

C-3L-M product specifications

(WiFi &B LE module)

Product model: C-3L-M

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Change record Change History:

Change record					
Vers ion	Revised content	Page times	Revision date	Revised v	Auditor
V1.0.	First time, when formulated	/	2020-08-19	Wu Delong	
V1.2.	Change to BK7231M		2021-04-10	He Yong	

1 Summary Summary

C-3L-M integrates Bluetooth dual-mode 5.1 and Wi-Fi 802.11n with BK7231M chips. Integrate hardware and software resources required to complete complete Wi-Fi and Bluetooth applications, can support AP and STA dual-role connectivity, and both classic and low-power Bluetooth connectivity. The 32-bit MCU with running speeds up to 120 MHz and the built-in 256 KB RAM, allow the chip to support cloudy-cloud connectivity, and the MCU extended instructions for signal processing enable efficient audio coding and decoding.

Has rich peripherals like PWM, I2C, UART, SPI, SDIO as well as IrDA. You can download and burn programs directly through the UART. Up to six roads of 32-bit high speed PWM output using chips are ideal for high quality LED control. Each 2 PWM can be configured as a phase controlled differential mode to support motor and light band drive.

Priority-based Wi-Fi and Bluetooth coexistence control modules are integrated internally to achieve real-time priority and transceiver scheduling. BK7231M can provide a transceiver state indication of the current transceiver to support external PA and LNA extensions.

Inbedded eFUSE and supports OTP read and write within FLASH to provide unique serial numbers, code encryption, and secure the debug interface. Internal integrates real random number generators and security modules for secure and fast authentication and network connectivity.

Supporting low-power sleep mode, MCU can enter sleep and reach a micro-safe sleep current. The BK7231M supports deep sleep modes, which can run 32-bit clocks at several microAnn currents, and can be awakened by this clock or by any GPIO.

It supports not only classic Bluetooth standard rate connectivity, but also all BLE 5.1 rates and features, including Long Range, High Data Rate, and AoA/AoD positioning of up to four antennas.

Modulation mode: wifi:DBPSK/DQPSK/CCK (DSSS)

BPSK/QPSK/16QAM/64QAM (OFDM)

BT: GFSK, π / 4DQPSK, 8DPSK.

Frequency range: 2400MHz-2483.5MHz

Occupancy bandwidth: Wifi: \leq 40MHz

BT: \leq 3MHz.

Launch power: \leq 20dBm (EIRP)

