AXM22001-2A-C
IEEE 802.11b/g WiFi Module Board User's Guide

Model Name: AXM22001-2A-C

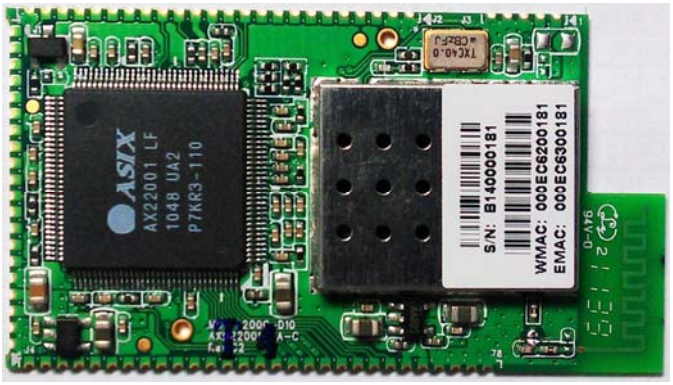
Document No: AXM22001-2A-C/V1.01/11/07/11

Key Features

- Integrated 2.4GHz, IEEE 802.11b/g compatible WiFi connectivity
- Integrated PCB antenna
- Max outdoor range up to 300m (984 ft.), line of sight
- Supports operation in Infrastructure or Ad-Hoc (IBSS) network topology
- Supports 802.11i security: WEP-64/128, TKIP (WPA-PSK) and AES (WPA2-PSK)
- Dual 8-bit 1T 8051/80390 CPU @ 80MHz
- 1MB shared Flash memory for MCPU and WCPU program code and configuration data storage
- 64KB data memory for MCPU
- 4 UART interfaces
- High Speed SPI interface (master or slave mode)
- I2S or PCM interface
- Local Bus host interface (master or slave mode)
- MII or RMII interface
- I2C interface
- Up to 32 GPIOs (4 GPIO ports of 8 bits each)
- Supports real-time clock, with option to use independent power supply from lithium battery
- Supports TCP, UDP, ICMP, IGMP, IPv4, DHCP, BOOTP, ARP, DNS, SMTP, SNTP, UPnP, PPPoE and HTTP in software
- Supports network boot over Ethernet or WiFi using BOOTP and TFTP
- Single operating voltage: 3.3V typical
- Board size: 51.0mm x 28.0mm x 4.5mm surface mountable module

Applications

- Serial to WiFi Device Server
- WiFi Speaker
- WiFi Remote Control/Monitor
- Ethernet to WiFi Bridge
- Zigbee to WiFi Bridge
- WiFi Network Camera
- WiFi RFID
- SPI to WiFi Bridge
- TCP/IP and WLAN Offload Co-processor
- WiFi Internet Radio



The AXM22001-2A-C is a 2.4GHz 802.11b/g WiFi module board which integrates AX22001 and Airoha AL2230S RF transceiver on board to provide a complete WiFi module solution with various user or host interfaces supported. The AXM22001-2A-C is a surface mountable module with castellated mounting holes which offers smaller-form-factor, lower-cost, pre-calibrated RF front-end and pre-certified WiFi module board to free the user from RF and antenna design tasks and regulatory compliance testing, ultimately providing quicker time to market. The user can design his host board with desired function and interface circuits and assemble it with the AXM22001-2A-C WiFi module board through the castellated mounting holes.

