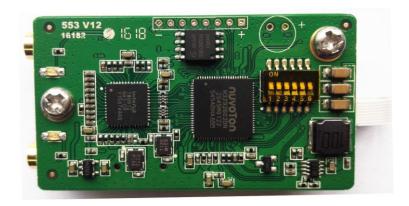


RAK553 Image Transmission Module

Specification V2.6



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Contents

1 Overview	1
1.1 Module overview	1
1.2 Application Field	
1.3 Product Features	
1.4 Specifications	
2 Hardware Overview	3
2 Hardware Overview	3
2.2 Module size	3
2.3 Location hole map	3
2.4 Pin definition	
2.4 LED State	
2.5 Dip switch definition	
3 RF Characteristic	
4 Electrical Characteristics	
4.1 Absolute maximum	
4.2 Recommended operating parameters	
5 Order Information	
6 Sales and Technical Support	
7 Povicion & Lictory	14



1 Overview

1.1 Module overview

RAK553 supports IEEE802.111a/b/g/n wireless protocol and is an ultra-low power consumption intelligent image transmission module which support the CVBS input.It has small foot print and the easy using feature. The Module support the H.264 codec,the sound processor and is specially designed for accelerating video/audio streaming performance. To fast the evaluation, the user can get the demo Apps on Android, iPhone and other equipment to complete the play and display of audio and video. RAK553 integrates the high-speed serial port to use for transparent in interaction.

RAK553 integrates the WIFI Module ,which support IEEE 802.11a/b/g/n 2x2 MIMO.The module support the remote image transmission.

1.2 Application Field

- Air vehicle
- Smart toys
- 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 $\leq 22 \text{dBm}$
- 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 processing

- support H.264/CIF/VGA/QVGA MJPG Stream
- ➤ Continuous/Static JPEG/RTP Stream
- Supports up to the 720p @ 25fps video resolution



- Pure Hardware engine
- Merged MJPG + MP3 Stream
- ➤ Separate MJPG + MP3 Stream
- ➤ Separate H.264 + PCMA Stream
- Input Interface
 - > 1 UART for transparent and 1 high- speed UART
 - > MIC Interface for audio
 - Video input Interface
- Module size

55mm*30mm*16.3(±0.2)mm (DIP LED)

55mm*30mm*13.1(±0.2)mm (Without LED)

1.4 Specifications

Parameters	Description
	VGA(640*480) 30FPS
Video	MJPEG /H.264Format
	Powerful hard-coding technique
	Work with RAK554(receiver):Effective distance: 1000m; Smooth video
Transmission distance	transmission: 500m.
	Only RAK553:Effective distance: 180m; Smooth video transmission: 100m.
Size	55mm*30mm*16.3(±0.2)mm (DIP LED)
Size	55mm*30mm*13.1(±0.2)mm (Without LED)
Baud rate	115200bps (default) for transparent transmission, customers can modify it by
Baud fate	command
Wireless parameters	Support IEEE 802.11a/b/g/n protocol,and Infra / Soft AP network;
wheless parameters	Support Soft AP connect.
	Power supply:7.0V~~24V;Operation current :150mA(Typical Power Value: 12V);
power	Wifi Peak current :300mA(Typical Power Value: 12V)
CPU	ARM926EJ-S
Operating system	Linux-2.6.35.5



2 Hardware Overview

2.1 Modules view





Figure 2-1 RAK553 module Top view

Figure 2-2 RAK553 module Bottom view

2.2 Module size

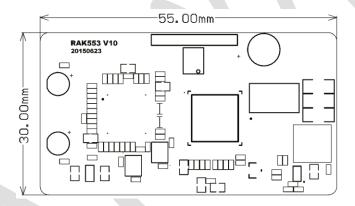
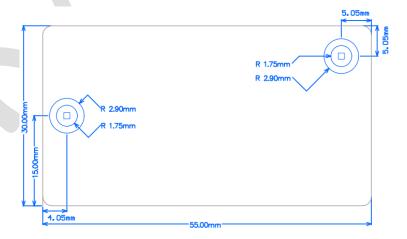


Figure 2-3 RAK553 Plane size

2.3 Location hole map





2.4 Pin definition

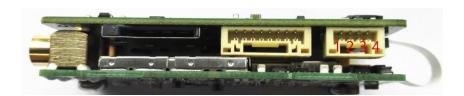


Figure 2-4 power supply

Pin	Name	Description	Remark
1	VDDIN	12V VCC	12V power input
2	VDDIN	12V VCC	12V power input
3	GND	GND	GND
4	GND	GND	GND



Figure 2-5 high-speed UART & Audio & video input interface

Pin	Name	Description	Remark
1	NC	Reserved	I/O
2	NC	Reserved	I/O
3	HUR_TXD	High-speed UART TXD	О
4	HUR_RXD	High-speed UART RXD	I
5	LINE_IN	LINE INPUT	I
6	AV_IN	PAL/NTSC Video Input	I
7	GND	GND	P
8	VCC12V	12V VCC	P

2.4 LED State



Note: LED will be changed by the demands of final customers.



2.5 Dip switch definition





There are 6 group Dial-up in the module . ON direction is showing low-level ,marked as 0.

When The Dial-up is on the opposite direction, that is showing high-level, marked as 1.

The dial-up flag order is 1-6,marked as sw1-6.

