



# WMX7408

## Wi-Fi 6 2.4GHz + 5GHz (DBS) Mini PCIe 2x2 Module

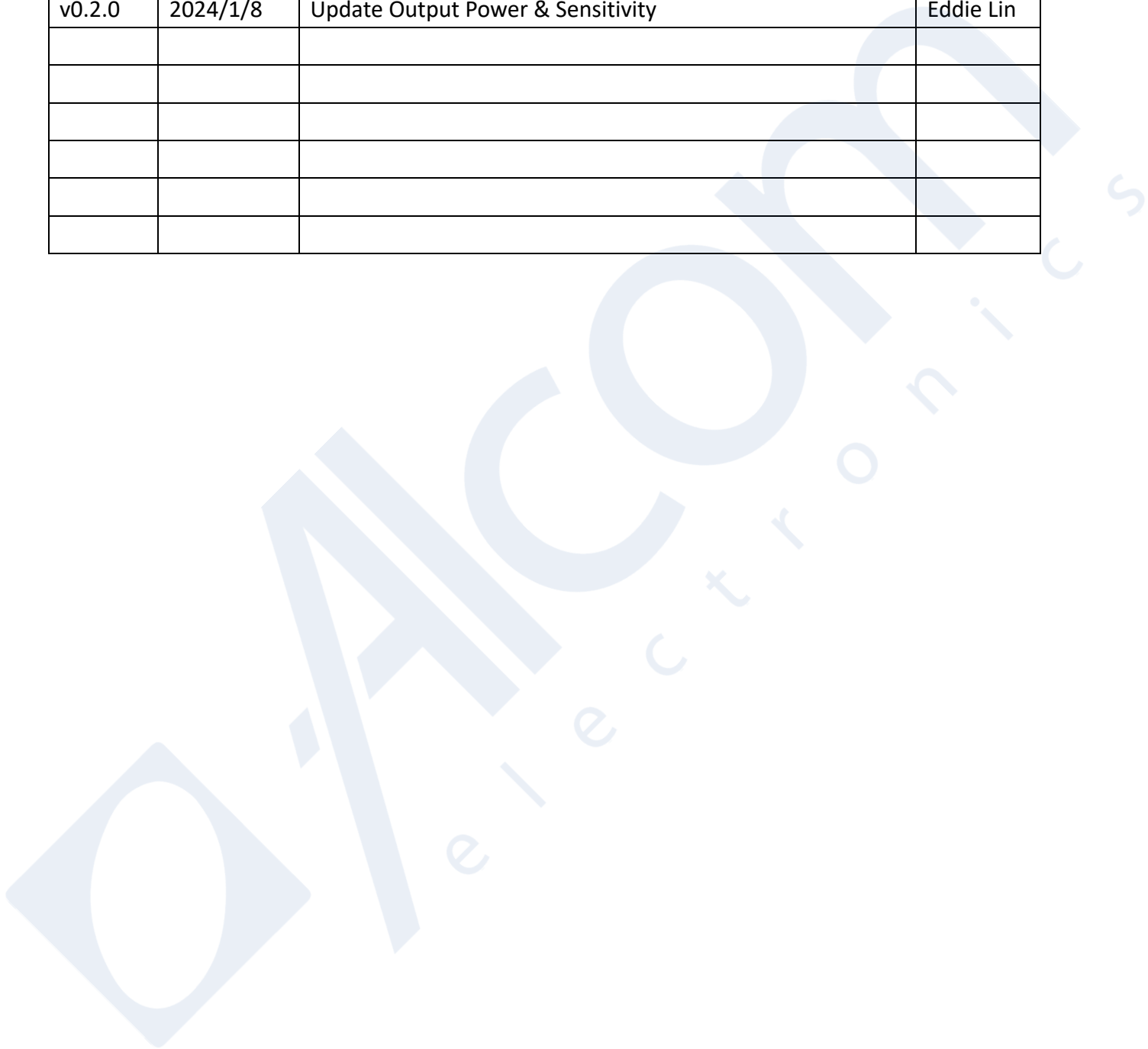
### Product Datasheet

Version: 0.2.0

2024/1/8

**Release Note**

Version	Date	Description	Editor
v0.1.0	2023/12/7	Initial draft	Eddie Lin
v0.2.0	2024/1/8	Update Output Power & Sensitivity	Eddie Lin



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## 1 Overview

The WMX7408 enterprise module is a highly integrated mini PCIe module for wireless local area networks (WLANs). This module is built on the Resesas Celeno CL8040 chip and serves as an 802.11ax Wi-Fi 6 PCIe radio designed specifically for Enterprise Access Points and Campus deployments.

