AB5656C2

Audio Player Microcontroller

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Declaration

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Revision History

Date	Version	Comments	Revised by
2023-1-31	0.0.1	First draft	Leo

Table of Contents

TABLE OF CONTENTS 2

1 PRODUCT FEATURES 3

2 PACKAGE DEFINITION 4

2.1 PIN ASSIGNMENT 4
2.2 PIN DESCRIPTIONS 5

3 CHARACTERISTICS 7

3.1 PMU PARAMETERS 7
3.2 IO PARAMETERS 8
3.3 AUDIO DAC PARAMETERS 8
3.4 AUDIO ADC PARAMETERS 9
3.5 BT PARAMETERS 10
3.6 CURRENT PARAMETERS 10

4 PACKAGE INFORMATION 11

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 1M bit flash
- Internal 113KB 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 5.3（QDID: 194248）;
- TX output power +9dBm in MAX;
- RX Sensitivity with -91.7 @ Basic Rate;
- RX Sensitivity with -94.2 @EDR;

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;
- Mono MIC amplifier input;
- High performance mono audio ADC with 94dB SNR;
- High performance mono audio DAC with 102dB SNR, with headphone amplifier output;

Peripheral and Interfaces

- Support Low power touch key;
- Three 32-bit timers;
- One multi-function 32-bit timers, support Capture and PWM mode;
- WatchDog;
- Three full-duplex UART;
- Sixteen Channels 10-bit SARADC;
- Build in PMU, such as Charger/Buck/LDO;

Package

- QFN20 3*3;

