AW326A Datasheet

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Version 1.2

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Revision History

Date	Revision	Description
2024.09.04	V1.0	Initial Release
2025.01.15	V1.1	Update Features_Bluetooth Update Block Diagram
2026.03.30	V1.2	Update Pin Assignment

Table of Contents

AW326A 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
- I^2S 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 I^2C Master/Slave interface
- 3 x SPI Master/Slave interface
- 1 x 10bit ADC(14 Channels)
- 14 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

- QFN32(4mm*4mm)

Temperature

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

Applications

- Low latency wireless audio

1 Block Diagram

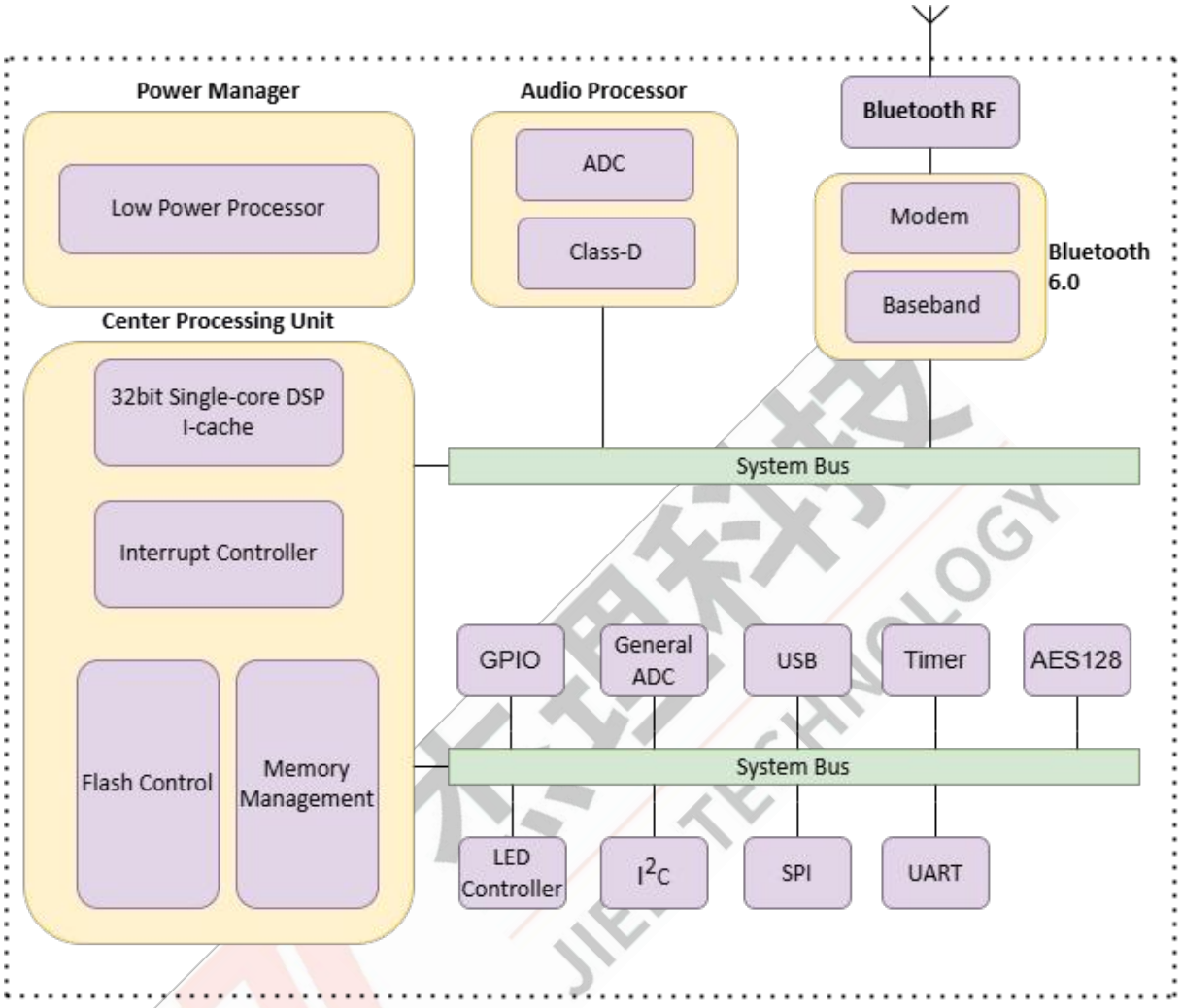


Figure 1-1 AW326A Block Diagram

2 Pin Definition

2.1 Pin Assignment

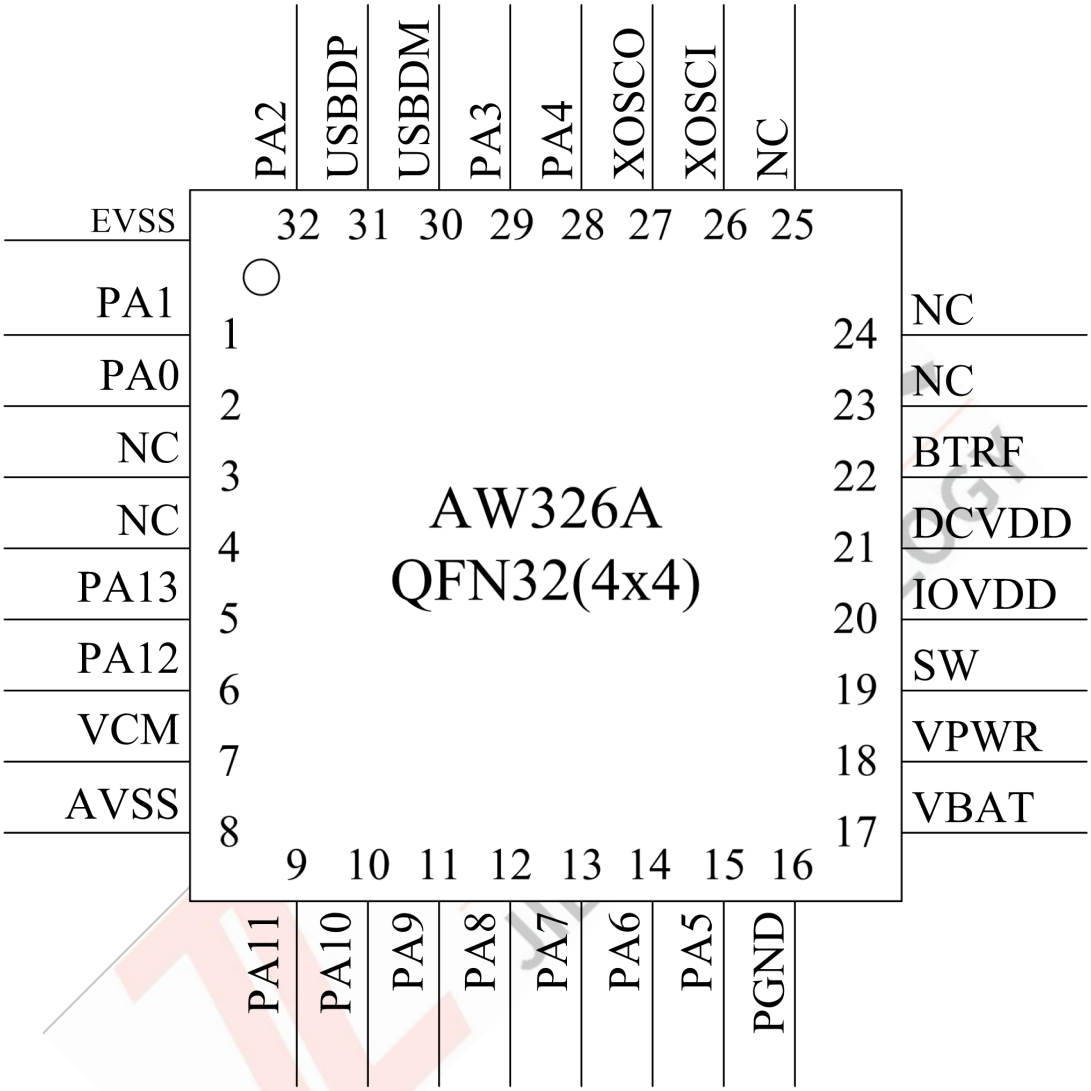


Figure 2-1 AW326A Pin Assignment

2.2 Pin Description

Table 2-2-1 AW326A Pin Description

Pin No.	Name	Type	IO Initial State	Description
1	PA1	I/O	Z	ADC1(ADC Input Channel 1)
2	PA0	I/O	Z	ADC0(ADC Input Channel 0)
