MXCHIP®
上海庆科信息技术有限公司
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Datasheet

EMW3092

Embedded Wi-Fi module

Version：1.1 **Date：2019-03-20** **Number: DS0132EN**

Abstract

Features

- Support 802.11b/g/n, integrate ARM-CM4F, WLAN MAC/Baseband/RF
- 256KB RAM/ 2MB FLASH
- Working Voltage: DC 3.0-3.6V
- Maximum transmission rate up to 65 Mbps with 20 MHz bandwidth.
- Wi-Fi Features
  - Support 802.11b/g/n, HT-20
  - Support Station, Soft AP, Station+Soft AP
  - Support EasyLink，Alink，Joinlink
- Antenna: PCB antenna
- Operating Temperature：
  - ♦ EMW3092: -20℃ to +105℃
  - ♦ EMW3092L: -20℃ to +85℃

Application

- Intelligent lighting
- Smart Home Application
- Industrial automation
- Intelligent Security

Module Type

Part Number	Note
EMW3092	PCB antenna, 105℃ operating temperature
EMW3092L	PCB antenna, 85℃ operating temperature

Version History

Date	Version	Details
2019-03-20	1.0	Initial release
2019-03-21	1.1	Add FCC&IC information

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1. Product Introduction

EMW3092 is a cost-effective embedded Wi-Fi module released by MXCHIP with high integrating ARM CM4F, WLAN MAC/Baseband/RF. Maximum frequency 62.5MHz with 256KB SRAM and 2M FLASH. Power supply is DC 3.3V.

Hardware diagram is shown below with four main parts:

- CM4F main core
- WLAN MAC/BB/RF/ANT
- Hardware encryption
- Power management

With：

1. ARM CM4F CPU with 62.5MHz maximum frequency and 256KB SRAM and 2M FLASH. Support high speed UART, I2C, SPI, PWM and multi-GPIO.
2. 2MB SPI Flash is used for custom firmware development.
3. Support PCB antenna and IPEX
4. Input voltage: DC 3.3V

1.1 EMW3092 Label Information

Figure 1 EMW3092 Label Information

Label Information:

- MXCHIP: Company LOGO.
- CMIIT ID: xxxxxxxxxx, SRRC approval number.
- EMW3092: Main module type.
- B0F89310583D: MAC address (Each module has a unique MAC address).
- X1908: Production cycle, factory initials and annual week time.
- 0000.0000.A213: SN series number.
- FCC ID: P53-EMW3092, FCC certification information.

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.

1.2 Pin Arrangement

EMW3092 adopts a through-hole and SMT package design. The stamp hole package design is convenient for customer debugging, easy to disassemble and easy to use for SMT. The left and right pads are 1.2x1.6mm and the lower pads are 1.2x0.8mm. The motherboard pad is recommended to expand 0.1mm.Solder mask opening and pad size are the same. SMT recommends stencil thickness 0.12mm-0.14mm.

