JL7094F Datasheet

Zhuhai Jieli Technology Co.,LTD

Version 1.2

Date 2025.06.19

Revision History

Date	Revision	Description
2024.10.12	V1.0	Initial Release
2025.01.15	V1.1	Update Features_Bluetooth Update Block Diagram Update BT Characteristics
2025.06.19	V1.2	Update Datasheet Format Update Features_SYSTEM Update Features_Bluetooth Update Package Information

Table of Contents

JL7094F Features

SYSTEM

- Dual Core 32bit DSP 192MHz
- With IEEE754 Single precision FPU
- Support FFT/MATRIX/MATH
- 2 x I-cache and D-cache
- Support SDTAP/EMU
- On-chip SRAM 320kbyte
- Support MMU
- Support MPU
- Built-In Flash
- 24MHz crystal oscillator
- Internal RC oscillator,PLL

DSP Audio Processing

- SBC/AAC/LDAC/LHDC/LC3/CVSD/mSBC codec
- mSBC voice codec supported for BT phone
- PLC for voice processing
- Single/Multi MIC ENC
- Multi-band DRC
- Multi-band EQ
- Support spatial sound
- Support assistive listening
- Support Hi-Res Audio

ANC

- Wide band digital adaptive ANC
- Support hybrid/feedforward/feedback
- Support wind noise detection
- Support wide area tap
- Support Speak-to-Chat
- Support tip fit test & wear detection
- Input-to-output latency < 8us

Audio

- 2 x 24bit DAC
  - SNR 113dB
  - Noise 1.2uVrms
  - Supports differential mode
  - Sampling rate 8~384kHz
- 3 x 24bit ADC
  - SNR 103dB
  - Sampling rate 8~192kHz
- I^2S/TDM/PDM/SPDIF AUDIO Master/Slave interface

Bluetooth

- Dual-mode BT6.0 with LE Audio (DN Q332415)
- Support AoA/AoD
- Support LE audio BIS/CIS
- Maximum transmitting power 13dBm
- Receiver sensitivity
  - -97dBm @BR
  - -97dBm @EDR Π/4 DQPSK
  - -89dBm @EDR 8DPSK

Peripherals

- 1 x Full speed USB
- 1 x SD host controller
- 6 x Multi-function 32bit timer
- 3 x UART interface
- 1 x I^2C Master/Slave interface
- 3 x SPI Master/Slave interface
- 1 x QDEC
- 2 x Light strip controller
- 1 x 10bit ADC(9 Channels)
- 4 x MCPWM
- 1 x CAN controller
- 22 x GPIO Support function remapping
- 4 x LP_Touch with low power wake up

PMU

- Integrated battery charger up to 180mA
- 2 x Buck DC-DC converter
- Support temperature sensor
- VPWR range 4.5V to 5.5V
- VBAT range 2.7V to 4.5V
- IOVDD range 2.7V to 3.6V

Packages

- QFN42(4*5mm)

Temperature

- Operating temperature
  TC = -20℃ to +85℃(standard range)
  TC = -40℃ to +105℃(extended range)
- Storage temperature -65℃ to +150℃

