

AW-NS145

IEEE 802.11 b/g/n WiFi/Bluetooth/GPS/FM Combo stamp Module

Datasheet

Version 0.5

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Document release	Date	Modification	Initials	Approved
Version 0.1	2012/11/23	Initial Version	Rich Tsai	Daniel Lee
Version 0.2	2013/01/04	Update Mechanical information	Rich Tsai	Daniel Lee
Version 0.3	2013/01/09	1. Update PCB layout recommendation 2. Update Key Features & Specifications Table	Rich Tsai	Daniel Lee
Version 0.4	2013/01/10	1. Update height of stamp module 2. Remove 32.768KHz requirement 3. Update BT specification 4. Update the block diagram 5. Update the wifi b mode test condition @11M	Rich Tsai	Daniel Lee
Version 0.5	2013/01/24	1. Add GPS SAW 2. Add gnd pad	Rich Tsai	Daniel Lee

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1. General Description

1-1. Product Overview and Functional Description

AzureWave Technologies, Inc. introduces the IEEE 802.11b/g/n WLAN, BT, GPS and FM TX/RX combo stamp module - **AW-NS145**. With four advanced radio technologies integrated into a stamp module, AW-NS145 provides the best and most convenient SMT process. The module is targeted to mobile devices including, Tablet PC, Portable Media Players (PMPs), Portable Navigation Devices (PNDs), Personal Digital Assistants (PDAs), Tracking Devices, Gaming Devices which need convenient SMT process, low power consumption, multiple OS (Android, Windows mobile, Linux, Symbian) support. By using AW-NS145, the customers can easily integrate the Wi-Fi, BT, GPS and FM by a stamp card module with the benefits of **high design flexibility, high success rate on SMT process, short development cycle, and quick time-to-market.**

Compliance with the IEEE 802.11b/g/n standard, the AW-NS145 uses **DSSS, OFDM, DBPSK, DQPSK, CCK** and **QAM** baseband modulation technologies. A high level of integration and full implementation of the power management functions specified in the IEEE 802.11 standard minimize the system power requirements by using AW-NS145.

The AW-NS145 supports standard interface **SDIO v2.0 (4-bit and 1-bit)** and **SPI** for WLAN, **High-speed UART** interface for BT/FM/GPS host controller interface and **PCM/I2S** for BT/FM audio data. The demodulated FM audio signal is available as line-level analog stereo output. AW-NS145 is suitable for multiple mobile processors for different applications. With the combo functions and the good performance, the AW-NS145 is the best solution for the consumer electronics and the tablet PC.

1-2. Key Features

General

- ✚ **AW-NS145 is a 4-in-1 wireless communication stamp module which includes WLAN, Bluetooth, GPS and FM Transmitter and Receiver.**
- ✚ **Small footprint: 15(L) mm x 15(W) mm x 1.60 mm (H, max) with shielding**
- ✚ **Pad pitch: 1.3 mm**
- ✚ **Coexistence: IEEE 802.15.2 external three-wire coexistence scheme to support additional wireless technologies such as 3G and WiMAX**
- ✚ **Best-in-class current consumption performance**
- ✚ **Intelligent BT/WLAN coexistence scheme that goes beyond PTA signaling (for example, transmit window and duration that take into account of protocol exchange sequence, frequency, etc.)**
- ✚ **Lead-free /Halogen Free Design**

WLAN

- ✚ **Single - band and single stream 2.4GHz 802.11b/g/n**
- ✚ **802.11 d/h/k compliant**
- ✚ **Security: WFA WPA/WPA2 personal, WPS2.0, WAPI (Hardware)**
- ✚ **QoS: WFA WMM, WMM PS**
- ✚ **Support 802.11n optional features: STBC, A-MPDU, Blk-Ack, RIFS, MCS Feedback, 20/40MHz coexistence (PCO), unscheduled PSMP**
- ✚ **Support 802.11w Protected Managed Frames**
- ✚ **Support WiFi Direct (WFA P-2-P standard)**
- ✚ **Interface: SDIO 2.0 (4-bit & 1-bit, up to 50MHz), SPI (48Mbps)**
- ✚ **Per packet TX power control**

