User Manual for AT Commands on UART Interface of Fanstel's nRF52 BLE 5.2 Modules

Table Of Contents

1. Introduction

An MCU can use AT Commands to communicate with a Bluetooth 5 module and to send data to a remote device over the Bluetooth 5 interface.

AT commands are supported for Fanstel BT Series modules using Nordic nRF52 SoCs. Due to hardware limitation, some AT commands are not supported by some modules.

- BC805 Series Nordic nRF52805 modules (BC805M)

- BC833M Series Nordic nRF52833 QDAA modules (BC833M, BC833E)

- BM833 Series nRF52833 QIAA modules (BM833, B833F, BM833E)

- BM833A Series nRF52811 modules (BM833A, B833AF)

- BT832 Series Nordic nRF52832 modules (BT832, BT832F, BC832, BM832, BM832E)

- BT832X Series Nordic nRF52832 with SKY66112 PA modules (BT832X, BT832XE)

- BT832A Series Nordic nRF52810 modules (BT832A, BT832AF, BM832A)

- BT840 Series Nordic nRF52840 modules (BT840, BT840E, BT840F, BC840, BC840M, BC840E)

- BT840X Series Nordic nRF52840 with SKY66112 PA modules (BT840X, BT840XE)

2. Preloaded Firmware

Starting with November 2018 production (date code 1847 or later), AT command codes for UART interface are used in production testing. Bootloader is included.

Fanstel will continue to develop firmware to support more features. New firmware will be used in future production testing. If you prefer to use a specific version of AT command codes, please download and save. Custom programming services are available for a fee.

Reprogram with New AT Command Codes

Up to date AT command codes for UART can be downloaded from Fanstel website.

http://www.fanstel.com/download-document/

You can reprogram new AT command codes using OTA DFU (Over The Air Device Firmware Upgrade) if Fanstel "published" private key is used when generating your codes.

Reprogram with Non-Fanstel Codes

To load your firmware, you need to *chiperase* and reprogram modules. An example for BT840 module:

//program BT840 Bootloader+Softdevice+Application hex

nrfjprog -f NRF52 --program BT840_AT_3in1PC181113.hex --chiperase --reset

//The file BT840_AT_3in1PC181113.hex = softdevice S140v6.1.1+BT840_AT_UARTwithout32K+bootloader

OTA Support

Modules Support OTA Firmware Upgrade

Bootloader is preloaded for nRF52832, nRF52833, nRF52840 modules. If you use Fanstel private key private.pem to generate codes, DFU OTA is possible on the preloaded codes. Modules support OTA:

nRF52832 modules: BT832, BT832F, BM832X, BT832XE, BM832, BM832E.

nRF52833 modules: BM833, BM833F, BM833E, BC833M, BC833E.

nRF52840 modules: BT840, BT840F, BT840E, BT840X, BT840XE, BC840, BC840M, BC840E.

Modules not Support OTA Firmware Upgrade

Limited by embedded memory sizes and AT command code sizes, bootloader is not included in the preloaded AT command codes. OTA firmware upgrade is not supported for the following modules:

nRF52810 modules: BM832A, BT832A, BT832AF.

nRF52811 modules: BM833A, BM833AF.

nRF52805 module: BC805M.

3. Hardware Interfaces
Block diagram for connecting a host MCU and BLE module is shown. Please refer to module evaluation board circuit diagram for the exact I/O pins used.

