# Bluetrum Technology

# AB5303B

## Audio Player Microcontroller

Versions: 0.0.1

2018/09/27

## Declaration

For further information on the technology, product and business term, please contact Bluetrum Company.
For sales or technical support, please send email to the address:

Sales: sales@bluetrum.com

Technical: project@bluetrum.com

# Revision History

| Date | Version | Comments | Revised by |
|---|---|---|---|
| 2018-09-27 | 0.0.1 | First draft | Leo |
| | | | |
| | | | |

# Table of Contents

# 1  Product Features

## CPU and Flexible IO

- 32bit High performance CPU with DSP instruction
- Flexible GPIO pins with Programmable pull-up and pull-down resistors;
- Support GPIO wakeup or interrupt;

## Bluetooth Radio

- Compliant to Bluetooth 5.0 and BLE specification (QDID: 115952);
- TX output power +2db in typical;
- RX Sensitivity with -90.5dBm @Basic Rate;

## FM Tuner

- Support frequency band 76~108MHz;
- Auto search tuning;
- Programable de-emphasis(50/75uS);
- Receive signal strength indicator (RSSI);

## Audio Interface

- Audio codec with 16bit stereo DAC and two channel 16bit ADC;
- Support flexible audio EQ adjust;
- Support Sample rate 8, 11.025, 12, 16, 22.05, 32, 44.1 and 48KHz;
- 4 channel Stereo Analog MUX;
- Two channel MIC amplifier input;
- High performance Stereo audio ADC with 90dB SNR;
- High performance Stereo audio DAC with 95dB SNR, with headphone amplifier output;

## Peripheral and Interfaces

- Three 32-bit timers;
- Three multi-function 32-bit timers, support Capture and PWM mode;
- WatchDog;
- Three full-duplex UART;
- SPI;
- IR controller;
- SD Card Host controller;
- Full speed USB 2.0 HOST/DEVICE controller;
- Sixteen Channels 10-bit SARADC;
- Build in PMU, such as LDO;

## Package

- SSOP28L;

## Temperature

- Operating temperature: -40℃ to +85℃;
- Storage temperature: -65℃ to +150℃;

# 2 Package Definition

## 2.1 Pin Assignment



**Figure 2-1 Pin assignment for SSOP28L**

## 2.2 Pin Descriptions

Table 2-1 SSOP28Lpin description

| Pin No. | Name | Type | Function |
|---------|------|------|----------|
| 1 | PB0 | I/O | FM/AM-G0 |
| | | | SPDIF2 |
| | | | SDCMD-G2 |
| | | | SPI1DI-G3 |
| | | | FMOSC-G3 |
| | | | PWM0-T3 |
| | | | TMR3CAP_G3/IR_G3 |
| | | | PB0 |
| 2 | PWRKEY | A | Power key input |
| 3 | BT_ANT | A | BT ANT |
| 4 | BT_OSCI | A | 26M OSC input |
| 5 | BT_OSCO | A | 26M OSC output |
| 6 | PB4/USB_DM | I/O | ADC6 |
| | | | USB DM |
| | | | SPI0CLK-G3 |

| | | | RX0-G3 |
|---|---|---|---|
| | | | PB4 |
| 7 | PB3/USB_DP | I/O | ADC5 |
| | | | USB DP |
| | | | SPI0DO-G3 |
| | | | TX0-G3 |
| | | | PB3 |
| 8 | PA7 | I/O | ADC2 |
| | | | AUXR0 |
| | | | SDDAT0-G1 |
| | | | SPI1DO-G2 |
| | | | TX0-G1 |
| | | | TX1-G1 |
| | | | HSTRX-G1 |
| | | | PWM2-T4 |
| | | | PA7 |
| 9 | PA6 | I/O | ADC1 |
| | | | AUXL0 |
| | | | SDCLK-G1 |
| | | | SPI1CLK-G2 |
| | | | RX0-G1 |
| | | | RX1-G1 |
| | | | HSTRX-G6 |
| | | | FMOSC-G2 |
| | | | PWM1-T4 |
| | | | TMR3CAP_G2/IR_G2 |
| | | | PA6 |
| 10 | PA5 | I/O | ADC0 |
| | | | SDCMD-G1 |
| | | | SPI1DI-G2 |
| | | | FMOSC-G1 |
| | | | PWM0-T4 |
| | | | TMR3CAP_G1/IR_G1 |
| | | | PA5 |
| 11 | PA2 | I/O | SPI1DI-G1 |
| | | | LPWM2-G3 |
| | | | IISSCLK-G1 |
| | | | PA2 |
| 12 | PA0 | I/O | SPDIF0 |
| | | | RX0-G5 |
| | | | HSTRX-G10 |
| | | | LPWM0-G3 |
| | | | IISDI-G1 |
| | | | PA0 |
| 13 | PF5 | I/O | PF5 |
| 14 | PF4 | I/O | PF4 |

