

USER MANUAL

LUZON-WIFI & BT Module

MODEL NO: SOMAT39

802.11a/b/g/n/ac

+

BT4.2

System on Module

Table of Contents

Introduction	1
Block Diagram.....	3
Technical Specifications	4
Absolute Maximum Rating	4
Recommended Operating Condition	4
Foot Print, Front & Back view	5
Pin Configurations.....	6
Wireless Specifications	8
WLAN.....	8
BLUETOOTH	8
WLAN Radio Specifications	9
IEEE Specifications.....	11
BLUETOOTH Radio Characteristics	12
RF Layout, Soldering Guidelines	13
RF Layout & Design Guidelines	13
Soldering Guidelines	14
Agency Approvals	15
Industry Canada.....	16
MSL Level / Storage Conditions	17

Introduction

This document specifies the details for a WiFi 802.11a/b/g/n/ac with BT4.1 RFSOM module called with Honeywell Part No.

50145732-001	RFSOM WBT, SOM MODULE, WIFI 802.11AC BT 4.2
--------------	---

The L uzon Module will use WM-BAC-AT-39 USI SiP module with Qualcomm QCA6174A chip set which includes LNA, switch, and internal power amplifier (iPA) for small form factor and optimum performance. All filters and diplexers will be included in the module to ensure maximum power flatness and optimum VSWR. The module will perform with all legacy hardware having data rates as low as 1Mbps. This chipset also supports concurrent operation of Bluetooth (Version 4.1) for wireless connectivity during browsing or other device applications. Along with both standard and high speed (HS) Bluetooth data rates, Bluetooth low energy modes are also supported. Hardware WAPI acceleration engine, AES, TKIP, WPA and WPA2 are supported to provide the latest security requirement on your network.

For placing the SOMAT39 onto the carrier board, the part number to be used is 50145748-001. The footprint details are available in Global Library for using on the carrier board.

NOTE

 Carrier Board Information

SOMAT39 is meant to be used inside Honeywell only. It is not meant or designed to be sold independently outside Honeywell

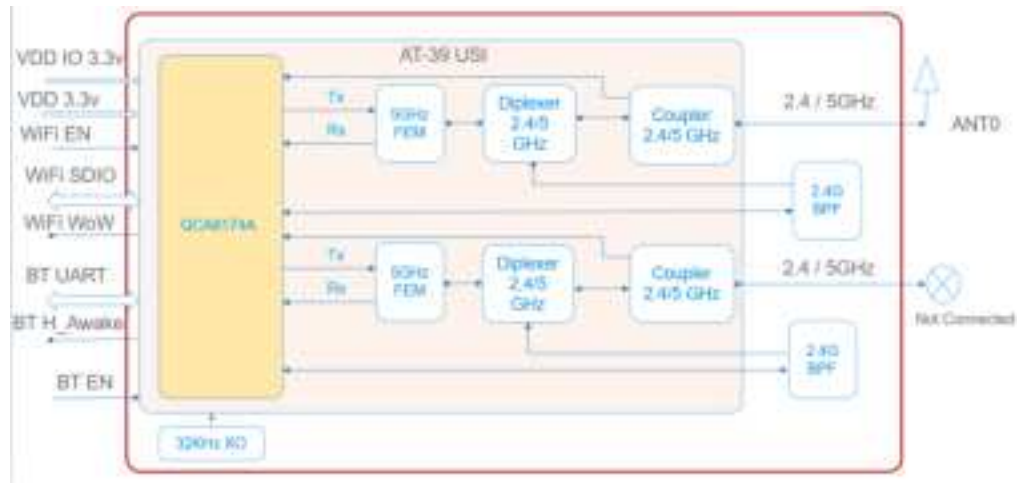
SOMAT39 – System on Module Features

- *IEEE 802.11 a/b/g/n/ac WLAN*
- *Bluetooth 4.2 + HS*
- *Bluetooth-WLAN coexistence*
- *WiFi Wake on Wireless (WoW)*
- *20/40 MHz bandwidth at 2.4GHz*
- *20/40/80 MHz bandwidth at 5GHz*
- *Internal PA/LNA*
- *RF SOM Size: 15 mm x 15 mm, LGA Package*
- *802.11 k/v/r [will be available in next release]*
- *Low Current consumption in IEEE PS and Deep Sleep*
- *WiFi Security methods: OPEN, WEP, WPA2-PSK, WPA2-1X (PEAP-MSCHAPV2, PEAP-TLS, EAP-TTLS)*
- *WiFi + BT Coexistence with simultaneous video streaming over WiFi and voice call over BT.*
- *Weight of module ~ 1gram*

- *Featuring integrated IEEE 802.11 a/b/g/n/ac + BT4.1.*
- *60 pins LGA.*
- *Future to support two streaming dual-band antennas.*

- *Low power consumption & excellent power management performance extends battery life.*

Block Diagram



SOMAT39 module is designed based on Qualcomm QCA6174A chipset solution. It supports generic SDIO, UART interface to connect the WLAN/BT to the host processor. A simplified block diagram of the WM-BAC-AT-39 module is depicted in above picture.