## 2 Feature

### 2.1 System

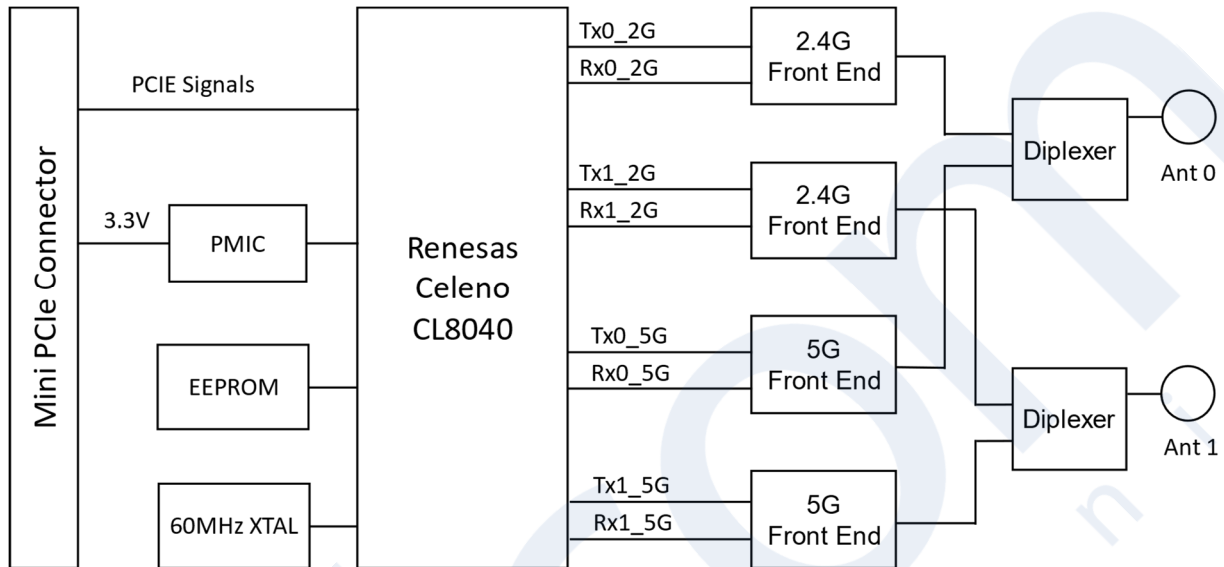
- Concurrent Dual Band, Dual Transceiver, Dual Function
- 2T2R+2T2R (total 4T4R) Flexible MIMO Architecture
- Up to 4.8Gbps data link speed
- Enhanced spectrum coverage, ready for UNII-4 (up to 5925 MHz)
- Low Power consumption with Advanced Power Management

### 2.2 WLAN

- Wi-Fi 6 (802.11ax) R2 support
- 802.11a/b/g/n/ac support
- DL/UL MU-OFDMA support
- DL/UL MU-MIMO support
- Beam Forming support
- Uplink Scheduling
- QAM 1024 (MCS 10, 11) modulation
- 20 / 40 / 80 / 160 MHz support in 5GHz
- 20 / 40 MHz support in 2.4GHz
- Target-Wait-Time
- Supports High Efficiency, Very High Throughput, High Throughput and Legacy
- WEP 64/128, WPA, WPA2, WPA3 (including 192-bit Enterprise mode), AES, TKIP
- Per Packet Dynamic Tx Power Control
- Optimal handling of strong interference (jammer) and near station signals
- QoS-WMM, WMM-PS, WMM-ACM
- Wi-Fi Direct, Wi-Fi Display, WPS 2.0, TDLS, Hotspot 2.0 support
- Support IEEE 802.11.d, h, e, l, k, r, v, w standards
- Multiple BSSID Support
- Dynamic Frequency Selection (DFS) in required bands and regulations
- WoWLAN support with GTK re-key

## 3 System Specification

### 3.1 Block Diagram



### 3.2 Chip Solution

- Resesas Celeno CL8040

### 3.3 Protocol & Interface

- PCIe Gen 3 interface for mini PCIe
- Antenna Port: U.FL(compatible) connector x2 for 2T2R

## 4 WLAN Specification

### 4.1 WLAN Standard

- Wi-Fi 6 (802.11ax) R2 support
- 802.11a/b/g/n/ac support
- Support IEEE 802.11.d, h, e, l, k, r, v, w standards

### 4.2 Frequency Range

- Support 2.4GHz frequency range: 2412MHz ~ 2472MHz
- Support 5GHz frequency range: 5180MHz - 5925MHz

