

EMC3091 Wi-Fi/BLE Module

Built-in ARM Cortex-M33 MCU
2.4G Hz IEEE 802.11 b/g/n, Bluetooth 4.2
ultra-high integration, rich peripherals

Version: 1.0

Date: 2020-05-18

Number: DS0172EN

Abstract

- **Input Voltage** : 3.0V~3.6V
- **Operating Temperature** : -20°C to +85°C
- **Processor: Cortex-M33 Processor Core MX1300CF**
 - MX1300CF: Main frequency up to 100MHz
 - SWD/JTAG simulation debugger interface

Memory

- 256K bytes SRAM
- 384 bytes OTP memory area
- 2M bytes XIP flash

Wi-Fi

- IEEE 802.11 b/g/n 1T1R 2.4GHz Single Frequency
- Support HT20, up to 65Mbps@MCS7
- Support 802.11e QoS enhancement (WMM)
- Support WPA/WPA2 PSK , Open/WEP/ TKIP/CCMP
- Support WPA/WPA2 Enterprise
- Support WPS , Wi-Fi Direct
- Support IEEE Power Save mode

Bluetooth

- Bluetooth Low Energy BLE compliant with the 4.2 standard
- Wi-Fi and BLE time division multiplexing, sharing the same PA and antenna
- Support Bluetooth slave mode, can be used for Bluetooth distribution network

Rich Peripherals

- 8 x GPIO
- 1 x SPI , 1 x I2C
- 8 x PWM
- 3 x UART , support hardware flow control
- Low-energy RTC

Interface and Dimension

- Golden finger
- PCB antenna: 15mm x 14.5mm x 2.8mm

Application Functions

- Support MXOS operating system
- Provide major cloud platforms access SDK
- Mass production firmware for typical applications

Typical applications

- smart home appliances
- smart electric equipment
- Industrial automation

Order Code

Order Code	Description
EMC3091-PZI5	PCB antenna, tray package

Order Code

For example,	EMC	3	09	1	-P	Z	I	5	-xxx
Product Series									
EMC=IoT Wi-Fi/BLE Module									
Product Type									
3=Welding type wireless module									
Typical target applications and features									
09=IOT Application 9 Series									
Dimensions, enhancements									
1 = Golden Finger									
RF Interface									
P = 2.4GHz On-Board PCB Antenna									
PSRAM capacity (optional)									
Z=No PSRAM									
Flash capacity									
I = 2M bytes of flash storage									
Temperature range									
5 = Industrial grade temperature range, -20 ° C ~ 85 ° C									
Optional									
TR = tape reel package (default package is tray)									

For a list of all relevant features (e.g. packaging, minimum order quantity, etc.) and other information, please contact your nearest MXCHIP point of sale or distributor.

Accessories

Order Code	Description
MXKIT-Base	Development board for all EMC3091 modules
MXKIT-Core-3091	The development board core board for the EMC3091, used with MXKIT-Base
FX-3091	EMC3091 production fixture with accompanying test board : MXKIT-Base

Release Note

Date	Version	Description
2020-05-18	1.0	Initial version

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1. Introduction

The EMC3091 series modules are mainly used for IoT data communication. Data collection and control are realized through a rich peripheral interface, and data can be transmitted to the Internet of Things cloud service platform through a Wi-Fi network connection to realize the Internet of Everything. This series of modules is used in a wide range of IoT applications through a variety of different form factors, interface types, antenna interfaces and temperature range.

After the user solders our module onto their mainboard according to the Recommended Package Drawing, the module's full capabilities become available, including Wi-Fi and BLE connectivity.