2 Basic feature Features

Meet the 802.11 b/g/n 1x1 standard

20 MHz bandwidth and STBC

The 54 Mbps output power is 17 dBm

STA, AP, and Direct modes

54 Mbps sensitivity-76 dBm

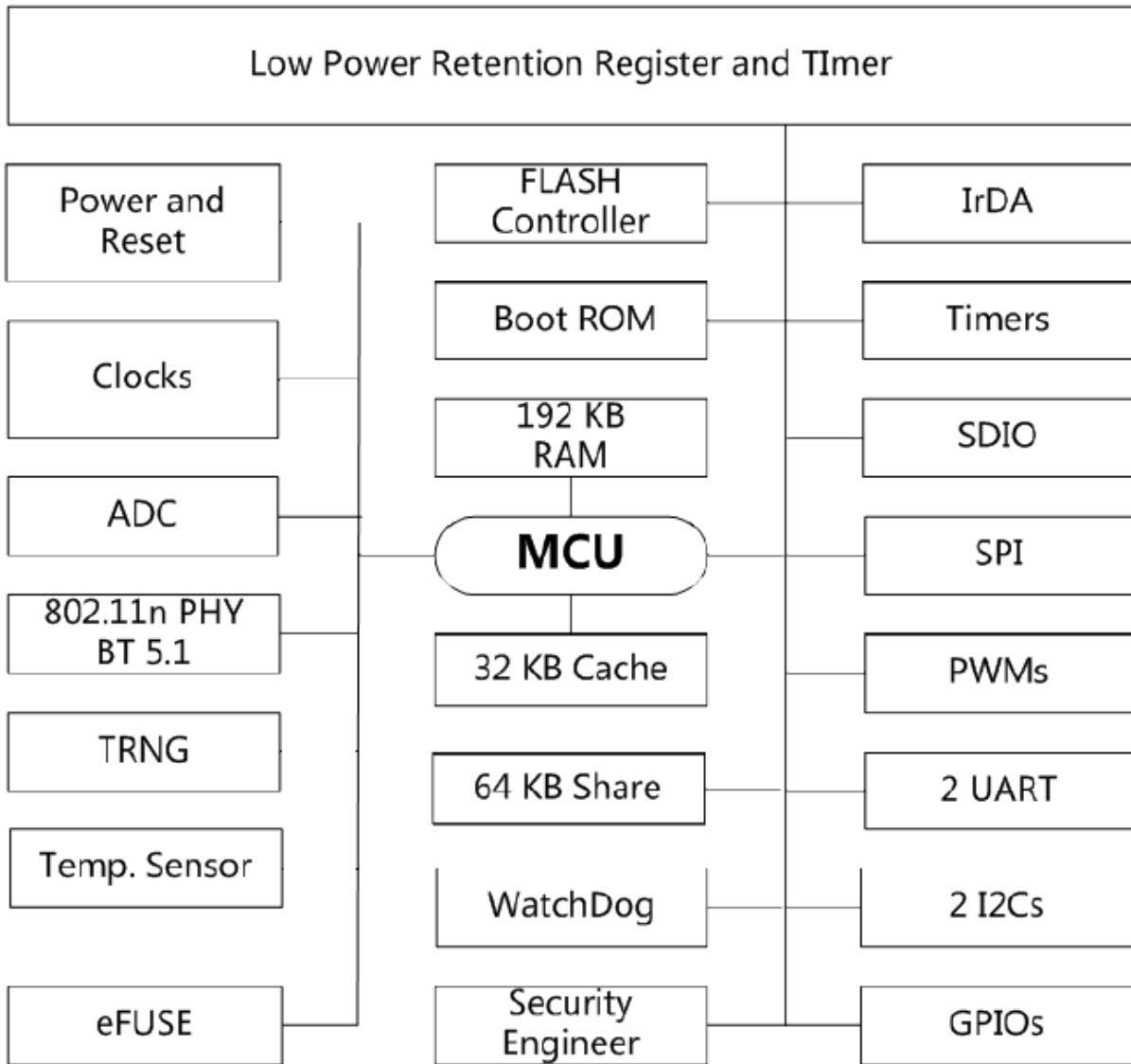
AP and STA roles in parallel

MCU speeds are up to 120 MHz	high-speed or low-power clocks
256 KB Internal RAM	Six-way highway 10-bit multi-channel ADC, and supports internal filtering to 16 bits
2MB or 4MB internal Flash	32-Bytes eFUSE
UART or SPI download	• 256 Byte ~ 2 KByte OTP.
50 MHz clock frequency SDIO	True random number generator
High-speed SPI interface	The 26 MHz and 32 KHz clock signal output
Dual I2C interface	Distinguish between upper reset and watchdog
Six-way 32-bit counter and a low-power counter	
Six circuits supports PWM output for	

3 Application domain Application Field

- IOT Internet of Things Applications
- Smart home
- Industrial control
- Network devices

4 Block diagram Module block diagram



5 Performance parameter, P erformance P arameter

5.1 Modulparameters

Modulparameters	
Wireless standard	WIFI 802.11b /g/n, 1T1R.
The antenna is available	Built-in antenna
Frequency range	2.402GHz-2.484GHz.
Emission power	IEEE802.11b <17 dBm. IEEE802.11g <14 dBm. IEEE802.11n <13 dBm. BLE <6dbm.

Receiving sensitivity	11b <-90dB. 11g <-73dB. 11n <-71dB. BLE <-95dB.
Wireless network type	STA/AP/AP + STA.
WIFI distance	>, 100 m
Extended the interface	UART, GPIO, ADC, PWM, I2C, .
Safety mechanism	W EP,WPA-PSK/WPA 2_PSK,WPA/WPA2.
Encryption type	WEP64/WEP128/AES.
Upgrade online	Support for this system
Dimensions	16±0.35mm (W)×24±0.35mm (L) × 2.8±0.15mm (H) SMD.
Certification information	In certification

5.2 The R F parameter

Parameters	Conditions	Minimu m value	Typica l values	Maximum value	Unit No
Operating frequency		2412	-	2484	MHz.
Emission power	IEEE802. 11b.	-	17	-	dBm.
	IEEE802. 11g.	-	14	-	dBm.
	IEEE802. 11n.	-	13	-	dBm.
	BLE.	-	6	-	dBm.
Sensitivity	IEEE802. 11b.	-	-	-90	dBm.
	IEEE802. 11g.	-	-	-73	dBm.
	IEEE802. 11n.	-	-	-71	dBm.
	BLE.	-	-	-95	dBm.