Temperature

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

Supports

- A2DP/AVDTP/AVRCP/RFCOMM/HFP/HSP/SPP/HID

2 Package Definition

2.1 Pin Assignment

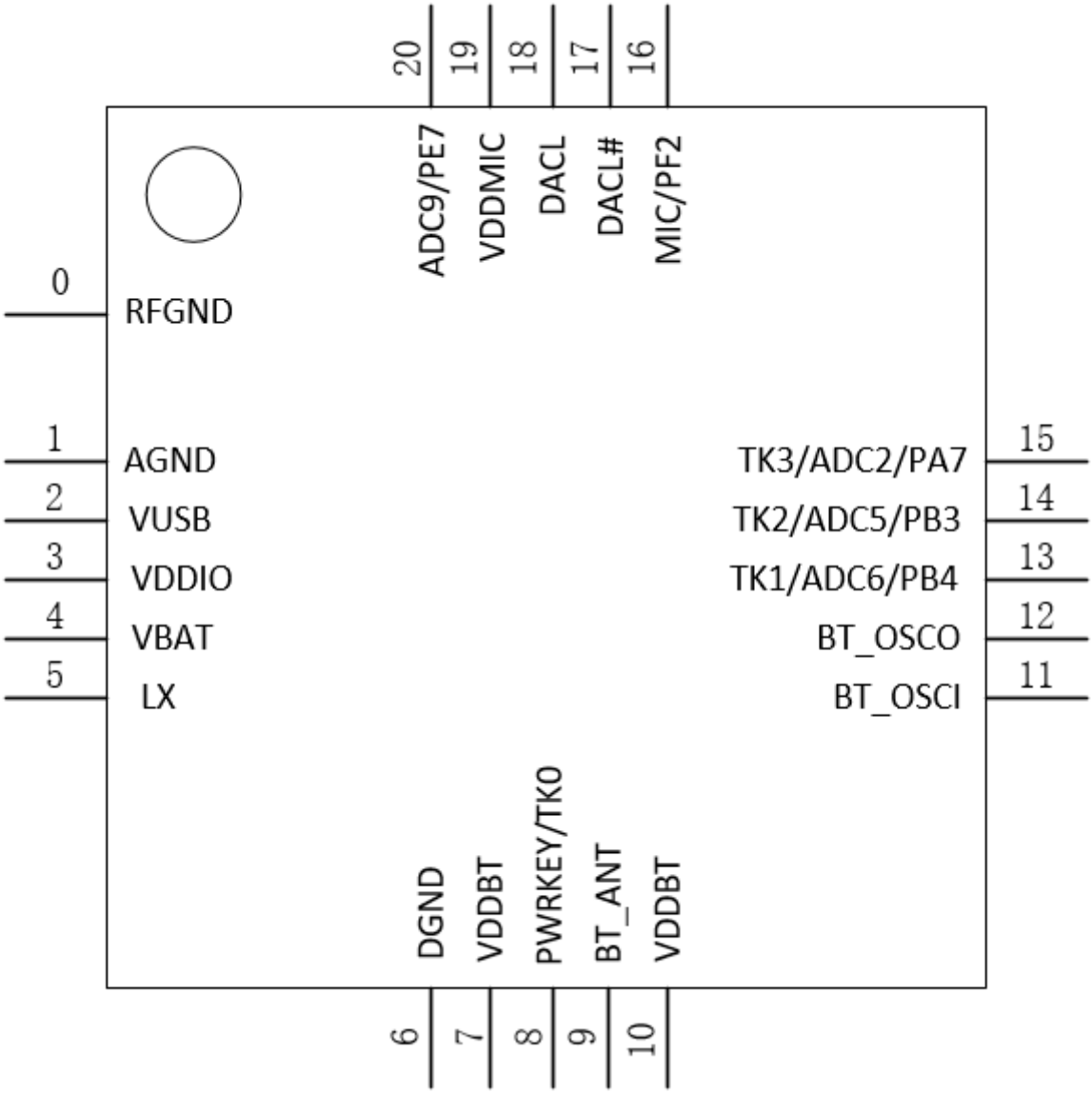


Figure 2-1 Pin assignment for QFN20

2.2 Pin Descriptions

Table 2-1 QFN20 pin description

Pin No.	Name	Type	Function
0	RFGND	GND	BT RF Ground
1	AGND	GND	DAC Ground
2	VUSB	PWR	VUSB power input
3	VDDIO	PWR	VDDIO Power Output
4	VBAT	PWR	VBAT Power Input
5	LX	PWR	Buck inductor connect pin
6	DGND	GND	Digital Ground
7	VDDBT	PWR	BT Power
8	PWRKEY/TK0	A	Power key input TK0
9	BT_ANT	A	BT ANT
10	VDDBT	PWR	BT Power
11	BT_OSCI	A	26M OSC input
12	BT_OSCO	A	26M OSC output
13	PB4/ADC6/TK1	I/O	TK1 ADC6 SDCMD-G2 SPI0CLK-G3 RX0-G3 HSTRX-G8 FMOSC-G4 PWM0-T3 TMR3CAP_G4 PB4
14	PB3/ADC5/TK2	I/O	TK2 ADC5 SDDAT0-G1/G2 AUXL1 SPI0DO-G3 TX0-G3 HSTRX-G3 FMOSC-G3 PWM2-T3 TMR3CAP_G3 PB3
15	PA7/ADC2/TK3	I/O	TK3 ADC2 SDCLK-G1/G2

			AUXL3 TX0-G1 TX1-G1 HSTRX-G1 FMOSC-G1 PWM1-T3 TMR3CAP_G1 PA7
16	PF2/MIC	I/O	MIC ADC10 TX0-G7 TX2-G1 HSTRX-G5 FMOSC-G7 PF2
17	DACL#	A	DAC differential L#
18	DACL	A	DAC L
19	VDDMIC	PWR	MIC Power
20	PE7/ADC9	I/O	ADC9 AUXL2 TX0-G4 RX2-G1 HSTRX-G4 FMOSC-G6 TMR3CAP_G6 PE7

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	2.4	3.3	3.8	V	Light Loading condition
△VVDDIO	Output Mismatch 1-sigma	-	12	-	mV	VDDIO=3.3v
ILOAD	Maximum output current	-	-	150	mA	@VBAT=3.6v
ISC	Short Circuit Current Limit	-	-	525	mA	@VBAT=3.8v

Table 3-3 1.25V LDO Parameters

Sym	Characteristics	Min	Typ	Max	Unit	Conditions
VDDBT	1.6V LDO voltage output	0.85	1.25	1.6	V	Light Loading condition
△VVDDBT	Output Mismatch 1-sigma	-	12	-	mV	VDDBT=1.6v
ILOAD	Maximum output current	-	-	370	mA	@VBAT=3.0v
ISC	Short Circuit Current Limit	-	-	580	mA	@VBAT=3.8v

Table 3-4 1.1V LDO Parameters

Sym	Characteristics	Min	Typ	Max	Unit	Conditions
VDDCORE	1.2V LDO voltage output	0.7	1.1	1.45	V	Light Loading condition
△VVDDCORE	Output Mismatch 1-sigma	-	5.7	-	mV	VDDCORE=1.1v
ILOAD	Maximum output current	-	-	230	mA	@VBAT=3.6v
ISC	Short Circuit Current Limit	-	-	700	mA	@VBAT=3.8v

Table 3-5 1.25V BUCK Parameters

Sym	Characteristics	Min	Typ	Max	Unit	Conditions
VDDCORE	1.2V LDO voltage output	0.85	1.25	1.6	V	Light Loading condition
△VVDDCORE	Output Mismatch 1-sigma	-	6	-	mV	VDDBT=1.25v

Sym	Characteristics	Min	Typ	Max	Unit	Conditions
ILOAD	Maximum output current	-	-	366	mA	@VBAT=3.6v
ISC	Short Circuit Current Limit	-	-	366	mA	@VBAT=3.8v

