AW306A Datasheet

Zhuhai Jieli Technology Co.,LTD

Version：1.1

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AW306A Features

CPU

- 32-bit DSP
- with IEEE754 Single precision FPU
- Icache
- 64Vectored interrupts
- 8 Levels interrupt priority
- Mathematic alaccelerate engine
- Support EMU

Memory

- On-chip SRAM (include cache)
- On-chip ROM
- Built-In Flash
- 4 region MPU protects

Clocks

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

Audio

- One channel 16-bit DAC,SNR maximum 91dB
- One channel 16-bit ADC,SNR maximum 95dB
- One channel 16-bit APA, SNR maximum 99dB
- Audio DAC Sampling rates of 8kHz/11.025kHz/16kHz/22.05kHz/24kHz/ 32kHz/44.1kHz/48kHz are supported
- Audio ADC Sampling rates of 8kHz/11.025kHz/16kHz/22.05kHz/24kHz/32 kHz/44.1kHz/48kHz are supported
- AUDIO ADC Support one analog MIC, supports single-end or differential MIC/LINEIN input
- Supported digital MIC inputs(IIS Port)
- Audio DAC supports single-ended mode, need connect PA to drive speaker

Audio APA

- Mono Class-D Speaker Amplifier
- Use PWM modulation technique, support 32/44.1/48kHz sample rate
- support single-end or differential output to drive 4 or 8 ohm speaker directly.

Bluetooth

- Compliant with Bluetooth V5.4+BLE specification（QDID:222830)
- Support AoA TX direction finding
- Meet class2 and class3 transmitting power requirement
- Maximum +6dbm transmitting power
- BLE receiver with minimum -98dBm sensitivity
- bap 1.0\pacs 1.0\ccp 1.0\mcp 1.0\micp 1.0\vcp 1.0\csip 1.0

LP_Touch

- 8-channel LP_Touch with low power wakeup

Peripherals

- One full speed USB OTG controller
- One SD host controller for eMMC/SD
- Four multi-function 32-bit timers, support capture and PWM mode
- Three UART interface
- I2C Master/Slave interface
- Three SPI Master/Slave interface
- I2S AUDIO Master/Slave interface
- 9-channel 12-bit ADC for analog sampling
- One CAN interface
- 25 Individually programmable and multiplexed GPIO pins
- Support IO function remapping
- Up to 25 external interrupt/wake-up source(low power available,can be multiplexed to any I/O)

PMU

- Built-in LDO
- Minimum 3uA current consumption in the soft-off mode
- RTC with 32.768k osc
- VPWR range : 1.8V to 5.5V
- IOVDD range : 2.2V to 3.4V

Packages

- QFN32 (4mm*4mm)