Pinout Diagram of Castellated Mounting Holes

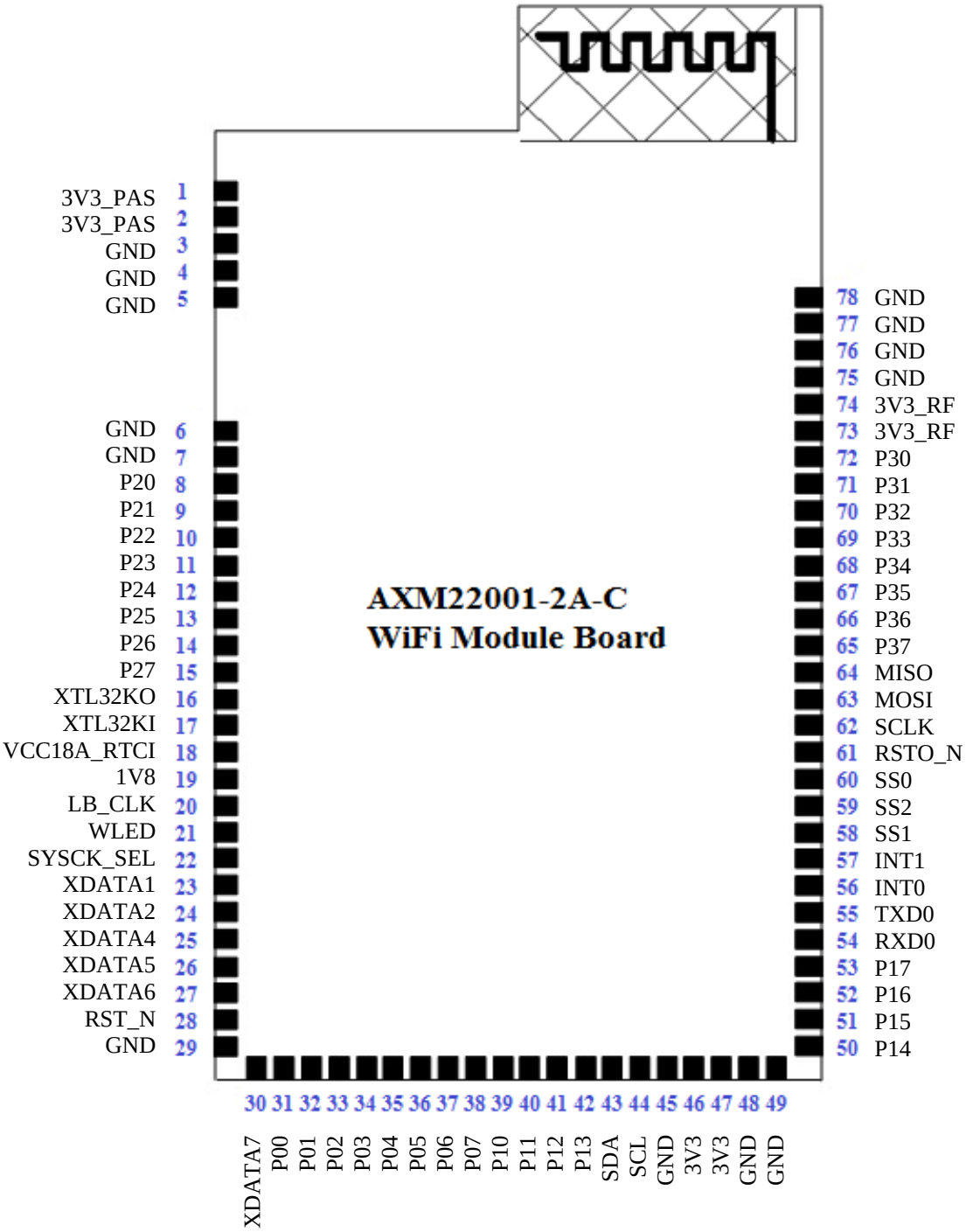


Figure 1. Module pinout

Pin Description of Castellated Mounting Holes

Pin type abbreviation:

PI: Power input
PO: Power output
G: Ground
B: Bidirectional signal pin
I: Input signal pin
O: Output signal pin