3	NC	--	--	(No Connection)
4	NC	--	--	(No Connection)
5	PA13	I/O	Z	Class-D Speaker Driver Negative Output
6	PA12	I/O	Z	Class-D Speaker Driver Positive Output
7	VCM	P	--	Audio reference voltage
8	AVSS	G	--	Audio Ground
9	PA11	I/O	Z	AIN_A0(Audio ADC Positive Input) MICBIAS (MIC Bias Output) ADC11(ADC Input Channel 11)
10	PA10	I/O	Z	AIN_A1(Audio ADC Positive Input) ADC10(ADC Input Channel 10)
11	PA9	I/O	Z	AIN_A2(Audio ADC Positive Input) AIN_AN(Audio ADC Negative Input) ADC9(ADC Input Channel 9)
12	PA8	I/O	Z	ADC8(ADC Input Channel 8)
13	PA7	I/O	10kΩ Pull-up	MCLR(Device Reset)
14	PA6	I/O	Z	--
15	PA5	I/O	Z	ADC5(ADC Input Channel 5) LVD(External Low Voltage Detection Input)
16	PGND	G	--	DCDC Ground
17	VBAT	P	--	Battery Input
18	VPWR	I/O	Z	Charge Power Input
19	SW	O	--	Buck DCDC Switch Port
20	IOVDD	P	--	IO Power
21	DCVDD	P	--	1.35V Power
22	BTRF	RF	--	Bluetooth RF Antenna
23	NC	--	--	(No Connection)
24	NC	--	--	(No Connection)
25	NC	--	--	(No Connection)
26	XOSCI	I	--	Crystal Oscillator Input
27	XOSCO	O	--	Crystal Oscillator Output
28	PA4	I/O	10kΩ Pull-up	Hold down 0 to reset ADC4(ADC Input Channel 4)
