R250D&R250D-E

Product Description

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About This Document

Intended Audience

This document describes the positioning, characteristics, hardware structure, product features, and technical specifications of the RU.

This document helps you understand the characteristics and features of the RU.

This document is intended for:

- Network planning engineers
- Hardware installation engineers
- Commissioning engineer
- Data configuration engineers
- On-site maintenance engineers
- Network monitoring engineers
- System maintenance engineers

Symbol Conventions

The symbols that may be found in this document are defined as follows.

Symbol	Description
⚠ DANGER	Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
⚠ WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
⚠ CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.
⚠ NOTICE	Indicates a potentially hazardous situation which, if not avoided, could result in equipment damage, data loss, performance deterioration, or unanticipated results. NOTICE is used to address practices not

Symbol	Description
	related to personal injury.
☐ NOTE	Calls attention to important information, best practices and tips.
	NOTE is used to address information not related to personal injury, equipment damage, and environment deterioration.

Change History

Changes between document issues are cumulative. The latest document issue contains all the changes made in previous issues.

Changes in Issue 01 (2016-07-05)

This is the initial commercial release.

Contents

1 Product Positioning and Characteristics

1.1 Product Positioning

Product Overview

The R250D and R250D-E are remote units (RUs) used in Huawei agile distributed Wi-Fi solution. They support PoE power supply, and are deployed indoors and connected to the central AP.   The central AP and RUs are connected through network cables, which greatly extends the coverage range, enhances flexibility in AP deployment and planning, and reduces the engineering construction costs. The central AP manages the RUs and processes services in a centralized manner. The RUs process radio signals independently. Such distributed architecture further improves the wireless access capability, creating optimal service experience for users.

The RU uses an 86 mm plate in compliance with international standards and can be easily installed into a junction box in a room. It is equipped with a built-in antenna and a hidden indicator; therefore, installation of the RU does not affect indoor decorations and designs. It also has an IEEE 802.11a/b/g/n/ac/ac wave2 wireless module and can work on both 5 GHz and 2.4 GHz frequency bands.

The RU is recommended for environments with complex wall structures and high-density rooms, such as schools, hotels, hospitals, and office meeting rooms. Signals are transmitted through network cables without attenuation. The RUs are deployed indoors and provide comprehensive signal coverage.

The RUs are managed by the central AP. The central AP and RUs are plug-and-play and can be managed and maintained in real time. Compared with traditional distributed AP solutions, the AC in Huawei agile distributed Wi-Fi solution needs to manage a smaller number of APs. A large number of RUs can be deployed, which improves the overall performance and reduces network deployment costs.

Usage Scenario

Figure 1-1 Distributed wireless access
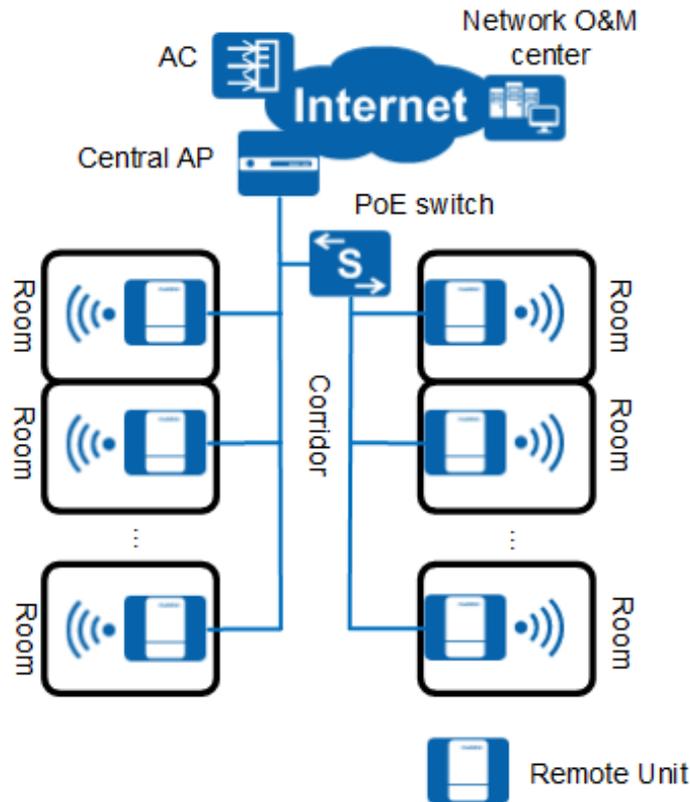
As shown in the figure, the downlink GE interfaces of the central AP support PoE power supply and can be directly connected to RUs. The central AP can connect to more RUs through a PoE switch. RUs are deployed indoors and communicate with the central AP through network cables.

1.2 Product Characteristics

Long-Distance Network Coverage

Unlike the traditional distributed AP which allows for a maximum feeder length of 15 m, the central AP uses network cables to replace feeder cables and supports up to 100 m distance from the RUs. The network coverage range is therefore expanded by several times.

