

AW306A Datasheet

Zhuhai Jieli Technology Co.,LTD

Version 2.0

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Revision History

| Date | Revision | Description |
|------------|----------|--|
| 2023.12.08 | V1.0 | Initial Release |
| 2023.12.14 | V1.1 | Update APA Characteristics Update BT Characteristics |
| 2024.01.24 | V1.2 | Update Features Update Pin Description |
| 2024.02.28 | V1.3 | Update Datasheet Format And Content |
| 2024.05.13 | V1.4 | Update Features Update Pin Description |
| 2024.08.12 | V1.5 | Update BT Transmitter characteristics Update IC Marking Information |
| 2025.01.17 | V2.0 | Update Features_Bluetooth |

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AW306A Features

SYSTEM

- 32bit DSP 240MHz
- Support AES128
- I-cache
- Support EMU
- On-chip SRAM 80kbyte
- Support MPU
- Built-In Flash
- 24MHz crystal oscillator
- 32.768kHz crystal oscillator
- Internal RC oscillator, PLL

DSP Audio Processing

- SBC/SPEEX/OPUS/MP2/UMP3/MP3/MIDI/F1 A/ADPCM/A codec
- mSBC voice codec

Audio

- 1 x 16bit DAC
 - ❖ SNR 91dB
 - ❖ Noise 16uVrms
 - ❖ Sampling rate 8~96kHz
- 1 x 16bit ADC
 - ❖ SNR 95dB
 - ❖ Sampling rate 8~48kHz
- 1 x 16bit Class-D Speaker Driver
 - ❖ SNR 98dB
 - ❖ Sampling rate 32~48kHz
 - ❖ Drive speaker directly 320mW @ 8Ω
- I²S interface

Bluetooth

- BLE6.0 +2.4GHz-Proprietary (DN Q334307)
- Support AoA Transmitter
- Support long range BLE
- Maximum transmitting power 8 dBm
- Receiver sensitivity
 - ❖ -97dBm @BLE-1Mbps
 - ❖ -94dBm @BLE-2Mbps
 - ❖ -100dBm @BLE-S2

❖ -105dBm @BLE-S8

Peripherals

- 1 x Full speed USB
- 1 x SD host controller
- 4 x Multi-function 16bit timer
- 3 x UART interface
- 1 x I²C Master/Slave interface
- 3 x SPI Master/Slave interface
- 1 x 12bit 1Msps ADC(9 Channel)
- 23 x GPIO Support function remapping
- 1 x CAN controller
- 6 x MCPWM
- 8 x Touchkey

PMU

- VPWR range 2.7V to 5.5V
- IOVDD range 1.8V 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

