

AC2005B Datasheet

Version 1.0

Date 2026.08.03

Revision History

Date	Revision	Description
2026.08.03	V1.0	Initial Release



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AC2005B Features

SYSTEM

- 32-bit DSP 307.2MHz
- With IEEE754 Single precision FPU
- Support FFT/MATH
- I-cache and D-cache
- Support EMU
- On-chip SRAM 176kbyte
- 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 MIC ENC
- Multi-band DRC
- Multi-band EQ
- Support spatial sound

Audio

- 1 x 24-bit DAC
 - ❖ SNR 114dB
 - ❖ Noise 2uVrms
 - ❖ Support single mode
 - ❖ Sampling rate 8~384kHz
- 1 x 24bit ADC
 - ❖ SNR 100dB
 - ❖ Sampling rate 8~192kHz
 - ❖ support analog/digital microphone
 - ❖ Support AMUX
- I²S/TDM Master/Slave interface

Bluetooth

- Dual-mode BT6.0 with LE Audio (DN Q332415)
- Support AoA TX
- Support LE audio BIS/CIS
- Maximum transmitting power 12dBm

- Receiver sensitivity
 - ❖ -93.5dBm @BR
 - ❖ -94.5dBm @EDR $\pi/4$ DQPSK
 - ❖ -86.5dBm @EDR 8DPSK

Analog FM

- RX support stereo/mono
 - ❖ Frequency 50 - 108MHz
 - ❖ Sensitivity TBD
- TX support stereo/mono
 - ❖ Frequency 50 - 108MHz

Peripherals

- 1 x Full speed USB
- 1 x SD host controller
- 6 x GPMulti-function 32bit timer
- 1 x ADVMulti-function 32bit timer
- 3 x UART interface
- 1 x I²C Master/Slave interface
- 2 x SPI Master/Slave interface
- 1 x QDEC
- 1 x 10-bit ADC(12 Channels)
- 12 x GPIO Support function remapping

PMU

- Integrated battery charger up to 300mA
- 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

- QSOP24

Temperature

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

Applications

- Auracast Speaker
- Soundbar
- Party box
- Outdoor Speaker
- Car Audio
- Gaming Speaker



