

COREXOM R405LQ LR MODULE DATASHEET

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Revision History

Rev.	Date	Description		
0.0	2024/03/27	Draft		
0.1	2024/04/01	Model name updated		
0.2	2024/06/25	P2. Updated Key SW function name		
		(valid start from FW versions 0.0.70 and 2.0.6)		
0.3	2024/07/03	P2. Add new item #19 to explain the function of PJ1 Conn		
0.41	2024/11/01	Change P/N group number from 80. to SP.		
		Add new section 1.3 MIMO RF Channels' configuration		
		Modify section 4.1 Product Marking, add NCC and P/N Labels		
0.5	2025/01/10	Following cricfg tool Menu items to adjustment		
		 Add criwifitool shell command to get RSSI information in 		
		section 2.1.4 and Connection Status in section 2.2.2		
0.6	2025/05/23	Updated section 1.1 Operation Temp. up range and condition		
		Add command to read RSSI at STA in section 2.2.2		

About This Document

- Illustrations in this documentation might look different from your product.
- Depending on the model, some optional accessories, features, and software programs might not be available on your device.
- Depending on the version of operating systems and programs, some user interface instructions might not be applicable to your device.
- Documentation content is subject to change without notice. Coretronic Reality Inc. (CRI) makes constant improvements on the documentation of your computer, including this guidebook.

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1. Introduction

CRI R405LQ LR Module is a high performance wireless network device, and leverage WiFi technology to implement long distance connection and data communication. It can through USB or UART to connect with Host controller, and work similar as external WiFi network module. The R405LQ can support RNDIS (Remote Network Driver Interface Specification) standard as module interface control.

When using R405LQ LR to build up connection network, please need to set up one of R405LQ LR as AP mode (default), and others R405LQ LR are set as STA (Cline) mode. They are communicate working in closed network areas.

1.1 Features and Specification

The following table shows the detailed features and Spec. of R405LQ LR module.

, ,					
ltem	Description				
Platform	Qualcomm QCS405 + QCN9074				
Technology	Leverage Wi-Fi 6 (802.11ax)				
MIMO	4T4R				
Fraguanay	• 2412MHz~2462MHz				
Frequency	 5180MHz~5240MHz / 5745MHz~5825MHz 				
RF signal B.W	5MHz / 10MHz / 20MHz				
Throughput	240 Mbps (TBC)				
Radio Tx Power	●				
Radio TX Power	●				
Distance	> 10KM (Open space without distractions)				
	1. USB 3.0 (Type C)				
Connection	2. USB 2.0 (Micro USB, for FW UD)				
Interfaces	3. UART x2 (1.8V)				
Interfaces	4. UART x1 (3.3V, for Debug only)				
	5. Buttons x6				
Power Supply	DC 6.6V~17V via Power Jack				
	• 2.4GHz 4T4R Tx < 9.8W				
Power	• 2.4GHz 4T4R Rx < 4.0W				
Consumption	• 5GHz 4T4R Tx < 13.8W				
	• 5GHz 4T4R Rx < 4.5W				
Dimension	60 x 72 x 9.9 mm				

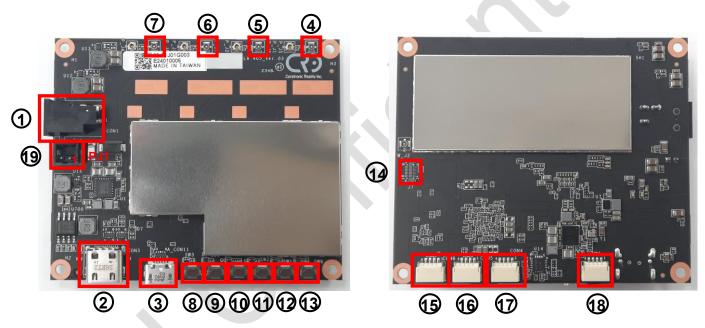
Key features of R405LQ LR module

ltem	Description			
Weight	Around 21 g			
Operation Temp.	-20 ~ 45 °C (attach with heat-sink surface area > 32800 mm^2)			
Storage Temp.	-20 ~ 70 °C			
Device Driver	RNDIS (Remote Network Driver Interface Specification)			

Notice : When using, be sure to connect the antenna as a load at the antenna terminal to prevent no-load reflection from damaging the PA.

