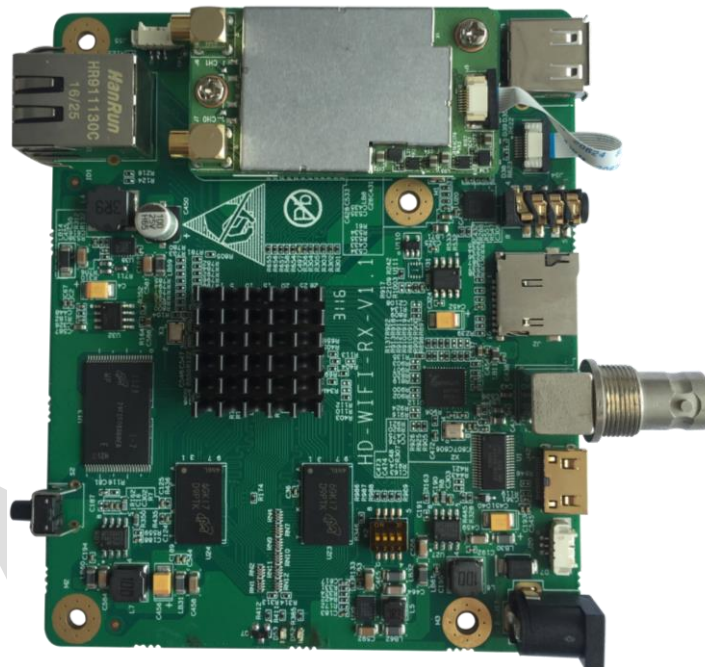


RAK567 Video HDMI Output

Datasheet V1.6



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1 Overview

1.1 Module overview

RAK567 supports IEEE802.11a/b/g/n wireless protocol ,it is an intelligent image transmission module which support the CVBS,WIFI,HDMI,USB and SDI video output.It has small foot print and the easy using feature. The Module support the H.264 codec and the sound processor and it is specially designed for accelerating video/audio streaming performance with 300Mbps data rate WIFI module . To fast the evaluation, the user can get the demo Apps on Android, iPhone and HDMI,CVBS,SDI input equipment to complete the play and display of audio and video. RAK567 integrates the high-speed serial port to use for transparent data interaction.

RAK567 integrates the WIFI Module ,which support IEEE 802.11a/b/g/n 2x2 MIMO.The data rate is up to 300Mbps and it have 22dbm TX power.The module support the remote image transmission.

1.2 Application Field

- Air vehicle
- Smart Robot
- Underwater Robot
- Oceanographers
- Building Automation
- Logistics and freight management
- Family safety and automation
- Safety Inspection

1.3 Product Features

- Powerful WIFI
 - Support IEEE 802.11a/b/g/n protocol
 - TX Power \leq 22dBm
 - Soft AP Mode
 - 2x2 300M PHY Rate
 - support Infra/Soft AP network type
 - support multiple security authentication mechanism: WEP64/WEP128/ TKIP/CCMP (AES) /

WEP/WPA-PSK/WPA2-PSK

- supporting many network protocol: TCP/UDP/ICMP/DHCP/DNS/HTTP

● Efficient Video Encode

- Support Encode Frame 1 fps~60fps
- Support 2x1080p Real time video input
- Support 4x720P Real time video input
- Support H.264 video encode
- Support AAC-LC audio input

● Efficient Video Decode

- Up to 6x720p video Real time decode
- Up to 3x1080p video Real time decode
- HDMI output up to 1080P@60fps
- 1 x GMAC Interface, Up to 1000M Full Duplex
- Support HDMI 1080P@60fps+CVBS output
- Support 1080P@60FPS SDI Video output
- Support H.264 video decode

● Video Input interface

- RTSP steam input via WIFI channel
- Support multichannel 1080P/720P/D1 H.264 video steam input
- High-speed UART serial port input for data

