

## 1.6 User Manual

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# **AW6202 Wi-Fi 802.11b/g/n ARM® Cortex M4 Embedded Module Specification**



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## 1.Introduction

Able Trend embedded Wi-Fi module AW6202 uses Texas Instruments (TI) CC3200 which is integrated an ARM Cortex M4 processor with 802.11b/g/n Wi-Fi network processor. It is fully available for application development and rich peripheral interfaces to support a wide variety of network connectivity-based applications, such as IOT (Internet of Things). With the surface mountable dielectric chip antennas on board, AW6202 is small and thin, stable and qualified, and suitable for many network based devices.

AW6202 module has a rich set of peripherals for diverse application requirements. The module optimizes bus matrix and memory management to give needed advantage for the application developer.

## 2.Features

### 2.1. Application Processor

- ARM Cortex M4
- 80-MHz Operation
- Up to 256 KB Local RAM
- Ext Serial Flash Bootloader & Peripheral Drivers in ROM
- 32 ch uDMA
- Support of Rich Peripherals Including:
  - I2C™ (Both Master and Slave)
  - SPIs (Both Master and Slave)
  - Two UARTs
  - One Multichannel Audio Serial Port (I2S and TDM)
  - Up to 27 GPIOs
  - 4 GPTs with 16-bit PWM Functionality
  - 4-Channel 12-bits ADC
  - 8-bit Parallel Camera Interface

### 2.2. Wi-Fi Features

- 802.11 b/g/n Station with Fully Integrated Radio, Baseband, and MAC
- WPA2 Personal and Enterprise Security
- SimpleLink Connection Manager
- Smart Config™, AP Mode and WPS2 for Easy Provisioning
- TX Power
  - 18.0 dBm @ 1 DSSS and 11 CCK
  - 14.5 dBm @ 54 OFDM
- RX Sensitivity
  - -95.7 dBm @ 1 DSSS
  - -74 dBm @ 54 OFDM



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### 2.3. Network Stack

- IPv4 TCP/IP Stack
- 8 Simultaneous TCP, UDP, or RAW Sockets
- 2 Simultaneous TLS and SSL Sockets
- Industry-Standard BSD Socket API
- ARP, ICMP, DHCP, DNS, mDNS
- TLS 1.2/SSL 3.0 with On-Chip Accelerators
- HTTP Server with Built-In Programmable HTML Page for Over-the-Network Device Configuration
- Application Throughput
  - UDP: 16 Mbps
  - TCP: 12 Mbps

### 2.3. Hardware Crypto Engine for Fast State-of-the-Art Security

- AES, DES and 3DES
- SHA2 and MD5
- CRC and Checksum

### 2.4. Power Management System

- V<sub>BAT</sub> Wide-Voltage Mode: 2.1 to 3.6 V
- Pre-regulated 1.85-V Mode
- Hibernate: 4 µA
- Low-Power Deep Sleep (LPDS): 120 µA
- RX Traffic (MCU Active): 59 mA @
- TX Traffic (MCU Active): 229 mA @54 OFDM, Maximum Power
- Idle Connected (MCU in LPDS): 695 µA @DTIM = 1

### 2.5. Clock Source

- 40.0MHz Crystal with internal Oscillaor
- 32.768kHz Crystal or ext. RTC Clock

### 2.6. Operating Temperature

- Ambient Temperature Range: -40°C to 85°C

#### Device Information

Order Number	Body Size
AW6202	(W)24mm x (H)27mm
AW6202S (preview)	(W)20mm x (H)27mm

