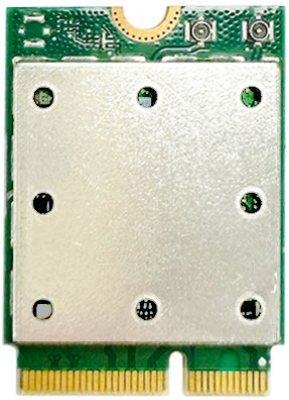
WNFQ-292BE(BT)

WiFi 7 2x2 MU-MIMO 802.11be/ax/ac/a/b/g/n

Tri-band 2.4GHz/5GHz/6GHz

2T2R Wi-Fi+Bluetooth 5.4M.2 module



Wi-Fi +Bluetooth Combo Solution M.2 Module

WNFQ-292BE(BT),Qualcomm based WiFi-7 (802.11be) module in M.2 2230 E key formfactor, running PCIe (Wifi) and USB (Bluetooth), supports DBDC (Dual-band, Dual-concurrent) mode, but with Tri-band capability (2.4GHz, 5GHz, and 6GHz). WNFQ-292BE(BT) is able to concurrently run 2.4GHz with 5GHz, or 6GHz, and support full IEEE802.11 be/ax/ac/a/b/g/n protocol, up to 160MHz mode.

WNFQ-292BE (BT) designed with 2 spatial streams (2T2R, or 2x2) in MU-MIMO mode. With a standard M.2 E key 2230 formfactor, WNFQ-292BE (BT) can accommodate to all existing platform that has M.2 Adaptor pre-integrated, no extra work with platform design.

Software wise WNFQ-292BE (BT) support Linux in the near future. The module is capable to run on both x86 platform and ARM based platform, and supports STA mode and Soft AP Mode*, recommend to run on application includes: digital signage/POS, rugged computer / tablets, fanless automation PC and other industrial environment applications that requires high speed data transmission.

Embedded Application

Applications include IPC/ Advertising machine/ OTT/ IPTV/ DVB/ STB / DV/ Mini Driving Recorder/ Intelligent Projector Pico/ VR/ AR terminal/ POS machine/ Vehicle mounted front/ Rear Terminal UAV/ Robot/ Intelligent Gateway/ Smart city and other electronic products.

Key Feature

- Compliant with IEEE 802.11 be/ax/ac/a/b/g/n
- Support Multi-link Operation (MLO)
- Supports 2x2 Multi-User Multiple-Input Multiple-Output (MU-MIMO)
- Support tri-band 2.4 GHz/5 GHz/6 GHz
- Support up to 4096 QAM modulation at each band
- Support channel bandwidth for both 20 MHz, and 40 MHz at 2.4GHz, 20 MHz, 40MHz, 80 MHz and 160MHz at 5GHz and 6GHz band.
- Low-power PCIe (with L1 substate) interface

www.sparklan.com / sales@sparklan.com / +886 2 2659-1880

Specification

Standards	IEEE 802.11be/ax/ac/a/b/g/n (2T2R) Bluetooth V5.4,V5.3,V5.2, V5.1, V5.0, V4.2, V4.1, V4.0 LE, V3.0, V2.1+EDR
Chipset	Qualcomm QCC2076
Data Rate	802.11b: 11Mbps 802.11a/g: 54Mbps 802.11n: MCS0~15 802.11ac: MCS0~9 802.11ax: MCS0~13 802.11be: MCS0~13 Bluetooth: 1 Mbps, 2Mbps and Up to 3Mbps
Operating Frequency	IEEE 802.11be/ax/ac/a/b/g/n ISM Band, 2.412GHz~2.484GHz, 5.150GHz~5.850GHz ,5.925~7.125GHz *Subject to local regulations
Interface	WLAN: PCIe Bluetooth: USB
Form Factor	M.2 2230 E Key
Antenna	2 x IPEX MHF4 connectors Main: WIFI/BT Aux: WIFI/BT
Modulation	Wi-Fi: 802.11b: DSSS (DBPSK, DQPSK, CCK) 802.11g: OFDM (BPSK, QPSK, 16-QAM, 64-QAM) 802.11n: OFDM (BPSK, QPSK, 16-QAM, 64-QAM) 802.11a: OFDM (BPSK, QPSK, 16-QAM, 64-QAM) 802.11ac: OFDM (BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM) 802.11ax: OFDMA (BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM, 1024-QAM, 2048-QAM,4096-QAM) 802.11be: OFDMA (BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM, 1024-QAM, 4096-QAM) BT: Header: GFSK Payload 2M: π/4-DQPSK Payload 3M: 8-DPSK