Temperature

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

Applications

- Bluetooth intercom
- Bluetooth TV remote controls

1 Block Diagram

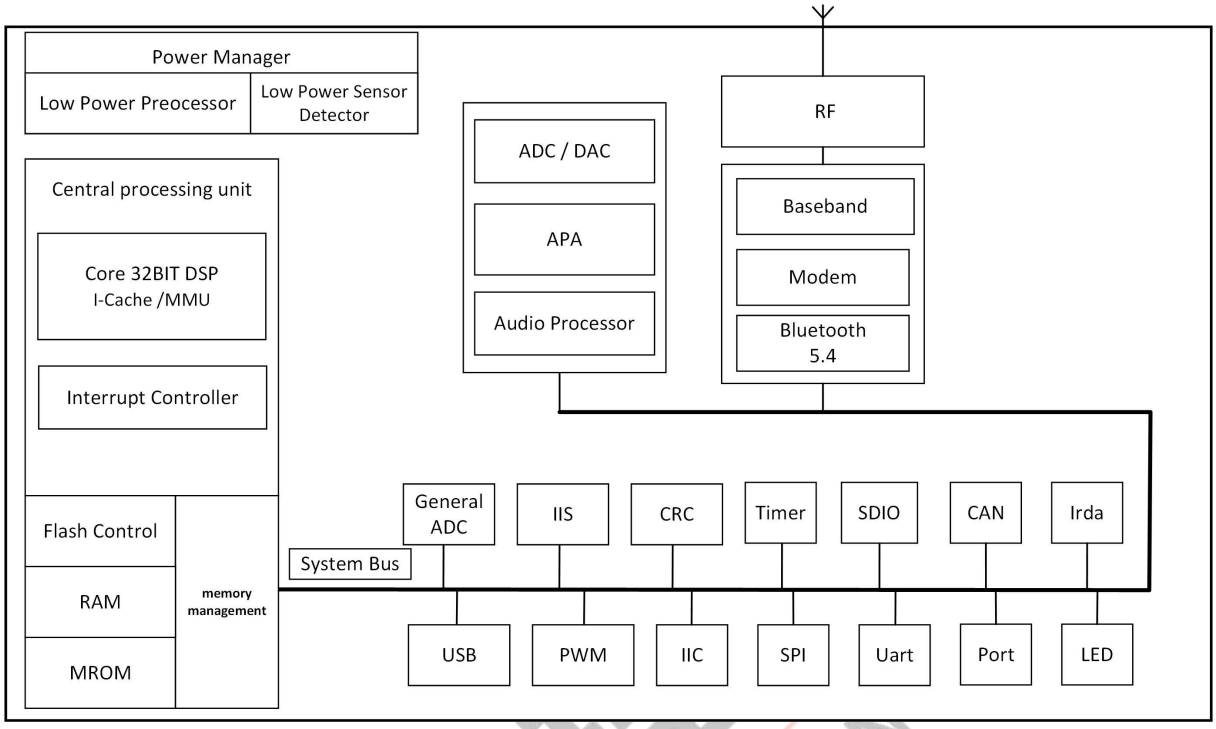


Figure 1-1 AW306A Block Diagram

2 Pin Definition

2.1 Pin Assignment

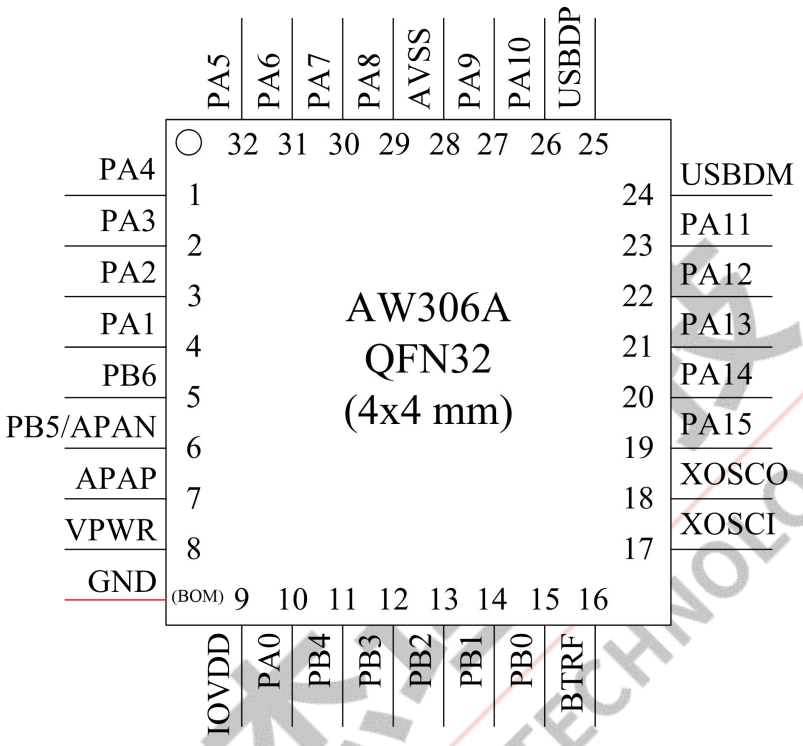


Figure 2-1 AW306A Package Diagram

2.2 Pin Description

Table 2-1 AW306A Pin Description

PIN NO.	Name	Type	Function	Other Function
1	PA4	I/O	GPIO	ADC0: ADC Input Channel0 AIN_AP1: audio adc differential input AP1 MCPWM_L0 ALNK_DAT1A SPI2DIA UART2RXA
2	PA3	I/O	GPIO	Touch2 TMR3 MCPWM_H0 ALNK_DAT0A SPIDOC UART2TXA
3	PA2	I/O	GPIO (pull up)	Touch1 Long-press reset TMR2 PWM1 ALNK_MCLKA SPI1CLKC UART1RXC
4	PA1	I/O	GPIO	Touch0 LVD TMR1 PWM0 SPI1DIC UART1TXC
5	PB6	I/O	GPIO (High Voltage Resistant)	
6	PB5	I/O	GPIO (High Voltage Resistant)	ALNK_DAT1B SPI2DIB UART1RXB
	APAN	AO		APA differential output N
7	APAP	AO		APA differential output P
8	VPWR	P		Power supply 5v
9	IOVDD	P		IO Power 3.3v

10	PA0	I/O	GPIO (pull down) (High Voltage Resistant)	TMR0 PWM2
11	PB4	I/O	GPIO	Touch7 MCPWM_L2 ALNK_DAT0B UART1TXB
12	PB3	I/O	GPIO	Touch6MCPWM_H2
13	PB2	I/O	GPIO	Touch5 OSCO_32K SPI2D3
14	PB1	I/O	GPIO	Touch4 OSCI_32K MCPWM_TMR2CK
15	PB0	I/O	GPIO (pull up)	Touch3 MCLR MCPWM_TMR1CK PWM3 UART1_RTS SPI1DOA UART0TXB SD0CLKB
16	BTRF	RF		Bluetooth RF antenna
