

AW312A Datasheet

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Revision History

Date	Revision	Description
2024.04.12	V1.0	Initial Release



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AW312A Features

SYSTEM

- 32bit CPU 160MHz
- Support MATH/AES128
- I-cache
- Support EMU
- On-chip SRAM 32kbyte
- Support MPU
- Support UDMA
- Built-In Flash
- 24MHz crystal oscillator
- Internal low jitter low power RC oscillator
- Internal PLL

Bluetooth

- BLE5.4 +2.4GHz-Proprietary (QDID 223418)
- Support AoA Transmitter
- Support long range BLE
- Maximum transmitting power 9dBm
- Receiver sensitivity
 - ❖ -93dBm @BLE-1Mbps
 - ❖ -90dBm @BLE-2Mbps
 - ❖ -96dBm @BLE-S2
 - ❖ -101dBm @BLE-S8

Peripherals

- 1 x Full speed USB
- 4 x Multi-function 32bit timer
- 1 x IR RX/TX
- 3 x UART interface
- 1 x I²C Master/Slave interface
- 2 x SPI Master/Slave interface
- 1 x QDEC
- 4 x MCPWM
- 2 x LEDC
- 1 x 10bit ADC(11 Channel)
- 10 x GPIO Support function remapping

PMU

- Support temperature sensor
- VPWR range 2.7V to 5.5V
- IOVDD range 1.8V to 3.6V
- Deep sleep mode (IOVDD @3.0V)
 - ❖ 170nA (External wakeup)
 - ❖ 1.37uA (32kHz RC OSC+wakeup)
 - ❖ 2.9uA (32kHz RC OSC+wakeup+16k retention SRAM)

Packages

- SOP16

Temperature

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

Applications

- Mouse devices
- Non-audio remote controller
- Selfie stick
- Page turner
- Adaptive USB
- Bluetooth mouldle
- Price tag and other diversified IOT product