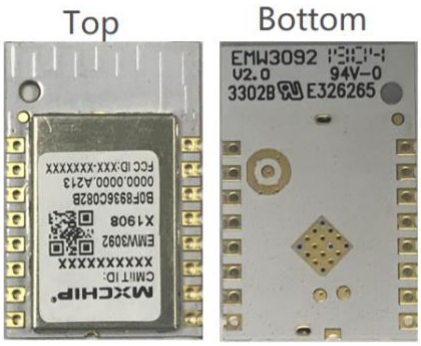


Figure 2 Module Picture

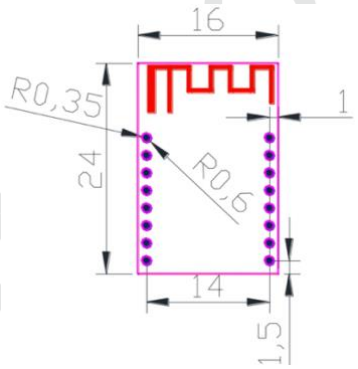


Figure 3 DIP Package Size

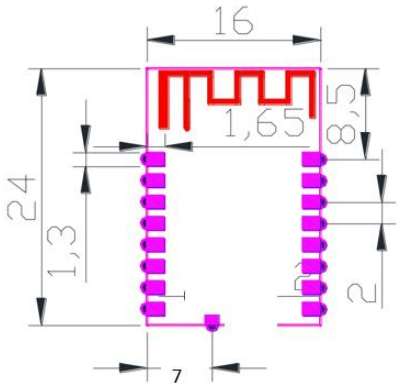


Figure 4 SMT Package Size

1.3 Pin Definition

1.3.1 EMW3092 Package Definition

Figure 5 Package Definition

1.3.2 EMW3092 Pin Definition

EMW3092 Pin Definition is shown as Table 1.

Table 1 EMW3092 Pin Definition

Pin	FUNCTION1	FUNCTION2	FUNCTION3	FUNCTION4	FUNCTION5
1	CHIP_EN				
2	MICO_GPIO_8	MICO_I2C0_SDA	MICO_UART0_CTS		MICO_SPI1_CS
3	MICO_GPIO_23				
4	MICO_GPIO_2			MICO_PWM2	SWD_DIO
5	MICO_GPIO_12			MICO_PWM3	
6	MICO_GPIO_13			MICO_PWM4	
7	MICO_GPIO_14			MICO_PWM5	
8	VDD				
9	GND				
10	MICO_GPIO_22	MICO_I2C0_SCL	MICO_UART1_RXD	MICO_PWM5	
11	MICO_GPIO_21	MICO_I2C0_SDA	MICO_UART1_TXD	MICO_PWM4	
12	MICO_GPIO_22	MICO_I2C0_SCL	MICO_UART1_RXD	MICO_PWM5	
13	MICO_GPIO_7	MICO_I2C0_SCL	MICO_UART0_RTS	MICO_PWM6	MICO_SPI1_MISO

Pin	FUNCTION1	FUNCTION2	FUNCTION3	FUNCTION4	FUNCTION5
14	MICO_GPIO_1			MICO_PWM1	SWD_CLK
15	MICO_GPIO_10	MICO_I2C1_CLK	MICO_UART0_RXD		MICO_SPI1_CLK
16	MICO_GPIO_9	MICO_I2C1_SDA	MICO_UART0_TXD	MICO_PWM1	MICO_SPI1_MOSI
17	MICO_GPIO_19				BOOT

Description:

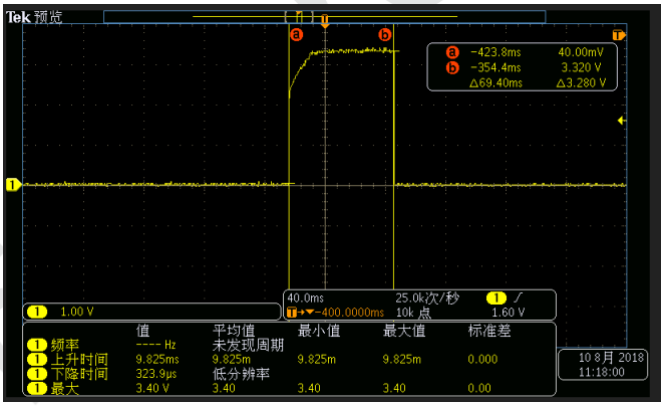
(1) The GPIO19 pin defaults to BOOT; the GPIO23 pin is used by EASYLINK; the PIN11/12 pin is used for debugging log information output. Please try not to use the hardware design. Please contact our engineers for confirmation.

(2) The PIN11 pin can't be pulled low and then powered on. The PWM3 power-on must be in the “L” state, and the module has made 10k resistor pull-down inside. Please pay special attention when designing the circuit.

(3) CHIP_EN is the enable pin. Pulling low and then pulling high will generate a chip reset.

(4) CHIP_EN, PIN11/12 has 10k pull-up inside; except PWM corresponding to SWD and UART1 (Debug) pin, other PWM1, PWM3, PWM4, PWM5, PWM6 have 10k pull-down inside; please allocate relevant peripheral devices reasonably.