www.sparklan.com / sales@sparklan.com / +886 2 2659-1880

Power Consumption	11be TX mode: 843 mA (Max) RX mode: 413 mA (Max)
Operating Voltage	DC 3.3V
Operating Temperature Range	-30°C ~+85°C (Operating)
Storage Temperature Range	-40°C~+85°C
Humidity **(Non-Condensing)**	5%~90% (Operating) 5%~90% (Storing)
Dimension L x W x H (in mm)	30mm(± 0.15mm) x 22mm(± 0.15mm) x 2.15mm(+ 0.15mm)
Weight (g)	2.58 g
Driver Support	Linux
Security	WPS2.0, WAPI, WPA, WPA2, WPA3

www.sparklan.com / sales@sparklan.com / +886 2 2659-1880

OUTPUT POWER & SENSITIVITY		
802.11b		
Data Rate	**Tx ± 1.5dBm**	**Rx Sensitivity**
11Mbps	18 dBm	≦-87.5 dBm

802.11g		
Data Rate	**Tx ± 1.5 dBm**	**Rx Sensitivity**
54Mbps	16 dBm	≦-74 dBm

802.11n / 2.4GHz				
HT20	**Data Rate**	**Tx ± 1.5 dBm (1TX)**	**Tx ± 1.5 dBm (2TX)**	**Rx Sensitivity**
	MCS7	16 dBm	19 dBm	≦-73.5dBm
HT40	MCS7	13.5 dBm	16.5 dBm	≦-71 dBm

802.11a		
Data Rate	**Tx ± 2dBm**	**Rx Sensitivity**
54Mbps	15 dBm	≦-73 dBm

802.11n / 5GHz				
HT20	**Data Rate**	**Tx ± 2dBm (1TX)**	**Tx ± 2dBm (2TX)**	**Rx Sensitivity**
	MCS7	14 dBm	17 dBm	≦-72.5 dBm
HT40	MCS7	13.5 dBm	16.5 dBm	≦-70 dBm

802.11ac				
VHT80	**Data Rate**	**Tx ± 2dBm (1TX)**	**Tx ± 2dBm (2TX)**	**Rx Sensitivity**
	MCS9	12 dBm	15 dBm	≦-61 dBm
VHT160	MCS9	12 dBm	15 dBm	≦-58.5 dBm

802.11ax / 2.4 GHz				
HE40	**Data Rate**	**Tx ± 1.5dBm (1TX)**	**Tx ± 1.5dBm (2TX)**	**Rx Sensitivity**
	MCS13	11.5 dBm	14.5 dBm	≦-52.5 dBm

802.11ax / 5GHz				
HE80	**Data Rate**	**Tx ± 2 dBm (1TX)**	**Tx ± 2 dBm (2TX)**	**Rx Sensitivity**
	MCS13	11 dBm	14 dBm	≦-48.5 dBm
HE160	MCS13	11 dBm	14 dBm	≦-46 dBm

www.sparklan.com / sales@sparklan.com / +886 2 2659-1880

802.11ax / 6GHz				
HE80	**Data Rate**	**Tx ± 2 dBm (1TX)**	**Tx ± 2 dBm (2TX)**	**Rx Sensitivity**
	MCS13	10 dBm	13 dBm	≦-47.5 dBm
HE160	MCS13	10 dBm	13 dBm	≦-45 dBm

802.11be / 2.4 GHz				
EHT40	**Data Rate**	**Tx ± 1.5 dBm (1TX)**	**Tx ± 1.5 dBm (2TX)**	**Rx Sensitivity**
	MCS13	11.5 dBm	14.5 dBm	≦-53 dBm