1 Block Diagram

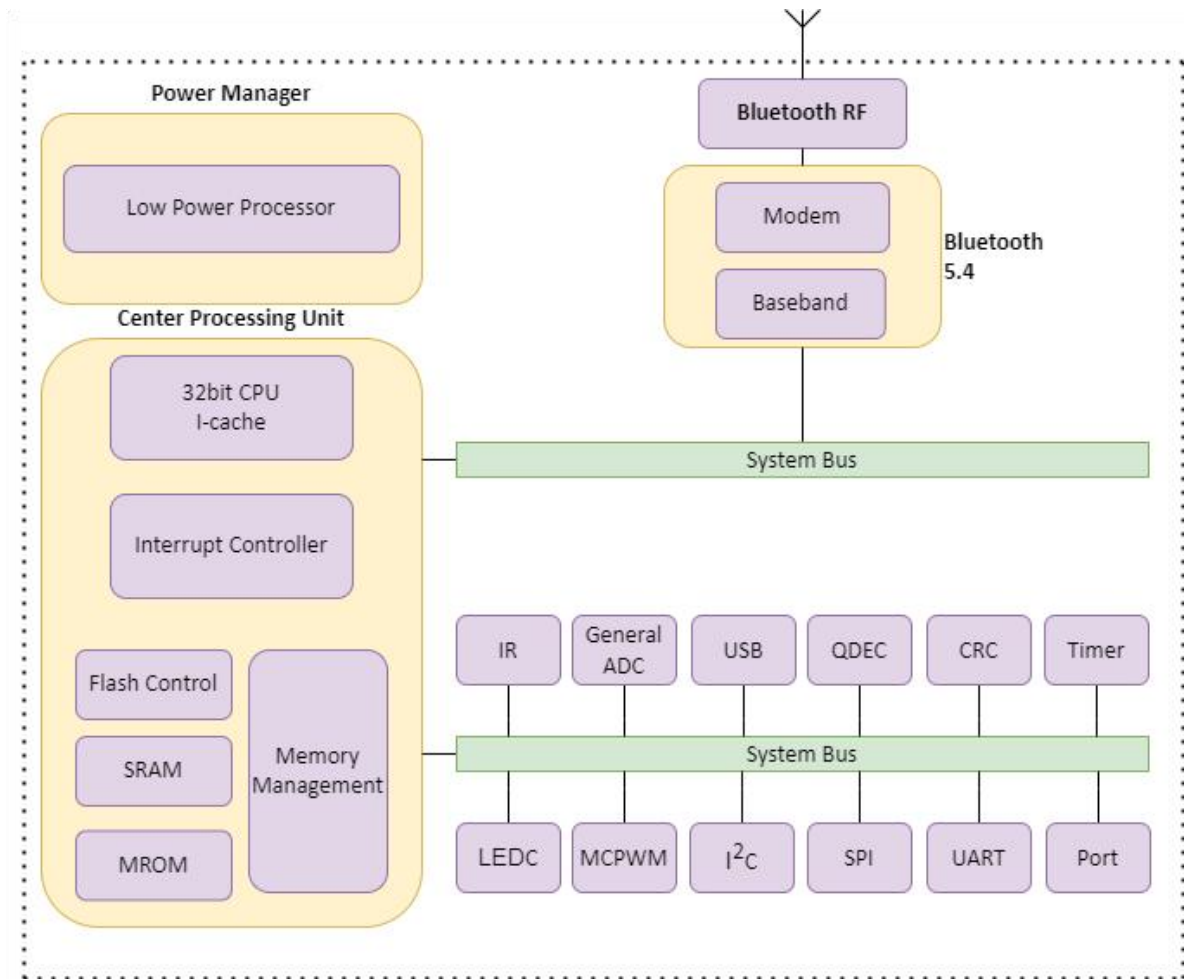


Figure 1-1 AW312A Block Diagram

2 Pin Definition

2.1 Pin Assignment

USBDM	○			16	XOSCI
USBDP	1			15	VSS
PA11	2			14	BTRF
PA10	3			13	PA0
IOVDD	4	AW312A		12	PA1
VPWR/PA7	5	SOP16		11	PA2
PA9	6			10	PA3
PA8	7			9	PA4
	8				

Figure 2-1 AW312A Pin Assignment

2.2 Pin Description

Table 2-2-1 AW312A Pin Description

Pin No.	Name	Type	IO Initial State	Description
1	USBDM	I/O	15kΩ Pull-down	ADC13(ADC Input Channel 13)
2	USBDP	I/O	15kΩ Pull-down	ADC14(ADC Input Channel 14)
3	PA11	I/O	10kΩ Pull-up	ADC11(ADC Input Channel 11) Hold down 0 to reset
4	PA10	I/O	Z	ADC10(ADC Input Channel 10)
5	IOVDD	P	--	IO Power
6	VPWR	P	--	Battery Input
	PA7	I/O	Z	--
7	PA9	I/O	Z	LVD(External Low Voltage Detection Input)
				ADC9(ADC Input Channel 9) SPI0_DAT3B
8	PA8	I/O	Z	ADC8(ADC Input Channel 8) SPI0_DAT2B
9	PA4	I/O	10kΩ Pull-up	ADC4(ADC Input Channel 4) MCLR(Device Reset)
10	PA3	I/O	Z	ADC3(ADC Input Channel 3) SPI0_DIB(1)
11	PA2	I/O	Z	ADC2(ADC Input Channel 2) SPI0_DOB(0)
12	PA1	I/O	Z	ADC1(ADC Input Channel 1) SPI0_CLKB
13	PA0	I/O	Z	ADC0(ADC Input Channel 0)
14	BTRF	RF	--	Bluetooth RF Antenna
15	VSS	G	--	Ground
16	XOSCI	I	--	Crystal Oscillator Input

Note

1.IO initial state abbreviations Z--High resistance, H--High level, L--Low level, X--May be changed during power on.