Applications

- Adaptive ANC headphone
- Bluetooth audio device

1 Block Diagram

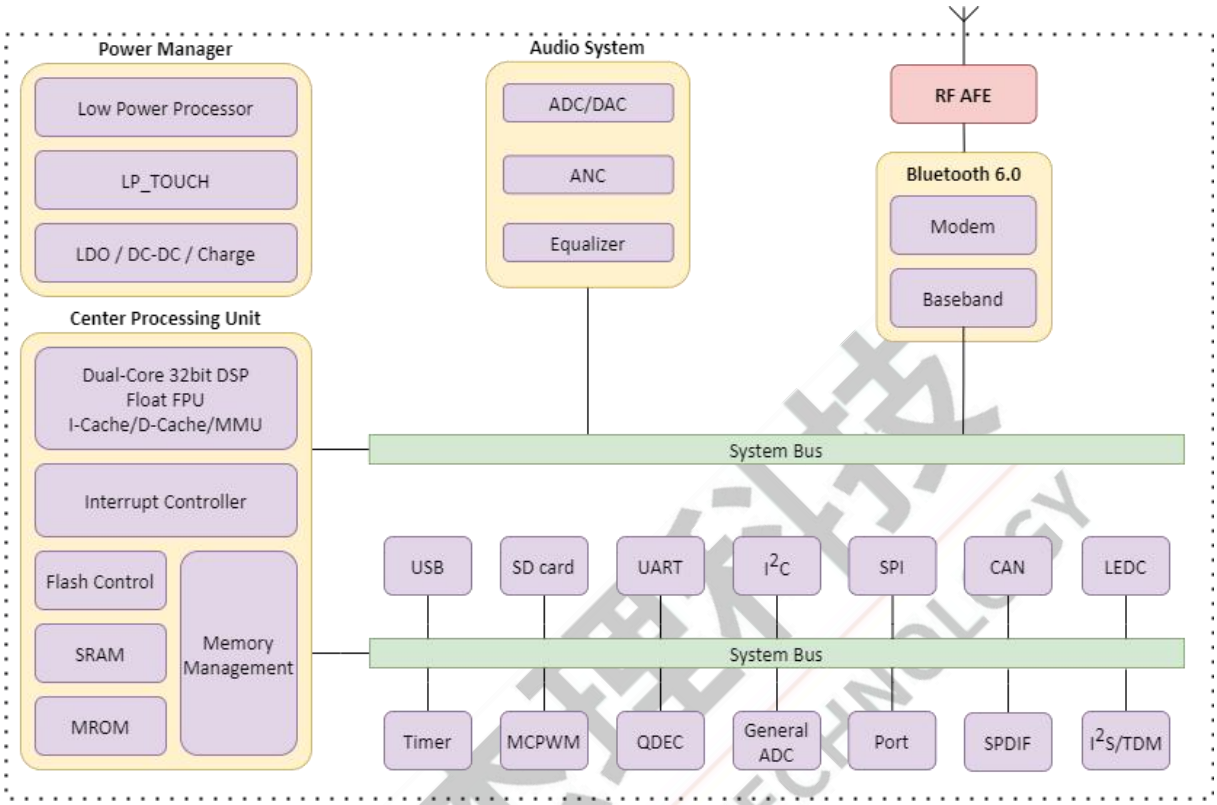


Figure 1-1 JL7094F Block Diagram

2 Pin Definition

2.1 Pin Assignment

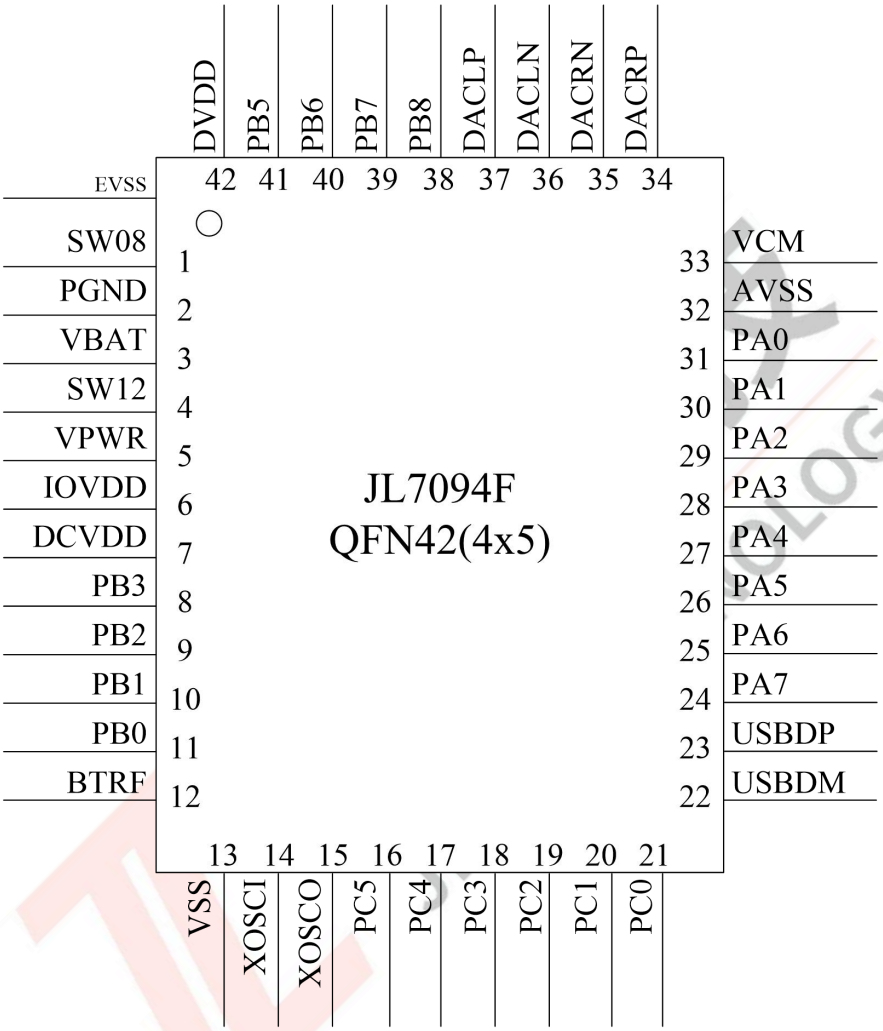


Figure 2-1 JL7094F Pin Assignment

2.2 Pin Description

Table 2-2-1 JL7094F Pin Description

Pin No.	Name	Type	IO Initial State	Description
1	SW08	P	--	Buck DCDC08 Switch Port
2	PGND	P	--	Ground of Buck DC-DC converter
3	VBAT	P	--	Battery Input
4	SW12	P	--	Buck DCDC12 Switch Port
5	VPWR	I/O	Z	Charge Power Input
6	IOVDD	P	--	IO Power
7	DCVDD	P	--	Buck DCDC12 Output Power
8	PB3	I/O	Z	ADC3(ADC Input Channel 3) LP_TOUCH3(TOUCH_CH3)
9	PB2	I/O	Z	ADC2(ADC Input Channel 2) LP_TOUCH2(TOUCH_CH2)
10	PB1	I/O	10kΩ Pull-up	ADC1(ADC Input Channel 1) LP_TOUCH1(TOUCH_CH1) Hold down 0 to reset