NOTE

Currently ANT 0 is enabled for SOMAT39. Ant 1 is disabled.

ANT1

Technical Specifications

Absolute Maximum Rating

Power Supply:	Max +3.6v
Storage Temperature:	- 40° to 125° Celsius
Voltage ripple:	± 2% (Max. Values not exceeding Operating voltage)
Maximum RF input (reference to 50 Ω input):	0dBm
Digital I/O input voltage for 3.3 V I/O supply:	Vdd + 0.3 V
Digital I/O input voltage for 1.8 V I/O supply:	Vdd + 0.2 V

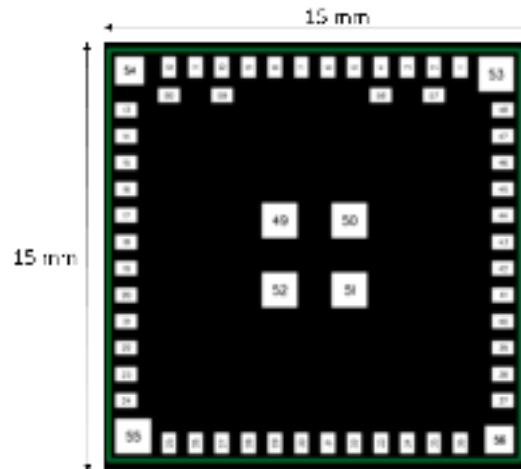
Recommended Operating Condition

Operating Temperature:	-20° to 65°C
Humidity	Max 85% (Non-condensing, relative humidity)
Voltage	VDD3P3: 3.3v +/- 0.1V VDDIO: 3.3v +/- 0.1vV (*1.8V for higher > 50MHz SDIO clock versions)
Current Consumption	Tx output power @ 19 dBm on 11b 1M (single stream): 420mA (typ), 490mA (max) **Tx output power @ 16 dBm on 11n MCS8_HT20 (dual stream): 620mA (typ), 720mA (max) Tx output power @ 15 dBm on 11n MCS0_HT20 (single stream-5g): 470mA (typ), 540mA (max) **Tx output power @ 13 dBm on 11n MCS0_VHT80 (dual stream-5g): 715mA (typ), 820mA (max)

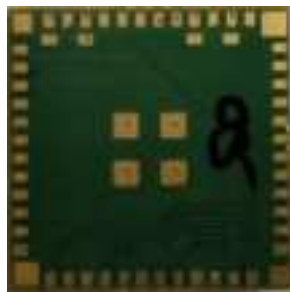
** Dual Streaming Current Consumption Data is for reference purpose only. Existing capability for SOMAT39 is enabled for single streaming only.

NOTE: Peak current bursts of 1.1A is observed during tests. Power supply input to RFSOM must support peak current of 1.1A.