1 Block Diagram

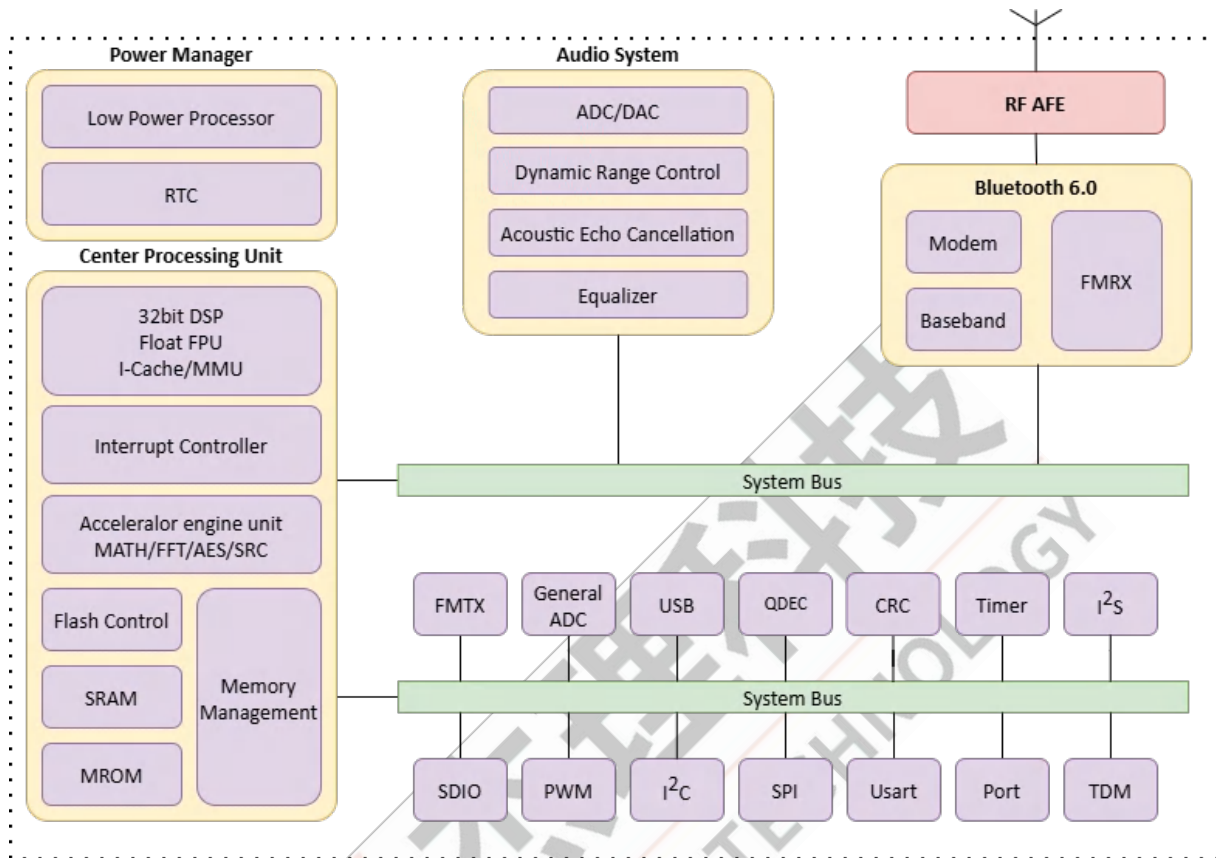


Figure 1-1 AC2005B Block Diagram

2 Pin Definition

2.1 Pin Assignment

PA10	1	24	FMVSS
PA9	2	23	XOSCI/PA11
USBDM	3	22	BTRF
USBDP	4	21	FMIP
PA4/PA8	5	20	VSS
PA3/PA7	6	19	PB1
PA2	7	18	IOVDD
PA1/PA6	8	17	VBAT
PA0/PA5	9	16	VPWR
AVSS	10	15	PB4/PP2
VCM	11	14	PB5
DACL	12	13	PB6

Figure 2-1 AC2005B Pin Assignment

2.2 Pin Description

Table 2-2-1 AC2005B Pin Description

Pin No.	Name	Type	IO Initial State	Description
1	PA10	I/O	--	ADC5 (ADC Input Channel 5)
2	PA9	I/O	--	ADC4 (ADC Input Channel 4)
3	USBDM	I/O	15kΩ Pull-down	ADC15 (ADC Input Channel 15) USB Negative Data
4	USBDP	I/O	15kΩ Pull-down	ADC14 (ADC Input Channel 14) USB Positive Data
5	PA4	I/O	--	AUX1(Audio ADC Input)
	PA8	I/O	--	ADC3(ADC Input Channel 3)
6	PA3	I/O	--	AUX0(Audio ADC Input)
	PA7	I/O	--	ADC2(ADC Input Channel 2)
7	PA2	I/O	--	MICBIASA(MIC Bias Output) MICLDO(MIC Bias LDO Output) MIC_B0(Audio ADC Input)
8	PA1	I/O	--	AUX2(Audio ADC Input) AIN_AN(Audio ADC Negative Input)
	PA6	I/O	--	ADC1(ADC Input Channel 1)
9	PA0	I/O	--	MIC_A0(Audio ADC Input) AUX3(Audio ADC Input)
	PA5	I/O	--	ADC0(ADC Input Channel 0)
10	AVSS	G	--	Audio Ground
11	VCM	P	--	Audio reference voltage
12	DACL	O	--	Left Channel DAC Output
13	PB6	I/O	--	ADC11(ADC Input Channel 11) SPI0_DATA2A/SPI0_DATA3B
14	PB5	I/O	--	ADC10(ADC Input Channel 10) SPI0_DATA3A/SPI0_DATA2B
15	PB4	I/O	--	FM_TX ADC9(ADC Input Channel 9)
	PP2	P	--	SDPower
16	VPWR	I/O	--	Charge Power Input
17	VBAT	P	--	Battery Input
18	IOVDD	P	--	IO Power
19	PB1	I/O	10kΩ Pull-up	Hold down0 toreset ADCP0(ADC Input Channel P0)
20	VSS	G	--	Ground
21	FMIP	I	--	FM Postive Input
22	BTRF	RF	--	Bluetooth RF Antenna