11	PB0	I/O	Z	ADC0(ADC Input Channel 0) LP_TOUCH0(TOUCH_CH0)
12	BTRF	RF	--	Bluetooth RF Antenna
13	VSS	G	--	Ground
14	XOSCI	I	--	Crystal Oscillator Input
15	XOSCO	O	--	Crystal Oscillator Output
16	PC5	I/O	Z	ADC11(ADC Input Channel 11)
17	PC4	I/O	Z	ADC10(ADC Input Channel 10) SPDIF_VIN3
18	PC3	I/O	Z	ADC9(ADC Input Channel 9) SPDIF_VIN2
19	PC2	I/O	Z	ADC8(ADC Input Channel 8) SPDIF_VIN1
20	PC1	I/O	Z	ADC7(ADC Input Channel 7) SPDIF_VIN0
21	PC0	I/O	Z	--
22	USBDM	I/O	15kΩ Pull-down	USB Negative Data ADC15(ADC Input Channel 15)
23	USBDP	I/O	15kΩ Pull-down	USB Positive Data ADC14(ADC Input Channel 14)
24	PA7	I/O	Z	AIN_CN1(Audio ADC Negative Input)
25	PA6	I/O	Z	AIN_CP1(Audio ADC Positive Input)
26	PA5	I/O	Z	AIN_BP0(Audio ADC Positive Input)