No Wall Penetration Loss, No Coverage Hole

Restricted by feeder length or installation requirements, signals have to pass through walls in some scenarios, resulting in large signal attenuation. If rooms to be covered have complex structures, coverage holes may occur. To prevent these problems, lots of calculation and verification work needs to be carried out. Huawei distributed solution solves these problems. In this solution, RUs are placed in rooms, and signals are transmitted over wired cables, without wall penetration loss, delivering high-quality wireless access services.

802.11ac/ac wave2 Gigabit Wireless Rate

The RU complies with IEEE 802.11a/b/g/n/ac/ac wave2, supports 2x2 MIMO, works on both 2.4 and 5 GHz frequency bands, and provides strong signals and gigabit wireless rate.

Unique, Graceful Plate Design

The RU is white in appearance and has heat emission holes and interfaces at the side and bottom. The mounting screws are hidden under the slide panel. The overall design is simple but graceful and blends well with the layout of hotels and apartments.

Easy to Install in a Standard 86-type Box

The RU uses an 86 mm plate in compliance with international standards and can be easily installed into a junction box in a room, requiring no drilling or cabling.

Flexible Installation Modes

In addition to an 86-type box, the R250D can be installed on a wall or ceiling, and the R250D-E can be installed on a desk, rendering the installation location flexible.

Hidden Indicator, Zero Impact on Sleep

The RU uses a hidden indicator design. When being turned on, the indicator has soft light. The AC controls the switch of the indicator and turns off the indicator at nights to prevent blinking lights from affecting sleep of guests.

Four Downlink Ethernet Interfaces, Supporting Wired Access from Multiple Users

The R250D-E has four downlink 1000M Ethernet interfaces that can process data concurrently. The interfaces can be connected to multiple terminals through network cables, such as the IPTV, desktop computer, and laptop, meeting requirements of hotels and apartments. One downlink 1000M Ethernet interface supports PoE out and can provide power supply for connected devices such as IP phones.

Auto Shutdown of the Wired Interface

In some cases, a loop may occur on a network connected to the RU's wired interface, for example, when the RU and the network are connected through a hub. The auto shutdown function enables the RU to automatically shut down its wired interface for protection.

📖 NOTE

This function takes effect only when the wired network connected to the RU's wired interface does not terminate STP packets from the RU.

Low Engineering Cost

Compared with traditional distributed APs, the central AP cuts down the following expenses:

- Construction: Network cables replace expensive feeder cables. The central AP can directly use the network cables originally routed in the rooms, without the need of deploying new cables.

- License: The maximum number of central APs in Fit AP mode allowed by the AC is controlled by licenses, but RUs do not require licenses. Therefore, one central AP can use RUs to cover dozens of rooms.

Hierarchical Processing Technology, High Wireless Forwarding Capability

Huawei distributed solution uses innovative hierarchical processing technology. The central AP manages RUs in a centralized manner and concurrently forwards service traffic, while the RUs only process radio signals. The hierarchical design makes the network structure clearer and reduces the processing burden on the central AP and RUs, improving efficiency and optimizing the overall wireless forwarding performance.

2 Hardware Structure

2.1 R250D

Appearance

📖 **NOTE**

The actual device appearance may be different from the following device appearance; these differences will not affect device functions.

Figure 2-1 R250D appearance

Port

Figure 2-2 R250D ports

As shown in Figure 2-2, each port can be described as follows:

1. GE1: 10/100/1000M port: connects to the wired Ethernet.
2. Default: Reset button used to restore factory settings and restarts the device if you hold down the button more than 3 seconds.
3. GE0/PoE_IN: 10/100/1000M port: connects to the wired Ethernet and supports PoE input.

The R250D provides only one indicator, as shown in Figure 2-3.

Figure 2-3 Indicator
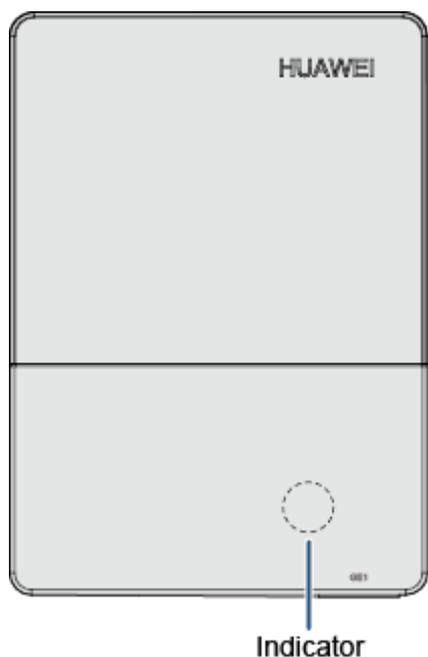
Indicator

☐ NOTE

● The indicator is located inside the panel, which turns on after the AP is powered on.

● Indicator colors may vary slightly at different temperature.

Table 2-1 Indicator description

Type	Color	Status	Description
Default status after power-on	Green	Steady on	The AP is just powered on and the software is not started yet.
Software startup status	Green	Steady on after blinking once	After the system is reset and starts uploading the software, the indicator blinks green once. Until the software is uploaded and started, the indicator remains steady green.
Running status	Green	Blinking once every 2s (0.5 Hz)	The system is running properly, the Ethernet connection is normal, and STAs are associated with the AP.

