CZ3730A WLAN MIMO and Bluetooth and Zigbee Module Evaluation Board for TI Sitara Platform

The CZ3730A-COM8 is WLAN dual-band, Bluetooth, BLE and Zigbee module evaluation board (EVB) with the Partron CZ3730A module The CZ3730A offers A 2.4G and 5-GHz module solution with two antennas.

Contents

1. Overview

Shows the CZ3730A-COM8 EVB

Figure 1 CZ3730A-COM8 EVB(Top View)

1.1 General Features

The CZ3730A-COM8 EVB includes the following features:
- WLAN, Bluetooth, BLE and Zigbee on a single module board
- 100-pin board card
- Dimensions:76mm(L) x 44.02mm(W)
- WLAN 2.4- and 5-GHz SISO(20- and 40-MHz channels), 2.4-GHz MIMO(20-MHz channels)
- Support for BLE dual mode
- Seamless integration with TI Sitara and Other application processors
- Design for the TI AM335X General-purpose evaluation module (EVM)
- WLAN and Bluetooth single-antenna coexistence
- Built-in chip antenna

2. Board Pin Assignment

Shows the top view of the EVB
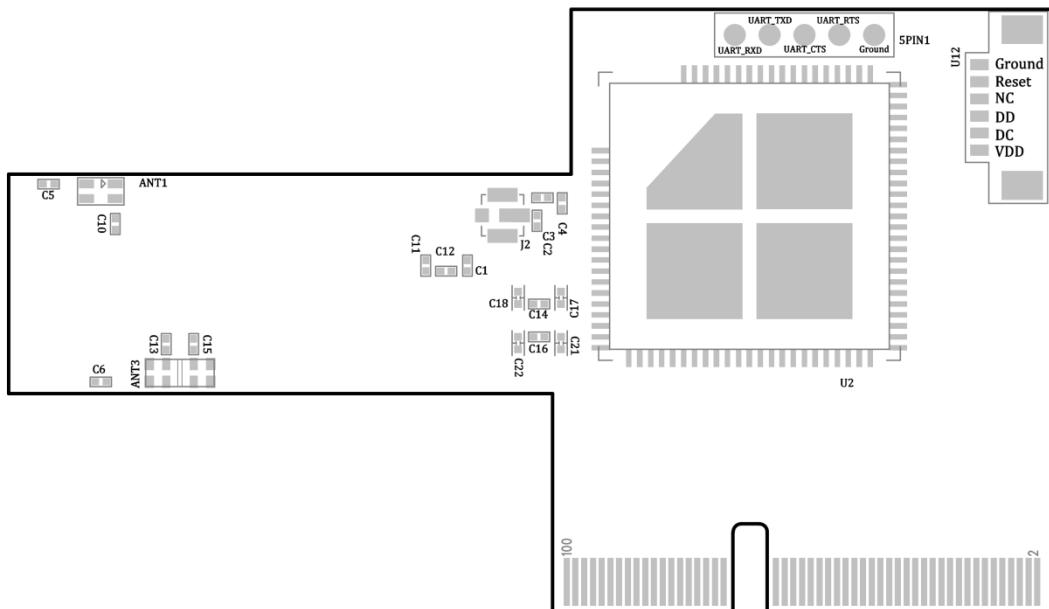
Figure 2 EVB Top (Top View)