UART Interface for BT832F Series
UART interface connection between a host MCU and BT832F Series is shown below.
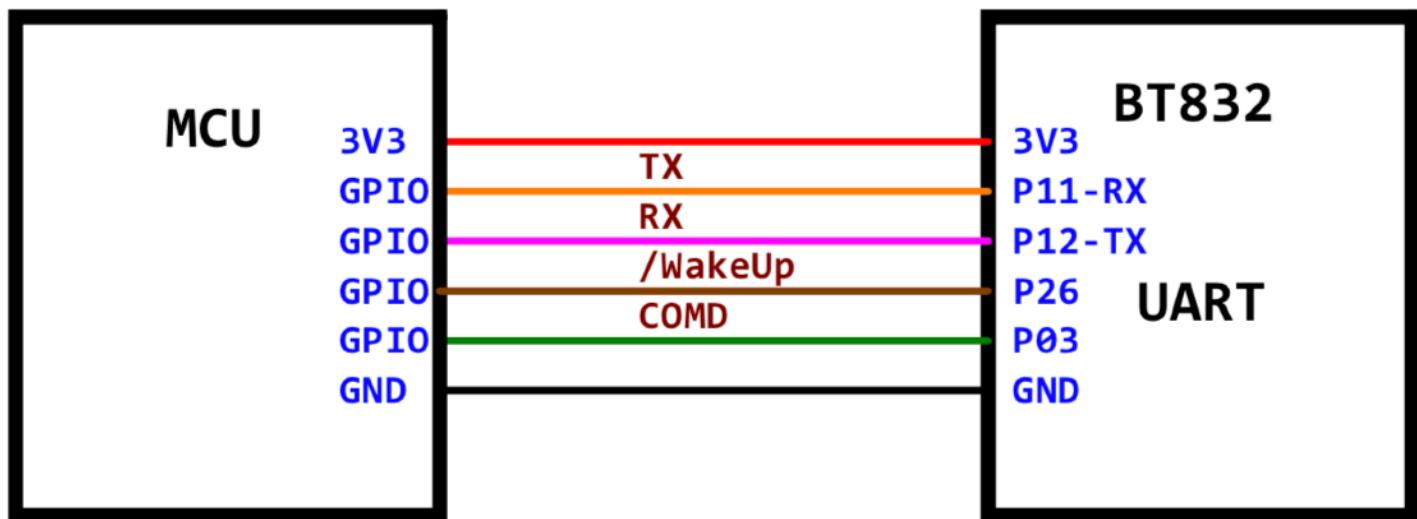
UART Interface for BT840F Series
UART interface connection between a host MCU and BT840F Series is shown below. nRF52840 port numbers are different from those of nRF52832/810. However, pin numbers on BT832F Series and BT840F Series modules are the same. Pin numbers on module evaluation board connectors are the same.
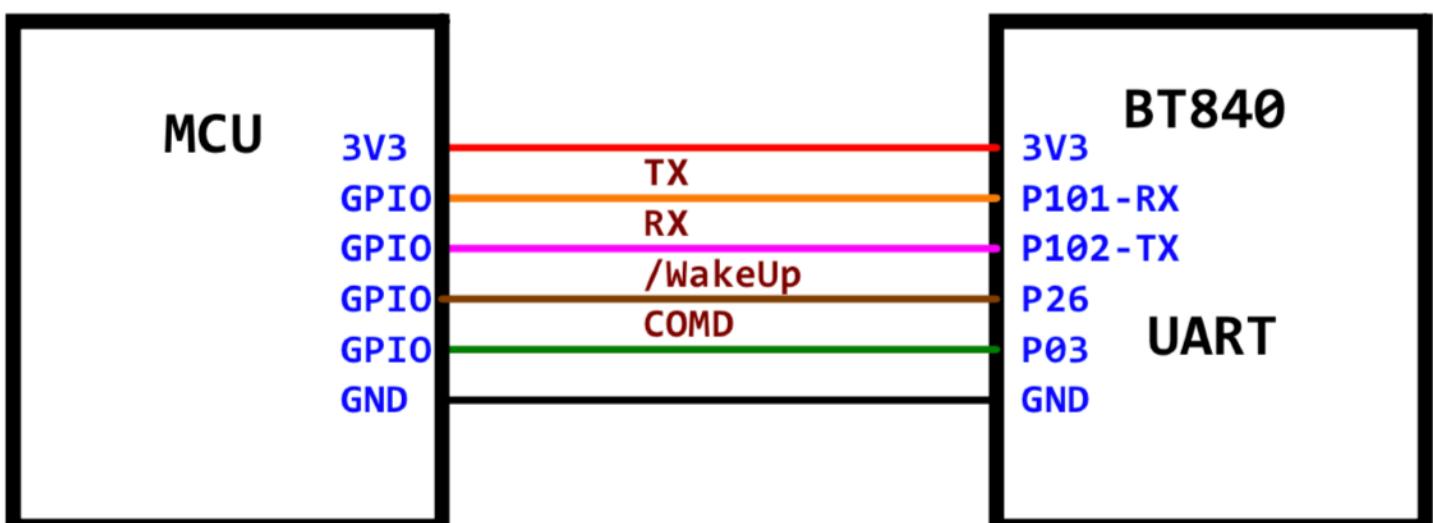
UART Interface for nRF52805M Module