EMC3091 module has a built-in ultra-highly integrated Wi-Fi/BLE Combo microcontroller MX1300CF, which provides the necessary computational capability and stable Wi-Fi/BLE connectivity for IOT data terminals. The chip integrates:

- Cortex-M33 core clocked up to 100MHz
- 256K bytes of SRAM
- 2M bytes XIP Flash
- 2.4GHz Wi-Fi controller conforming to IEEE 802.11 b/g/n standard
- Bluetooth Low Energy Controller that complies with BLE4.2 specifications

EMC3091 module is powered by a single 3.3V power supply, supports golden finger installation, and is suitable for various smart home appliances application scenarios.

Shanghai MXCHIP provides MXOS software platforms to support the development of EMC3091 series modules, providing an efficient development environment, access protocol stacks for various IoT cloud services, rich sample programs and various typical applications.

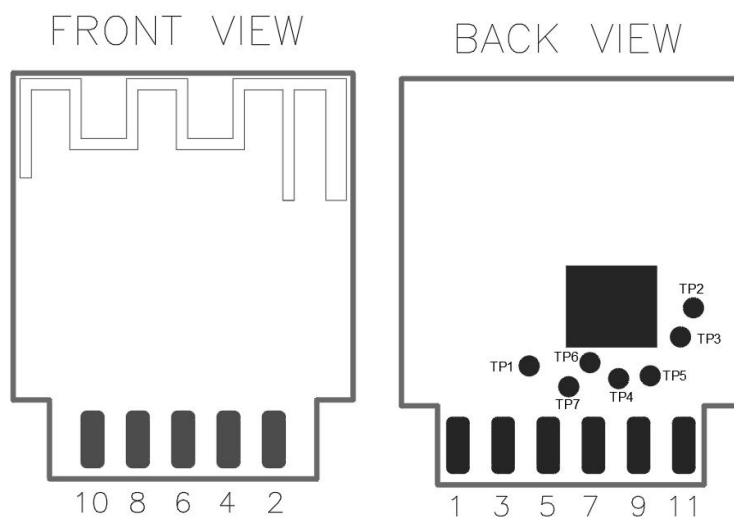
The following figure shows the hardware block diagram of the EMC3091 module, which mainly includes:

- Wi-Fi microcontroller MX1300CF
- Onboard or external antenna
- Power supply and communication interface

2. Pin Definition

2.1. Pin Arrangement

Figure 2 Pin Arrangement



2.2. Pin Definition

Table 1 pin definition

Pin No.	Name	I/O Type	Function	Use 1	Use 2
1	VDD	Power	3.3V Input	3.3V	3.3V
2	PA_3	I/O	PA_2/PWM3/SPI_CLK	PWM3	PWM3
3	VSS	GND	GND	GND	GND
4	PA_4	I/O	PA_4/PWM4	PWM4	PWM4
5	PA_13 ⁽¹⁾	I/O	PA_13/UART0_RX	UART0_RX	UART0_RX
6	PA_18	I/O	PA_18/PWM6	PWM6	PWM6
7	PA_14	I/O	PA_14/UART0_TX	UART0_TX	UART0_TX
8	PA_17	I/O	PA_17/PWM5	PWM5	PWM5
9	PA_12	I/O	PA_12/UART0_RX/SDA	UART0_RX	UART0_RX
10	CHIP_EN ^{(3) (5)}	I	RESET	RESET	RESET
11	PA_11	I/O	PA_11/UART0_TX/SCL	UART0_TX	UART0_TX

Table 2 test point pin definition

Pin No.	Name	I/O Type	Function	Use 1	Use 2
TP1	NC	I/O			
TP2	PA_0	I/O	PA_0/SWD_DIO		
TP3	PA_1	GND	PA_1/SWD_CLK		
TP4	PA_4	I/O	PA_15/DEBUG_RXD		
TP5	PA_13 ⁽¹⁾	I/O	PA_16/DEBUG_TXD		
TP6	PA_18	I/O	PA_20/BOOT		
TP7	PA_14	I/O	PA_19/ELINK		

Special precautions:

1. Module working mode selection signal. During the startup phase, the module detects the level of these pins and enters a specific working state. The correspondence between level and working mode is shown in Table 2:

Table 2 operation mode

Operation Mode	PA_0 Default: 0	PA_13 Default: 0	PA_20 (BOOT) Default: 1	PA_19 (ELINK) Default: 1	Remarks
ISP Program Mode	1	1	Floating	Floating	ISP burn mode
Test mode	1	0	Floating	Floating	Chip reserving
ATE	Floating	Floating	0	Floating	ATE test mode
QC	Floating	Floating	0	0	QC detect mode
Normal	Floating	Floating	Floating	Floating	Normal

- (1). ISP Program Mode, Test mode and Normal mode are detected by hardware at startup. PA_0 and PA_13, because it is a function of hardware solidification, it cannot be modified.
- (2). QC, ATE and APP modes are judged by the firmware provided by MXCHIP, and the detection conditions and functions can be adjusted by modifying the firmware.
- (3). ISP Program Mode function contempt: In the startup phase, if the processor hardware detects that the levels of PA_0 and PA_13 are high, it enters ISP programming mode. In the ISP programming mode, the flash of the module can be programmed through UART2 (PA_16, PA_15).
- (4). Test mode is the reserved mode of the chip and will not be used.
- (5). After the startup is completed, when the processor runs the firmware provided by MXCHIP, the firmware detects the status of PA_20 and PA_19 to enter the corresponding working mode. among them:
 - ATE mode: a series of serial commands are provided to make the radio frequency in a specific transceiver mode, so that the instrument can be tested and calibrated.
 - QC mode: used to self-check the hardware during production and generate QC information for the production device to check the quality of the module.
 - Normal working mode: Normal operation mode of the module.
2. The UART2 serial port is used for the input / output of debugging information. Do not use it during design and provide as easy a way as possible to facilitate software development.
3. The CHIP_EN pin is an enable reset pin, which is active low and can be left floating if not used or pull up 3.3V.
4. Please keep the unused pins floating. It should be noted that the IO port is in a floating state at startup. If you need to configure the state of the pin through software, you need to wait until the code in the bootloader starts to execute. The time from when the module is powered on to when the code in the bootloader is executed will be affected by the flash startup time.
5. The processing of chip pins inside the module is as follows:
 - PA_0, PA_1, PA_23: 10K pull-down resistor.
 - CHIP_EN: 10K pull-up resistor and 22nF capacitance to ground.

3. Electric Parameter

3.1. Absolute Maximum Parameters

Operation of the module outside of its absolute maximum ratings may result in permanent damage. At the same time, long-term exposure to the maximum rated conditions will affect the reliability of the module.

Table 3 Absolute Maximum Parameter : Voltage

Symbol	Ratings	Min	Max	Unit
Ts	Storage temperature	-40	105	°C
VDD	Power supply voltage	-0.3	3.6	V
VDD-VSS	Voltage	-0.3	3.6	V
VIN	Input voltage on any other pin	VSS-0.3	VDD+0.3	V

3.2. Working Condition

Table 4 Operating Parameters: Rated Voltage and Current

Symbol	Note	Specification			
		Min.	Typical	Max.	Unit
V _{DD}	Voltage	3.0	3.3	3.6	V
I _{VDD}	3.3V inrush current	-	-	400	mA
I _{VDD}	3.3V , RF Tx CCK 11M 21dBm , peak current	-	-	600	mA