Show the bottom slide of the EVB
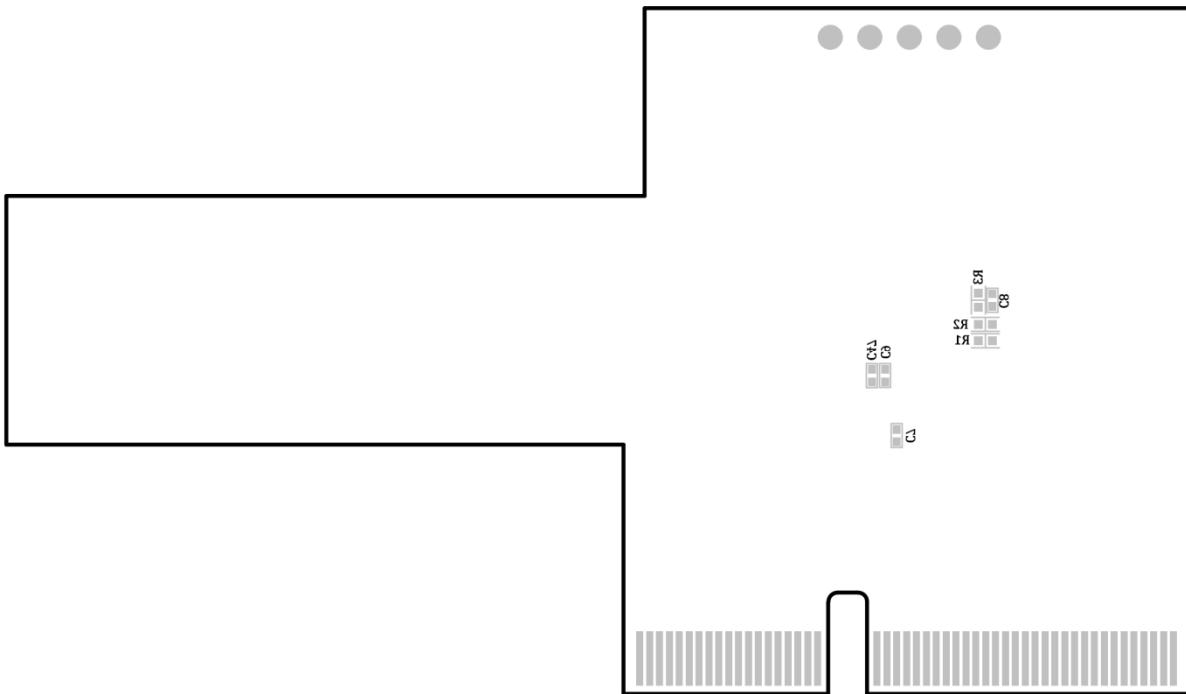
Figure 3 EVB Bottom (Top View)

2.1 Pin Description

| No.	Name	Type	Description
1	RTC_CLK	I	Slow clock input option (default: NU)
2	Ground	G	Ground
3	Ground	G	Ground
4	WLAN_EN_SOC	I	WLAN enable
5	VBAT_IN	P	3.6-V typical voltage input
6	Ground	G	Ground
7	VBAT_IN	P	3.6-V typical voltage input
8	VIO_IN	P	Vio 1.8-V (I/O voltage) input
9	Ground	G	Ground
10	N.C		No connection
11	WL_RS232_TX	O	WLAN tool RS232 output
12	N.C		No connection
13	WL_RS232_RX	I	WLAN tool RS232 input
14	N.C		No connection
15	WL_UART_DBG	O	WLAN Logger output
16	N.C		No connection
17	N.C		No connection
18	Ground	G	Ground
19	Ground	G	Ground
20	SDIO_CLK_WL	I	WLAN SDIO clock
21	N.C		No connection
22	Ground		Ground
23	N.C		No connection
24	SDIO_CMD_WL	I/O	WLAN SDIO command
25	N.C		No connection
26	SDIO_D0_WL	I/O	WLAN SDIO data bit 0
27	N.C		No connection
28	SDIO_D1_WL	I/O	WLAN SDIO data bit 1
29	N.C		No connection

