

AW323A Datasheet

Zhuhai Jieli Technology Co.,LTD

Version 1.1

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Revision History

Date	Revision	Description
2024.08.06	V1.0	Initial Release
2025.01.15	V1.1	Update Features_Bluetooth Update Block Diagram

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AW323A Features

SYSTEM

- 32bit Single-core DSP 192MHz
- Support MATH
- 1 x I-cache
- Support EMU
- Support MPU
- Built-In Flash
- 24MHz crystal oscillator
- Internal RC oscillator,PLL

DSP Audio Processing

- JLA/JLA_LW/JLA_LL codec
- PLC for voice processing
- EQ,DRC

Audio

- 1 x 16bit ADC
 - ❖ SNR 98dB
 - ❖ Sampling rate 8~96kHz
- 1 x 16bit Class-D Speaker Driver
 - ❖ SNR 99dB
 - ❖ Sampling rate 22.05~96kHz
- I²S interface

Bluetooth

- BLE6.0 +2.4GHz-Proprietary (DN Q332415)
- Support AoA Transmitter
- Support LE audio BIS/CIS
- Maximum transmitting power 10dBm
- Receiver sensitivity
 - ❖ -98dBm @BLE1M
 - ❖ -95dBm @BLE2M

Peripherals

- 1 x Full speed USB
- 4 x Multi-function 16bit timer
- 3 x UART interface
- 1 x I²C Master/Slave interface
- 3 x SPI Master/Slave interface
- 1 x 10bit ADC(9 Channel)

- 7 x GPIO Support function remapping

PMU

- Integrated battery charger up to 150mA
- 1 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

- QFN20(3mm*3mm)