2.Timer, IR,MCPWM, QDEC, UART, LEDC, I²C, SPI1 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 PA7)	-0.3	3.6	V
HVTIO	Input voltage of HVT-IO (PA7)	-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 3-3-1 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	--	--	60	mA
Low Power mode						
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
IOVDD	Loading current	IOVDD=3.0V@VPWR = 3.7V	--	--	8	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~PA4 PA7~PA11	-0.3	1.4	V
V_{IH}	High-Level Input Voltage	IOVDD = 3.0V	PA0~PA4 PA8~PA11 USB DP USB DM	1.7	3.3	V
		IOVDD = 3.0V	PA7	1.7	5.5	V
Output Characteristics						
Symbol	Parameter	Conditions	IO	Typ	Unit	
I_{OL}	Output Current	IOVDD = 3.0V Voutput = 0.3V	PA0~PA4 PA8~PA11	3(HD=0) 9(HD=1) 21(HD=2) 54(HD=3)	mA	
		IOVDD = 3.0V Voutput = 0.3V	PA7 USB DP USB DM	8	mA	
I_{OH}	Output Current	IOVDD = 3.0V Voutput = 2.7V	PA0~PA4 PA8~PA11	3(HD=0) 9(HD=1) 21(HD=2) 54(HD=3)	mA	
		IOVDD = 3.0V Voutput = 2.7V	PA7 USB DP USB DM	8	mA	
Internal Resistance Characteristics						
Symbol	Parameter	Conditions	IO	Typ	Unit	
R_{pu}	Pull-up Resistance	IOVDD = 3.0V	PA0~PA4 PA7~PA11	10k(PU=1) 100k(PU=2) 1M(PU=3)	Ω	
		IOVDD = 3.0V	USB DP	1.5k	Ω	
		IOVDD = 3.0V	USB DM	180k	Ω	
R_{pd}	Pull-down Resistance	IOVDD = 3.0V	PA0~PA4 PA7~PA11	10k(PD=1) 100k(PD=2) 1M(PD=3)	Ω	
		IOVDD = 3.0V	USB DP USB DM	15k	Ω	

Note

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

3.5 BT Characteristics

3.5.1 Transmitter

Table 3-5-1 Transmitter characteristics

Parameter	Conditions	Min	Typ	Max	Unit
Maximum RF Transmit Power	BLE-1Mbps	--	8	9	dBm

3.5.2 Receiver

Table 3-5-2 Receiver characteristics

Parameter	Conditions	Min	Typ	Max	Unit
Sensitivity	BLE-1Mbps	--	-93	--	dBm
	BLE-2Mbps	--	-90	--	dBm
	BLE-S2	--	-96	--	dBm
	BLE-S8	--	-101	--	dBm