Type	Color	Status	Description
		Blinking once every 5s (0.2 Hz)	The system is running properly, the Ethernet connection is normal, and no STA is associated with the AP. The system is in low power consumption state.
Alarm	Green	Blinking once Alarm Green every 0.25s (4 Hz)	- The software is being upgraded. - After the software is uploaded and started, the AP working in Fit AP mode requests to go online on the AC and maintains this state until it goes online successfully on the AC (before the CAPWAP link is established). - The AP registration fails (the CAPWAP link is disconnected).
Fault	Red	Steady on	A fault that affects services has occurred, such as a DRAM detection failure or system software loading failure. The fault cannot be automatically rectified and must be rectified manually.

2.2 R250D-E

Appearance

> **NOTE**
>
> The actual device appearance may slightly differ from the following device appearance, but these differences will not affect device functions.

Figure 2-4 AP2050DN-E appearance

Ports

Figure 2-5 AP2050DN-E ports
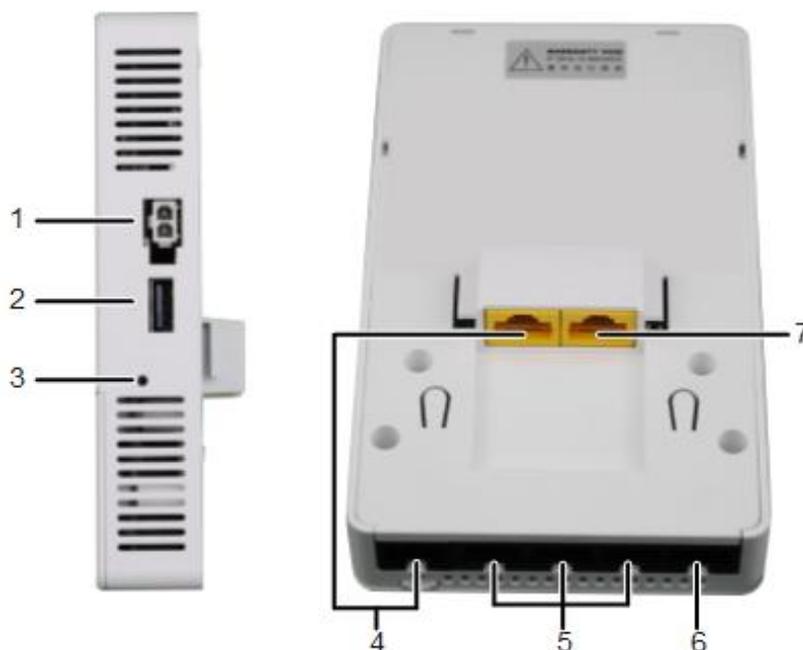
As shown in Figure 2-5, each port can be described as follows:

1. DC 48V: DC power socket: connects a 48V power adapter to the AP.
2. USB: Connects to a USB flash drive or other storage devices to extend the storage space of the AP. The USB2.0 standard is supported.
3. Default: Reset button: restores factory settings and restarts the device if you hold down the button more than 3 seconds.
4. Pass Through: Connects to a network cable or phone cable for transparent transmission.
5. GE2 to GE4: 10/100/1000M port: connects to the wired Ethernet.
6. GE1/PoE_OUT: 10/100/1000M port: connects to the wired Ethernet and supports PoE output.
7. GE0/PoE_IN: 10/100/1000M port: connects to the wired Ethernet and supports PoE input.

LED Indicator

The R250D-E provides only a single indicator, as shown in Figure 2-6.

Figure 2-6 Indicator
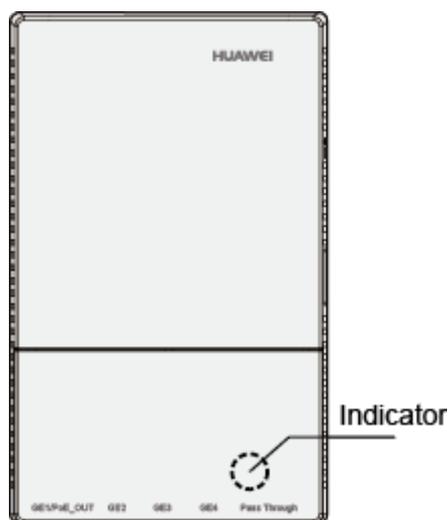
📖 **NOTE**

- The indicator is located inside the panel, which turns on after the AP is powered on.
- Indicator colors may vary slightly at different temperature.