30	SDIO_D2_WL	I/O	WLAN SDIO data bit 2
31	N.C		No connection
32	SDIO_D3_WL	I/O	WLAN SDIO data bit 3
33	N.C		No connection
34	WLAN_IRQ	O	WALN SDIO interrupt out
35	N.C		No connection
36	N.C		No connection
37	Ground	G	Ground
38	N.C		No connection
39	N.C		No connection
40	N.C		No connection
41	N.C		No connection
42	Ground	G	Ground
43	N.C		No connection
44	N.C		No connection
45	N.C		No connection
46	N.C		No connection
47	Ground	G	
48	N.C		No connection
49	N.C		No connection
50	N.C		No connection
51	N.C		No connection
52	BT_AUD_CLK	I/O	Bluetooth PCM clock input of output
53	N.C		No connection
54	BT_AUD_FSYNC	I/O	Bluetooth PCM frame sync input of output
55	N.C		No connection
56	BT_AUD_IN	I	Bluetooth PCM data input
57	N.C		No connection
58	BT_AUD_OUT	O	Bluetooth PCM data output
59	N.C		No connection
60	Ground	G	Ground
61	N.C		No connection
62	N.C		No connection
63	Ground	G	Ground
64	Ground	G	Ground
65	N.C		No connection
66	BT_HCI_TX	O	Bluetooth HCI UART transmit output
67	N.C		No connection
68	BT_HCI_RX	I	Bluetooth HCI UART receive input
69	N.C		No connection
70	BT_HCI_CTS	I	Bluetooth HCI UART Clear to Send input
71	N.C		No connection
72	BT_HCI_RTS	O	Bluetooth HCI UART Request to Send output
73	N.C		No connection
74	N.C		No connection
75	N.C		No connection
76	BT_UART_DBG	O	Bluetooth Logger UART output
77	Ground	G	Ground
78	N.C		No connection
79	N.C		No connection
80	N.C		No connection
81	N.C		No connection
82	N.C		No connection
83	Ground	G	Ground
84	N.C		No connection
85	N.C		No connection
86	N.C		No connection

87	Ground	G	Ground
88	N.C		No connection
89	N.C		No connection
90	N.C		No connection
91	N.C		No connection
92	Ground	G	Ground
93	N.C		No connection
94	N.C		No connection
95	Ground	G	Ground
96	GPIO11	I/O	General-purpose I/O
97	Ground	G	Ground
98	N.C		No connection
99	N.C		No connection
100	N.C		No connection

3. CZ3730A Module Electrical Characteristics

3.1 DC characteristics

Recommended Operating Conditions

Symbol	Parameter	Min.	Nom.	MAX.	Unit
VBAT		2.9	3.3	3.7	V
VIO		1.62	1.8	1.92	V
LS_VIO		3.3		5	V

3.2 External Slow clock Input (RTC Clock)

The external slow clock input should be present at all times. The slow clock is used to maintain timers that synchronize the device to the access point beacons.

Slow Clock is a digital square-wave in the range of 0`1.8V nom.

Parameter	Condition	Sym	Min.	Nom.	MAX.	Unit
Input slow clock frequency				32768		Hz
Input slow clock accuracy (Initial + temp + aging)	WLAN,BT				±250	ppm
	ANT				±50	
Input transition time Tr/Tf-10% to 90%		Tr/Tf			100	ns
Frequency input duty cycle			15	50	85	%
Input voltage limits	Square wave DC-coupled	Vih	0.65 xVIO		VIO	Vpeak
		Vil	0		0.35xVIO	
Input impedance			1			MΩ
Input capacitance					5	pF

3.3 1.8V I/O Operation Condition

Parameter	Condition	Sym	Min	Max	Unit	PIN
IO High-level input voltage		VIH	0.65x VIO	VIO	V	24pin, 25pin 26pin, 27pin 28pin, 29pin 30pin
IO low-level input voltage		VIL	0	0.35xVIO		
Enable inputs high-level input voltage		Vih_en	1.365	VIO		
Enable inputs low-level input voltage		Vil_en	0	0.4		
High-level output voltage	@4mA	VOH	VIO-0.45	VIO		
	@1mA		VIO-0.112	VIO		
	@0.3mA		VIO-0.033	VIO		
Low-Level output voltage	@4mA	VOL	0	0.45		
	@1mA		0	0.112		
	@0.09mA		0	0.01		
Input transitions time Tr/Tf from 10% to 90% (Digital IO)		Tr/Tf	1	10	ns	
Output rise time from 10% to 90% (Digital IO)	CL < 25pF	Tr		4.9	ns	
Output fall time from 10% to 90% (Digital IO)	CL < 25pF	Tf		5.3	ns	

3.4 3.3V I/O Operation Condition

Ta = 25, VBAT=3V, unless otherwise noted.