17	XOSCI	I		Crystal Oscillator Input;
18	XOSCO	O		Crystal Oscillator Output;
19	PA15	I/O	GPIO	ADC5: ADC Input Channel5 MCPWM_TMR0CK SPI0DIB1 SPICLKA UART1RXA SD0CMDB
20	PA14	I/O	GPIO	ADC4: ADC Input Channel4 MCPWM_FPIN2 SPI0DOB0 SPI1DIA UART1TXA SD0DAT0B
21	PA13	I/O	GPIO	ADC3: ADC Input Channel3 MCPWM_FPIN1 MCPWM_L1 SPI0CLKB SPI1D3

22	PA12	I/O	GPIO	ADC differential input N MCPWM_FPIN0 MCPWM_H1 SPI0DATB3 SPI1D2
23	PA11	I/O	GPIO	ADC differential input P CLKOUT2 SPI0DATB2 SPI2DOC UART2RXC
24	USBDM	I/O	GPIO (pull down)	ADC6: ADC Input Channel6 High Speed USB Data Minus IIC_SDA_A SPI2DOB UART1RXD
25	USBDP	I/O	GPIO (pull down)	ADC6: ADC Input Channel6 High Speed USB Data Positive IIC_SCL_A SPI2CLKB UART1TXD
26	PA10	I/O	GPIO	CLKOUT1 SPI0DATA3 SPI2CLKC UART2TXC
27	PA9	I/O	GPIO	CLKOUT0 ALNK_MCLKB SPI0DATA2 SPI2DIC
28	AVSS	G		AUDIO Ground
29	PA8	I/O	GPIO	ADC2: ADC Input Channel2 AIN_AP0: audio adc differential input AP0 ALNK_LRCKA UART2RXB
30	PA7	I/O	GPIO	AIN_AP4: audio adc differential input AP4 MIC_BIASCAP1 ALNK_SCLKA UART2TXB

31	PA6	I/O	GPIO	AIN_AP3: audio adc differential input AP3 AIN_AN: audio adc differential input N CAP0 UART1_CTS IIC_SDA_D ALNK_DAT3A SPI2DOA UART0RXA
32	PA5	I/O	GPIO	ADC1: ADC Input Channel1 AIN_AP2: audio adc differential input AP2 DAC: Digital-to-Analog Converter output channel IIC_SCL_D ALNK_DAT2A SPI2CLKA UART0TXA
BOM	GND	G		Ground;