Table 5 Working parameters: Working Current

Symbol	Note		Specification			
	CPU	Wi-Fi	Min.	Typical	Max.	Unit
I _{VDD}	Shut Down	Wi-Fi OFF	-	10	-	μA
I _{VDD}	Deep Sleep	Wi-Fi OFF	-	30	-	μA
I _{VDD}	Standby	Wi-Fi OFF	-	200	-	μA
I _{VDD}	Sleep	Wi-Fi OFF	-	450	-	μA
I _{VDD}	Active	Wi-Fi OFF	-	9	-	mA
I _{VDD}	Active	TX@MCS7/HT20 , 14dBm	-	198	-	mA
I _{VDD}	Active	TX@MCS7/HT20 , 16dBm	-	218	-	mA
I _{VDD}	Active	TX@OFDM54M, 15dBm	-	207	-	mA
I _{VDD}	Active	TX@OFDM54M, 17dBm	-	230	-	mA
I _{VDD}	Active	TX@CCK11M, 18dBm	-	249	-	mA
I _{VDD}	Active	TX@CCK11M, 21dBm	-	315	-	mA
I _{VDD}	Active	RX@MCS7, HT20 (Pin= -60dBm)	-	67	-	mA
I _{VDD}	Active	RX@OFDM54M (Pin= -60dBm)	-	TBD	-	mA
I _{VDD}	Active	RX@CCK11M (Pin= -60dBm)	-	61	-	mA
I _{VDD}	Active	RF Standby	-	33	-	mA
I _{VDD}	Active	RF disable	-	24	-	mA

(1) The above parameters were measured in a wireless shielding environment in the laboratory.

(2) The power consumption of Flash is not included in the data in Table 5. When reading code or reading and writing data from Flash, the power consumption of Flash shall not exceed 20mA, and the power consumption of Flash in standby mode (CS signal raised) shall not exceed 50 μ A.

3.3. General I/O Port

Table 6 DC Parameters: Digital I/O

Symbol	Note	Conditions	Specification			
			Min.	Typical	Max.	Unit
V_{IH}	Input-High Voltage	LVTTL	2.0	-	-	V
V_{IL}	Input-Low Voltage	LVTTL	-	-	0.8	V
V_{OH}	Output-High Voltage	LVTTL	2.4	-	-	V
V_{OL}	Output-Low Voltage	LVTTL	-	-	0.4	V
I_{T+}	Schmitt-trigger High Level		1.377	1.683	1.908	V
I_{T-}	Schmitt-trigger Low Level		0.729	0.957	1.116	V
I_{IL}	Input-Leakage Current	$V_{IN}=3.3V$ or 0	-10	± 1	10	μA

3.4. Typical Application Power Consumption

The module current test environment is based on VDD=3.3V. Test under common office application environment (values measured under different test environments will be different).

Table 7 operation parameter : Typical RF power consumption

Mode	Average	Max.	Unit	Note
Wi-Fi off	18.2	20	mA	CPU Active
Keep Wi-Fi connected	82.4	97.4	mA	Turn off Wi-Fi and MCU low power consumption
Keep Wi-Fi connected	35.6	97.4	mA	Turn on Wi-Fi low power consumption and MCU low power consumption, DTIM = 1
Keep Wi-Fi connected	TBD	TBD	mA	Turn on Wi-Fi low power consumption and MCU low power consumption, DTIM = 3
SoftAP mode	67.9	244.6	mA	SoftAP networking status
Monitor mode	86.4	101.5	mA	Distribution process, in RX state
Iperf mode	TBD	TBD	mA	Turn off the low power consumption of Wi-Fi and MCU, iperf sends at full speed

3.5. ESD

Table 8 Electrostatic discharge parameters

Symbol	Name	Name	Level	Max.	Unit
--------	------	------	-------	------	------

$V_{ESD}(HBM)$	Electrostatic discharge voltage (Human body model)	TA= +25 °C comply with JESD22-A114	2	2000	V
$V_{ESD}(CDM)$	Electrostatic discharge voltage (Discharge equipment model)	TA = +25 °C comply with JESD22-C101	II	500	

3.6. RF parameter

3.6.1. Wi-Fi Parameter

Table 9 Wi-Fi Parameter

Item	Specification
Operating Frequency	2.412~2.484GHz
Antenna Interface	1T1R, Single stream
Wi-Fi Standard	IEEE 802.11b/g/n
Modulation Type	11b: DBPSK, DQPSK, CCK for DSSS 11g: BPSK, QPSK, 16QAM, 64QAM for OFDM 11n: MCS0~7, OFDM
Data Rates	802.11b: 1, 2, 5.5 and 11Mbps 802.11g: 6, 9, 12, 18, 24, 36, 48 and 54 Mbps 802.11n: MCS0~7, up to 65Mbps
Antenna type	One U.F.L connector for external antenna PCB printed ANT (Reserve)

Note: The typical values of the following Tx test data are recorded under normal temperature environment and Tx lasts about 20s.