UART interface connection between a host MCU and BC805M is shown below.
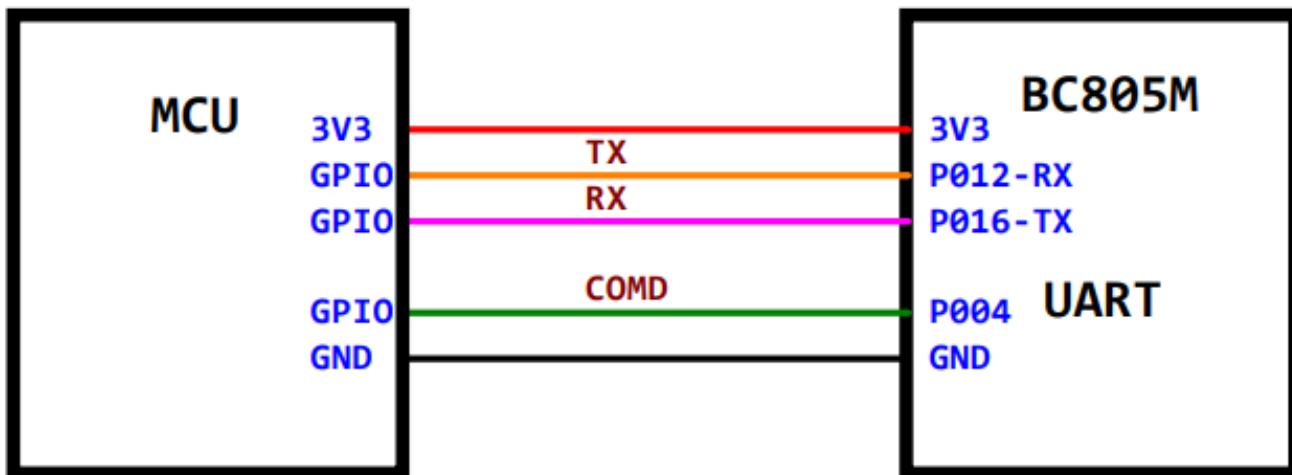

UART interface Timing Diagrams

- Blue color port numbers are for both BT840F and BT832F mdules, for example, **P26**.

- If port number is different, BT840F port number is in blue, for example, **P101** and BT832F port number is in red, for example **P11**.

- Default baud rate for UART interface is 115200.

- CTS and RTS are not used.
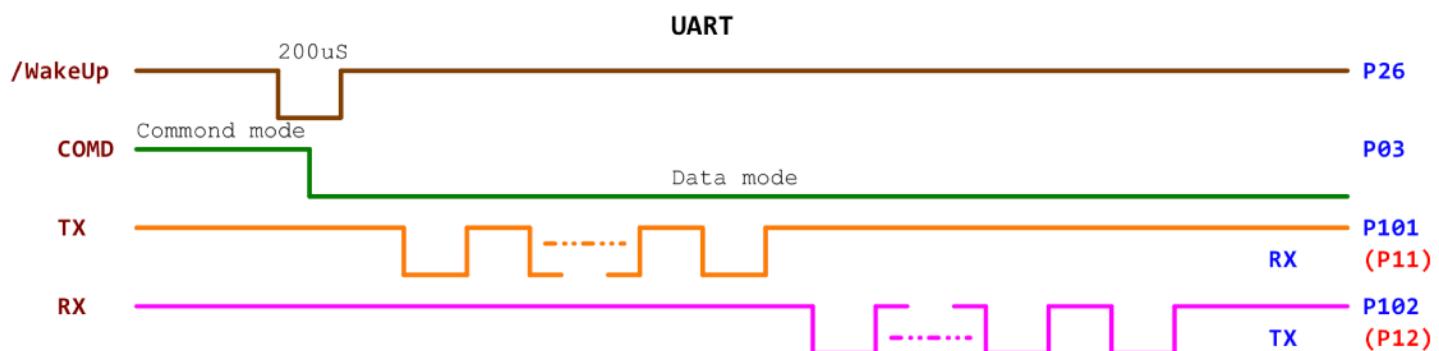
- Module UART interface can be disable to save power by sending command "**AT+STOP**". To wake up UART interface, pull the /WakeUp pin low for 200 uS or more.