(5) Other pins that are not used can be left floating. It should be noted that the IO port is a floating state at startup. This is the case from the beginning of the ROM code. It is also necessary to go to the boot code at the earliest. Up and down, and the time elapsed in it will be affected by the flash, so if the module needs to be at the level determined by the module at startup, it needs to externally pull at least 100k resistor to externally pull up to stabilize the level. If the figure below shows the level of the IO port that is configured to be normally low after the module is started, the floating state is pulled up by the external 100K resistor.



2. Electrical Parameters

2.1 Operating Conditions

EMW3092 would be unstable when input voltage is less than the lowest rated voltage.

Table 1 Range of input voltage

Symbol	Illustration	Condition	Details			
			Minimum	Typ	Maximum	Unit
VDD	Power Supply		3.0	3.3	3.6	V

There would be permanent damage in hardware if the device operates at the voltage over rated value. Meanwhile, reliability could be influenced when the device has a long-term operating at maximum voltage.

Table 2 Absolute maximum voltage rating

Symbol	Description	Minimum	Typ	Unit
VDD	Module input voltage	–0.3	3.6	V
VIN	GPIO input voltage	−0.3	3.6	V

2.2 Power Consumption

Table 3 EMW3092 Power Consumption

Mode	EMW3092 current		Note
	Average	Max	
Wi-Fi off	20.903mA	21.209mA	CPU idle
Wi-Fi off	3.704mA	3.450mA	CPU idle and in low power mode
Wi-Fi off	19.610mA	20.295mA	CPU run at full speed
Wi-Fi initialization	110.603mA	126.092mA	Wi-Fi and MCU low power mode OFF
Wi-Fi keep connected with router	109.447 mA	124.086 mA	Wi-Fi and MCU low power mode OFF
Wi-Fi keep connected with router	9.059 mA	282.791 mA	Wi-Fi and MCU low power mode ON
SoftAP	116.698 mA	306.078 mA	SoftAP
Monitor	114.699mA	126.954mA	Monitor mode for WiFi configuration

Standby	4.642 uA	20.323 uA	MCU/RAM/Peripherals/RTC OFF, wake up by IO or internal Timer
Iperf	115.697mA	345.190mA	Wi-Fi and MCU low power mode OFF
Iperf	115.030mA	353.832mA	Wi-Fi and MCU low power mode ON

Actual working current is variable at different operating mode. Maximum operating current 300 mA 。

2.3 Working Environment

Table 4 Temperature and humidity condition

Symbol	Name	Maximum	Unit
TSTG	Storage Temperature	-40 to +125	℃
TA	Operation Temperature	-20 to +85	℃
Humidity	Non-condensing, Relative humidity	95	%

2.4 Electrostatic Discharge

Table 5 Electrostatic Discharge Parameters

Symbol	Name	Details	Level	Maximum	Unit
V_{ESD}(HBM)	Electrostatic discharge voltage (Human Body Model)	TA= +25 ℃ , JESD22-A114	2	2000	V
V_{ESD}(CDM)	Electrostatic discharge voltage (Charged Device Model)	TA = +25 ℃ , JESD22-C101	II	500	

3. RF parameters

3.1 Basic RF parameters

Table 6 Radio-frequency standards

Name		Illustration
Working frequency		2.412~2.484GHz
Wi-Fi wireless standard		IEEE802.11b/g/n
Data transmission rate	20MHz	11b：1,2,5.5 和 11Mbps 11g : 6,9,12,18,24,36,48,54Mbps 11n : MCS0~7,72.2Mbps
Antenna type		PCB (Default) IPX (Optional)