Table 2-2 Indicator description

Type	Color	Status	Description
Default status after power-on	Green	Steady on	The AP is just powered on and the software is not started yet.
Software startup status	Green	Steady on after blinking once	After the system is reset and starts uploading the software, the indicator blinks green once. Until the software is uploaded and started, the indicator remains steady green.
Running status	Green	Blinking once every 2s (0.5 Hz)	The system is running properly, the Ethernet connection is normal, and STAs are associated with the AP.
		Blinking once every 5s (0.2 Hz)	The system is running properly, the Ethernet connection is

Type	Color	Status	Description
			normal, and no STA is associated with the AP. The system is in low power consumption state.
Alarm	Green	Blinking once Alarm Green every 0.25s (4 Hz)	• The software is being upgraded. • After the software is uploaded and started, the AP working in Fit AP mode requests to go online on the AC and maintains this state until it goes online successfully on the AC (before the CAPWAP link is established). • The AP registration fails (the CAPWAP link is disconnected).
Fault	Red	Steady on	A fault that affects services has occurred, such as a DRAM detection failure or system software loading failure. The fault cannot be automatically rectified and must be rectified manually.

3 Product Features

3.1 WLAN Features

WLAN features supported by the AP are as follows:

- Compliance with IEEE 802.11a/b/g/n/ac/ac Wave 2
- Maximum rate of 1.167 Gbit/s
- Maximum ratio combining (MRC)
- Space time block code (STBC)
- Beamforming
- MU-MIMO
- Low-density parity-check (LDPC)
- Maximum-likelihood detection (MLD)
- Frame aggregation, including A-MPDU (Tx/Rx) and A-MSDU (Rx only)
- 802.11 dynamic frequency selection (DFS)
- Short guard interval (GI) in 20 MHz, 40 MHz, and 80 MHz modes
- Priority mapping and packet scheduling based on a Wi-Fi Multimedia (WMM) profile to implement priority-based data processing and forwarding
- Automatic and manual rate adjustment
- WLAN channel management and channel rate adjustment

  ☐ NOTE

  For details about WLAN channel management, see the *Country Code & Channel Compliance Table*.

- Automatic channel scanning and interference avoidance
- Service set identifier (SSID) hiding
- Signal sustain technology (SST)
- Unscheduled automatic power save delivery (U-APSD)
- Control and Provisioning of Wireless Access Points (CAPWAP)
- Automatic login
- Extended Service Set (ESS)
- Multi-user CAC

3.2 Network Features

Network features supported by the AP are as follows:

- Compliance with IEEE 802.3u
- Auto-negotiation of the rate and duplex mode and automatic switchover between the Media Dependent Interface (MDI) and Media Dependent Interface Crossover (MDI-X)
- Compliance with IEEE 802.1q
- SSID-based VLAN assignment
- VLAN trunk on uplink Ethernet ports
- Management channel of the AP uplink port in tagged and untagged mode
- DHCP client, obtaining IP addresses through DHCP
- Tunnel data forwarding and direct data forwarding
- STA isolation in the same VLAN
- Access control lists (ACLs)
- Link Layer Discovery Protocol (LLDP)
- Uninterrupted service forwarding upon CAPWAP channel disconnection
- Unified authentication on the AC
- AC dual-link backup
- IPv6

3.3 QoS Features

QoS features supported by the AP are as follows:

- Priority mapping and packet scheduling based on a Wi-Fi Multimedia (WMM) profile to implement priority-based data processing and forwarding
- WMM parameter management for each radio
- WMM power saving
- Priority mapping for upstream packets and flow-based mapping for downstream packets
- Queue mapping and scheduling
- User-based bandwidth limiting
- Adaptive bandwidth management (automatic bandwidth adjustment based on the user quantity and radio environment) to improve user experience
- Airtime scheduling

3.4 Security Features

Security features supported by the AP are as follows:

- Open system authentication
- WEP authentication/encryption using a 64-bit, 128-bit, or 152-bit encryption key
- WPA/WPA2-PSK authentication and encryption (WPA/WPA2 personal edition)
- WPA/WPA2-802.1x authentication and encryption (WPA/WPA2 enterprise edition)

- WPA-WPA2 hybrid authentication
- WAPI authentication and encryption
- Wireless intrusion detection system (WIDS) and wireless intrusion prevention system (WIPS), including rogue device detection and countermeasure, attack detection and dynamic blacklist, and STA/AP blacklist and whitelist
- 802.1x authentication, MAC address authentication, and Portal authentication
- DHCP snooping
- Dynamic ARP Inspection (DAI)
- IP Source Guard (IPSG)

3.5 Maintenance Features

Maintenance features supported by the AP are as follows:

- Unified management and maintenance on the AC
- Automatic login and configuration loading, and plug-and-play (PnP)
- Batch upgrade
- Telnet
- STelnet using SSH v2
- Real-time configuration monitoring and fast fault location using the NMS
- System status alarm

3.6 BYOD

BYOD features supported by the AP are as follows:

- Identifies the device type according to the organizationally unique identifier (OUI) in the MAC address.
- Identifies the device type according to the user agent (UA) information in an HTTP packet.
- Identifies the device type according to DHCP options.
- The RADIUS server delivers packet forwarding, security, and QoS policies according to the device type carried in the RADIUS authentication and accounting packets.

3.7 Locating Service

☐ NOTE

The AP supports the locating service only in Fit AP mode.