Parameter	Test Condition	MIN	TYP	MAX	Unit
Logic-0 input voltage				0.5	V
Logic-1 input voltage		2.5			
Logic-0 output voltage 4-mA pins	Output load 4mA			0.5	
Logic-1 output voltage 4-mA pins	Output load 4mA	2.4			
Logic-0 output voltage 20-mA pins	Output load 20mA			0.5	
Logic-1 output voltage 20-mA pins	Output load 20mA	2.4			

3.5 WLAN 2.4-GHz current consumption (AT BT and ZIGBEE Disable)

Recommended Operating Conditions

Parameter	Conditions	Min.	Nom.	MAX.	Unit
TX, 802.11b 11Mbps	Maximum output power Packet size = 400Byte, Delay 700uSec		265		mA
TX, 802.11g 54Mbps	Maximum output power Packet size = 2000Byte, Delay 700uSec		193		mA
TX, 802.11n MCS7	Maximum output power Packet size = 2000Byte, Delay 700uSec		172		mA
TX, 802.11n MCS15	Maximum output power Packet size = 2000Byte, Delay 700uSec		195		mA
RX, 802.11b 11Mbps	At -85dBm		86		mA
RX, 802.11g 54Mbps	At -72dBm		94		mA
RX, 802.11n MCS7	At -70dBm		92		mA
RX, 802.11n MCS15			TBD		mA

3.6 WLAN 5-GHz current consumption (AT BT and ZIGBEE Disable)

Recommended Operating Conditions

Parameter	Conditions	Min.	Nom.	MAX.	Unit
TX, 802.11a 54Mbps	Maximum output power Packet size = 2000Byte, Delay 700uSec		167		mA
TX, 802.11n MCS7	Maximum output power Packet size = 2000Byte, Delay 700uSec		158		mA
RX, 802.11a 54Mbps	At -71dBm		80		mA
RX, 802.11n MCS7	At -69dBm		74		mA

3.7 Bluetooth 4.0 current consumption (AT WLAN and ZIGBEE Disable)

Recommended Operating Conditions

Parameter	Conditions	Min.	Nom.	MAX.	Unit
TX, Basic mode	Packet type = PRBS		73		mA
TX, EDR mode	EDR-3M		47		mA
RX, Basic mode	At -90dBm		42		mA
RX, EDR mode	At -82dBm, EDR-3M		42		mA

3.8 Bluetooth Low Energy Current consumption (AT WLAN and ZIGBEE Disable)

Recommended Operating Conditions

Parameter	Conditions	Min.	Nom.	MAX.	Unit
TX	Packet type = PRBS		60		mA
RX	At -90dBm		49		mA

3.9 Bluetooth Low Energy Current consumption (AT WLAN and ZIGBEE Disable)

Recommended Operating Conditions

Parameter	Conditions	Min.	Nom.	MAX.	Unit
TX	Modulated, Continuous TX,		52		mA
RX			43		mA

