JL7012F Datasheet

Zhuhai Jieli Technology Co.,LTD

Version：2.2

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JL7012F Features

CPU

- 32bit Dual-Core DSP
- Maximum speed 160MHz
- 32KB ICache and 16KB DCache
- IEEE754 Single precision FPU
- Mathematical accelerate engine
- Interrupts with 8 priority level

Memory

- On-chip 640KB SRAM
- Support MMU
- Built-In Flash

Clocks

- On-chip 16 MHz clock oscillator
- On-chip 200 kHz lower-temperature-drift clock oscillator
- 24 MHz crystal oscillator
- 32.768 kHz crystal oscillator

DSP Audio Processing

- LDAC,LHDC,SBC, AAC Audio decodes supported for BT audio
- mSBC voice codec supported for BT phone
- Support MP2, MP3, WMA, APE, FLAC, AAC, MP4, M4A, WAV, AIF, AIFC audio decoding
- Packet Loss Concealment (PLC) for voice processing
- Single/Dual MIC Environmental Noise Cancellation (ENC)
- Multi-band DRC limiter
- Multi-band EQ configuration for voice Effects
- Support Hi-Res Audio

Audio Codec

- Two channels 24-bit DAC,SNR≥ 105dB in Differential Mode
- Four channels 24-bit ADC,SNR ≥ 95dB
- Audio DAC Sampling rates of 8kHz/11.025kHz/16kHz/22.05kHz/24kHz/ 32kHz/44.1kHz/48kHz/64kHz/88.2kHz/ 96kHz are supported
- Audio ADC Sampling rates of 8kHz/11.025kHz/16kHz/22.05kHz/24kHz/32 kHz/44.1kHz/48kHz are supported
- Support four digital/analog MIC inputs
- Four channels analog audio inputs
- Audio DAC support differential cap-less mode or single-ended mode
- Direct drive 16ohm/32ohm Speaker loading

Bluetooth

- Compliant with Bluetooth V6.0+BR+EDR+BLE specification (DN Q332415)
- Support AoA/AoD direction finding
- Support LE audio BIS/CIS full function
- Meet class1、class2 and class3 transmitting power requirement
- Maximum +9dbm transmitting power
- EDR receiver with minimum -95dBm sensitivity
- Support a2dp\avctp\avdtp\avrcp\hfp\spp\smp\ att\gap\gatt\rfcomm\sdp\l2cap profile
- bap 1.0.2\pacs 1.0.2\ccp 1.0\mcp 1.0\micp 1.0\vcp 1.0\csip1.0.1\ascs1.1\bass1.0\cap 1.0\hap 1.0\pbp 1.0.1\tmap 1.0\lc3 1.0.1
- a2dp 1.4\avctp 1.4\avdtp 1.3\ avrcp 1.6.3\ hfp 1.9\spp 1.2\rfcomm 1.2\pnp 1.3\ hid 1.1.1\sdp core 6.0\l2cap core 6.0

Graphics

- 2D Graphics accelerator
- Support crop, scale, rotation process
- Support multiple data format graphics
- SPI and QSPI display driver

Peripherals

- One full speed USB OTG controller

- One SD host controller for eMMC/SD
- Six multi-function 32-bit timers, support capture and PWM mode
- Four UART interface, UART0,UART1&UART2 support DMA
- Two I2C Master/Slave interface
- Four SPI Master/Slave interface
- 4-channel I2S Master/Slave interface, support sampling rates: 8kHz to 384kHz
- 2-channel PDM Slave interface, support sampling rates: 8kHz to 192kHz
- QDEC
- Low power CapSense
- 15-channel 10-bit ADC for analog sampling
- 4-channel Motor PWM controller
- 40 Individually programmable and multiplexed GPIO pins
- Up to 12 external interrupt/wake-up source(low power available,can be multiplexed to any I/O)

PMU

- Built-in lithium battery charging manager,up to 200mA charging current
- Built-in LDO and Buck DC-DC converter
- Less than 2uA sleep current
- VPWR range : 4.5V to 5.5V
- VBAT range : 2.2V to 4.5V
- IOVDD range : 2.2V to 3.6V
- Conform with IEC 62368-1:2018 certification

Packages

- QFN52(6mm*6mm)

Temperature

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

Applications

- Bluetooth Smart Watch
- Bluetooth Smart Home
- Bluetooth Intelligent Voice
- Bluetooth Stereo speaker
- Bluetooth TWS speaker
- Bluetooth alarm clock speaker