Pin No.	Name	Type	IO Initial State	Description
27	PA4	I/O	Z	AIN_BN0(Audio ADC Negative Input) AIN_AN1(Audio ADC Negative Input)
28	PA3	I/O	Z	AIN_AP1(Audio ADC Positive Input) MICBIASB(MIC Bias Output)
29	PA2	I/O	Z	AIN_AN0(Audio ADC Negative Input)
30	PA1	I/O	Z	AIN_AP0(Audio ADC Positive Input)
31	PA0	I/O	Z	ADC6(ADC Input Channel 6) MICBIASA(MIC Bias Output) MICLDO(MIC Bias LDO Output)
32	AVSS	G	--	Audio Ground
33	VCM	P	--	Audio reference voltage
34	DACRP	O	--	Right Channel DAC Positive Output
35	DACRN	O	--	Right Channel DAC Negative Output
36	DACLN	O	--	Left Channel DAC Negative Output
37	DACLP	O	--	Left Channel DAC Positive Output
38	PB8	I/O	Z	AIN_CP0(Audio ADC Positive Input)
39	PB7	I/O	Z	AIN_CN0(Audio ADC Negative Input)
40	PB6	I/O	Z	LVD(External Low Voltage Detection Input) AIN_BP1(Audio ADC Positive Input) MICBIASC(MIC Bias Output)
41	PB5	I/O	Z	SDPG(SD Card Power) AIN_BN1(Audio ADC Negative Input) ADC5(ADC Input Channel 5)
42	DVDD	P	--	Buck DCDC08 Output Power

Note

1.IO initial state abbreviations Z--High resistance, H--High level, L--Low level, X--May be changed during power on.

2.Timer, SPDIF, MCPWM, QDEC, UART, LEDC, I^2C, I^2S, SPI, CAN and SD functions can be remapped to any I/O.

Table 2-2-2 Pin Types Description

Pin Type	Description	Pin Type	Description
P	Power	I/O	Input or Output
G	Ground	I	Input
RF	RF antenna	O	Output

3 Electrical Characteristics

3.1 Absolute Maximum Ratings

Table 3-1 Absolute Maximum Ratings

Symbol	Parameter	Min	Max	Unit
Topt	Operating temperature	-20	+85	℃
Tstg	Storage temperature	-65	+150	℃
VBAT	Supply Voltage	-0.3	4.5	V
VPWR		-0.3	6	V
IOVDD		-0.3	3.6	V
DCVDD		-0.3	1.25	V
DVDD		-0.3	0.9	V
GPIO	Input voltage of GPIO (except PC0)	-0.3	3.6	V
HVTIO	Input voltage of HVT-IO (PC0)	-0.3	6	V

Note

1.Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device.

3.2 ESD Ratings

Table 3-2 ESD Ratings

Parameter	Typ	Test pin	Reference standard
Human Body Mode	±4kV	All pins	JEDEC EIA/JESD22-A114
Machine Mode	±300V	All pins	JEDEC EIA/JESD22-A115
Charge Device Model	±2kV	All pins	ANSI/ESDA/JEDEC JS-002-2022

3.3 PMU Characteristics

Table 3-3 PMU Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
VBAT	Power supply	--	2.7	3.7	4.5	V
VPWR	Power supply	--	4.5	5.0	5.5	V
Operating mode						
Symbol	**Parameter**	**Conditions**	**Min**	**Typ**	**Max**	**Unit**
IOVDD	Voltage output	--	--	3	--	V
	Loading current	IOVDD=3.0V@VBAT = 3.7V or VPWR=5V	--	--	120	mA
DCVDD	Voltage output	--	--	1.15	--	V
	Loading current	DCVDD=1.15V@IOVDD=3.0V in LDO mode	--	--	120	mA
		DCVDD=1.15V@VBAT=3.7V in DCDC mode	--	--	120	mA
Low Power mode						

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
IOVDD	Loading current	IOVDD=3.0V@VBAT = 3.7V or VPWR=5V	--	--	10	mA

3.4 Battery Charge

Table 3-4 Charger Characteristics

Symbol	Parameter	Min	Typ	Max	Unit
VPWR	Charge Input Voltage	4.5	5	5.5	V
CV	CV Mode Voltage Accuracy	4.175	4.2	4.225	V
		4.325	4.35	4.375	V
CC	CC Mode Current	15	--	180	mA
I_{end}	End Of Charge Current	1.5	--	18	mA
V_{Trikl}	Trickle Charge Voltage	--	3	--	V