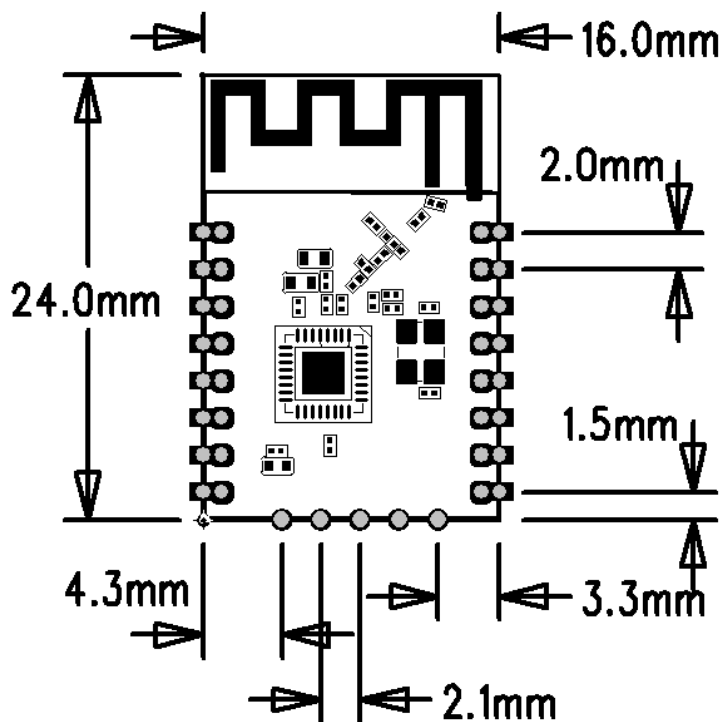
Note: These test results are in 25 degree room temperature and 3.3V power supply mode

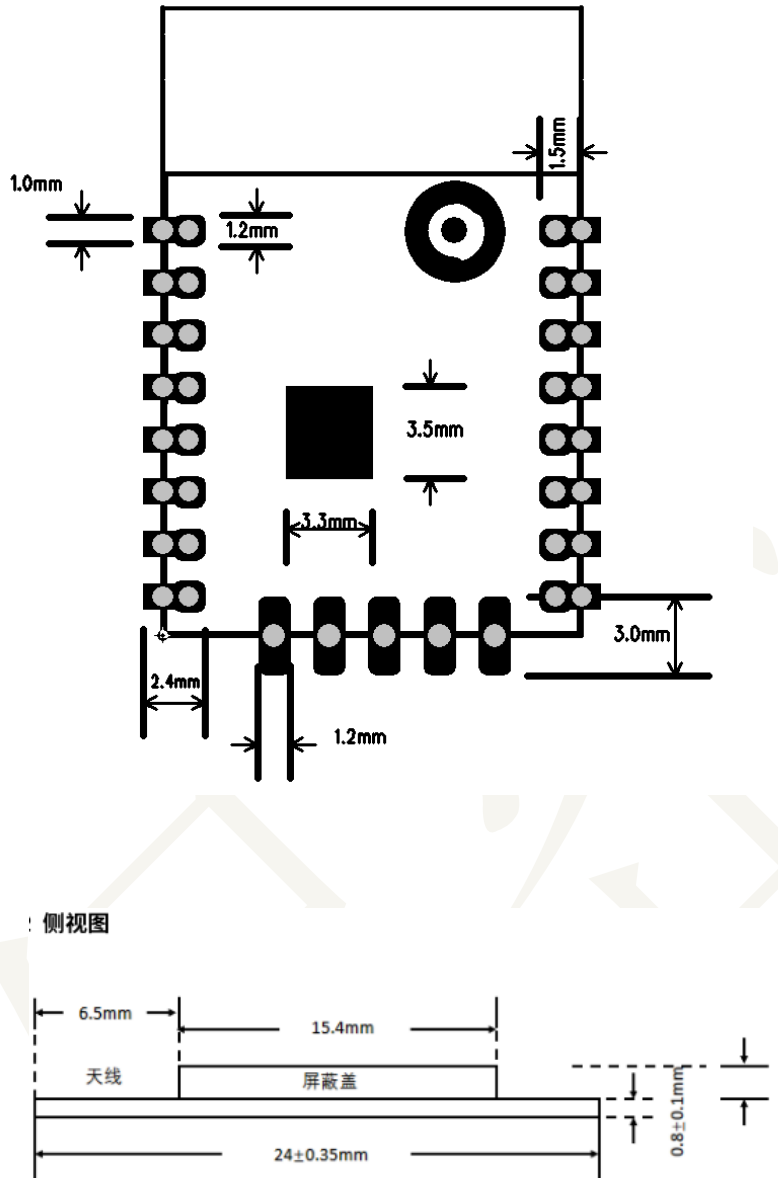
Tx Verify Summary:

ItemNo.	ANT	Ch	Freq	Rate	EVM	Pwr	FeqErr	Mask	Result
15	ANT0	1	2412	11M	-17.12dB	17.87dBm	-0.57ppm	0.00%	PASS
16	ANT0	7	2442	11M	-16.35dB	17.63dBm	-0.40ppm	0.98%	PASS
17	ANT0	13	2472	11M	-16.43dB	17.24dBm	-0.01ppm	1.53%	PASS
18	ANT0	1	2412	54M	-31.08dB	14.92dBm	-0.38ppm	0.00%	PASS
19	ANT0	7	2442	54M	-30.93dB	14.82dBm	-0.32ppm	0.00%	PASS
20	ANT0	7	2442	HT20-7	-31.63dB	13.58dBm	-0.39ppm	0.00%	PASS
21	ANT0	7	2442	HT40-7	-28.86dB	14.42dBm	-0.08ppm	0.00%	PASS

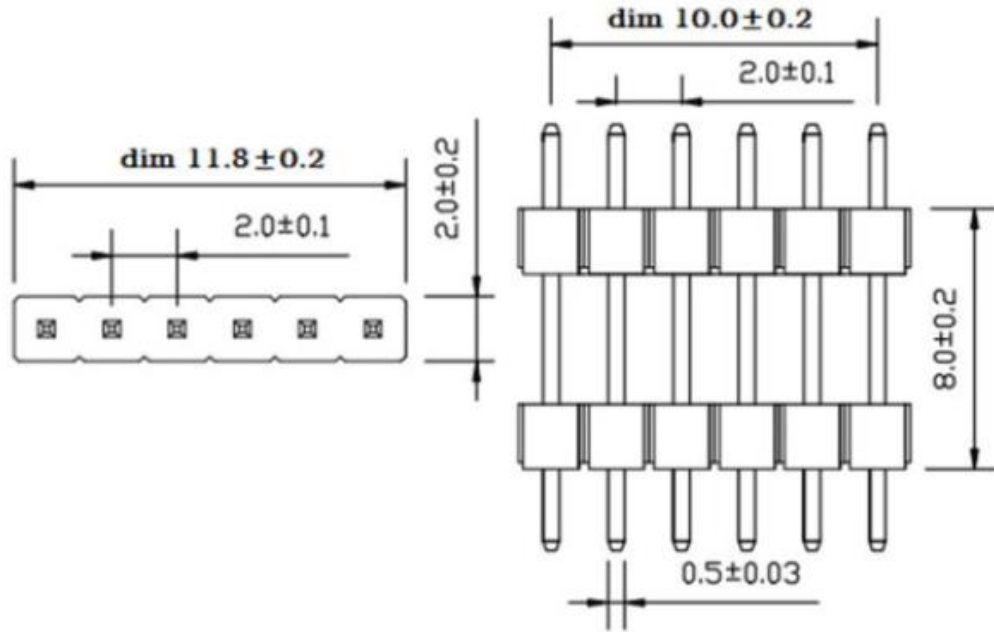
6 Module dimension diagram and foot position definition Mechanical Size and Pin Definition

