AB5325B

Audio Player Microcontroller

Versions: 0.0.6

2023/11/30

Declaration

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Revision History

Date	Version	Comments	Revised by
2018-12-13	0.0.1	First draft	Leo
2019-02-25	0.0.2	Modify some misdescription	Leo
2022-01-22	0.0.3	Update QDID	Leo
2022-08-31	0.0.4	Update QDID	Leo
2023-01-11	0.0.5	Update Product Features	Leo
2023-11-30	0.0.6	Update to BT5.4	Leo

Table of Contents

1 Product Features

CPU and Flexible IO

- High performance 32bit RISC-V processor Core with DSP instruction
- RISC-V typical speed: 125MHz
- Program memory: internal 4M bit flash
- Internal 124KB RAM for data and program
- Flexible GPIO pins with Programmable pull-up and pull-down resistors
- Support GPIO wakeup or interrupt

Bluetooth Radio

- Compliant to Bluetooth 5.4 and BLE specification (QDID: 215269);
- TX output power +2dBm 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 16bit mono ADC;
- Support flexible audio EQ adjust;
- Support Sample rate 8, 11.025, 12, 16, 22.05, 32, 44.1 and 48KHz;
- 2 channel Stereo Analog MUX;
- One channel MIC amplifier input;
- High performance mono 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 charger/LDO;

Package

- SSOP24L;