Foot Print, Front & Back view



Note: Bottom View of RF SOM Module – LGA Package Footprint



Pin Configurations

S.No	PINOUT	Signal Type	Signal Description
1	IO1	Input/Output	BT_DEV_WAKE
2	GND	Ground	Ground
3	RF_ANT1 (WiFi)	RF Output	RF Antenna 1 WiFi Output
4	GND	Ground	Ground
5	IO2	Input/Output	BT_HOST_WAKE
6	IO3	Input/Output	GPS_COEX_WOW
7	IO4	Input/Output	BT_PCM_OUT
8	IO5	Input/Output	BT_EN
9	IO6	Input/Output	WL_EN
10	GND	Ground	Ground
11	RF_ANT0 (WiFi/BT)	RF Output	RF Antenna 0 WiFi/BT Output
12	GND	Ground	Ground
13	IO7	Input/Output	LTE_SYNC_TMS
14	IO8	Input/Output	BT_PCM_IN
15	IO9	Input/Output	BT_PCM_CLK
16	IO10	Input/Output	BT_PCM_SYNC
17	IO11	Input/Output	PCIE_WAKE_L
18	IO12	Input/Output	PCIE_CLKREQ_L
19	IO13	Input/Output	PCIE_RST_L
20	IO14	Input/Output	LTE_PRI_TCK
21	IO15	Input/Output	USB_DN
22	IO16	Input/Output	USB_DP
23	VDD1	Power Supply	Power Supply for IO's
24	GND	Ground	Ground
25	PCIE_REFCLK_P	Clock Diff. Input +ve	PCIE Clock Diff. input Positive
26	PCIE_REFCLK_N	Clock Diff. Input -ve	PCIE Clock Diff. input Negative
27	GND	Ground	Ground
28	PCIE_TX_P	Transmit Diff. Output +ve	PCIE Transmit Diff. Output Positive
29	PCIE_TX_N	Transmit Diff. Output -ve	PCIE Transmit Diff. Output Negative
30	GND	Ground	Ground
31	PCIE_RX_N	Receive Diff. Input -ve	PCIE Receive Diff. Output Negative
32	PCIE_RX_P	Receive Diff. Input +ve	PCIE Receive Diff. Output Positive
33	GND	Ground	Ground
34	IO17	Input/Output	LTE_ACTIVE_TDI
35	IO18	Input/Output	SDIO_INT_TDO

<u>S.No</u>	<u>RF SOM SOM PINOUT</u>	<u>Signal Type</u>	<u>Signal Description</u>
36	VDD2	Power Supply	Power Supply - SOM VDD3V3
37	VDD3	Power Supply	Power Supply - SOM VDD3V3
38	SDIO_DATA_0	Data Bidirectional output 0	Serial Data IO Data 0
39	SDIO_DATA_1	Data Bidirectional output 1	Serial Data IO Data 1
40	SDIO_DATA_2	Data Bidirectional output 2	Serial Data IO Data 2
41	SDIO_DATA_3	Data Bidirectional output 3	Serial Data IO Data 3
42	SDIO_CMD	SDIO Command input	SDIO Command input
43	SDIO_CLK	SDIO Clock input	SDIO Clock input
44	GND	Ground	Ground
45	IO19	Input/Output	BT_UART_TXD
46	IO20	Input/Output	BT_UART_RXD
47	IO21	Input/Output	BT_UART_CTS
48	IO22	Input/Output	BT_UART_RTS
49	GND	Ground	Ground
50	GND	Ground	Ground
51	GND	Ground	Ground
52	GND	Ground	Ground
53	GND	Ground	Ground
54	GND	Ground	Ground
55	GND	Ground	Ground
56	GND	Ground	Ground
57	GND	Ground	Ground
58	GND	Ground	Ground
59	GND	Ground	Ground
60	GND	Ground	Ground

Wireless Specifications

WLAN

The SOMAT39 module complies with the following features and standards;

Features	Description
WLAN Standards	IEEE 802.11a/b/g/n/ac
Antenna Port	Support 1 streaming with Ant 0 (Ant1 is disabled)
Frequency Band	2.400 GHz – 2.484 GHz 4.900 GHz – 5.845 GHz
Number of Sub Channels	1~11 Channels 36~48, 52~64, 100~140, 149~165 Channels
Modulation	DSSS, CCK, OFDM, BPSK, QPSK, 16QAM, 64QAM
Supported data rates	1, 2, 5.5, 11 (Mbps) 6, 9, 12, 18, 24, 36, 48, 54 (Mbps) HT20_MCS0 ~ HT20_MCS7 VHT80_MCS0 ~ VHT80_MCS9

BLUETOOTH

The Radio specification is compliant with the Bluetooth 2.1 + EDR specification

Features	Description
Frequency Band	2400 MHz ~ 2483.5 MHz
Number of Channels	79 channels
Modulation	FHSS (Frequency Hopping Spread Spectrum), GFSK, DPSK
Antenna Port	Single Antenna for Wi-Fi and BT

WLAN Radio Specifications

Mode	Data rate (Mbps)	Channel Frequency (MHz)	Set Power
802.11b	1	2412	19
		2442	19
		2462	19
	11	2412	19
		2442	19
		2462	19
802.11g	6	2412	19
		2442	19
		2462	19
	54	2412	19
		2442	18
		2462	16
802.11n	MCS0_20	2412	19
		2442	19
		2462	16
	MCS7_20	2412	19
		2442	18
		2462	16
802.11n	MCS0_40	2422	19
		2442	16
		2457	15
	MCS7_40	2422	19
		2442	16
		2457	15