Module Pin No	Schematic Symbol Pin No	Pin Name	Pin Type	Description
1	J3.1	3V3_PAS	PI	3.3V power input for RF power amplifier
2	J3.2	3V3_PAS	PI	3.3V power input for RF power amplifier
3	J3.3	GND	G	Ground
4	J3.4	GND	G	Ground
5	J3.5	GND	G	Ground
6	J2.1	GND	G	Ground
7	J2.2	GND	G	Ground
8	J2.3	P20*	B	P20 / LA5 / RXD1 / MDC signals
9	J2.4	P21*	B	P21 / LA6 / TXD1 / MDIO signals
10	J2.5	P22*	B	P22 / LA7 / WRXD0 signals
11	J2.6	P23*	B	P23 / LALE / PCLK / WTXD0 signals
12	J2.7	P24*	B	P24 / LRDY / DVP_RDY / RXD3 / TM0_CK signals
13	J2.8	P25*	B	P25 / LINT / TXD3 / TM0_GT signals
14	J2.9	P26*	B	P26 / LLDS_N / RXD2 / TM1_CK signals
15	J2.10	P27*	B	P27 / LUDS_N / TXD2 / TM1_GT signals
16	J2.11	XTL32KO	O	32.768KHz crystal output
17	J2.12	XTL32KI	I	32.768KHz crystal input
18	J2.13	VCC18A_RTCI	PI	1.8V power input for 32.768KHz crystal I/O and RTC logic
19	J2.14	1V8	PO	1.8V power output
20	J2.15	LB_CLK	B	Local bus clock input or output
21	J2.16	WLED*	O	WiFi link status LED
22	J2.17	SYSCK_SEL	I	Operating system clock frequency selection input
23	J2.18	XDATA1	B	XDATA1 / LB_MOD configuration
24	J2.19	XDATA2	B	XDATA2 / SYNC_BUS configuration
25	J2.20	XDATA4	B	XDATA4 / BURN_FLASH_EN configuration
26	J2.21	XDATA5	B	XDATA5 / BURN_FLASH_921K configuration
27	J2.22	XDATA6	B	XDATA6 / I2C_BOOT_DIS configuration
28	J2.23	RST_N	I	Module reset input
29	J2.24	GND	G	Ground
30	J1.1	XDATA7	B	XDATA7 / REV_EN configuration
31	J1.2	P00*	B	P00 / LA8 / DE3 / TX_CLK / REFCKO signals
32	J1.3	P01*	B	P01 / LA9 / RE3_N / MTXD0 signals
33	J1.4	P02*	B	P02 / LA10 / CTS3 / MTXD1 signals
34	J1.5	P03*	B	P03 / LA11 / DSR3 / TX_EN signals
35	J1.6	P04*	B	P04 / LA12 / RI3 / RX_CLK / REFCKI signals
36	J1.7	P05*	B	P05 / LA13 / DCD3 / MRXD0 signals
37	J1.8	P06*	B	P06 / LA14 / RTS3 / MRXD1 signals
38	J1.9	P07*	B	P07 / LA15 / DTR3 / RX_DV / CRS_DV signals
39	J1.10	P10*	B	P10 / LA0 / MCLK / MTXD2 signals
40	J1.11	P11*	B	P11 / LA1 / BCKT / MTXD3 signals
41	J1.12	P12*	B	P12 / LA2 / WST / TX_ER signals
42	J1.13	P13*	B	P13 / LA3 / DATAT / COL signals
43	J1.14	SDA	B	I2C serial clock
44	J1.15	SCL	B	I2C serial data
45	J1.16	GND	G	Ground
46	J1.17	3V3	PI	3.3V power input
47	J1.18	3V3	PI	3.3V power input
48	J1.19	GND	G	Ground

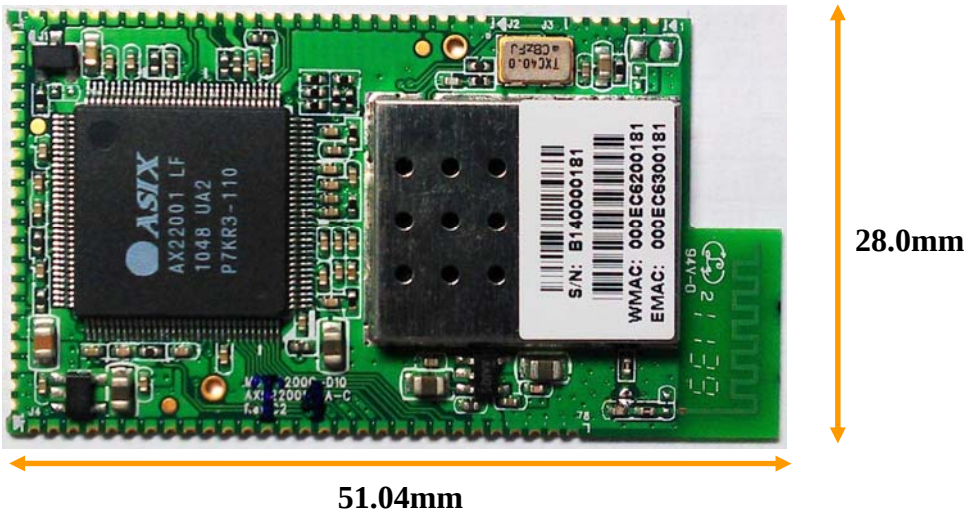
49	J1.20	GND	G	Ground
50	J4.1	P14*	B	P14 / LA4 / BCKR / MRXD2 signals
51	J4.2	P15*	B	P15 / LRD_N / WSR / MRXD3 signals
52	J4.3	P16*	B	P16 / LWR_N / DATAR / RX_ER signals
53	J4.4	P17*	B	P17 / LCS0_N / HREF / CRS signals
54	J4.5	RXD0	B	MCPU UART 0 serial receive data
55	J4.6	TXD0	O	MCPU UART 0 serial transmit data
56	J4.7	INT0*	B	INT0 / XWKUP / LDA8 / SINT / DB_DI signals
57	J4.8	INT1*	B	INT1 / WINT0 / LDA9 / SRDY / DB_CKO signals
58	J4.9	SS1*	B	SS1 / LDA10 / STPZ / DB_DO signals
59	J4.10	SS2*	B	SS2 / LDA11 / DQ / MINT_N signals
60	J4.11	SS0*	B	SS0 / LDA12 signals
61	J4.12	RSTO_N	O	Reset output
62	J4.13	SCLK*	B	SCLK / LDA13 / WDB_DI signals
63	J4.14	MOSI*	B	MOSI / LDA14 / WDB_CKO signals
64	J4.15	MISO*	B	MISO / LDA15 / WDB_DO signals
65	J4.16	P37*	B	P37 / LDA7 / Y7 / DTR2 / CEX4 signals
66	J4.17	P36*	B	P36 / LDA6 / Y6 / RTS2 / CEX3 signals
67	J4.18	P35*	B	P35 / LDA5 / Y5 / DCD2 / CEX2 signals
68	J4.19	P34*	B	P34 / LDA4 / Y4 / RI2 / CEX1 signals
69	J4.20	P33*	B	P33 / LDA3 / Y3 / DSR2 / CEX0 signals
70	J4.21	P32*	B	P32 / LDA2 / Y2 / CTS2 / ECI signals
71	J4.22	P31*	B	P31 / LDA1 / Y1 / RE2_N / TM2_GT signals
72	J4.23	P30*	B	P30 / LDA0 / Y0 / DE2 / TM2_CK signals
73	J4.24	3V3_RF	PI	3.3V power input for RF circuit
74	J4.25	3V3_RF	PI	3.3V power input for RF circuit
75	J4.26	GND	G	Ground
76	J4.27	GND	G	Ground
77	J4.28	GND	G	Ground
78	J4.29	GND	G	Ground

