Embstar®

M16
802.11 b/g/n WiFi AP Module
Product Specification

File Name	M16 802.11 b/g/n WiFi AP Module
Revision	Version B
Release Date	20-March-2018

Embstar®

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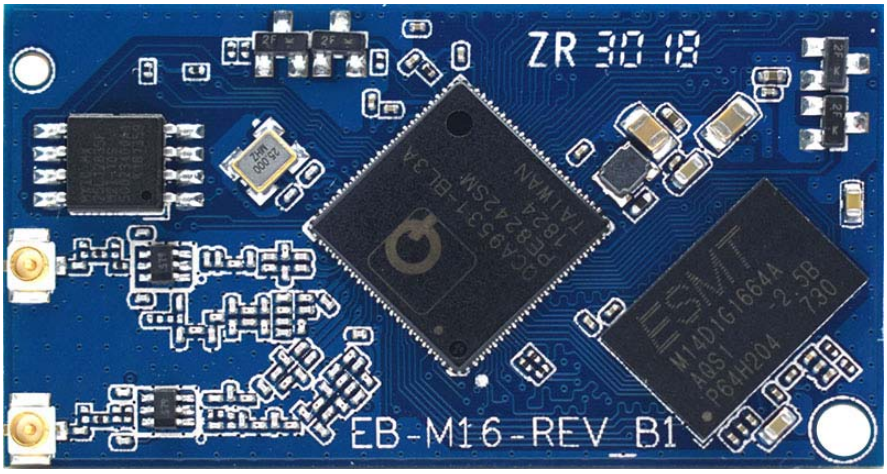
1 Product Overview

M16 is a complete, small form factor 802.11b/g/n Wi-Fi Solution optimized for low power, low-cost, and highly integrated AP and consumer electronic devices, the module integrates all Wi-Fi functionality in a package friendly to low-cost PCB design, requiring only a few external 3.3V and connection to antenna.

The module based on the single chip QCA9531 which integrates an 802.11n 2x2 MIMO MAC/BB/ radio with internal PA and LNA. It supports 802.11n operations up to 150 Mbps for 20MHZ and 300 Mbps for 40MHZ,and 802.11b/g data rates.

The module supports AP mode and client mode at the same time and include mass service application software to reduce the research and design work of customer.