Temperature

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

Applications

- Low latency wireless audio

1 Block Diagram

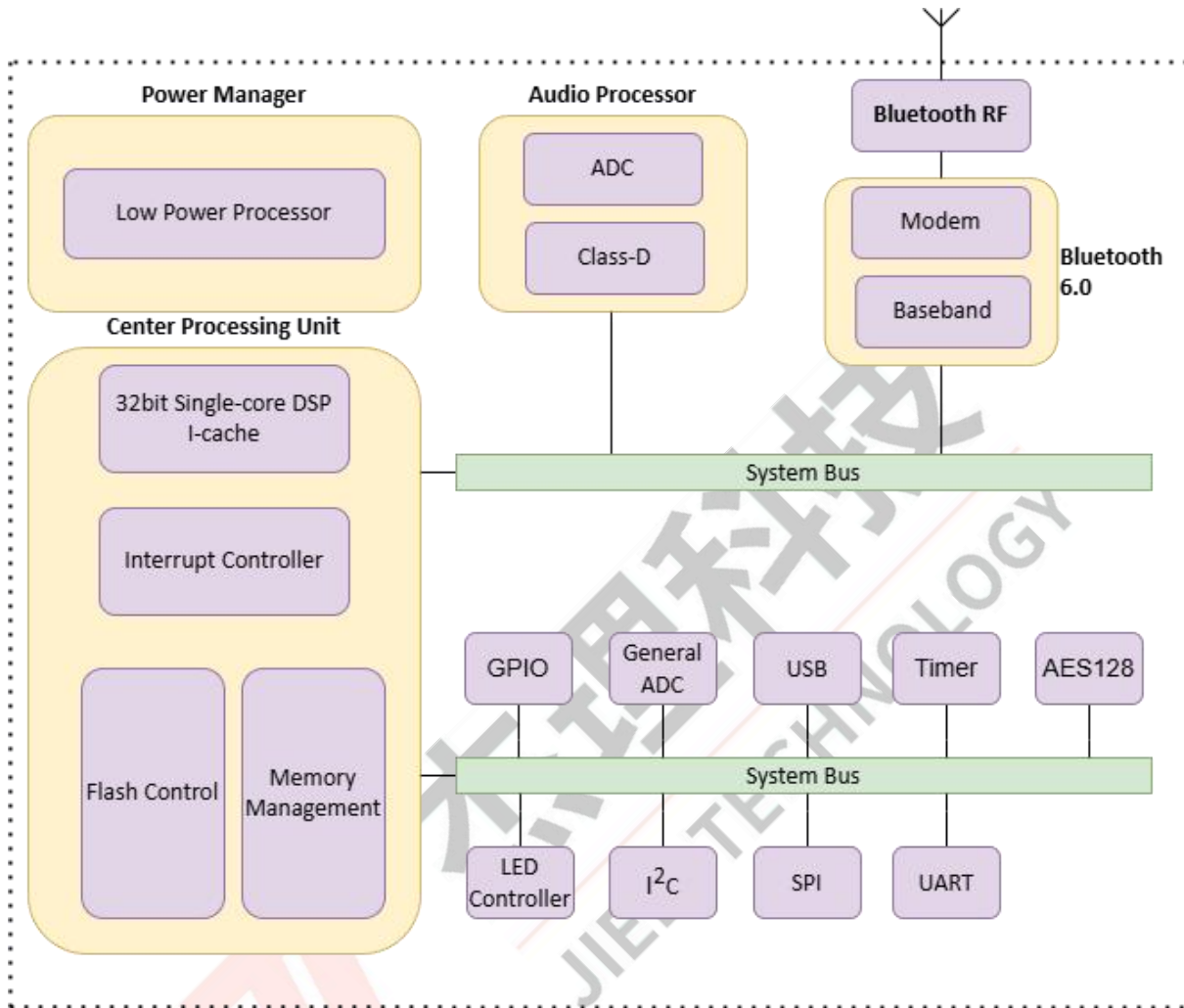


Figure 1-1 AW323A Block Diagram

2 Pin Definition

2.1 Pin Assignment

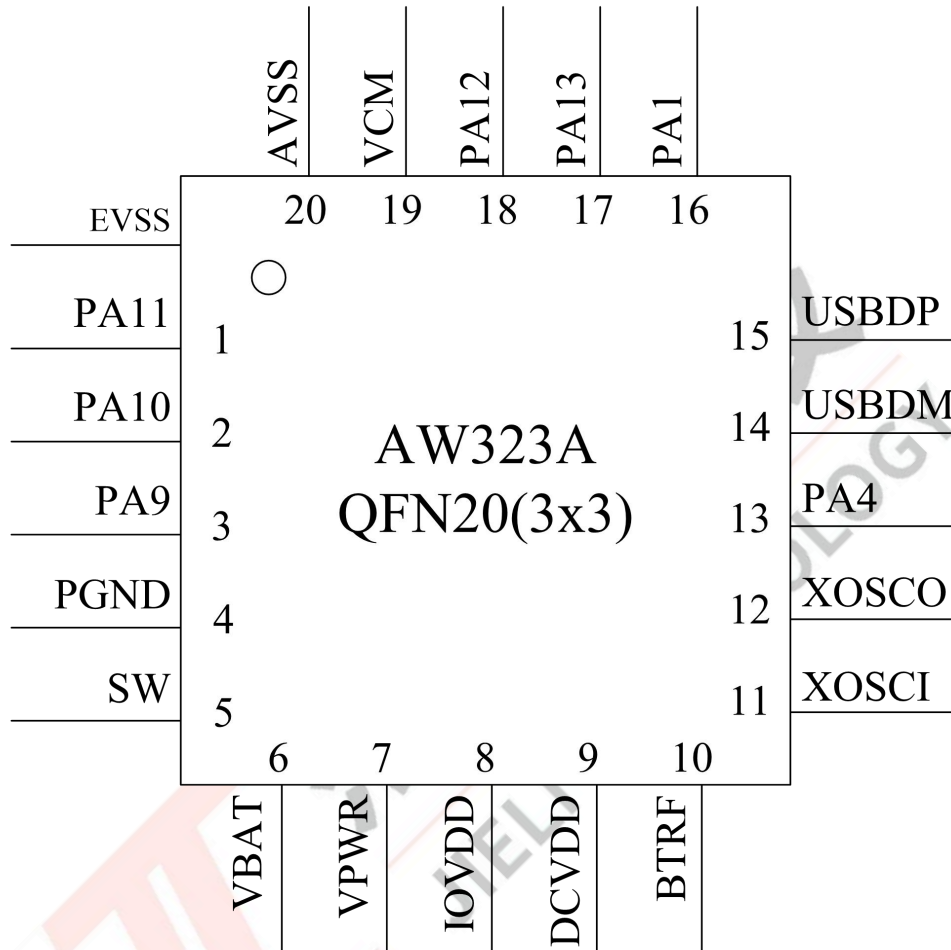


Figure 2-1 AW323A Pin Assignment

2.2 Pin Description

Table 2-2-1 AW323A Pin Description

Pin No.	Name	Type	IO Initial State	Description
1	PA11	I/O	Z	AIN_A0(Audio ADC Positive Input) MICBIAS (MIC Bias Output) ADC11(ADC Input Channel 11)
2	PA10	I/O	Z	AIN_A1(Audio ADC Positive Input) ADC10(ADC Input Channel 10)
3	PA9	I/O	Z	AIN_A2(Audio ADC Positive Input) AIN_AN(Audio ADC Negative Input) ADC9(ADC Input Channel 9)
4	PGND	G	--	DCDC Ground
5	SW	O	--	Buck DCDC Switch Port
6	VBAT	P	--	Battery Input
7	VPWR	I/O	Z	Charge Power Input
8	IOVDD	P	--	IO Power
9	DCVDD	P	--	1.35V Power
10	BTRF	RF	--	Bluetooth RF Antenna
11	XOSCI	I	--	Crystal Oscillator Input
12	XOSCO	O	--	Crystal Oscillator Output
13	PA4	I/O	10kΩ Pull-up	Hold down 0 to reset ADC4(ADC Input Channel 4)
14	USBDM	I/O	15kΩ Pull-down	ADC7(ADC Input Channel 7)
15	USBDP	I/O	15kΩ Pull-down	ADC6(ADC Input Channel 6)
16	PA1	I/O	Z	ADC1(ADC Input Channel 1)
17	PA13	I/O	Z	Class-D Speaker Driver Negative Output
18	PA12	I/O	Z	Class-D Speaker Driver Positive Output
19	VCM	P	--	Audio reference voltage
20	AVSS	G	--	Audio Ground

Note

- 1.IO initial state abbreviations Z--High resistance, H--High level, L--Low level, X--May be changed during power on.
- 2.Timer, UART, I²C, I²S, SPI1/2 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	°C