Note:Timer、IIC、ALNK、SPI、UART、SD、CAN function can be remapped to any I/O

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	RF	RF antenna
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
VPWR	Supply Voltage	-0.3	6	V
V_{IOVDD}	Voltage applied at IOVDD	-0.3	3.6	V
V_{GPIO}	Voltage applied to GPIO(Except PA0 /PB5/PB6)	-0.3	3.6	V
V_{HVTIO}	Voltage applied to High Voltage Resistant IO (PA0/PB5/PB6)	-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
VPWR	Voltage Input	1.8	-	5.5	V	
Operating mode						
IOVDD	Voltage output	_	3.0	_	V	VPWR = 3.3V, 10mA loading
	Loading current	_	_	120	mA	IOVDD=3.0V@VPWR = 3.3V
Low Power mode						
IOVDD	Loading current	_	_	20	mA	IOVDD=3.2V@VPWR = 3.7V

3.3 IO Input/Output Electrical Logical Characteristics

Table 3-3

GPIO (Except PA0/PB5/PB6) input characteristics						
Symbol	**Parameter**	**Min**	**Typ**	**Max**	**Unit**	**Test Conditions**
V_{IL}	Low-Level Input Voltage	-0.3	_	1.4	V	IOVDD = 3.2V
V_{IH}	High-Level Input Voltage	1.8	_	3.6	V	IOVDD = 3.2V
High Voltage Resistant IO (PA0/PB5/PB6) input characteristics						
Symbol	**Parameter**	**Min**	**Typ**	**Max**	**Unit**	**Test Conditions**
V_{IL}	Low-Level Input Voltage	-0.3	_	1.4	V	IOVDD = 3.2V
V_{IH}	High-Level Input Voltage	1.8	_	5.5	V	IOVDD = 3.2V
GPIO & High Voltage Resistant IO output characteristics						
Symbol	**Parameter**	**GPIO**	**Typ**		**Unit**	**Test Conditions**
V_{OL}	0.1* IOVDD Drive current	PA1~PA15 PB0~PB4	HD=0 : -3 HD=1 : -8 HD=2 : -20 HD=3 : -40~ -50		mA	IOVDD = 3.2V
		PA0、PB5、PB6 USBDM USBDP	-8			
V_{OH}	0.9* IOVDD Drive current	PA1~PA15 PB0~PB4	HD=0 : 3 HD=1 : 8 HD=2 : 20 HD=3 : 40~50		mA	IOVDD = 3.2V
		PA0、PB5、PB6 USBDM USBDP	8			

3.4 Internal Resistor Characteristics

Table 3-4

Port	Internal Pull-Up Resistor	Internal Pull-Down Resistor	Comment
PA0~PA15 PB0~PB6	PU=0: NC PU=1: 10K PU=2: 100K PU=3: 1M	PD=0: NC PD=1: 10K PD=2: 100K PD=3: 1M	1、PA2 & PB0 default pull up 10KΩ 2、PA0 default pull Down 10KΩ 3、USBDM & USBDP default pull Down 15KΩ 4、internal pull-up /pull-down resistance | accuracy ±20%
USBDP	1.5K	15K	
USBDM	180K	15K	

3.5 Audio DAC Characteristics

Audio high voltage mode Table 3-5

Parameter	MODE	Min	Typ	Max	Unit	Test Conditions
Frequency Response		20		20k	Hz	Fin=1kHz/0dB
Output Swing	Single-ended		0.57		Vrms	Fs=44.1kHz
THD+N	Single-ended		-82		dB	B/W=20Hz~20kHz
S/N	Single-ended		91			A-Weighted Filter
Noise Floor	Single-ended		16		uVrms	10k ohm loading

3.6 Audio ADC Characteristics

Audio high voltage mode Table 3-6

Parameter	MODE	Min	Typ	Max	Unit	Test Conditions
Resolution				16	bits	
Maximum Input Level	Single-ended		0.85		Vrms	Gain Level = 0 Fin = 1kHz Fs = 44.1kHz THD+N < 0.1%
	Differential		0.85			
SNR	Single-ended		93		dB	Gain Level = 0 Fs = 44.1kHz
	Differential		95			
THD+N	Single-ended		-80		dB	Fin = 1kHz,Maximum Input B/W = 20Hz~20kHz A-Weighted Filter
	Differential		-85			

