

AW305A Datasheet

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AW305A 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
- 32.768 KHz 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/32kHz/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\wcp 1.0\esip 1.0

LP_Touch

- 3-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
- 8-channel 12-bit ADC for analog sampling
- One CAN interface
- 17 Individually programmable and multiplexed GPIO pins
- Support IO function remapping
- Up to 17 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

- SSOP24

Temperature

- Operating temperature: -40°C to +85°C
- Storage temperature: -65°C to +150°C

Applications

- Bluetooth intercom
- Bluetooth TV remote controls

1 Block Diagram

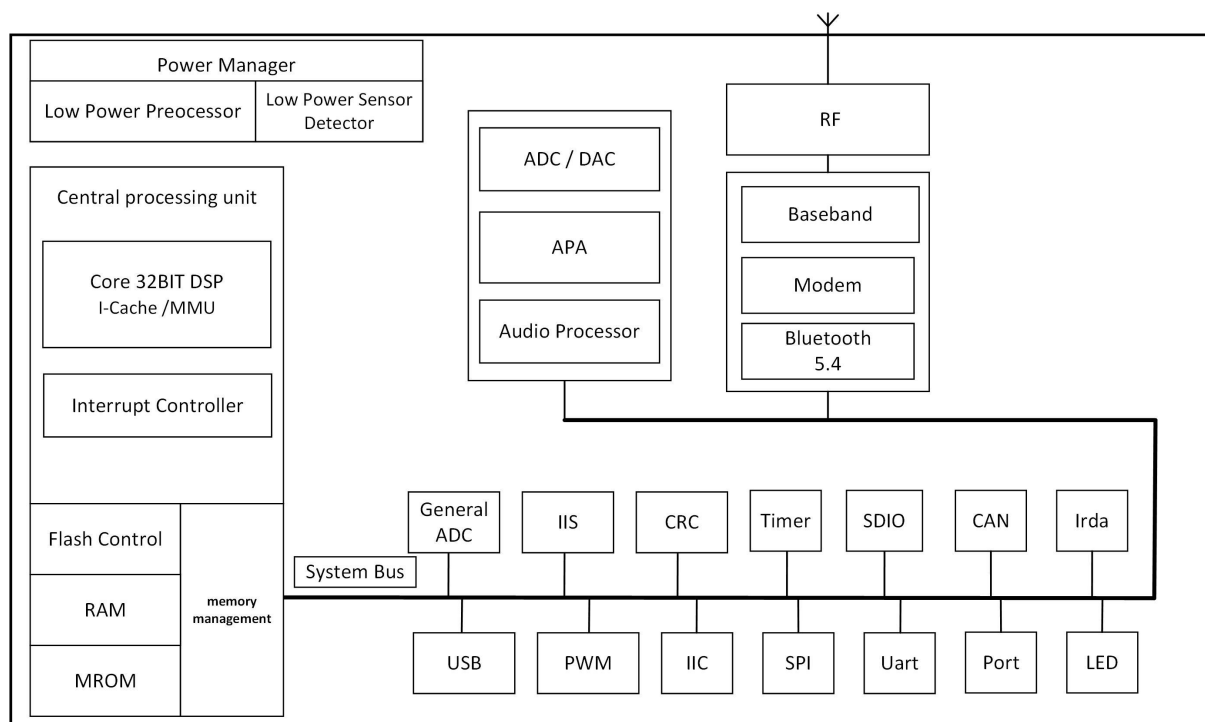


Figure 1-1 AW305A Block Diagram

2 Pin Definition

2.1 Pin Assignment

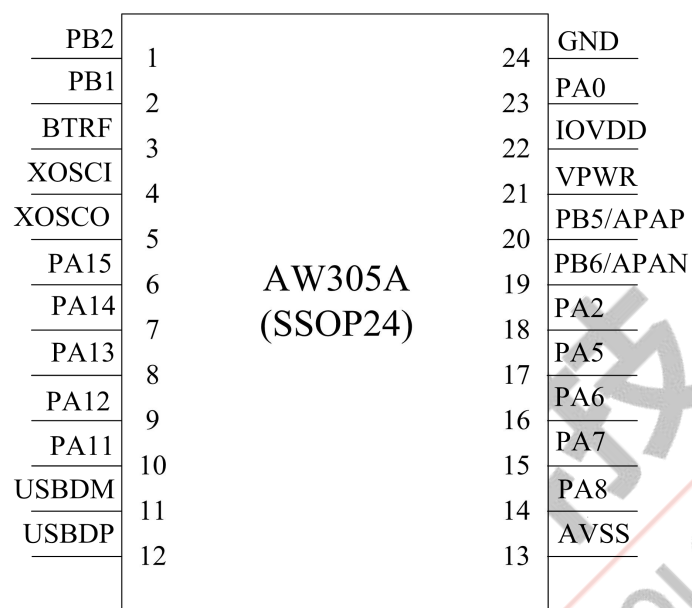


Figure 2-1 AW305A Package Diagram

2.2 Pin Description

Table 2-1 AW305A Pin Description

PIN NO.	Name	Type	Function	Other Function
1	PB2	I/O	GPIO	Touch5 OSCO_32K SPI2D3
2	PB1	I/O	GPIO	Touch4 OSCI_32K MCPWM_TMR2CK
3	RF			Bluetooth RF antenna
4	XOSCI	I		Crystal Oscillator Input;
5	XOSCO	O		Crystal Oscillator Output;