Tstg	Storage temperature	-65	+150	°C
VBAT	Supply Voltage	-0.3	4.5	V
VPWR		-0.3	6.0	V
IOVDD		-0.3	3.6	V
DCVDD		-0.3	1.5	V
GPIO	Input voltage of GPIO	-0.3	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	±8kV	All pins	JEDEC EIA/JESD22-A114
Machine Mode	±400V	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	--	--	3.0	--	V
	Loading current	IOVDD=3.0V@VBAT = 3.7V	--	--	50	mA
DCVDD	Voltage output	--	--	1.35	--	V
	Loading current	DCVDD12=1.35V@VBAT = 3.7V	--	--	120	mA
Low Power mode						
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
IOVDD	Loading current	IOVDD=3.0V@VBAT = 3.7V	--	--	10	mA

3.4 Battery Charge

Table 3-4 Charger Characteristics

Symbol	Parameter	Min	Typ	Max	Unit
VPWR	Charge Input Voltage	VBAT+0.1V	5.0	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	20	--	150	mA
I _{end}	End Of Charge Current	2	--	15	mA
V _{Trickl}	Trickle Charge Voltage	--	3.0	--	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	PA1,PA4,PA9~PA13 USBDP USBDM VPWR	-0.3	1.4	V
V _{IH}	High-Level Input Voltage	IOVDD = 3.0V	PA1,PA4,PA9~PA13 USBDP USBDM	1.7	3.3	V
		IOVDD = 3.0V	VPWR	1.7	5.5	V
Output Characteristics						
Symbol	Parameter	Conditions	IO	Typ	Unit	
I _{OL}	Output Current	IOVDD = 3.0V V _{output} = 0.3V	PA1,PA4,PA9~PA13	3(HD=0) 9(HD=1) 21(HD=2) 30(HD=3)	mA	
		IOVDD = 3.0V V _{output} = 0.3V	USBDP USBDM	8	mA	
		IOVDD = 3.0V V _{output} = 0.3V	VPWR	2	mA	
I _{OH}	Output Current	IOVDD = 3.0V V _{output} = 2.7V	PA1,PA4,PA9~PA13	3(HD=0) 9(HD=1) 21(HD=2) 30(HD=3)	mA	
		IOVDD = 3.0V V _{output} = 2.7V	USBDP USBDM	8	mA	
		IOVDD = 3.0V V _{output} = 2.7V	VPWR	2	mA	

