CM05 WIFI/BLE Module

Product Specification

Model Name	CM05
Project code	
Description	WIFI/BLE
Version	1.2
Issue Date	2018/05/31

Approved by	Reviewed by	Issued by
Taka Wei	JH Huang	Iestyn Chen

Revision History

Revision	Released Date	Comments/Remark	Author
0.1	2017/10/13	Initial release	Iestyn Chen
0.2	2017/12/01	Add in HW performance data	Iestyn Chen
0.3	2017/12/12	Modify the memory configuration of WiFi	Iestyn Chen
1.0	2018/03/09	Modify the spec	JH
1.1	2018/04/12	Modify the Mechanical information	JH
1.2	2018/05/31	Modify the current consumption spec	JH

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1. Introduction

CM05 is a compact module that integrates both BLE and WiFi function, and an ARM Cortex-M4 MCU that runs customer's application. The typical application of the module is bridging BLE sensor clients to the cloud through WiFi router.

2. Key Features

- ■ **BLE**
    - BLE 5 connectivity
    - ARM Cortex-M4 32-bit processer with FPU
    - Memory
        - 512kB Flash (chip internal)
        - 64kB RAM (chip internal)
    - 2.4GHz transceiver
        - 95dBm sensitivity in Bluetooth low energy mode
    - 1Mbps, 2Mbps supported data rate
    - TX power -20 to +4 dBm in 4 dB steps
    - Single-pin antenna interface

- ■ **WIFI**
    - ARM Cortex-M4 32-bit processer with FPU
    - Memory
        - 512kB ROM (chip internal)
        - 256kB RAM (chip internal)
        - 2MB Flash (external)
- Radio
    - Single-pin antenna interface
    - 2.4GHz
- Support of Standard
    - 802.11b/g/n compatible WLAN
    - 802.11e QoS Enhancement(WMM)
    - 802.11i(WPA, WPA2). Open, shared key, and pair-wise key authentication services
    - WIFI Direct support
    - Light Weight TCP/IP protoco

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3. PIN Map and Signal Description

Refer to Section 9 for pin location and arrangement.

Pin #	Pin Name	Description
1	GND	Ground
2	GND	Ground
3	BLE_ANT	BLE Antenna
4	GND	Ground
5	GPIO15	Digital
6	GPIO14	Digital
7	SWDIO	BLE Debug/download
8	SWCLK	BLE Debug/download
9	VDD	Module Power in
10	n_RESET	Reset, active Low, with internal pull–up
11	GPIO13	Digital/Trace port CLK
12	GPIO12	Digital
13	WIFI_DEBUG_EN	WiFi Debug mode Enable
14	GND	Ground
15	SWD_DATA	WiFi Debug
16	SWD_CLK	WiFi Debug
17	GND	Ground
18	WIFI_ANT	WiFi Antenna
19	GND	Ground
20	WIFI_DEBUG_RX	WiFi Log UART/download
21	WIFI_DEBUG_TX	WiFi Log UART/download
22	GND	Ground
23	GPIO10	Digital/Trace port
24	GPIO9	Digital/Trace port
25	GPIO8	Digital
26	GPIO7	Digital
27	GPIO6	Digital
28	GPIO5	Digital
29	GPIO11	Digital
30	GPIO4	Analog/Digital, SAADC/COMP/LPCOMP input
31	GPIO3	Analog/Digital, SAADC/COMP/LPCOMP input
32	GND	Ground
33	GND	Ground
34	GPIO1	Analog/Digital, SAADC/COMP/LPCOMP input
35	GPIO2	Analog/Digital, SAADC/COMP/LPCOMP input
36	GPIO22	Analog/Digital, SAADC/COMP/LPCOMP input
37	GPIO21	Analog/Digital, SAADC/COMP/LPCOMP input

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Pin #	Pin Name	Description
38	GPIO20	Analog/Digital, SAADC/COMP/LPCOMP input
39	GPIO19	Analog/Digital, SAADC/COMP/LPCOMP input
40	GPIO18	Digital
41	GPIO17	Digital
42	GPIO16	Digital
43	GND	Ground
F1	NC	
F2	NC	
F3	NC	
F4	NC	
F5	NC	
F6	NC	