6.1 Module size diagram





可选用 SMT 贴片式或排针插件。插件尺寸如下图所示：



6.2 Foot in description

Pin	Name.	P in Type.	Description.
1	RST.	I.	reset,active low.
2	P23_ADC/TDO	I/O.	P23 or ADC or JTAG TDO.
3	EN.	I.	Chip enable,active high.
4	P14.	I/O.	P14.
5	PWM5.	I/O.	PWM5.
6	PWM4.	I/O.	PWM4.
7	PWM0.	I/O.	PWM0.
8	3V3.	P.	Power input(3.3V-3.6V)
9	GND.	G.	GND.
10	PWM3.	I/O.	PWM3.
11	UART2.	I/O.	UART2.
12	P16.	I/O.	P16.
13	PWM2.	I/O.	PWM2.
14	PWM1.	I/O.	PWM1.
15	1RX.	I/O.	1RX.
16	1TX.	I/O.	1TX.

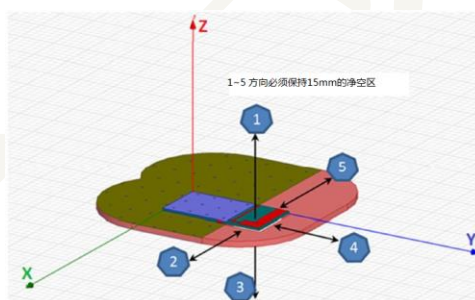
Notes:.

1. I:Input.

2. O:Output.
3. P:Power.
4. G:Ground.

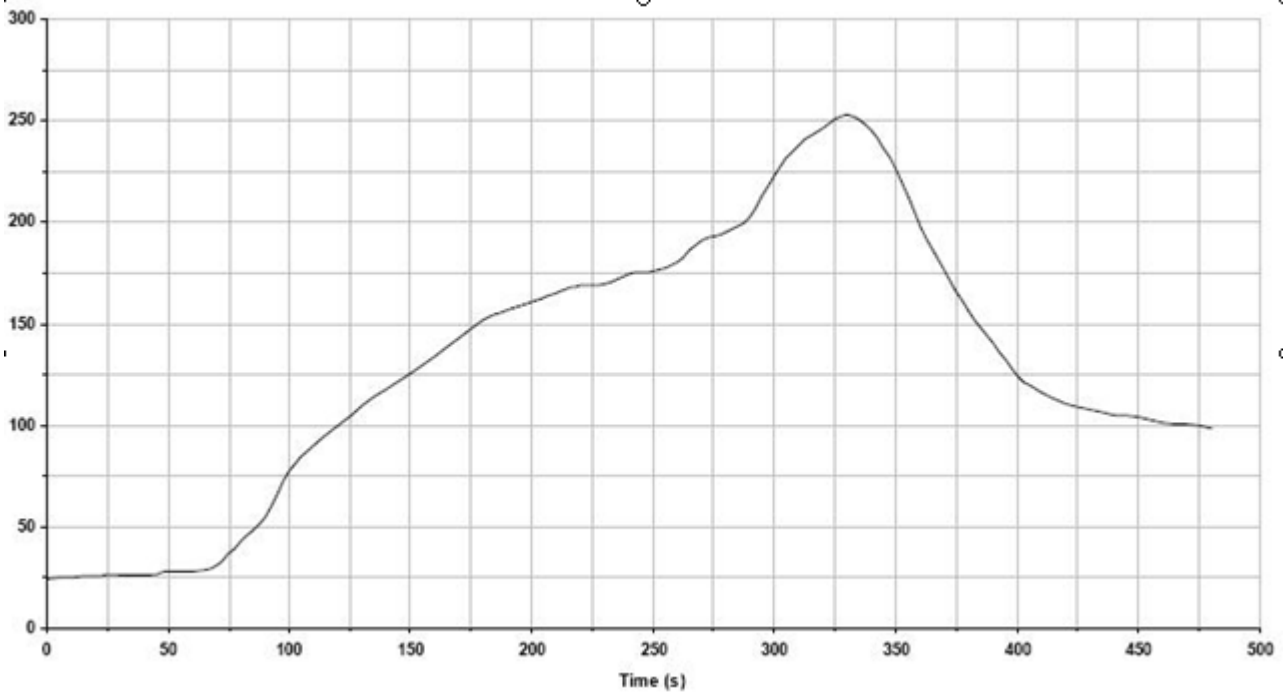
7 Note Application Note

- A. In the use of the module, please pay attention to avoid the influence of the power amplifier, booster line, DC/DC circuit and other interference sources on the module, to avoid the module power supply circuit and the high power circuit unit, and reduce the interference
- B. If there is a battery, metal, LCD, horn, etc. next to the module antenna, at least 15mm (distance from the antenna as shown in the figure)