EBST-M16 Top View

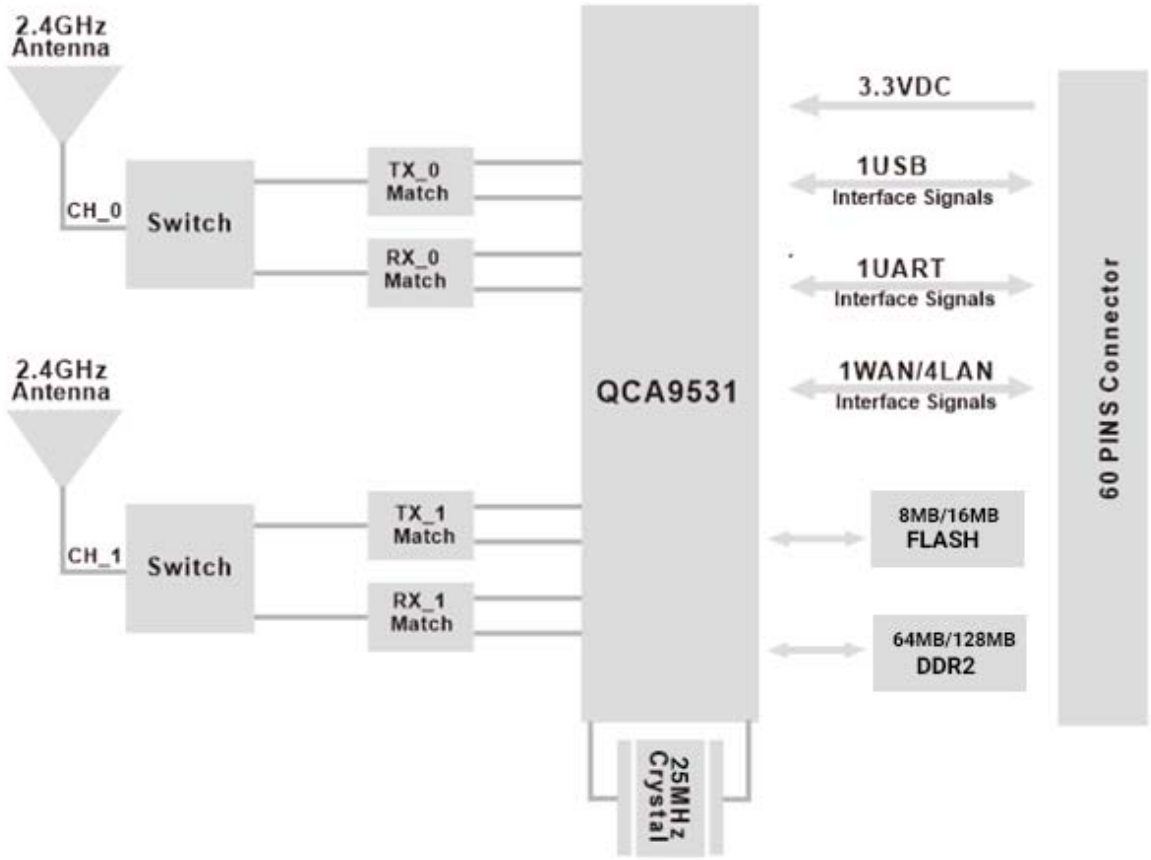
2 Applications

- WiFi AP
- 3G/4G WiFi Router
- WiFi Repeater
- WiFi Enabled Security Cameras
- Smart Door Locks
- Building Automation
- Smart Home & Building
- Smart Healthcare
- Industrial Sensor Controller

3 Features

- Small Module Size 48.4mm x 26mm x 9.0mm
- Compliant to 802.11 b/g/n
- DDR Memory up to 128MB
- SPI NOR Flash memory up to 32MB
- 4 LAN ports and 1 WAN port
- Supports USB 2.0 host/device(option) mode
- Supports GPIO/LED
- Supports AP mode and Client mode
- Support High-Speed UART for console
- The MIPS R24k supports 64KByte I-Cache and 32Kbyte D-Cache,targeted to operate at up to 550MHz.
- Security: WPA/WPA2, WEP, TKIP and AES, WPS2.0, WAPI

4 Block Diagram



5 Interfaces

USB

The USB2.0 interface support USB slave devices, such as USB storage device, USB 3G/4G dongle, USB camera, etc.

UART

The UART default baud rate is 115200bps.

GPIO

The GPIO Support 2.5/3.0/3.3V Voltage.