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4. ELECTRICAL CHARACETRISTICS

4.1 Recommended Operating Range

PARAMETER	MIN	TYP	MAX	UNIT
Operating temperature range	−20	25	85	°C
Operating supply voltage	3	3.3	3.6	V

4.2 Power Consumption

PARAMETER	MIN	TYP	MAX	UNIT
WIFI 11n TX supply current at maximum output power			280	mA
WIFI 11g TX supply current at maximum output power			280	mA
WIFI 11b TX supply current at maximum output power			350	mA
WIFI RX supply current			130	mA
BLE TX supply current at maximum output power(+4dBm)			25	mA
BLE RX			16	mA
System off mode			10	uA

Detail to be added

4.3 GPIO Characterization information

PARAMETER	MIN	TYP	MAX	UNIT
Voltage at digital I/O pins	-0.3		VDD + 0.3	V
Input Low voltage level(VIL)			0.3xVDD	V
Input High voltage level(VIH)	0.7xVDD		VDD	V
Output Low Voltage level(VOL)			0.4	V
Output Low Voltage level(VOH)	VDD-0.4		VDD	V

5. RF Characteristics

5.1 BLE TX Characteristics

Following characteristics are valid for conditions as follows (unless otherwise specified)
T_{amb} = -20 °C to 85 °C, VCC = 3.3 V
Bursts: 10, Payload: PRBS 9, Length: 37 Bytes

PARAMETER	MIN	TYP	MAX	UNIT
Maximum TX Power			4	dBm
1st Adjacent Channel Transmit Power 1 MHz (1 Msps)			-25	dBc
2nd Adjacent Channel Transmit Power 2 MHz (1 Msps)			-50	dBc
1st Adjacent Channel Transmit Power 2 MHz (2 Msps)			-25	dBc
2nd Adjacent Channel Transmit Power 4 MHz (2 Msps)			-50	dBc

5.2 BLE RX Characteristics

Following characteristics are valid for conditions as follows (unless otherwise specified)
T_{amb} = -20 °C to 85 °C, VCC = 3.3 V, Payload: PRBS 9, Length: 37

PARAMETER	MIN	TYP	MAX	UNIT
Receiver Sensitivity	-95			dBm

5.3 WIFI TX Characteristics

Following characteristics are valid for conditions as follows (unless otherwise specified
T_{amb} = -20 °C to 85 °C, VCC = 3.3 V

PARAMETER	MIN	TYP	MAX	UNIT
Maximum TX Power 802.11G 54MHz			20.5	dBm
Maximum TX Power 802.11B 11MHz			28	dBm
Maximum TX Power 802.11N HT20			28	dBm
Maximum TX Power 802.11N HT40			26	dBm

Following characteristics are valid for conditions as follows (unless otherwise specified T_{amb} = -20 °C to 85 °C, VCC = 3.3 V				
PARAMETER	**MIN**	**TYP**	**MAX**	**UNIT**
EVM 802.11G 54MHz			-30	dB
EVM 802.11B 11MHz			-24.5	dB
EVM 802.11N HT20			-31	dB
EVM 802.11N HT40			-31	dB

5.4 WIFI RX Characteristics

Following characteristics are valid for conditions as follows (unless otherwise specified T_{amb} = -20 °C to 85 °C, VCC = 3.3 V				
PARAMETER	**MIN**	**TYP**	**MAX**	**UNIT**
Sensitivity 802.11G 54MHz	-79			dBm
Sensitivity 802.11B 11MHz	-89			dBm
Sensitivity 802.11N HT20	-73			dBm
Sensitivity 802.11N HT40	-70			dBm