Locating service features supported by the AP are as follows:

- Locates tags manufactured by AeroScout or Ekahau.
- Locates Wi-Fi terminals.
- Works with eSight to locate rogue devices.
- The R250D-E supports Bluetooth location.

3.8 Spectrum Analysis

Spectrum analysis features supported by the AP are as follows:

- Identifies interference sources such as baby monitors, Bluetooth devices, digital cordless phones (at 2.4 GHz frequency band only), wireless audio transmitters (at both the 2.4 GHz and 5 GHz frequency bands), wireless game controllers, and microwaves.

- Works with eSight to locate and perform spectrum analysis on interference sources.

4 Technical Specifications

4.1 Basic Specifications

Table 4-1 R250D Basic specifications

Item		Description
Physical specifications	Dimensions (H x W x D)	26 mm x 86 mm x 120 mm
	Weight	0.2 kg
	System memory	• 256 MB DDR3L • 32MB Flash
Power specifications	Power input	PoE power supply: in compliance with IEEE 802.3af/at
	Maximum power consumption	10.1 W **NOTE** The actual maximum power consumption depends on local laws and regulations.
Environment specifications	Operating temperature	• -60 m to +1800 m: 0 ℃ to +40 ℃ • 1800 m to 5000 m: Temperature decreases by 1 ℃ every time the altitude increases 300 m.
	Storage temperature	-40 ℃ to +70 ℃
	Operating humidity	5% to 95% (non-condensing)
	IP rating	IP20
	Atmospheric pressure	53 kPa to 106 kPa

Table 4-2 R250D-E Basic specifications

Item		Description
Physical specifications	Dimensions (H x W x D)	36mm x 86mm x 140mm
	Weight	0.26kg
	System memory	• 256MB DDR3L • 32MB FLASH
Power specifications	Power input	• DC:48V±5% • PoE power supply: in compliance with IEEE 802.3af/at
	Maximum power consumption	11.5 W (excluding the output power of the USB port and PoE_OUT port) **NOTE** The actual maximum power consumption depends on local laws and regulations.
Environment specifications	Operating temperature	• -60 m to +1800 m: 0 ℃ to +40 ℃ • 1800 m to 5000 m: Temperature decreases by 1 ℃ every time the altitude increases 300 m.
	Storage temperature	-40 ℃ to +70 ℃
	Operating humidity	5% to 95% (non-condensing)
	IP rating	IP20
	Atmospheric pressure	53 kPa to 106 kPa

4.2 Radio Specifications (R250D)

Table 4-3 Radio specifications

Item	Description
Antenna type	Built-in antenna
Antenna gain	• 2.4 GHz: 4 dBi(Typical) • 5 GHz: 6 dBi(Typical)
Maximum number of concurrent users	≤256

Item	Description			
Maximum number of VAPs for each radio	16			
Maximum transmit power	• 2.4 GHz: 21 dBm (combined power) • 5 GHz: 20 dBm (combined power) **NOTE** The actual transmit power depends on local laws and regulations. You can adjust the transmit power from the maximum transmit power to 1 dBm, with a step of 1 dB.			
Maximum number of non-overlapping channels	2.4 GHz 802.11b/g • 20 MHz: 3 802.11n • 20 MHz: 3 • 40 MHz: 1	5 GHz • 802.11a – 20 MHz: 13 • 802.11n – 20 MHz: 13 – 40 MHz: 6 • 802.11ac – 20 MHz: 13 – 40 MHz: 6 – 80 MHz: 3	**NOTE** The table uses the number of non-overlapping channels supported by China as an example. The number of non-overlapping channels varies in different countries. For details, see the *Country Codes & Channels Compliance*.	
Channel rate	• 802.11b: 1, 2, 5.5, and 11 Mbit/s • 802.11a/g: 6, 9, 12, 18, 24, 36, 48, and 54 Mbit/s • 802.11n: 6.5 to 300 Mbit/s • 802.11ac: 6.5 to 867 Mbit/s			
Receiver sensitivity (Typical values)	2.4 GHz 802.11b • -99 dBm @ 1 Mbit/s • -97 dBm @ 2 Mbit/s • -95 dBm @ 5.5 Mbit/s • -92 dBm @ 11 Mbit/s	2.4 GHz 802.11g • -94 dBm @ 6 Mbit/s • -93 dBm @ 9 Mbit/s • -90 dBm @ 12 Mbit/s • -89 dBm @ 18 Mbit/s • -85 dBm @ 24 Mbit/s • -84 dBm @	2.4 GHz 802.11n (HT20) • -93 dBm @ MCS0 • -89 dBm @ MCS1 • -87 dBm @ MCS2 • -85 dBm @ MCS3 • -82 dBm @ MCS4 • -78 dBm @	2.4 GHz 802.11n(HT40) • -91 dBm @ MCS0 • -88 dBm @ MCS1 • -85 dBm @ MCS2 • -83 dBm @ MCS3 • -80 dBm @ MCS4 • -76 dBm @