6	PA15	I/O	GPIO	ADC5: ADC Input Channel5 MCPWM_TMR0CK SPICLK_A UART1RXA SD0CMD_B
7	PA14	I/O	GPIO	ADC4: ADC Input Channel4 MCPWM_FPIN2 SPI1DIA UART1TXA SD0DAT0B
8	PA13	I/O	GPIO	ADC3: ADC Input Channel3 MCPWM_FPIN1 MCPWM_L1 SPI1D3
9	PA12	I/O	GPIO	ADC differential input N MCPWM_FPIN0 MCPWM_H1 SPI1D2
10	PA11	I/O	GPIO	ADC differential input P CLKOUT2 SPI2DOC UART2RXC
11	USBDM	I/O	GPIO (pull down)	ADC6: ADC Input Channel6 High Speed USB Data Minus IIC_SDA_A SPI2DOB UART1RXD

12	USBDP	I/O	GPIO (pull down)	ADC6: ADC Input Channel6 High Speed USB Data Positive IIC_SCL_A SPI2CLKB UART1TXD
13	AVSS	G		AUDIO Ground
14	PA8	I/O	GPIO	ADC2: ADC Input Channel2 AIN_AP0: audio adc differential input AP0 ALNK_LRCKA UART2RXB
15	PA7	I/O	GPIO	AIN_AP4: audio adc differential input AP4 MIC_BIASCAP1 ALNK_SCLKA UART2TXB
16	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
17	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
18	PA2	I/O	GPIO (pull up)	Touch1 Long-press reset TMR2 PWM1 ALNK_MCLKA SPI1CLKC UART1RXC
19	PB6	I/O	GPIO (High Voltage Resistant)	
	APAN	O		APA differential output N
20	PB5	I/O	GPIO (High Voltage Resistant)	ALNK_DAT1B SPI2DIB UART1RXB
	APAP	O		APA differential output P