3.5 IO Characteristics

Table 3-5 IO Characteristics

Input Characteristics						
Symbol	**Parameter**	**Conditions**	**IO**	**Min**	**Max**	**Unit**
V_{IL}	Low-Level Input Voltage	IOVDD = 3.0V	PA0~PA7 PB0~PB3,PB5~PB8 PC0~PC5 USBDP USBDM VPWR	-0.3	1.4	V
V_{IH}	High-Level Input Voltage	IOVDD = 3.0V	PA0~PA7 PB0~PB3,PB5~PB8 PC1~PC5 USBDP USBDM	1.7	3.3	V
		IOVDD = 3.0V	PC0 VPWR	1.7	5.5	V
Output Characteristics						
Symbol	**Parameter**	**Conditions**	**IO**	**Typ**		**Unit**
$\lvert I_{OL} \rvert$	Output Current	IOVDD = 3.0V Voutput = 0.3V	PA0~PA7 PB0~PB3,PB5~PB8 PC1~PC5	4(HD=0) 8(HD=1) 16(HD=2) 32(HD=3)		mA
		IOVDD = 3.0V Voutput = 0.3V	USBDP USBDM PC0	8		mA
		IOVDD = 3.0V	VPWR	2		mA

		Voutput = 0.3V			
| I_{OH} |	Output Current	IOVDD = 3.0V Voutput = 2.7V	PA0~PA7 PB0~PB3,PB5~PB8 PC1~PC5	4(HD=0) 8(HD=1) 16(HD=2) 32(HD=3)	mA
		IOVDD = 3.0V Voutput = 2.7V	USBDP USBDM PC0	8	mA
		IOVDD = 3.0V Voutput = 2.7V	VPWR	2	mA
Internal Resistance Characteristics					
Symbol	**Parameter**	**Conditions**	**IO**	**Typ**	**Unit**
R_{pu}	Pull-up Resistance	IOVDD = 3.0V	PA0~PA7 PB0~PB3,PB5~PB8 PC0~PC5 VPWR	10k(PU=1) 100k(PU=2) 1M(PU=3)	Ω
		IOVDD = 3.0V	USBDP	1.5k	Ω
		IOVDD = 3.0V	USBDM	180k	Ω
R_{pd}	Pull-down Resistance	IOVDD = 3.0V	PA0~PA7 PB0~PB3,PB5~PB8 PC0~PC5 VPWR	10k(PD=1) 100k(PD=2) 1M(PD=3)	Ω
		IOVDD = 3.0V	USBDP USBDM	15k	Ω

Note

1.Internal pull-up/pull-down resistance accuracy ±20%

3.6 Audio DAC Characteristics

Table 3-6-1 Stereo DAC Characteristics

Parameter	Conditions	Min	Typ	Max	Unit
Resolution	--	--	24	--	bits
Input Sample Rate	--	8	--	384	kHz
SNR①	Differential Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted Load=10kΩ	--	113	--	dB
Dynamic Range	Differential Mode Fin=1kHz@-60dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted	--	106	--	dB

Parameter	Conditions	Min	Typ	Max	Unit
	Load=10kΩ				
THD+N	Differential Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted Load=32Ω	--	-85	--	dB
Noise Floor	Differential Mode B/W=20Hz~20kHz A-Weighted Load=10kΩ	--	2.7	--	uVrms
Noise Floor with MUTE	Differential Mode B/W=20Hz~20kHz A-Weighted Load=10kΩ	--	1.2	--	uVrms
Stereo Crosstalk	Differential Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted Load=10kΩ	--	-120	--	dB
Max Output Power	Differential Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted Load=16Ω THD+N≤1%	--	20	29	mW

Note

1. ①SNR is the ratio of output level with a 1kHz full-scale input to output level with MUTE on.

3.7 Audio ADC Characteristics

Table 3-7 Audio ADC Characteristics

Parameter	Conditions	Min	Typ	Max	Unit
Resolution	--	--	24	--	bits
Output Sample Rate	--	8	--	192	kHz
SNR	Differential input Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted ADC gain=0dB	--	103	--	dB
	Single-ended input Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted ADC gain=0dB	--	100	--	dB
Dynamic Range	Differential input Mode Fin=1kHz@-60dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted ADC gain=0dB	--	103	--	dB
	Single-ended input Mode Fin=1kHz@-60dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted ADC gain=0dB	--	100	--	dB
THD+N	Differential input Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted ADC gain=0dB	--	-85	--	dB
	Single-ended input Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted ADC gain=0dB	--	-83	--	dB
Analogue Gain	--	-6	--	27	dB
Max Input Level	Differential input Mode ADC gain=0dB	--	0.56	--	Vrms
	Single-ended input Mode ADC gain=0dB	--	0.28	--	Vrms