29	PA3	I/O	Z	ADC3(ADC Input Channel 3)
30	USBDM	I/O	15kΩ Pull-down	ADC7(ADC Input Channel 7)

Pin No.	Name	Type	IO Initial State	Description
31	USBDP	I/O	15kΩ Pull-down	ADC6(ADC Input Channel 6)
32	PA2	I/O	Z	ADC2(ADC Input Channel 2)

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, I^2C, I^2S, 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	℃
Tstg	Storage temperature	-65	+150	℃
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 (except PA6)	-0.3	3.6	V
HVTIO	Input voltage of HVT-IO (PA6)	-0.3	6.0	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_{Trikl}	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	PA0~PA13 USBDP USBDM VPWR	-0.3	1.4	V
V_{IH}	High-Level Input Voltage	IOVDD = 3.0V	PA0~PA5 PA7~PA13 USBDP USBDM	1.7	3.3	V
		IOVDD = 3.0V	PA6 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~PA5 PA7~PA13	3(HD=0) 9(HD=1) 21(HD=2) 30(HD=3)		mA
		IOVDD = 3.0V Voutput = 0.3V	PA6 USBDP USBDM	8		mA
		IOVDD = 3.0V Voutput = 0.3V	VPWR	2		mA
$\lvert I_{OH} \rvert$	Output Current	IOVDD = 3.0V Voutput = 2.7V	PA0~PA5 PA7~PA13	3(HD=0) 9(HD=1) 21(HD=2) 30(HD=3)		mA
		IOVDD = 3.0V	PA6	8		mA