- Set **COMD** pin high to communicate with MCU in module.

- Set **COMD** pin low to send data to a far end device (for example, a smartphone) transparently.

UART Pins on BT832F Evaluation Boards

UART pins can be accessed at Arduino type connector of EV-BT832 Series nRF52832 and nRF52810 modules. UART pins in brown color (for example, **RX**).
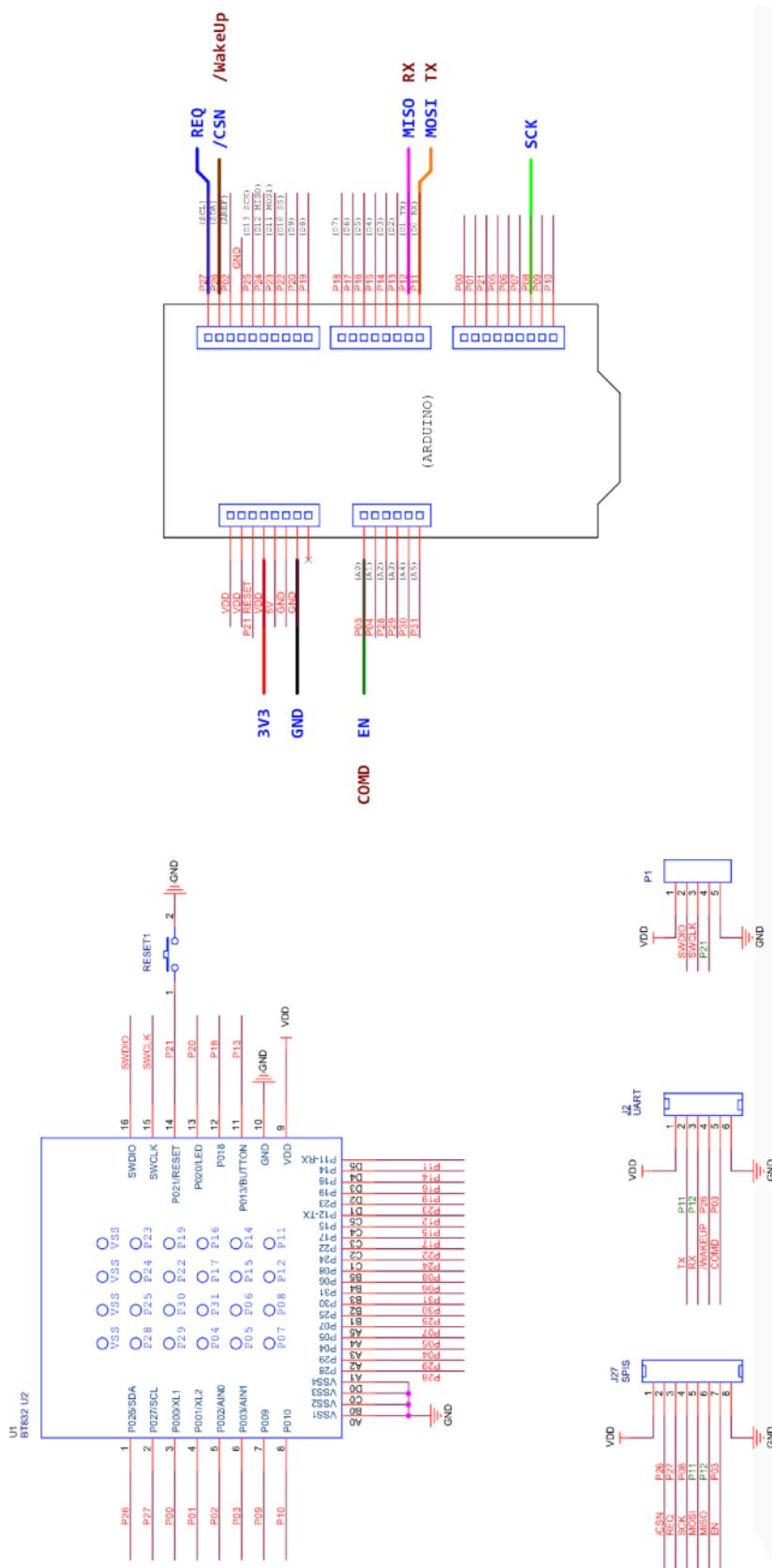
UART Pins on BT840F Evaluation Boards