Bluetooth

- Bluetooth specification v2.1+EDR and 3.0+HS (802.11 AMP) compliance
- Bluetooth v4.0 Low Energy (LE)
- Integrated PA with 13dBm (class 1) transmit power and balun
- HCI over high speed (4Mbps) UART(H4), and SDIO 2.0
- Best-in-class BT/Wi-Fi coexistence performance
- Up to 4 piconets simultaneously with background inquiry/page scan
- Support Scatternet
- Support wide-band speech and SBC codec
- FM over Bluetooth
- Packet loss concealment (PLC) function for better voice quality
- Low power scan function to reduce the power consumption in scan modes

FM

- 76-108MHz with 50KHz step
- RDS/RBDS support
- Digital stereo modulator/demodulator
- Digital audio interface (I2S)
- Fast seek time 30ms/channel
- Stereo noise reduction
- Integrated short antenna

GPS

- Advanced proprietary multipath algorithms for robust low-dropout tracking in indoor and outdoor urban canyons
- GPS/GALILEO/QZSS/SBAS (WAAS/MSAS/EGNOS/GAGAN) support
- Dead Reckoning MEMS sensor interface
- Full A-GPS capability (E911/SUPL/EPO/HotStill)
- Active interference cancellation for up to 12 in-band tones
- Low power operational modes for mobile phone and DSC applications
- 5Hz update rate

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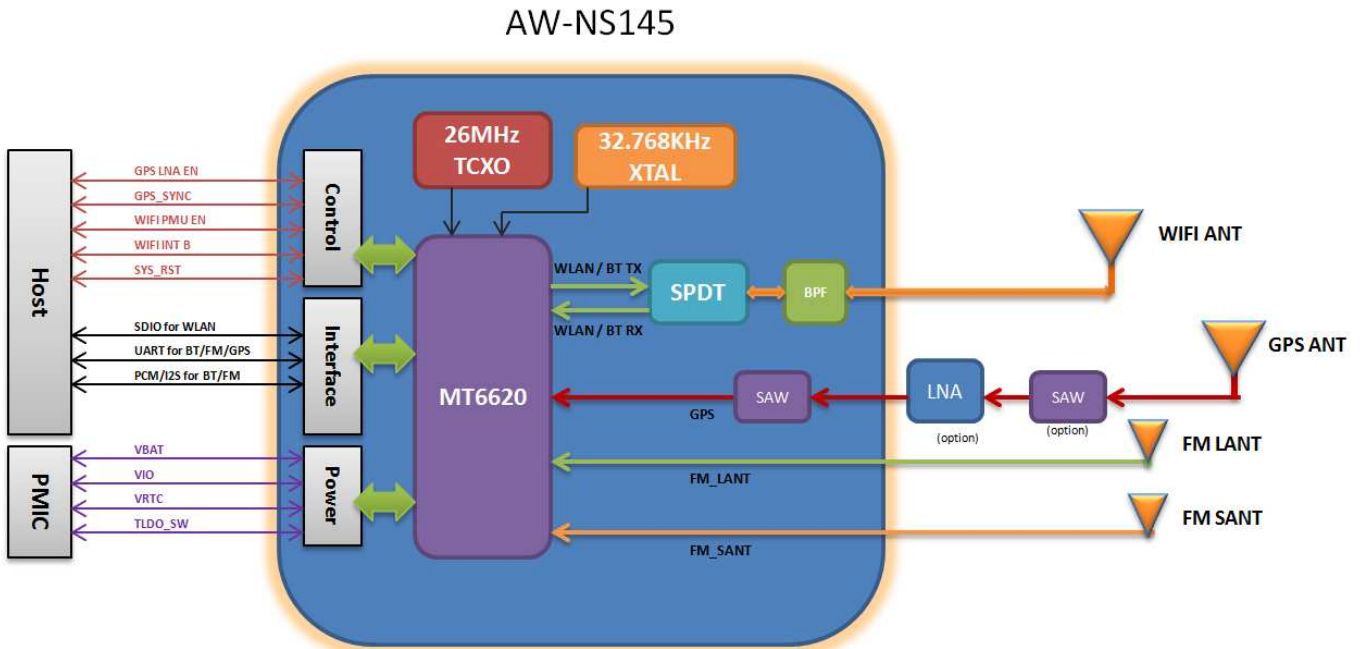
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1-3. Block Diagram

