

JL7006D Datasheet

Zhuhai Jieli Technology Co.,LTD

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JL7006D Features

CPU

- 32bit Dual-Issue DSP
- Up to 160MHz programmable processor
- With IEEE754 Single precision FPU
- With cordic accelerate engine
- Advanced debug with 8 hardware breakpoints/watchpoints
- Advanced system exception capture unit

Interrupt

- Support for up to 64 interrupts with 8 priority level
- NMI supported
- SWI supported, with configurable priority
- Low power wake up by polling pending 12 IO interrupts for low power wake up

DSP Audio Processing

- SBC, AAC, LDAC, LHDC Audio decodes supported for BT audio
- mSBC voice codec supported for BT phone
- Supports 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
- 20-band EQ configuration for voice Effects
- Support Hi-Res Audio

Audio Codec

- Two channels 24-bit DAC, SNR $\geq$ 103dB
- Two channels 24-bit ADC, SNR $\geq$ 92dB
- DAC Sampling rates of 8kHz/11.025kHz/16kHz/22.05kHz/24kHz/32kHz/44.1kHz/48kHz/64kHz/88.2kHz/96kHz are supported
- ADC Sampling rates of 8kHz/11.025kHz/16kHz/22.05kHz/24kHz/

32kHz/44.1kHz/48kHz are supported

- Two analog MIC amplifier, build-in MIC bias generator
- Supports Four PDM digital MIC inputs
- Two channels analog AUX
- Supports cap-less, single-ended, and differential mode at the DAC path
- Supports 16ohm and 32ohm Speaker loading

ANC

- ANC processing engine up to 750 kHz sample rate
- 7.5 μ s analog to analog latency
- Supports 4 digital microphone inputs, 2 differential or single-ended analog inputs for ANC
- Supports Feed-Forward, Feed-Back, Hybrid ANC
- ANC module include 20 double precision Biquad filters for each FF/FB/ music compensation control

Bluetooth

- Compliant with Bluetooth V5.4+BR+EDR+BLE specification (QDID: 223418)
- Meet class2 and class3 transmitting power requirement
- Support GFSK and DQPSK all packet types
- Provides maximum +10dbm transmitting power
- EDR receiver with minimum -94dBm sensitivity
- Fast AGC for enhanced dynamic range
- Support a2dp\avctp\avdtp\avrcp\hfp\spp\smpl\att\gap\gatt\rfcomm\sdpl2cap profile
- A2DP 1.4\AVCTP 1.4\AVDTP 1.3\AVRCP 1.6.2\HFP 1.8\SPP 1.2\RFCOMM 1.2\PNP 1.3\HID 1.1.1\SDP core5.4\L2CAP core 5.4

Peripherals

- One full speed USB 2.0 OTG controller
- Six multi-function 32-bit timers, support capture and PWM mode
- Three full-duplex basic UART, UART0、UART1 support DMA mode
- One hardware IIC interface supports host and device mode
- Three Built-in low power Cap Sense Keys
- LED controller, support 2 LED control by one IO
- 10-bit ADC for analog sampling
- External wake up/interrupt on all GPIOs
- Crossbar IO support: timer\SPI\SDC\IIC\UART\RDECA\LINK\PLINK

PMU

- Low voltage LDO and DC-DC for internal

digital and analog circuit supply

- Soft-off mode current:
Build-in LP_Touch off: $\leq 2\mu\text{A}$
Build-in LP_Touch on: $\leq 13\mu\text{A}$
- Built-in LDO and DC-DC for the core, I/O, Bluetooth and flash
- VBAT is 2.2V to 4.4V
- VDDIO is 2.2V to 3.6V

Packages

- QFN32(4mm*4mm)

Temperature

- Operating temperature: -40°C to $+85^{\circ}\text{C}$
- Storage temperature: -65°C to $+150^{\circ}\text{C}$

