AB5602C

Audio Player Microcontroller

Versions: 0.0.3
2022.08.24

Declaration

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Revision History

Date	Version	Comments	Revised by
2021-08-02	0.0.1	First draft	Leo
2022-01-22	0.0.2	Update QDID	Leo
2022-08-24	0.0.3	Update QDID	Leo

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1 Product Features

CPU and Flexible IO

- RISC-V 32bit High performance CPU with DSP instruction;
- Maximum 120MHz operating frequency;
- 128k bytes SRAM;
- Program memory: internal 4M bit flash;
- Flexible GPIO pins with Programmable pull-up and pull-down resistors;
- Support GPIO wakeup or interrupt;

Bluetooth Radio

- Compliant to Bluetooth 5.3 (QDID: 194248);
- TX output power +6dBm in typical;
- RX Sensitivity with -90.5dBm @EDR;
- BLE supports the transmission rate of 1Mbps;
- BLE transmission power ranges from 7dBm to 12dBm;
- BLE Sensitivity with -88.3dBm in typical;

FM Tuner

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

Audio Interface

- Audio codec with 16bit mono 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;
- 4 channel Analog MUX;
- One channel MIC amplifier input;
- High performance mono audio ADC with 90dB SNR;
- High performance audio DAC with 96dB 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

- QFN32;
- Maximum 21 GPIOs in the wafer(include PWRKEY);
- Maximum 20 GPIOs in the chip(include PWRKEY);

Temperature

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

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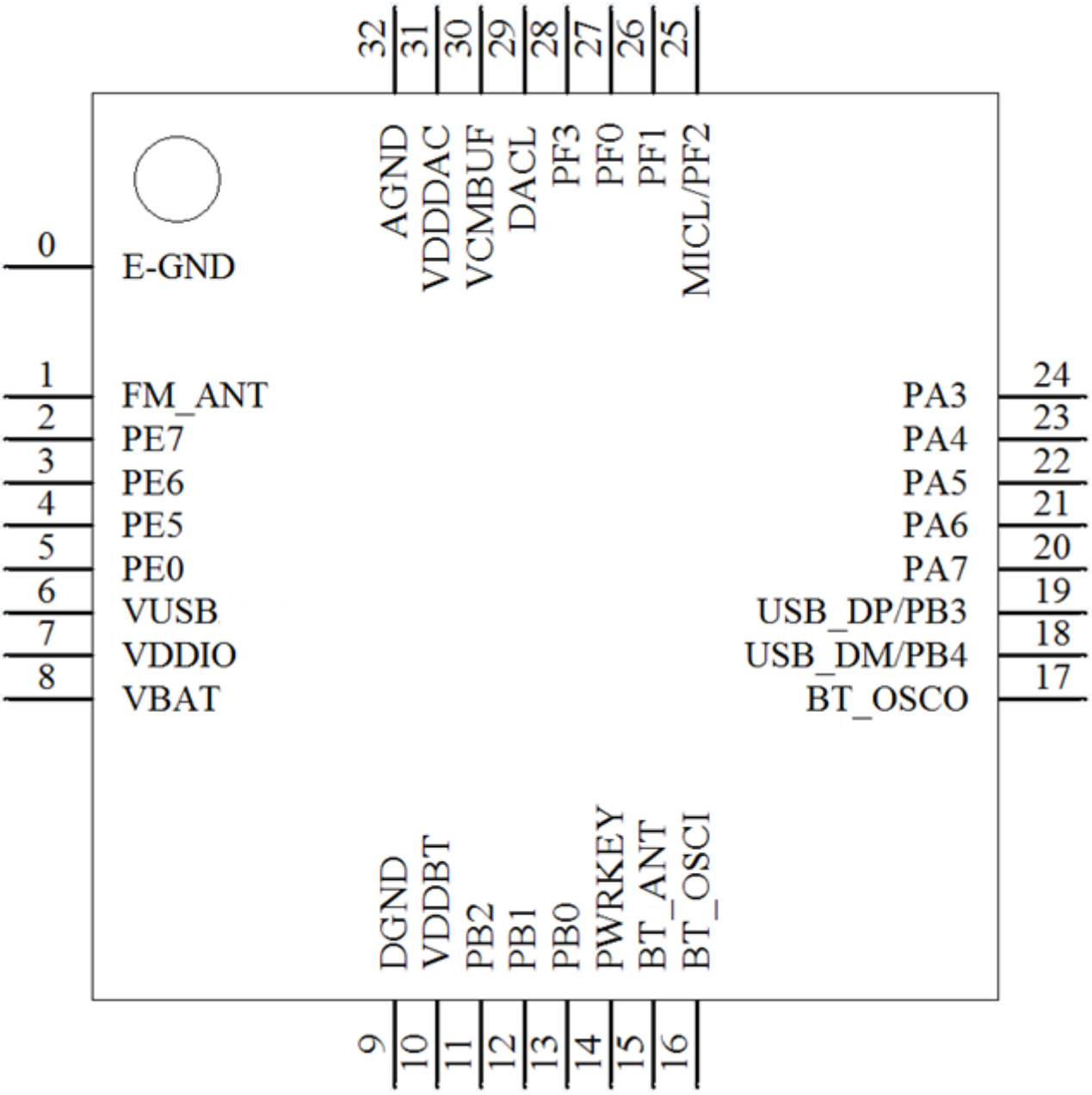
2 Package Definition