● Extensions Function

- Hardware encryption algorithm with AES/DES/3DES
- Digital watermarking
- Support add watermarking before decode up to 8 sector.
- Support I2S, UART, I2C, GPIO interface

● Module Size

120mm*100mm

1.4 Parameters

Parameters	Description	
Video Output	HDMI Output	1080P(1920*1080) @60FPS, 1080P(1920*1080) @30FPS, 720P(1280*720) @60FPS, 720P(1280*720) @30FPS;
	Ethernet output	1080P(1920*1080) @30FPS, 720P(1280*720) @30FPS;
	CVBS Output	640*480@30FPS;
	WIFI Output	1080P(1920*1080) @30FPS, 720P(1280*720) @30FPS;
	SDI Output *	1080P(1920*1080) @60FPS, 1080P(1920*1080) @30FPS, 720P(1280*720) @60FPS, 720P(1280*720) @30FPS;
HDMI version	HDMI 1.4a	
Audio Input	Audio sample rate only support 48KHz.	
Video Input	Support mutlichannel steam input with High TX power wifi.	
Video Delay	IOS phone: 200-300ms. Android Phone:about 300ms.HDMI Output: 150-200ms.	
RTMP stream	Support to push RTMP stream to cloud server with audio and video	
Transmission distance	600m -1000m	
Baud rate	115200bps (default) for transparent transmission, customers can modify it by command	
Wireless parameters	5.8GWIFI, support Infra/Soft AP network type	
Power Supply	9-23V power supply, the max current :500mA(Typical Power Value:12V);	
Platform	Linux-3.x + ARM Cortex A9	

* : Under development or Customization for customer .