UART pins can be accessed at Arduino type connector of EV-BT840F Series nRF52840 modules. UART pins in brown color (for example, **RX**).
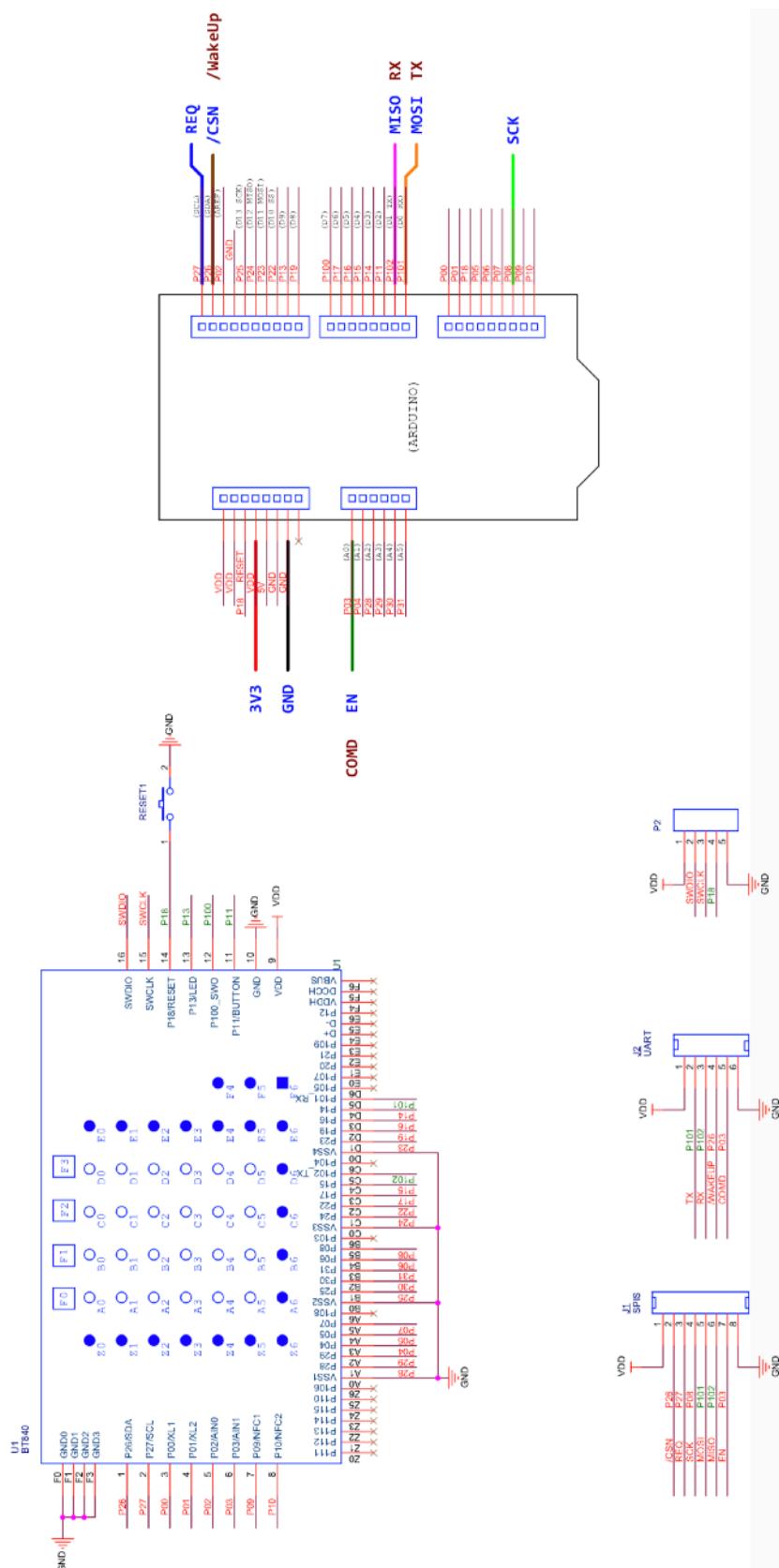
