AB5376T2

Audio Player Microcontroller

Versions: 0.0.1

2020/02/04

Declaration

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Revision History

Date	Version	Comments	Revised by
2020-02-04	0.0.1	First draft	Leo

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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 specification (QDID: 115952);
- TX output power +2dBm in typical;
- RX Sensitivity with -90.5dBm @Basic Rate;

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 90dB SNR;
- High performance mono audio DAC with 95dB SNR, with headphone amplifier output;

Peripheral and Interfaces

- 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;

Temperature

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

2 Package Definition

2.1 Pin Assignment

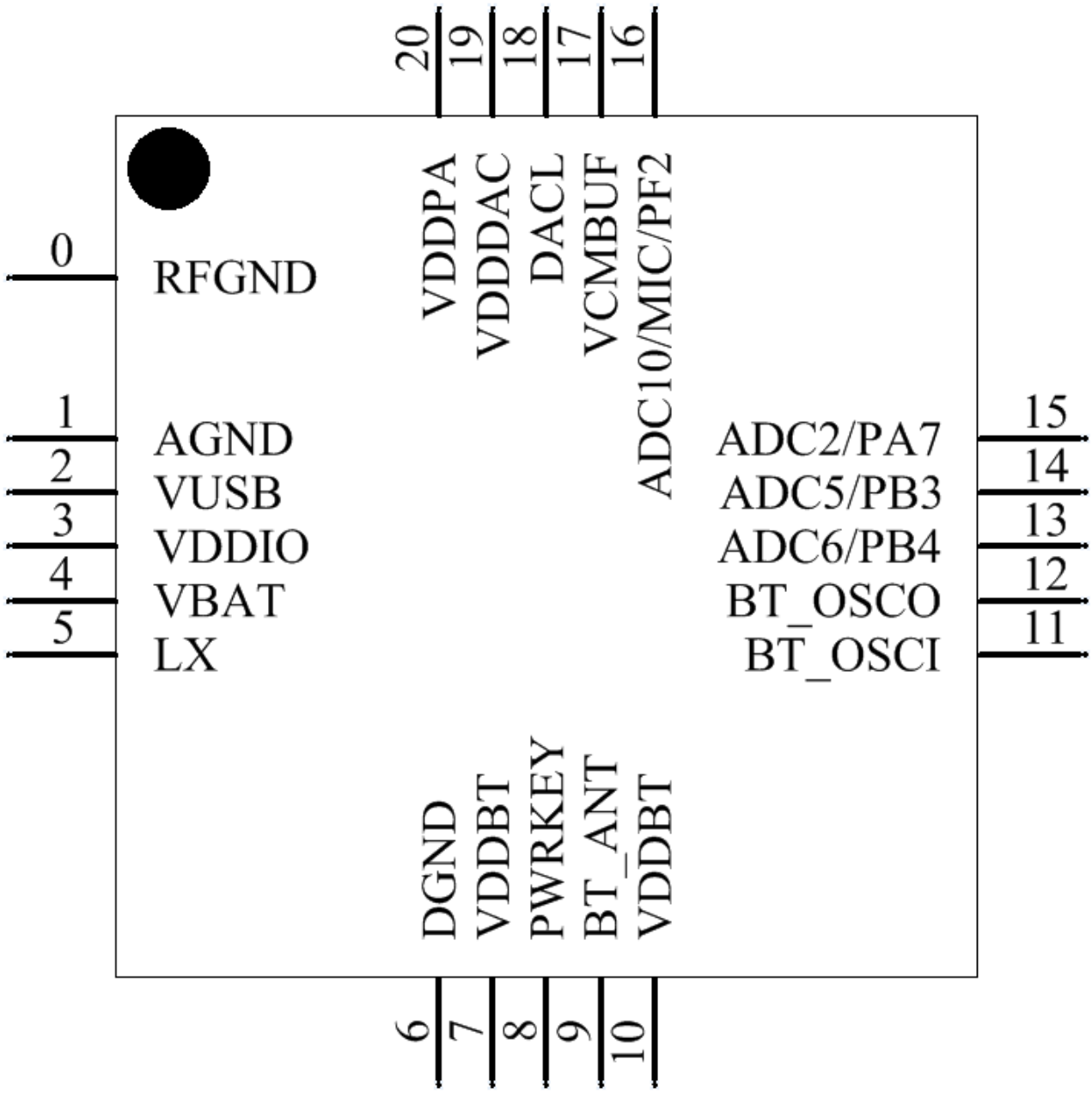


Figure 2-1 Pin assignment for QFN20

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	A	Power key input
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	I/O	ADC6 SPI0CLK-G3 RX0-G3 HSTRX-G8 PB4
14	PB3/ADC5	I/O	ADC5 SPI0DO-G3 TX0-G3 HSTRX-G3 PWM2-T3 PB3
15	PA7/ADC2	I/O	ADC2 TX0-G1 TX1-G1 HSTRX-G1 PWM1-T3 PA7
16	MIC/PF2/ ADC10	I/O	ADC10 MIC TX0-G7 PF2
17	VCMBUF	A	VCM buffer output
18	DACL	A	DAC L