1 Block Diagram

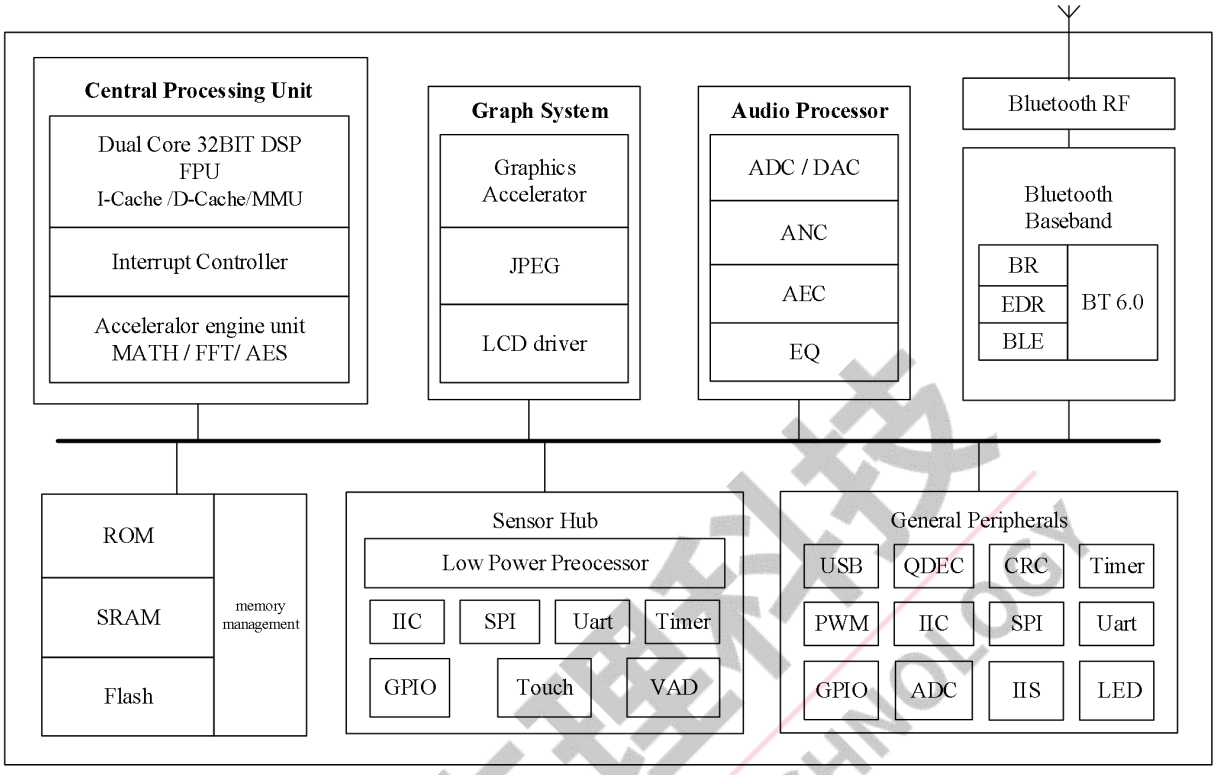


Figure 1-1 JL7012F Block Diagram

2 Pin Definition

2.1 Pin Assignment

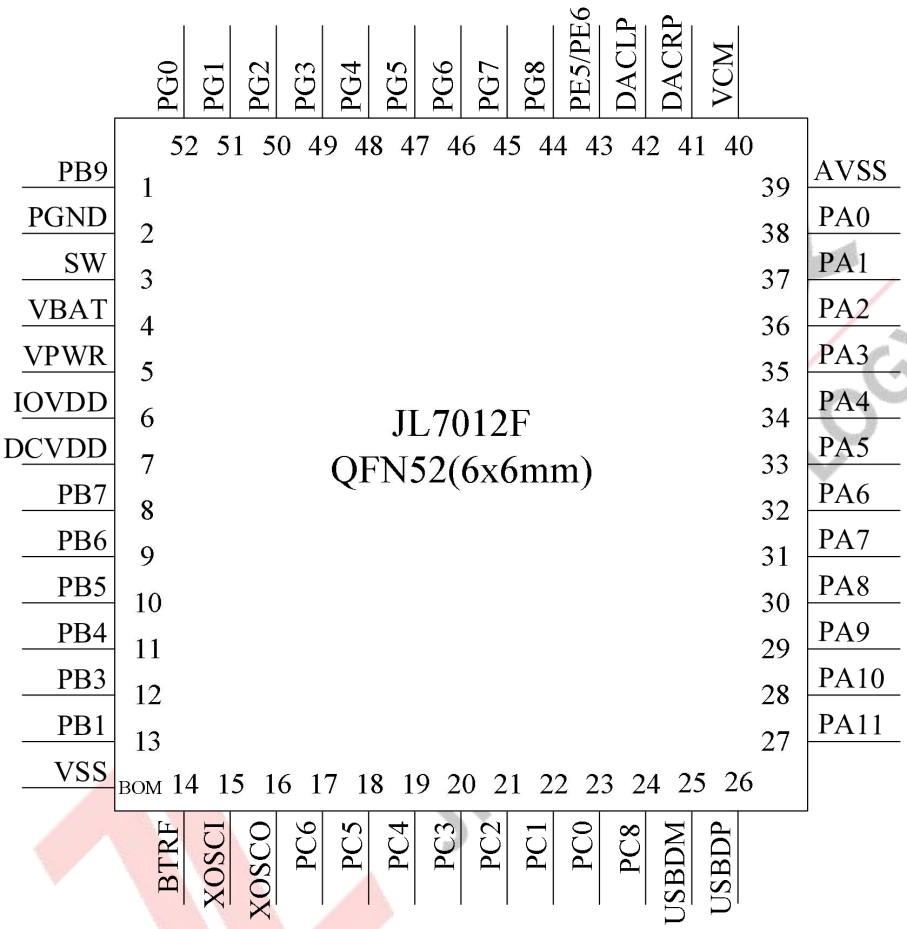


Figure 2-1 JL7012F Package Diagram

2.2 Pin Description

Table 2-1 JL7012F Pin Description

PIN NO.	Name	Type	Function	Other Function
1	PB9	I/O	GPIO	ADC9:ADC Input Channel 9;
2	PGND	G		The ground of Buck DC-DC converter;
3	SW	PO		Switch signal of the Buck converter,Connected to inductor;
4	VBAT	P		Battery interface;
5	VPWR (PP0)	PI (I/O)	GPIO (High Voltage Resistant)	Charging power input; UART0TXB:Uart0 Data Output(B); UART0RXB:Uart0 Data Input(B); CAP1:Timer1 Capture; PWM3:Timer3 PWM Output;
6	IOVDD	PO		Built-in linear voltage regulator output;
7	DCVDD	P		Internal power;
8	PB7	I/O	GPIO	OSC32KI:32.768khz crystal oscillator input;
9	PB6	I/O	GPIO	OSC32KO:32.768khz crystal oscillator output; PWM2:Timer2 PWM Output;
10	PB5	I/O	GPIO	LP_Touch4:Low Power Touch Channel 4; IIC1_SDA_A:IIC1 SDA(A); ADC8:ADC Input Channel 8; UART3RXB:Uart3 Data Input(B);
11	PB4	I/O	GPIO	LP_Touch3:Low Power Touch Channel 3; CLKOUT0:Clock Out0; IIC1_SCL_A:IIC1 SCL(A); UART3TXB:Uart3 Data Output(B); TMR2:Timer2 Clock Input;
12	PB3	I/O	GPIO	UART3RXA:Uart3 Data Input(A);
13	PB1	I/O	GPIO (pull up)	Hold down 0 to reset; LP_Touch1:Low Power Touch Channel 1; ADC6:ADC Input Channel 6;
14	BTRF	RFI		Bluetooth RF antenna interface;
15	XOSCI	I		System Crystal Oscillator Input;
16	XOSCO	O		System Crystal Oscillator Output;