### 3.Functional Block Diagram

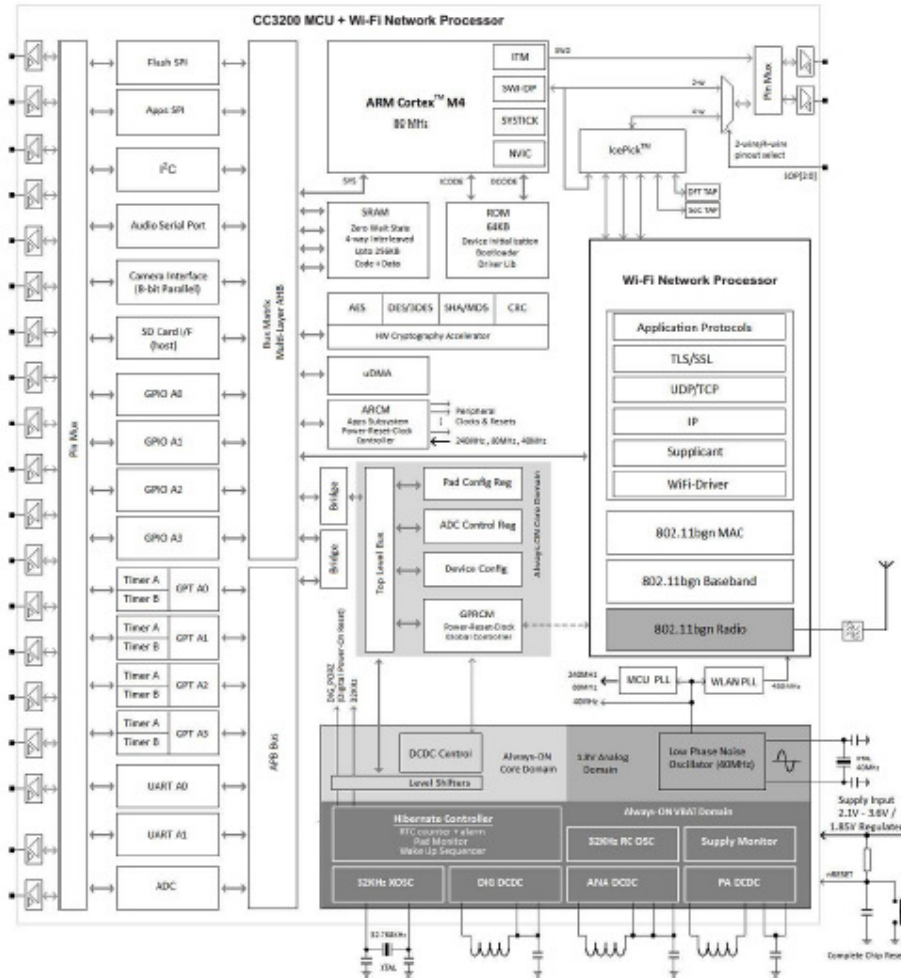


Fig. 3-1 TI CC3200 functional block diagram

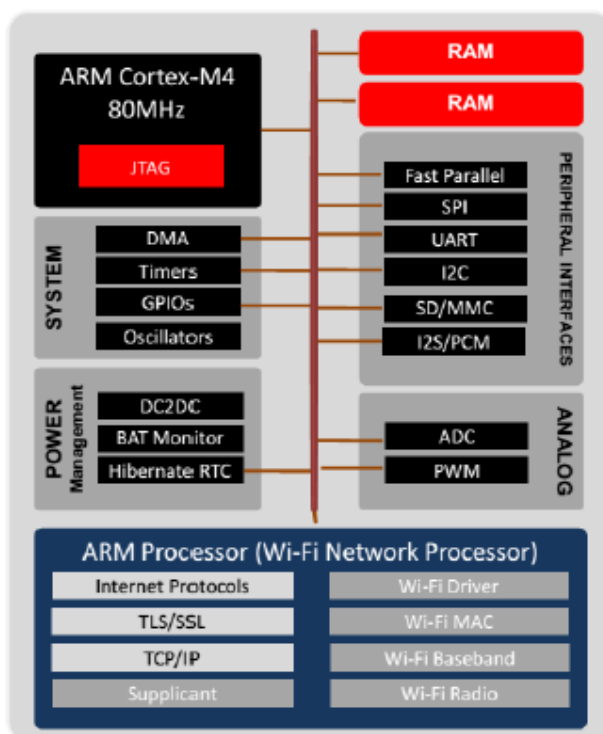


Fig. 3-2 Module functional block diagram

#### 4.Application Diagram

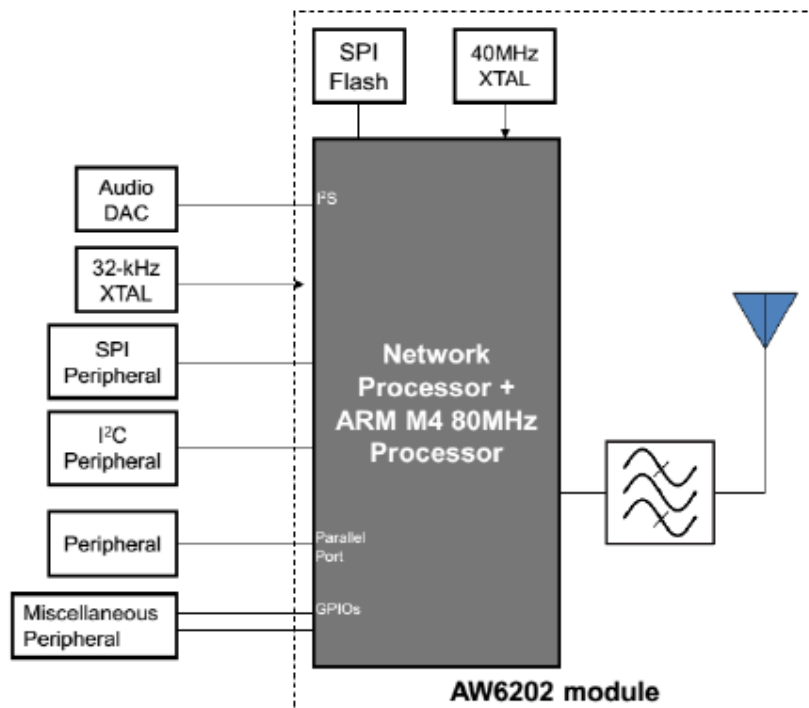


Fig. 4-1 Module functional block diagram

## 5. Pin Assignments

### 5.1 Pin Outline

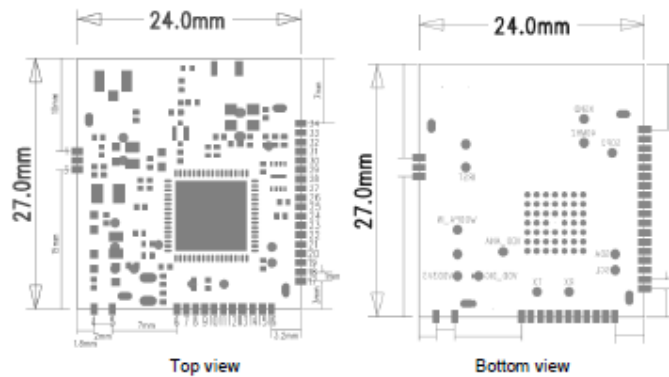


Fig.5-1 AW6202 Pin Outline

### 5.2 Pin Definition

No.	Name	Type	Description
1	Reset	IN	Reset Input for the module, active low, has 100-k pull up internally
2	SOP1	IN	Sense on Power 1
3	SOP0	IN	Sense on Power 0
4	V3V3	POW	3.3V
5	GND	GND	Ground
6	IO_00/UART1_nRTS	I/O	GPIO / UART host Interface
7	IO_30	I/O	GPIO
8	IO_1/UART1_TX	I/O	GPIO / UART host interface
9	IO_2/UART1_RX	I/O	GPIO / UART host interface
10	IO_3	I/O	GPIO
11	IO_4	I/O	GPIO
12	IO_5	I/O	GPIO
13	IO_6/UART1_nCTS	I/O	GPIO / UART host interface
14	IO_7	I/O	GPIO
15	IO_8	I/O	GPIO
16	IO_9	I/O	GPIO
17	IO_10	I/O	GPIO
18	IO_11	I/O	GPIO
19	IO_12	I/O	GPIO
20	IO_13	I/O	GPIO
21	IO_14/HOST_SPI_CLK	I/O	GPIO / Host interface SPI clock

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22	IO_15/HOST_SPI_MOSI	I/O	GPIO / Host interface SPI data input
23	IO_16/HOST_SPI_MISO	I/O	GPIO / Host interface SPI data output
24	IO_17/HOST_SPI_nCS	I/O	GPIO / Host interface SPI chip select
25	IO_22	I/O	GPIO
26	IO_23	I/O	GPIO / JTAG TDI
27	IO_24	I/O	GPIO / JTAG TDO
28	IO_28	I/O	GPIO
29	JTG_TCK	IN	JTAG TCK
30	JTG_TMS	IN	JTAG TMS
31	IO_25	I/O	GPIO / SOP2
32	IO_26	I/O	GPIO
33	IO_27	I/O	GPIO
34	GND	GND	Ground



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## 6. Module Specifications

### 6.1. Electrical Characteristics

#### 6.1.1. Absolute Maximum Ratings

These specifications indicate levels where permanent damage to the module can occur. Functional operation is not ensured under these conditions. Operation at absolute maximum conditions for extended periods can adversely affect long-term reliability of the module.