Temperature

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

2 Package Definition

2.1 Pin Assignment

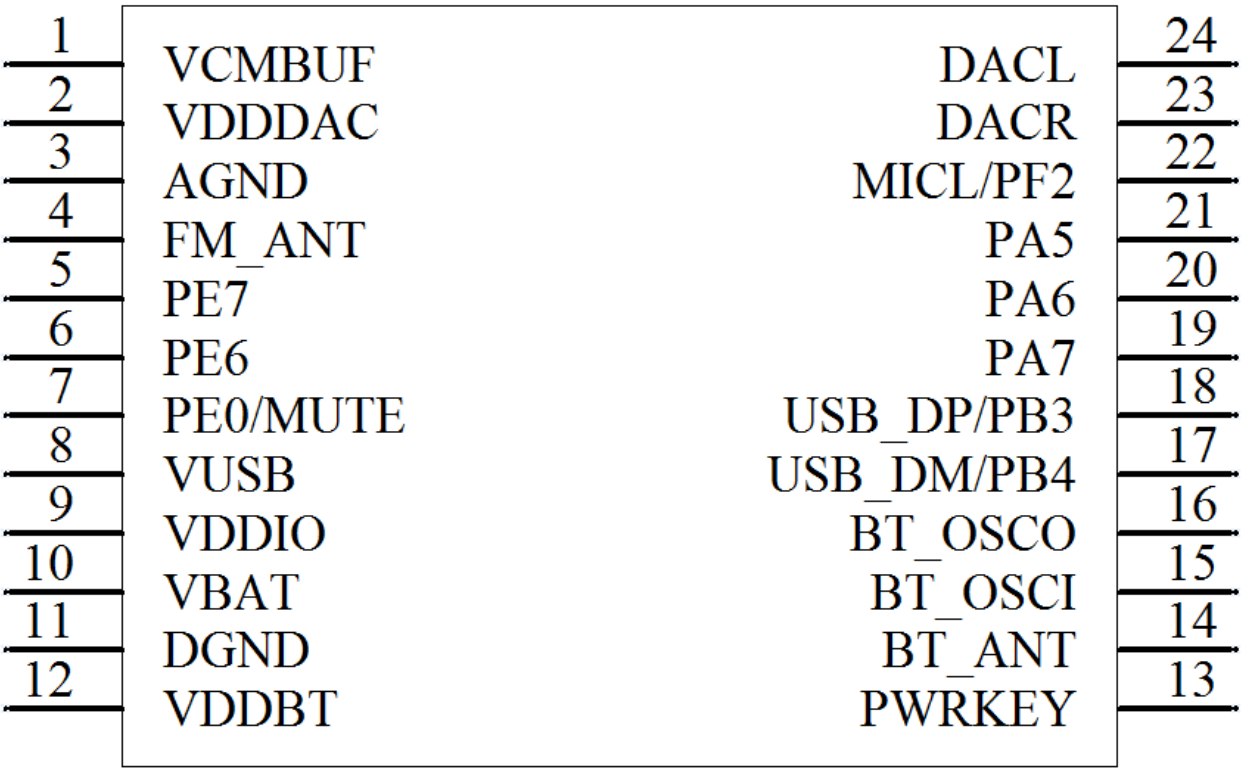


Figure 2-1 Pin assignment for SSOP24L

2.2 Pin Descriptions

Table 2-1 SSOP24L pin description

Pin No.	Name	Type	Function
1	VCMBUF	A	VCM buffer output
2	VDDDAC	PWR	DAC power
3	AGND	GND	DAC Ground
4	FM_ANT	A	FMRX ANT
5	PE7	I/O	ADC9 AUXR2 SDDAT0-G3 SPI1DO-G4 TX0-G4 HSTRX-G4 TMR4PWM2-G2

			TMR4CAP-G1/IR-G8 PE7
6	PE6	I/O	ADC8 AUXL2 SDCLK-G3 SPI1CLK-G4 RX0-G4 HSTRX-G9 FMOSC-G6 TMR4T1-G2 TMR3CAP-G7/IR-G7 PE6
7	PE0/MUTE	I/O	SPI0DI-G3 TX0-G6 TMR3PWM0-G4 TMR3CAP-G5/IR-G5 PE0
8	VUSB	PWR	VUSB power input
9	VDDIO	PWR	VDDIO power output
10	VBAT	PWR	VBAT power input
11	DGND	GND	Digital Ground
12	VDDBT	PWR	BT power
13	PWRKEY	A	Power key input
14	BT_ANT	A	BT ANT
15	BT_OSCI	A	26M OSC input
16	BT_OSCO	A	26M OSC output
17	USB_DM/PB4	I/O	ADC6 USB DM SDDAT0-G4/ SDDAT0-G6 SPI0CLK-G3 RX0-G3 HSTRX-G8 TMR3PWM2-G2 PB4
18	USB_DP/PB3	I/O	ADC5 USB DP SDDAT0-G5/ SDCMD-G6 SPI0DO-G3 TX0-G3 HSTRX-G3 TMR3PWM1-G2 PB3
19	PA7	I/O	ADC2 AUXR0 SDDAT0-G1 SPI1DO-G2 TX0-G1 TX1-G1

			HSTRX-G1 TMR5PWM2-G1 PA7
20	PA6	I/O	ADC1 AUXL0 SDCLK-G1/ SDCLK-G4/ SDCLK-G5/ SDCLK-G6 SPI1CLK-G2 RX0-G1 RX1-G1 HSTRX-G6 FMOSC-G2 TMR5PWM1-G1 TMR3CAP-G2/IR-G2 PA6
21	PA5	I/O	ADC0 SDCMD-G1/SDCMD-G4/SDCMD-G5 SPI1DI-G2 FMOSC-G1 TMR5PWM0-G1 TMR3CAP-G1/IR-G1 PA5
22	MICL/PF2	I/O	ADC10 MICL SPI1DO-G5 TX0-G7 TMR3PWM0-G5 TMR5CAP-G1/IR-G9 PF2
23	DACR	A	DAC R
24	DACL	A	DAC L

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	4.6	5.0	5.5	V	
VBAT	Voltage input	3.0	3.7	4.5	V	

Table 3-2 3.3V LDO Parameters

Sym	Characteristics	Min	Typ	Max	Unit	Conditions
VDDIO	3.3V LDO voltage output	-	3.3	-	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 VDDDAC cap=1uF with A-wt filter Output -3dBV Fin=1KHz
THD+N		-	-86	-	dB	VCM cap=1uF VDDDAC cap=1uF with A-wt filter Output -3dBV with 10K loading 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 VDDDAC cap=1uF with A-wt filter Input sine amplitude, 850mV RMS Fin=1KHz
THD+N		-	-87	-	dB	VCM cap=1uF VDDDAC cap=1uF with A-wt filter Input sine amplitude, 850mV RMS 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