Pin No.	Name	Type	IO Initial State	Description
23	XOSCI	I	--	Crystal Oscillator Input
	PA11	I/O	--	ADC6 (ADC Input Channel 6)
24	FMVSS	G	--	FM 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, MCPWM, QDEC, UART, LEDC, IIC, IIS, SPI and SD functions can be remapped to any I/O.
- 3.If the ADCP0 function is enabled,the IO will be pulled down by 200kΩ resistor

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

2.3 Pin Specialist

Table 2-3-1 Pin keep Description

Pin	Description for IOVDD power off mode
PB1	keep IO state in IOVDD power off mode
VPWR	Keep detection of charging insertion in IOVDD power off mode
Others IO	IO state loss in IOVDD power off mode

3 Electrical Characteristics

3.1 Absolute Maximum Ratings

Table 3-1 Absolute Maximum Ratings

Symbol	Parameter	Min	Max	Unit
T _{opt}	Operating temperature	-40	+85	°C
T _{stg}	Storage temperature	-65	+150	°C
VBAT	Supply Voltage	-0.3	5.5*	V
VPWR		-0.3	6	V
IOVDD		-0.3	3.6	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.
2. When VBAT is in the range of 4.5–5.5V, VPWR will connect to weak pull-up.

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	±200V	All pins(except XOSCI)	JEDEC EIA/JESD22-A115
	±150V	XOSCI	
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	--	--	180	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
		4.375	4.4	4.425	V
CC	CC Mode Current	40	--	300	mA
I _{end}	End Of Charge Current	4	--	30	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	VPWR PA0~PA11 PB1 PB4~PB6 USBDP USBDM	-0.3	1.0	V
V _{IH}	High-Level Input Voltage	IOVDD = 3.0V	PA0~PA11 PB1 PB4~PB6 USBDP USBDM	2.0	3.3	V
		IOVDD = 3.0V	VPWR	2.0	5.5	V
Output Characteristics						
Symbol	Parameter	Conditions	IO	Typ	Unit	
I _{OL}	Output Current	IOVDD = 3.0V Voutput = 0.3V	VPWR	2	mA	
		IOVDD = 3.0V Voutput = 0.3V	PB4	1(HD=0) 4(HD=1) 8(HD=2) 64(HD=3)	mA	
		IOVDD = 3.0V Voutput = 0.3V	PA0~PA11 PB1 PB5~PB6	1(HD=0) 4(HD=1) 8(HD=2) 32(HD=3)	mA	
		IOVDD = 3.0V Voutput = 0.3V	USBDP USBDM	10	mA	
I _{OH}	Output Current	IOVDD = 3.0V Voutput = 2.7V	VPWR	2	mA	
		IOVDD = 3.0V	PB4	1(HD=0)	mA	

		Voutput = 2.7V		4(HD=1) 8(HD=2) 64(HD=3)	
		IOVDD = 3.0V Voutput = 2.7V	PP2	120	mA
		IOVDD = 3.0V Voutput = 2.7V	PA0~PA11 PB1 PB5~PB6	1(HD=0) 4(HD=1) 8(HD=2) 32(HD=3)	mA
		IOVDD = 3.0V Voutput = 2.7V	USBDP USBDM	10	mA
Internal Resistance Characteristics					
Symbol	Parameter	Conditions	IO	Typ	Unit
R _{pu}	Pull-up Resistance	IOVDD = 3.0V	VPWR PA0~PA11 PB1 PB4~PB6	5k(PU=1) 10k(PU=2) 200K(PU=3)	Ω
		IOVDD = 3.0V	USBDP	1.5k 5k(PU=1) 10k(PU=2) 200K(PU=3)	Ω
		IOVDD = 3.0V	USBDM	180k 5k(PU=1) 10k(PU=2) 200K(PU=3)	Ω
R _{pd}	Pull-down Resistance	IOVDD = 3.0V	VPWR PA0~PA11 PB1 PB4~PB6	5k(PD=1) 10k(PD=2) 200K(PD=3)	Ω
		IOVDD = 3.0V	USBDP USBDM	15k 5k(PD=1) 10k(PD=2) 200K(PD=3)	Ω