- Bluetooth TV remote controller
- Bluetooth intercom

1 Block Diagram

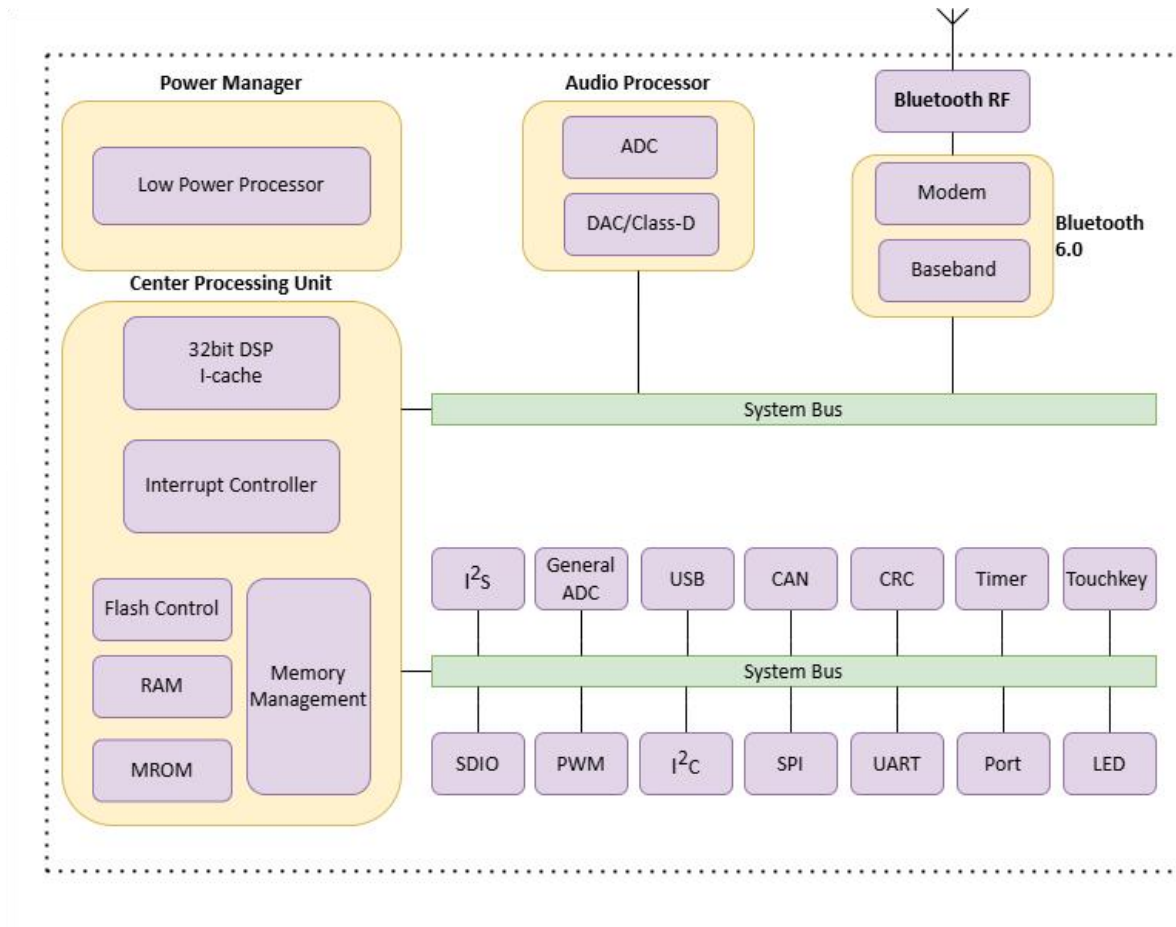


Figure 1-1 AW306A Block Diagram

2 Pin Definition

2.1 Pin Assignment

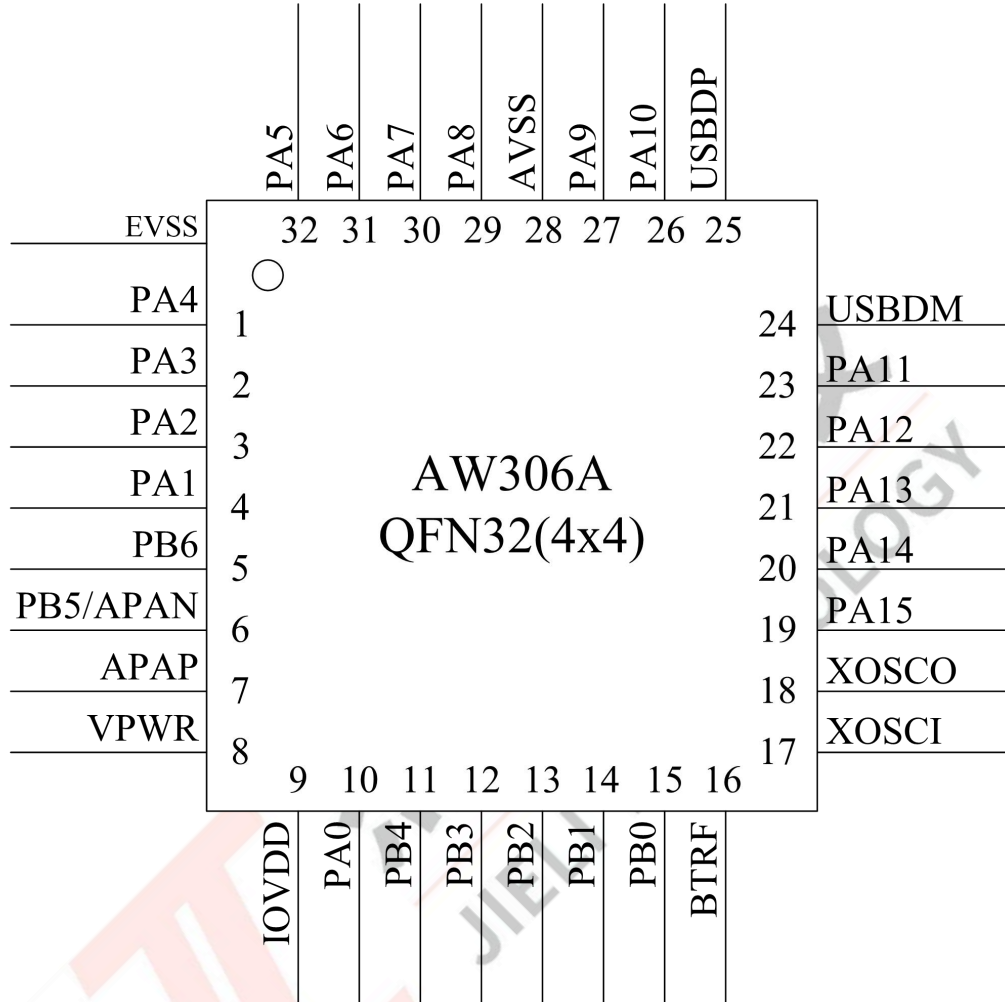


Figure 2-1 AW306A Pin Assignment

2.2 Pin Description

Table 2-2-1 AW306A Pin Description

| Pin No. | Name | Type | IO Initial State | Description |
|---------|-------|------|------------------|--|
| 1 | PA4 | I/O | Z | ADC0(ADC Input Channel 0) AIN_AP1(Audio ADC Positive Input) |
| 2 | PA3 | I/O | Z | Touch2 |
| 3 | PA2 | I/O | 10kΩ Pull-up | Touch1 Hold down 0 to reset |
| 4 | PA1 | I/O | Z | LVD(External Low Voltage Detection Input) Touch0 |
| 5 | PB6 | I/O | Z | -- |
| 6 | PB5 | I/O | Z | -- |
| | APAN | O | Z | Class-D Speaker Driver Negative Output |
| 7 | APAP | O | Z | Class-D Speaker Driver Positive Output |
| 8 | VPWR | P | -- | Battery Input |
| 9 | IOVDD | P | -- | IO Power |
| 10 | PA0 | I/O | 15kΩ Pull-down | -- |
| 11 | PB4 | I/O | Z | Touch7 |
| 12 | PB3 | I/O | Z | Touch6 |
| 13 | PB2 | I/O | Z | Touch5 32.768k Crystal Oscillator Output |
| 14 | PB1 | I/O | Z | Touch4 32.768k Crystal Oscillator Input |