A simplified block diagram of the AW-NS145 module is depicted in the figure below.

WiFi / BT with common antenna



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1-4. Specifications Table

Product Description	Wireless LAN & Bluetooth & FM
WLAN Standard	IEEE 802.11b/g/n, Wi-Fi compliant
Bluetooth Standard	Bluetooth 2.1+Enhanced Data Rate (EDR) / BT3.0+HS/BT4.0
Host Interface	SDIO/SPI for WLAN UART for GPS, Bluetooth and FM
Audio Interface	Digital PCM/I2S for FM/Bluetooth Analog line level I/O for FM.
Dimension	15 mm X 15 mm x 1.60 mm with shielding
Weight	TBD
Operating Conditions	
Temperature	Operating: -20 ~ 70°C ; Storage: -40 ~ 85°C
Relative Humidity	< 60 % (storage) <85% (operation)
Electrical Specifications	
Frequency Range	2.4 GHz Band WLAN/Bluetooth 1575.42 MHz GPS L1 radio band 76 MHz to 108 MHz FM bands
Number of Channels	802.11b: USA, Canada and Taiwan – 11 Most European Countries – 13 Japan – 14 802.11g: USA and Canada – 11 Most European Countries – 13 802.11n(HT20):Channel 1~13 (2412~2472MHz) 802.11n(HT40):Channel 3~11 (2422~2462MHz)
Modulation	*DSSS, OFDM, DBPSK, DQPSK, CCK, 16-QAM, 64-QAM for WLAN *GFSK (1Mbps), $\pi/4$ DQPSK (2Mbps) and 8DPSK (3Mbps) for Bluetooth
Output Power	WLAN: 802.11b: 17dBm \pm 2dBm 802.11g: 15dBm \pm 2dBm 802.11n(HT20): 14dBm \pm 2dBm 802.11n(HT40): 14dBm \pm 2dBm Bluetooth: Typ. 9dBm

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Receive Sensitivity	WLAN: 802.11b: Typ. -88dBm@11Mbps 802.11g: Typ. -74dBm@54Mbps 802.11n(HT20): Typ. -71dBm@MCS7 802.11n(HT40): Typ. -68dBm@MCS7 Bluetooth: Typ. -90dBm@2M Typ. -84dBm@3M GPS: C/N 38dB@-130dBm FM: SNR>26 @-100dBm
Data Rates	WLAN 802.11b: 1, 2, 5.5, 11Mbps 802.11g: 6, 9, 12, 18, 24, 36, 48, 54Mbps 802.11n:MCS 0~7 Bluetooth Bluetooth 2.1+EDR data rates of 1,2, and 3Mbps
Power Consumption	Refer to power consumption report
Security	WFA WPA/WPA2 personal, WPS2.0, WAPI (Hardware)

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2. Electrical Characteristics

2-1. Absolute Maximum Ratings

Symbol	Parameter	Min	Max	Units
TLDO_SW	2.8V Digital Power Supply	-0.3	3.6	V
VIO	1.8V or 2.8V SDIO Digital IO Power Supply	-0.3	3.6	V
VRTC	RTC Power Supply	-0.3	3.6	V
VBAT	BUCK Power Supply and Power-on circuit supply	-0.3	5.5	V