3.8 BT Characteristics

3.8.1 Transmitter

Table 3-8-1 Transmitter characteristics

Parameter	Conditions	Min	Typ	Max	Unit
Maximum RF Transmit Power	BR	--	10	13	dBm
Maximum RF Transmit Power	EDR Π/4 DQPSK EDR 8DPSK	--	10	--	dBm
Relative Transmit Power	EDR Π/4 DQPSK EDR 8DPSK	--	3	--	dB
Maximum RF Transmit Power	BLE-1Mbps	--	10	13	dBm

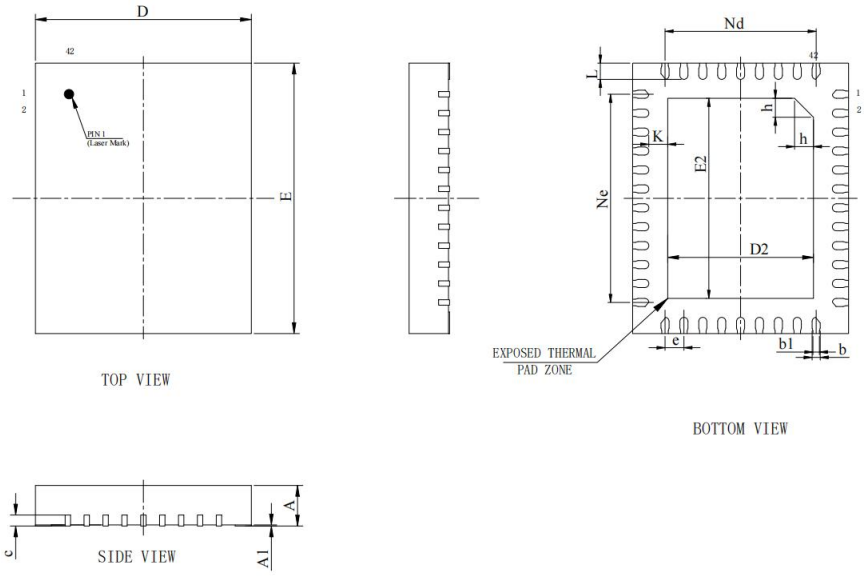
3.8.2 Receiver

Table 3-8-2 Receiver characteristics

Parameter	Conditions	Min	Typ	Max	Unit
Sensitivity	BR	--	-97	--	dBm
	EDR Π/4 DQPSK	--	-97	--	dBm
	EDR 8DPSK	--	-89	--	dBm
	BLE-1Mbps	--	-99.5	--	dBm
	BLE-2Mbps	--	-96.5	--	dBm

4 Package Information

4.1 QFN42_4×5mm



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0.65	0.80	0.95
A1	0	0.02	0.05
b	0.10	0.15	0.20
b1	0.12REF		
c	0.203REF		
D	3.90	4.00	4.10
D2	2.60	2.70	2.80
e	0.35BSC		
Nd	2.80BSC		
E	4.90	5.00	5.10
E2	3.60	3.70	3.80
Ne	3.85BSC		
L	0.25	0.30	0.35
h	0.30	0.35	0.40
K	0.35REF		