| 15 | PB0 | I/O | 10kΩ Pull-up | Touch3 MCLR(Device Reset) |
| 16 | BTRF | RF | -- | Bluetooth RF Antenna |
| 17 | XOSCI | I | -- | Crystal Oscillator Input |
| 18 | XOSCO | O | -- | Crystal Oscillator Output |
| 19 | PA15 | I/O | Z | ADC5(ADC Input Channel 5) SPI0_DIB(1) |
| 20 | PA14 | I/O | Z | ADC4(ADC Input Channel 4) SPI0_DOB(0) |
| 21 | PA13 | I/O | Z | ADC3(ADC Input Channel 3) SPI0_CLKB |
| 22 | PA12 | I/O | Z | AINN(ADC Negative Input) SPI0_DATB(3) |
| 23 | PA11 | I/O | Z | AINP(ADC Positive Input) SPI0_DATB(2) |
| 24 | USBDM | I/O | 15kΩ Pull-down | ADC7(ADC Input Channel 7) |
| 25 | USBDP | I/O | 15kΩ Pull-down | ADC6(ADC Input Channel 6) |

| Pin No. | Name | Type | IO Initial State | Description |
|---------|------|------|------------------|--|
| 26 | PA10 | I/O | Z | -- |
| 27 | PA9 | I/O | Z | -- |
| 28 | AVSS | G | -- | AUDIO Ground |
| 29 | PA8 | I/O | Z | ADC2(ADC Input Channel 2) AIN_AP0(Audio ADC Positive Input) |
| 30 | PA7 | I/O | Z | AIN_AP4(Audio ADC Positive Input) MICBIASC(MIC Bias Output) |
| 31 | PA6 | I/O | Z | AIN_AP3(Audio ADC Positive Input) AIN_AN(Audio ADC Negative Input) |
| 32 | PA5 | I/O | Z | ADC1(ADC Input Channel 1) AIN_AP2(Audio ADC Positive Input) DAC Output |