Item	Description			
		36 Mbit/s • -79 dBm @ 48 Mbit/s • -78 dBm @ 54 Mbit/s	MCS5 • -76 dBm @ MCS6 • -74 dBm @ MCS7 • -91 dBm @ MCS8 • -87 dBm @ MCS9 • -85 dBm @ MCS10 • -83 dBm @ MCS11 • -80 dBm @ MCS12 • -76 dBm @ MCS13 • -74 dBm @ MCS14 • -72 dBm @ MCS15	MCS5 • -75 dBm @ MCS6 • -72 dBm @ MCS7 • -89 dBm @ MCS8 • -86 dBm @ MCS9 • -83 dBm @ MCS10 • -81 dBm @ MCS11 • -78 dBm @ MCS12 • -74 dBm @ MCS13 • -73 dBm @ MCS14 • -70 dBm @ MCS15
	5 GHz 802.11a • -91 dBm @ 6 Mbit/s • -91 dBm @ 9 Mbit/s • -89 dBm @ 12 Mbit/s • -88 dBm @ 18 Mbit/s • -85 dBm @ 24 Mbit/s • -82 dBm @ 36 Mbit/s • -77 dBm @ 48 Mbit/s • -76 dBm @ 54 Mbit/s	5 GHz 802.11n (HT20) • -91 dBm @ MCS0 • -88 dBm @ MCS1 • -87 dBm @ MCS2 • -84 dBm @ MCS3 • -80 dBm @ MCS4 • -76 dBm @ MCS5 • -74 dBm @ MCS6 • -72 dBm @ MCS7 • -89 dBm @ MCS8 • -86 dBm @ MCS9 • -85 dBm @ MCS10	5 GHz 802.11n (HT40) • -88 dBm @ MCS0 • -86 dBm @ MCS1 • -82 dBm @ MCS2 • -80 dBm @ MCS3 • -77 dBm @ MCS4 • -73 dBm @ MCS5 • -71 dBm @ MCS6 • -69 dBm @ MCS7 • -86 dBm @ MCS8 • -84 dBm @ MCS9 • -80 dBm @ MCS10	-

Item	Description			
		• -82 dBm @ MCS11	• -78 dBm @ MCS11	
		• -78 dBm @ MCS12	• -75 dBm @ MCS12	
		• -74 dBm @ MCS13	• -71 dBm @ MCS13	
		• -72 dBm @ MCS14	• -69 dBm @ MCS14	
		• -70 dBm @ MCS15	• -67 dBm @ MCS15	
	5 GHz 802.11ac (VHT20) • -91 dBm @ MCS0NSS1 • -88 dBm @ MCS1NSS1 • -87 dBm @ MCS2NSS1 • -83 dBm @ MCS3NSS1 • -80 dBm @ MCS4NSS1 • -76 dBm @ MCS5NSS1 • -74 dBm @ MCS6NSS1 • -72 dBm @ MCS7NSS1 • -69 dBm @ MCS8NSS1 • -89 dBm @ MCS0NSS2 • -86 dBm @ MCS1NSS2 • -85 dBm @ MCS2NSS2 • -81 dBm @ MCS3NSS2 • -78 dBm @ MCS4NSS2 • -74 dBm @ MCS5NSS2 • -72 dBm @ MCS6NSS2	5 GHz 802.11ac (VHT40) • -88 dBm @ MCS0NSS1 • -85 dBm @ MCS1NSS1 • -82 dBm @ MCS2NSS1 • -80 dBm @ MCS3NSS1 • -77 dBm @ MCS4NSS1 • -73 dBm @ MCS5NSS1 • -71 dBm @ MCS6NSS1 • -69 dBm @ MCS7NSS1 • -66 dBm @ MCS8NSS1 • -64 dBm @ MCS9NSS1 • -86 dBm @ MCS0NSS2 • -83 dBm @ MCS1NSS2 • -80 dBm @ MCS2NSS2 • -78 dBm @ MCS3NSS2 • -75 dBm @ MCS4NSS2 • -71 dBm @ MCS5NSS2	5 GHz 802.11ac (VHT80) • -85 dBm @ MCS0NSS1 • -82 dBm @ MCS1NSS1 • -79 dBm @ MCS2NSS1 • -77 dBm @ MCS3NSS1 • -74 dBm @ MCS4NSS1 • -70 dBm @ MCS5NSS1 • -68 dBm @ MCS6NSS1 • -67 dBm @ MCS7NSS1 • -62 dBm @ MCS8NSS1 • -61 dBm @ MCS9NSS1 • -83 dBm @ MCS0NSS2 • -80 dBm @ MCS1NSS2 • -77 dBm @ MCS2NSS2 • -75 dBm @ MCS3NSS2 • -72 dBm @ MCS4NSS2 • -68 dBm @ MCS5NSS2	-

Item	Description			
	• -70 dBm @ MCS7NSS2 • -67 dBm @ MCS8NSS2	• -69 dBm @ MCS6NSS2 • -67 dBm @ MCS7NSS2 • -64 dBm @ MCS8NSS2 • -62 dBm @ MCS9NSS2	• -66 dBm @ MCS6NSS2 • -65 dBm @ MCS7NSS2 • -60 dBm @ MCS8NSS2 • -59 dBm @ MCS9NSS2	