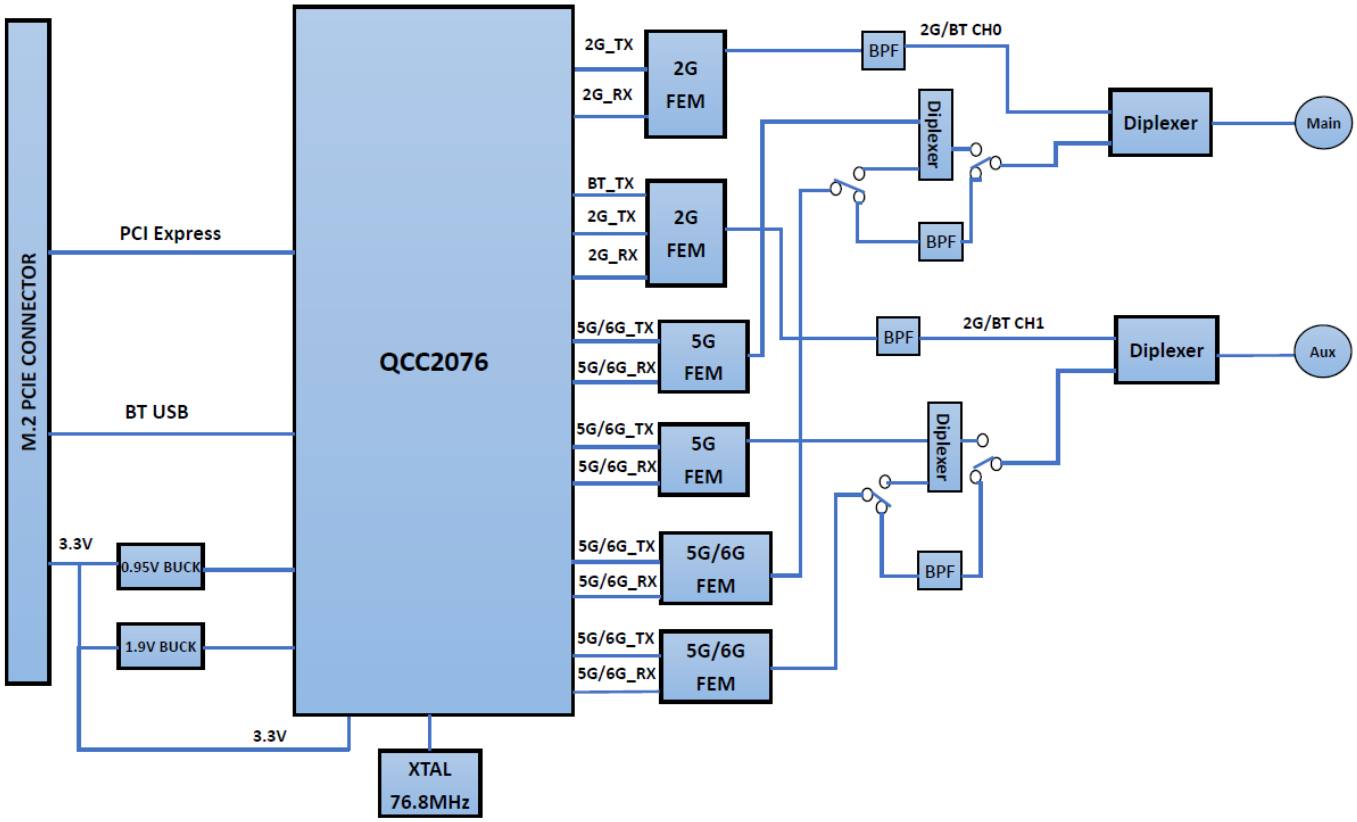
802.11be / 5GHz				
EHT80	**Data Rate**	**Tx ± 2 dBm (1TX)**	**Tx ± 2 dBm (2TX)**	**Rx Sensitivity**
	MCS13	11 dBm	14 dBm	≦-49 dBm
EHT160	MCS13	11 dBm	14 dBm	≦-46 dBm

802.11be/ 6GHz				
EHT80	**Data Rate**	**Tx ± 2 dBm (1TX)**	**Tx ± 2 dBm (2TX)**	**Rx Sensitivity**
	MCS13	10 dBm	13 dBm	≦-48 dBm
EHT160	MCS13	10 dBm	13 dBm	≦-45 dBm