21	VPWR	P		Power supply 5v
22	IOVDD	P		IO Power 3.3v
23	PA0	I/O	GPIO (pull down) (High Voltage Resistant)	TMR0 PWM2
24	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
T _{opt}	Operating temperature	-40	+85	°C
T _{stg}	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	PA2,PA5~PA8 PA11~PA15 PB1,PB2,	PA2,PA5~PA8 PA11~PA15 PB1,PB2, USBDM USBDP	HD=0 : -3 HD=1 : -8 HD=2 : -20 HD=3 : -40~-50	mA	IOVDD = 3.2V
		PA0,PB5,PB6 USBDM USBDP	PA0,PB5,PB6 USBDM USBDP	-8		
V _{OH}	0.9* IOVDD Drive current	PA2,PA5~PA8 PA11~PA15 PB1,PB2,	PA2,PA5~PA8 PA11~PA15 PB1,PB2, USBDM USBDP	HD=0 : 3 HD=1 : 8 HD=2 : 20 HD=3 : 40~50	mA	IOVDD = 3.2V
		PA0,PB5,PB6 USBDM USBDP	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,PA2,PA5~PA8 PA11~PA15 PB1,PB2,PB5,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 default pull up 10K Ω 2、PA0 default pull Down 10K Ω 3、USBDM & USBDP default pull Down 15K Ω 4、internal pull-up /pull-down resistance accuracy $\pm 20\%$
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			$R_L=8\Omega$	
			1.47			$R_L=4\Omega$	
	2.4V		1.43			$R_L=10K$	
			1.03			$R_L=8\Omega$	
			0.77			$R_L=4\Omega$	
SNR	3.7V		99		dB	$R_L=10K$	Differential mode Fin=1kHz/0dB B/W=20Hz~20kHz A-Weighted Filter
			96			$R_L=8\Omega$	
			96			$R_L=4\Omega$	
	2.4V		99			$R_L=10K$	
			96			$R_L=8\Omega$	
			94			$R_L=4\Omega$	
THD+N	3.7V		-73		dB	$R_L=10K$	Differential mode Fin=1kHz/0dB B/W=20Hz~20kHz A-Weighted Filter
			-38			$R_L=8\Omega$	
			-31			$R_L=4\Omega$	
	2.4V		-73			$R_L=10K$	
			-36			$R_L=8\Omega$	
			-30			$R_L=4\Omega$	
Output power	3.7V		0.38		W	$R_L=8\Omega$	Differential mode Fin=1kHz/0dB
			0.54			$R_L=4\Omega$	
	2.4V		0.13			$R_L=8\Omega$	
			0.14			$R_L=4\Omega$	

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	25℃ Power Supply VBAT=3.7V 2441MHz 4 Layers Board
Co-channel Interference Rejection			5		dB	
Adjacent Channel Interference Rejection	+1MHz		-15		dB	
	-1MHz		-20		dB	
	+2MHz		-35		dB	
	-2MHz		-25		dB	
	+3MHz		-30		dB	
	-3MHz		-25		dB	

2M Data Rate

Table 3-8-2-2

Parameter		Min	Typ	Max	Unit	Test Conditions
Sensitivity		-95	-94		dBm	25℃ Power Supply VBAT=3.7V 2441MHz 4 Layers Board
Co-channel Interference Rejection			3		dB	
Adjacent Channel Interference Rejection	+1MHz		6		dB	
	-1MHz		6		dB	
	+2MHz		-20		dB	
	-2MHz		-16		dB	
	+3MHz		-25		dB	
	-3MHz		-30		dB	

3.9 ESD Protection

Table 3-9

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	$\pm 500\text{V}$	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.