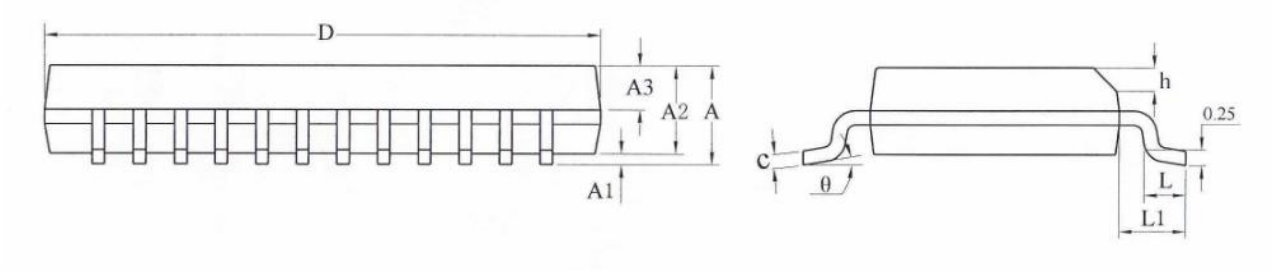
Characteristics	Min	Typical	Max	Unit	Conditions
Maximum Transmit Power	-	-	7	dBm	
RMS DEVM	-	5.5	-	%	Maximum TX power 2-DH5 packet
Peak DEVM	-	12.5		%	
EDR Relative Transmit Power		-0.2		dB	
Sensitivity @ Basic Rate		-90.5		dBm	BER=0.1%, using DH5 packet
Sensitivity @ EDR		-89.5		dBm	BER=0.01%, using 2-DH5 packet

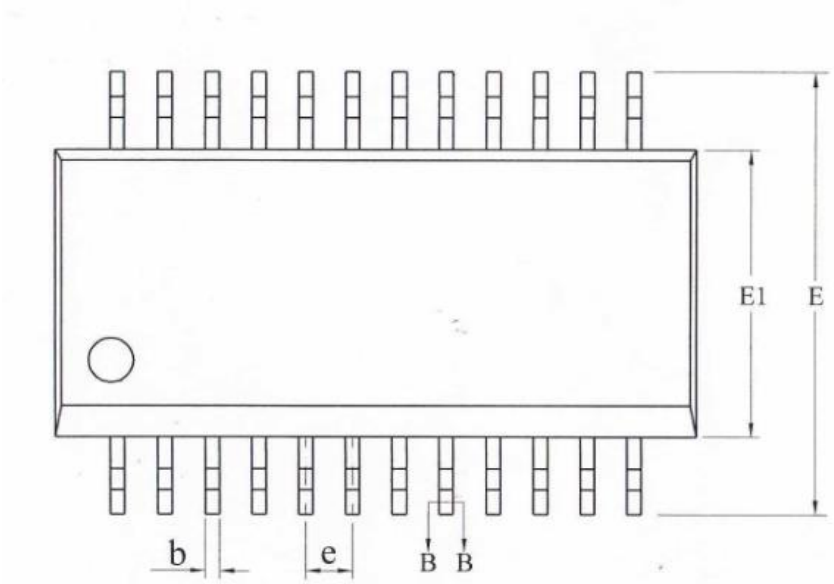
3.6 Current Parameters

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





SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	—	—	1.75
A1	0.10	0.15	0.25
A2	1.30	1.40	1.50
A3	0.60	0.65	0.70
b	0.23	—	0.31
b1	0.22	0.25	0.28
c	0.20	—	0.24
c1	0.19	0.20	0.21
D	8.55	8.65	8.75
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e	0.635BSC		
h	0.30	—	0.50
L	0.50	—	0.80
L1	1.05REF		
θ	0	—	8°