Note:
* These pins are multi-function pins in AX22001. Please refer to Section 3.1.3 "Multi-function Pin Setting (0x07 ~ 0x02)" on AX22001 datasheet to configure proper pin functions for your AX22001 application.

Please feel free to contact ASIX Electronics Technical Support (support@asix.com.tw) to receive AXM22001-2A-C WiFi module board schematic and BOM file for details.

Board Dimensions

The AXM22001-2A-C is a surface mountable module with castellated mounting holes on three sides. Below shows the module dimensions.



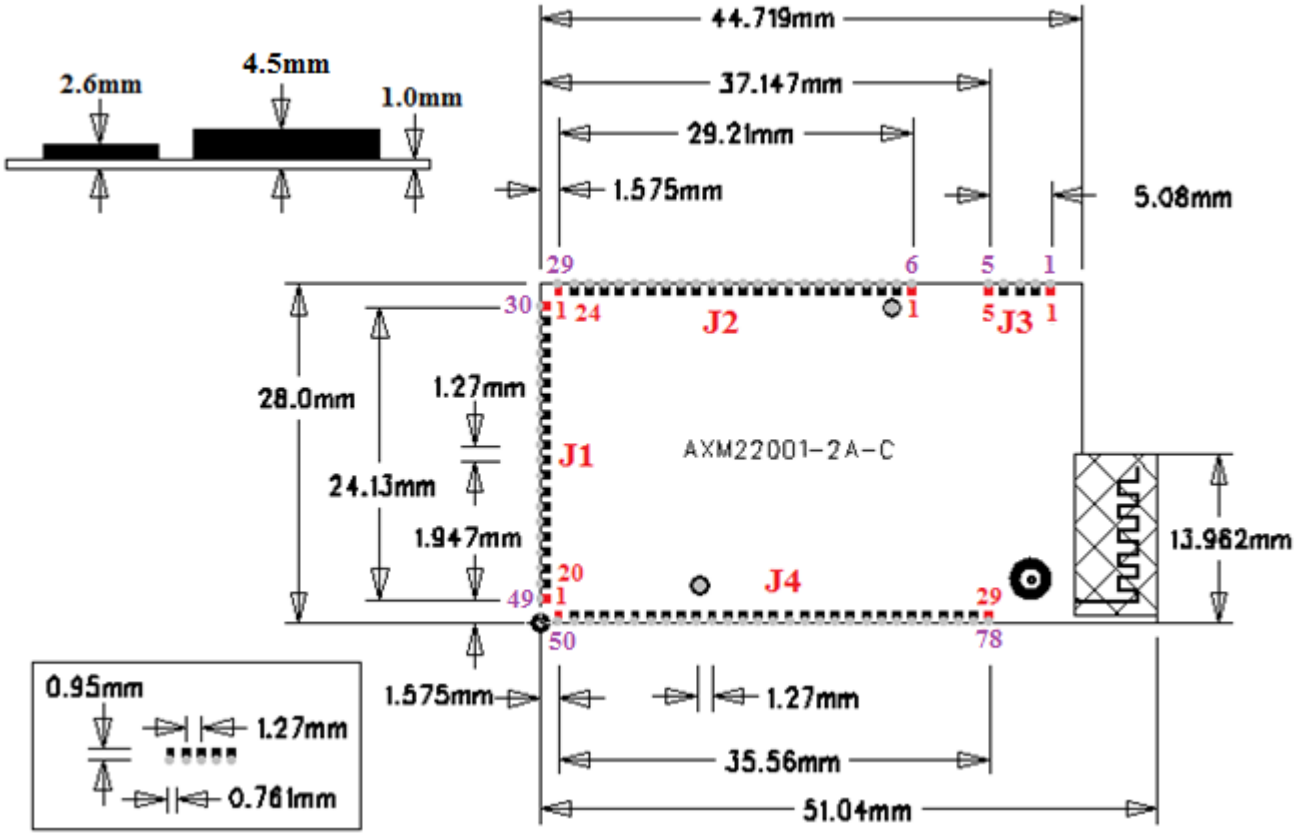


Figure 2. Module Dimension

Host PCB Footprint

Below shows the recommended host PCB footprints for the module. The AXM22001-2A-C module has an integrated PCB antenna which requires the host PCB to maintain certain copper keep-out area as shown below, for best antenna performance. Also, when mounting on the host PCB of user's system, the module's PCB antenna should be on the edge of the host PCB and faced outward.