4.3 Radio Specifications (R250D-E)

Table 4-4 Radio specifications

Item	Description		
Antenna type	Built-in antenna		
Antenna gain	• 2.4 GHz: 4 dBi(Typical) • 5 GHz: 5 dBi(Typical)		
Maximum number of concurrent users	≤256		
Maximum number of VAPs for each radio	16		
Maximum transmit power	• 2.4 GHz: 21 dBm (combined power) • 5 GHz: 20 dBm (combined power) **NOTE** The actual transmit power depends on local laws and regulations. You can adjust the transmit power from the maximum transmit power to 1 dBm, with a step of 1 dB.		
Maximum number of non-overlapping channels	2.4 GHz 802.11b/g • 20 MHz: 3 802.11n • 20 MHz: 3 • 40 MHz: 1	5 GHz • 802.11a – 20 MHz: 13 • 802.11n – 20 MHz: 13 – 40 MHz:	**NOTE** The table uses the number of non-overlapping channels supported by China as an example. The number of non-overlapping channels varies in different countries. For details, see the *Country Codes & Channels Compliance*.

Item	Description			
	6 • 802.11ac − 20 MHz: 13 − 40 MHz: 6 − 80 MHz: 3			
Channel rate	• 802.11b: 1, 2, 5.5, and 11 Mbit/s • 802.11a/g: 6, 9, 12, 18, 24, 36, 48, and 54 Mbit/s • 802.11n: 6.5 to 300 Mbit/s • 802.11ac: 6.5 to 867 Mbit/s			
Receiver sensitivity (Typical values)	2.4 GHz 802.11b • -97 dBm @ 1 Mbit/s • -95 dBm @ 2 Mbit/s • -94 dBm @ 5.5 Mbit/s • -91 dBm @ 11 Mbit/s	2.4 GHz 802.11g • -93 dBm @ 6 Mbit/s • -92 dBm @ 9 Mbit/s • -90 dBm @ 12 Mbit/s • -89 dBm @ 18 Mbit/s • -87 dBm @ 24 Mbit/s • -84 dBm @ 36 Mbit/s • -80 dBm @ 48 Mbit/s • -78 dBm @ 54 Mbit/s	2.4 GHz 802.11n (HT20) • -93 dBm @ MCS0 • -89 dBm @ MCS1 • -88 dBm @ MCS2 • -85 dBm @ MCS3 • -82 dBm @ MCS4 • -78 dBm @ MCS5 • -76 dBm @ MCS6 • -74 dBm @ MCS7 • -91 dBm @ MCS8 • -87 dBm @ MCS9 • -86 dBm @ MCS10 • -83 dBm @ MCS11 • -80 dBm @ MCS12 • -76 dBm @ MCS13 • -74 dBm @ MCS14	2.4 GHz 802.11n(HT40) • -90 dBm @ MCS0 • -87 dBm @ MCS1 • -86 dBm @ MCS2 • -83 dBm @ MCS3 • -79 dBm @ MCS4 • -75 dBm @ MCS5 • -74 dBm @ MCS6 • -73 dBm @ MCS7 • -88 dBm @ MCS8 • -85 dBm @ MCS9 • -84 dBm @ MCS10 • -81 dBm @ MCS11 • -77 dBm @ MCS12 • -73 dBm @ MCS13 • -72 dBm @ MCS14

Item	Description			
			• -72 dBm @ MCS15	• -71 dBm @ MCS15
	5 GHz 802.11a • -93 dBm @ 6 Mbit/s • -92 dBm @ 9 Mbit/s • -90 dBm @ 12 Mbit/s • -89 dBm @ 18 Mbit/s • -87 dBm @ 24 Mbit/s • -82 dBm @ 36 Mbit/s • -79 dBm @ 48 Mbit/s • -77 dBm @ 54 Mbit/s	5 GHz 802.11n (HT20) • -92 dBm @ MCS0 • -90 dBm @ MCS1 • -88 dBm @ MCS2 • -85 dBm @ MCS3 • -81 dBm @ MCS4 • -77 dBm @ MCS5 • -75 dBm @ MCS6 • -74 dBm @ MCS7 • -90 dBm @ MCS8 • -88 dBm @ MCS9 • -86 dBm @ MCS10 • -83 dBm @ MCS11 • -79 dBm @ MCS12 • -75 dBm @ MCS13 • -73 dBm @ MCS14 • -72 dBm @ MCS15	5 GHz 802.11n (HT40) • -89 dBm @ MCS0 • -87 dBm @ MCS1 • -85 dBm @ MCS2 • -82 dBm @ MCS3 • -79 dBm @ MCS4 • -75 dBm @ MCS5 • -73 dBm @ MCS6 • -72 dBm @ MCS7 • -87 dBm @ MCS8 • -85 dBm @ MCS9 • -83 dBm @ MCS10 • -80 dBm @ MCS11 • -77 dBm @ MCS12 • -73 dBm @ MCS13 • -71 dBm @ MCS14 • -70 dBm @ MCS15	-
	5 GHz 802.11ac (VHT20) • -92 dBm @ MCS0NSS1 • -90 dBm @ MCS1NSS1 • -87 dBm @ MCS2NSS1	5 GHz 802.11ac (VHT40) • -90 dBm @ MCS0NSS1 • -87 dBm @ MCS1NSS1 • -85 dBm @ MCS2NSS1	5 GHz 802.11ac (VHT80) • -86 dBm @ MCS0NSS1 • -83 dBm @ MCS1NSS1 • -81 dBm @ MCS2NSS1	-