3.10 2.4GHz WLAN RF specification

Parameter	Conditions	Min.	Nom.	MAX.	Unit
Operation frequency range		2412		2462	MHz
Linear output power in 802.11b mode					
1~11Mbps(ch1~11)	Packet Size =2000byte Delay = 400usec		15	16	dBm
Linear output power in 802.11g mode					
6~54Mbps(ch1,11)	Packet Size =2000byte		12	13	dBm
6~54Mbps(ch2~10)	Delay = 400usec		15	16	dBm
Linear output power in 802.11n mode					
HT20,MCS0~7(ch1,11)			12	13	dBm
HT20,MCS0~7(ch2~10)			15	16	dBm
HT20,MCS8~15(ch1,11)	Packet Size =2000byte		13.5	14.5	dBm
HT20,MCS8~15(ch2~10)	Delay = 400usec		15.5	16.5	dBm
HT40,MCS0~7(ch3,9)			10.5	11.5	dBm
HT40,MCS0~7(ch4~8)			13.5	14.5	dBm
Transmit spectrum mask					
Margin to 802.11b spectrum mask			1		dB
Margin to 802.11g spectrum mask	Maximum output power		5		dB
Margin to 802.11n spectrum mask			5		dB
Transmit modulation accuracy in 802.11b mode					
1~11Mbps	As specified in IEEE 802.11b			35	%
Transmit modulation accuracy in 802.11g mode					
6Mbps	Maximum output power		-16		dB
54Mbps			-26		dB
Transmit modulation accuracy in 802.11n mode					
HT20, MCS0			-17		dB
HT20, MCS7	Maximum output power		-28		dB
HT20, MCS15			-28		dB

Parameter	Conditions	Min.	Nom.	MAX.	Unit
Transmit power-on and power-down ramp time in 802.11b mode					
Transmit power-on ramp time From 10% to 90% output power				2	usec
Transmit power-down ramp time From 90% to 10% output power				2	usec

3.11 5GHz WLAN specification

Parameter	Conditions	Min.	Nom.	MAX.	Unit
Linear output power in 802.11a mode					
6~54Mbps (ch36,40,44,48,149,165)	Packet Size =2000byte Delay = 400usec		12.5	13.5	dBm
6~54Mbps (ch153,157,161)			14.5	15.5	dBm
Linear output power in 802.11n mode					
HT20,MCS0~7 (ch36,40,44,48,149,165)	Packet Size =2000byte Delay = 400usec		12.5	13.5	dBm
HT20,MCS0~7 (ch153,157,161)			14.5	15.5	dBm
HT40, MCS0~7 (ch38,151)			9	10	dBm
HT40, MCS0~7 (ch46,159)			13	14	dBm
Transmit spectrum mask					
Margin to 802.11a spectrum mask	Maximum output power		4		dB
Margin to 802.11n spectrum mask			4		dB
Transmit modulation accuracy in 802.11a mode					
6Mbps	Maximum output power		-19		dB
54Mbps			-26		dB
Transmit modulation accuracy in 802.11n mode					
HT20, MCS0	Maximum output power		-20		dB
HT20, MCS7			-28		dB
HT40, MCS0			-20		dB
HT40, MCS7			-28		dB

3.12 Bluetooth 4.0 RF Specificaiton

Parameter	Conditions	Min.	Nom.	MAX.	Unit
Bluetooth Specification		Bluetooth 4.0 Classic 1			
Power Class		Class 1			
Frequency range		2402		2480	MHz
Channel Spacing			1		MHz
BDR Transmitter					
RF transmit power			12	13	dBm
Initial carrier frequency		-75		75	kHz
Carrier frequency drift	Drift rate		-2.3		kHz/50μs
Modulation characteristics	Δflavg		161		kHz
	Δf2max		133		kHz
	Δf2avg/Δf1avg		8.2		%
EDR Transmitter					
RF transmit power			7	8	dBm

3.15 Bluetooth Low Energy RF Specification

Parameter	Conditions	Min.	Nom.	MAX.	Unit
Bluetooth Specification		Bluetooth Low Energy			
Frequency range		2402		2480	MHz
Channel Spacing			2		MHz
BLE Transmitter					
RF transmit power			9	10	dBm
Initial carrier frequency			-4		kHz
Carrier frequency drift	Drift rate		2		kHz/50μs
Modulation characteristics	Δflavg		247		kHz
	Δf2avg/Δf1avg		0.82		%

3.16 Zigbee RF Specification

| Parameter	Conditions	Min.	Nom.	MAX.	Unit
Operation frequency range		2402		2480	MHz
Maximum RF Transmit Power			2	3	dBm
Frequency Tolerance		-96		+96	kHz
Error Vector Magnitude				35	%