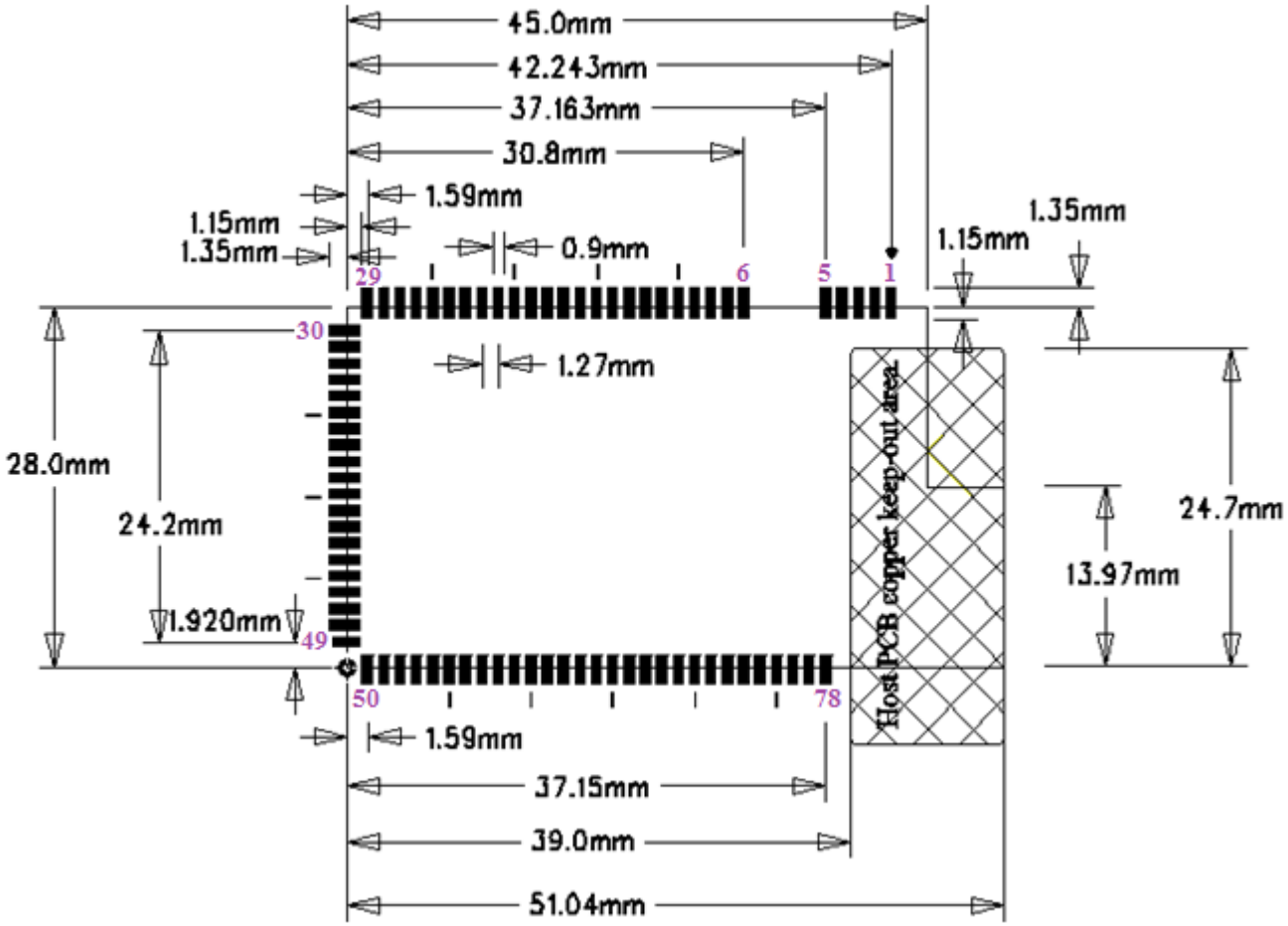
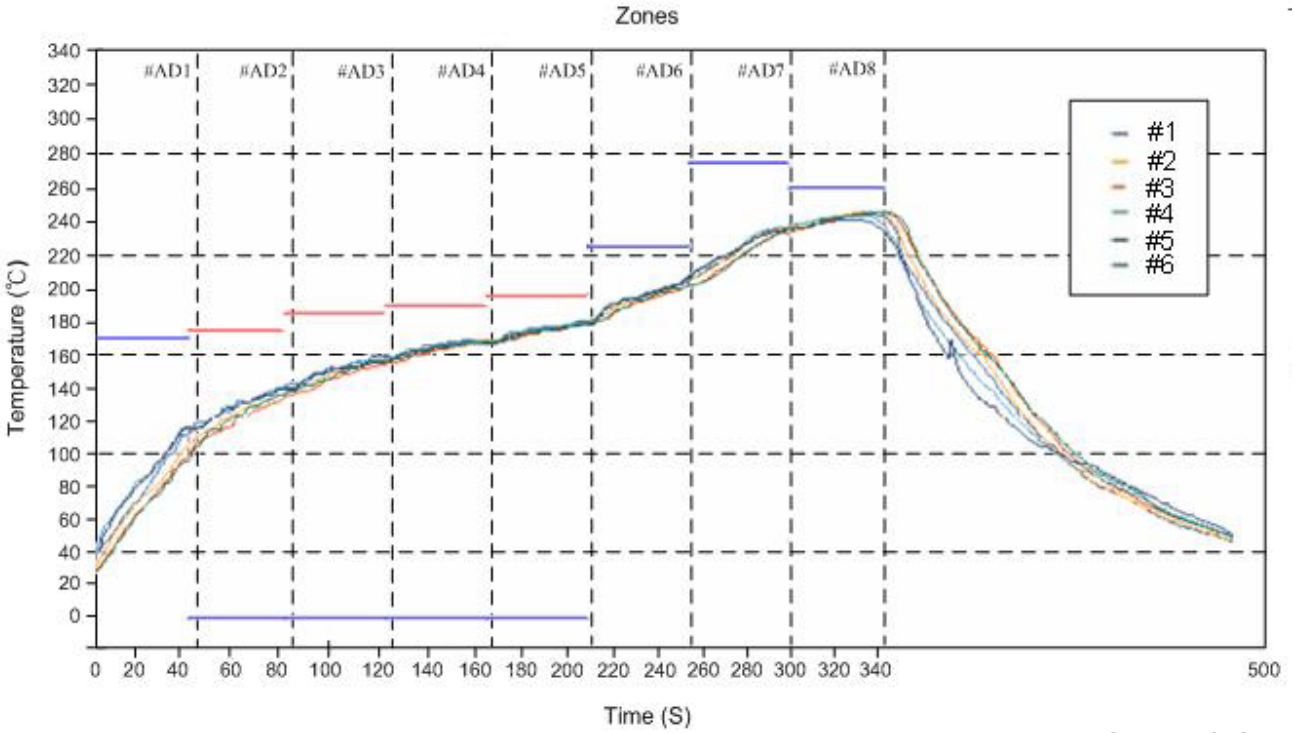


Figure 3. Layout Footprint & layout guide

Module Reflow Profile



Conveyor Speed: 70 cm/min

Zone	#AD1	#AD2	#AD3	#AD4	#AD5	#AD6	#AD7	#AD8
Upper Limit(℃)	170	175	185	190	195	225	275	260
Lower Limit(℃)	170	0	0	0	0	225	275	260
Time (S)	50	50	50	50	50	50	50	50

Figure 4. Module Reflow

PCB Antenna

One of the main reasons to use a PCB antenna is to reduce cost. Since the antennas is fabricated on the top layer with solder mask. Other layers below the antenna have no copper trace and plane. It is recommended that the module be mounted on the edge of the host PCB. To have best performance, place the module on the host PCB according to the details shown in Figure 3. The antenna patterns are shown in the Figure 5 and Figure 6. These patterns allow the designer to understand the performance of the module with respect to the position of the receive/transmit antenna at the other end of the link.