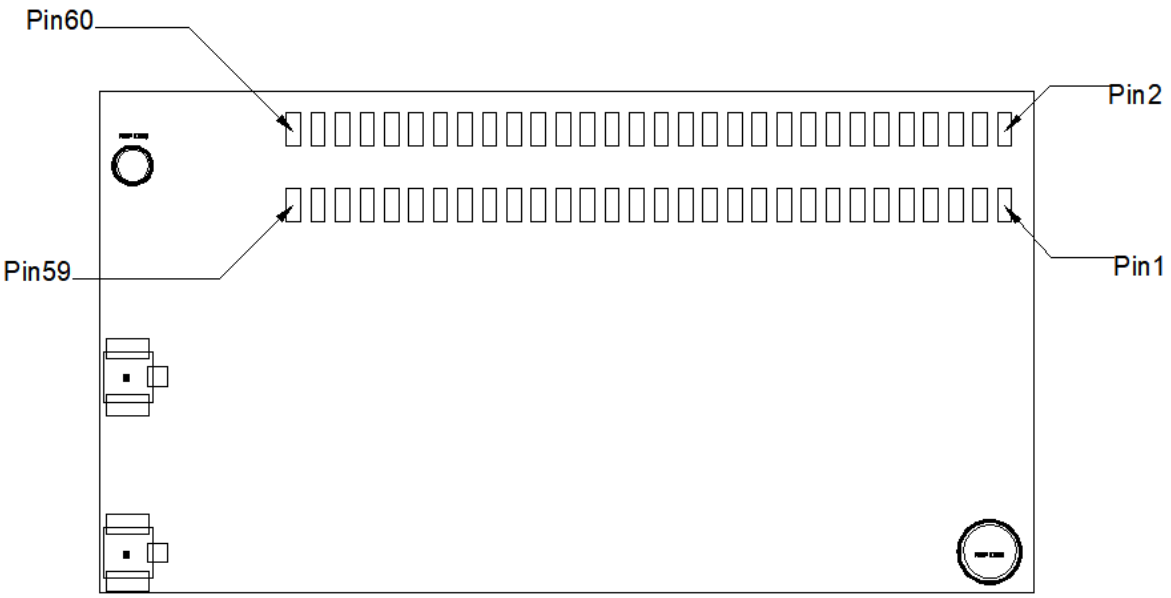
WAN/LAN

The EBST-M16-B module integrates 5-port 10/100Mbps fast Ethernet switch.

6 Module Specifications

Hardware Features	
Model No.:	M16
Antenna Type	IPEX
Chipset Solution	QCA9531
CPU Clock Speed	Up to 650MHz
DDR2 Memory	Up to 1024Mb
Flash Memory	Up to 256Mb
Network	1WAN/4LAN , 10/100Mbps
Ethernet	1xSPI, 1xUART,1xUSB2.0, 10xGPIO
Voltage	3.3V±5%
Dimension（LxWxH）	48.4mm*26mm*9.0mm
Wireless Features	
Wireless Standards	IEEE 802.11b/g/n
Frequency Range	2412GHz---2484MHz
Data Rates	IEEE 802.11n : MCS0--MCS7 @ HT20
	IEEE 802.11n : MCS0--MCS7 @ HT40
	IEEE 802.11g : 6,9,12,18,24,36,48,54Mbps
	IEEE 802.11b : 1,2,5.5,11Mbps
Receiver Sensitivity	HT40 MCS7 : -69dBm@10% PER(MCS7)
	HT20 MCS7 : -71dBm@10% PER(MCS7)
	54M: -75dBm@10% PER
	11M: -88dBm@ 8% PER
Modulation Technique	DSSS (DBPSK, DQPSK, CCK)
	OFDM (BPSK, QPSK, 16-QAM, 64-QAM)
Wireless Security	WPA/WPA2, WEP, TKIP and AES, WPS2.0, WAPI
Transmit Power	IEEE 802.11n: 13-16dBm @HT20/40 MCS7
	IEEE 802.11g: 14-17dBm @54MHz
	IEEE 802.11b: 16-20dBm @11MHz
Work Mode	Bridge/Gateway/AP Client
Others	
Certification	FCC/IC/CE/RoHS/Proposition 65
Environment	Operating Temperature: -20℃~70℃
	Storage Temperature: -40℃~85℃
	Operating Humidity: 10%~90% non-condensing
	Storage Humidity: 5%~90% non-condensing