Applications

- Bluetooth TWS Earphones
- Bluetooth ANC TWS Earphones

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1 Pin Definition

1.1 Pin Assignment

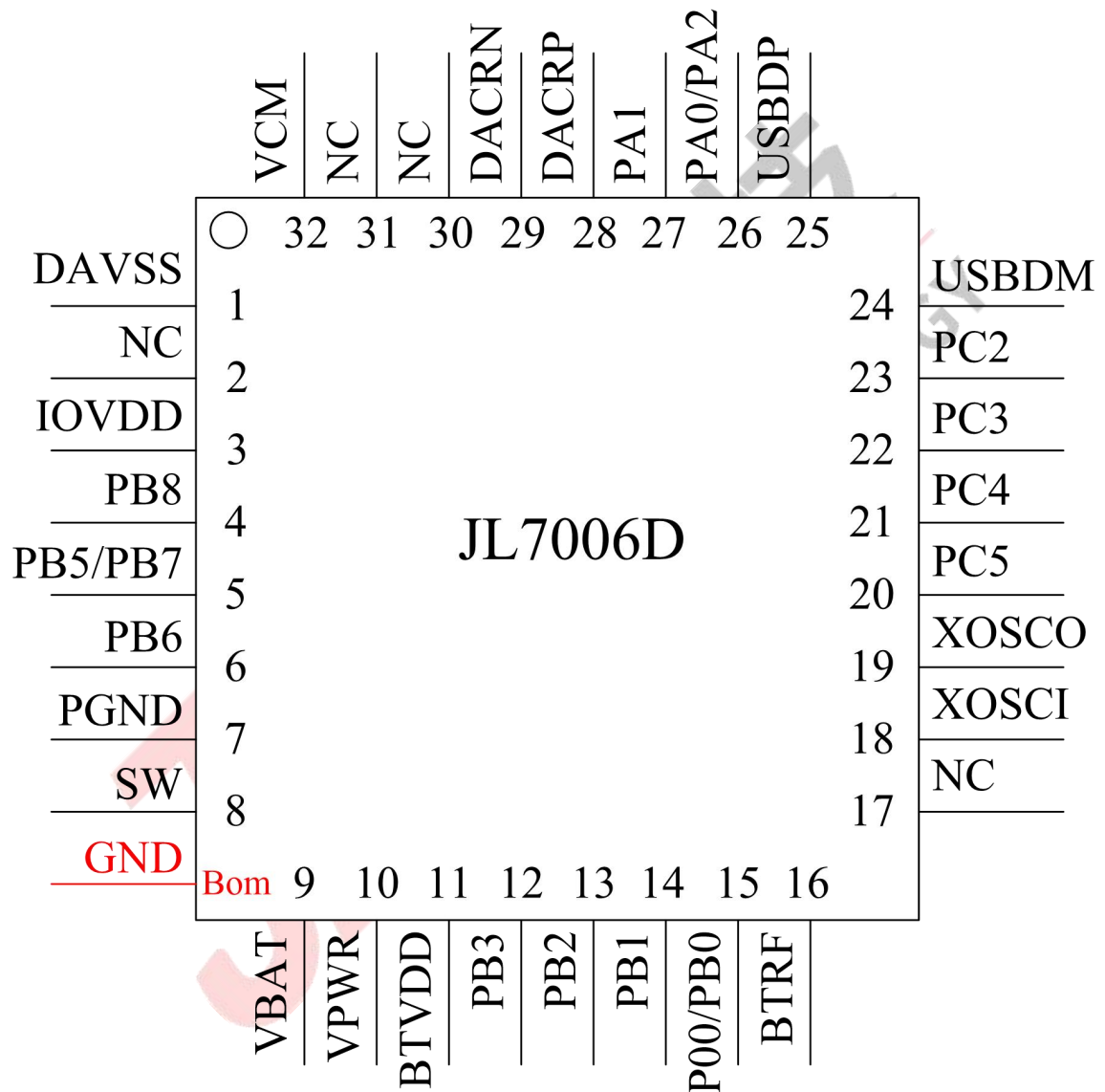


Figure 1-1 JL7006D Package Diagram

1.2 Pin Description

Table 1-1 JL7006D Pin Description

PIN NO.	Name	I/O Type	Drive (mA) 4 level	Function	Other Function
1	DAVSS	P	/		Analog Ground
2	NC				
3	IOVDD	PO	/		IO Power 3.3v
4	PB8	I/O	2.4~64	GPIO	AIN_B0; MIC1: MIC1 Input Channel; MIC1_P: Different MIC1 Positive; AMUX_B0: Analog Channel B0 L/R Input; UART0RXB: Uart0 Data Input(B); CAP4: Timer4 Capture.
5	PB5	I/O	2.4~64	GPIO	LP_TH4: Low Power Touch Channel 4; UART1TXA: Uart1 Data Output(A).
	PB7	I/O	2.4~64	GPIO	MIC_BIAS1: MIC1 Bias Output; MIC1_N: Different MIC1 Negative; AMUX_B1: Analog Channel B1 L/R Input; UART0TXB: Uart0 Data Output(B).
6	PB6	I/O	2.4~64	GPIO	ADC9: ADC Input Channel 9; UART1RXA: Uart1 Data Input(A); PWM2: Timer2 PWM Output.
7	PGND	P	/		DCDC Ground
8	SW	P	/		DCDC switch output, connected to inductor
9	VBAT	PI	/		Power Supply, connect to battery
10	VPWR	PI	/		Charge Power Input;
		I/O	8	GPIO	High Voltage Resistance I/O; UART0TXC: Uart0 Data Output(C); UART0RXC: Uart0 Data Input(C); PWM3: Timer3 PWM Output; CAP1: Timer1 Capture.
11	BTVDD	PO	/	GPIO	BT Power
12	PB3	I/O	2.4~64	GPIO	
	EVDD	PO	/		EVDD: Supply voltage to Peripherals