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6. Mechanical Information

TOP SIDE

BOTTOM SIDE
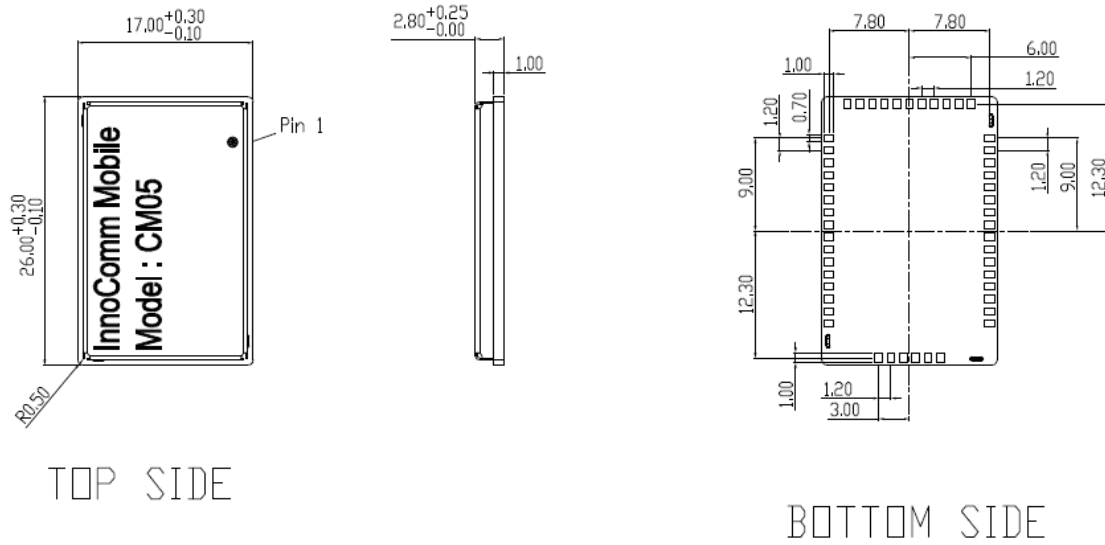
7. Recommended PCB Layout Footprint

Module Position
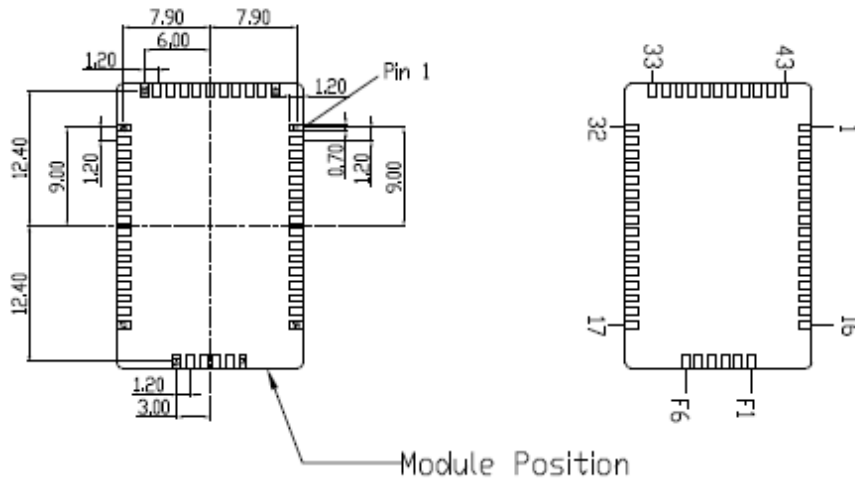
RECOMMENDED P.C.B PATTERN LAYOUT

TOP VIEW

8. Module Layout Guide

    I.   Do not route traces under module to minimize on interference.

(O)

(X)