17	PC6	I/O	GPIO (High Voltage Resistant)	IIS_MCLKB:ALNK Master Clock(B);

18	PC5	I/O	GPIO	SFC1_D2:SFC1 Data2(nor flash); SPI0_DAT2C(2):SPI0 Data2(C); SD0_CLKA:SD0 Clock(A); SPI1DOB:SPI1 Data Out(B); IIC0_SDA_B:IIC0 SDA(B); IIS_DAT3(B):Audio Link Data3(B); ADC5:ADC Input Channel 5; UART2RXA:Uart2 Data Input(A);
19	PC4	I/O	GPIO	SFC1_DI(D1):SFC1 Data In(nor flash); SPI0_DIC(1):SPI0 Data In(C); SD0_CMDA:SD0 CMD(A); SPI1CLKB:SPI1 Clock(B); IIC0_SCL_B:IIC0 SCL(B); IIS_DAT2(B):Audio Link Data2(B); ADC4:ADC Input Channel 4; UART2TXA:Uart2 Data Output(A); PWM4:Timer4 PWM Output;
20	PC3	I/O	GPIO	SFC1_CS:SFC1 Chip Select(nor flash); LNA_EN:LNA Enable; SPI0_CSC:SPI0 Chip Select(C); SD0_DATA:SD0 Data(A); SPI1DIB:SPI1 Data In(B); IIS_LRCK(B):Audio Link Word Select(B); TMR3:Timer3 Clock Input;
21	PC2	I/O	GPIO	SFC1_DO(D0):SFC1 Data Out(nor flash); PA_EN:PA Enable; SPI0_DOC(0):SPI0 Data Out(C); IIS_SCLK(B):Audio Link Serial Clock(B); TMR1:Timer1 Clock Input;
22	PC1	I/O	GPIO	SFC1_CLK:SFC1 Clock(nor flash); SPI0_CLKC:SPI0 Clock(C); IIS_DAT1(B):Audio Link Data1(B); TMR5:Timer5 Clock Input; PWMCH1L:Motor PWM Channel1(L);
23	PC0	I/O	GPIO	SFC1_D3:SFC1 Data3(nor flash); SPI0_DAT3C(3):SPI0 Data3(C); IIS_DAT0(B):Audio Link Data0(B); PWMCH1H:Motor PWM Channel1(H);
24	PC8	I/O	GPIO	SPI2DIB:SPI2 Data In(B);
25	USBDM	I/O	USB Negative Data (pull down)	SPI2DOB:SPI2 Data Out(B); IIC0_SDA_A:IIC0 SDA(A); ADC11:ADC Input Channel 11; UART1RXB:Uart1 Data Input(B);