13	PB2	I/O	2.4~64	GPIO	LP_TH2: Low Power Touch Channel 2; ADC7: ADC Input Channel 7; CAP5: Timer5 Capture; UART2RXC: Uart2 Data Input(C);

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					SPI2DOC: SPI2 Data Out(C).
14	PB1	I/O	2.4~64	GPIO (pull up)	Long Press Reset; LP_TH1: Low Power Touch Channel 1; UART2TXC: Uart2 Data Output(C); ADC6: ADC Input Channel 6; SPI2CLKC: SPI2 Clk(C).
15	P00	I/O	8		Test pin
	PB0	I/O	2.4~64		LP_TH0: Low Power Touch Channel 0; SPI2DIC: SPI2 Data Input(C); ALNK_MCLK(B): ALNK Master Clock(B); TMR4: Timer4 Clock Input.
16	BTRF	/	/		BT Antenna
17	NC				
18	XOSCI	I	/		XOSC In
19	XOSCO	O	/		XOSC Out
20	PC5	I/O	2.4~64	GPIO	SD0CLKA: SD0 Clock(A); UART2RXD: Uart2 Data Input(D); SPI1DOB: SPI1 Data Out(B); ALNK_DAT3(B): Audio Link Data3(B); IIC_SDA_B: IIC SDA(B); ADC5: ADC Input Channel 5.
21	PC4	I/O	2.4~64	GPIO	SD0CMDA: SD0 CMD(A); UART2TXD: Uart2 Data Output(D); SPI1CLKB: SPI1 Clock(B); ALNK_DAT2(B): Audio Link Data2(B); IIC_SCL_B: IIC SCL(B); ADC4: ADC Input Channel 4; PWM4: Timer4 PWM Output.
22	PC3	I/O	2.4~64	GPIO	SD0DATA: SD0 Data(A); UART0RXD: Uart0 Data Input(D); SPI1DIB: SPI1 Data In(B); ALNK_LRCK(B): Audio Link Word Select(B); IIC_SDA_C: IIC SDA(C); TMR3: Timer3 Clock Input.
23	PC2	I/O	2.4~64	GPIO	ALNK_SCLK(B): Audio Link Serial Clock(B); IIC_SCL_C: IIC SCL(C); UART0TXD: Uart0 Data Output(D); TMR1: Timer1 Clock Input.
24	USBDM	I/O	4	USB Negative Data	UART1RXD: Uart1 Data Input(D); IIC_SDA_A: IIC SDA(A); ADC11: ADC Input Channel 11;