2 Hardware Overview

2.1 Module overview

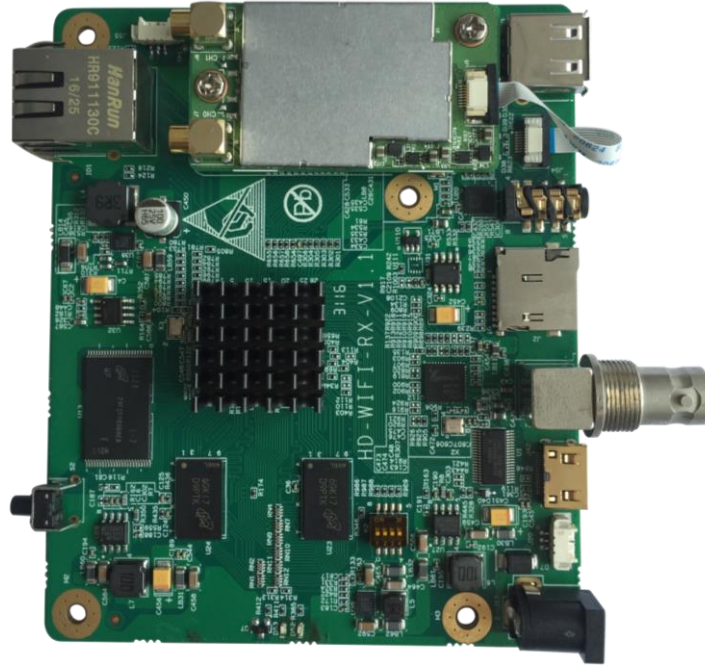


Figure 2-1 RAK567 Top view

2.2 Module size



图2-3 模块平面尺寸图

2.3 Interface

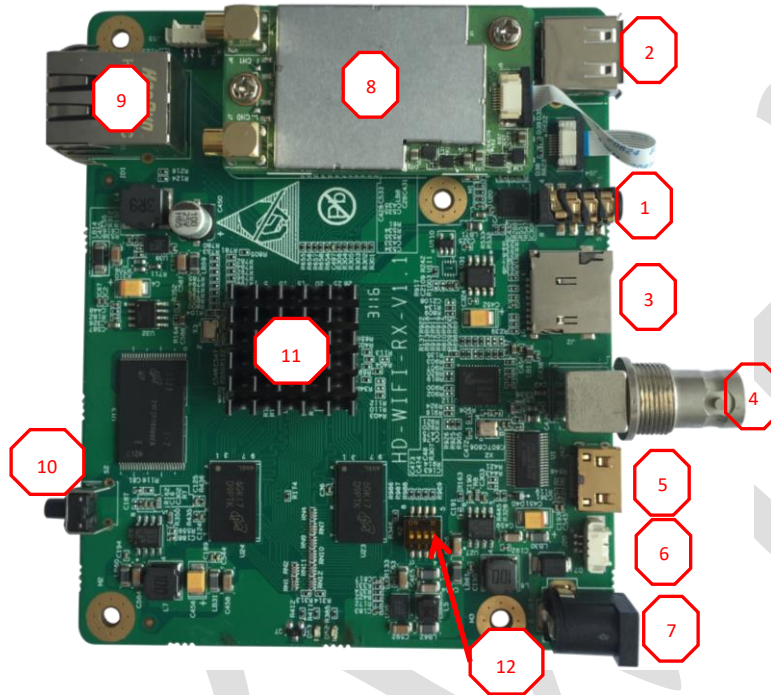


Figure2-4 Hardware Interface

Label	Name	Description	Note
1	CVBS	CVBS output interface	HDMI and WIFI output work at the same time
2	USB	USB output interface (developing)	developing
3	TF card	TFcard .	
4	SDI	Suopport 3G-SDI video output (developing)	
5	Mini-HDMI	Support high definition vedio HDMI output	CVBS work with WIFI output at the same time
6	UART	High speed UART transparent transmission	Default Bound rate 115200.
7	DC power	9-24V DC power supply	
8	WIFI module	5.8G high-power WIFI module, double antenna	Highest Transmit power:23dB
9	Ethernet	1000M full-duplex Ethernet Interface	
10	Button	Functional button, WPS Configuration、restore factory etc.	If you press it more than 3s and less than 5s , the module will run into WPS mode . If you press more than 5s ,the module will reset to the factory mode .
11	CPU	CPU	
12	DIP switch	Function selector switch, exchange channel	

3 Radio Feature

Item	Key specifications		
Chip	○ QCA AR9375		
TX/RX	○ 2T2R		
Frequency range	○ USA: 2.400 ~ 2.483GHz, 5.15 ~ 5.25GHz, 5.725 ~ 5.85GHz ○ Europe: 2.400 ~ 2.483GHz, 5.15 ~ 5.25GHz ○ Japan: 2.400 ~ 2.497GHz, 5.15 ~ 5.25GHz,		
Modulation technique	○ 802.11 Legacy a/b/g DSSS (DBPSK, DQPSK, CCK) OFDM (BPSK, QPSK, 16-QAM, 64-QAM) DSSS (Direct Sequence Spread Spectrum) with DBPSK (Differential Binary Phase Shift Keying 1Mbps), DQPSK (Differential Quaternary Phase Shift Keying 2Mbps), and CCK (Complementary Code Keying 5.5&11Mbps), and OFDM (Orthogonal Frequency Division Multiplexing with BPSK for 6,9Mbps for 12,18Mbps 16QAM for 24,36Mbps 64QAM for 48,54Mbps)		
Host interface	○ 802.11n a/g ○ USB 2.0		
Channels support	○ 802.11n b/g US/Canada: 11 (1 ~ 11) Major European country: 13 (1 ~ 13) France: 4 (10 ~ 13) Japan: 11b: 14 (1~13 or 14 th), 11g: 13 (1 ~ 13) ○ 802.11n a 1). US/Canada: channels (36,40,44,48,52, 149,153,157,161,165) 2). Europe: channel (36,40,44,48,52) 3). Japan: channels (36,40,44,48,52)		
Operation voltage	○ 5V +/- 5%		
Power consumption @25 °C	802.11ng MCS8(40MHz)	802.11na MCS8(40MHz)	
	(mA)	Avg	Avg
	5V	350	756