2-2. Recommended Operating Range

Symbol	Parameter	Min	Typ	Max	Units
TLDO_SW	2.8V Digital Power Supply	2.0	2.8	3.6	V
VIO	1.8V or 2.8V SDIO Digital IO Power Supply	1.6	1.8	2.0	V
		2.0	2.8	3.6	V
VRTC	RTC Power Supply	2.52	2.8	3.08	V
		1.62	1.8	1.98	
VBAT	BUCK Power Supply and Power-on circuit supply	2.3	4.2	5.5	V

DC Characteristics for 1.8V Operation

Symbol	Parameter	Conditions	Min	Max	Units
V _{IL}	Input Low Voltage	LVTTL	-0.18	0.4	V
V _{IH}	Input High Voltage		1.5	1.98	V
V _T	Schmitt Trigger Negative Going Threshold Voltage	LVTTL	0.44	0.88	V
	Schmitt Trigger Positive Going Threshold Voltage		0.88	1.1	V
V _{OL}	Output Low Voltage	I _{OL} = 1.6~14 mA	-0.18	0.4	V
V _{OH}	Output High Voltage	I _{OH} = 1.6~14 mA	1.4	VDD18 +0.18	V
R _{PU}	Input Pull-Up Resistance	PU=high, PD=low	40	190	KΩ
R _{PD}	Input Pull-Down Resistance	PU=low, PD=high	40	190	KΩ

DC Characteristics for 2.8V Operation

Symbol	Parameter	Conditions	Min	Max	Units
V _{IL}	Input Low Voltage	LVTTL	-0.28	0.6	V
V _{IH}	Input High Voltage		2.0	3.08	V
V _T	Schmitt Trigger Negative Going Threshold Voltage	LVTTL	0.68	1.36	V
V _{T+}	Schmitt Trigger Positive Going Threshold Voltage		1.36	1.7	V
V _{OL}	Output Low Voltage	I _{OL} = 1.6~14 mA	-0.28	0.4	V
V _{OH}	Output High Voltage	I _{OH} = 1.6~14 mA	2.4	V _{DD28} +0.18	V
R _{PU}	Input Pull-Up Resistance	PU=high, PD=low	40	190	KΩ
R _{PD}	Input Pull-Down Resistance	PU=low, PD=high	40	190	KΩ

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3. Pin Definition

3-1. Pin Description

PIN No.	Name	Description	Type
1	NC	NA	NC
2	NC	NA	NC
3	VBAT	AW-NS145 main power 3.3V	VDD
4	GND	GND pin	VSS
5	VIO1	Interface IO power input (1.8 ~3.3V)	VDD
6	SD_D2	SDIO data2	I/O
7	SD_D3	SDIO data3	I/O
8	SD_CMD	SDIO command	I/O
9	SD_CLK	SDIO clock	I
10	SD_D0	SDIO data0	I/O
11	SD_D1	SDIO data1	I/O
12	UTXD	TX pin of UART interface	O
13	URXD	RX pin of UART interface	I
14	UR_CTS	UART flow control	I
15	UR_RTS	UART flow control	O
16	AUOUT_R	FM analog output, R channel	O
17	AUOUT_L	FM analog output, L channel	O
18	FM_SANT	FM short antenna input port	I
19	FM_LANT	FM long antenna input port	I
20	FM_GND	FM long antenna differential GND	VSS
21	GPS RF	GPS antenna input port	I
22	SYS_RST	External system reset pin (active low)	I
23	GND	GND pin	VSS
24	NC	NA	NC
25	GND	GND pin	VSS
26	WLAN/BT	WIFI / BT main antenna port	I/O
27	GND	GND pin	VSS
28	EFUSE	Efuse enable power pin	VDD
29	6620 WIFI INT B	WIFI interrupt pin (module to host)	O
30	6620 PMU EN	Internal PMU enable	I
31	NC	NA	NC
32	NC	NA	NC