Bluetooth		
Data Rate	**Tx ± 2dBm (Class I and Class II Device)**	**Rx Sensitivity**
3M bps	11 ≤ Output Power ≤ 17 dBm	BER<0.1% Typical: -90dBm
1M bps	1 ≤ Output Power ≤ 7dBm	BLE 1Mbps (PER <30.8%) Typical: -93dBm
2M bps	1 ≤ Output Power ≤ 7dBm	BLE 2 Mbps (PER <30.8%) Typical: -90dBm

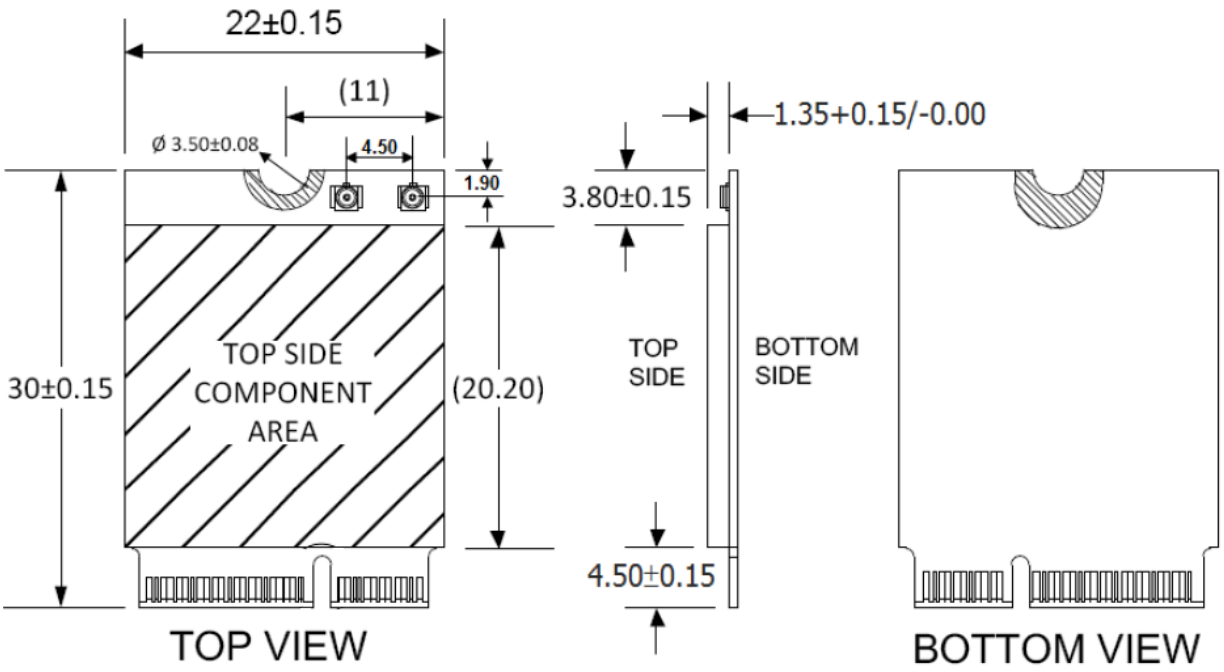
www.sparklan.com / sales@sparklan.com / +886 2 2659-1880