<div>Output Power</div> <div>(Typical-for each chain; with ±2dB tolerance).</div> <div>This power table bases on the maximum HW capability complying with IEEE spec regardless the regulatory limitation</div>	○ 802.11a							
	Test Frequencies	6-24_Target	36_Target	48_Target	54_Target			
	5180	21	20	19	17			
	5320	21	20	19	17			
	5500	21	20	19	17			
	5600	21	20	19	17			
	5700	21	20	19	17			
	5825	21	20	19	17			
	○ 802.11b							
	Test Frequencies	1/2_Target	5.5_Target	11_Target				
	2412	16	16	16				
	2437	16	16	16				
	2472	16	16	16				
	○ 802.11g							
	Test Frequencies	6-24_Target	36_Target	48_Target	54_Target			
	2412	16	16	15	14			
	2437	16	16	15	14			
	2472	16	16	15	14			
	○ 802.11n							
Freq. Range: HT20								
Test Freq	MCS 0/8	MCS 1/9	MCS 2/10	MCS 3/11	MCS 4/12	MCS 5/13	MCS 6/14	MCS 7/15
5180	21	21	21	21	20	20	19	17
5240	21	21	21	21	20	20	19	17
5320	21	21	21	21	20	20	19	17
5500	21	21	21	21	20	20	19	17
5700	21	21	21	21	20	20	19	17
5745	21	21	21	21	20	20	19	17
5825	21	21	21	21	20	20	19	17
Freq. Range: HT40								
Test Freq	MCS 0/8	MCS 1/9	MCS 2/10	MCS 3/11	MCS 4/12	MCS 5/13	MCS 6/14	MCS 7/15
5190	21	21	21	21	20	20	19	17
5230	21	21	21	21	20	20	19	17
5310	21	21	21	21	20	20	19	17
5510	21	21	21	21	20	20	19	17
5670	21	21	21	21	20	20	19	17
5755	21	21	21	21	20	20	19	17
5795	21	21	21	21	20	20	19	17
Freq. Range: HT20								
Test Freq	MCS 0/8	MCS 1/9	MCS 2/10	MCS 3/11	MCS 4/12	MCS 5/13	MCS 6/14	MCS 7/15
2412	16	16	16	16	15	15	14	14
2437	16	16	16	16	15	15	14	14
2472	16	16	16	16	15	15	14	14
Freq. Range: HT40								
Test Freq	MCS 0/8	MCS 1/9	MCS 2/10	MCS 3/11	MCS 4/12	MCS 5/13	MCS 6/14	MCS 7/15
2412	16	16	16	16	15	15	14	14
2437	16	16	16	16	15	15	14	14
2472	16	16	16	16	15	15	14	14

EVM

The transmit modulation accuracy is measured using error vector magnitude (EVM). EVM is the magnitude of the phase difference as a function of time between an ideal reference signal and the measured transmitted signal.

802.11a

Modulation	Code Rate	Relative constellation error (dB) IEEE Spec (1Tx dB)	Relative constellation error (dB) Typical (1Tx dB)
BPSK	1/2	-5	-25
BPSK	3/4	-8	-25
QPSK	1/2	-10	-25
QPSK	3/4	-13	-25
16-QAM	1/2	-16	-25
16-QAM	3/4	-19	-28
64-QAM	2/3	-22	-30
64-QAM	3/4	-25	-31

802.11b

Modulation	Code Rate	Relative constellation error (dB) IEEE Spec (1Tx dB)	Relative constellation error (dB) Typical (1Tx dB)
DBPSK		-10	-28
DQPSK		-10	-28
CCK		-10	-28

802.11g

Modulation	Code Rate	Relative constellation error (dB) IEEE Spec (1Tx dB)	Relative constellation error (dB) Typical (1Tx dB)
BPSK	1/2	-5	-28
BPSK	3/4	-8	-28
QPSK	1/2	-10	-28
QPSK	3/4	-13	-28
16-QAM	1/2	-16	-28
16-QAM	3/4	-19	-29
64-QAM	2/3	-22	-29
64-QAM	3/4	-25	-29