3.2 TX Performance

3.2.1 Transmit performance of IEEE802.11b mode

Table 7 CCK_11 transmit performance parameters of IEEE802.11b mode

Category	Content				
Mode	IEEE802.11b				
Channel	CH1 to CH13				
Rate	1, 2, 5.5, 11Mbps				
TX	Minimum	Typ.	Maximum	Unit	
1. Output power	14.5	16.5	18.0	dBm	
2. Spectrum template					
1) fc +/-11MHz to +/-22MHz	-	-	-30	dBr	
2) fc > +/-22MHz	-	-	-50	dBr	
3. Frequency offset	-15	-2	+15	ppm	
4. EVM(Peak EVM)					
1) 1~11Mbps	-	-	35%		
RX Minimum receiving sensitivity	Minimum	Typ	Maximum (IEEE Spec)	Unit	
1Mbps (FER≦8%)	-	-98	-83	dBm	
11Mbps (FER≦8%)	-	-89	-76	dBm	

3.2.2 Transmit performance of IEEE802.11g mode

Table 8 OFDM_54 transmit performance parameters of IEEE802.11g mode

Category	Content				
Mode	IEEE802.11g				
Channel	CH1 to CH13				
Rate	6, 9, 12, 18, 24, 36, 48, 54Mbps				
TX	Minimum	Typ	Maximum	Unit	
1. Output Power	12.5	14.5	16.5	dBm	
2. Spectrum template					
1) at fc +/- 11MHz	-	-	-20	dBr	
2) at fc +/- 20MHz	-	-	-28	dBr	
3) at fc > +/-30MHz			-40	dBr	
3. Frequency offset	-15	-2	+15	ppm	
4. EVM(Peak EVM)					
6Mbps	-	-30	-5	dBm	
54Mbps	-	-31	-25	dBm	
RX Minimum receiving sensitivity	Minimum	Typ	Maximum (IEEE Spec)	Unit	
6Mbps (FER≦10%)	-	-92	-82	dBm	
54Mbps (FER≦10%)	-	-76	-65	dBm	

3.2.3 Transmit performance of IEEE802.11n-HT20 mode

Table 9 MCS7 transmit performance parameters of IEEE802.11n-HT20 mode

Category	Content				
Mode	IEEE802.11n HT20				
Channel	CH1 to CH13				
Rate	MCS0/1/2/3/4/5/6/7, Maximum 65Mbps				
TX	Minimum	Typ	Maximum	Unit	
1. Output power	11.5	13.5	15.5	dBm	
2. Spectrum template					

1) at fc +/- 11MHz	-	-	-20	dBr	
2) at fc +/- 20MHz	-	-	-28	dBr	
3) at fc > +/-30MHz			-45	dBr	
3. Frequency offset	-15	-2	+15	ppm	
4. EVM(Peak EVM)					
MCS0	-	-30	-5	dBm	
MCS7	-	-32	-27	dBm	
RX Minimum receiving sensitivity	Minimum	Typ	Maximum (IEEE Spec)	Unit	
MCS0 (FER≦10%)	-	-92	-82	dBm	
MCS7 (FER≦10%)	-	-73	-64	dBm	

4. Antenna Information

4.1 Type of Antenna

EMW3092 is a PCB on-board antenna. Please pay attention to the module PCB onboard antenna clearance area while using.

4.2 PCB antenna clearance area

When using a PCB antenna on a WIFI module, you need to ensure that the distance between the motherboard PCB and other metal components is at least 16mm. The shaded areas in the figure below need to be kept away from metal components, sensors, sources of interference, and other materials that may cause signal interference.