1.2 Major interface components location

Below picture identify the major interface components and connectors found on the R405LQ LR module



No.	Function Description	No.	Function Description
1	DC Power Jack	11	Key SW, FAST BOOT MODE *1
2	USB 3.0 Type C	12	Key SW, N/A
3	USB 2.0 Micro (for FW UD)	13	Key SW, USB BOOT *1
4	RF Conn, Chain 1	14	JTAG (for Debug only)
5	RF Conn, Chain 2	15	UART (1.8V, CON6)
6	RF Conn, Chain 3	16	UART (1.8V, CON5)
7	RF Conn, Chain 4	17	UART (3.3V, for Debug only, CON4)
8	Key SW, Power	18	USB 2.0 (ALT with #3 for FW UD, CON7)
9	Key SW, Volume up +	19	Option Power Conn PJ1 *2
10	Key SW, Volume down -		(Hirose, DF3-2P-2DSA(01))

*1 Keep pressing during power on entry

*² pin-1 : DC power in, pin-2 : GND

1.3 MIMO RF Channels' configuration

R405LQ module can be configured MIMO models listed in below

	CH1	CH2	CH3	CH4
2T/2R	TX/RX	NA	TX/RX	NA
2T/4R	TX/RX	RX	TX/RX	RX
4T/4R	TX/RX	TX/RX	TX/RX	TX/RX

RF Antenna Connect type : I-PEX MHF4, P/N : 20449-001E-03

2. Device Tools Operation

This chapter introduces the detail setup and testing steps of R405LQ LR Module build in configuration tools, and via PC's connection and operation. Please install the ADB (Android Debug Bridge) environment in your PC at first, then refer section 1.2 to setup R405LQ LR Module and connected with PC via USB cable.

Please use the "adb devices" command to check whether the R405LQ LR module is successfully connected to the PC ? Then use the "cricfg" command to enter the device tool's control menu of R405LQ LR Module.



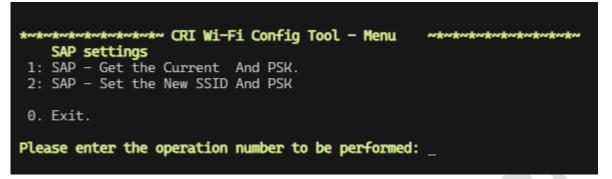
2.1 AP mode Menu operation

R405LQ LR EVA KIT can be configured as AP (Access Point) mode or STA (Station, Cline) mode through System Menu setup. This section introduces when R405LQ LR is configured as AP mode then re-power on. After connected with ADB PC, and enter "cricfg" command. The items select Menu will be shown on ADB PC as below.



2.1.1 Settings (SSID)

When enter "1" at top menu, then into "SAP - settings" menu.



You can enter "1" again to get current SSID and Password set

Or, enter "2" to setup new SSID and Password.

Or, enter "0" will exit to go back top Menu

R)

2.1.2 Switch Channel and Bandwidth

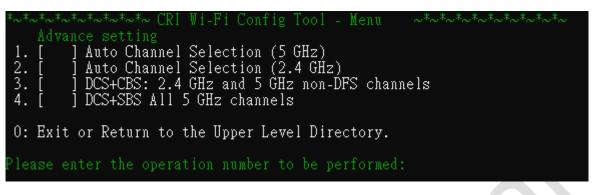
When enter "2" at top menu, then into "SAP - Switch Channel / Bandwidth" menu.

Channel: 36 (5180 MHz) bandwidth: 20MHz (network mdoe: 11AHE20.) ~*~*~*~*~*~*~*~*~ CRI Wi-Fi Config Tool - Menu - ~*~*~*~*~*~*~*~*~*~*~ 1: SAP - Switch Channel. 2: SAP - Switch Bandwidth. 3: SAP - Switch Channel and Bandwidth. 0: Exit or Return to the Upper Level Directory. lease enter the operation number to be performed: The current Channel and Bandwidth information are shown at top line, or enter "1" to change the Channel number, or enter "2" to change Channel Bandwidth. Or, enter "3" to change Channel and Bandwidth in the same time. Please enter the new channel: 40 Bandwidth only support: 0: 20MHz, 1: 10MHz, 2: 5MHz Please enter the new bandwidth: [0/1/2]: 1 Change channel to 40 with bandwidth to 10 MHz, please wait... Channel changed to 40 successfully. Bandwidth changed to 10MHz successfully. Channel: 40 (5200 MHz) bandwidth: 10MHz (network mdoe: 11AHE20.) ~*~*~*~*~ CRI Wi-Fi Config Tool - Menu ~~~*~*~*~*~*~*~*~*~*~ SAP Channel / Bandwidth settings 1: SAP - Switch Channel. 2: SAP - Switch Bandwidth. 3: SAP - Switch Channel and Bandwidth. 0: Exit or Return to the Upper Level Directory. lease enter the operation number to be performed: Please enter the oper-