802.11ng

Modulation	Code Rate	Relative constellation error (dB) IEEE Spec (1Tx dB)	Relative constellation error (dB) Typical (1Tx dB)
HT20			
(MCS0)	BPSK 1/2	-5	-25
(MCS1)	QPSK 1/2	-10	-26
(MCS2)	QPSK 3/4	-13	-26
(MCS3)	16-QAM 1/2	-16	-26
(MCS4)	16-QAM 3/4	-19	-29
(MCS5)	64-QAM 2/3	-22	-30
(MCS6)	64-QAM 3/4	-25	-30
(MCS7)	64-QAM 5/6	-27	-31
(MCS8)	BPSK 1/2	-5	-25
(MCS9)	QPSK 1/2	-10	-26
(MCS10)	QPSK 3/4	-13	-26

EVM	(MCS11)	16-QAM	1/2	-16	-26
	(MCS12)	16-QAM	3/4	-19	-29
	(MCS13)	64-QAM	2/3	-22	-30
	(MCS14)	64-QAM	3/4	-25	-30
	(MCS15)	64-QAM	5/6	-27	-31
	HT40				
	(MCS0)	BPSK	1/2	-5	-26
	(MCS1)	QPSK	1/2	-10	-27
	(MCS2)	QPSK	3/4	-13	-27
	(MCS3)	16-QAM	1/2	-16	-27
	(MCS4)	16-QAM	3/4	-19	-29
	(MCS5)	64-QAM	2/3	-22	-30
	(MCS6)	64-QAM	3/4	-25	-30
	(MCS7)	64-QAM	5/6	-27	-31
	(MCS8)	BPSK	1/2	-5	-26
	(MCS9)	QPSK	1/2	-10	-27
	(MCS10)	QPSK	3/4	-13	-27
	(MCS11)	16-QAM	1/2	-16	-27
	(MCS12)	16-QAM	3/4	-19	-29
	(MCS13)	64-QAM	2/3	-22	-30
	(MCS14)	64-QAM	3/4	-25	-30
	(MCS15)	64-QAM	5/6	-27	-31
	○ 802.11na				
	Modulation		Code Rate	Relative constellation error (dB)	Relative constellation error (dB)
				IEEE Spec (1Tx dB)	Typical (1Tx dB)
	HT20				
	(MCS0)	BPSK	1/2	-5	-25
	(MCS1)	QPSK	1/2	-10	-26
	(MCS2)	QPSK	3/4	-13	-26
	(MCS3)	16-QAM	1/2	-16	-26
	(MCS4)	16-QAM	3/4	-19	-29
	(MCS5)	64-QAM	2/3	-22	-30
	(MCS6)	64-QAM	3/4	-25	-30
	(MCS7)	64-QAM	5/6	-27	-31
	(MCS8)	BPSK	1/2	-5	-25
	(MCS9)	QPSK	1/2	-10	-26
	(MCS10)	QPSK	3/4	-13	-26
	(MCS11)	16-QAM	1/2	-16	-26
	(MCS12)	16-QAM	3/4	-19	-29
	(MCS13)	64-QAM	2/3	-22	-30
	(MCS14)	64-QAM	3/4	-25	-30
	(MCS15)	64-QAM	5/6	-27	-31
	HT40				
	(MCS0)	BPSK	1/2	-5	-26
	(MCS1)	QPSK	1/2	-10	-27
	(MCS2)	QPSK	3/4	-13	-27
	(MCS3)	16-QAM	1/2	-16	-27
	(MCS4)	16-QAM	3/4	-19	-29
	(MCS5)	64-QAM	2/3	-22	-30
	(MCS6)	64-QAM	3/4	-25	-30
	(MCS7)	64-QAM	5/6	-27	-31
	(MCS8)	BPSK	1/2	-5	-26
	(MCS9)	QPSK	1/2	-10	-27
	(MCS10)	QPSK	3/4	-13	-27