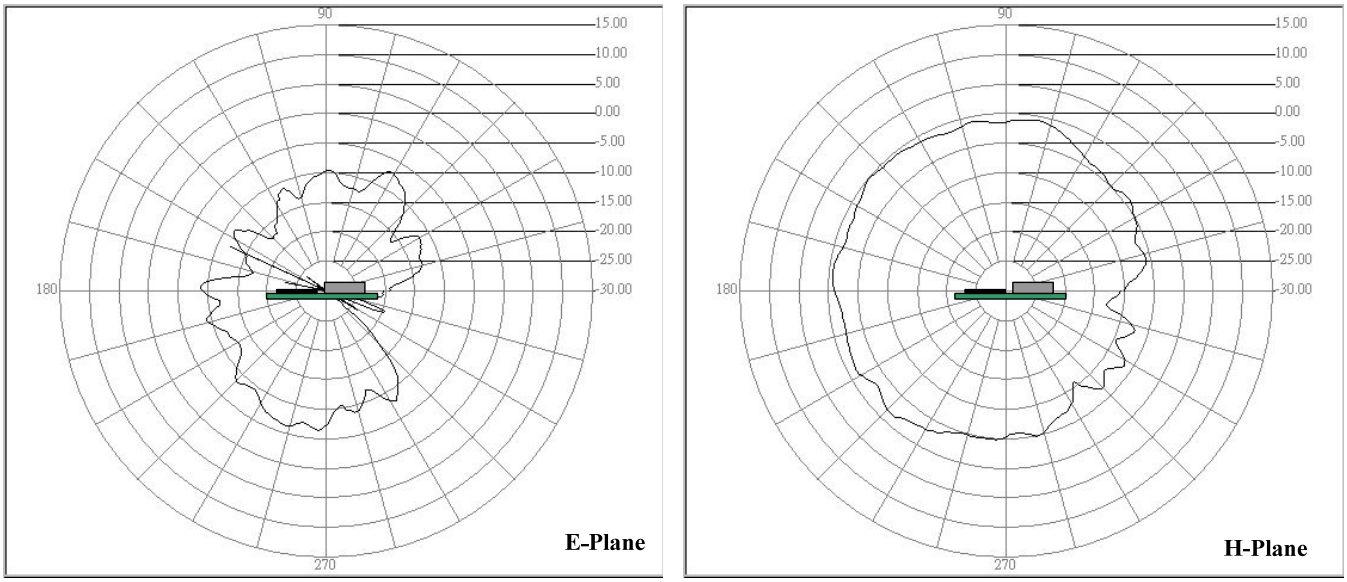


Figure 5. Module in horizontal antenna pattern

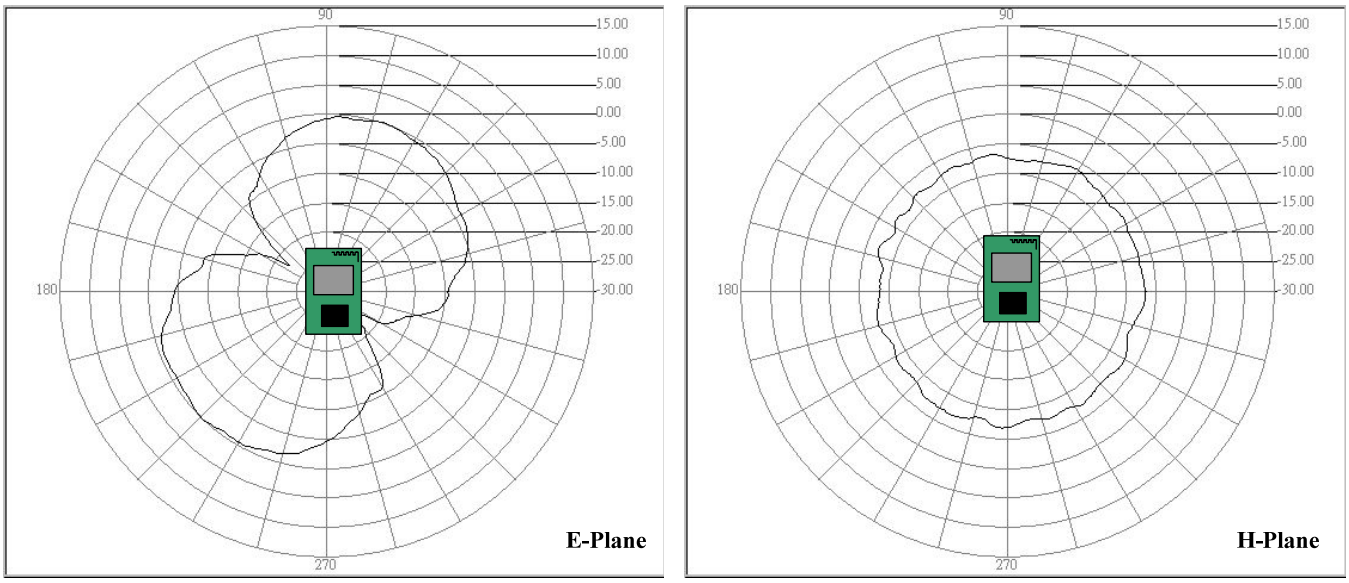


Figure 6. Module in vertical antenna pattern

Regulatory Approval

The AXM22001-2A-C module has acquired the regulatory approvals for modular devices in the United States. Modular approval allows the user to mount the AXM22001-2A-C module inside his own final product and needn't the regulatory testing, if no changes or modifications to the module circuitry. Any changes or modifications will cause the user to lose his authority to operate the equipment. The user must comply with all of the instructions provided by ASIX Electronics, which indicate the necessary of the installation and/or operating conditions for the compliance.

The integrator still has the responsibility to test the end product for any additional compliance (for example: digital device emission, PC peripheral requirements, etc.) in the specific country that the end product will be sold.

United States

The AXM22001-2A-C module has complied with part 15 subpart C "Intentional Radiators" 15.247, 15.207 and 15.209 of the FCC Rules. And modular approval with FCC part 15.212. The module can be integrated into a finished product without obtaining subsequent and separate FCC approvals. For product available in the USA market, only channel 1~11 can be operated. Selection of other channels is not possible.

FCC Statement:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help

The user's manual or datasheet of the end product should include the above statement.

FCC Caution

To ensure continued compliance, (1) Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment. (2)This device must not be co-located or operating in conjunction with any other antenna or transmitter.

Co-location with other radio transmitting devices operating concurrently in the same band will require additional testing and certification.

FCC Notice

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.
2. This device must accept any interference received, including interference that may cause undesired operation.

FCC Label requirement:

If the FCC ID is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains Transmitter Module FCC ID: Z59A22001C" or "Contains FCC ID: Z59A22001C." Any similar wording that expresses the same meaning may be used.