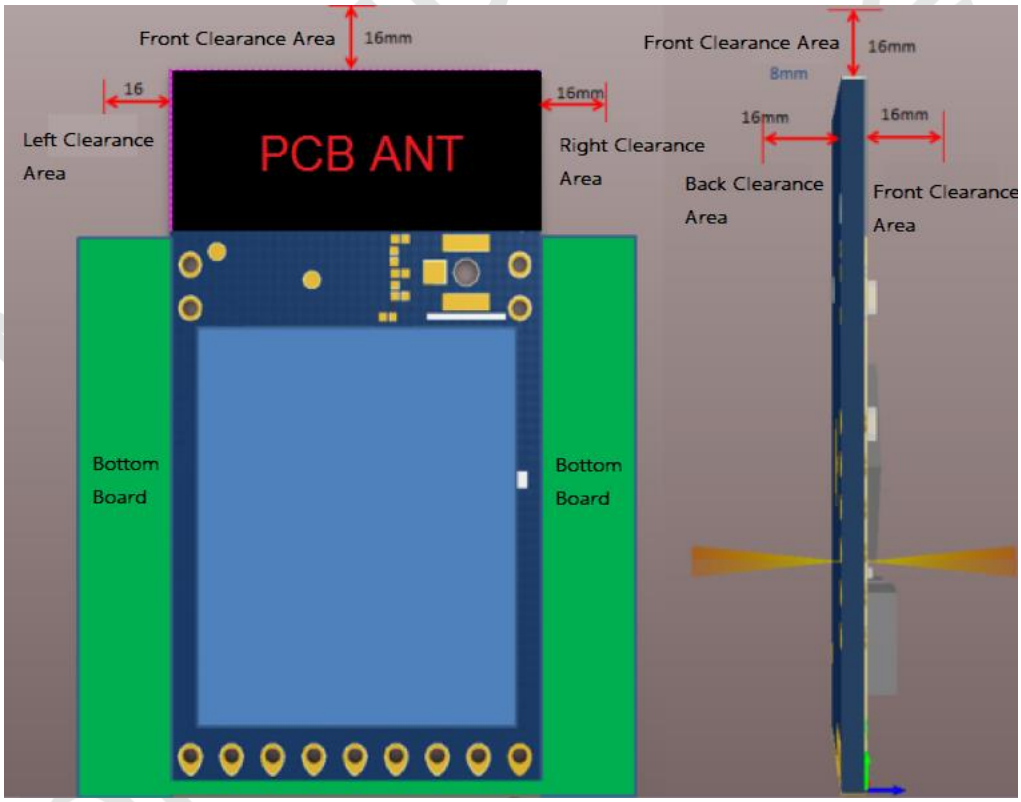


Figure 6 PCB antenna minimum clearance area (unit: mm)

5. Assembly Information and Production Guidance

5.1 Production Guidance

- The stamp hole package module produced by Mxchip must completely being patched by SMT machine in 24 hours after open firmware package. Otherwise the module should be re-package by vacuum pumping and drying before patch.
  - Devices for SMT patch:
    （1）Reflow soldering machine
    （2）AOI detector
    （3）Suction nozzle with 6-8mm caliber
  - Device for drying:
    （1）Cabinet type oven
    （2）Anti-static and high thermos tolerant tray
    （3）Anti-static and high thermos tolerant gloves
- Conditions of product storage (Storage environment is shown in figure 8):
  - Moisture bag must be stored in temperature below 30 and humidity less than 85%RH.
  - Dry packaging products, the guarantee period should be from 6 months date of packing seal.
  - Humidity indicator card is in the hermetic package.

Figure 7 Humidity Card

- Humidity indicator card and drying situation:
  - 2 hours drying for module if the color ring at 30%, 40%, 50% in humidity indicator card is blue after unpacking;
  - 4 hours drying for module if the color ring at 30% in humidity indicator card is pink after unpacking;
  - 6 hours drying for module if the color ring at 30%, 40% in humidity indicator card is pink after unpacking;

- 12 hours drying for module if the color ring at 30%, 40%, 50% in humidity indicator card is pink after unpacking.

- Drying parameters:
  - Drying temperature: 125℃±5℃;
  - Alarm temperature: 130℃;
  - SMT patch when the device cool down below 36℃ in natural condition;
  - Dry times: 1;
  - Please dry again if the module is unsoldering in 12 hours after last drying.

- SMT is unsuitable if the module packed over 3 months. There would be serious oxidation of the pad because of immersion gold and cause false welding and lack of weld. Mxchip does not assume the corresponding responsibility;

- ESD protection is required before SMT;

- SMT patch should on the basis of reflow profile diagram, maximum temperature 245℃, reflow profile diagram is shown in figure 10;

- In order to guarantee the reflow soldering qualification rate, vision and AOI detection should be done in 10% products for the first patch to make sure the rationality of temperature control, device adsorption mode and position. Detect 5 to 10 sample every hour in the following batch production.