26	USBDP	I/O	USB Positive Data (pull down)	SPI2CLKB:SPI2 Clock(B); IIC0_SCL_A:IIC0 SCL(A); ADC10:ADC Input Channel 10; UART1TXB:Uart1 Data Output(B);
27	PA11	I/O	GPIO	LCD_SPID3(A); FPIN0;
28	PA10	I/O	GPIO	LCD_SPID2(A); FPIN3;
29	PA9	I/O	GPIO	LCD_SPID1(DI)(A); PWMCH0H:Motor PWM Channel0(H);
30	PA8	I/O	GPIO	LCD_SPID0/DO(A); PLNK_DAT1/ANCDE; IIS_LRCK(A):Audio Link Word Select(A); ADC3:ADC Input Channel 3; UART2RXB:Uart2 Data Input(B);
31	PA7	I/O	GPIO	LCD_SPICLK(A); IIS_SCLK(A):Audio Link Serial Clock(A); UART2TXB:Uart2 Data Output(B); TMR0:Timer0 Clock Input;
32	PA6	I/O	GPIO	PLNK_DAT0/ANCDR; SPI2DOA:SPI2 Data Out(A); IIS_DAT3(A):Audio Link Data3(A); ADC2:ADC Input Channel 2; UART0RXA:Uart0 Data Input(A); CAP0:Timer0 Capture;
33	PA5	I/O	GPIO	PLNK_SCLK/ANCCK; SPI2CLKA:SPI2 Clock(A); IIS_DAT2(A):Audio Link Data2(A); ADC1:ADC Input Channel 1; UART0TXA:Uart0 Data Output(A); PWM5:Timer5 PWM Output;
34	PA4	I/O	GPIO	MIC_BIAS1:MIC1 Bias Output(Built-in resistor); MIC1_N:Different MIC1 Negative; AMUX_B1:Analog Channel B1 input； SPI2DIA:SPI2 Data In(A); IIS_DAT1(A):Audio Link Data1(A); CAP2:Timer2 Capture;
35	PA3	I/O	GPIO	MICIN1:MIC1 Input Channel 1; MIC1_P:Different MIC1 Positive; AMUX_B0:Analog Channel B0 input； SPI1DOA:SPI1 Data Out(A); IIS_DAT0(A):Audio Link Data0(A); PWM1:Timer1 PWM Output;

36	PA2	I/O	GPIO	MIC_BIAS0:MIC0 Bias Output(Built-in resistor); MIC0_N:Different MIC0 Negative; AMUX_A1:Analog Channel A1 input； CLKOUT1:Clock Out1; SPI1CLKA:SPI1 Clock(A); IIS_MCLKA:ALNK Master Clock(A); UART1RXA:Uart1 Data Input(A); CAP3:Timer3 Capture;
37	PA1	I/O	GPIO	MICIN0:MIC0 Input Channel 0; MIC0_P:Different MIC0 Positive; AMUX_A0:Analog Channel A0 input； SPI1DIA:SPI1 Data In(A); UART1TXA:Uart1 Data Output(A); PWM0:Timer0 PWM Output;
38	PA0	I/O	GPIO	MICLDO:Microphone linear voltage regulator output; ADC0:ADC Input Channel 0;
39	AVSS	G		Audio analog ground;
40	VCM	P		Audio analog reference bias;
41	DACRP	AO		Right channel audio output positive;
42	DACLP	AO		Left channel audio output positive;
43	PE6	I/O	GPIO	SDPG:SD card power gate;
	PE5	I/O	GPIO	
44	PG8	I/O	GPIO	MICIN2:MIC2 Input Channel 2; MIC2_P:Different MIC2 Positive; AMUX_C0:Analog Channel C0 input；
45	PG7	I/O	GPIO	LCD_SPID3(B); MIC_BIAS2:MIC2 Bias Output(Built-in resistor); MIC2_N:Different MIC2 Negative; AMUX_C1:Analog Channel C1 input； ADC15:ADC Input Channel 15;
46	PG6	I/O	GPIO	LCD_SPID2(B); MICIN3:MIC3 Input Channel 3; MIC3_P:Different MIC3 Positive; AMUX_D0:Analog Channel D0 input； FPIN2;
47	PG5	I/O	GPIO	LCD_SPID1/DI(B); MIC_BIAS3:MIC3 Bias Output(Built-in resistor); MIC3_N:Different MIC3 Negative; AMUX_D1:Analog Channel D1 input； ADC14:ADC Input Channel 14; TMR3CK;
48	PG4	I/O	GPIO (pull up)	LCD_SPID0/DO(B); PWMCH3L:Motor PWM Channel3(L);

49	PG3	I/O	GPIO	LCD_SPICLK(B); TDM_MCLK; PWMCH3H:Motor PWM Channel3(H);
50	PG2	I/O	GPIO	TDM_DAT; SD0_CLKB:SD0 Clock(B); PWMCH2L:Motor PWM Channel2(L);
51	PG1	I/O	GPIO	TDM_SYN; SD0_CMDB:SD0 CMD(B); ADC13:ADC Input Channel 13; PWMCH2H:Motor PWM Channel2(H);
52	PG0	I/O	GPIO	TDM_CLK; LVD:Low Voltage Detect; SD0_DATB:SD0 Data(B); ADC12:ADC Input Channel 12; TMR2CK;
BOM	VSS	G		System ground;

Pin Type	**Description**	**Pin Type**	**Description**
P	Power	I/O	Input or Output
PO	Power Output	I	Input
PI	Power Input	O	Output
G	Ground	RFI	Radio frequency interface
AO	Analog Output		