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					SPI2DOB: SPI2 Data Out(B); ISP_DI.
25	USBDP	I/O	4	USB Positive Data	UART1TXD: Uart1 Data Output(D); IIC_SCL_A: IIC SCL(A); ADC10: ADC Input Channel 10; SPI2CLKB: SPI2 Clock(B); ISP_CLK.
26	PA0	I/O	2.4~64	GPIO	MIC_LDO: MIC Power Supply
	PA2	I/O	2.4~64	GPIO	ALNK_MCLK(A): ALNK Master Clock(A); MIC_BIAS0: MIC0 Bias Output; MIC0_N: Different MIC0 Negative; AMUX_A1: Analog Channel A1 L/R Input; CAP3: Timer3 Capture; UART1RXC: Uart1 Data In(C); CLKOUT1.
27	PA1	I/O	2.4~64	GPIO	AIN_A0; MIC0: MIC0 Input Channel; MIC0_P: Different MIC0 Positive; AMUX_A0: Analog Channel A0 L/R Input; PWM0: Timer0 PWM Output; UART1TXC: Uart1 Data Output(C).
28	DACRP	O	/		Different DAC Right Positive Channel
29	DACRN	O	/		Different DAC Right Negative Channel
30	NC				
31	NC				
32	VCM	P	/		DAC reference voltage
/	Bom	P	/		Ground

P: Power or Ground PO:Power Output PI:Power Input I/O:Input or Output I:Input O:Output

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2 Electrical Characteristics

2.1 Absolute Maximum Ratings

Table 2-1

Symbol	Parameter	Min	Max	Unit
T _{opt}	Operating temperature	-40	+85	°C
T _{stg}	Storage temperature	-65	+150	°C
VBAT	Supply Voltage	-0.3	4.5	V
VPWR	Charger Voltage	-0.3	6	V
V _{3.0IO}	3.0V IO Input Voltage (IOVDD)	-0.3	3.6	V

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

2.2 PMU Characteristics

Table 2-2

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	
Normal mode						
IOVDD	Voltage output	—	3.0	—	V	VBAT = 4.2V, 10mA loading
	Loading current	—	—	100	mA	IOVDD=3.0V@VBAT = 4.2V
BTVDD	Voltage output	—	1.25	—	V	IOVDD=3.0V, 10mA loading
	Loading current	—	—	60	mA	BTVDD=1.25V@IOVDD=3.0v
EVDD	Voltage output	—	1.1	—	V	BTVDD=1.25V, 1mA loading
	Loading current	—	—	5	mA	EVDD=1.1V@BTVDD=1.25v
LP mode						
IOVDD	Loading current			5	mA	IOVDD=3V@VBAT = 4.2V

2.3 Battery Charge

Table 2-3

Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
VPWR	Charge Input Voltage	4.5	5	5.5	V	—
V _{Charge}	Charge Voltage	4.15	4.2	4.25	V	VPWR > 4.5V

		4.30	4.35	4.40	V	VPWR>4.65V
I _{Charge}	Charge Current	20		200	mA	Charge current at fast charge mode
I _{Trickl}	Trickle Charge Current	20	45	70	mA	V _{BAT} <V _{Trickl}

2.4 IO Input/Output Electrical Logical Characteristics

Table 2-4

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	—	IOVDD+0.3	V	IOVDD= 3.0V
IO output characteristics						
V _{OL}	Low-Level Output Voltage	—	—	0.33	V	IOVDD= 3.0V
V _{OH}	High-Level Output Voltage	2.7	—	—	V	IOVDD = 3.0V