3.2 IO Parameters

Table 3-6 I/O Parameters

IOTYPE1—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	

IOTYPE4—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	Output Driver Ability			8		mA	VDDIO=3.3V
RPUP	Internal pull-up resister		8	10	12	KΩ	
RPDN	Internal pull-down resister		8	10	12	KΩ	

3.3 Audio DAC Parameters

Table 3-7 Audio DAC Parameters differential mode

Sym	Characteristics	Min	Typ	Max	Unit	Conditions
SNR		-	102	-	dB	VCM cap=NC VDDDAC cap=NC with A-wt filter Output -4.98dBV

Sym	Characteristics	Min	Typ	Max	Unit	Conditions
						Fin=1KHz
THD+N		-	-92.4	-	dB	VCM cap=NC VDDDAC cap=NC with A-wt filter Output -4.98dBV with 32ohm loading Fin=1KHz
Output Range	Maximum output voltage	-	-2.3		dBVrms	32ohm Loading

Table 3-8 Audio DAC Parameters VCMBUF MODE

Sym	Characteristics	Min	Typ	Max	Unit	Conditions
SNR		-	94.67	-	dB	VCM cap=NC VDDDAC cap=NC with A-wt filter Output -9.9dBV Fin=1KHz
THD+N		-	-78.2	-	dB	VCM cap=NC VDDDAC cap=NC with A-wt filter Output -9.9dBV with 32ohm loading Fin=1KHz
Output Range	Maximum output voltage	-	-9.9		dBVrms	32ohm Loading

3.4 Audio ADC Parameters

Table 3-9 Audio ADC Parameters

Mode	Sym	Characteristics	Min	Typ	Max	Unit	Conditions
ADC Mode	SNR		-	92	-	dB	VCM cap=NC VDDMIC cap=1uF with A-wt filter Input -1dBV @ Fin=1KHz
	THD+N		-	-94.92	-	dB	
	Input Range	Maximum input voltage	-	-1	-	dBVrms	
external-RC PGA+ADC mode	PGA Gain		-6		42	dB	-6 / 0~42dB@step=3dB
	SNR		-	92	-	dB	VCM cap=NC

Mode	Sym	Characteristics	Min	Typ	Max	Unit	Conditions
	THD+N		-	-72.4	-	dB	VDDMIC cap=1uF with A-wt filter Input -1dBV @ Fin=1KHz PGA Gain=0dB
	Input Range	Maximum input voltage	-	-1	-	dBVrms	
internal-RC PGA+ADC mode	PGA Gain		-6		42	dB	-6 / 0~42dB@step=3dB
	SNR		-	66.8	-	dB	VCM cap=NC VDDMIC cap=1uF with A-wt filter Input -23dBV @ Fin=1KHz PGA Gain=0dB
	THD+N		-	-60.3	-	dB	
	Input Range	Maximum input voltage	-	-10	-	dBVrms	THD<-60dB @ Input voltage ⩽-23dBV

3.5 BT Parameters

Table 3-10 BT Parameters

Characteristics	Min	Typical	Max	Unit	Conditions
Maximum Transmit Power	-	8	9	dBm	GFSK TX power
RMS DEVM	-	8	-	%	Maximum TX power 2-DH5 packet
Peak DEVM	-	20		%	
EDR Relative Transmit Power		-0.5		dB	
Sensitivity @ Basic Rate		-91.7		dBm	BER=0.1%, using DH5 packet
Sensitivity @ EDR		-94.2		dBm	BER=0.01%, using 2-DH5 packet