3 Electrical Characteristics

3.1 Absolute Maximum Ratings

Table 3-1

Symbol	Parameter	Min	Max	Unit
Topt	Operating temperature	-40	+85	°C
Tstg	Storage temperature	-65	+150	°C
VBAT	Supply Voltage	-0.3	4.5	V
VPWR	Charger Voltage	-0.3	6	V
V_{IOVDD}	Voltage applied at IOVDD	-0.3	3.6	V
V_{GPIO}	Voltage applied to GPIO	-0.3	IOVDD+0.3	V
V_{HVIO}	Voltage applied to High Voltage Resistant IO	-0.3	+5.5	V

Note : The chip can be damaged by any stress in excess of the absolute maximum ratings listed below

3.2 PMU Characteristics

Table 3-2

Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
VBAT	Voltage Input	2.2	3.7	4.4	V	
VPWR	Charger supply Voltage	4.5	5.0	5.5	V	
Operating mode						
IOVDD	Voltage output	2.0	3.0	3.4	V	VBAT = 4.2V, 10mA loading
	Loading current	_	_	120	mA	IOVDD=3V@VBAT = 3.3V
DCVDD	Voltage output	1.0	1.25	1.4	V	IOVDD=3.0V, 10mA loading
	Loading current	_	_	100	mA	DCVDD=1.25V@IOVDD=3.0v On LDO mode
		_	_	180	mA	DCVDD=1.25V@IOVDD=3.0v On DC-DC mode
V_{LVD}	Voltage input	1.8	2.5	2.5	V	Low-Voltage Detection for IOVDD
Low Power mode						
IOVDD	Loading current	_	_	10	mA	IOVDD=3V@VBAT = 4.2V

3.3 Battery Charge

Table 3-3

Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
VPWR	Charge Input Voltage	4.5	5	5.5	V	_
$V_{bat\ float}$	Charge Voltage	4.15	4.2	4.25	V	VPWR＞4.5V
		4.30	4.35	4.40	V	VPWR＞4.65V
I_{bat}	Charge Current	15	_	200	mA	Charge current at fast charge mode VBAT=4.0V@VPWR=5.0V
I_{end}	End Of Charge Current	2	_	30	mA	End of charge current
V_{Trikl}	Trickle Charge Voltage	_	3.0	_	V	VPWR＞4.5V
I_{Trikl}	Trickle Charge Current	1.5	_	30	mA	V_{BAT}<V_{Trikl}

3.4 IO Input/Output Electrical Logical Characteristics

Table 3-4

GPIO input characteristics						
Symbol	**Parameter**	**Min**	**Typ**	**Max**	**Unit**	**Test Conditions**
V_{IL}	Low-Level Input Voltage	-0.3	_	0.3* IOVDD	V	IOVDD = 3.0V
V_{IH}	High-Level Input Voltage	0.7* IOVDD	_	IOVDD+0.3	V	IOVDD = 3.0V
High Voltage Resistant IO input characteristics						
Symbol	**Parameter**	**Min**	**Typ**	**Max**	**Unit**	**Test Conditions**
V_{IL}	Low-Level Input Voltage	-0.3	_	0.3* IOVDD	V	IOVDD = 3.0V
V_{IH}	High-Level Input Voltage	0.7* IOVDD	_	+5V	V	IOVDD = 3.0V
GPIO & High Voltage Resistant IO output characteristics						
Symbol	**Parameter**	**Min**	**Typ**	**Max**	**Unit**	**Test Conditions**
V_{OL}	Low-Level Output Voltage	_	_	0.1* IOVDD	V	IOVDD = 3.0V
V_{OH}	High-Level Output Voltage	0.9* IOVDD	_	_	V	IOVDD = 3.0V

3.5 Internal Resistor Characteristics

Table 3-5

Port	Drive Current(mA)		Internal Pull-Up Resistor	Internal Pull-Down Resistor	Comment
PA0~PA11 PC0~PC5,PC8 PG0~PG8 PE5,PE6	HD1,HD0==0,1	8	10K	10K	1. PB1, PG4 default pull up 2. USBDM & USBDP default pull down 3. Internal pull-up/pull-down resistance accuracy ±20%
	HD1,HD0==1,0	26			
	HD1,HD0==1,1	46			
PB1~PB9 PC6 PP0(VPWR)	8		10K	10K	
USBDP	4		1.5K	15K	
USBDM			180K	15K	

3.6 Audio DAC Characteristics

DAC_MODE_H1(Watch Application) **Table 3-6**

Parameter	Mode	Min	Typ	Max	Unit	Test Conditions
Frequency Response		20	_	20K	Hz	1KHz/0dB 10k ohm loading With A-Weighted Filter
Output Swing	Differential	_	1	_	Vrms	
	Single-ended	_	520	_	mVrms	
THD+N	Differential	_	-70	_	dB	
	Single-ended	_	-70	_	dB	
S/N	Differential	_	104	_	dB	
	Single-ended	_	98	_	dB	
Dynamic Range	Differential	_	104	_	dB	1KHz/-60dB 10k ohm loading With A-Weighted Filter
	Single-ended	_	98	_	dB	
Noise Floor	Differential	_	5.8	_	uVrms	A-Weighted Filter
	Single-ended	_	5.8	_	uVrms	