Or, enter "0" will exit to go back top Menu

2.1.3 Advance Setting (CBS / SBS)

When enter "3" at top menu, then into "SAP – Advance setting (CBS/SBS)" menu.



You can choose suitable item to decide channel frequency hopping range depend on RF usage.

For example, enter "3" to enable DCS+CBS frequency hopping range



(You can choose active item again to disable)

2.1.4 Get RSSI

When enter "6" at top menu, then can get RSSI information shows in below as reference depend on R405LQ LR working environment and situation.

ADDR AID CHAN TXRATE RXRATE RSSI MINRSSI MAXRSSI IDLE TXSEQ RXSEQ CAPS XCAPS ACAPS ERF STATE MAXRATE(DOT11) HTCAPS VHTCAPS ASSOCTIME IEs MODE RXNSS TXNSS PSMODE	
44:a8:42:ff:46:df 1 44 6M 17M -51 -52 -51 27 0 65535 Es ETWt NULL 0	
b 286800 APM 1gTRs 00:04:05 WME IEEE80211_MODE_11AXA_HE20 4 2 0	
RSSI is combined over chains in dBm Minimum Tx Power : 0 Maximum Tx Power : 0 HT Capability : Yes VHT Capability : Yes MU capable : No SNR : 42 Operating band : 5GHz Current Operating class : 115	
	6
Supported Operating classes : 81 82 83 84 115 116 117 118 119 120 121 122 123 124 125 12 127 128 130	0
Supported Rates : 12 18 24 36 48 72 96 108	
Max STA phymode : IEEE80211_MODE_11AXA_HE20	
00:03:7f:06:00:22 2 44 6M 14M -15 -15 -12 54 0 65535 Es ETWt NULL 0	
b 144400 APM 1gTRs 00:04:04 WME IEEE80211_MODE_11NA_HT20 4 2 0	

BTW, except to through cricfg tool Menu choose to get RSSI information, user can also through criwifitool shell command to get RSSI information.

./vendor/cri/wifi/sh/criwifitool.sh getRSSI

• Connected: STA mac address, RSSI

root@qcs405-pine:/# ./vendor/cri/wifi/sh/criwifitool.sh getRSSI
44:a8:42:ff:46:ff.-39

2.1.5 Throughput Test

When enter "7" at top menu, then into "SAP – Throughput Test" menu

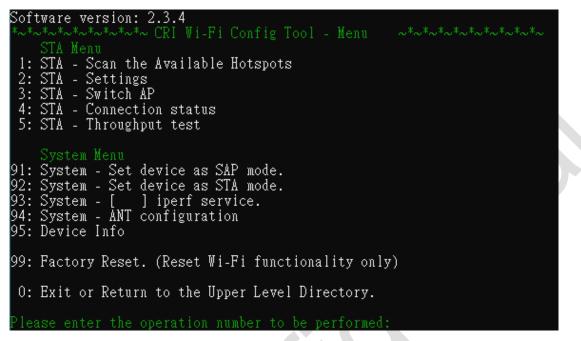
~~************** CRI Wi-Fi Config Tool - SAP throughput test *****************
1: TCP: iperf 10 seconds
2: TCP: iperf 60 seconds
3: TCP: assign time
4: UDP: iperf 10 seconds
5: UDP: iperf 60 seconds
6: UDP: assign time
0. Exit.
Please enter the operation number to be performed: _

Choose the throughput test item number to perform the test as requirement, and result shows in below as reference