PIN No.	Name	Description	Type
33	GPS_SYNC	AGPS sync signal	I
34	VRTC	VRTC for AW-NS145	VDD
35	NC	NA	NC
36	GPS_LNA_EN	External GPS LNA EN	O
37	PCM_CLK	BT PCM interface clock	I/O
		FM I2S interface clock	I/O
38	PCM_IN	BT PCM synchronous data input	I
		FM I2S data input	I/O
39	PCM_OUT	BT PCM synchronous data output	O
		FM I2S data output	O
40	PCM_SYNC	BT PCM interface sync	I/O
		FM I2S word select	I/O
41	6620 BGF INT B	BT / GPS / FM interrupt pin (module to host)	O
42	TLDO_SW	Internal 2.8V LDO output	O
43	GND	GND pin	VSS
44	GND	GND pin	VSS
45	GND	GND pin	VSS
46	GND	GND pin	VSS
47	GND	GND pin	VSS

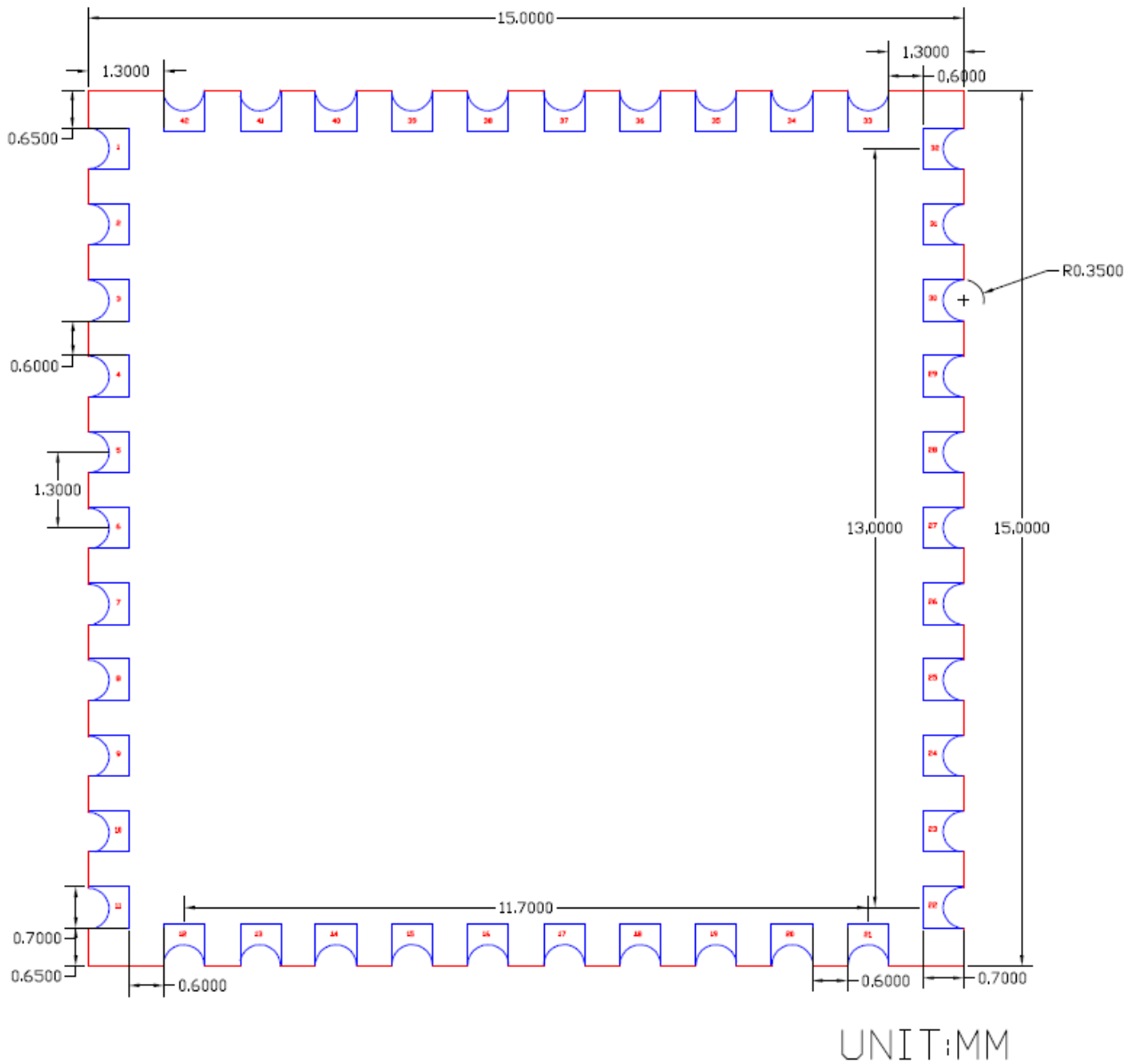
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4. Mechanical Information