DAC_MODE_H2(Speaker Application) **Table 3-7**

Parameter	Mode	Min	Typ	Max	Unit	Test Conditions
Frequency Response		20	_	20K	Hz	1KHz/0dB 10k ohm loading With A-Weighted Filter
Output Swing	Differential	_	1.7	_	Vrms	
	Single-ended	_	860	_	mVrms	
THD+N	Differential	_	-70	_	dB	
	Single-ended	_	-70	_	dB	
S/N	Differential	_	105	_	dB	
	Single-ended	_	98	_	dB	
Dynamic Range	Differential	_	105	_	dB	1KHz/-60dB 10k ohm loading With A-Weighted Filter
	Single-ended	_	98	_	dB	

Noise Floor	Differential	_	10	_	uVrms	A-Weighted Filter
	Single-ended	_	10	_	uVrms	

3.7 Audio ADC Characteristics

Table 3-8

Parameter	Min	Typ	Max	Unit	Test Conditions
Dynamic Range	_	94	_	dB	Fsample=44.1kHz,Gain=0dB Fin=1KHz 590mVrms
S/N	_	95	_	dB	Fsample=44.1kHz,Gain=0dB
THD+N	_	-75	_	dB	Fin=1KHz 590mVrms
S/N	_	76	_	dB	Fsample=44.1kHz,Gain=18dB
THD+N	_	-73	_	dB	Fin=1KHz 75mVrms

3.8 BT Characteristics

3.8.1 Transmitter

Basic Rate

Table 3-9

Parameter		Min	Typ	Max	Unit	Test Conditions
RF Transmit Power			7.0		dBm	25℃, Power Supply VBAT=3.7V 2441MHz 4 Layer Board
RF Power Control Range			18.2		dB	
20dB Bandwidth			950		KHz	
In-band spurious Emissions （BQB Test Mode RF_Tx Power=5dBm）	F=F0±1MHz		-22		dBm	
	F=F0±2MHz		-51		dBm	
	F=F0±3MHz		-55		dBm	
	F=F0+/->3MHz		-55		dBm	

Enhanced Data Rate

Table 3-10

Parameter		Min	Typ	Max	Unit	Test Conditions
Relative Power			-2.5		dB	25℃ Power Supply VBAT=3.7V 2441MHz 4 Layer Board
π/4 DQPSK Modulation Accuracy	DEVM RMS		6		%	
	DEVM 99%		11		%	
	DEVM Peak		16		%	
In-band spurious Emissions （BQB Test Mode RF_Tx Power=5dBm）	F=F0±1MHz		-4		dBm	
	F=F0±2MHz		-34		dBm	
	F=F0±3MHz		-43		dBm	
	F=F0+/->3MHz		-48		dBm	

3.8.2 Receiver

Basic Rate **Table 3-11**

Parameter		Min	Typ	Max	Unit	Test Conditions
Sensitivity			-92		dBm	25℃ Power Supply VBAT=3.7V 2441MHz DH5 4 Layer Board
Co-channel Interference Rejection			10		dB	
Adjacent Channel selectivity C/I	+1MHz		-4		dB	
	-1MHz		-3		dB	
	+2MHz		-39		dB	
	-2MHz		-33		dB	
	+3MHz		-45		dB	
	-3MHz		-28		dB	

Enhanced Data Rate **Table 3-12**

Parameter		Min	Typ	Max	Unit	Test Conditions
Sensitivity		-95	-94		dBm	25℃ Power Supply VBAT=3.7V 2441MHz 2DH5 4 Layer Board
Co-channel Interference Rejection			10		dB	
Adjacent Channel selectivity C/I	+1MHz		-8		dB	
	-1MHz		-8		dB	
	+2MHz		-40		dB	
	-2MHz		-33		dB	
	+3MHz		-45		dB	
	-3MHz		-27		dB	

3.8.3 BLE

1M Data Rate **Table 3-13**

Parameter		Min	Typ	Max	Unit	Test Conditions
Sensitivity			-97		dBm	25℃ Power Supply VBAT=3.7V 2441MHz 4 Layer Board
RF Transmit Power			6.5		dBm	
In-band Spurious Emission	|M-N|=2MHz			-40	dBm	
	|M-N|≥3MHz			-50	dBm	
Modulation Characteristics	Δf1 avg		250		KHz	
	Δf2 99%		200		KHz	
	Δf1avg/Δf2avg		0.9		/	
Carrier Frequency Offset		-10		+10	KHz	
Frequency Drift		-10		+10	KHz	
Frequency Drift Rate		-5		+5	KHz/50us	

2M Data Rate **Table 3-14**

Parameter		Min	Typ	Max	Unit	Test Conditions
Sensitivity			-94		dBm	25℃ Power Supply VBAT=3.7V 2441MHz 4 Layer Board
RF Transmit Power			6.5		dBm	
In-band Spurious Emission	|M-N|=4MHz			-40	dBm	
	|M-N|=5MHz			-40	dBm	
	|M-N|≥6MHz			-50	dBm	
Modulation Characteristics	Δf1 avg		500		KHz	
	Δf2 99%		415		KHz	
	Δf1avg/Δf2avg		0.9		/	
Carrier Frequency Offset		-10		+10	KHz	
Frequency Drift		-10		+10	KHz	
Frequency Drift Rate		-5		+5	KHz/50us	