5.2 Considerations

- Operator should wear anti-static gloves during producing;

- No more than drying time;

- Any explosive, flammable and corrosive material is not allowed to add in drying;

- Module should be put into oven with high thermotolerant tray. Ventilation should exist between each module and no direct contact with oven;

- Make sure oven is closed when drying to prevent temperature leaking;

- Reduce opening time or keep closing the door of the oven during drying;

- Use anti-static glove to take out module when its temperature below 36℃ by natural cool down after drying;

- Make sure no water and dirt in the bottom of the module;

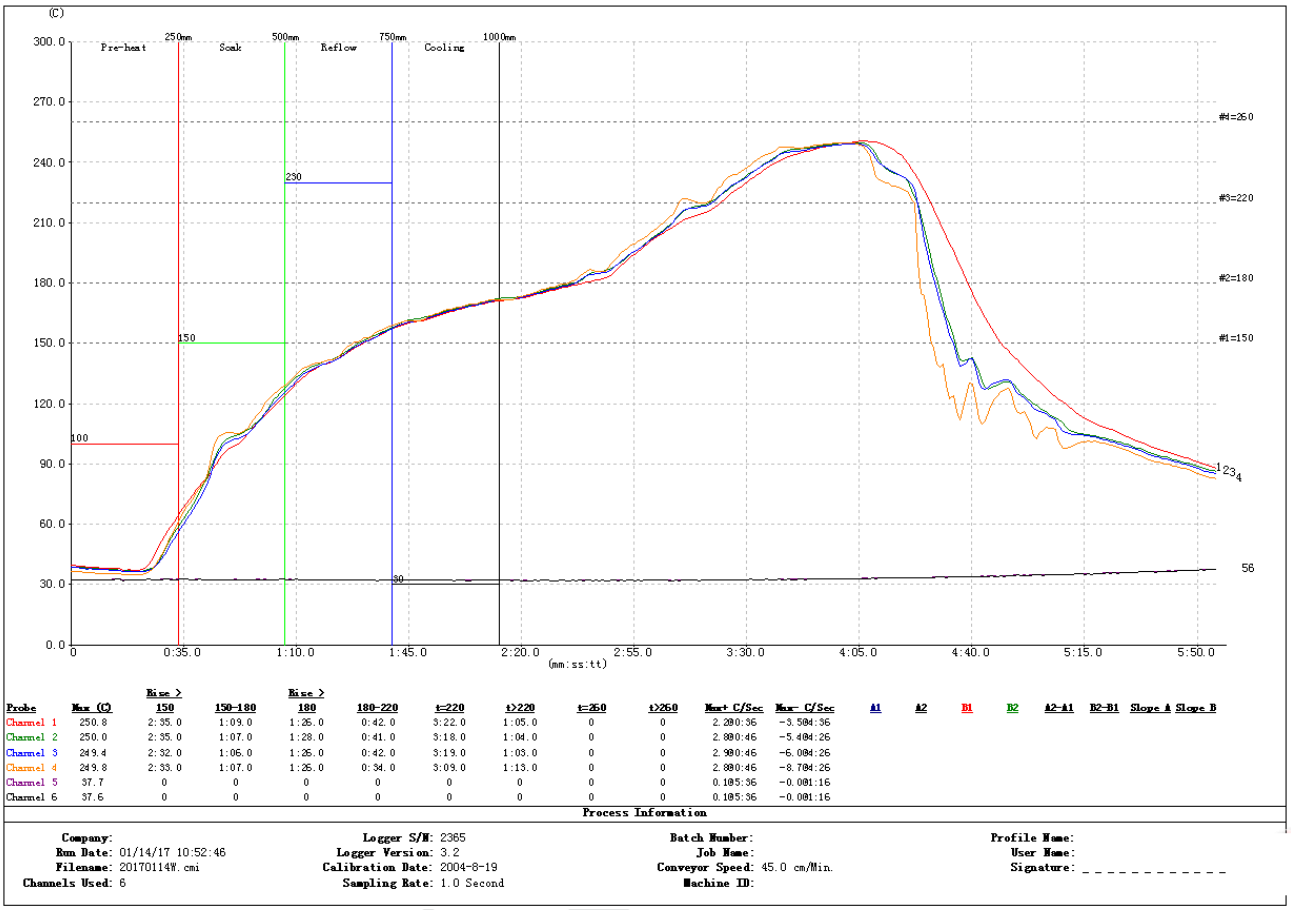
- Temperature and humidity control is level 3 for initial modules. Storage and drying conditions are based on IPC/JEDEC J-STD-020.