	(MCS11) 16-QAM 1/2	-16	-27
	(MCS12) 16-QAM 3/4	-19	-29
	(MCS13) 64-QAM 2/3	-22	-30
	(MCS14) 64-QAM 3/4	-25	-30
	(MCS15) 64-QAM 5/6	-27	-31
Sensitivity (1RX with +4/-2dB tolerance, dBm)	○ 802.11a		
	Modulation	Code Rate	IEEE Spec (1Rx dBm) Typical (1Rx dBm)
	BPSK	1/2	-82 -88
	BPSK	3/4	-81 -86
	QPSK	1/2	-79 -85
	QPSK	3/4	-77 -83
	16-QAM	1/2	-74 -79
	16-QAM	3/4	-70 -77
	64-QAM	2/3	-66 -73
	64-QAM	3/4	-65 -70
	○ 802.11b		
	Modulation	IEEE Spec (1Rx dBm)	Typical (1Rx dBm)
	DBPSK	not specified	-93
	DQPSK	not specified	-91
	CCK	not specified	-87
	○ 802.11g		
	Modulation	Code Rate	IEEE Spec (1Rx dBm) Typical (1Rx dBm)
	BPSK	1/2	-82 -93
	BPSK	3/4	-81 -91
	QPSK	1/2	-79 -89
	QPSK	3/4	-77 -86
	16-QAM	1/2	-74 -83
	16-QAM	3/4	-70 -80
	64-QAM	2/3	-66 -75
	64-QAM	3/4	-65 -70
	○ 802.11ng		
	Modulation	Code Rate	IEEE Spec (1Rx dBm) Typical (1Rx dBm)
	HT20		
	(MCS0) BPSK	1/2	-82 -90
	(MCS1) QPSK	1/2	-79 -87
	(MCS2) QPSK	3/4	-77 -86
	(MCS3) 16-QAM	1/2	-74 -84
	(MCS4) 16-QAM	3/4	-70 -80
	(MCS5) 64-QAM	2/3	-66 -77
	(MCS6) 64-QAM	3/4	-65 -72
	(MCS7) 64-QAM	5/6	-64 -67
	HT40		
	(MCS0) BPSK	1/2	-79 -88
	(MCS1) QPSK	1/2	-76 -86
	(MCS2) QPSK	3/4	-74 -84
	(MCS3) 16-QAM	1/2	-71 -80
	(MCS4) 16-QAM	3/4	-67 -78
	(MCS5) 64-QAM	2/3	-63 -73
	(MCS6) 64-QAM	3/4	-62 -70
	(MCS7) 64-QAM	5/6	-61 -64