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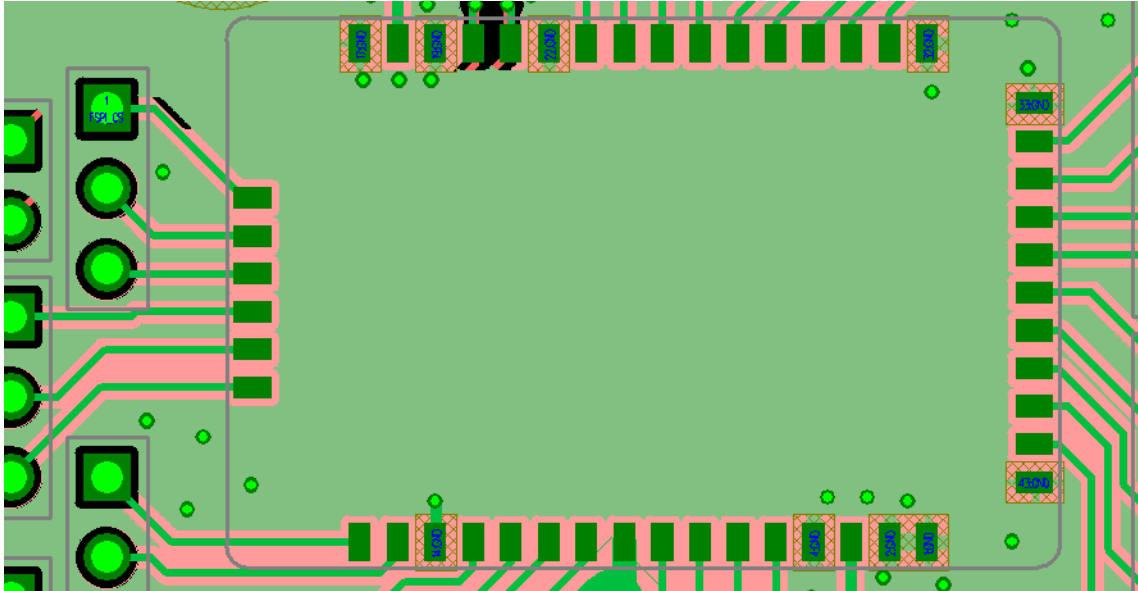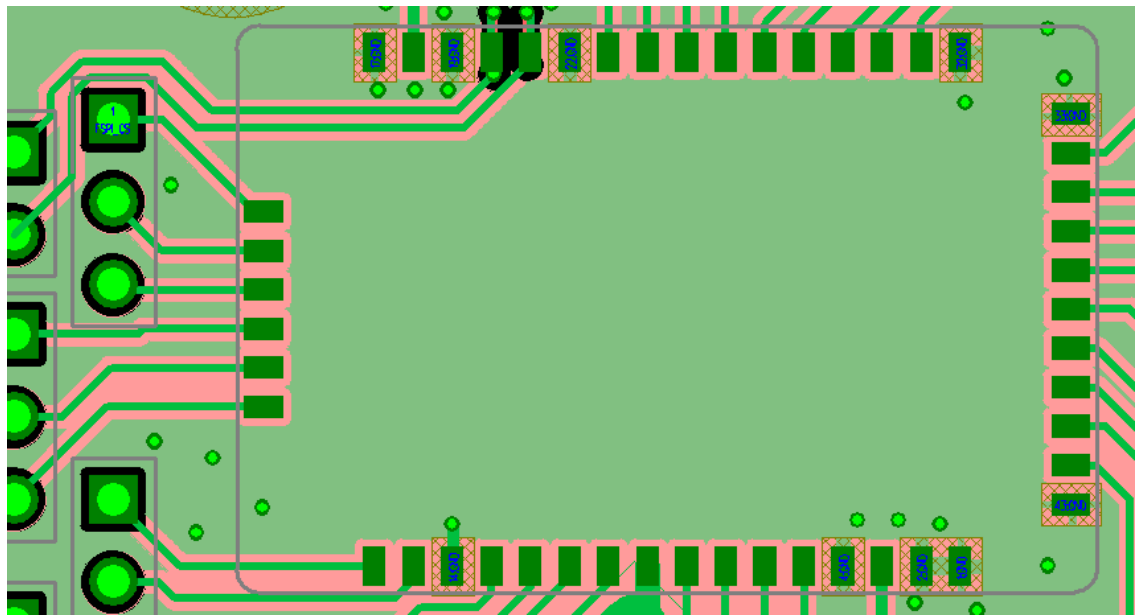
II.   The trace Impedance of the antenna port (Pin 18) is 50 Ω. In order to