### 4.3 Band Width

- 20 MHz/40 MHz channel bandwidth for 2.4 GHz
- 20 MHz/40 MHz/80 MHz/160 MHz channel bandwidth for 5 GHz

### 4.4 Data Rate

- 2.4GHz  
 802.11n HT40 2SS: 300Mbps  
 802.11ax HE40 2SS: 573Mbps
- 5GHz  
 802.11n HT40 2SS:300Mbps  
 802.11ac VHT160 2SS: 1733Mbps  
 802.11ax HE160 2SS: 2402Mbps

### 4.5 Modulation

- 802.11n:  
 OFDM (BPSK, QPSK, 16-QAM, 64-QAM)
- 802.11ac:  
 OFDM (BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM)
- 802.11ax:  
 OFDM (BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM, 1024-QAM)

### 4.6 Output Power & Sensitivity (TBD)

#### 2.4GHz

2.4GHz 802.11b(dBm)		
Data Rate	Tx $\pm$ 2dB	Rx Sensitivity $\pm$ 2dB
1M	21.0	-93.0
11M	21.0	-90.0

2.4GHz 802.11g(dBm)		
Data Rate	Tx $\pm$ 2dB	Rx Sensitivity $\pm$ 2dB
6M	20.0	-91.0
54M	16.5	-76.0

2.4GHz 802.11n(dBm)				
Data Rate		Tx $\pm$ 2dB	Tx $\pm$ 2dB(2TX)	Rx Sensitivity $\pm$ 2dB
HT20	MCS 0	21.0	24.0	-90.0
	MCS 7	17.5	20.5	-75.0
HT40	MCS 0	21.0	24.0	-88.0
	MCS 7	17.5	20.5	-72.0

2.4GHz 802.11ax(dBm)				
Data Rate		Tx $\pm$ 2dB	Tx $\pm$ 2dB(2TX)	Rx Sensitivity $\pm$ 2dB
HE20	MCS 0	21.0	24.0	-90.0
	MCS 7	17.0	20.0	-76.0
	MCS 9	15.0	18.0	-72.0
	MCS 11	13.0	16.0	-65.0
HE40	MCS 0	21.0	24.0	-88.0
	MCS 7	16.0	19.0	-74.0
	MCS 9	14.0	17.0	-69.0
	MCS 11	12.0	15.0	-63.0

### 5GHz

5GHz 802.11a(dBm)		
Data Rate	Tx $\pm$ 2dB	Rx Sensitivity $\pm$ 2dB
6M	20.0	-91.0
54M	16.5	-75.0

5GHz 802.11ac(dBm)				
Data Rate		Tx $\pm$ 2dB	Tx $\pm$ 2dB(2TX)	Rx Sensitivity $\pm$ 2dB
VHT20	MCS 0	20.0	23.0	-91.0
	MCS 7	17.5	20.5	-74.0
	MCS 8	16.5	19.5	-70.0
VHT40	MCS 0	20.0	23.0	-90.0
	MCS 7	17.5	20.5	-71.0
	MCS 9	15.5	18.5	-65.0
VHT80	MCS 0	19.5	22.5	-85.0
	MCS 7	17.0	20.0	-68.0
	MCS 9	15.0	18.0	-62.0



5GHz 802.11ax(dBm)				
Data Rate		Tx $\pm$ 2dB	Tx $\pm$ 2dB(2TX)	Rx Sensitivity $\pm$ 2dB
HE20	MCS 0	19.5	22.5	-92.0
	MCS 7	17.0	20.0	-75.0
	MCS 9	15.0	18.0	-70.0
	MCS 11			
HE40	MCS 0	19.5	22.5	-88.0
	MCS 7	17.0	20.0	-73.0
	MCS 9	15.0	18.0	-67.0
	MCS 11			
HE80	MCS 0	19.5	22.5	-85.0
	MCS 7	17.0	20.0	-71.0
	MCS 9	15.0	18.0	-65.0
	MCS 11	13.0	16.0	-56.0
HE160	MCS 0	19.5	22.5	-81.0
	MCS 7	17.0	20.0	-62.0
	MCS 9	15.0	18.0	-59.0
	MCS 11	13.0	16.0	-52.0

## 5 Electrical Specification

### 5.1 Temperature

- Operating Temperature: -40°C to +85°C
- Storage Temperature: -40°C to +105°C

### 5.2 Humidity

- Operating Humidity (non-condensing): 5% ~ 90%
- Storage Humidity (non-condensing): 5% ~ 90%