Package dimensions

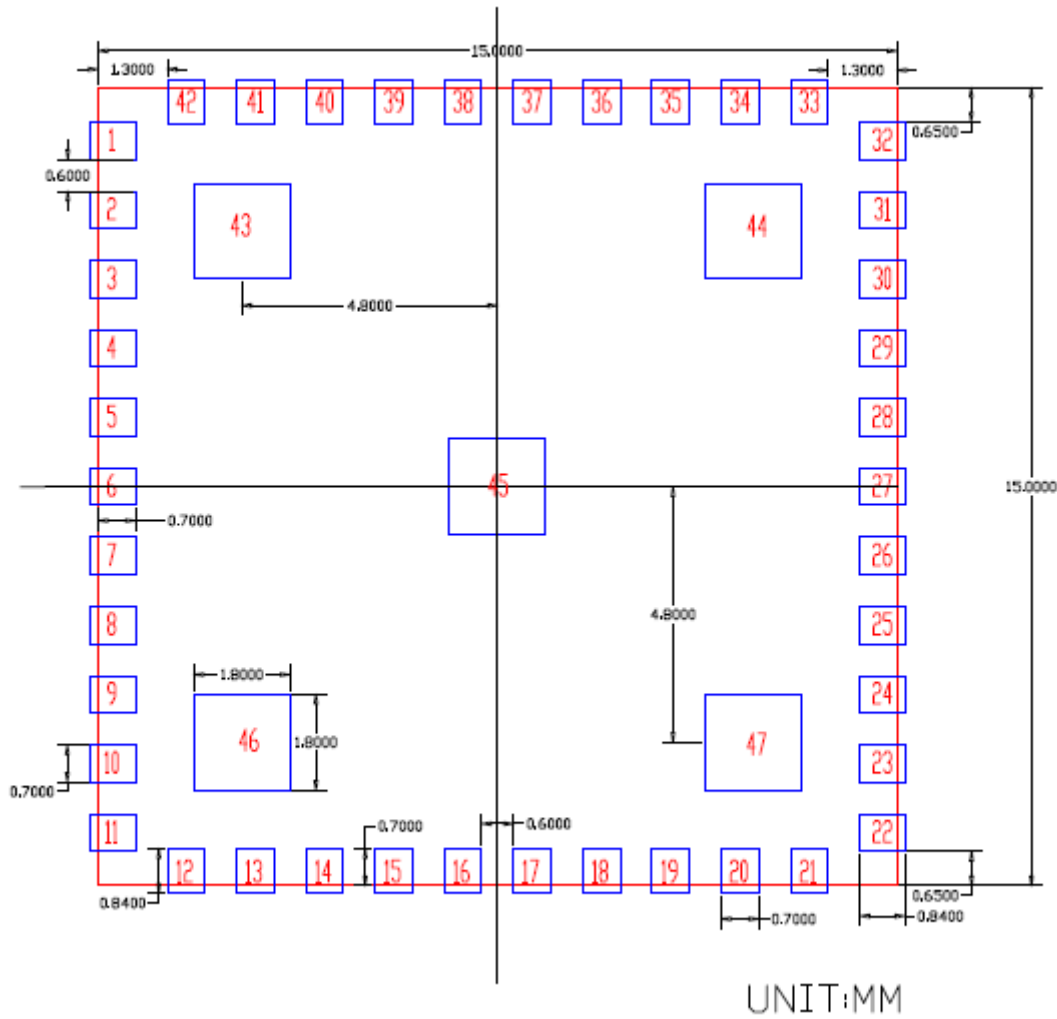
* Total typical height is 1.6mm (with shielding)