2.1 Pin Assignment



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2.2 Pin Descriptions

Table 2-1 QFN32 pin description

Pin No.	Name	Type	Function
0	E-GND	GND	E-Pad Ground
1	FM_ANT	A	FMRX ANT
2	PE7	I/O	ADC9 SDDAT0-G3 SPI1DO -G4 TX0-G4 HSTRX-G4 PWM2-T4-G1 TMR4CAP_G1/IR_G8 IISLRCLK-G2 PE7
3	PE6	I/O	SPDIF2 ADC8 SDCLK-G3 SPI1CLK-G4 RX0-G4 HSTRX-G9 FMOSC-G6 PWM1-T4-G1 TMR3CAP_G7/IR_G7 IISSCLK-G2 PE6
4	PE5	I/O	SPDIF1 ADC7 SDCMD-G3 SPI1DI-G4 FMOSC-G5 PWM0-T4-G1 TMR3CAP_G6/IR_G6 IISDO/DAT-G2 PE5
5	PE0	I/O	SPI0DI-G3 TX0-G5 PWM0-T3-G4 TMR3CAP_G5/IR_G5 IISMCLK-G2 PE0
6	VUSB	PWR	VUSB power input

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7	VDDIO	PWR	VDDIO power output
8	VBAT	PWR	VBAT power input
9	DGND	GND	Digital Ground
10	VDDBT	PWR	BT power
11	PB2	I/O	ADC4 SDDAT0-G2 SPI1DO-G3 TX0-G2 TX2-G2 HSTRX-G2 PWM2-T3-G1 PB2
12	PB1	I/O	ADC3 SDCLK-G2 SPI1CLK-G3 RX0-G2 RX2-G2 HSTRX-G7 FMOSC-G4 PWM1-T3-G1 TMR3CAP_G4/IR_G4 PB1
13	PB0	I/O	SPDIF0 SDCMD-G2 SPI1DI-G3 FMOSC-G3 PWM0-T3-G1 TMR3CAP_G3/IR_G3 IISDI-G2 PB0
14	PWRKEY	A	Power key input
15	BT_ANT	A	BT ANT
16	BT_OSCI	A	26M OSC input
17	BT_OSCO	A	26M OSC output
18	USB_DM/PB4	I/O	USBDM ADC6 SDDAT0-G4 SDDAT0-G6 SPI0CLK-G3 RX0-G3 HSTRX-G8 PWM1-T3-G2 PB4
19	USB_DP/PB3	I/O	USBDP