TX Performance

Table 10 Output Power

TX Characteristics	Min.	Typical	Max.	Unit
Power@11Mbps, 802.11b	14	16.5	18	dBm
Power@54Mbps, 802.11g	13	14.5	16	dBm
Power@HT20, MCS7,802.11n	11	12.5	14	dBm

Table 11 Frequency error

TX Characteristics	Min.	Typical	Max.	Unit
Frequency Error	-15	-	+15	ppm

Table 12 EVM

TX Characteristics	Min.	Typical	Max.	Unit
EVM@11Mbps, 802.11b	-	-20	-10	dB
EVM@54Mbps, 802.11g	-	-29	-25	dB
EVM@HT20, MCS7, 802.11n	-	-31	-27	dB

RX performance

Table 13 RX sensitivity

RX Characteristics	Min.	Typical	Max.	Unit
Minimum Input Level Sensitivity				
PER _≤ 8%@11Mbps, 802.11b	-	-88	-	dBm
PER _≤ 10%@54Mbps, 802.11g	-	-75	-	dBm
PER _≤ 10%@HT20, MCS7, 802.11n	-	-72	-	dBm

3.6.2. Bluetooth RF parameter

Table 14 Bluetooth TX/RX Parameters

Item	Min	Typical	Max	Unit
TX_AVERAGE	4	6	8	dBm
Drift	-	-4	-	KHz
ICFT	-	-15	-	KHz
Modulation characteristics:				
ΔF1avg	-	246	-	KHz
ΔF2avg/ΔF1avg	-	0.92	-	
ΔF2max	-	220	-	KHz
Adjacent channel transmit power				
F = F0 + 1MHz	-	-10	-	dB
F = F0 + 1MHz	-	-10	-	dB
F = F0 + 2MHz	-	-45	-	dB
F = F0 - 2MHz	-	-45	-	dB
F = F0 + 3MHz	-	-50	-	dB
F = F0 - 3MHz	-	-50	-	dB
F = F0 + > 3MHz	-	-50	-	dB
F = F0 - > 3MHz	-	-50	-	dB
RX Characteristics				
Minimum Sensitivity	-	-96	-	dBm

4. Antenna Information

PCB antenna.

4.1. PCB antenna parameters and use

4.1.1. On-board PCB parameter

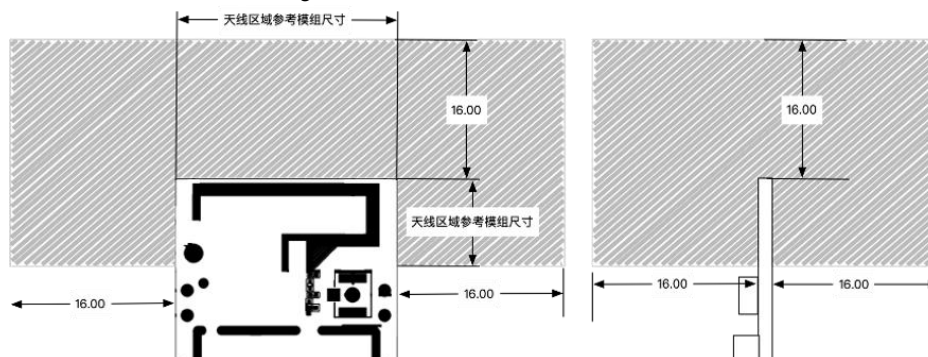
Table 15 On-board PCB parameter

Item	Min.	Typical	Max.	Unit
Frequency	2400		2500	MHz
Impedance		50		Ω
VSWR			2	
Gain	$\leq 2\text{dBi}$			
Efficiency	$>70\%$ or $>-1.54\text{dB}$			

4.2. PCB Antenna Clearance

When using PCB antenna in WIFI module, it is necessary to ensure that PCB and other metal devices are at least 16 mm away from the motherboard. The shaded areas in the figure below need to be far away from metal devices, sensors, interference sources and other materials that may cause signal interference.