> Contains Transmitter Module FCC ID: Z59A22001C
> or
> Contains FCC ID: Z59A22001C

RF Exposure:

The following statement must be included as a CAUTION statement in manuals and OEM products to alert users of FCC RF exposure compliance:

> To satisfy FCC RF Exposure requirements for mobile and base station transmission devices, the distance between the antenna of for this device and the persons must be 20 cm or more during operation.
>
> This device must not be co-located or operating in conjunction with any other antenna or transmitter.

If the AXM22001-2A-C module is used in a portable application (i.e., the antenna is less than 20 cm from persons during operation), the integrator is responsible for performing Specific Absorption Rate (SAR) testing in accordance with FCC rules 2.1091.

Helpful Web Sites:

Federal Communications Commission (FCC): http://www.fcc.gov

Europe

The AXM22001-2A-C module has been certified for using in European countries. The following testing has been completed:

Test standard ETSI EN 300 328 V1.7.1 (2006):

- •Equivalent Isotropic Radiated Power
- •Maximum Spectral Power Density
- •Frequency Range
- •Transmitter Spurious Emissions
- •Receiver Spurious Emissions

Test standards ETSI EN 301 489-1:2008 and ETSI EN 301 489-17:2009:

- •Radiated Emissions
- •Electrostatic Discharge (ESD)
- •RF Electromagnetic Field (RS)

The modules are fully compliant with

- •Radiated Emissions EN 55022
- •Electrostatic Discharge EN 61000-4-2
- •RF Electromagnetic Field EN 61000-4-3

ETSI does not provide a modular approval service. However, the testing completed above included the test plan, test results and can be the reference for the certification. The end user is responsible for ensuring compliance with harmonized frequencies and labeling requirements for each country in which the end device is marketed and sold.

Helpful Web Sites:

Radio and Telecommunications Terminal Equipment (R&TTE):http://ec.europa.eu/enterprise/rtte/index_en.htm

European Conference of Postal and Telecommunications Administrations (CEPT):http://www.cept.org/

European Telecommunications Standards Institute (ETSI): http://www.etsi.org/

European Radio Communications Office (ERO): http://www.ero.dk/