7 Module Pinout and Pin Definition



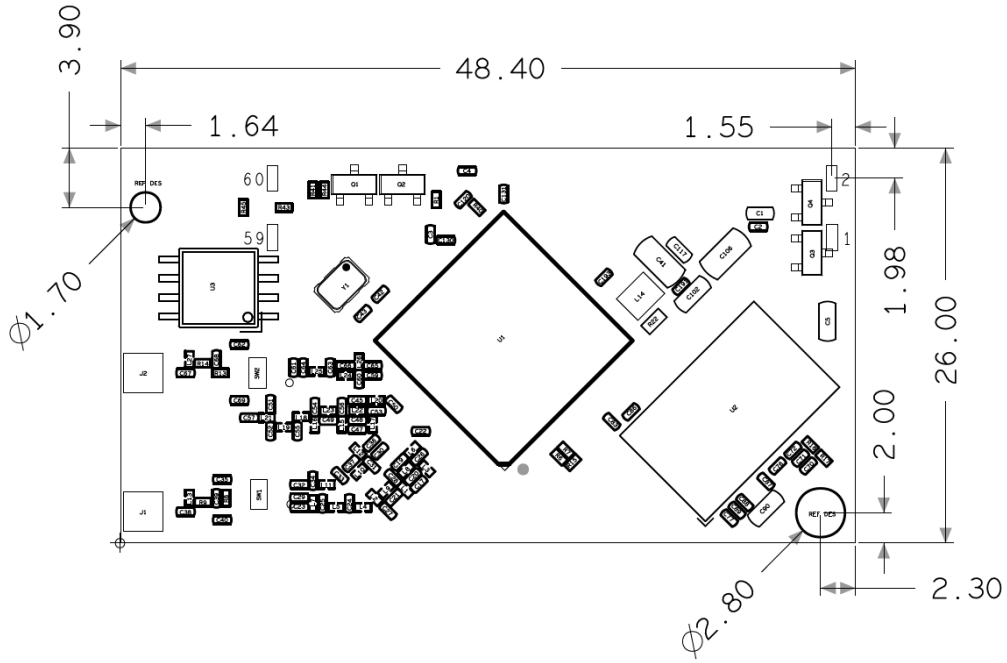
Note:

- I/O A digital bidirectional signal
- I A digital input signal
- O A digital output signal
- P A power or ground signal
- OA An analog output signal
- IA Analog input signal
- IH Input signals with weak internal pull-up,to prevent signals from floating when left open
- NC No connection should be made to this pin

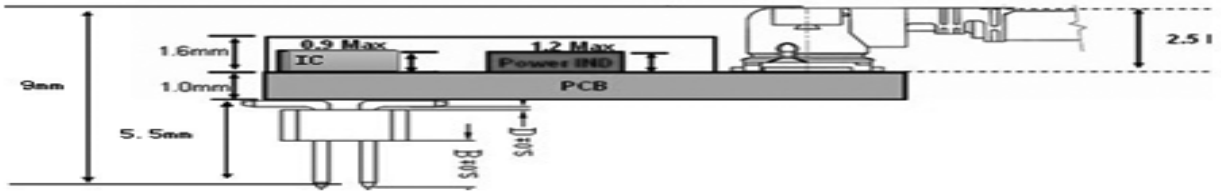
Pin No.	Symbol Name	Status	Pin Description
1	GND	P	GROUND
2	GND	P	GROUND
3	LED_LINK_4(GPIO_11)	I/O	LAN_PORT3_LED
4	LAN_PORT1_RX+	IA	Ethernet port
5	LED_LINK_3(GPIO_14)	I/O	LAN_PORT2_LED
6	LAN_PORT1_RX-	IA	Ethernet port
7	LED_LINK_2(GPIO_15)	I/O	LAN_PORT1_LED
8	LAN_PORT1_TX+	OA	Ethernet port
9	GND	P	GROUND
10	LAN_PORT1_TX-	OA	Ethernet port
11	LAN_PORT0_TX+	OA	Ethernet port
12	GND	P	GROUND
13	LAN_PORT0_TX-	OA	Ethernet port
14	LAN_PORT2_TX+	OA	Ethernet port
15	LAN_PORT0_RX+	IA	Ethernet port
16	LAN_PORT2_TX-	OA	Ethernet port
17	LAN_PORT0_RX-	IA	Ethernet port
18	LAN_PORT2_RX+	IA	Ethernet port
19	VDD_3.3V	P	3.3V input 1000mA, recommended voltage 3.3V,Min2.97V, MAX 3.63V
20	LAN_PORT2_RX-	IA	Ethernet port
21	VDD_3.3V	P	3.3V input 1000mA, recommended voltage 3.3V,Min2.97V, MAX 3.63V
22	GND	P	GROUND
23	GPIO_0	I/O	GPIO
24	WAN_PORT_RX+	IA	Ethernet port
25	GPIO_1	I/O	GPIO
26	WAN_PORT_RX-	IA	Ethernet port
27	GPIO_2	I/O	GPIO
28	WAN_PORT_TX+	OA	Ethernet port
29	GPIO_3	I/O	GPIO
30	WAN_PORT_TX-	OA	Ethernet port