Figure 3 Antenna minimum clearance area (unit: mm)



4.2.1. SRRC Important statements

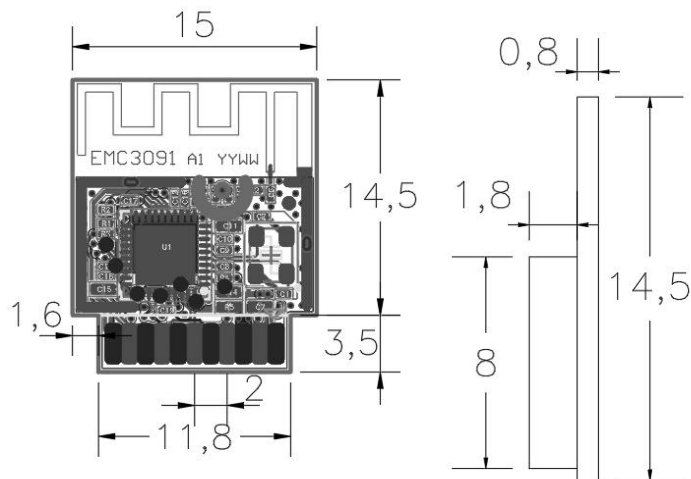
Type approval of a module does not imply that the end equipment in which the module is embedded or in which it is used complies with the relevant radio regulations or standards, and the end equipment manufacturer is responsible for the conformity of the technical characteristics of the product with the radio regulations or standards.

5. Dimensions and Production Guidance

5.1. Assembly Dimension Diagram

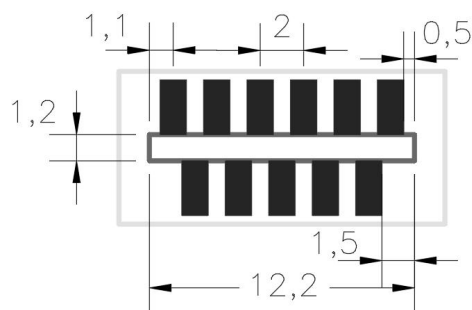
Figure 6 Assembly Dimension Diagram (unit: mm, tolerance: ± 0.1 , outside tolerance ± 0.2)

EMC3091-P



5.2. Recommended Package Drawing

Figure 7 Package dimension (unit: mm, tolerance: ± 0.1)



6. Label Information

Figure 14 Label diagram



1. MXCHIP: Company Logo
2. EMC3091-P: Product Main Type
3. CMIIT ID: SRRC Model Authorization ID.
4. FCC ID : FCC Authorization
5. Z15: Product Auxiliary Model
6. X2536: Production serial number
7. B0F893D415E3: MAC Address
8. QR Code: MAC Address

7. Production Guidelines

Module humidity sensitivity grade MSL3, after unpacking more than a fixed time patches to bake module.

- SMT patches require instruments
 - Reflow bonding machine
 - AOI detector
 - 6-8mm suction nozzle
- Baking requires equipment:
 - Cabinet oven
 - Anti-static, high temperature tray
 - Antistatic and heat resistant gloves

The storage conditions of MXCHIP module are as follows:

- Moisture-proof bags must be stored in an environment with temperature < 30 degree C and humidity < 85% RH.
- A humidity indicator card is installed in the sealed package.

Figure 15 Humidity Card



After the module is split, if the humidity card shows pink, it needs to be baked.