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			ADC5 SDDAT0-G5 SDCMD-G6 SPI0DO-G3 TX0-G3 HSTRX-G3 PWM0-T3-G2 PB3
20	PA7	I/O	ADC2 SDDAT0-G1 SPI1DO-G2 TX0-G1 TX1-G1 HSTRX-G1 PWM2-T5-G1 IISDI-G1 PA7
21	PA6	I/O	ADC1 SDCLK-G1/G4/G5/G6 SPI1CLK-G2 RX0-G1 RX1-G1 HSTRX-G6 FMOSC-G2 PWM1-T5-G1 TMR3CAP_G2/IR_G2 IISDO/DAT-G1 PA6
22	PA5	I/O	ADC0 SDCMD-G1/G4/G5 SPI1DI-G1 SPI1DI-G2 FMOSC-G1 PWM0-T5-G1 TMR3CAP_G1/IR_G1 IISSCLK-G1 PA5
23	PA4	I/O	SPI1DO -G1 TX1-G2 PWM2-T3-G3 IISLRCLK-G1 PA4
24	PA3	I/O	SPI1CLK-G1 RX1-G2 PWM1-T3-G3 IISMCLK-G1

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			PA3
25	MICL/PF2	I/O	MICL SPDIF5 ADC10 SPI1DO -G5 TX0-G7 PWM0-T3-G3 TMR5CAP_G1/IR_G9 PF2
26	PF1	I/O	SPDIF4 SPI1CLK-G5 RX0-G6 PWM2-T4-G2 PF1
27	PF0	I/O	SPDIF3 SPI1DI-G5 TX0-G6 PWM1-T4-G2 PF0
28	PF3	I/O	PWM1-T4-G2 PF3
29	DACL	A	DACL
30	VCMBUF	A	VCM buffer output
31	VDDDAC	PWR	DAC power
32	AGND	GND	DAC Ground

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

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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	5.5	V	
VBAT	Voltage input	2.4	3.3	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 1.2V LDO Parameters

Sym	Characteristics	Min	Typ	Max	Unit	Conditions
VDDBT	1.2V LDO voltage output	-	2.8	-	V	Light Loading condition
△VVDDBT	Output Mismatch 1-sigma	-	48	-	mV	VDDBT=1.2v
ILOAD	Maximum output current	-	-	20	mA	@VBAT=3.0v
ISC	Short Circuit Current Limit	-	-	40	mA	@VBAT=3.8v

3.2 IO Parameters

Table 3-4 I/O Parameters

GPIO—Electrical Characteristics							
Symbol	Description	Related GPIO	Min	Typical	Max	Units	Conditions
VIL	Low-level input voltage		-0.3		1.27	V	VDDIO=3.3V
VIH	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
RPUP0	Internal pull-up resister 0		8	10	12	KΩ	
RPUP1	Internal pull-up resister 1		0.24	0.3	0.36	KΩ	
RPUP2	Internal pull-up resister 2		160	200	240	KΩ	
RPDN0	Internal pull-down resister 0		8	10	12	KΩ	
RPDN1	Internal pull-down resister 1		0.24	0.3	0.36	KΩ	
RPDN2	Internal pull-down resister 2		160	200	240	KΩ	

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3.3 Audio DAC Parameters

Table 3-5 Audio DAC Parameters

Sym	Characteristics	Min	Typ	Max	Unit	Conditions
SNR		-	96	-	dB	VDDDAC cap=1uF with A-wt filter Output -3dBV Fin=1KHz
THD+N		-	-70	-	dB	VDDDAC cap=1uF with A-wt filter Output -3dBV with 10K loading Fin=1KHz
Output Range	Maximum output voltage	-	2.6		Vpeak-peak	32ohm Loading

3.4 Audio ADC Parameters

Table 3-6 Audio ADC Parameters

Sym	Characteristics	Min	Typ	Max	Unit	Conditions
SNR		-	90	-	dB	VDDDAC cap=1uF with A-wt filter Input sine amplitude, 850mV RMS Fin=1KHz
THD+N		-	-76	-	dB	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 3-7 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	

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Characteristics	Min	Typical	Max	Unit	Conditions
Sensitivity @ Basic Rate		-88.3		dBm	BER=0.1%, using DH5 packet
Sensitivity @ EDR		-90.5		dBm	BER=0.01%, using 2-DH5 packet
BLE transmission rate		1		Mbps	
BLE transmission power	7		12	dBm	
BLE Sensitivity		-88.3		dBm	

3.6 Current Parameters

Table 3-8 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

3.7 Power Consumption Parameters

Table 3-9 Power Consumption Parameters

Characteristics	Min	Typ	Max	Unit	Conditions
RF transmission power consumption		43		mA	Transmit 10dBm tone, only include the power consumption of RF PHY
RF receiving power consumption		18		mA	only include the power consumption of RF PHY
OFF MODE power consumption		2.8		uA	Reset after wake-up