Note

1.Internal pull-up/pull-down resistance accuracy $\pm 20\%$

3.6 Audio DAC Characteristics

Table 3-6-1 Mono DAC Characteristics

Parameter	Conditions		Min	Typ	Max	Unit
Resolution	--		--	24	--	bits
Input Sample Rate	--		8	--	384	kHz
SNR ^①	Single-ended Mode	Load=10kΩ	--	114	--	dB

	Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted					
Dynamic Range	Single-ended Mode Fin=1kHz@-60dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted	Load=10kΩ	--	104	--	dB
THD+N	Single-ended Mode Fin=1kHz@-0.5dBFS* Fs=44.1kHz B/W=20Hz~20kHz A-Weighted	Load=10kΩ	--	-80	--	dB
Noise Floor	Single-ended Mode Fs=44.1kHz B/W=20Hz~20kHz A-Weighted	Load=10kΩ	--	6.5	--	uVrms
Noise Floor with MUTE	Single-ended Mode Fs=44.1kHz B/W=20Hz~20kHz A-Weighted	Load=10kΩ	--	2.0	--	uVrms
Max Output Level	Single-ended Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted THD+N<0.1%	Load=10kΩ	--	1	--	Vrms

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
Input Sample Rate	--	8	--	192	kHz
SNR	Differential input Mode Fin=1kHz@2Vrms input Fs=44.1kHz B/W=20Hz~20kHz A-Weighted ADC gain=0dB	--	103	--	dB
	Single-ended input Mode Fin=1kHz@1Vrms input Fs=44.1kHz B/W=20Hz~20kHz A-Weighted ADC gain=0dB	--	100	--	dB
Dynamic Range	Differential input Mode	--	103	--	dB

	Fin=1kHz@2mVrms input Fs=44.1kHz B/W=20Hz~20kHz A-Weighted ADC gain=0dB				
	Single-ended input Mode Fin=1kHz@1mVrms input Fs=44.1kHz B/W=20Hz~20kHz A-Weighted ADC gain=0dB	--	100	--	dB
THD+N	Differential input Mode Fin=1kHz@2Vrms input Fs=44.1kHz B/W=20Hz~20kHz A-Weighted ADC gain=0dB	--	-85	--	dB
	Single-ended input Mode Fin=1kHz@1Vrms input Fs=44.1kHz B/W=20Hz~20kHz A-Weighted ADC gain=0dB	--	-80	--	dB
Analogue Gain	--	-3	--	33	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	BR	--	9	12	dBm
Maximum RF Transmit Power	EDR $\pi/4$ DQPSK EDR 8DPSK	--	9	--	dBm
Relative Transmit Power	EDR $\pi/4$ DQPSK EDR 8DPSK	--	1	--	dB
Maximum RF Transmit Power	BLE-1Mbps	--	9	--	dBm
1 σ of Maximum RF Transmit Power distribution	BR/EDR/BLE	--	2	--	dB

3.8.2 Receiver

Table 3-8-2 Receiver characteristics

Parameter	Conditions	Min	Typ	Max	Unit
Sensitivity	BR	--	-93.5	--	dBm
	EDR $\pi/4$ DQPSK	--	-94.5	--	dBm
	EDR 8DPSK	--	-86.5	--	dBm
	BLE-1Mbps	--	-96.5	--	dBm
	BLE-2Mbps	--	-93.5	--	dBm
1 σ of sensitivity distribution	BR/EDR/BLE	--	2	--	dB