minimize the return loss, it is recommended to use short traces.
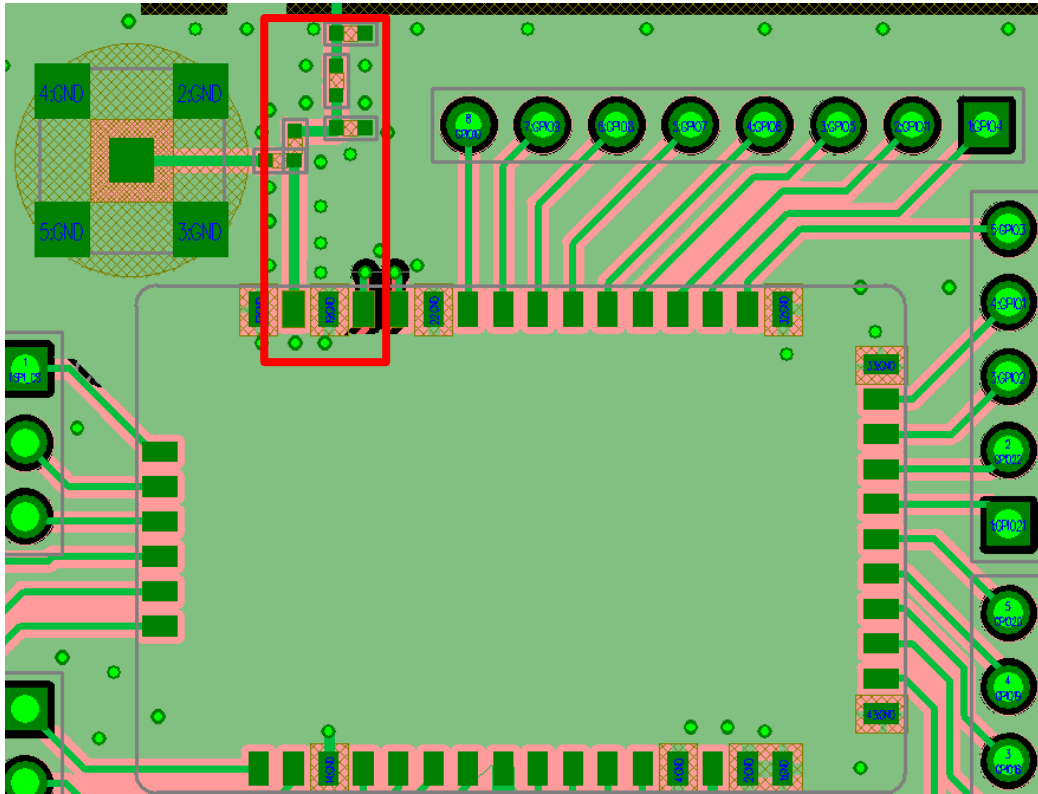
III. Keep enough clearance between the antenna port (Pin 18) and surrounding GND to minimize the power loss.