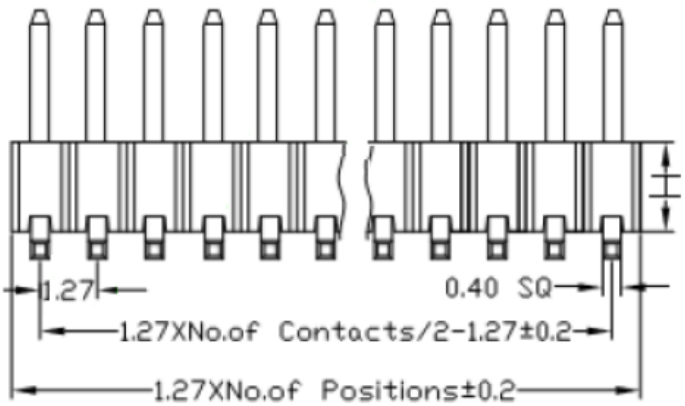
31	NC	X	NC
32	LAN_PORT3_RX+	IA	Ethernet port
33	NC	X	NC
34	LAN_PORT3_RX-	IA	Ethernet port
35	USB +	IA/OA	USB signal, carries USB data to and from the USB 2.0 PHY
36	LAN_PORT3_TX+	OA	Ethernet port
37	USB -	IA/OA	USB signal, carries USB data to and from the USB 2.0 PHY
38	LAN_PORT3_TX-	OA	Ethernet port
39	SYSTEM_LED(GPIO_13)	I/O	SYSTEM_LED
40	GND	P	GROUND
41	VDD_2.5V OUTPUT	P	I/O Voltage ouput
42	VDD_2.0V OUTPUT	P	Power supply output for peripheral network transformer
43	RESET	IH	external power on reset , it has an internal 10 K pull up resistance,the external pull low effective.
44	VDD_2.0V OUTPUT	P	Power supply output for peripheral network transformer
45	JUMPSTART(GPIO_17)	I/O	KEY_INPUT to start WPS function, it has an internal 10 K pull-up resistance,the external pull low effective.
46	GND	P	GROUND
47	GND	P	GROUND
48	SPI_MI_SO	I	SPI data input
49	3.3V	P	3.3V input 1000mA, recommended voltage 3.3V,Min2.97V, MAX 3.63V
50	SPI_CLK	O	SPI_CLK
51	3.3V	P	3.3V input 1000mA, recommended voltage 3.3V,Min2.97V, MAX 3.63V
52	SPI_MO_SI	O	SPI data ouput
53	WAN_LED(GPIO_4)	I/O	WAN LED
54	LED_LINK_1(GPIO_16)	I/O	LAN_PORT0_LED
55	NC	X	NC
56	WLAN_LED(GPIO_12)	I/O	2.4G_wifi_LED
57	UART_RX	I	Serial data in
58	UART_TX	O	Serial data out
59	GND	P	GROUND
60	GND	P	GROUND

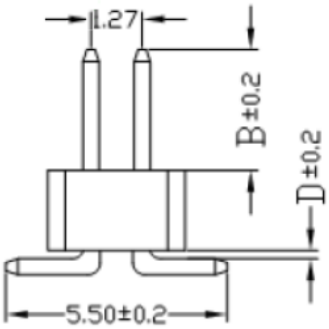
8 PCB Footprint and Dimensions



All linear demensions are in millimeters.







Dimension antitheses list

ITEM	D	B	H
Standard	0.4	4.0	1.0

9 Electrical Characteristics

■ **Absolute Maximum Ratings**

Parameter	Condition	Min	Typ.	Max	Unit
Storage temperature range		-40		125	°C
ESD Protection	VESD	/		2000	V
Supply voltage	VDD_3.3V	0		3.6	V
Voltage on any I/O pin		-0.3		3.63	V

EBST-M16-B series modules are Electrostatic Sensitive Devices and require special precautions while handling.