3.7 APA Characteristics

Table 3-7

Parameter	VPWR	Min	Typ	Max	Unit	Test Conditions	
Output Swing	3.7V		2.30		Vrms	R_L=10K	Differential mode Fin=1kHz/0dB B/W=20Hz~20kHz
			1.76			R_L=8Ω	
			1.47			R_L=4Ω	
	2.4V		1.43			R_L=10K	
			1.03			R_L=8Ω	
			0.77			R_L=4Ω	
SNR	3.7V		99		dB	R_L=10K	Differential mode Fin=1kHz/0dB B/W=20Hz~20kHz A-Weig hted Filter
			96			R_L=8Ω	
			96			R_L=4Ω	
	2.4V		99			R_L=10K	
			96			R_L=8Ω	
			94			R_L=4Ω	
THD+N	3.7V		-73		dB	R_L=10K	
			-38			R_L=8Ω	
			-31			R_L=4Ω	
	2.4V		-73			R_L=10K	
			-36			R_L=8Ω	
			-30			R_L=4Ω	
Output power	3.7V		0.38		W	R_L=8Ω	Differential mode Fin=1kHz/0dB
			0.54			R_L=4Ω	
	2.4V		0.13			R_L=8Ω	
			0.14			R_L=4Ω	

3.8 BT Characteristics

3.8.1 Transmitter

1M Data Rate **Table 3-8-1-1**

Parameter		Min	Typ	Max	Unit	Test Conditions
RF Transmit Power			0	6	dBm	25℃ Power Supply VPWR=3.7V 2440MHz 4 Layers Board
RF Power Control Range			20		dB	
In-band spurious Emissions	+2MHz		-40		dBm	
	-2MHz		-40			
	+3MHz		-45			
	-3MHz		-45			
△f1 avg			250		KHz	
△f2 min			210			
△f2 avg/△f1 avg			1			

2M Data Rate **Table 3-8-1-2**

Parameter		Min	Typ	Max	Unit	Test Conditions
Adjacent Channel Transmit Power	+4MHz		-40		dBm	25℃ Power Supply VPWR=3.7V 2440MHz 4 Layers Board
	-4MHz		-40			
	+5MHz		-40			
	-5MHz		-40			
	+6MHz		-40			
	-6MHz		-40			
△f1 avg			500		KHz	
△f2 min			430			
△f2 avg/△f1 avg			1.1			

3.8.2 Receiver

1M Data Rate **Table 3-8-2-1**

Parameter		Min	Typ	Max	Unit	Test Conditions
Sensitivity		-98	-97		dBm	
Co-channel Interference Rejection			5		dB	
Adjacent Channel Interference Rejection	+1MHz		-15		dB	25℃ Power Supply VPWR=3.7V 2440MHz 4 Layers Board
	-1MHz		-20			
	+2MHz		-35			
	-2MHz		-25			
	+3MHz		-30			
	-3MHz		-25			

2M Data Rate **Table 3-8-2-2**

Parameter		Min	Typ	Max	Unit	Test Conditions
Sensitivity		-95	-94		dBm	
Co-channel Interference Rejection			3		dB	
Adjacent Channel Interference Rejection	+1MHz		6		dB	25℃ Power Supply VPWR=3.7V 2440MHz 4 Layers Board
	-1MHz		6			
	+2MHz		-20			
	-2MHz		-16			
	+3MHz		-25			
	-3MHz		-30			