Internal Resistance Characteristics					
Symbol	Parameter	Conditions	IO	Typ	Unit
R _{pu}	Pull-up Resistance	IOVDD = 3.0V	PA1,PA4,PA9~PA13 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	PA1,PA4,PA9~PA13 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 Class-D Speaker Driver Characteristics

Table 3-6 Class-D Speaker Driver Characteristics

Parameter	Conditions	Min	Typ	Max	Unit
Resolution	--	--	16	--	bits
Output Sample Rate	--	22.05	--	96	kHz
SNR	Differential Mode Fin=1kHz@0dBFS Fs=48kHz B/W=20Hz~20kHz A-Weighted Load=10kΩ	--	99	--	dB
	Single-ended Mode Fin=1kHz@0dBFS Fs=48kHz B/W=20Hz~20kHz A-Weighted Load=10kΩ	--	88	--	dB
	Differential Mode Fin=1kHz@0dBFS Fs=48kHz B/W=20Hz~20kHz A-Weighted Load=16Ω	--	86	--	dB
THD+N	Differential Mode Fin=1kHz@0dBFS Fs=48kHz B/W=20Hz~20kHz A-Weighted Load=10kΩ	--	-79	--	dB

Parameter	Conditions	Min	Typ	Max	Unit
	Single-ended Mode Fin=1kHz@0dBFS Fs=48kHz B/W=20Hz~20kHz A-Weighted Load=10kΩ	--	-51	--	dB
	Differential Mode Fin=1kHz@0dBFS Fs=48kHz B/W=20Hz~20kHz A-Weighted Load=16Ω	--	-33	--	dB
Noise Floor	Differential Mode Fin=1kHz@0dBFS Fs=48kHz B/W=20Hz~20kHz A-Weighted Load=10kΩ	--	12	--	uVrms
	Single-ended Mode Fin=1kHz@0dBFS Fs=48kHz B/W=20Hz~20kHz A-Weighted Load=10kΩ	--	22	--	uVrms
	Differential Mode Fin=1kHz@0dBFS Fs=48kHz B/W=20Hz~20kHz A-Weighted Load=16Ω	--	41	--	uVrms
Dynamic Range	Differential Mode Fin=1kHz@-60dBFS Fs=48kHz B/W=20Hz~20kHz A-Weighted Load=10kΩ	--	92	--	dB
	Single-ended Mode Fin=1kHz@-60dBFS Fs=48kHz B/W=20Hz~20kHz A-Weighted Load=10kΩ	--	86	--	dB
	Differential Mode Fin=1kHz@0dBFS Fs=48kHz B/W=20Hz~20kHz A-Weighted Load=16Ω	--	83	--	dB

3.7 Audio ADC Characteristics

Table 3-7 Audio ADC Characteristics

Parameter	Conditions	Min	Typ	Max	Unit
Resolution	--	--	16	--	bits
Input Sample Rate	--	8	--	96	kHz
SNR	Differential input Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted ADC gain=0dB	--	98	--	dB
	Single-ended input Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted ADC gain=0dB	--	97	--	dB
Dynamic Range	Differential input Mode Fin=1kHz@-60dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted ADC gain=0dB	--	98	--	dB
	Single-ended input Mode Fin=1kHz@-60dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted ADC gain=0dB	--	97	--	dB
THD+N	Differential input Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted ADC gain=0dB	--	-89	--	dB
	Single-ended input Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted ADC gain=0dB	--	-81	--	dB
Analogue Gain	--	-6	--	27	dB
Max Input Level	Differential input Mode ADC gain=0dB	--	2	--	Vrms
	Single-ended input Mode ADC gain=0dB	--	1	--	Vrms