3.8 ESD Voltage Parameters

Table 3-10 ESD Voltage Parameters

ESD model	Voltage value	unit
ESD HBM	4	KV
ESD MM	NC	—
ESD CMD	NC	—

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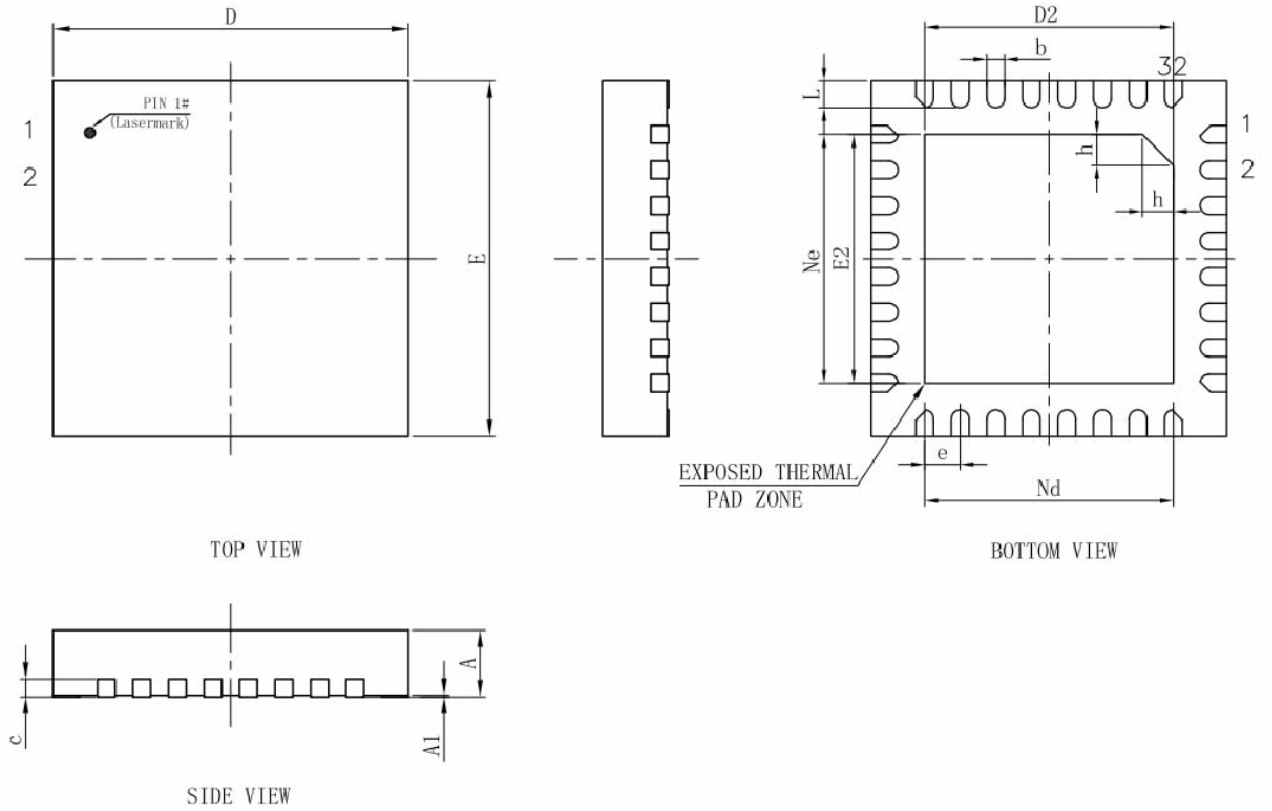
4 Package Information



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	0	0.02	0.05
b	0.15	0.20	0.25
c	0.18	0.20	0.25
D	3.90	4.00	4.10
D2	2.70	2.80	2.90
e	0.40BSC		
Ne	2.80BSC		
Nd	2.80BSC		
E	3.90	4.00	4.10
E2	2.70	2.80	2.90
L	0.25	0.30	0.35
h	0.30	0.35	0.40
L/F载体尺寸	122X122		

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