Symbol	Condition	Min	Typ	Max	Unit
VBAT_IN, VBAT_IN2, VBAT_IN3	Respect to GND	-0.5	3.3	3.8	V
VDD_Flash	Respect to GND	-0.5	3.3	3.8	V
Digital I/O	Respect to GND	-0.5	-	VBAT + 0.5	V
Max ripple on supplied voltage	3.3V			330	mVpp
Operating temperature	-	-20	25	70	°C
Storage temperature	-	-40	25	85	°C

#### 6.1.2. Recommended Operating Conditions

Function operation is not ensured outside this limit, and operation outside this limit for extended periods can adversely affect long-term reliability of the module.

Symbol	Condition	Min	Typ	Max	Unit
VBAT_IN, VBAT_IN2, VBAT_IN3	Battery Mode	2.3	3.3	3.6	V
VDD_Flash	Battery Mode	2.3	3.3	3.6	V

#### 6.1.3. Reset Requirement

Parameter	Symbol	Min	Typ	Max	Unit
Operation mode level	ViH		0.65 x VBAT		V
Shutdown mode level	ViL	0	0.35 x VBAT		V
Minimum time for nReset low for resetting the module		5			ms
Rise/fall times	Tr/Tf		20		us

#### 6.1.4. SPI Host Interface Timings

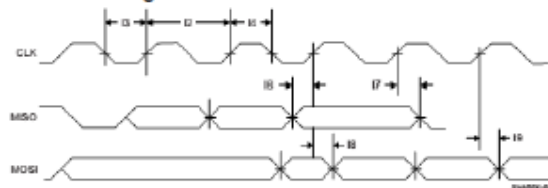


Fig. 6-1 SPI Master Timing Diagram

Parameter Number	Symbol	Parameter	Min	Max	Unit
I1	F	Clock Frequency		20	MHz
I2	T <sub>clk</sub>	Clock period	50		ns
I3	t <sub>LP</sub>	Clock low period		25	ns
I4	t <sub>HP</sub>	Clock high period		25	ns

15	D	Duty cycle	45	55	%
16	$t_{\text{IS}}$	RX data setup time	1		ns
17	$t_{\text{IH}}$	RX data hold time	2		ns
18	$t_{\text{OD}}$	TX data output delay		8.5	ns
19	$t_{\text{OH}}$	TX data hold time		8	ns

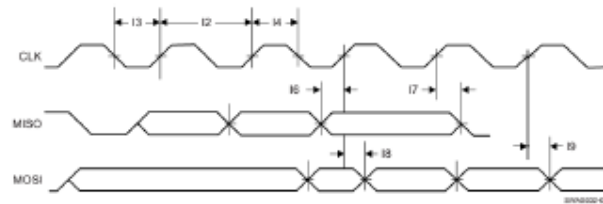


Fig. 6-2 SPI Slave Timing Diagram

Parameter Number	Symbol	Parameter	Min	Max	Unit
11	F	Clock Frequency@VBAT=3.3V		20	MHz
		Clock Frequency@VBATs2.1V		12	
12	$T_{\text{clk}}$	Clock period	50		ns
13	$t_{\text{LP}}$	Clock low period		25	ns
14	$t_{\text{HT}}$	Clock high period		25	ns
15	D	Duty cycle	45	55	%
16	$t_{\text{IS}}$	RX data setup time	4		ns
17	$t_{\text{IH}}$	RX data hold time	4		ns
18	$t_{\text{OD}}$	TX data output delay		20	ns
19	$t_{\text{OH}}$	TX data hold time		24	ns

#### 6.1.5. ESD Specifications

Mode	Level	Unit
HBM	$\pm 1500$	V
MM	$\pm 200$	V

#### 6.1.6. Current Consumption

Mode	Condition	Typical Current at 3.6V
Active mode	11Mbps TX at 18.5 dBm	250mA
	54Mbps TX at 14 dBm	200mA
	RX at 54 Mbps	53mA
Low-power mode	LPDS (low-power deep sleep)	100uA
	Hibernate	28uA