4. Antenna Characteristics
Show the antenna VSWR characteristics.

■ Test Result for Passive Test WiFi 2.4GHz
- Matching : Default

3D	Peak Gain [dBi]	Average Gain [dBi]	Efficiency [%]
2400	-2.18	-5.89	25.74
2425	-2.01	-5.52	28.08
2445	-1.73	-5.42	28.73
2465	-1.81	-5.66	27.16
2485	-1.07	-5.13	30.67
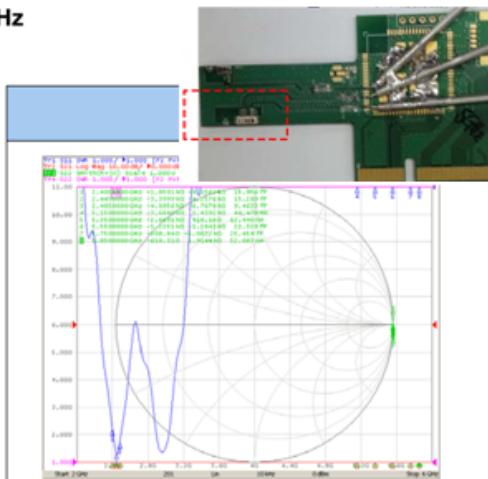
■ Test Result for Passive Test WiFi 5GHz
- Matching : Default

3D	Peak Gain [dBi]	Average Gain [dBi]	Efficiency [%]
5150	1.16	-3.23	47.50
5350	0.43	-3.97	40.06
5500	-1.34	-6.52	22.26
5725	-2.44	-6.91	20.36
5825	-0.08	-4.64	34.38
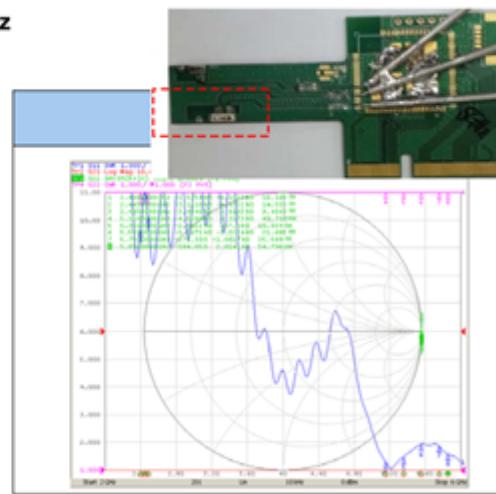
■ Test Result for Passive Test BT Matching 수정
- Matching : Series1=3.3nH, GND=1.5pF, Series2=Default, Shunt1,2=N/C