- C. PCB cloth plate: because the metal will weaken the function of the antenna, it is strictly prohibited to lay the ground and wire under the module antenna, so that it is better to dig out.
- D. Since metal enclosure are shielding in wireless radio frequency signals, it is recommended not to be installed in the metal enclosure
- E. As for the use environment of WIFI, the wireless signal is easy to be greatly affected by the surrounding environment, and obstacles such as trees and metal will absorb the wireless signal somewhat, so that in practical application, the distance of data transmission is subject to a certain extent

8 Recommended return temperature is Reflow Temperature Profile



Key features of the profile:.

- Initial Ramp=1-2.5 °C / sec to 175 °C equilibrium.
- Equilibrium time=60 to 80 seconds.
- Ramp to Maximum temperature (250 °C) =3 °C / sec Max.
- Time above liquidus temperature(217 °C): 45-90 seconds.
- Device absolute maximum reflow temperature: 250 °C.

FCC Statements

(OEM) Integrator has to assure compliance of the entire end-product incl. the integrated RF Module. For 15 B (§15.107 and if applicable §15.109) compliance, the host manufacturer is required to show compliance with 15 while the module is installed and operating.

Furthermore the module should be transmitting and the evaluation should confirm that the module's intentional emissions (15C) are compliant (fundamental / out-of-band). Finally the integrator has to apply the appropriate equipment authorization (e.g. Verification) for the new host device per definition in §15.101.

Integrator is reminded to assure that these installation instructions will not be made available to the end-user of the final host device.

The final host device, into which this RF Module is integrated" has to be labeled with an auxiliary label stating the FCC ID of the RF Module, such as "Contains FCC ID: 2AG94C-3L-M

"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."

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

the Integrator will be responsible to satisfy SAR/ RF Exposure requirements, when the module integrated into the host device.

Module statement

The single-modular transmitter is a self-contained, physically delineated, component for which compliance can be demonstrated independent of the host operating conditions, and which complies with all eight requirements of § 15.212(a)(1) as summarized below.

- 1) The radio elements have the radio frequency circuitry shielded.
- 2) The module has buffered modulation/data inputs to ensure that the device will comply with Part 15 requirements with any type of input signal.
- 3) The module contains power supply regulation on the module.
- 4) The module contains a permanently attached antenna.
- 5) The module demonstrates compliance in a stand-alone configuration.
- 6) The module is labeled with its permanently affixed FCC ID label.
- 7) The module complies with all specific rules applicable to the transmitter, including all the conditions provided in the integration instructions by the grantee.
- 8) The module complies with RF exposure requirements.

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 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

Integration instructions for host product manufacturers according to KDB 996369 D03 OEM Manual v01

2.2 List of applicable FCC rules

FCC Part 15.247

2.3 Specific operational use conditions

This transmitter/module and its antenna(s) must not be co-located or operating in conjunction with any transmitter. This information also extends to the host manufacturer's instruction manual.

2.4 Limited module procedures

not applicable

2.5 Trace antenna designs

not applicable

2.6 RF exposure considerations

This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This compliance to FCC radiation exposure limits for an uncontrolled environment, and minimum of 20cm separation between antenna and body.

The host product manufacturer would provide the above information to end users in their end-product manuals.

2.7 Antennas

PCB antenna; 0dBi; 2.400 GHz~2.4835GHz

2.8 Label and compliance information

The end product must carry a physical label or shall use e-labeling followed KDB784748D01 and KDB 784748 stating "Contains Transmitter Module FCC ID: 2AG94C-3L-M".

2.9 Information on test modes and additional testing requirements

For more information on testing, please contact the manufacturer.

2.10 Additional testing, Part 15 Subpart B disclaimer

The modular transmitter is only FCC authorized for the specific rule parts (FCC Part 15.247) listed on the grant, and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. The final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed when contains digital circuitry.

THE END!