19	VDDDAC	PWR	DAC power OUTPUT
20	VDDPA	PWR	PA power INPUT

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	5.5	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	-	3.3	-	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		-92.5		dBm	BER=0.01%, using 2-DH5 packet

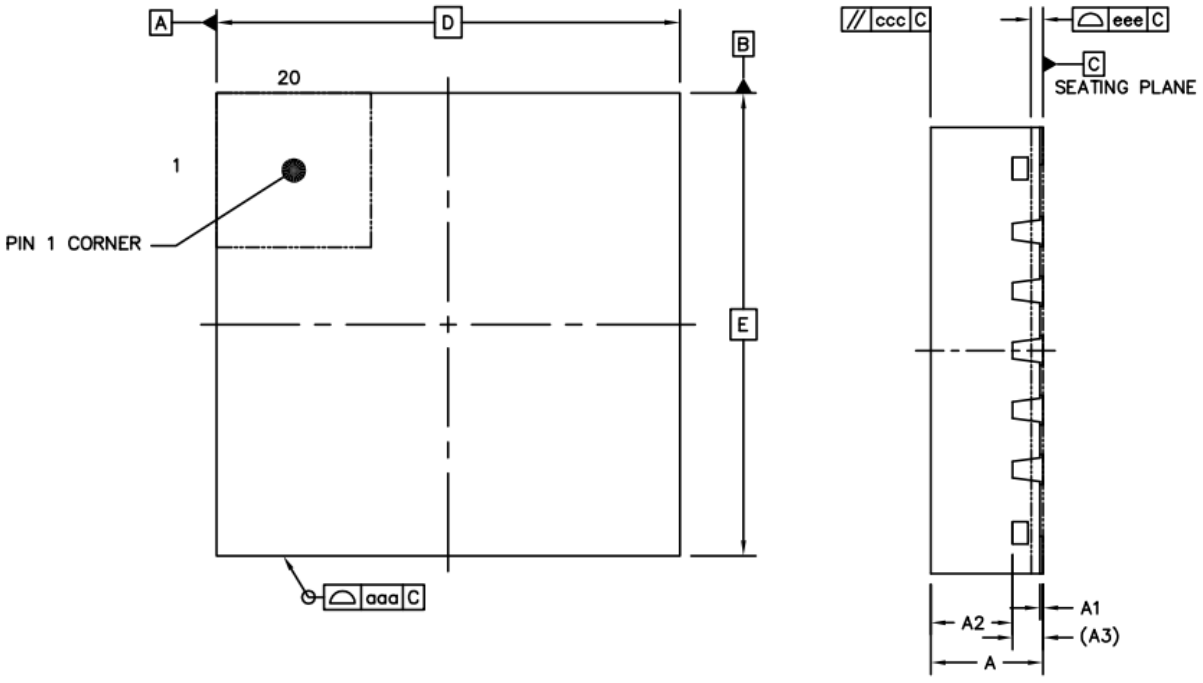
3.6 Current Parameters

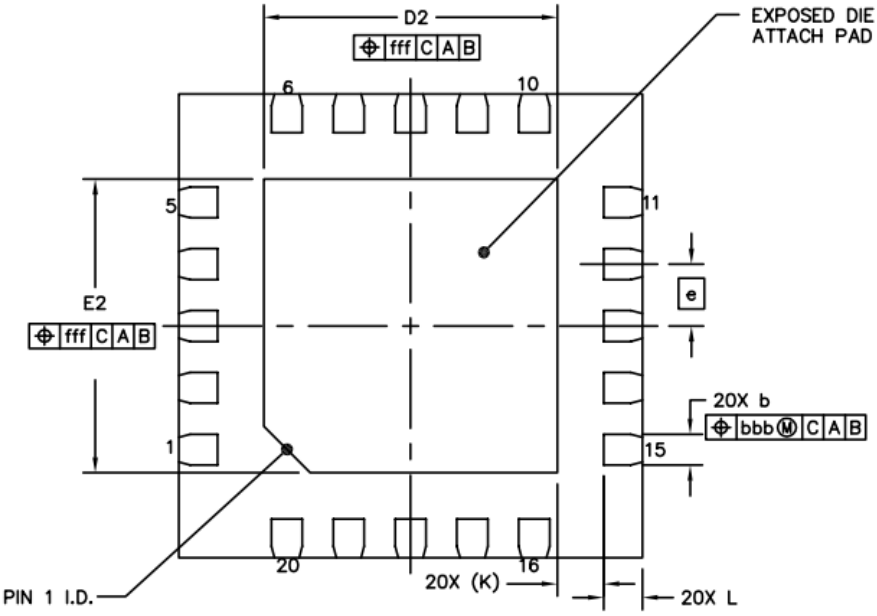
Table 3-9 Current Parameters

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

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	