| 15 | MICL/PF2 | I/O | ADC10 |
| | | | MICL |
| | | | SPI1DO-G5 |
| | | | TX0-G7 |
| | | | LPWM3-G2 |
| | | | PF2 |
| 16 | DACR | A | DAC R |
| 17 | DACL | A | DAC L |
| 18 | VDDDAC | PWR | DAC power |
| 19 | AGND | GND | DAC Ground |
| 20 | FM_ANT | A | FMRX ANT |
| 21 | PE7 | I/O | ADC9 |
| | | | AUXR2 |
| | | | SDDAT0-G3 |
| | | | SPI1DO-G4 |
| | | | TX0-G4 |
| | | | HSTRX-G4 |
| | | | LPWM3-G1 |
| | | | TMR4CAP_G1/IR_G8 |
| | | | PE7 |
| 22 | PE0 | I/O | SPI0DI-G3 |
| | | | TX0-G6 |
| | | | LPWM2-G2 |
| | | | IISDI-G2 |
| | | | TMR3CAP_G5/IR_G5 |
| | | | PE0 |
| 23 | VDDIO | PWR | VDDIO power output |
| 24 | VBAT | PWR | VBAT power input |
| 25 | DGND | GND | Digital Ground |
| 26 | VDDBT | PWR | BT power |
| 27 | PB2 | I/O | ADC4 |
| | | | AUXR1 |
| | | | SDDAT0-G2 |
| | | | SPI1DO-G3 |
| | | | TX0-G2 |
| | | | TX2-G2 |
| | | | HSTRX-G2 |
| | | | PWM2-T3 |
| | | | PB2 |
| 28 | PB1 | I/O | ADC3 |
| | | | FM/AM-G1 |
| | | | AUXL1 |
| | | | SDCLK-G2 |
| | | | SPI1CLK-G3 |
| | | | RX0-G2 |
| | | | RX2-G2 |
| | | | HSTRX-G7 |
| | | | FMOSC-G4 |

| | | | PWM1-T3 |
| --- | --- | --- | --- |
| | | | TMR3CAP_G4/IR_G4 |
| | | | PB1 |

Note: I/O: Digital input/output;    I : Digital input;    A : Analog Pin; PWR: Power Pin; GND: Ground.

# 3  Characteristics

## 3.1  PMU Parameters

Table 3-1 PMU voltage input Parameters

| Sym | Characteristics | Min | Typ | Max | Unit | Conditions |
|---|---|---|---|---|---|---|
| VUSB | Charger Voltage input | 3.0 | 5.0 | 5.0 | V | |
| VBAT | Voltage input | 3.0 | 3.7 | 5.0 | V | |

Table 3-2 3.3V LDO Parameters

| Sym | Characteristics | Min | Typ | Max | Unit | Conditions |
|---|---|---|---|---|---|---|
| VDDIO | 3.3V LDO voltage output | 3.0 | 3.3 | 3.6 | V | Light Loading condition |
| △VVDDIO | Output Mismatch 1-sigma | - | 56 | - | mV | VDDIO=3.3v |
| ILOAD | Maximum output current | - | - | 150 | mA | @VBAT=3.6v |
| ISC | Short Circuit Current Limit | - | - | 300 | mA | @VBAT=3.8v |

Table 3-3 1.6V LDO Parameters

| Sym | Characteristics | Min | Typ | Max | Unit | Conditions |
|---|---|---|---|---|---|---|
| VDDBT | 1.6V LDO voltage output | - | 1.6 | - | V | Light Loading condition |
| △VVDDBT | Output Mismatch 1-sigma | - | 27 | - | mV | VDDBT=1.6v |
| ILOAD | Maximum output current | - | - | 100 | mA | @VBAT=3.0v |
| ISC | Short Circuit Current Limit | - | - | 200 | mA | @VBAT=3.8v |