2.5 Internal Resistor Characteristics

Table 2-5

Port	Drive(mA)				Internal Pull-Up Resistor	Internal Pull-Down Resistor	Comment
PA0~PA3 PB0~PB8 PC2~PC5	2.4	8	26.4	64	10K	10K	1、PB1 default pull up 2、USBDM & USBDP default pull Down 3、PC0, PP0(VPWR), P00 are high voltage resistance to 5V 4、internal pull-up/pull-down resistance accuracy ±20%
PP0(VPWR), P00	8				10K	10K	
USBDP	4				1.5K	15K	
USBDM	4				180K	15K	

2.6 DAC Characteristics

Table 2-6

Parameter	Min	Typ	Max	Unit	Audio Format	Test Conditions
Frequency Response	20	—	20K	Hz	—	Differential Mode

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Output Swing		0.55	0.74	Vrms	—	1KHz/0dB
THD+N	—	-76	—	dB	PCM	32 ohm loading
	—	-68.7	—	dB	SBC	With A-Weighted Filter
S/N	—	100.4	102	dB	PCM	Filter
	—	98.7	—	dB	SBC	
Dynamic Range	—	100	—	dB	PCM	Differential Mode
	—	99.1	—	dB	SBC	1KHz/-60dB 32 ohm loading With A-Weighted Filter
Noise Floor		6.0		uV	—	A-Weighted Filter
DAC Output Power	—	20	30.0	mW	—	Differential Mode 16ohm loading

2.7 ADC Characteristics

Table 2-7

Parameter	Min	Typ	Max	Unit	Test Conditions
Dynamic Range		95		dB	Fsample=44.1kHz Fin=1KHz 2mVpp Input
S/N	—	95	—	dB	Fsample=44.1kHz Fin=1KHz 2Vpp Input
THD+N	—	-72	—	dB	
Crosstalk	—	-80	—	dB	

2.8 BT Characteristics

2.8.1 Transmitter

Basic Rate

Table 2-8

Parameter	Min	Typ	Max	Unit	Test Conditions
RF Transmit Power		7	9	dBm	25°C, Power Supply VBAT=3.7V 2441MHz
RF Power Control Range		18		dB	
20dB Bandwidth		950		KHz	
In-band spurious	F=F ₀ ±1MHz	-19		dBm	
Emissions	F=F ₀ ±2MHz	-48		dBm	
(BQB Test Mode RF_Tx Power=5dBm)	F=F ₀ ±3MHz	-50		dBm	
	F=F ₀ +/->3MHz	-55		dBm	

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Enhanced Data Rate**Table 2-9**

Parameter		Min	Typ	Max	Unit	Test Conditions
Relative Power			-2		dB	25°C, Power Supply VBAT=3.7V 2441MHz
$\pi/4$ DQPSK Modulation Accuracy	DEVM RMS		5		%	
	DEVM 99%		13		%	
	DEVM Peak		10		%	
In-band spurious Emissions (BQB Test Mode RF_Tx Power=5dBm)	$F=F_0 \pm 1\text{MHz}$		-1.5		dBm	
	$F=F_0 \pm 2\text{MHz}$		-28		dBm	
	$F=F_0 \pm 3\text{MHz}$		-42		dBm	
	$F=F_0 + / - > 3\text{MHz}$		-45		dBm	

2.8.2 Receiver

Basic Rate**Table 2-10**

Parameter		Min	Typ	Max	Unit	Test Conditions
Sensitivity			-92		dBm	25°C, Power Supply VBAT=3.7V 2441MHz DH5
Co-channel Interference Rejection			-10		dB	
Adjacent Channel Interference Rejection	+1MHz		+4		dB	
	-1MHz		+2		dB	
	+2MHz		+38		dB	
	-2MHz		+38		dB	
	+3MHz		>+40		dB	
	-3MHz		+34		dB	