4 Package Information

4.1 SOP16

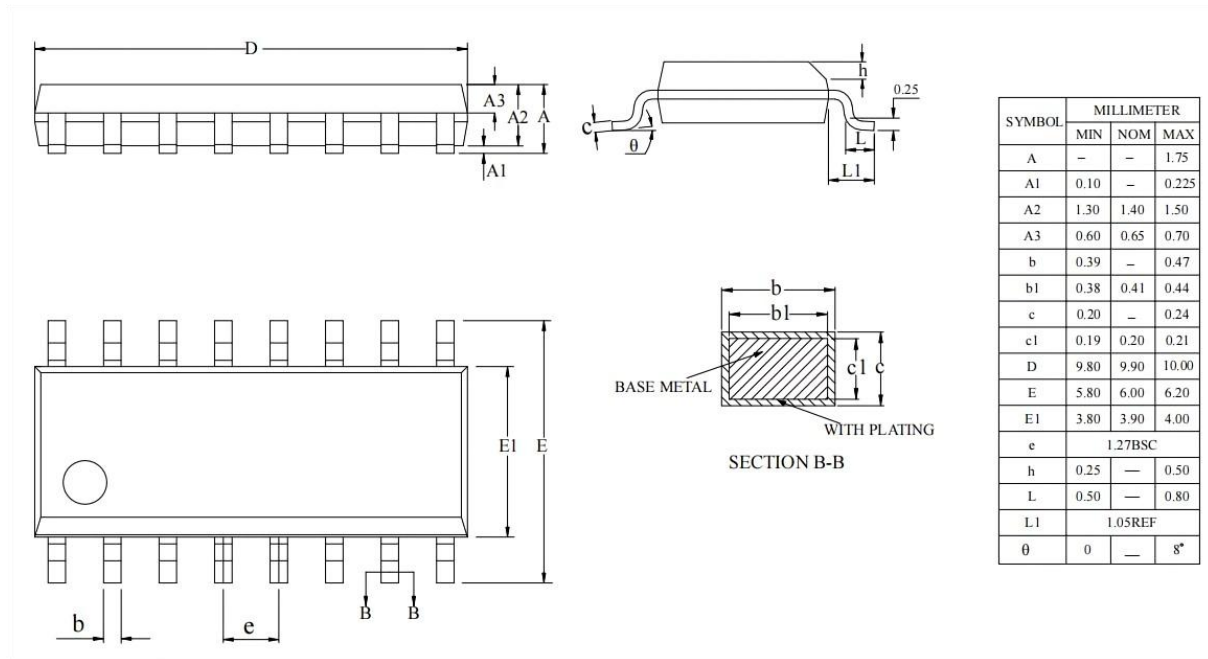


Figure 4-1 AW312A Package

5 IC Marking Information

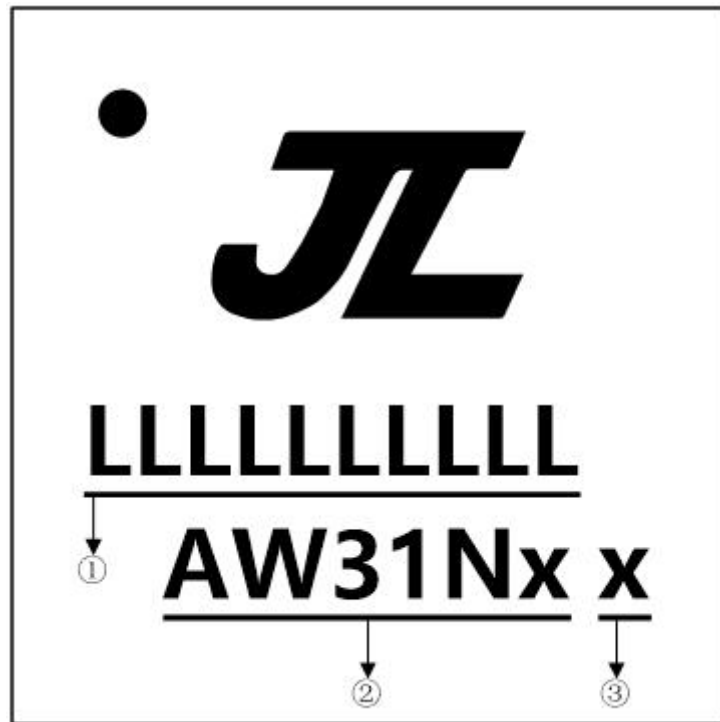


Figure 5-1 AW312A Package Outline

- ① LLLLLLLLL Production Batch
- ② AW31Nx Chip Model
- ③ x Built-in flash size
 - 0 No Flash Memory
 - 2 2Mbit Flash
 - 4 4Mbit Flash

6 Solder-Reflow Condition

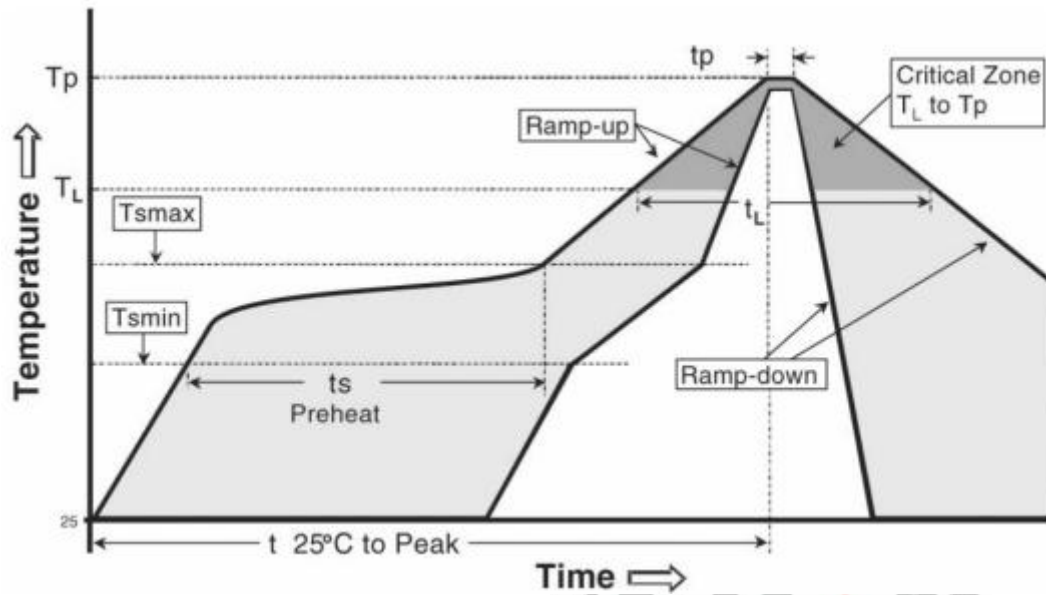


Figure 6-1 Classification Reflow Profile

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	Volume mm ³
	< 350	≥ 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	350 - 2000	> 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.