### 5.3 Power Consumption

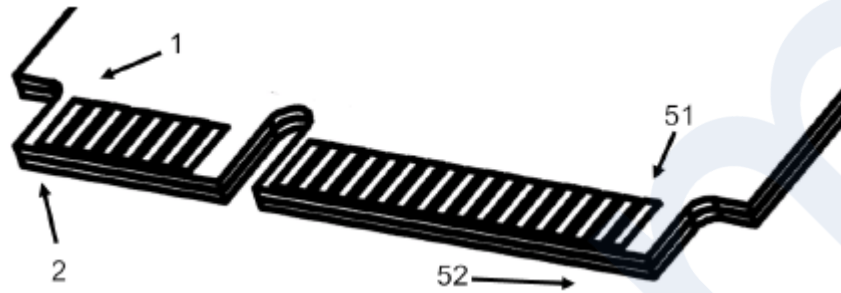
- Max power consumption 10W (25°C)

### 5.4 Operating Voltage

- Mini PCIe 3.3V

## 6 Pin Assignment

### 6.1 Module Pinout



### 6.2 Module Pin Define

PIN	Pin Name	Design Status	PIN	Pin Name	Design Status
1	WAKE#	NC	2	+3.3Vaux	3V3
3	COEX1	NC	4	GND	GND
5	COEX2	NC	6	+1.5V	NC
7	CLKREQ#	NC	8	UIM_PWR	NC
9	GND	GND	10	UIM_DATA	NC
11	REFCLK-	PCIE_REFCLKN	12	UIM_CLK	NC
13	REFCLK+	PCIE_REFCLKP	14	UIM_RESET	NC
15	GND	GND	16	UIM_VPP	NC
17	Reserved	NC	18	GND	GND
19	Reserved	NC	20	W_DISABLE#	NC
21	GND	GND	22	PERST#	PCIE_RESET
23	PETn0	PCIE_TXN	24	+3.3Vaux	3V3
25	PETp0	PCIE_TXP	26	GND	GND
27	GND	GND	28	+1.5V	NC
29	GND	GND	30	SMB_CLK	NC
31	PERn0	PCIE_RXN	32	SMB_DATA	NC
33	PERp0	PCIE_RXP	34	GND	GND
35	GND	GND	36	USB_D-	NC
37	Reserved	GND	38	USB_D+	NC
39	+3.3Vaux	3V3	40	GND	GND
41	+3.3Vaux	3V3	42	LED_WWAN	NC
43	GND	GND	44	LED_WLAN	NC

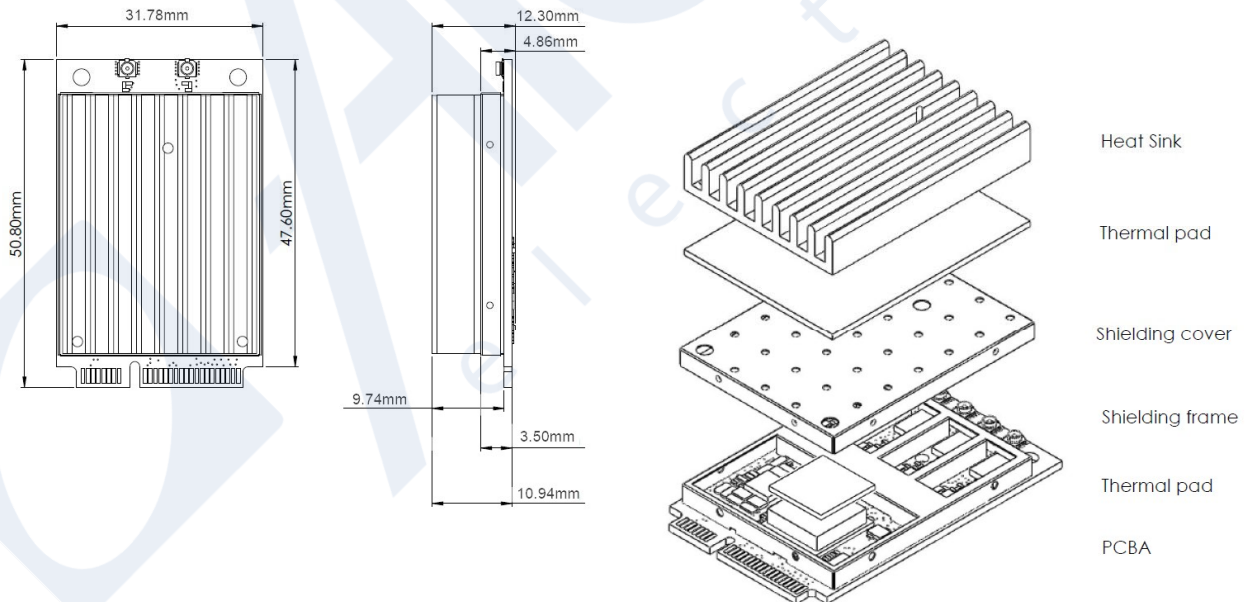
45	RESERVED	NC	46	LED_WPAN	NC
47	RESERVED	NC	48	+1.5V	NC
49	RESERVED	NC	50	GND	GND
51	RESERVED	NC	52	+3.3Vaux	3V3