#### 6.1.7. Power-up Sequence

## 6.2. WLAN RF Characteristics

### 6.2.1. IEEE802.11b

Items		Contents			
Specification		IEEE 802.11 b			
Mode		DSSS or CCK			
Data rate		1, 2, 5.5 and 11Mbps			
Channels		Ch1~Ch13			
TX Characteristics		Min	Typ	Max	Unit
Power Level	Target Power	17	18.5	20	dBm
	$f_c - 33\text{MHz} < f < f_c - 22\text{MHz}$	-	-	-50	dBr
Spectrum mask at target power	$f_c - 22\text{MHz} < f < f_c - 11\text{MHz}$	-	-	-50	dBr
	$f_c + 11\text{MHz} < f < f_c + 22\text{MHz}$	-	-	-50	dBr
	$f_c + 22\text{MHz} < f < f_c + 33\text{MHz}$	-	-	-50	dBr
Frequency error		-15	-	+15	ppm
Modulation accuracy (EVM) at target power	1 Mbps	-	-	-10	dB
	2 Mbps	-	-	-10	dB
	5.5 Mbps	-	-	-10	dB
	11 Mbps	-	-	-10	dB
RX Characteristics		Min	Typ	Max	Unit
Minimum input level sensitivity		-	-86	-82	dBm
Maximum input level (FER < 8%)	1, 2 Mbps (FER ≤ 8%)	-4	-	-	
	5.5, 11 Mbps (FER ≤ 8%)	-10	-	-	
Spurious Emission (TX)		Min	Typ	Max	Unit
(30MHz to 1GHz)		-	-	-41.3	dBm/MHz
(1GHz to 12.75GHz)		-	-	-41.3	dBm/MHz
Spurious Emission (RX)		Min	Typ	Max	Unit
(30MHz to 1GHz)		-	-	-57	dBm/MHz
(1GHz to 12.75GHz)		-	-	-54	dBm/MHz

### 6.2.2. IEEE802.11g

Items		Contents			
Specification		IEEE 802.11 g			
Mode		OFDM			
Data rate		6, 9, 12, 18, 24, 36, 48 and 54 Mbps			
Channels		Ch1~Ch13			
TX Characteristics		Min	Typ	Max	Unit
Power Level	Target power at 6Mbps	15	16.8	18	dBm
	Target power at 9Mbps	15	16.8	18	dBm
	Target power at 12Mbps	15	16.8	18	dBm
	Target power at 18Mbps	15	16.8	18	dBm
	Target power at 24Mbps	14.5	16	17.5	dBm
	Target power at 36Mbps	14.5	16	17.5	dBm
	Target power at 48Mbps	13.5	15	16.5	dBm
Spectrum mask at target power	Target power at 54Mbps	13.5	15	16.5	dBm
	$f_c \pm 11\text{MHz}$	-	-	-50	dBr
	$f_c \pm 20\text{MHz}$	-	-	-50	dBr
Frequency error	$f_c \pm 30\text{MHz}$	-	-	-50	dBr
		-15	-	+15	ppm
Constellation error (EVM) at target power	6Mbps	-	-	-5	dB
	9Mbps	-	-	-8	dB
	12Mbps	-	-	-10	dB
	18Mbps	-	-	-13	dB
	24Mbps	-	-	-16	dB
	36Mbps	-	-	-19	dB
	48Mbps	-	-	-22	dB
	54Mbps	-	-	-25	dB

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RX Characteristics		Min	Typ	Max	Unit
Minimum input level sensitivity	6Mbps (PER < 10%)	-	-89	-85	dBm
	9Mbps (PER < 10%)	-	-88	-84	dBm
	12Mbps (PER < 10%)	-	-86	-82	dBm
	18Mbps (PER < 10%)	-	-85	-81	dBm
	24Mbps (PER < 10%)	-	-82	-78	dBm
	36Mbps (PER < 10%)	-	-80	-76	dBm
	48Mbps (PER < 10%)	-	-76	-72	dBm
	54Mbps (PER < 10%)	-	-74	-70	dBm
Maximum input level (PER < 10%)		-15	-	-	dBm
Spurious Emission (TX)		Min	Typ	Max	Unit
(30MHz to 1GHz)		-	-	-41.3	dBm/MHz
(1GHz to 12.75GHz)		-	-	-41.3	dBm/MHz
Spurious Emission (RX)		Min	Typ	Max	Unit
(30MHz to 1GHz)		-	-	-57	dBm/MHz
(1GHz to 12.75GHz)		-	-	-54	dBm/MHz