Above Set Power is based on Antenna Gain of 4.27dBi Maximum

Mode	Data rate	Channel Frequency	Set Power dBm	Mode	Data rate	Channel Frequency	Set Power dBm	Mode	Data rate	Channel Frequency	Set Power dBm
802.11a	6Mbps	5180	16	802.11n	MCS0_40	5190	14		MCS9_20	5180	15
		5240	16			5230	14			5240	15
		5260	16			5270	14			5260	15
		5320	16			5510	14			5320	15
		5500	16			5590	14			5500	15
		5600	16			5670	14			5600	15
		5700	16			5755	14			5700	15
		5745	16			5795	14			5745	15
		5825	16			5825	14			5825	15
	54Mbps	5180	16		MCS7_40	5190	14		MCS0_40	5190	14
		5240	16			5230	14			5230	14
		5260	16			5270	14			5270	14
		5320	16			5510	14			5510	14
		5500	16			5590	14			5590	14
		5600	16			5670	14			5670	14
		5700	16			5755	14			5755	14
		5745	16			5795	14			5795	14
		5825	16			5825	14			5825	14
802.11n	MCS0_20	5180	15	802.11ac	MCS0_80	5210	13		MCS9_40	5190	14
		5240	15			5290	13			5230	14
		5260	15			5530	13			5270	14
		5320	15		MCS9_80	5690	13			5510	14
		5500	15			5775	13			5590	14
		5600	15			5210	13			5670	14
		5700	15			5290	13			5755	14
		5745	15			5530	13			5795	14
		5825	15			5690	13				
	MCS7_20	5180	15		MCS0_20	5775	13				
		5240	15			5180	15				
		5260	15			5240	15				
		5320	15			5260	15				
		5500	15			5320	15				
		5600	15			5500	15				
		5700	15			5600	15				
		5745	15			5700	15				
		5825	15			5745	15				
						5825	15				

Above Power values are based on the Antenna Gain of 3.10dBi Maximum

IEEE Specifications

WiFi TX EVM follow the IEEE spec that as list in the table below:

Characteristics	IEEE Spec		Unit
RF Average Output EVM (11b)	@1 Mbps	35	%
	@11 Mbps	35	%
RF Average Output EVM (11a/g)	@6 Mbps	-5	dB
	@54 Mbps	-25	dB
RF Average Output EVM (11n)	@ MCS0	-5	dB
	@ MCS7	-27	dB
RF Average Output EVM (11ac)	@ MCS0	-5	dB
	@ MCS9	-32	dB

The SOMAT39 module 2.4GHz WiFi Sensitivity as list in the table below:

Receiver Characteristics	Typ.	Max.	Unit
PER <8%, Rx Sensitivity @ 1 Mbps	-97	-82	dBm
PER <8%, Rx Sensitivity @ 11 Mbps	-89	-76	dBm
PER <10%, Rx Sensitivity @ 6 Mbps	-91	-82	dBm
PER <10%, Rx Sensitivity @ 54 Mbps	-76	-65	dBm
PER <10%, Rx Sensitivity @ MCS0_HT20	-91	-82	dBm
PER <10%, Rx Sensitivity @ MCS7_HT20	-73	-64	dBm

The SOMAT39 module 5GHz WiFi Sensitivity as list in the table below:

Receiver Characteristics	Typ.	Max.	Unit
PER <10%, Rx Sensitivity @ 6 Mbps	-94	-82	dBm
PER <10%, Rx Sensitivity @ 54 Mbps	-78	-65	dBm
PER <10%, Rx Sensitivity @ MCS0_HT20	-93	-82	dBm
PER <10%, Rx Sensitivity @ MCS7_HT20	-75	-64	dBm
PER <10%, Rx Sensitivity @ MCS0_VHT80	-87	-76	dBm
PER <10%, Rx Sensitivity @ MCS7_VHT80	-62	-51	dBm