3.8 BT Characteristics

3.8.1 Transmitter

Table 3-8-1-1 Transmitter characteristics

Parameter	Conditions	Min	Typ	Max	Unit
Maximum RF Transmit Power	BLE-1Mbps	--	9	10	dBm

3.8.2 Receiver

Table 3-8-2 Receiver characteristics

Parameter	Conditions	Min	Typ	Max	Unit
Sensitivity	BLE-1Mbps	--	-98	--	dBm
	BLE-2Mbps	--	-95	--	dBm

4 Package Information

4.1 QFN20_3×3mm

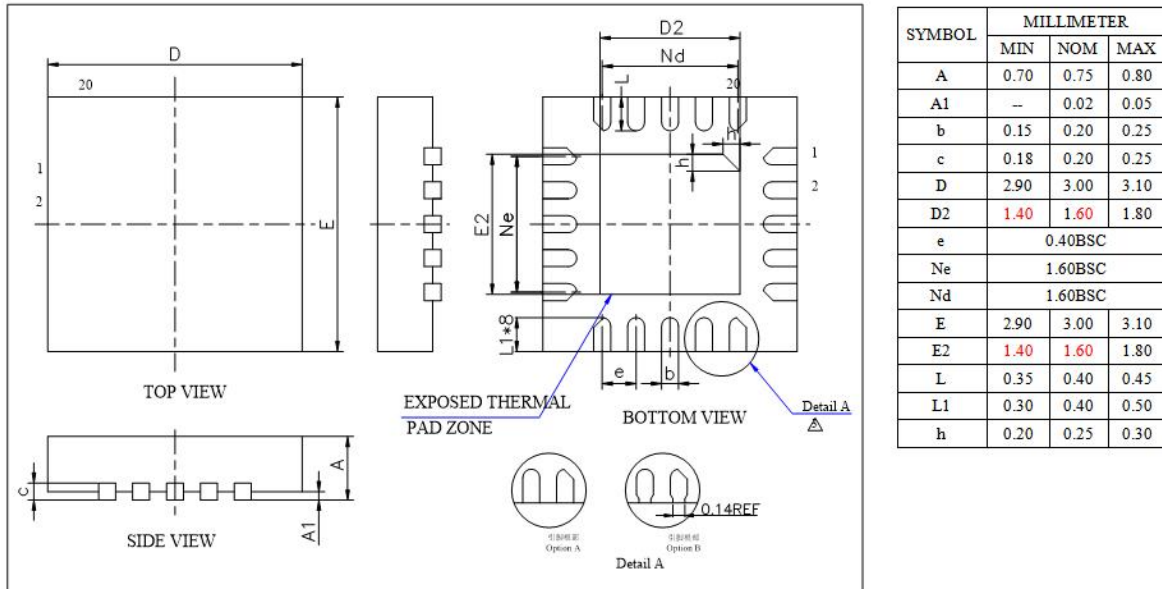


Figure 4-1 AW323A Package

5 IC Marking Information

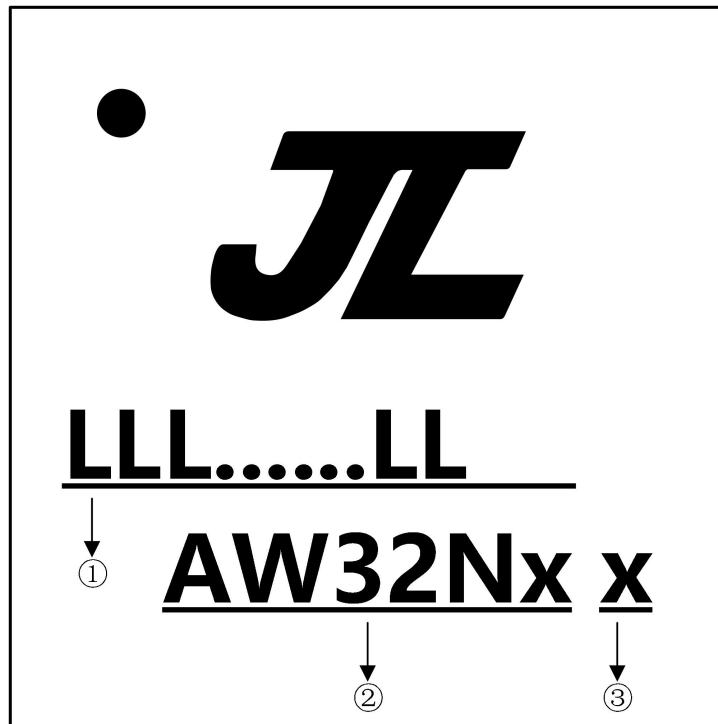


Figure 5-1 AW323A Package Outline

- ① LLL.....LL LOT No. , It contains 7 to 18 alphanumerics
- ② AW32NX Chip Model
- ③ x Built-in flash size
 - 0 No Flash Memory
 - 2 2Mbit Flash
 - 4 4Mbit Flash

6 Solder-Reflow Condition

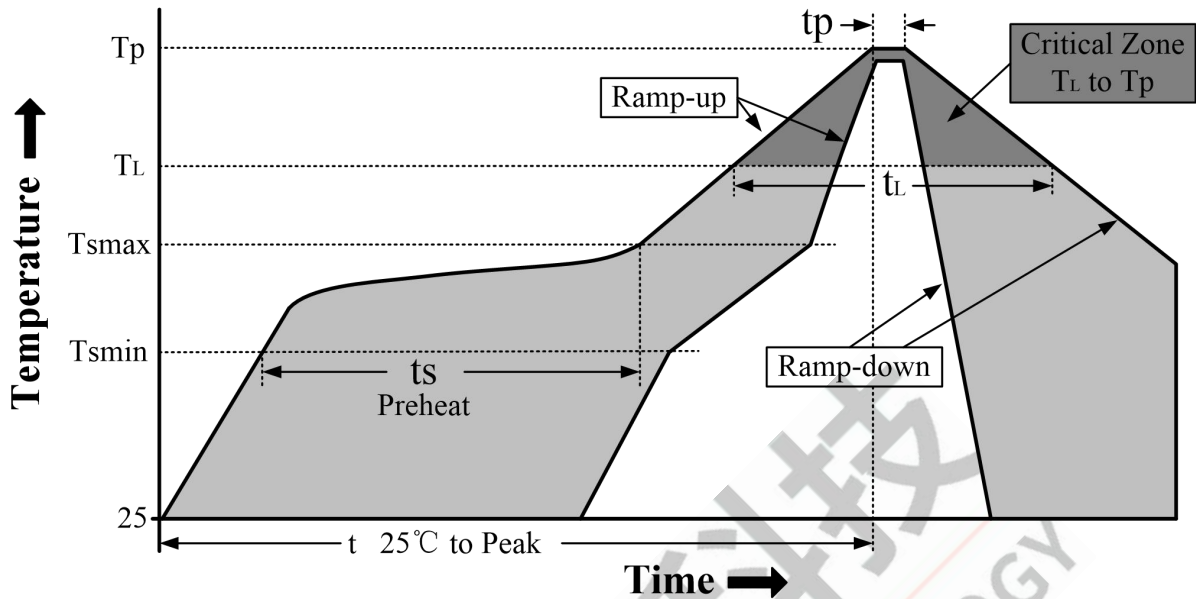


Figure 6-1 Classification Reflow Profile

Table 6-1 Classification Profiles

Profile Feature		Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat/Soak	Temperature Min (T_{smin})	100°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 6-2	See Table 6-3
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
2. Time within 5°C of actual peak temperature (t_p) specified for the reflow profiles is a "supplier" and "user" maximum.

Table 6-2 SnPb Classification Temperature

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

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°C	260°C	260°C
1.6 mm - 2.5mm	260°C	250°C	245°C
> 2.5mm	250°C	245°C	245°C

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°C.For example 260°C+0°C)at the rated MSL level.