Enhanced Data Rate**Table 2-11**

Parameter		Min	Typ	Max	Unit	Test Conditions
Sensitivity			-93		dBm	25°C, Power Supply VBAT=3.7V 2441MHz 2DH5 2 Layer Board
Co-channel Interference Rejection			-11		dB	
Adjacent Channel Interference Rejection	+1MHz		+4		dB	
	-1MHz		+2		dB	
	+2MHz		+38		dB	
	-2MHz		+38		dB	
	+3MHz		>+40		dB	
	-3MHz		+34		dB	

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2.9 ESD Protection

Table 2-12

Parameter	Typ.	Test pin	Reference standard
Human Body Mode	$\pm 4\text{KV}$	All pins	JEDEC EIA/JESD22-A114
Machine Mode	$\pm 200\text{V}$	All pins	JEDEC EIA/JESD22-A115
Charge Device Model	$\pm 1\text{KV}$	All pins	JEDEC EIA/JESD22-C101F
Latch up	$\pm 200\text{mA}$	All GPIO pins	JEDEC STANDARD NO.78E
	$1.5\times V_{\text{opmax}}$	All power pins	

Note : $1.5\times V_{\text{opmax}}$ = 1.5 times maximum operating voltage.



3 Package Information

3.1 QFN32_4.0x4.0

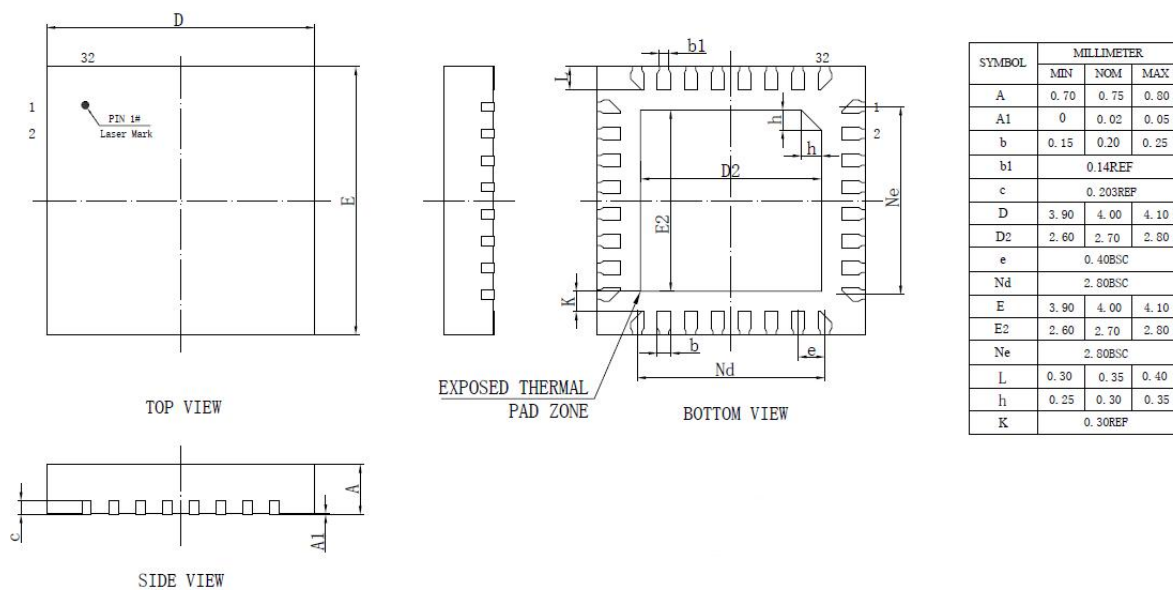
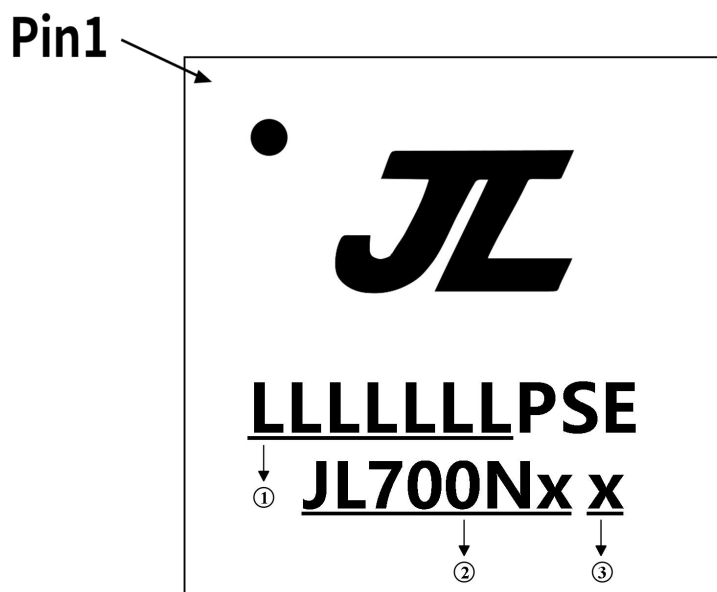