Block Diagram

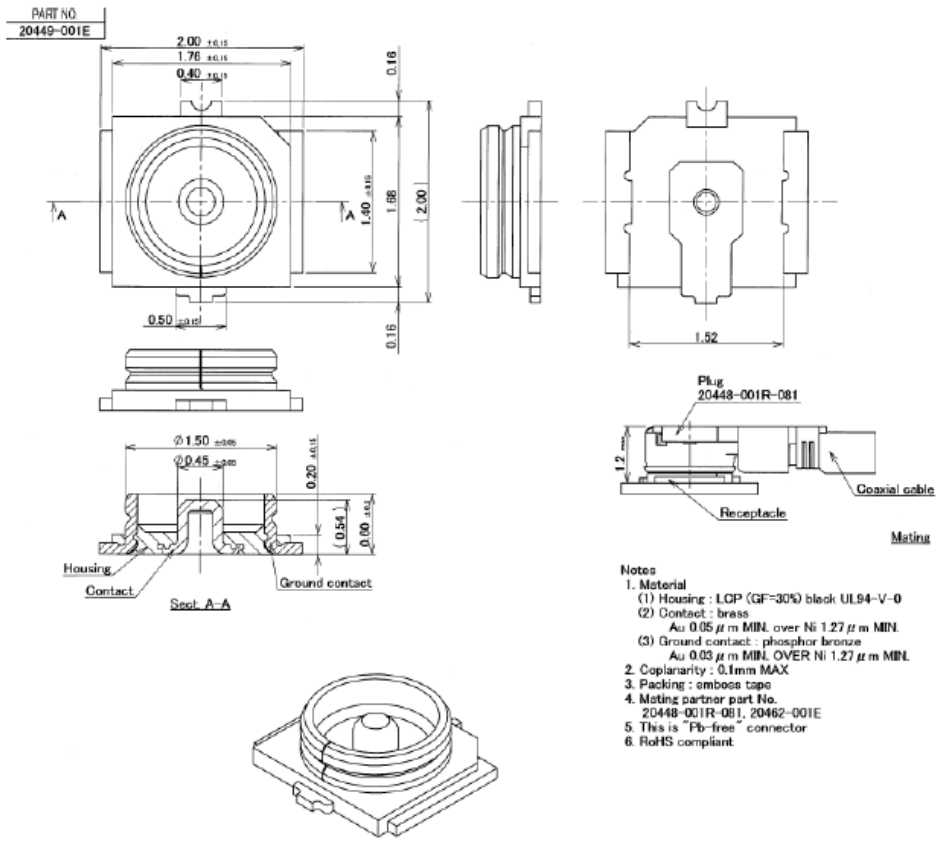


www.sparklan.com / sales@sparklan.com / +886 2 2659-1880

Mechanical Dimension (mm)



MHF4 Connector spec.



www.sparklan.com / sales@sparklan.com / +886 2 2659-1880

Pin Assignment

The following section illustrate signal pin-outs for the module connector.

TOP			
Pin#	Pin Name	Type	Description
1	GND	G	Ground connections
3	USB_D+	I/O	USB serial differential data Positive
5	USB_D-	I/O	USB serial differential data Negative
7	GND	G	Ground connections
9	SDIO_CLK/SYSCLK	NC	No Connection
11	SDIO_CMD	NC	No Connection
13	SDIO_DATA0 (0/1.8V)	NC	No Connection
15	SDIO_DATA1 (0/1.8V)	NC	No Connection
17	SDIO_DATA2 (0/1.8V)	NC	No Connection
19	SDIO_DATA3 (0/1.8V)	NC	No Connection
21	SDIO_WAKE# (0/1.8V)	NC	No Connection
23	SDIO_RESET#/TX_BLANKING(0/1.8V)	NC	No Connection
25	NOTCH FOR KEY E	NC	No Connection
27	NOTCH FOR KEY E	NC	No Connection
29	NOTCH FOR KEY E	NC	No Connection
31	NOTCH FOR KEY E	NC	No Connection
33	GND	G	Ground connections
35	PERp0	I	PCI Express receive data-Positive
37	PERn0	I	PCI Express receive data-Negative
39	GND	G	Ground connections
41	PETp0	O	PCI Express transmit data- Positive
43	PETn0	O	PCI Express transmit data- Negative
45	GND	G	Ground connections
47	REFCLKp0	I	PCI Express differential clock input- Positive
49	REFCLKn0	I	PCI Express differential clock input- Negative
51	GND	G	Ground connections
53	CLKREQ0# (3.3V)	OD	PCIe clock request
55	PEWAKE0# (3.3V)	OD	PCIe wake signal

www.sparklan.com / sales@sparklan.com / +886 2 2659-1880

TOP			
Pin#	Pin Name	Type	Description
57	GND	G	Ground connections
59	RESERVED/PERp1	I	PCI Express receive data-Positive
61	RESERVED/PERn1	I	PCI Express receive data-Negative
63	GND	G	Ground connections
65	RESERVED/PETp1	O	PCI Express receive data-Positive
67	RESERVED/PETn1	O	PCI Express receive data-Negative
69	GND	G	Ground connections
71	RESERVED/REFCLKp1	NC	No Connection
73	RESERVED/REFCLKn1	NC	No Connection
75	GND	G	Ground connections

Pin Assignment

The following section illustrate signal pin-outs for the module connector.