UART Pins on BC805M Evaluation Boards
UART pins can be accessed at Arduino type connector of EV-BC805M evaluation board.
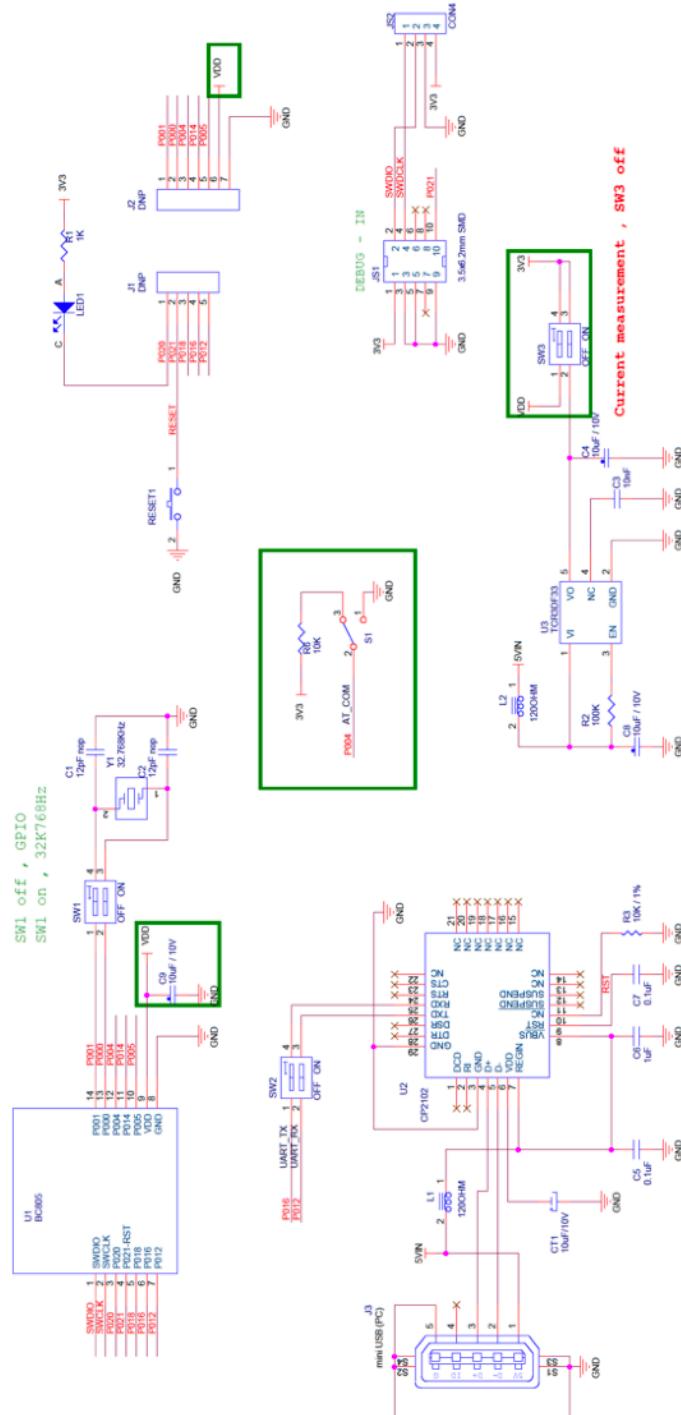
4. AT Commands