[4] [4] [4] [4] [4] [4] [4] [4]	1.01-2.01 2.01-3.00 0.00-1.00 1.00-2.01 2.01-3.01 3.01-4.00 4.00-5.00 5.00-6.00 6.00-7.00 7.00-8.00 8.00-9.01 9.01-10.00	sec sec sec sec sec sec sec sec	14.5 MBytes 13.4 MBytes 14.4 MBytes 14.2 MBytes 14.1 MBytes 13.8 MBytes 13.2 MBytes 13.4 MBytes	121 Mbits/sec 119 Mbits/sec 121 Mbits/sec 112 Mbits/sec 121 Mbits/sec 119 Mbits/sec 118 Mbits/sec	1840 (on 1820 1850 1710 1840 1820 1800 1760 1690 1710	nitted) nitted)
[4]	Interval 0.00-10.00 Sent 17780 da			Bandwidth 117 Mbits/sec		Lost/Total Datagrams 0/17780 (0%)
iperf [)one.					
1: TCF 2: TCF 3: TCF 4: UDF 5: UDF	2: iperf 10 s 2: iperf 60 s 2: assign tim 2: iperf 10 s 2: iperf 10 s 2: iperf 60 s 2: assign tim	econd econd econd econd	ls -	ool - SAP throug	hput test	~*~*~*~*~*~*~*~
0. Exi	it.					

2.2 STA (Cline) mode Menu operation

This section introduces when R405LQ LR is configured as STA (Cline) mode then repower on. After connected with ADB PC, and enter "cricfg" command. The below items select Menu will shows on ADB PC.



2.2.1 STA (Cline) Setting

When enter "1" at top menu, then into "STA - Settings" menu.

<pre>STA Settings 1: STA Mode: Show WPA supplicant network Info. 2: STA Mode: Get Connected SSID And PSK. 3: STA Mode: Add new SSID And PSK. 4: STA Mode: Remove Saved SSID. 5: STA Mode: List the Actived WPA supplicant.</pre>
0. Exit or Return to the Upper Level Directory.
Please enter the operation number to be performed: _
You can enter "2" to get current connected SSID of AP
Current current connection, ssid: CRIssidJeff
<pre>STA Settings 1: STA Mode: Show WPA supplicant network Info. 2: STA Mode: Get Connected SSID And PSK. 3: STA Mode: Add new SSID And PSK. 4: STA Mode: Remove Saved SSID. 5: STA Mode: List the Actived WPA supplicant.</pre>
 0. Exit or Return to the Upper Level Directory. Please enter the operation number to be performed: 2_

Or, enter "5" to get the list of active WPA supplicant which shows as below picture as reference.

```
network id / ssid / bssid / flags
0 CRIssidJeff any [CURRENT]
STA Settings
1: STA Mode: Show WPA supplicant network Info.
2: STA Mode: Get Connected SSID And PSK.
3: STA Mode: Add new SSID And PSK.
4: STA Mode: Add new SSID And PSK.
4: STA Mode: Remove Saved SSID.
5: STA Mode: List the Actived WPA supplicant.
0. Exit or Return to the Upper Level Directory.
Please enter the operation number to be performed: 5_
```

2.2.2 STA Connection status

When enter "4" at top menu, then get current W405LQ LR Cline connection information.

**************** CRI Wi-Fi Config Tool - Menu ************************************
1: STA - Scan the Available Hotspots 2: STA - Settings 3: STA - Service Switch (on/off) 4: STA - Connection status
5: STA - Throughput test
System Menu 91: System - Enable device as SAP mode. 92: System - Enable device as STA mode. 93: System - Enable iperf service. 95: Device Info 99: Factory Reset.
0. Exit or Return to the Upper Level Directory.
Please enter the operation number to be performed: 4_
Connected to 46:a8:42:ff:46:a8 (on ath1) SSID: CRIssidJeff freg: 5220

BTW, except to through cricfg tool Menu choose to get Connection status, user can also through criwifitool shell command to get.

./vendor/cri/wifi/sh/criwifitool.sh getConnStat

- Connected: return 1, SAP mac address
- disconnected: return 0

```
/ # ./vendor/cri/wifi/sh/criwifitool.sh getConnStat
1,46:a8:42:ff:46:dd
```

And, through below command to get RSSI value. iwlist ath1 ap

2.2.3 STA Throughput Test

When enter "5" at top menu, then into "STA – Throughput Test" menu

****************** CRI Wi-Fi Config Tool - STA throughput test *****************
1: TCP: iperf 10 seconds
2: TCP: iperf 60 seconds
3: TCP: assign time
4: UDP: iperf 10 seconds
5: UDP: iperf 60 seconds
6: UDP: assign time
0. Exit or Return to the Upper Level Directory.
Please enter the operation number to be performed: 4_