Figure 4-1 JL7094F Package

5 IC Marking Information

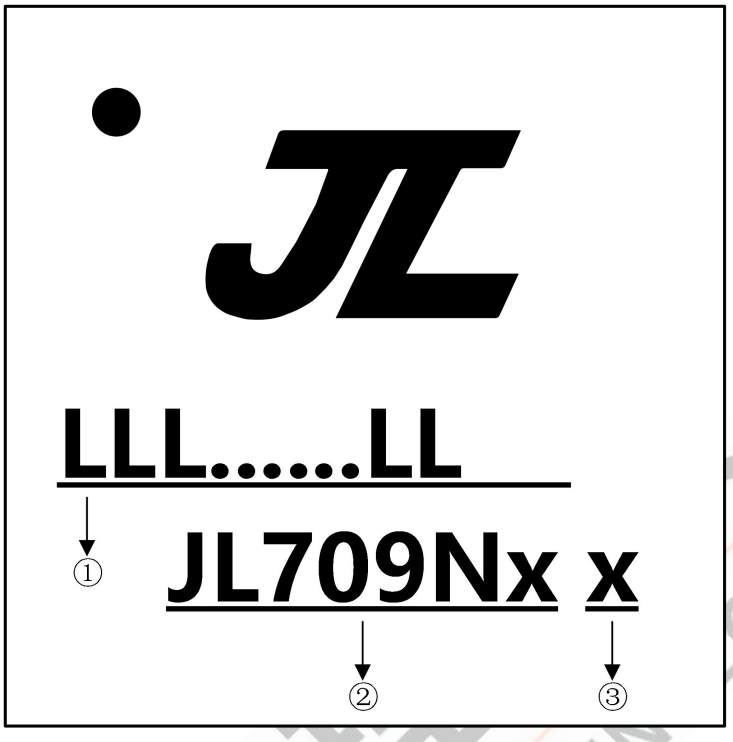


Figure 5-1 JL7094F Package Outline

① LLL.....LL LOT No. , It contains 7 to 18 alphanumerics

② JL709Nx 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

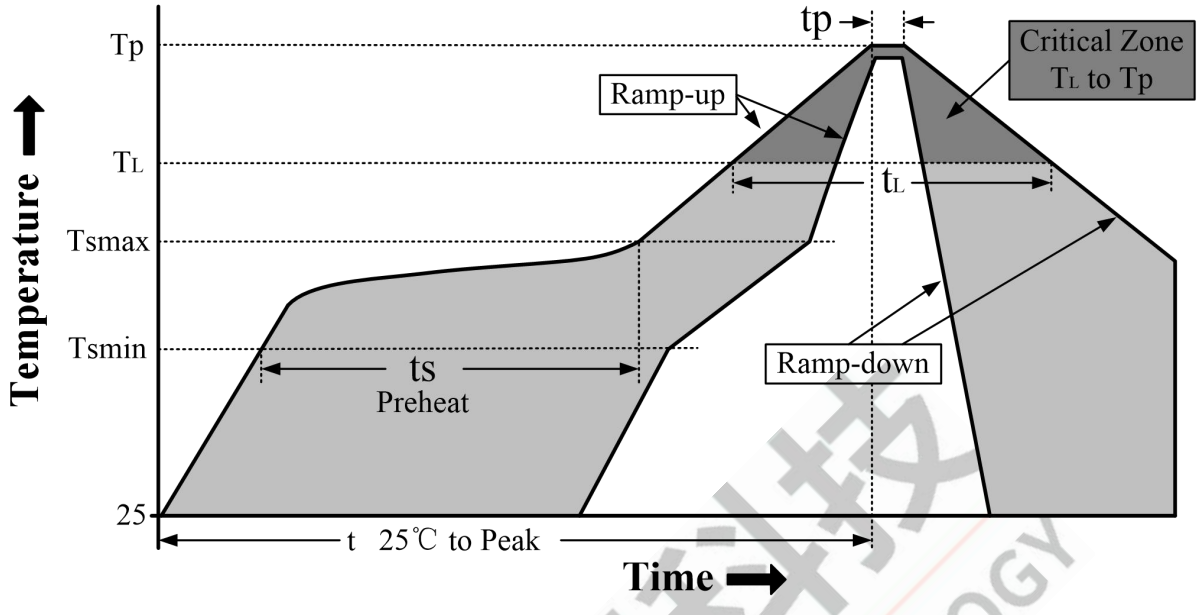


Figure 6-1 Classification Reflow Profile

Table 6-1 Classification Profiles

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℃ of actual Peak 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

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

Table 6-2 SnPb Classification Temperature

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℃

Table 6-3 Pb-free - Classification Temperature

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℃

Note

1.*Tolerance The device manufacturer/supplier shall assure process compatibility up to and including the stated classification temperature (this means Peak reflow temperature +0℃.For example 260℃+0℃)at the rated MSL level.