	○ 802.11na			
	HT20	Modulation	Code Rate	IEEE Spec (1Rx dBm)
	(MCS0) BPSK	1/2	-82	-89
	(MCS1) QPSK	1/2	-79	-87
	(MCS2) QPSK	3/4	-77	-84
	(MCS3) 16-QAM	1/2	-74	-80
	(MCS4) 16-QAM	3/4	-70	-77
	(MCS5) 64-QAM	2/3	-66	-72
Sensitivity (1RX with +4/-2dB tolerance, dBm)	(MCS6) 64-QAM	3/4	-65	-71
	(MCS7) 64-QAM	5/6	-64	-67
	HT40			
	(MCS0) BPSK	1/2	-79	-84
	(MCS1) QPSK	1/2	-76	-81
	(MCS2) QPSK	3/4	-74	-79
	(MCS3) 16-QAM	1/2	-71	-76
	(MCS4) 16-QAM	3/4	-67	-72
	(MCS5) 64-QAM	2/3	-63	-70
	(MCS6) 64-QAM	3/4	-62	-67
(MCS7) 64-QAM	5/6	-61	-64	
Transmit spectrum mask	⌚ For transmitted spectral mask for 11a shall be less than -40dBr for $f_c-30\text{MHz}<f<f_c+30\text{MHz}$. ⌚ For transmitted spectral mask for 11b shall be less than -50dBr for $f_c-22\text{MHz}<f<f_c+22\text{MHz}$. ⌚ For transmitted spectral mask for 11g shall be less than -40dBr for $f_c-30\text{MHz}<f<f_c+30\text{MHz}$. ⌚ For transmitted spectral mask for 11n 20MHz shall be less than -45dBr for $f_c-30\text{MHz}<f<f_c+30\text{MHz}$. ⌚ For transmitted spectral mask for 11n 40MHz shall be less than -45dBr for $f_c-60\text{MHz}<f<f_c+60\text{MHz}$.			
Transmit spectrum flatness	⌚ For 802.11a/g the average energy of the constellations in each of spectral lines -16..-1 and +1..+16 will deviate no more than +/- 2dB from their average energy. For 802.11n 40MHz mode, the average energy of the constellations in each of spectral lines -42..-2 and +2..+42 will deviate no more than +/- 2dB from their average energy. ⌚ The transmitted spectral flatness should be with in +/- 4dB.			
Transmit center frequency tolerance	⌚ The transmitted center frequency tolerance shall be ±20 ppm maximum.			
Receiver maximum input level	Modulation	Code Rate	IEEE Spec (1Rx dBm)	
			>-30	
	⌚ 802.11b			
	Modulation		IEEE Spec (1Rx dBm)	
	DBPSK		>-10	
	DQPSK		>-10	
	CCK		>-10	
	⌚ 802.11g			
	Modulation	Code Rate	IEEE Spec (1Rx dBm)	
			>-20	

	<p>⌚ 802.11na Modulation Code Rate IEEE Spec (1Rx dBm) >-30</p> <p>⌚ 802.11ng Modulation Code Rate IEEE Spec (1Rx dBm) >-20</p>
Transfer data rate	<p>⌚ 802.11a: 6, 9, 12, 18, 24, 36, 48, 54Mbps ⌚ 802.11b: 1, 2, 5.5, 11Mbps ⌚ 802.11g: 6, 9, 12, 18, 24, 36, 48, 54Mbps ⌚ 802.11n: @800GI(400GI) z 20MHz BW 1 Nss: 65(72.2) Mbps maximal 2 Nss: 130(144.444) Mbps maximal z 40MHz BW 1 Nss: 135(150) Mbps maximal 2 Nss: 270(300) Mbps maximal</p>

4 Electrical Characteristics

4.1 Absolute maximum

The table below gives the absolute maximum value, exceed the maximum range may make the module device damaged. In order to avoid the modules and devices damaged please operate under specified conditions.

Table 4-1: parameter and range

parameters	Symbol	value	uint
The external power supply voltage	VDD	9~25	V
IO maximum input voltage	3V3V _{in} IOMax	3.6	V
IO minimum input voltage	3V3V _{in} IOMin	-0.3	V
Storage temperature	T _{store}	-40~+125	°C
Operation temperature	T _{oper}	-20~+85	°C

4.2 Recommended operating parameters

Figure 4-2 Power supply range

parameters	Symbol	minimum	Typical values	maximum	unit
Power supply	VDD	9.0	12.0	25.0	V

5 Order Information

Table 5-1: Product Models

PART NO.	Description	Volume/tray	MPQ
RAK567	Image transmission,plug and play,AP Mode	12PCS/tray	60PCS

6 Sales and Technical Support

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7 Revision&History

Revision	Update	Date
V1.0	Modify the document Format.	2016-06-09
V1.1	Fix some bug in the document .	2016-07-09
V1.2	1, Update the module size . 2, Add Ethernet interface video output and RTMP stream.	2016-08-20
V1.3	1, Delete the USB video function.	2016-10-20
V1.4	1, Delete the TF card error description.	2016-10-31
V1.5	Update sales and Technical Support.	2016-11-10
V1.6	Update the audio parameters.	2017-2-28