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(X)

9. SMT Solder Reflow Recommendation

	Line Speed:	Zone:	Zone #1	Zone #2	Zone #3	Zone #4	Zone #5	Zone #6	Zone #7	Zone #8	Zone #9	Zone #10	Zone #11
	90.00 cm/min	Length (cm):	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0
		Upper (°C):	130.0	160.0	175.0	175.0	190.0	190.0	220.0	240.0	255.0	250.0	245.0
		Lower (°C):	130.0	160.0	175.0	175.0	190.0	190.0	220.0	240.0	255.0	250.0	245.0

Reflow Results / **Maximum / Minimum** / **Slopes**

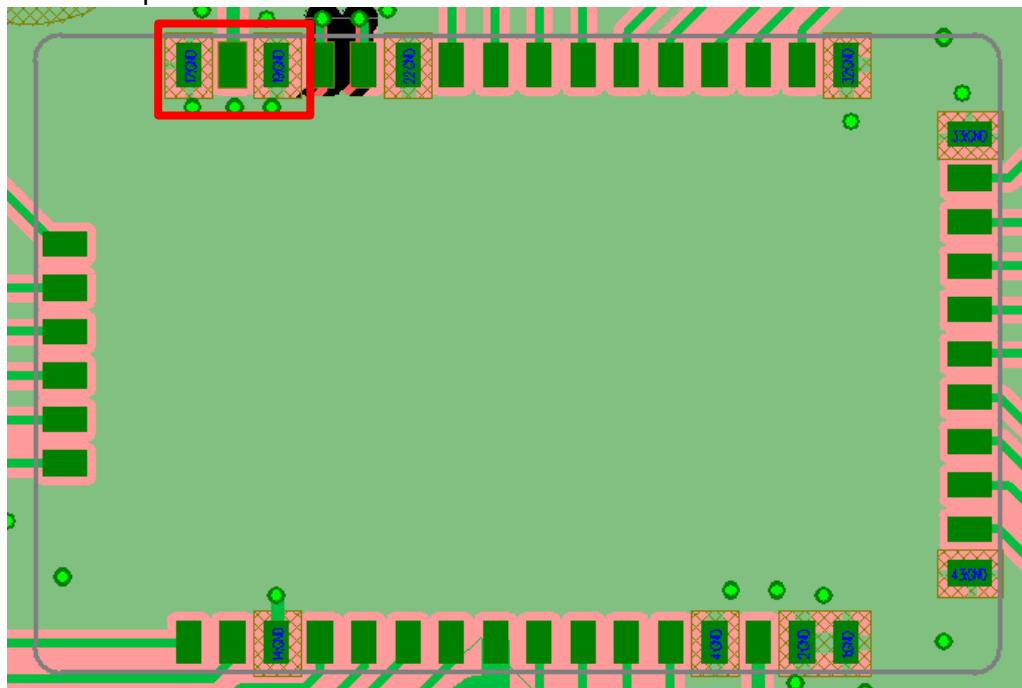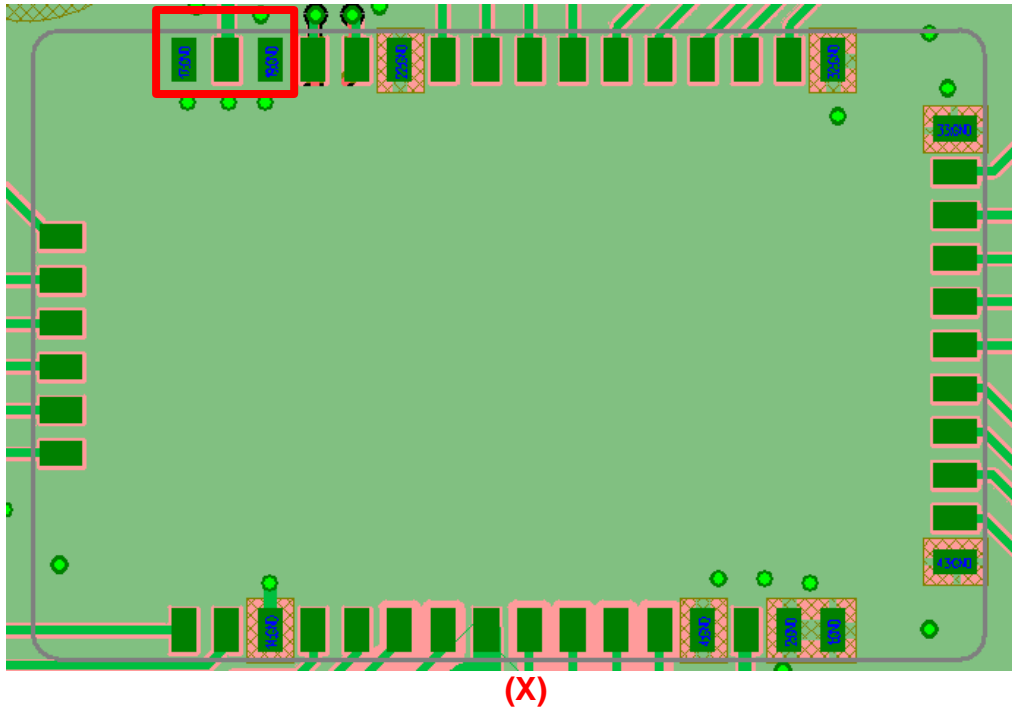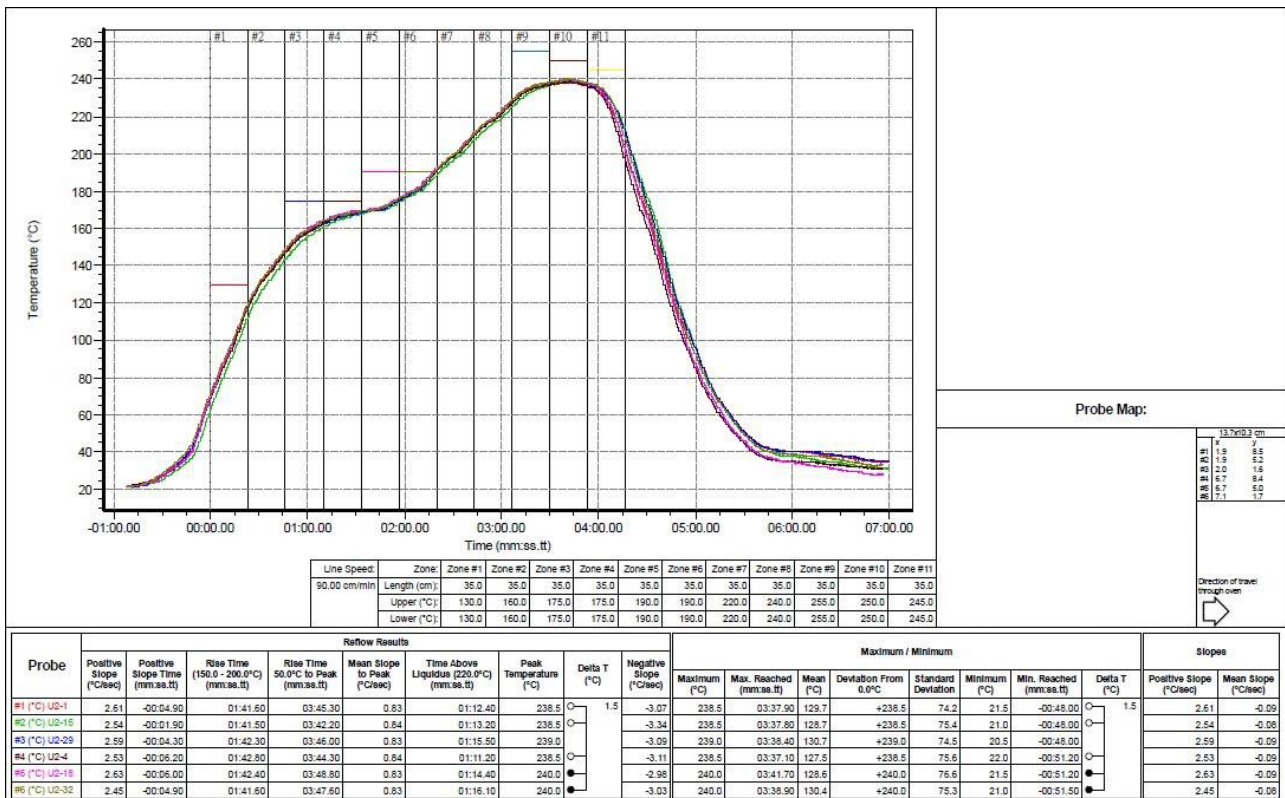| Probe	Positive Slope (°C/sec)	Positive Slope Time (mm:ss.tt)	Rise Time (150.0 - 200.0°C) (mm:ss.tt)	Rise Time 50.0°C to Peak (mm:ss.tt)	Mean Slope to Peak (°C/sec)	Time Above Liquidus (220.0°C) (mm:ss.tt)	Peak Temperature (°C)	Delta T (°C)	Negative Slope (°C/sec)	Maximum (°C)	Max. Reached (mm:ss.tt)	Mean (°C)	Deviation From 0.0°C	Standard Deviation	Minimum (°C)	Min. Reached (mm:ss.tt)	Delta T (°C)	Positive Slope (°C/sec)	Mean Slope (°C/sec)