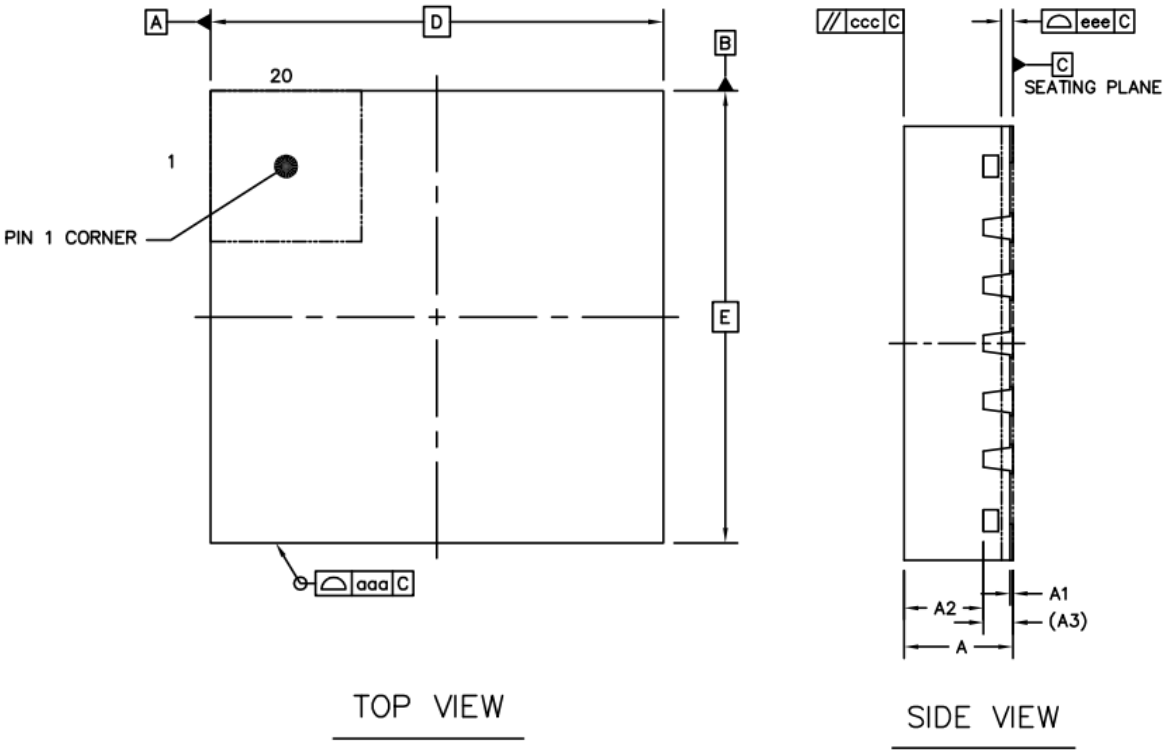
3.6 Current Parameters

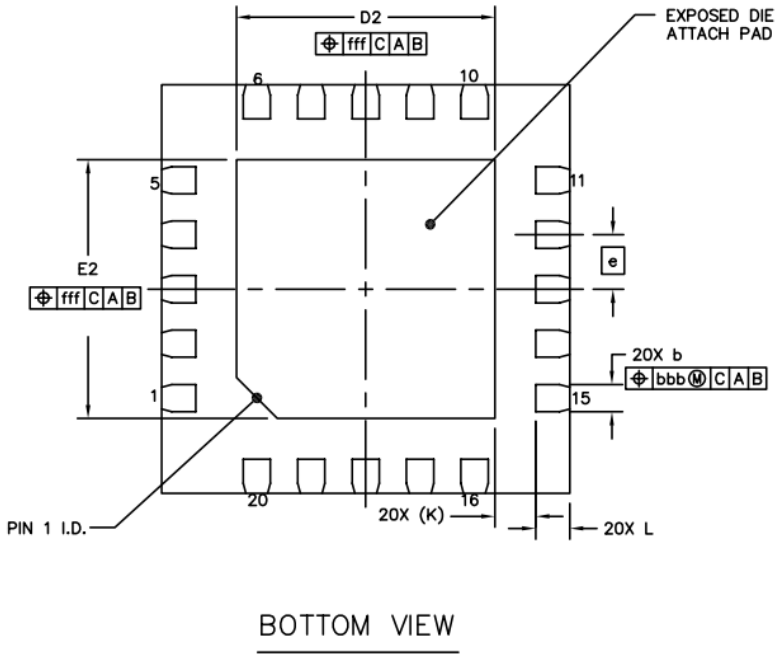
Table 3-11 Current Parameters

Sym	Characteristics	Min	Typ	Max	Unit	Conditions
IRTC	RTC mode current	-	3	-	μA	4.2V input, room temp. Without TouchKey
Sleep	Sleep current	-	450		μA	3.3V input, room temp Wake-up every 500ms to keep BT connecting

4 Package Information

QFN3X3-20L(P0.4T0.75)





		SYMBOL	MIN	NOM	MAX
TOTAL THICKNESS		A	0.7	0.75	0.8
STAND OFF		A1	0	0.02	0.05
MOLD THICKNESS		A2	---	0.55	---
L/F THICKNESS		A3		0.203 REF	
LEAD WIDTH		b	0.15	0.2	0.25
BODY SIZE	X	D		3 BSC	
	Y	E		3 BSC	
LEAD PITCH		e		0.4 BSC	
EP SIZE	X	D2	1.8	1.9	2
	Y	E2	1.8	1.9	2
LEAD LENGTH		L	0.15	0.25	0.35
LEAD TIP TO EXPOSED PAD EDGE		K		0.3 REF	
PACKAGE EDGE TOLERANCE		aaa		0.1	
MOLD FLATNESS		ccc		0.1	
COPLANARITY		eee		0.08	
LEAD OFFSET		bbb		0.07	
EXPOSED PAD OFFSET		fff		0.1	

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