Table 3-4 1.2V LDO Parameters

| Sym | Characteristics | Min | Typ | Max | Unit | Conditions |
|---|---|---|---|---|---|---|
| VDDCORE | 1.2V LDO voltage output | - | 1.2 | - | V | Light Loading condition |
| △VVDDCORE | Output Mismatch 1-sigma | - | 20 | - | mV | VDDCORE=1.2v |
| ILOAD | Maximum output current | - | - | 80 | mA | @VBAT=3.6v |
| ISC | Short Circuit Current Limit | - | - | 120 | mA | @VBAT=3.8v |

## 3.2  IO Parameters

Table 3-5 I/O Parameters

| GPIO—Electrical Characteristics | | | | | | | |
|---|---|---|---|---|---|---|---|
| Symbol | Description | Related GPIO | Min | Typical | Max | Units | Conditions |
| $V_{IL}$ | Low-level input voltage | | -0.3 | | 1.27 | V | VDDIO=3.3V |
| $V_{IH}$ | High-level input voltage | | 2.03 | | 3.6 | V | VDDIO=3.3V |
| Driver Ability 1 | Output Driver Ability 1 | | | 32 | | mA | VDDIO=3.3V |
| Driver Ability 0 | Output Driver Ability 0 | | | 8 | | mA | VDDIO=3.3V |
| $R_{PUP0}$ | Internal pull-up resister 0 | | 8 | 10 | 12 | KΩ | |
| $R_{PUP1}$ | Internal pull-up resister 1 | | 0.24 | 0.3 | 0.36 | KΩ | |
| $R_{PUP2}$ | Internal pull-up resister 2 | | 160 | 200 | 240 | KΩ | |
| $R_{PDN0}$ | Internal pull-down resister 0 | | 8 | 10 | 12 | KΩ | |
| $R_{PDN1}$ | Internal pull-down resister 1 | | 0.24 | 0.3 | 0.36 | KΩ | |
| $R_{PDN2}$ | Internal pull-down resister 2 | | 160 | 200 | 240 | KΩ | |

## 3.3  **Audio DAC Parameters**

Table 3-6 Audio DAC Parameters

| Sym | Characteristics | Min | Typ | Max | Unit | Conditions |
|---|---|---|---|---|---|---|
| SNR | | - | 96 | - | dB | VCM cap=1uF<br>VDDDAC cap=1uF<br>with A-wt filter<br>Output -3dBV<br>Fin=1KHz |
| THD+N | | - | -86 | - | dB | VCM cap=1uF<br>VDDDAC cap=1uF<br>with A-wt filter<br>Output -3dBV with 10K loading<br>Fin=1KHz |
| Output Range | Maximum output voltage | - | 2.6 | | $V_{peak-peak}$ | 32ohm Loading |

## 3.4  **Audio ADC Parameters**

Table 3-7 Audio ADC Parameters

| Sym | Characteristics | Min | Typ | Max | Unit | Conditions |
|---|---|---|---|---|---|---|
| SNR | | - | 90 | - | dB | VCM cap=1uF<br>VDDDAC cap=1uF<br>with A-wt filter<br>Input sine amplitude, 850mV RMS<br>Fin=1KHz |
| THD+N | | - | -87 | - | dB | VCM cap=1uF<br>VDDDAC cap=1uF<br>with A-wt filter<br>Input sine amplitude, 850mV RMS<br>Fin=1KHz. |
| Input Range | Input sine wave peak amplitude | 0 | | VCM | V | From aux input, aux 0db gain, VCM represent VCM voltage. |

## 3.5 **BT Parameters**

Table 3-8 BT Parameters

| Characteristics | Min | Typical | Max | Unit | Conditions |
|---|---|---|---|---|---|
| Maximum Transmit Power | - | 2 | - | dBm | |
| RMS DEVM | - | 5.5 | - | % | Maximum TX power<br>2-DH5 packet |
| Peak DEVM | - | 12.5 | | % | |
| EDR Relative Transmit Power | | -0.2 | | dB | |
| Sensitivity @ Basic Rate | | -90.5 | | dBm | BER=0.1%, using DH5 packet |
| Sensitivity @ EDR | | -89.5 | | dBm | BER=0.01%, using 2-DH5 packet |

## 3.6 **Current Parameters**

Table 3-9 Current Parameters

| Sym | Characteristics | Min | Typ | Max | Unit | Conditions |
|-----|-----------------|-----|-----|-----|------|------------|
| IRTC | RTC mode current | - | 4 | - | uA | 4.2V input, room temp. |
| Sleep | Sleep current | - | 500 | 2000 | uA | 3.3V input, room temp |

# 4 **Package Information**