#1 (°C) U2-1	2.61	-00:04.90	01:41.60	03:45.30	0.83	01:12.40	238.5	1.5	-3.07	238.5	03:37.90	129.7	+238.5	74.2	21.5	-00:48.00	1.5	2.61	-0.09
#2 (°C) U2-15	2.54	-00:01.90	01:41.50	03:42.20	0.84	01:13.20	238.5		-3.34	238.5	03:37.80	128.7	+238.5	75.4	21.0	-00:48.00		2.54	-0.08
#3 (°C) U2-29	2.59	-00:04.30	01:42.30	03:46.00	0.83	01:15.50	239.0		-3.09	239.0	03:38.40	130.7	+239.0	74.5	20.5	-00:48.00		2.59	-0.09
#4 (°C) U2-4	2.53	-00:06.20	01:42.80	03:44.30	0.84	01:11.20	238.5		-3.11	238.5	03:37.10	127.6	+238.5	75.6	22.0	-00:51.20		2.53	-0.09
#5 (°C) U2-16	2.63	-00:06.00	01:42.40	03:48.80	0.83	01:14.40	240.0		-2.96	240.0	03:41.70	128.6	+240.0	76.6	21.5	-00:51.20		2.63	-0.09
#6 (°C) U2-32	2.45	-00:04.90	01:41.60	03:47.60	0.83	01:16.10	240.0		-3.03	240.0	03:38.90	130.4	+240.0	75.3	21.0	-00:51.50		2.45	-0.08