3D	Peak Gain [dBi]	Average Gain [dBi]	Efficiency [%]
2400	1.46	-4.01	39.70
2425	1.63	-3.84	41.28
2445	1.32	-4.40	36.29
2465	1.05	-4.97	31.83
2485	0.99	-5.19	30.24
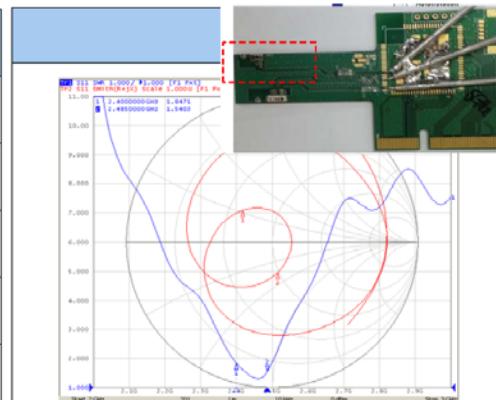
5. Circuit Design
5.1 EVB Reference Schematics
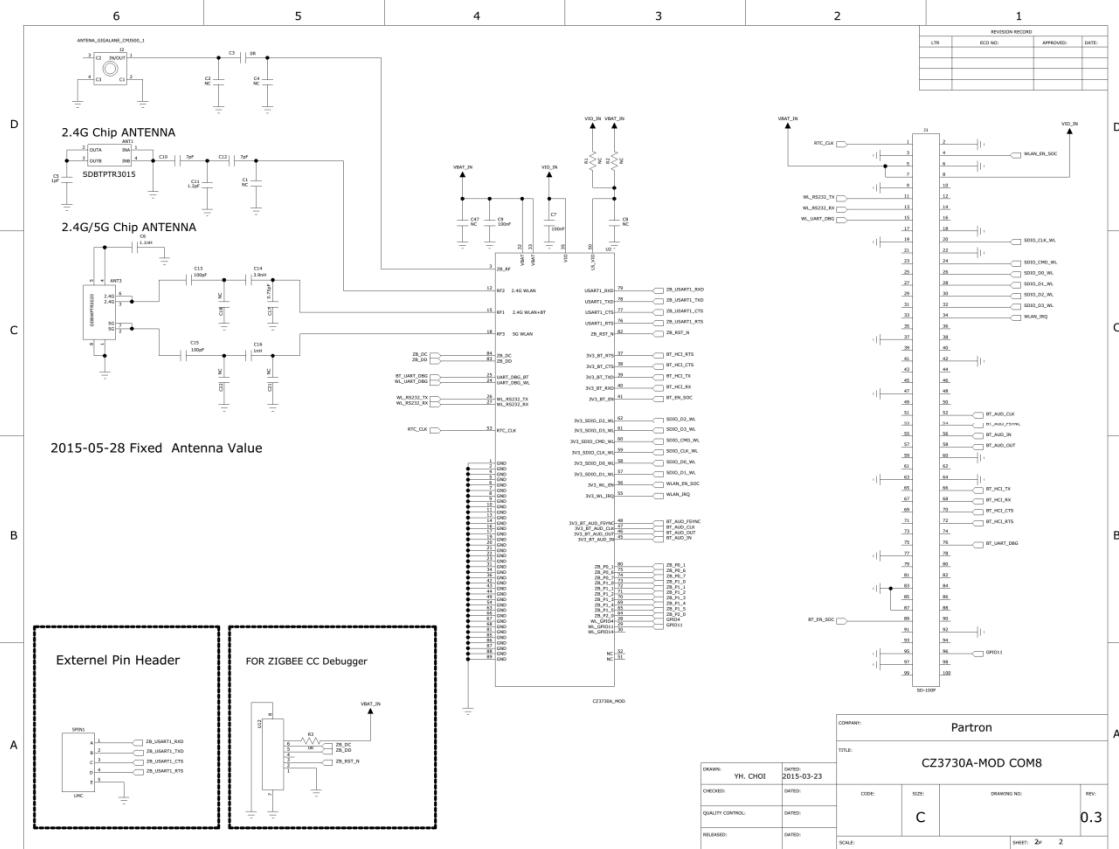
6. FCC Approval

-Caution
Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this device.

This device complies with Part 15 of the FCC`s 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 undesirable operation.

This device 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 technical for help.

This device complies with FCC radiation exposure limits set forth for an uncontrolled environment.
This device should be installed and operated with minimum distance 20cm between the radiating element of this device and the user.
This device must not be co-located or operating in conjunction with any other antenna or transmitter.
This device may only operate using an antenna of a type and maximum (or lesser) gain approved by partron. Antenna types not included in the list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this transmitter.
Note

Function (ANT A)	2402~2480MHz	5180~5240 MHz	5745~5825 MHz
	Peak Gain(Chip Antenna)		
WLAN(2.4/5GHz), Blutooth	-1.07 dBi	1.16 dBi	-0.08 dBi

Function (ANT B)	2412~2462 MHz	X	X
	Peak Gain(Chip Antenna)		
WLAN(2.4GHz Only)	1.63 dBi	X	X

In the event that these conditions cannot be met then the FCC authorization is no longer considered valid and the FCC ID cannot be used on the final product.

The satisfy FCC exterior labeling requirements, the following text must be placed on the exterior of the end product.
Contains Transmitter module FCC ID: 2AD5K-CZ3730A

This device is restricted to indoor use only within the 5150~5250MHz band.