		Voutput = 2.7V	USBDP USBDM		
		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~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	PA0~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	--	-79	--	dB

Parameter	Conditions	Min	Typ	Max	Unit
	Fs=48kHz B/W=20Hz~20kHz A-Weighted Load=10kΩ				
	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	--	83	--	dB

Parameter	Conditions	Min	Typ	Max	Unit
	Load=16Ω				

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	--	1	--	Vrms

Parameter	Conditions	Min	Typ	Max	Unit
	ADC gain=0dB				

3.8 BT Characteristics

3.8.1 Transmitter

Table 3-8-1 Transmitter characteristics

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

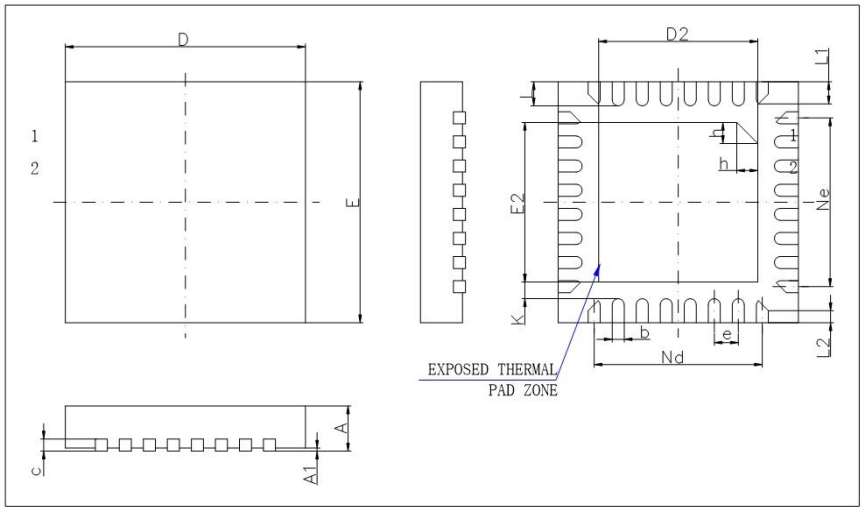
3.8.2 Receiver

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 QFN32_4×4mm



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0.70	0.75	0.80
	0.80	0.85	0.90
	0.85	0.90	0.95
A1	0	0.02	0.05
b	0.15	0.20	0.25
c	0.18	0.20	0.25
D	3.90	4.00	4.10
D2	2.50	2.65	2.80
e	0.40BSC		
Nd	2.80BSC		
E	3.90	4.00	4.10
E2	2.50	2.65	2.80
Ne	2.80BSC		
K	0.20	-	-
L	0.35	0.40	0.45
L1	0.30	0.35	0.40
L2	0.15	0.20	0.25
h	0.30	0.35	0.40
L/F 载体尺寸 (mil)	112*112		