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, UART, I²C, I²S, SPI1/2, SD, CAN 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 |
| VPWR | Supply Voltage | -0.3 | 6.0 | V |
| IOVDD | | -0.3 | 3.6 | V |
| GPIO | Input voltage of GPIO (except PA0/PB5/PB6) | -0.3 | 3.6 | V |
| HVTIO | Input voltage of HVT-IO (PA0/PB5/PB6) | -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 | ±4kV | All pins | JEDEC EIA/JESD22-A114 |
| Machine Mode | ±200V | All pins | JEDEC EIA/JESD22-A115 |
| Charge Device Model | ±2kV | All pins | ANSI/ESDA/JEDEC JS-002-2022 |

3.3 PMU Characteristics

Table 3-3-1 PMU Characteristics under VPWR supply

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|----------------|-----------------|------------------------|-----|-----|-----|------|
| VPWR | Power supply | -- | 2.7 | -- | 5.5 | V |
| Operating mode | | | | | | |
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
| IOVDD | Voltage output | -- | -- | 3.0 | -- | V |
| | Loading current | IOVDD=3.0V@VPWR = 3.7V | -- | -- | 120 | mA |
| Low Power mode | | | | | | |
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
| IOVDD | Loading current | IOVDD=3.0V@VPWR = 3.7V | -- | -- | 10 | mA |

Table 3-3-2 PMU Characteristics under IOVDD supply

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------|--------------|------------|-----|-----|-----|------|
| IOVDD | Power supply | -- | 1.8 | -- | 3.6 | V |

3.4 IO Characteristics

Table 3-4 IO Characteristics

| Input Characteristics | | | | | | |
|-------------------------------------|--------------------------|--------------------------------|---------------------------------------|--|------|------|
| Symbol | Parameter | Conditions | IO | Min | Max | Unit |
| V _{IL} | Low-Level Input Voltage | IOVDD = 3.0V | PA0~PA15 PB0~PB6 USBDP USBDM | -0.3 | 1.4 | V |
| V _{IH} | High-Level Input Voltage | IOVDD = 3.0V | PA1~PA15 PB0~PB4 USBDP USBDM | 1.7 | 3.3 | V |
| | | IOVDD = 3.0V | PA0 PB5 PB6 | 1.7 | 5.5 | V |
| Output Characteristics | | | | | | |
| Symbol | Parameter | Conditions | IO | Typ | Unit | |
| I _{OL} | Output Current | IOVDD = 3.0V Voutput = 0.3V | PA1~PA15 PB0~PB4 | 3(HD=0) 9(HD=1) 21(HD=2) 54(HD=3) | mA | |
| | | IOVDD = 3.0V Voutput = 0.3V | PA0 PB5 PB6 USBDP USBDM | 8 | mA | |
| I _{OH} | Output Current | IOVDD = 3.0V Voutput = 2.7V | PA1~PA15 PB0~PB4 | 3(HD=0) 9(HD=1) 21(HD=2) 54(HD=3) | mA | |
| | | IOVDD = 3.0V Voutput = 2.7V | PA0 PB5 PB6 USBDP USBDM | 8 | mA | |
| Internal Resistance Characteristics | | | | | | |
| Symbol | Parameter | Conditions | IO | Typ | Unit | |
| R _{pu} | Pull-up Resistance | IOVDD = 3.0V | PA0~PA15 PB0~PB6 | 10k(PU=1) 100k(PU=2) 1M(PU=3) | Ω | |
| | | IOVDD = 3.0V | USBDP | 1.5k | Ω | |
| | | IOVDD = 3.0V | USBDM | 180k | Ω | |

| Symbol | Parameter | Conditions | IO | Typ | Unit |
|-----------------|----------------------|--------------|---------------------|-------------------------------------|------|
| R _{pd} | Pull-down Resistance | IOVDD = 3.0V | PA0~PA15 PB0~PB6 | 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 $\pm 20\%$.