Figure 3-1 JL7006D Package

4 IC Marking Information



- ① LLLLLL: Production Batch
- ② JL700Nx: 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

5 Solder-Reflow Condition

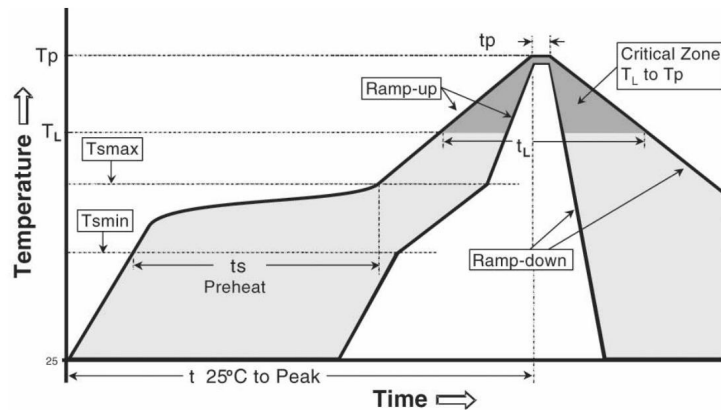


Figure 5-1 Classification Reflow Profile

Classification Profiles

Table 5-1

Profile Feature		Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat /Soak	Temperature Min (T_{smin})	100°C	150°C
	Temperature Max (T_{smax})	150°C	200°C
	Time (t_s) from (T_{smin} to T_{smax})	60-120 seconds	60-180 seconds
Average ramp-up rate (T_{smax} to T_p)		3°C/second max	3°C/second max
Liquidous temperature (T_L)		183°C	217°C
Time (t_L) maintained above T_L		60-150 seconds	60-150 seconds
Peak package body temperature (T_p)		See Table 5-2	See Table 5-3
Time within 5°C of actual Peak Temperature (t_p) ²		10-30 seconds	20-40 seconds
Ramp-down rate (T_p to T_L)		6°C/second max	6°C/second max
Time 25°C 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°C of actual peak temperature (t_p) specified for the reflow profiles is a “supplier” minimum and “user” maximum.

SnPb - Classification Temperature

Table 5-2

Package Thickness	Volume mm ³ < 350	Volume mm ³ ≥ 350
<2.5 mm	240 +0/-5°C	225 +0/-5°C
≥2.5 mm	225 +0/-5°C	225 +0/-5°C

Pb-free - Classification Temperature**Table 5-3**

Package Thickness	Volume mm³ < 350	Volume mm³ 350 - 2000	Volume mm³ > 2000
< 1.6mm	260°C	260°C	260°C
1.6 mm - 2.5mm	260°C	250°C	245°C
> 2.5mm	250°C	245°C	245°C



6 Revision History

Date	Revision	Description
2022.05.14	V1.0	Initial Release
2022.07.13	V1.1	Update Soft-off mode current consumption
2022.07.19	V1.2	Update Package Information & Add ANC Mode description
2023.11.22	V1.3	Update JL7006D BT_Features
2024.08.26	V1.4	Update JL7006D Audio_Features Update DAC Characteristics