Figure 4-1 AW326A Package

5 IC Marking Information

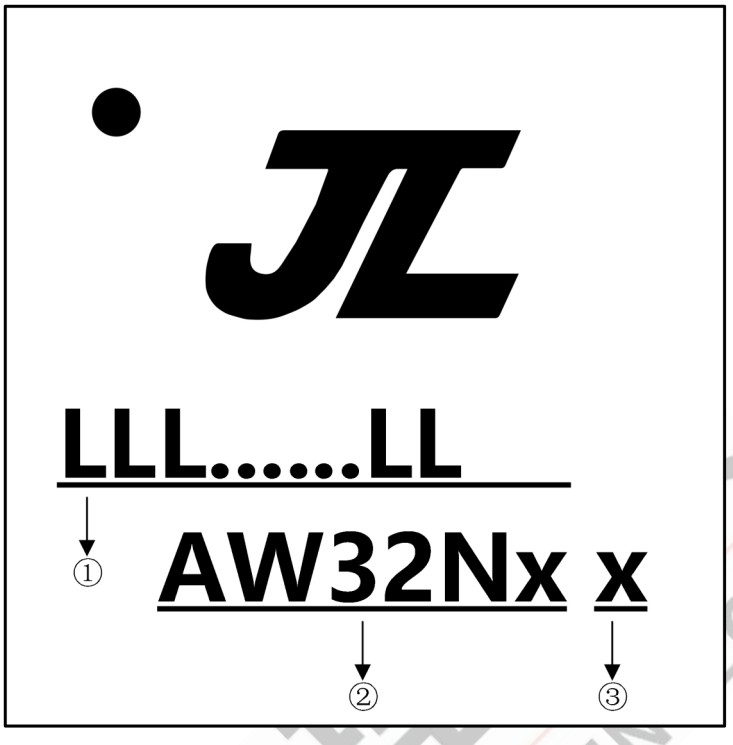


Figure 5-1 AW326A Package Outline

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

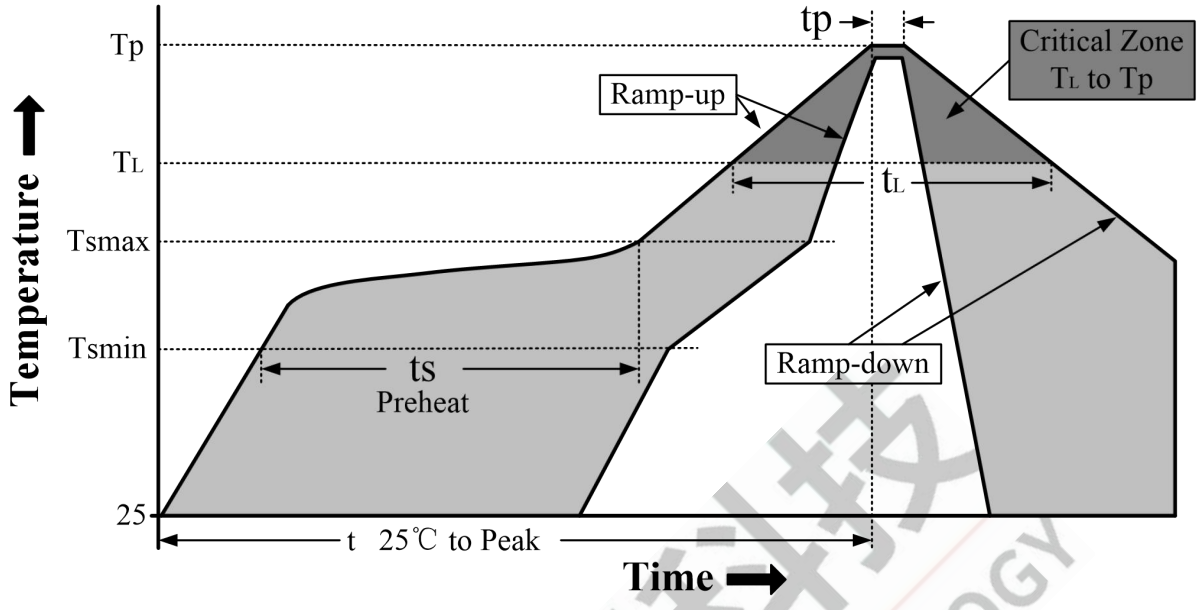


Figure 6-1 Classification Reflow Profile

Table 6-1 Classification Profiles

Profile Feature		Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat/Soak	Temperature Min (T_{smin})	100℃	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 mm³ < 350	Volume mm³ 350 - 2000	Volume mm³ > 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.