The baking parameters are as follows:

- The baking temperature is $120^{\circ}\text{C} \pm 5^{\circ}\text{C}$ and the baking time is 4 hours.
- The alarm temperature is set to 130°C .
- SMT patches can be made after cooling $< 36^{\circ}\text{C}$ under natural conditions.
- Drying times: 1 time.
- If there is no welding after baking for more than 12 hours, please bake again.

If the disassembly time exceeds 3 months, SMT process is forbidden to weld this batch of modules, because PCB gold deposition process, over 3 months, pad oxidation is serious, SMT patch is likely to lead to virtual welding, leak welding, resulting in various problems, our company does not assume the corresponding responsibility;

Before SMT patch, ESD (Electrostatic Discharge, Electrostatic Release) protection should be applied to the module.

SMT patches should be made according to the reflow curve. The peak temperature is 250 C. The reflow temperature curve is shown in Chapter 9.

In order to ensure the qualified rate of reflow soldering, 10% of the first patches should be taken for visual inspection and AOI testing to ensure the rationality of furnace temperature control, device adsorption mode and placement mode, and 5-10 patches per hour are recommended for visual inspection and AOI testing in subsequent batch production.

7.1. Precautions

- Operators of each station must wear static gloves during the entire production process.
- Do not exceed the baking time when baking.
- It is strictly forbidden to add explosive, flammable, or corrosive substances during baking.
- When baking, the module uses a high temperature tray to be placed in the oven to keep the air circulation between each module while avoiding direct contact between the module and the inner wall of the oven.
- When baking, please close the oven door to ensure that the oven is closed to prevent temperature leakage and affect the baking effect.
- Try not to open the door when the oven is running. If it must be opened, try to shorten the time for opening the door.
- After baking, the module should be naturally cooled to <36°C before wearing the static gloves to avoid burns.
- When operating, strictly guard against water or dirt on the bottom of the module.

The temperature and humidity control level of MXCHIP factory module is Level3, and the storage and baking conditions are based on IPC/JEDEC J-STD-020.

7.2. Secondary reflow temperature curve

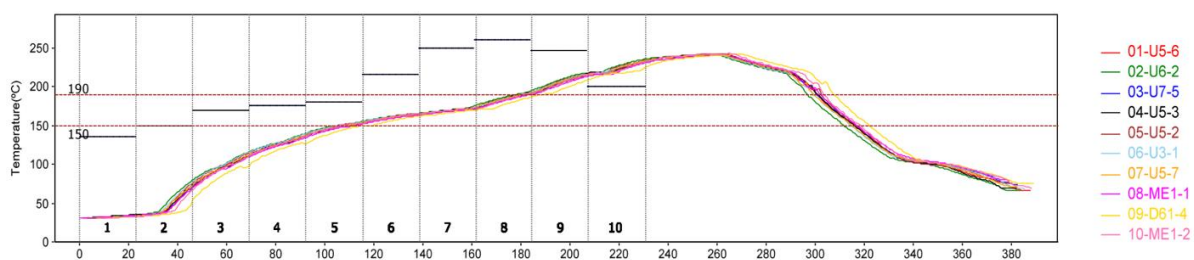
Recommended solder paste type: SAC305, lead free. No more than 2 reflow cycles. Peak temperature not to exceed 245°C. The following is a typical furnace temperature profile setting.

Table 18 Typical furnace temperature settings

Furnace settings	Z1	Z2	Z3	Z4	Z5	Z6	Z7	Z8	Z9	Z10
------------------	----	----	----	----	----	----	----	----	----	-----

Upper temperature zone setting	135	150	170	175	180	215	250	260	247	200
Lower temperature zone setting	135	150	170	175	180	215	250	260	247	200

Figure 16 Typical secondary reflux temperature profile



- 30°C ~ 150°C preheating temperature rise: 0-3°C/s, typical value: 1.2°C/s
- 150°C ~ 190°C immersion time: 60-100second, typical value : 72second
- Peak temperature: 245°C, typical value: 242°C
- Time above 220°C: 50 sec. to 90 sec. Typical value: 70 sec
- 217°Ccooling speed: -3 ~ 0°C/s, typical value : -2.0°C/s

7.3. Storage Condition

Figure 17 Label diagram

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

8. Sales and Technical Support Information

If you need to consult or purchase this product, please call Shanghai MXCHIP Information Technology Co., Ltd. during office hours.