5.3 Storage Condition

Figure 8 Storage Condition

5.4 Temperature Curve of Secondary Reflow

Suggested solder paste type: SAC305, unleaded, solder paste thickness from 0.12 to 0.15, less than 2 times reflow.



Probe	Max (C)	Rise > 150	150-180	Rise > 180	180-220	t>220	t>220	t>260	t>260	Max+ C/Sec	Max- C/Sec	A1	A2	B1	B2	A2-A1	B2-B1	Slope A	Slope B
Channel 1	250.8	2:35.0	1:09.0	1:25.0	0:42.0	3:22.0	1:05.0	0	0	2.200:36	-3.504:36								
Channel 2	250.0	2:35.0	1:07.0	1:28.0	0:41.0	3:18.0	1:04.0	0	0	2.800:46	-5.404:26								
Channel 3	249.4	2:32.0	1:06.0	1:25.0	0:42.0	3:19.0	1:03.0	0	0	2.900:46	-6.004:26								
Channel 4	249.8	2:33.0	1:07.0	1:25.0	0:34.0	3:09.0	1:13.0	0	0	2.800:46	-8.704:26								
Channel 5	37.7	0	0	0	0	0	0	0	0	0.105:36	-0.001:16								
Channel 6	37.6	0	0	0	0	0	0	0	0	0.105:36	-0.001:16								

Process Information

Company:	**Logger S/N:** 2365	**Batch Number:**	**Profile Name:**
Run Date: 01/14/17 10:52:46	**Logger Version:** 3.2	**Job Name:**	**User Name:**
Filename: 20170114W.cmi	**Calibration Date:** 2004-8-19	**Conveyor Speed:** 45.0 cm/Min.	**Signature:** _____
Channels Used: 6	**Sampling Rate:** 1.0 Second	**Machine ID:**	

Figure 9 Temperature Curve of Secondary Reflow

6. FCC& IC Information

6.1 FCC Warning

Any 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 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 device has been evaluated to meet general RF exposure requirement.

6.2 IC warning

- English:

This device complies with 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.

- French:

Le présentappareilestconforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitationestautorisée aux deux conditions suivantes:

(1) l'appareil ne doit pas produire de brouillage, et.

(2) l'utilisateur de l'appareildoit accepter tout brouillageradioélectriquesubi, mêmesi le brouillageest susceptible d'encompromettre le fonctionnement.

6.3 Other information

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.

There are more information you should know here:

- Module is limited to OEM installation ONLY.

- OEM integrators is responsible for ensuring that the end-user has no manual instructions to remove or install module.
- Module is limited to installation in mobile or fixed applications, according to Part 2.1091(b).
- Separate approval is required for all other operating configurations, including portable configurations with respect to Part 2.1093 and different antenna configurations.
- Labeling instructions of finished products.

Example: “Contains Transmitter Module FCC ID: P53-EMW3092” or “Contains FCC ID: P53-EMW3092”

7. Sales Information and Technical Support

For consultation or purchase the product, please contact Mxchip during working hours:

From Monday to Friday, morning 9:00~12:00, afternoon 13:00~18:00

Telephone: +86-21-52655026

Contact address: 9thFloor, No.5, Lane2145 JinshaJiang Road Putuo District, ShangHai.

Postcode：200333

Email: sales@mxchip.com