BLUETOOTH Radio Characteristics

Parameter	Conditions	Min.	Typ.	Max	Unit
Basic Rate					
Output Power ⁺	Average Power	7	10	13	dBm
Frequency Range*		2400	...	2483.5	MHz
Sensitivity (BER)	BER $\leq$ 0.1%		-92	-70	dBm
Maximum Input Level	BER $\leq$ 0.1%			-20	dBm
EDR					
Relative Power*	$\pi/4$ -DQPSK	-4	0	1.0	dBm
	8DPSK	-4	0	1.0	dBm
EDR Sensitivity(BER)	$\pi/4$ -DQPSK	...	-91	-70	dBm
	BER $\leq$ 0.01%				
	8DPSK	...	-86	-70	dBm
	BER $\leq$ 0.01%				
EDR Maximum Input Level	$\pi/4$ -DQPSK	...	...	-20	dBm
	BER $\leq$ 0.01%				
	8DPSK	...	...	-20	dBm
	BER $\leq$ 0.01%				
BLE					
BLE Output Power ⁺	Average Power	-4	2	6	dBm
BLE Sensitivity (PER)	PER $\leq$ 30.8%	...	-95	-70	dBm
BLE Maximum Input Level	PER $\leq$ 30.8%	...	...	-10	dBm

+ The maximum output power is based on the Antenna Gain of 4.27 dBi.

RF Layout, Soldering Guidelines

RF Layout & Design Guidelines

- I. Do not run antenna cables directly above or directly below the radio.
- II. Do not run any high speed digital lines below the radio.
- III. For applications using only 1X1, the second antenna port i.e RF_ANT1 to be terminated with a 50 ohm resistor close to the pin of SOMAT39.
- IV. Isolate VDD2 & VDD3 (pin no 36 & 37) with a ferrite bead (BLM15AG100SN1D) and decaps of 22uF and 0.1uF to be placed very close to the pins.
- V. 10uF and 0.1uF to be used at VDD1 i.e pin no 23 and the input power supply which are to be placed very close to the pins.
- VI. A 100K pull down resistors to be used for BT_DEV_WAKE, WL_EN and BT_EN close to the pins of RF SOM.
- VII. A series R (10E) and shunt capacitor (22pf) is recommended to reduce the SDIO clock noise going to the input of SOMAT39 pin (pin no 43).
- VIII. Use proper electro-static-discharge (ESD) procedures when installing the SOMAT39 module.

Soldering Guidelines

SOMAT39 is compatible with industrial standard reflow profile for Pb-free solders. The reflow profile selection to be done based on the thermal mass of the entire populated PCB, heat transfer efficiency of the oven and solder paste used.

- I. Refer to technical documentations of solder paste for profile configurations.
- II. Avoid using more than one reflow cycle.
- III. Aperture size of the stencil should be 1:1 with the pad size.
- IV. For further recommendation, please refer to the JEDEC/IPC J-STD-020, IPC-SM-782 and IPC 7351 guidelines.

Below is the overview of recommended Re-flow:



- (1) Solder paste alloy: SAC305 (Sn96.5/Ag3.0/Cu0.5) (Lead Free solder paste.)
 - (2) A-B. Temp.: 150~200°C; soak time:60~120sec. (Base on Flux type, reference only)
 - (3) C. Peak temp: <245°C
 - (4) D. Time above 217 °C: 40~90sec. (Base on SAC305)
 - (5) Suggestion: Optimal cooling rate is <1°C/sec. from peak to 217 °C.
 - (6) Nine heater zones at least for Reflow equipment.
 - (7) Nitrogen usage is recommended and be controlled the value less than 1500 ppm.
- Note: Need to inspect solder joint by X-ray post reflow

Agency Approvals

FCC:

Model: SOMAT39

FCC ID: HD5-HWUSIA



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. However, there is no guarantee that interference will not occur in a installation. If this equipment does cause harmful interference to radio or 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 technician for help.

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.

MODIFICATION: Any changes or modifications not expressly approved by the grantee of this device could void the user's authority to operate the device.



This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.

Industry Canada

Model: SOMAT39

IC: 1693B-HWUSIA

This device complies with Industry Canada 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.

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

Le présent appareil est conforme aux CNR d'Industrie Canada applicable aux appareils radio

Exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

- (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement."

Cet équipement doit être installé et utilisé avec une distance minimale de 20cm entre le radiateur et votre corps.

MSL Level / Storage Conditions

	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 $\leq 40^{\circ}\text{C}$ and $\leq 90\%$ relative humidity (RH)		
2. Peak package body temperature: <u>250</u> $^{\circ}\text{C}$ 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 be		
a) Mounted within: <u>168</u> hours of factory conditions if blank, see adjacent bar code label		
$\leq 30^{\circ}\text{C}/60\%$, or		
b) Stored at per J-STD-033		
4. Devices require bake, before mounting, if:		
a) Humidity Indicator Card reads $>10\%$ for level 2a-5a devices or $>60\%$ for level 2 devices when read at $23 \pm 5^{\circ}\text{C}$		
b) 3a or 3b are not met		
5. If baking is required, refer to 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		