### 6.3 Pin Description

Design Name	I/O	Description
PCIE_RESET	I	RESET (active low)
PCIE_REFCLKP	I	External reference clock from PCIe RC
PCIE_REFCLKN	I	
PCIE_RXP	I	PCIe receive input differential signals
PCIE_RXN	I	
PCIE_TXP	O	PCIe transmit output differential signals
PCIE_TXN	O	

## 7 Mechanical Specification

### 7.1 Module Outline Drawing (TBD)

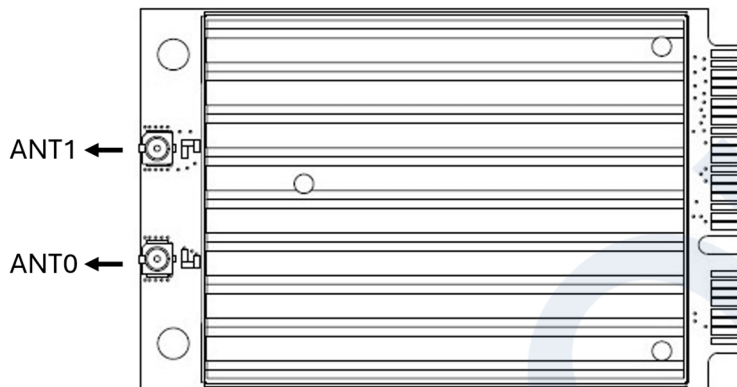


General tolerance:  $\pm 0.2\text{mm}$

## 7.2 Interface & Dimension

- Mini PCIe full size
- Typical Dimension (TBD): (W)31.78mm x (L)50.80mm x (H)12.30mm

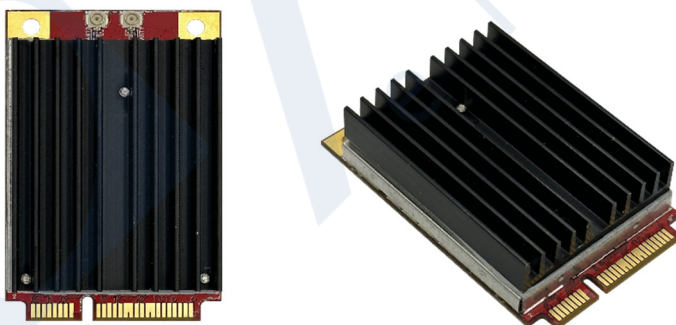
## 7.3 Antenna Connector




Pin Name	Description
ANT0	RF Antenna 0 for Wi-Fi 2.4GHz and 5GHz
ANT1	RF Antenna 1 for Wi-Fi 2.4GHz and 5GHz

## 8 Product Appearance

### 8.1 Product Picture



## 8.2 Label Define

Model: WMX7408 MAC: 00156128BFE1 SN: 01WMX7408000065	
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Item	Description
Size	30x5mm
Model	Product Model Name
MAC	Wi-Fi Mac Address
SN	Product Serial Number

## 9 Software & Driver

### 9.1 Driver Support

- Linux kernel 5.15

### 9.2 Platform Support List

- Intel x86
- NXP LS1046
- (TBD)

### 9.3 RF Tool

- RF test tool consultant service available

## 10 Certification

CE/FCC/IC (TBD)

## 11 Package Information

- One module per one static bag



- One static bags in one lattice and 100pcs per inner box



- 5 inner boxes per 1 carton and 500pcs per carton



## 12 Ordering Information

### 12.1 Main Parts

Part Number	Description
WMX7408	Wi-Fi 6 2.4GHz + 5GHz (DBS) Mini PCIe 2x2 Module

### 12.2 Accessories

Part Number	Description
ATD6251	Dipole Antenna 2dBi 2.4GHz/5GHz
ATD6351	Dipole Antenna 3dBi 2.4GHz/5GHz
ATD6551	Dipole Antenna 5dBi 2.4GHz/5GHz
AC11501	Cable IPEX to SMA, 150mm