3.9 Radio Characteristics

3.9.1 Analog FM Receiver

Table 3-9-1 FM receiver characteristics

Parameter	Conditions	Min	Typ	Max	Unit
Frequency range	--	50	--	108	MHz
Sensitivity	f MOD = 1 kHz, $\Delta f = 22.5 \text{ kHz}, (S+N)/N$ = 26dB, MONO	--	TBD	--	uV EMF

3.9.2 Analog FM Transmitter

Table 3-9-2 FM transmitter characteristics

Parameter	Conditions	Min	Typ	Max	Unit
Frequency range	--	50	--	108	MHz
Transmitter power	--	--	TBD	--	dBm

4 Package Information

4.1 QSOP24

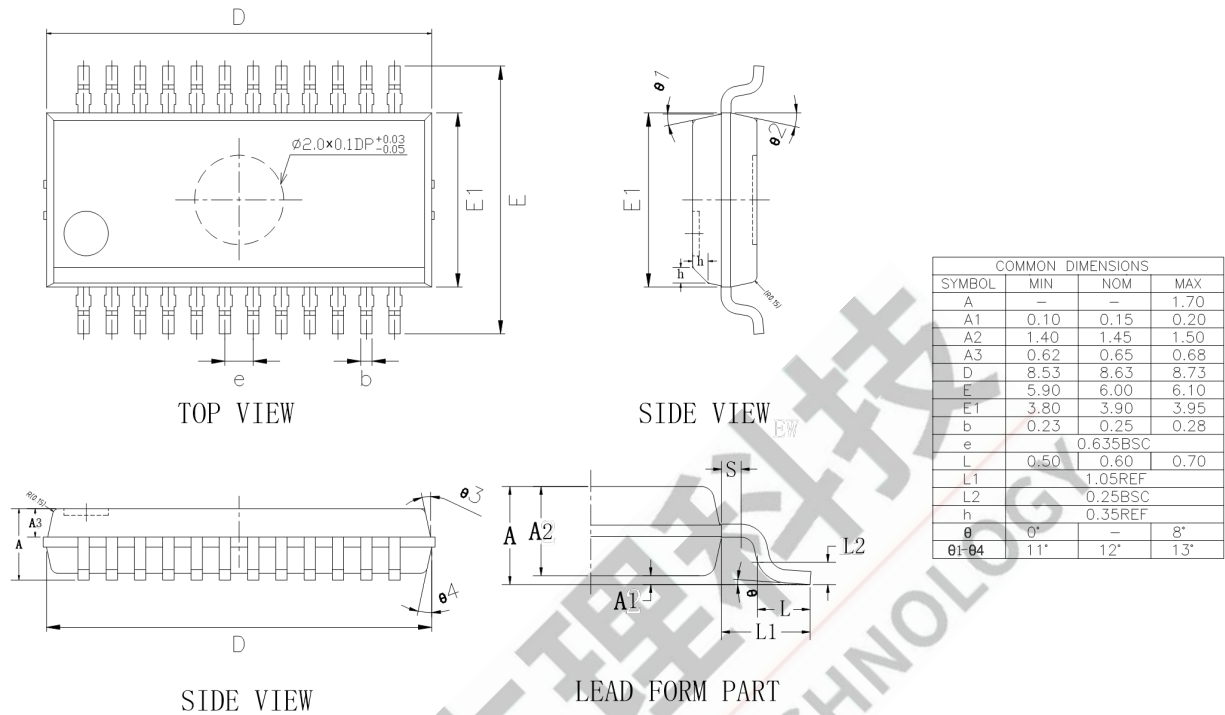