3.5 Audio DAC Characteristics

Table 3-5 Audio DAC Characteristics

| Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------|--|-----|-----|-----|-------|
| Resolution | -- | -- | 16 | -- | bits |
| Output Sample Rate | -- | 8 | -- | 96 | kHz |
| SNR | Single-ended Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted Load=100kΩ | -- | 91 | -- | dB |
| Dynamic Range | Single-ended Mode Fin=1kHz@-60dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted Load=100kΩ | -- | 91 | -- | dB |
| THD+N | Single-ended Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted Load=100kΩ | -- | -83 | -- | dB |
| Noise Floor | Single-ended Mode B/W=20Hz~20kHz A-Weighted Load=100kΩ | -- | 16 | -- | uVrms |
| Max Amplitude | Single-ended Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted Load=100kΩ THD+N<0.1% | -- | 0.6 | -- | Vrms |

3.6 Audio ADC Characteristics

Table 3-6 Audio ADC Characteristics

| Parameter | Conditions | Min | Typ | Max | Unit |
|-------------------|--|-----|-----|-----|------|
| Resolution | -- | -- | 16 | -- | bits |
| Input Sample Rate | -- | 8 | -- | 48 | kHz |
| SNR | Differential Input Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted ADC Gain=0dB | -- | 95 | -- | dB |
| | Single-ended Input Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted ADC Gain=0dB | -- | 92 | -- | dB |
| Dynamic Range | Differential Input Mode Fin=1kHz@-60dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted ADC Gain=0dB | -- | 95 | -- | dB |
| | Single-ended Input Mode Fin=1kHz@-60dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted ADC Gain=0dB | -- | 92 | -- | dB |
| THD+N | Differential Input Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted ADC Gain=0dB | -- | -85 | -- | dB |
| | Single-ended Input Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted ADC Gain=0dB | -- | -80 | -- | dB |
| Analogue Gain | -- | -6 | -- | 21 | dB |
| Max Input Level | Differential Input Mode ADC Gain=0dB | -- | 2 | -- | Vrms |
| | Single-ended Input Mode ADC Gain=0dB | -- | 1 | -- | Vrms |

3.7 Class-D Speaker Driver Characteristics

Table 3-7 Class-D Speaker Driver Characteristics under HPVDD 3.7V

| Parameter | Conditions | Min | Typ | Max | Unit |
|---------------|---|-----|-----|-----|-------|
| SNR | Differential Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted Load=10kΩ | -- | 98 | -- | dB |
| | Differential Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted Load=8Ω | -- | 98 | -- | dB |
| THD+N | Differential Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted Load=10kΩ | -- | -73 | -- | dB |
| | Differential Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted Load=8Ω | -- | -37 | -- | dB |
| Noise Floor | Differential Mode B/W=20Hz~20kHz A-Weighted Load=10kΩ | -- | 30 | -- | uVrms |
| | Differential Mode B/W=20Hz~20kHz A-Weighted Load=8Ω | -- | 20 | -- | uVrms |
| Dynamic Range | Differential Mode Fin=1kHz@-60dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted Load=10kΩ | -- | 88 | -- | dB |
| | Differential Mode Fin=1kHz@-60dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted Load=8Ω | -- | 88 | -- | dB |

3.8 12bit ADC Characteristics

Table 3-8 12bit ADC Characteristics

| Parameter | Conditions | Min | Typ | Max | Unit |
|--|--------------------------------|------|---------|------|-------------|
| AVDD(ADC Supply Voltage) | AVDD=IOVDD | 1.8 | 3 | 3.3 | V |
| f_{ADC} (ADC Clock Frequency) | -- | 0.25 | -- | 14 | MHz |
| T_s (ADC Sampling Time) | -- | 1.5 | -- | -- | $1/f_{ADC}$ |
| ADC Conversion Time | Including Sampling Time | 8 | -- | 14 | $1/f_{ADC}$ |
| ADC Input Voltage Range | -- | 0 | -- | AVDD | V |
| ADC Internal Sample and Hold Capacitor | -- | -- | 5 | -- | pF |
| Sampling Switch Resistance | -- | -- | -- | 1 | k Ω |
| External Input Impedance | $T_s=1.5/f_{ADC}$ | -- | -- | 1.5 | k Ω |
| | $T_s \geq 50/f_{ADC}$ | -- | -- | 50 | k Ω |
| ADC Resolution | Programmable | 6 | 12 | 12 | bit |
| INL | AVDD=3V, $f_{ADC}=14$ MHz | -- | ± 2 | -- | LSB |
| DNL | AVDD=3V, $f_{ADC}=14$ MHz | -- | ± 1 | -- | LSB |
| ADC Offset Error | AVDD=3V, $f_{ADC}=14$ MHz | -- | 3 | -- | LSB |
| Gain Error | AVDD=3V, $f_{ADC}=14$ MHz | -- | 3 | -- | LSB |
| Current Consumption in Conversion Mode | Single-ended, $f_{ADC}=14$ MHz | -- | 350 | -- | μ A |

