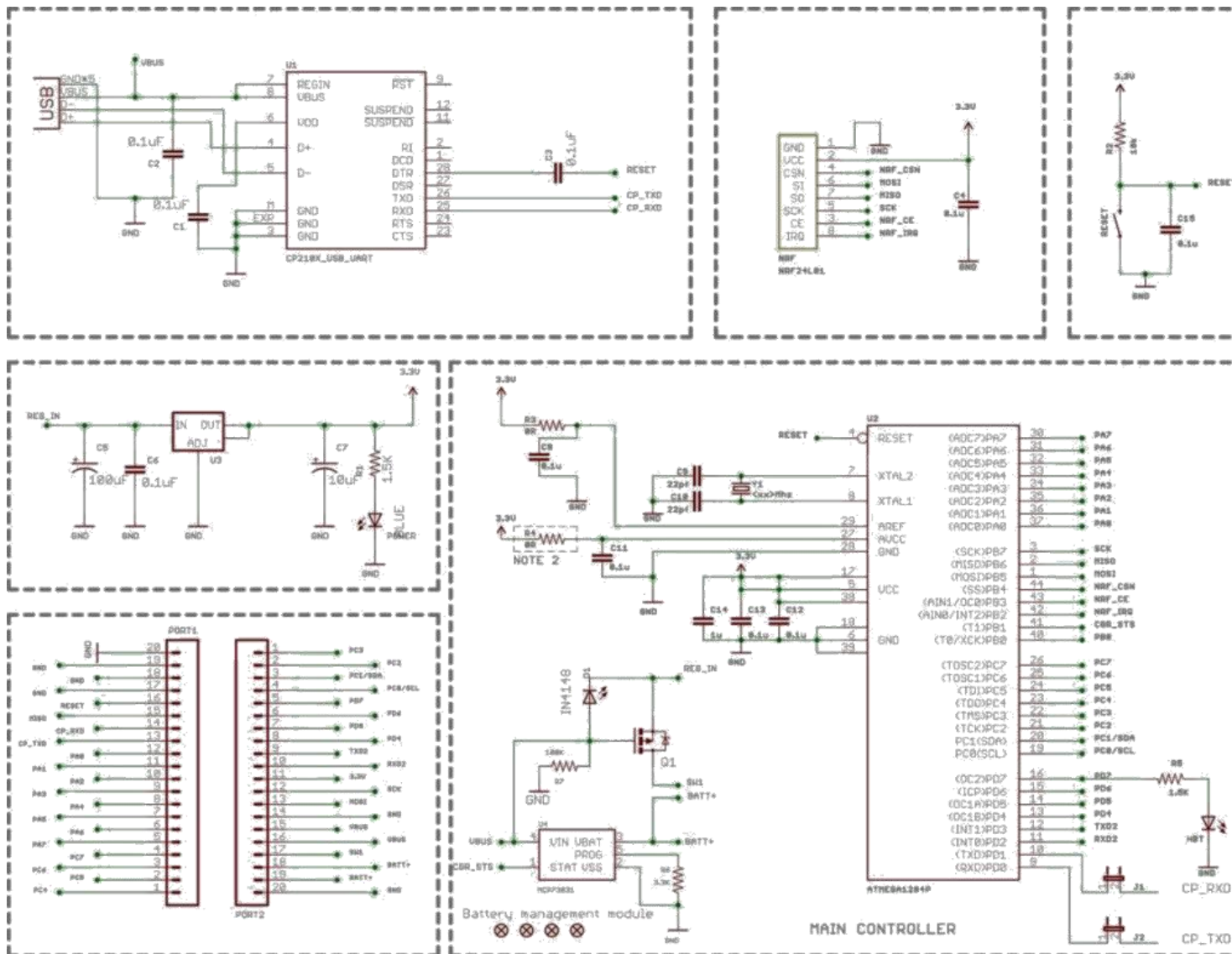
* This schematic is for full version board, some of the components and associated circuits may not be applicable if you have different version of the board. Kindly check actual board received while referring to this schematic.

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* All dimensions in mm

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Rev.	Version	Date	Remarks / Change-list	Added by
0	1.0	13.10.2015	Initial document	Prashant S

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