## 6.2.3. IEEE802.11n HT20

Items		Contents			
Specification		IEEE 802.11 n HT20			
Mode		OFDM			
Data rate		MCS0, MCS1, MCS2, MCS3, MCS4, MCS5, MCS6 and MCS7			
Channels		Ch1~Ch13			
TX Characteristics		Min	Typ	Max	Unit
Power Level	Target power at MCS0	14	15.5	17	dBm
	Target power at MCS1	14	15.5	17	dBm
	Target power at MCS2	14	15.5	17	dBm
	Target power at MCS3	14	15.5	17	dBm
	Target power at MCS4	13.5	15	16.5	dBm
	Target power at MCS5	13.5	15	16.5	dBm
	Target power at MCS6	12.5	14	15.5	dBm
	Target power at MCS7	12.5	14	15.5	dBm
Spectrum mask at target power	$f_c \pm 11\text{MHz}$	-	-	-20	dB
	$f_c \pm 20\text{MHz}$	-	-	-28	dB
	$f_c > \pm 30\text{MHz}$	-	-	-45	dB
Frequency error		-15	-	+15	ppm
Constellation error (EVM) at target power	MCS0	-	-	-5	dB
	MCS1	-	-	-10	dB
	MCS2	-	-	-13	dB
	MCS3	-	-	-16	dB
	MCS4	-	-	-19	dB
	MCS5	-	-	-22	dB
	MCS6	-	-	-25	dB
	MCS7	-	-	-28	dB
RX Characteristics		Min	Typ	Max	Unit
Minimum input level sensitivity	MCS0 (PER < 10%)	-	-88	-84	dBm
	MCS1 (PER < 10%)	-	-85	-81	dBm
	MCS2 (PER < 10%)	-	-83	-79	dBm
	MCS3 (PER < 10%)	-	-80	-76	dBm
	MCS4 (PER < 10%)	-	-78	-74	dBm
	MCS5 (PER < 10%)	-	-76	-72	dBm
	MCS6 (PER < 10%)	-	-74	-70	dBm
	MCS7 (PER < 10%)	-	-71	-67	dBm
Maximum input level (PER < 10%)		-20	-	-	dBm
Spurious Emission (TX)		Min	Typ	Max	Unit
FCC (30MHz to 1GHz)		-	-	-41.3	dBm/MHz

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FCC average (1GHz to 12.75GHz)	-	-	-41.3	dBm/MHz
<b>Spurious Emission (RX)</b>	<b>Min</b>	<b>Typ</b>	<b>Max</b>	<b>Unit</b>
(30MHz to 1GHz)	-	-	-57	dBm/MHz
(1GHz to 12.75GHz)	-	-	-54	dBm/MHz

## 7. Recommended Reflow Profile

1. Heating method: Conventional Convection or IR/convection
2. Temperature measurement: Thermocouple  $d = 0.1 \text{ mm}$  to  $0.2 \text{ mm}$  CA (K) or CC (T) at soldering portion or equivalent method.
3. Solder paste composition: Sn/3.0 Ag/0.5 Cu
4. Allowable reflow soldering times: 2 times based on the following reflow soldering profile
5. Temperature profile: Reflow soldering shall be done according to the following temperature profile
6. Peak temp:  $245^{\circ}\text{C}$

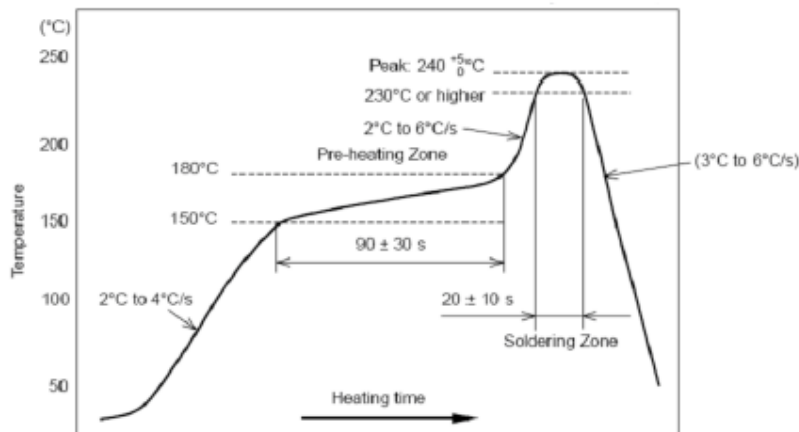


Fig. 7-1 Reflow Profile Diagram



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#### Environmental Requirements and Specifications

### 8.1 Temperature

#### 8.1.1 Operating Temperature Conditions

The product is capable of continuous reliable operation when operating in ambient temperature of  $-20^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$

#### 8.1.2 Nonoperating Temperature Conditions

The subassemblies must not be damaged and the operational performance must not be degraded when restored to the operating temperature when exposed to storage temperature in the range of  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ .

#### 8.1.3 PCB Bending

The PCB bending specification shall maintain planeness at a thickness of less than 0.1 mm.

### 8.2 Handling Environment

#### 8.2.1 ESD

The product ESD immunity is Human Body Model (HBM)  $\geq \pm 1500$  (V), Mechanical Model (MM)  $\geq \pm 200$  (V). Handle it under ESD protection environment.

This device is ESD sensitive, thus it must be protected at all times from ESD. Industry-standard ESD precautions must be followed at all times.

#### 8.2.2 Terminals

The product is mounted with motherboard through land grid array (LGA). To prevent poor soldering, do not touch the LGA portion by hand.

#### 8.2.3 Falling

The mounted components will be damaged if the product falls or is dropped. Such damage may cause the product malfunction.

### 8.3 Storage Condition

#### 8.3.1 Moisture Barrier Bag Before Opened

A moisture barrier bag must be stored in a temperature of less than  $30^{\circ}\text{C}$  with humidity under 85% RH. The calculated shelf life for the dry-packed product shall be a 12 months from the date the bag is sealed.

#### 8.3.2 Moisture Barrier Bag Open

Humidity indicator cards must be blue,  $<30\%$ .

### 8.4 Baking Conditions

Products require baking before mounting if:


- Humidity indicator cards read  $>30\%$
- Temp  $< 30^{\circ}\text{C}$ , humidity  $< 70\%$  RH, over 96 hours

Baking condition:  $90^{\circ}\text{C}$ , 12–24 hours

Baking times: 1 time



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	<p><b>CAUTION</b> This bag contains MOISTURE-SENSITIVE DEVICES</p>	<p>LEVEL <b>3</b></p>
	<p>If Blank, see adjacent bar code label</p> <p>1. Calculated shelf life in sealed bag: 12 months at <math>&lt; 40^{\circ}\text{C}</math> and <math>&lt; 90\%</math> relative humidity (RH)</p> <p>2. Peak package body temperature: <u>260</u> <math>^{\circ}\text{C}</math> If Blank, see adjacent bar code label</p> <p>3. After bag is opened, devices that will be subjected to reflow solder or other high temperature process must</p> <p>a) Mounted within: <u>168</u> hours of factory</p> <p>If Blank, see adjacent bar code label</p> <p>conditions <math>\leq 30^{\circ}\text{C} / 60\%</math> b) stored at <math>\leq 10\%</math> RH</p> <p>4. Devices require bake, before mounting, if:</p> <p>a) Humidity Indicator Card is <math>&gt; 10\%</math> when read at <math>23 \pm 5^{\circ}\text{C}</math> b) 3a or 3b not met.</p> <p>5. If baking is required, devices may be baked for 48 hours at <math>125 \pm 5^{\circ}\text{C}</math></p> <p>Note: If device containers cannot be subjected to high temperature or shorter bake times are desired, reference IPC / JEDEC J-STQ-033 for bake procedure</p> <p>Bag Seal Date: _____ If Blank, see adjacent bar code label</p> <p>Note: Level and body temperature defined by IPC / JEDEC J-STQ-020</p>	

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:  
(1) this device may not cause harmful interference, and  
(2) this device must accept any interference received, including interference that may cause undesired operation.

**Caution:**  
Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.





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**IMPORTANT NOTE:****RF Exposure statement:**

This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This transmitter should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body and must not be co-located or operating in conjunction with any other antenna or transmitter.

**Comprehensive integration instructions:**

The devices must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product. Modular could be only used in mobile or fix device, and could not be used in any portable device.

- This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter.
- IEEE 802.11b or 802.11g or 802.11n(HT20) operation of this product in the U.S. is firmware-limited to Channel 1 through 11.
- The OEM integrator is responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.).
- In the event that the grant conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization for this module in combination with the host equipment is no longer considered valid and the FCC ID of the module cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.
- The final end product must be labeled in a visible area with the following:  
Contains FCC ID: 2AATFMA026WX (the FCC ID: 2AATFMA026WX)
- **Information that must be placed in the end user manual:** The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.

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