Long Range **Table 3-15**

Parameter	Min	Typ	Max	Unit	Test Conditions
Sensitivity LE 125K(S8)		-104		dBm	VBAT=3.7V,25℃ 2441MHz
Sensitivity LE 500K(S2)		-101		dBm	

3.9 ESD Protection

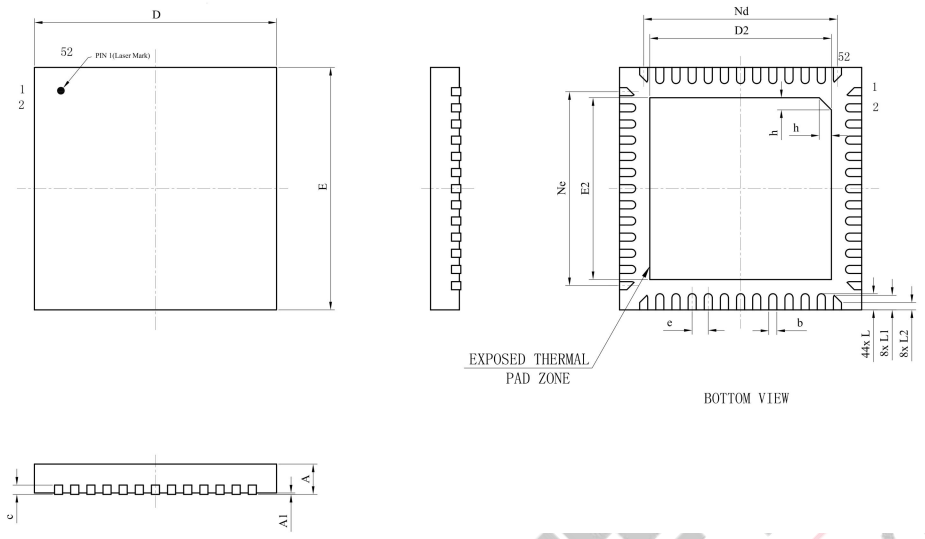
Table 3-16

Parameter	Typ.	Test pin	Reference standard
Human Body Mode	±4KV	All pins	JEDEC EIA/JESD22-A114
Machine Mode	±200V	All pins	JEDEC EIA/JESD22-A115
Charge Device Model	±1KV	All pins	JEDEC EIA/JESD22-C101F
Latch up	±200mA	All GPIO pins	JEDEC STANDARD NO.78E
	1.5xVopmax	All power pins	

Note : 1.5xVopmax = 1.5 times maximum operating voltage.

4 Package Information

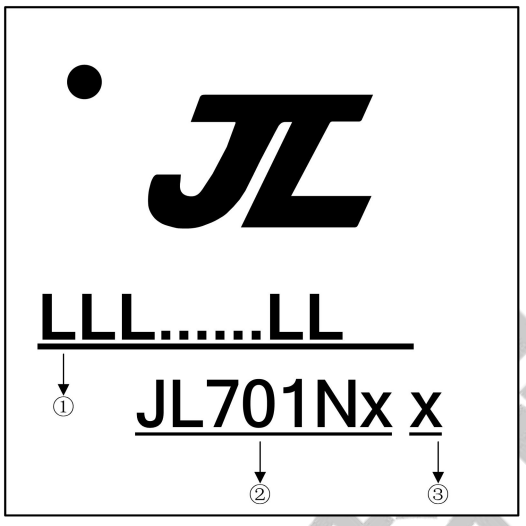
4.1 QFN52_6×6mm



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0.65	0.80	0.95
A1	—	0.035	0.05
b	0.15	0.20	0.25
c	0.18	0.20	0.25
D	5.90	6.00	6.10
D2	4.40	4.50	4.60
e	0.40BSC		
Nd	4.80BSC		
E	5.90	6.00	6.10
E2	4.40	4.50	4.60
Ne	4.80BSC		
L	0.35	0.40	0.45
L1	0.31	0.36	0.41
L2	0.13	0.18	0.23
h	0.25	0.30	0.35
L/F载体尺寸 (mil)	185*185		

Figure 4-1 JL7012F Package

5 IC Marking Information



① LLL.....LL：LOT No. , It contains 7 to 18 alphanumerics
② JL701Nx：Chip Model
③ x：Built-in flash size
0: No Flash Memory
2: 2Mbit Flash
4: 4Mbit Flash
8: 8Mbit Flash
6: 16Mbit Flash
3: 32Mbit Flash