3.9 ESD Protection

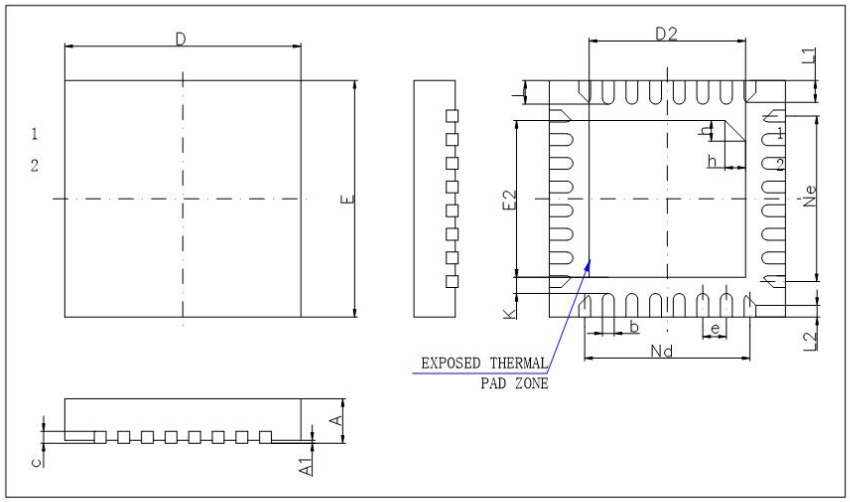
Table 3-9

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	±500V	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

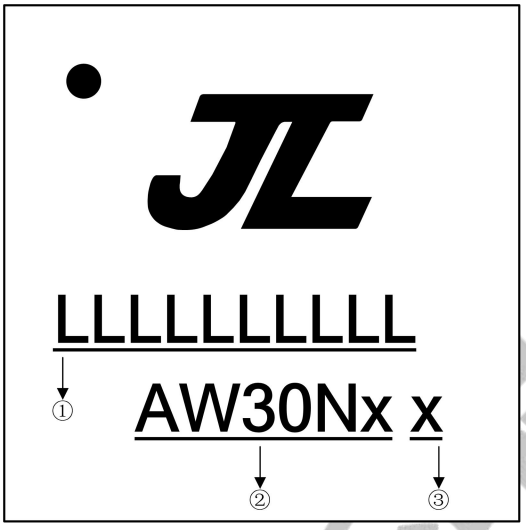
4.1 QFN32_4×4mm



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 AW306A Package

5 IC Marking Information



① LLLLLLLLLL：Production Batch
② AW30Nx：Chip Model
③ 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

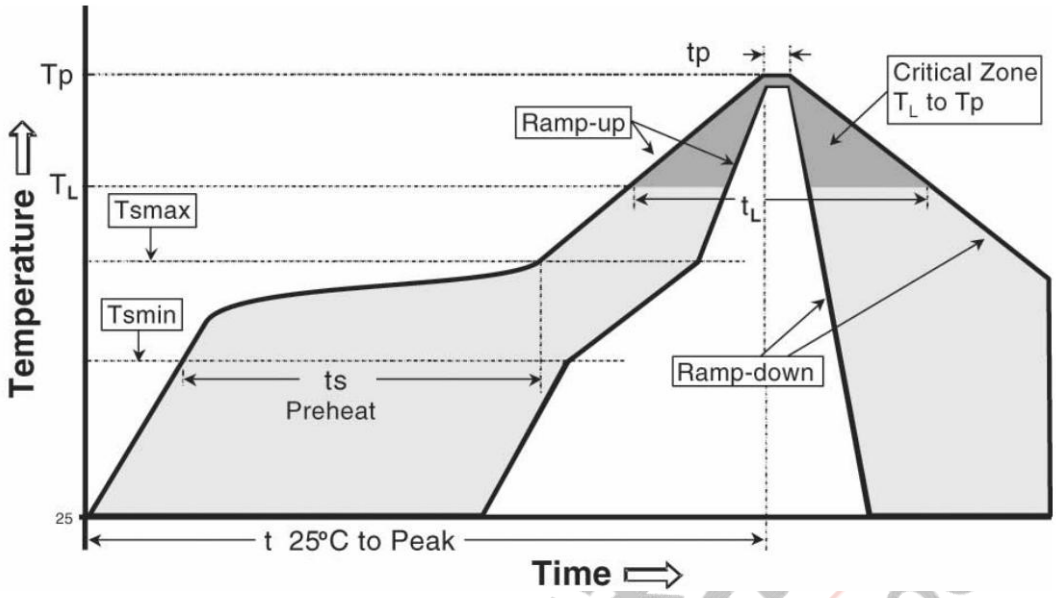


Figure 6-1 Classification Reflow Profile

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 5-2	See Table 5-3
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.

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 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℃

*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.

7 Revision History

Date	Revision	Description
2023.12.08	V1.0	Initial Release
2023.12.14	V1.1	Update APA Characteristics Update BT Characteristics