ESD precautions The EBST-M16-B module contain highly sensitive electronic circuitry and are Electrostatic Sensitive Devices (ESD). Handling the EBST-M16-B module without proper ESD protection may destroy or damage them permanently.

The EBST-M16-B module are electrostatic sensitive devices (ESD) and require special ESD precautions typically applied to ESD sensitive components. Proper ESD handling and packaging procedures must be applied throughout the processing, handling, transportation and operation of any application that incorporates the EBST-M16-B module. Don't touch the module by hand or solder with non-anti-static soldering iron to avoid damage to the module.

■ **Recommended Operation Ratings**

Parameter	Condition	Min	Typ.	Max	Unit
Extended temp. range	TA	-40		125	°C
Power Supply		/		2000	V
Input Low Voltage	VDD_3.3V	0		3.6	V
Input High Voltage		-0.3		3.63	V

■ **Measurement Conditions**

System State	Current (Typ.)@3.3V	Current (Max.)@3.3V
Standby	180 mA	210 mA
Transmit (2.4g; +15 dBm @ TX HT20 MCS7.)	400 mA	512mA
Transmit (2.4g; +18 dBm @ 11b 11Mbps.)	580 mA	685mA

10 Statement

■ **FCC Statement**

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

NOTE: 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 th
e 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 important announcement

Important Note:

Radiation Exposure Statement
This equipment complies with FCC radiation exposure limits set forth for anuncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Important Note:

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID 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.

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

11 Contact Us

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Website on alibaba.com:embstar.en.alibaba.com

FCC Regulatory notices

Modification statement

Shenzhen Embstar Technology Co., Ltd. has not approved any changes or modifications to this device by the user. Any changes or modifications could void the user's authority to operate the equipment.

Interference statement

This device complies with Part 15 of the FCC Rules and Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

RF exposure

This equipment complies with FCC and ISED radiation exposure limits set forth for an uncontrolled environment. The antenna should be installed and operated with minimum distance of 20 cm between the radiator and your body. Antenna gain must be below 2 dBi.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

The host end product must include a user manual that clearly defines operating requirements and conditions that must be observed to ensure compliance with current FCC RF exposure guidelines.

For portable devices, in addition to above, a separate approval is required to satisfy the SAR requirements of FCC Part 2.1093.

If the device is used for other equipment that separate approval is required for all other operating configurations, including portable configurations with respect to 2.1093 and different antenna configurations.

FCC Class B digital device notice

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.

Labelling Requirements for the Host device

The host device shall be properly labelled to identify the modules within the host device. The certification label of the module shall be clearly visible at all times when installed in the host device, otherwise the host device must be labelled to display the FCC ID and ISED of the module, preceded by the words "Contains transmitter module", or the word "Contains", or similar wording expressing the same meaning, as follows:

Model: M16

Contains FCC ID：2AUPL-M16

The host OEM user manual must also contain clear instructions on how end users canfind and/or access the module and the FCC ID and ISED.

Model: M16

Contains FCC ID：2AUPL-M16

OEM Statement:

a. The module manufacturer must show how compliance can be demonstrated only for a specific host or hosts

b. The module manufacturer must limit the applicable operating conditions in which the transmitter will be used, and

c. The module manufacturer must disclose that only the module grantee can make the test evaluation that the module is compliant in the host. When the module grantee either refuses to make this evaluation, or does not think it is necessary, the module certification is rendered invalid for use in the host, and the host manufacturer has no choice other than to use a different module, or take responsibility (§ 2.929) and obtain a new FCC ID for the product.

d. The module manufacturer must provide the host manufacturer with the following requirements:

i. The host manufacturer is responsible for additional testing to verify compliance as a composite system. When testing the host device for compliance with Part 15 Subpart B, the host manufacturer is required to show compliance with Part 15 Subpart B while the transmitter module(s) are installed and operating. The modules should be transmitting and the evaluation should confirm that the module’s intentional emissions are compliant (i.e. fundamental and out of band emissions).