BOTTOM			
Pin#	Pin Name	Type	Description
2	3.3 V	P	VDD system power supply input
4	3.3 V	P	VDD system power supply input
6	WLAN_LED_1#	NC	No Connection
8	PCM_CLK/I2S_SCK (1.8V)	I	Bluetooth PCM clock or I2S continuous serial clock for audio
10	PCM_SYNC/I2S_WS (1.8V)	I	Bluetooth PCM synchronous SYNC or I2S word select for audio
12	PCM_OUT/I2S_SD_OUT (1.8V)	O	Bluetooth PCM synchronous data output or I2S serial data output for audio
14	PCM_IN/I2S_SD_IN (1.8V)	I	Bluetooth PCM synchronous data input or I2S serial data input for audio
16	LED_2#	NC	No Connection
18	VIO_CFG	G	NC for 1.8 V I/O, GND for 3.3 V I/O
20	UART_WAKE# (3.3V)	NC	No Connection
22	UART_TXD(0/1_8V)	NC	No Connection
24	NOTCH FOR KEY E	NC	No Connection
26	NOTCH FOR KEY E	NC	No Connection

www.sparklan.com / sales@sparklan.com / +886 2 2659-1880

BOTTOM			
Pin#	Pin Name	Type	Description
28	NOTCH FOR KEY E	NC	No Connection
30	NOTCH FOR KEY E	NC	No Connection
32	UART_RXD (0/1.8V)	NC	No Connection
34	UART_RTS (0/1.8V)	NC	No Connection
36	UART_CTS (0/1.8V)	NC	No Connection
38	VENDOR DEFINED	NC	No Connection
40	VENDOR DEFINED	NC	No Connection
42	VENDOR DEFINED	NC	No Connection
44	COEX3 (0/1.8V)	NC	No Connection
46	COEX_TXD (0/1.8V)	NC	No Connection
48	COEX_RXD (0/1.8V)	NC	No Connection
50	SUSCLK (0/3.3V)	NC	No Connection
52	PERST0# (0/3.3V)	I	WLAN PCIe reset signal is an input signal
54	W_DISABLE2# (0/3.3V)	I	Bluetooth enable signal. It is an input, active high to enable Bluetooth operation
56	W_DISABLE1# (0/3.3V)	I	It is an interrupt pin to the WLAN CPU. When WLAN detects an interrupt, it turns off WLAN MAC/PHY/RF for power save application.
58	I2C_DATA (0/3.3V)	NC	No Connection
60	I2C_CLK (0/3.3V)	NC	No Connection
62	ALERT#	NC	No Connection
64	RESERVED	NC	No Connection
66	UIM_SWP/PERST1#	NC	No Connection
68	UIM_POWER_SNK/CLKREQ1#	NC	No Connection
70	UIM_POWER_SRC/GPIO_1/PEWAKE1#	NC	No Connection
72	3.3 V	P	VDD system power supply input
74	3.3 V	P	VDD system power supply input

Note: Power (P), Ground (G), Open-Drain (OD), Input (I), Output (O), Do Not Connect (DNC), No Connection (NC)

www.sparklan.com / sales@sparklan.com / +886 2 2659-1880

Certification

- ■ FCC
- ■ CE
- ☐ IC
- ☐ MIC
- ☐ NCC
- ☐ ASNZS

Ordering Information

Product Name	Part Number	Description
WNFQ-292BE(BT)	R9701B10006	11be/ax/ac/a/b/g/n 2T2R Wi-Fi+BT M.2 Module

Optional Accessory

Product Name	Part Number	Description
AD-510AX	R3410A10051	Dipole Antenna,2.27dBi/2.69dBi/3.52dBi/2.4G/5G/6GHz,RP-SMA(M)connector
CBIRF-NE150	R3470300025	RF Cable, I-PEXMHF4 to RP-SMA(F); L150mm; Coaxial 0.81 Black
CBIRF-NE250	R3470300026	RF Cable, I-PEXMHF4 to RP-SMA(F); L250mm; Coaxial 0.81 Black

www.sparklan.com / sales@sparklan.com / +886 2 2659-1880