Choose the throughput test item number to perform the test as requirement, and

result shows in below as reference

run: iperf3 10 seconds in UDP.							
♦♦eU							
Connecting to host 192.168.1.1, port 5201							
[4] local 192.168.1.2 port 46308 connected to 192.168.1.1 port 5201							
[ID]	Interval				Total Dat		
[4]	0.00-1.00	sec	11.6 MBytes	96.9 Mbits/sec	1480 (om	itted)	
[4]	1.00-2.00	sec	13.8 MBytes	116 Mbits/sec	1770 (om	itted)	
[4]	2.00-3.00	sec	18.9 MBytes	158 Mbits/sec	2420 (om	itted)	
[4]	0.00-1.00	sec	19.5 MBytes	163 Mbits/sec	2490		
[4]	1.00-2.00	sec	18.3 MBytes	154 Mbits/sec	2340		
[4]	2.00-3.00	sec	21.8 MBytes	183 Mbits/sec	2790		
[4]	3.00-4.00	sec	16.3 MBvtes	137 Mbits/sec	2090		
[4]	4.00-5.00			170 Mbits/sec			
[4]	5.00-6.00			168 Mbits/sec			
[4]	6.00-7.00			169 Mbits/sec			
Į 4j	7.00-8.00			170 Mbits/sec			
[4]	8.00-9.01		~	146 Mbits/sec			
Į 4j			~	119 Mbits/sec			
					1000		
Г то Т	Interval		Transfer	Bandwidth	Jitter	Lost/Total	Datagrams
[4]				158 Mbits/sec			
[4]	Sent 24064 da			100 10103/360	0.710 113	1001/24004	(4.0%)
L 4J	5ent 24004 ua	cagra					
iperf Done.							

2.3 System Menu operation

The "System Menu" are common supported by both AP mode and STA (Cline) mode of R405LQ LR.

System Menu 91: System - Set device as SAP mode. 92: System - Set device as STA mode. 93: System - [] iperf service. 94: System - ANT configuration 95: Device Info 99: Factory Reset. (Reset Wi-Fi functionality only) 0: Exit or Return to the Upper Level Directory. Please enter the operation number to be performed:

2.3.1 System – Enable device as SAP mode

When enter "91" at top menu, then R405LQ LR module will be configured as AP mode, and disable STA (Cline) mode.

Note : The system only changes the configuration file. To complete the change mode, you need to restart the device.

2.3.2 System – Enable device as STA mode

When enter "92" at top menu, then R405LQ LR module will be configured as STA (Cline) mode, and disable AP mode

Note : The system only changes the configuration file. To complete the change mode, you need to restart the device.

2.3.3 System – Enable iperf service

When enter "93" at top menu, then R405LQ LR module will enable iperf service. After enable iperf service, the R405LQ LR can perform to response specified iperf test package on network. You can choose active item again to disable test service. 93: System - [] iperf service.

2.3.4 Device Info

Device type: QCS405 CRI image version: G6-LR-2.1.3-debug |- wlan_pine: "WLAN.IOE_PN.1.3-00215-QCAHKSWPL_SILICONZ-1 |- Meta_Build_ID: "QCS405.LE.2.0-00025-STD.PROD-1 Device Info: |- Service: STA |- IP: 192.168.1.2 |- MAC: 44:a8:42:ff:46:c6 |- Antena type: 4T4R |- channel 191 (2402 MHz), width: 20 MHz |- Network Mode: 11G

2.3.5 Factory Reset

2.4 Throughput test by paired 2 sets EVA Kit

This chapter will introduce how to use 2 sets EVA Kit, one is setup as AP mode, and another one is setup as STA mode, then through R405LQ module build in tools to perform "iperf" throughput test as evaluation case.

2.4.1 Setup at AP side

- A. Please refer <u>chapter 2.3.1</u> System Menu 91 operation to setup 1st EVA Kit as AP mode. Please re-power off/on once mode has been changed.
- B. Please refer <u>chapter 2.3.3</u> System Menu 93 operation to Enable iperf service.

2.4.2 Setup at STA (Cline) side

- A. Please refer <u>chapter 2.3.2</u> System Menu 92 operation to setup 2nd EVA Kit as STA (Cline) mode. Please re-power off/on once mode has been changed.
- B. Please refer chapter 2.3.3 System Menu 93 operation to Enable iperf service
- C. Please refer <u>chapter 2.2.2</u> STA Menu 4, to check WiFi connection status, and confirmed WiFi has been connected.