Figure 4-1 AC2005B Package

5 IC Marking Information

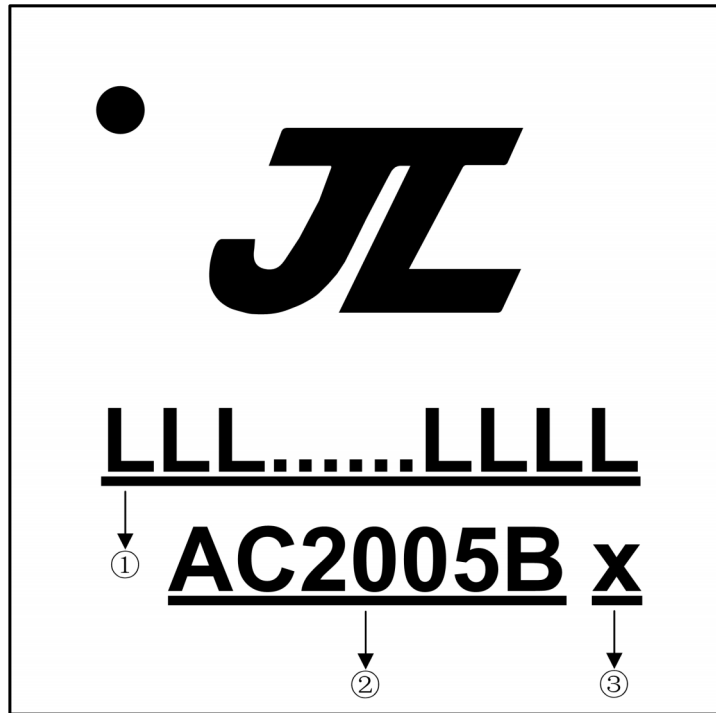


Figure 5-1 AC2005B Package Outline

- ① LLL.....LLLL Production Batch
- ② AC2005B Chip Model
- ③ x Built-in flash size
8 8Mbit Flash

6 Solder-Reflow Condition

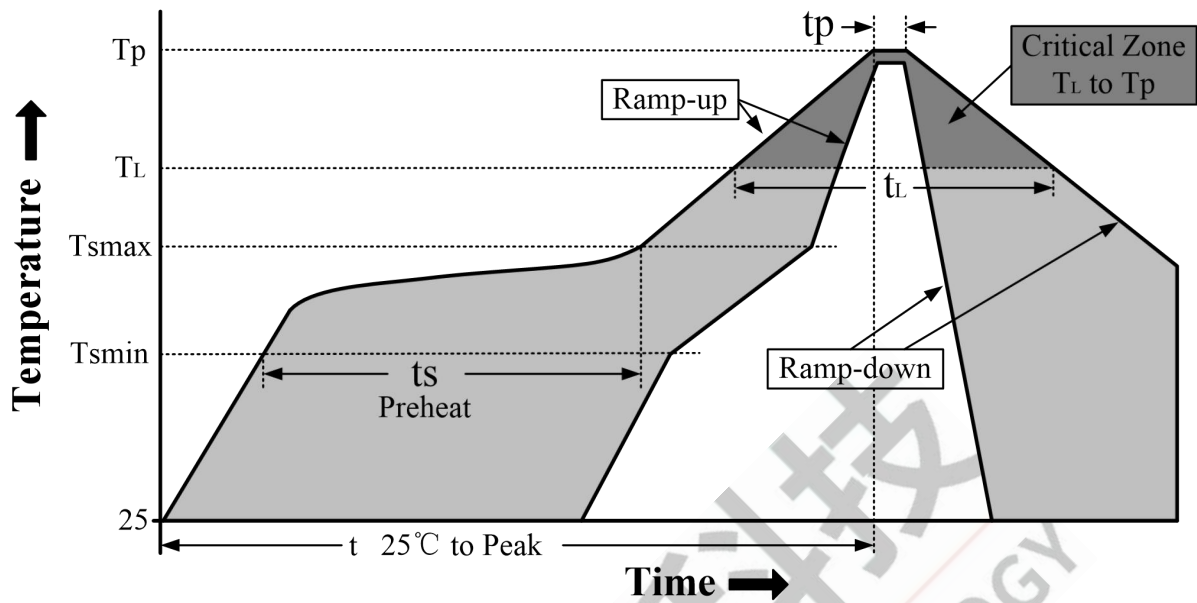


Figure 6-1 Classification Reflow Profile

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 < 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

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.