6 Solder-Reflow Condition

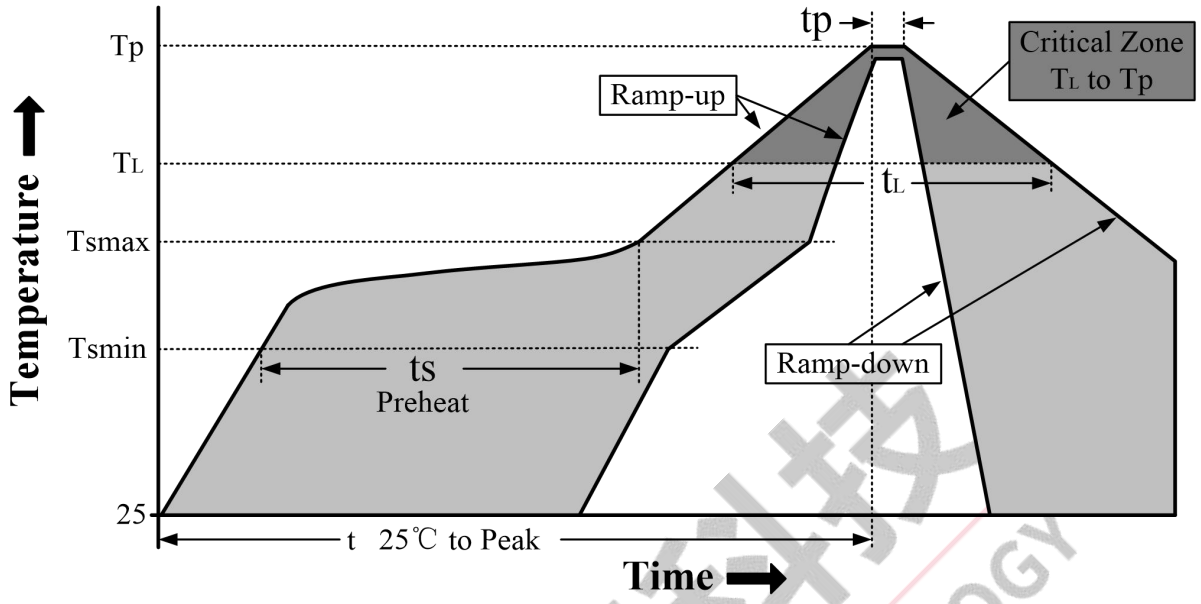


Figure 6-1 Classification Reflow Profile

Classification Profiles **Table 6-1**

Profile Feature		Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat/Soak	Temperature Min (T_{smin})	100 ℃	150 ℃
	Temperature Max (T_{smax})	150 ℃	200 ℃
	Time (ts) from (T_{smin} to T_{smax})	60-120 seconds	60-180 seconds
Average ramp-up rate (T_{smax} to T_p)		3 ℃/second max	3 ℃/second max
Liquidous temperature (T_L) Time (t_L) maintained above T_L		183 ℃ 60-150 seconds	217 ℃ 60-150 seconds
Peak package body temperature (T_p)		See Table 6-2.	See Table 6-3.
Time within 5° C of actual Pea k Temperature (tp)[2]		10-30 seconds	20-40 seconds
Ramp-down rate (T_p to T_L)		6 ℃/second max.	6 ℃/second max.
Time 25 ℃ to peak temperature		6 minutes max.	8 minutes max.

Note 1: All temperatures refer to topside of the package, measured on the package body surface.

Note 2: Time within 5 ℃ of actual peak temperature (tp) specified for the reflow profiles is a "supplier" minimum and "user" maximum.

SnPb - Classification Temperature **Table 6-2**

Package Thickness	Volume mm^3 < 350	Volume mm^3 ⩾ 350
<2.5 mm	240 +0/-5 ℃	225 +0/-5 ℃
⩾ 2.5 mm	225 +0/-5 ℃	225 +0/-5 ℃

Pb-free - Classification Temperature **Table 6-3**

Package Thickness	Volume mm^3 < 350	Volume mm^3 350 - 2000	Volume mm^3 > 2000
< 1.6mm	260 ℃	260 ℃	260 ℃
1.6 mm - 2.5mm	260 ℃	250 ℃	245 ℃
> 2.5mm	250 ℃	245 ℃	245 ℃

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7 Storage Condition

7.1 Moisture Sensitivity Level

JL7012F is qualified to moisture sensitivity level MSL3 in accordance with JEDEC J-STD-033.

7.2 Storage Alert

1. Calculated shelf life in sealed bag 12 months at＜40°C and 90% relative humidity (RH).
2. Peak package body temperature≤260°C.
3. After bag is opened,devices that will be subjected to reflow solder or other high temperature process must be mounted within 168 hours of factory conditions≤30°C/60%RH or stored per J-STD-033.
4. Devices require bake before mounting if humidity indicator card reads＞10% for level 2a-5a devices or＞60% for level 2 devices when read at 23±5°C,or 3a or 3b are not met.
5. Please refer to IPC/JEDEC J-STD-033 for baking procedure if necessary.

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8 Revision History

Date	Revision	Description
2022.02.09	V1.0	Initial Release
2022.04.08	V1.1	Modify Pin Assignment (PIN41 update to DACRP) Update DAC Characteristics
2022.08.02	V1.2	Add IC Marking Information & Solder-Reflow Condition Add BLE Parameters Update DAC Characteristics
2022.10.14	V1.3	Update BT Characteristics Update IC Marking Information Add Storage Conditions
2023.03.01	V1.4	Update Features Update Pin Description
2023.10.24	V1.5	Update JL7012F BT_Features Update Drive Current Characteristics PIN8 Delete GPIO PB8
2023.12.27	V1.6	Update BLE Characteristics
2024.06.07	V1.7	Update Audio& PMU Characteristics
2024.06.12	V1.8	Update IC Marking Information
2024.07.25	V1.9	Update Audio Characteristics Update Pin Description
2024.12.02	V2.0	Update CPU Features Update Memory Features Update Peripheral Features
2025.01.09	V2.1	Update Bluetooth Vision and profiles
2025.03.04	V2.2	Update Package Information