Office hours: Monday to Friday morning: 9:00-12:00, afternoon: 13:00-18:00

Contact Tel: +86-21-52655026

Address: 9th Floor, Lane 5, 2145 Jinshajiang Road, Putuo District, Shanghai

Zip code: 200333

Email: sales@mxchip.com

Radiation Exposure Statement

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

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 important announcement

This modular complies with FCC RF radiation exposure limits set forth for an uncontrolled environment.

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

The module is limited to OEM installation only The OEM integrator is responsible for ensuring that the end-user has no manual instructions to remove or install module If the FCC identification number 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: **P53-EMC3091**

When the module is installed inside another device, the user manual of the host must contain below warning statements.

1.1 List of applicable FCC rules

FCC Part 15 Subpart C 15.247

1.2 Specific operational use conditions

This module is a BLE, 2.4GHz Wi-Fi module

2.4GHz Wi-Fi/BLE Module	Operation Frequency	Number of Channel	Modulation	Antenna Spec.
BLE	2402~2480MHz	40	GFSK	PCB Antenna 2dBi Max
WLAN	2412~2462MHz	13	DSSS, OFDM	PCB Antenna 2dBi Max

The module can be used for mobile applications with antenna up to 2dBi. The host manufacturer installing this module into their product must ensure that the final composite product complies with the FCC requirements by a technical assessment or evaluation to the FCC rules, including the transmitter operation. The host manufacturer 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 shown in this manual.

1.3 Limited module procedures Not applicable. The module is a Single module and complies with the requirement of FCC Part 15.212.

1.4 Trace antenna designs Not applicable.

The module has its own antenna, and doesn't need a host's printed board microstrip trace antenna etc.

1.5 RF exposure considerations

The module must be installed in the host equipment such that at least 20cm is maintained between the antenna and users' body; and if RF exposure statement or module layout is changed, then the host product manufacturer required to take responsibility of the module through a change in FCC ID or new application. The FCC ID of the module cannot be used on the final product. In these circumstances, the host manufacturer will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

1.6 Antenna

Antenna Specification are as follows:

Type: Single PCB antenna Gain: 2dBi . This device is intended only for host manufacturers under the following conditions: The transmitter module may not be co-located with any other transmitter or antenna; The module shall be only used with the internal antenna(s) that has been originally tested and certified with this module. The antenna must be either permanently attached or employee ‘unique’ antenna coupler. As long as the conditions above are met, further transmitter test will not be required.

However, the host manufacturer is still 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.).

1.7 Label and compliance information

Host product manufacturers need to provide a physical or e-label stating “Contains FCC ID: :**P53-EMC3091**” with their finished product.

1.8 Information on test modes and additional testing requirements Operation Frequency: **2402-2480MHz**

Number of Channel: 40、 13

Modulation: GFSK, DSSS, OFDM

Host manufacturer must perform test of radiated & conducted emission and spurious emission, etc. according to the actual test modes for a stand-alone modular transmitter in a host, as well as for multiple simultaneously transmitting modules or other transmitters in a host product. Only when all the test results of test modes comply with FCC requirements, then the end product can be sold legally.

1.9 Additional testing, Part 15 Subpart B disclaimer

The modular transmitter is only FCC authorized for FCC Part 15 Subpart C 15.247 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. If the grantee markets their product as being Part 15 Subpart B compliant (when it also contains unintentional-radiator digital circuitry), then the grantee shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