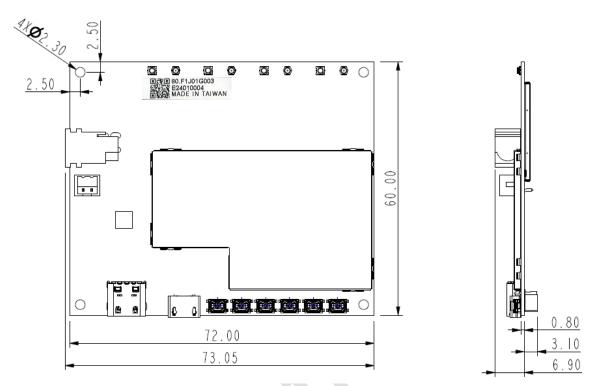
2.4.3 Perform iperf test

- A. Please refer <u>chapter 2.2.3</u> STA Menu 5, to enter STA Throughput Test Menu. Then, choose the test item which you would like to do ?
- B. For example, after enter 4, then the test result of "UDP : iperf 10 second" will be shown like below picture.

```
run: iperf3 10 seconds in UDP.
��eU
Connecting to host 192.168.1.1, port 5201
  4] local 192.168.1.2 port 46308 connected to 192.168.1.1 port 5201
  ID] Interval
                          Transfer
                                       Bandwidth
                                                        Total Datagrams
                                       96.9 Mbits/sec
                                                              (omitted)
  4]
        0.00-1.00
                         11.6 MBytes
                                                        1480
                    sec
  4]
        1.00-2.00
                         13.8 MBytes
                                        116 Mbits/sec
                                                        1770
                                                              (omitted)
                    sec
                         18.9 MBytes
  4]
        2.00-3.00
                                        158 Mbits/sec
                                                        2420
                                                              (omitted)
                    sec
                         19.5 MBytes
  4]
       0.00-1.00
                                        163 Mbits/sec
                                                        2490
                    sec
  4]
                         18.3 MBytes
        1.00-2.00
                                        154 Mbits/sec
                                                        2340
                    sec
  4]
        2.00-3.00
                    sec 21.8 MBytes
                                        183 Mbits/sec
                                                        2790
  4]
        3.00-4.00
                         16.3 MBytes
                                        137 Mbits/sec
                                                        2090
                    sec
  4]
       4.00-5.00
                         20.2 MBytes
                                        170 Mbits/sec
                                                        2590
                    sec
  4]
                         20.0 MBytes
        5.00-6.00
                                        168 Mbits/sec
                                                        2560
                    sec
  4]
        6.00-7.00
                         20.2 MBytes
                                        169 Mbits/sec
                                                        2580
                    sec
  4]
        7.00-8.00
                         20.2 MBytes
                                        170 Mbits/sec
                                                        2590
                    sec
        8.00-9.01
                         17.5 MBytes
                                        146 Mbits/sec
  4]
                                                        2240
                    sec
                                        119 Mbits/sec
  4]
        9.01-10.00
                                                        1800
                    sec
                         14.1 MBytes
 ID]
                                                        Jitter
     Interval
                          Transfer
                                       Bandwidth
                                                                  Lost/Total Datagrams
  4]
                          188 MBytes
        0.00-10.00 sec
                                        158 Mbits/sec 0.718 ms 1081/24064 (4.5%)
  4] Sent 24064 datagrams
iperf Done.
```

3. Mechanical Specification

3.1 Mechanical dimensions



3.2 Weight

Around 21 ± 2 g

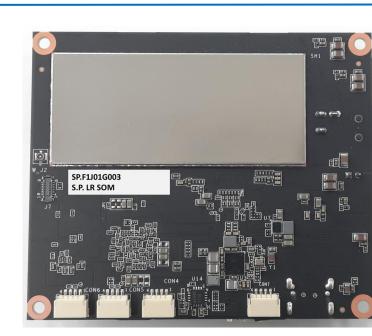
4. Product Marking, Ordering and Shipping Info.

4.1 Product Marking (Label)



NCC Certification Label :





<u>P/N Label :</u>

SP.F1J01G003 S.P. LR SOM

 \mathbf{R}