Item	Description			
	• -84 dBm @ MCS3NSS1	• -81 dBm @ MCS3NSS1	• -79 dBm @ MCS3NSS1	
	• -81 dBm @ MCS4NSS1	• -78 dBm @ MCS4NSS1	• -76 dBm @ MCS4NSS1	
	• -77 dBm @ MCS5NSS1	• -74 dBm @ MCS5NSS1	• -71 dBm @ MCS5NSS1	
	• -75 dBm @ MCS6NSS1	• -73 dBm @ MCS6NSS1	• -70 dBm @ MCS6NSS1	
	• -73 dBm @ MCS7NSS1	• -71 dBm @ MCS7NSS1	• -68 dBm @ MCS7NSS1	
	• -69 dBm @ MCS8NSS1	• -67 dBm @ MCS8NSS1	• -65 dBm @ MCS8NSS1	
	• -90 dBm @ MCS0NSS2	• -65 dBm @ MCS9NSS1	• -62 dBm @ MCS9NSS1	
	• -90 dBm @ MCS1NSS2	• -88 dBm @ MCS0NSS2	• -84 dBm @ MCS0NSS2	
	• -88 dBm @ MCS2NSS2	• -85 dBm @ MCS1NSS2	• -81 dBm @ MCS1NSS2	
	• -85 dBm @ MCS3NSS2	• -83 dBm @ MCS2NSS2	• -79 dBm @ MCS2NSS2	
	• -82 dBm @ MCS4NSS2	• -79 dBm @ MCS3NSS2	• -77 dBm @ MCS3NSS2	
	• -79 dBm @ MCS5NSS2	• -76 dBm @ MCS4NSS2	• -74 dBm @ MCS4NSS2	
	• -75 dBm @ MCS6NSS2	• -72 dBm @ MCS5NSS2	• -69 dBm @ MCS5NSS2	
	• -73 dBm @ MCS7NSS2	• -71 dBm @ MCS6NSS2	• -68 dBm @ MCS6NSS2	
	• -71 dBm @ MCS8NSS2	• -69 dBm @ MCS7NSS2	• -66 dBm @ MCS7NSS2	
		• -65 dBm @ MCS8NSS2	• -63 dBm @ MCS8NSS2	
		• -63 dBm @ MCS9NSS2	• -60 dBm @ MCS9NSS2	

4.4 Standards Compliance

Safety standards

- UL 60950–1
- IEC 60950–1
- EN 60950–1
- GB 4943

Radio standards

- ETSI EN 300 328
- ETSI EN 301 893
- FCC Part 15C: 15.247
- FCC Part 15C: 15.407
- RSS-210
- AS/NZS 4268

EMC standards

- EN 301 489–1
- EN 301 489–17
- ETSI EN 60601-1-2
- FCC Part 15
- ICES-003
- YD/T 1312.2-2004
- ITU k.21
- GB 9254
- GB 17625.1
- EN 55022
- EN 55024
- CISPR 22
- CISPR 24
- IEC61000-4-6
- IEC61000-4-2

IEEE standards

- IEEE 802.11a/b/g
- IEEE 802.11n
- IEEE 802.11ac
- IEEE 802.11h
- IEEE 802.11d
- IEEE 802.11e

Security Standards

- 802.11i, Wi-Fi Protected Access 2 (WPA2), and WPA
- 802.1X
- Advanced Encryption Standards (AES) and Temporal Key Integrity Protocol (TKIP)
- EAP Type (s)

Environment Standards

- ETSI 300 019-2-1
- ETSI 300 019-2-2

- ETSI 300 019-2-3
- ETSI 300 019-1-1
- ETSI 300 019-1-2
- ETSI 300 019-1-3

EMF

- CENELEC EN 62311
- CENELEC EN 50385
- RSS-102
- FCC Part1&2
- FCC KDB

RoHS

- Directive 2002/95/EC & 2011/65/EU

Reach

- Regulation 1907/2006/EC

WEEE

- Directive 2002/96/EC & 2012/19/EU

FCC Statement

- 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 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 technician for help.

FCC Radiation Exposure Statement

- This device complies with FCC radiation exposure limits set forth for an uncontrolled environment and it also complies with Part 15 of the FCC RF Rules. This equipment must be installed and operated in accordance with provided instructions and the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 25 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. End-users and installers must be provide with antenna installation instructions and consider removing the no-collocation statement.

  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.

Caution!

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