3.9 BT Characteristics

3.9.1 Transmitter

Table 3-9-1 Transmitter characteristics

| Parameter | Conditions | Min | Typ | Max | Unit |
|---------------------------|------------|-----|-----|-----|------|
| Maximum RF Transmit Power | BLE-1Mbps | -- | 0 | 8 | dBm |

3.9.2 Receiver

Table 3-9-2 Receiver characteristics

| Parameter | Conditions | Min | Typ | Max | Unit |
|-------------|------------|------|------|-----|------|
| Sensitivity | BLE-1Mbps | -- | -97 | -- | dBm |
| | BLE-2Mbps | -95 | -94 | -- | dBm |
| | BLE-S2 | -100 | -99 | -- | dBm |
| | BLE-S8 | -105 | -104 | -- | dBm |

4 Package Information

4.1 QFN32_4×4mm

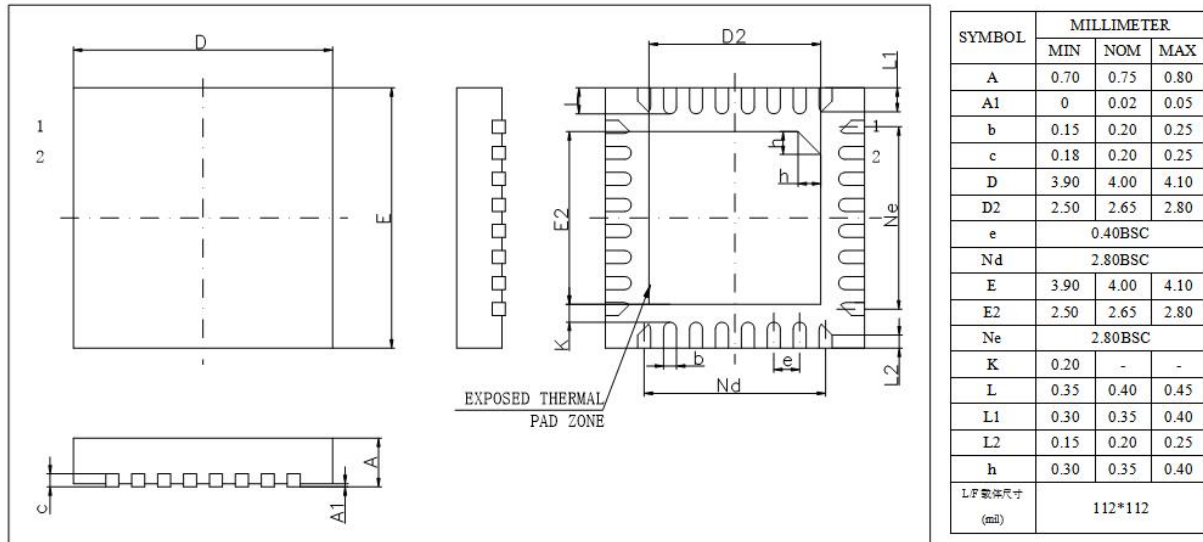


Figure 4-1 AW306A Package

5 IC Marking Information

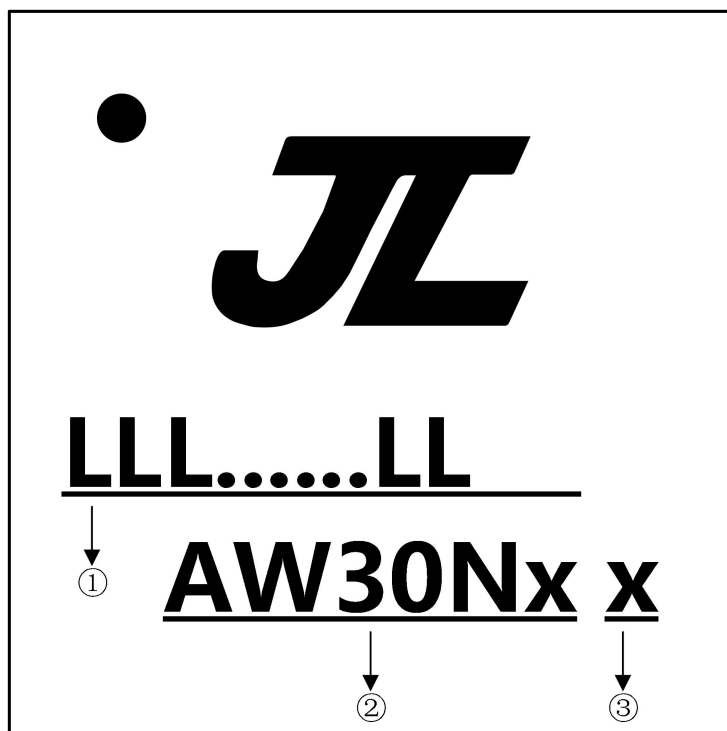


Figure 5-1 AW306A Package Outline

- ① LLL.....LL Production Batch
- ② AW30Nx Chip Model
- ③ x Built-in flash size
 - 0 No Flash Memory
 - 2 2Mbit Flash
 - 4 4Mbit Flash

6 Solder-Reflow Condition

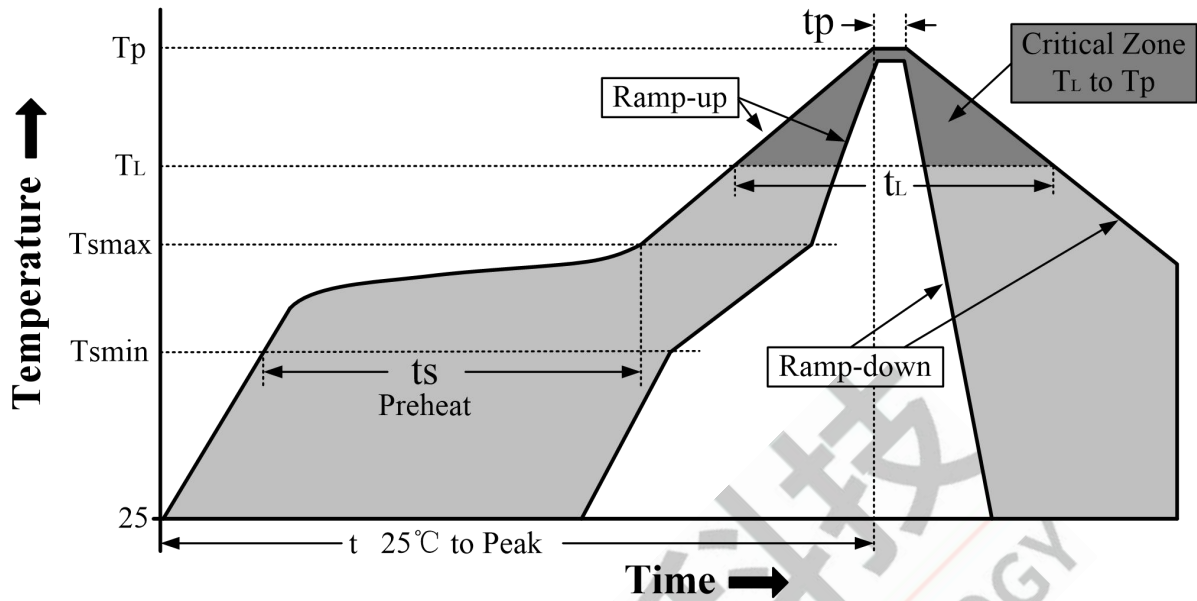


Figure 6-1 Classification Reflow Profile

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 |
| Liquidus 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.