.AT commands are text commands starting with the character sequence "AT" and terminated by a '\r' character (ASCII code 0x0D). Commands are not case sensitive and have zero or more parameters.

- Each command line consists of a prefix, a body and a terminator.

- All command lines begin with the prefix AT (ASCII 065, 084) or at (ASCII 097, 116).

- Or, in hex format, all command lines begin with the prefix AT (HEX 0x41, 0x54) or at (HEX 0x61, 0x74).

- The body is a string of characters in the ASCII range 032-255. Control characters other than <CR> (carriage return; ASCII 013) and <BS> (back space; ASCII 008) in a command line are ignored.

- Or, in hex format, the body is a string of characters in the DEC range 032-255. Control characters other than <CR> (carriage return; HEX 0x0d) and <LF> (line feed; HEX 0x0a) in a command line are ignored.

- The terminator is <CR>.

- There is no distinction between upper-case and lower-case characters. A command line can have a maximum length of 80 characters. It is automatically discarded if the input is longer. Corrections are made

- The default baud rate is 115200, one stop bit and no parity

Command Mode

To set AT command mode,

- Pin 6 of BT832F (P0.03 of nRF52832/810) is pulled high.

- Pin 6 of BT840F (P0.03 of nRF52840) is pulled high.

In AT command mode, the host processor communicates with the processor on module.

Data Mode

To set data mode,

- Pin 6 of BT832 (P0.03 of nRF52832/810) is pulled low.

- Pin 6 of BT840F (P0.03 of nRF52840) is pulled low.

In data model, Bluetooth module provides transparent data transfer between the host processor and a remote device, for example, a smartphone.

AT Command List

AT command list is updated periodically. Please download new AT command list from this webpage.

https://www.fanstel.com/download-document

Limited by the sizes of flash and RAM memories, some AT commands are not supported by the following modules:

- nRF52810 modules: BT832A, BT832AT, BM832A.

- nRF52805 module: BC805M.

- nRF52811 modules: BM833A, BM833AF.

5. Evaluation Board

Communicating with a PC

A quick and easy way to evaluate BT832 is to use a PC as the host processor. Connect the evaluation board to a PC with an USB cable. Then,

- Set S1, Bluetooth module is set to command mode. PC will communicate with module.
- Set switch S1 to the other position, Bluetooth module is set to data mode. PC will communicate with a remote device through Bluetooth wireless connection.

Docklight is a testing, analysis and simulation tool for serial communication protocols (RS232, RS485/422 and others). It allows you to monitor the communication between two serial devices or to test the serial communication of a single device. Docklight significantly increases productivity in a broad range of industries, including automation and control, communications, automotive, equipment manufacturers, and embedded / consumer products. Docklight is easy to use and runs on almost any standard PC using Windows 10, Windows 8, Windows 7, Windows Vista or Windows XP operating system.

Docklight software can be downloaded from the following:

http://www.docklight.de/download_en.htm

BT832F and BT840F Evaluation Board Schematics
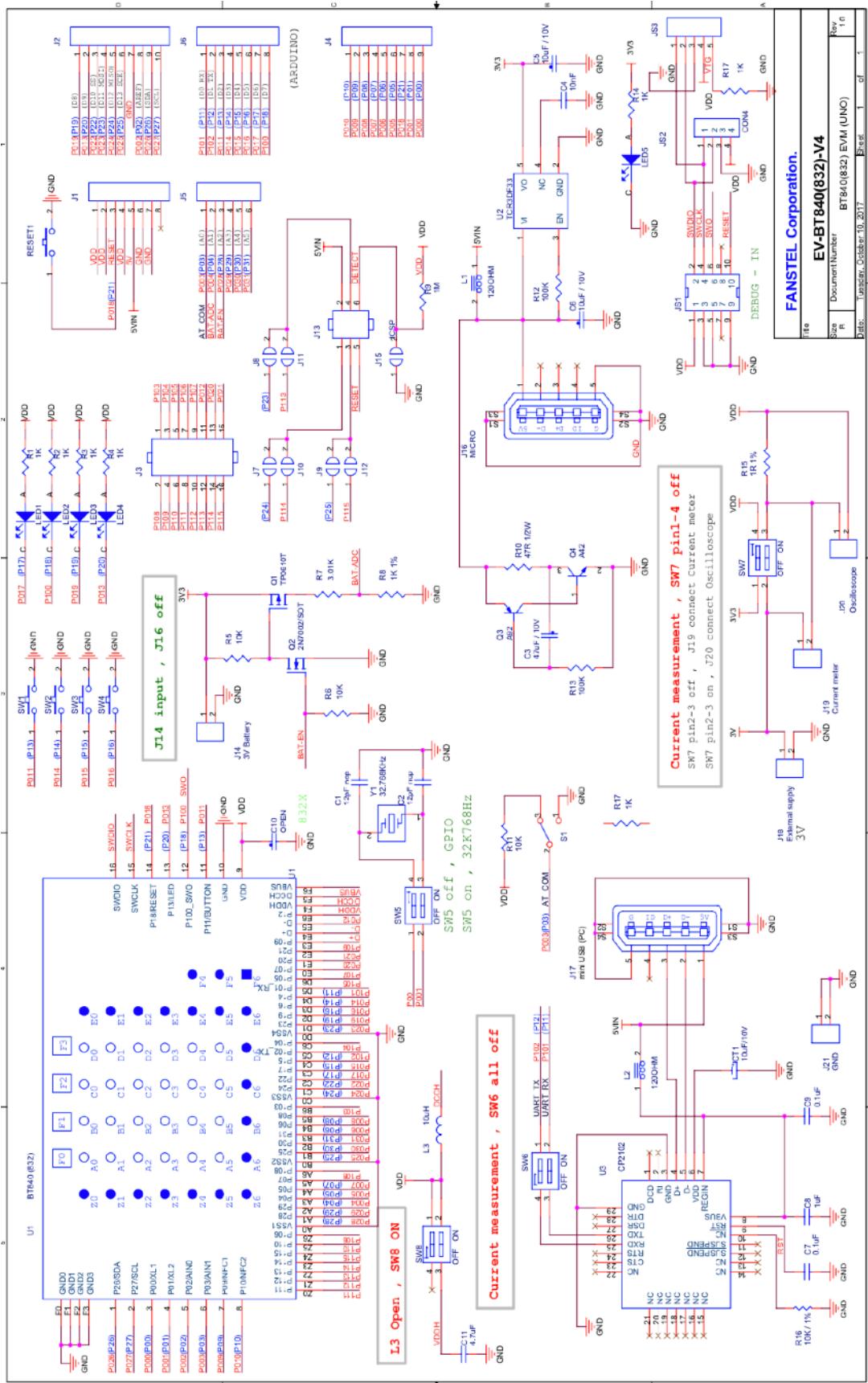
Revision History

• July 2018, Ver. 0.1: Draft copy

• Nov.2018, Ver.0.3: Update AT command list.

• December 7th, 2018: Ver. 1.0.

• Sep. 2020, Ver 1.01: Remove reference to SPI interface

• July 2021, Ver 1.02: add supports for new modules

Contact Us

United States:
Fanstel Corp.
7466 E. Monte Cristo Ave. Scottsdale AZ 85260
Tel. 1 480-948-4928
Fax. 1-480-948-5459
Email: info@fanstel.com
Website: www.fanstel.com

Taiwan:
Fanstel Corp.
10F-10, 79 Xintai Wu Road
Xizhu, New Taipei City, Taiwan 22101
泛世公司
臺灣省新北市汐止區新臺五路79號10樓之10, 22101
Tel. 886-2-2698-9328
Fax. 886-2-2698-4813
Email: info@fanstel.com
Website: www.fanstel.com

China:
Fanstel Technologies Corp.
11 Jiale Street
Ping-Dih, Long-Gang, Shen Zhen, GD 518117
泛世康科技(深圳)有限公司
廣東省深圳市龍崗區坪地鎮佳樂街11號
Tel. 86-755-8409-0928
Fax. 86-755-8409-0973
QQ. 3076221086
Email: info@fanstel.com
Website: www.fanstel.com