4 Package Information

4.1 SSOP24

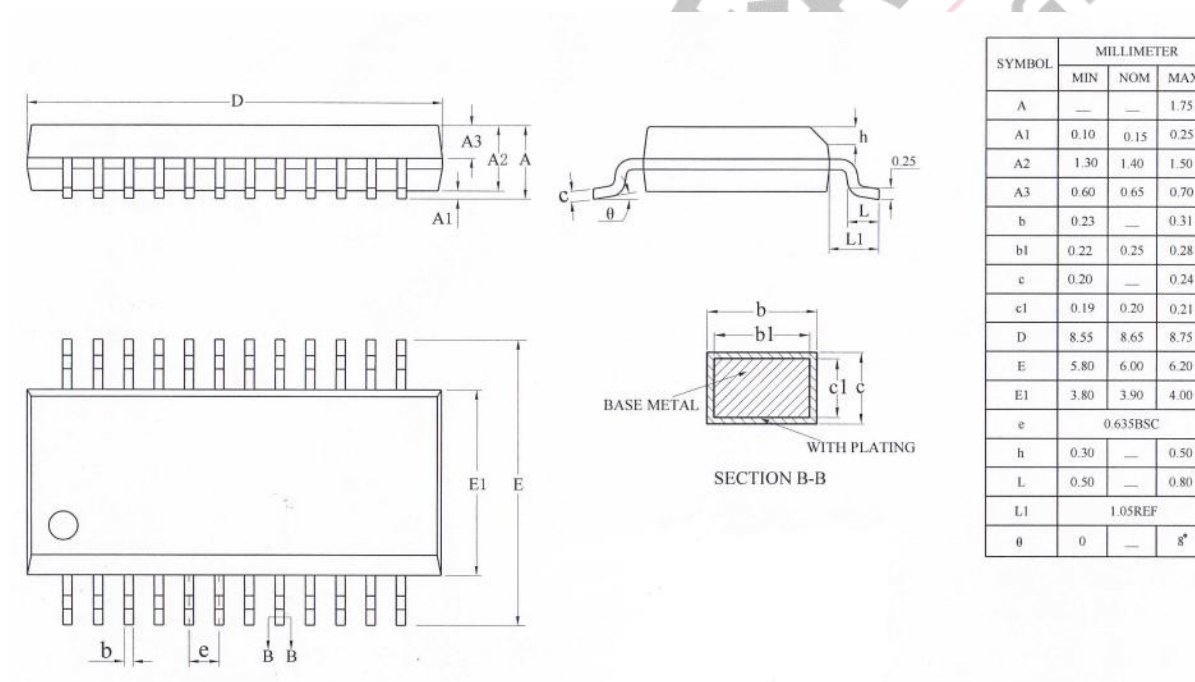
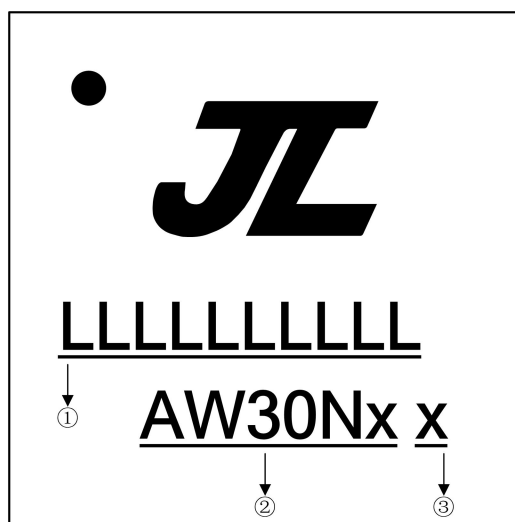


Figure 4-1 AW305A Package

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

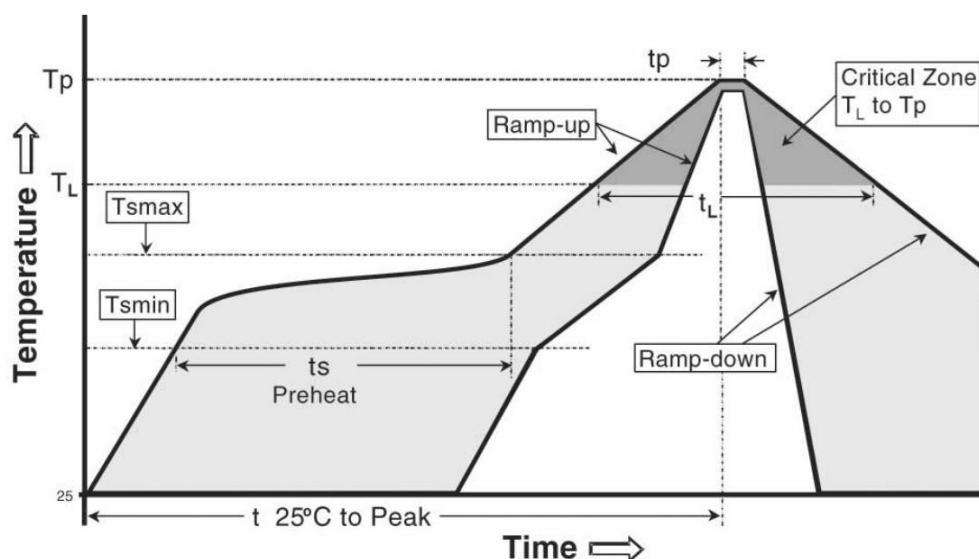


Figure 6-1 Classification Reflow Profile

Classification Profiles

Table 6-1

Profile Feature		Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat/ Soak	Temperature Min (T_{smin})	100°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 6-2

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 6-3**

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

*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