Note: Allowable reflow soldering times: 2 times base on recommended reflow profile.

10. Appendix

IO Mapping

BLE			CM05 Module Pin Assignment		WIFI
Pin Number	Pin Name	Type	Pin Number	Pin name	Pin name
4	P0.02	Analog/Digital	34	GPIO1	
5	P0.03	Analog/Digital	35	GPIO2	
6	P0.04	Analog/Digital	31	GPIO3	
7	P0.05	Analog/Digital	30	GPIO4	
8	P0.06	Digital	29	GPIO11	
9	P0.07	Digital	28	GPIO5	
10	P0.08	Digital	27	GPIO6	
11	P0.09	NFC/Digital	26	GPIO7	
12	P0.10	NFC/Digital	25	GPIO8	
14	P0.11	Digital			GPIOA23 UART0_TXD
15	P0.12	Digital			GPIOA22 UART0_RTS
16	P0.13	Digital			GPIOA19 UART0_CTS
17	P0.14	Digital/Trace port	24	GPIO9	
18	P0.15	Digital/Trace port	23	GPIO10	
19	P0.16	Digital/Trace port			WIFI_EN
20	P0.17	Digital			GPIOA18 UART0_RXD
21	P0.18	Digital/Trace port			GPIOA_5
22	P0.19	Digital	12	GPIO12	
23	P0.20	Digital/Trace port CLK	11	GPIO13	
24	P0.21	Digital/Reset	10	nReset	
27	P0.22	Digital			GPIOA_12
28	P0.23	Digital	6	GPIO14	
29	P0.24	Digital	5	GPIO15	
37	P0.25	Digital	42	GPIO16	
38	P0.26	Digital	41	GPIO17	
39	P0.27	Digital	40	GPIO18	
40	P0.28	Analog/Digital	39	GPIO19	
41	P0.29	Analog/Digital	38	GPIO20	
42	P0.30	Analog/Digital	37	GPIO21	
43	P0.31	Analog/Digital	36	GPIO22	

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Federal Communications Commission Statement

This device complies with FCC Rules Part 15. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a class B digital device, pursuant to Part 15 of the Federal Communications Commission (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 causes 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 doing 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.

FCC Caution

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
The antenna(s) used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. End users must follow the specific operating instructions for satisfying RF exposure compliance. To maintain compliance with FCC exposure compliance requirement, please follow operation instruction as documented in this manual.

This equipment must be installed and operated in accordance with provided instructions and the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

FCC Label Instructions:

The outside of final products that contains this module device must display a label referring to the enclosed module. This exterior label can use wording such as: "Contains Transmitter Module FCC ID:YAICM05",or "Contains FCC ID: YAICM05", Any similar wording that expresses the same meaning may be used.