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4.1. PCB layout recommendation



Note: for more detail footprint information, please reference “Module IC SMT Process Notification v05.pdf” in AZ module IC design package.

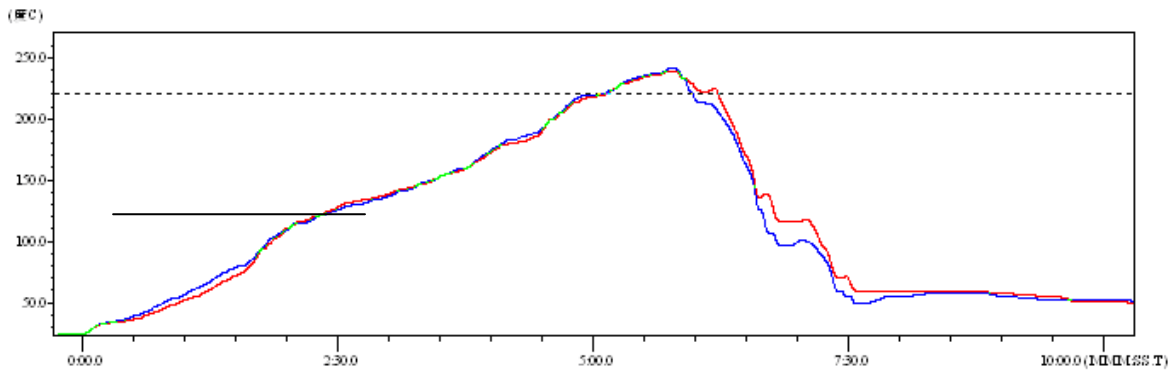
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5. Package Information

5-1. Recommended Reflow Profile



No	Item	Temperature(°C)	Time(sec)
1	Reflow Time	Time of above 220°C	35~55sec
2	Peak-Temp	260°C max	

Note: 1. Recommend to supply N₂ for reflow oven
 2. N₂ atmosphere during reflow (O₂<300ppm)

5-2. Device Handling Instruction(Module IC SMT Preparation)

5-2.1 Shelf life in sealed bag: 12 months, at <30°C and <60% relative humidity (RH)

5-2.2 After bag is opened, devices that will be

5-2.2.1 Baked for 24 hours at 125±5°C with tray

5-2.2.2 Re-baked required after last baked with window time 168 hours

5-2.3 Recommend to oven bake with N₂ supplied

5-2.4 Recommend end to reflow oven with N₂ supplied

5-2.5 Baked required with 24 hours at 125±5°C before rework process for two modules, one is new module and two is board with module

5-2.6 Recommend to store at ≤ 10% RH with vacuum packing

5-2.7 If SMT process needs twice reflow:

5-2.7.1 Process flow: (1) Top side SMT and reflow → (2) Bottom side SMT and reflow

5-2.7.1.1 Case 1: SIP module mound on Top side. Need to bake when bottom side process over 24 hours window time, no need to bake within 168 hours

5-2.7.1.2 Case 2: SIP module mound on bottom side, follow normal bake rule before process

Note: Window time means from last bake end to next reflow start that has 168 hours space.