The function definition is followed:

Sw6	Sw5	Band	Channel	Central Frequency
1	1	Band4	149	5745
1	0	Band1	48	5240
0	1	Band1	36	5180
0	0	Band4	165	5825

The default band is Band4. That is to say channel 149. If you are localing on china or Taiwan, you'd better set he channel to Band4 any channel.

Sw1 is using for WPS function . If you want to use this function , you need do the following steps.

- 1) Whatever the SW1 level , set SW1 into low-level more than 3 second .
- 2) Then Set SW2 into high-level.
- 3) The Wifi light will blink.that is showing you have step into the WPS mode.



3 RF Characteristic

Item	Key specifications
Chip	O QCA AR9375
TX/RX	O 2T2R
Frequency	O USA: 2.400 ~ 2.483GHz, 5.15 ~ 5.25GHz, 5.725 ~ 5.85GHz
range	O Europe: 2.400 ~ 2.483GHz, 5.15 ~ 5.25GHz
range	O Japan: 2.400 ~ 2.497GHz, 5.15 ~ 5.25GHz,
	O 802.11 Legacy a/b/g
	DSSS (DBPSK, DQPSK, CCK)
	OFDM (BPSK, QPSK, 16-QAM, 64-QAM)
	DSSS (Direct Sequence Spread Spectrum) with
Modulation	DBPSK (Differential Binary Phase Shift Keying 1Mbps),
technique	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 QPSK
	for 12,18Mbps 16QAM for 24,36Mbps 64QAM
	for 48,54Mbps)
	O 802.11n a/g
Host interface	O USB 2.0
	O 802.11n b/g
	US/Canada: 11 (1 ~ 11)
	Major European country: 13 (1 ~ 13)
Channels	France: 4 (10 ~ 13)
support	Japan: 11b: 14 (1~13 or 14 th), 11g: 13 (1 ~ 13)
	O 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	O 5V +/- 5%
Power	802.11ng MCS8(40MHz) 802.11na MCS8(40MHz)
consumption	(mA) Avg Avg
@25 °C	5V 350 756
@25 C	7,00



The simplest, the		11.							
		.11a		(3.4 FF :	26 E	40.75	, -	• 4 m	
	[Test Frequence	cies (5-24_Target	36_Targ		_	54_Target	
		5180		21	20		19	17	
Output Power		5320		21	20		19	17	
_		5500		21	20		19	17	
(Typical-for		5600		21	20		19	17	
each chain;		5700		21	20		19	17	
with ±2dB		5825		21	20	-	19	17	
tolerance).		441							
This power		.11b							
_	[7	Test Frequenc	cies 1	l/2_Target	5.5_Targ		get		
table bases on		2412		16	16	16			
the maximum		2437		16	16	16			
HW capability		2472		16	16	16			
complying									
with IEEE		.11g							
spec	[7	Test Frequenc	cies (6-24_Target	36_Targ	get 48_Tar	get 5	54_Target	
regardless the		2412		16	16	15		14	
regulatory		2437		16	16	15		14	
limitation		2472		16	16	15		14	
]								
	O 802	.11n							
	Freq. R	ange: HT20							
			MCS 1/	9 MCS 2/10	MCS 3/11	MCS 4/12 M	ICS 5/13	MCS 6/14	MCS 7/15
	5180		21	21	21	20	20	19	17
	5240		21	21	21	20	20	19	17
	5320		21	21	21	20	20	19	17
	5500		21	21	21	20	20	19	17
	5700		21	21	21	20	20	19	17
	5745		21	21	21	20	20	19	17
	5825		21	21	21	20	20	19	17
							_~		- <i>-</i>
	Frea. R	ange: HT40							
			MCS 1/	9 MCS 2/10	MCS 3/11	MCS 4/12 M	ICS 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
	3175	21		21	21	20	20	17	17
	Freg. R	ange: HT20							
	_		MCS 1/	9 MCS 2/10	MCS 3/11	MCS 4/12 M	CS 5/13	MCS 6/14	MCS 7/15
	2412	16	16	16	16	15	15	14	14
	2437	16	16	16 16	16	15	15	14	14
	2472	16	16	16	16	15	15 15	14	14
	27,2	10	10	10	10	13	13	17	17
	Frea R	ange: HT40							
	Teet Fr	rea MCS n/s	MCS 1	9 MCS 2/10	MCS 3/11	MCS 4/12 M	CS 5/13	MCS 6/14	MCS 7/15
	2412		16	9 MCS 2/10 16	16	15	15	14	14
	2412		16 16	16 16	16 16	15 15	15 15	14 14	14 14
	2437		16 16	16 16	16 16	15 15	15 15	14 14	14 14
	24/2	10	10	10	10	13	13	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

G		phase difference as a function of tin ared transmitted signal.	
O 802.11a Modulation	Code Rate	Relative constellation error (dB) IEEE Spec (1Tx dB)	Relative constellation error (dE 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		-16	-25
16-QAM		-19	-28
64-QAM	2/3	-22	-30
64-QAM	3/4	-25	-31
S 802.11b			
Modulation	Code Rate	Relative constellation error (dB)	Relative constellation error (dl
		IEEE Spec (1Tx dB)	Typical (1Tx dB)
DBPSK		-10	-28
DQPSK		-10	-28
CCK		-10	-28
O 802.11g			
Modulation	Code Rate	Relative constellation error (dB)	Relative constellation error (dI
		IEEE Spec (1Tx 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 I	Relative constellation error (dB)	Relative constellation error (
HT20		IEEE Spec (1Tx dB)	Typical (1Tx dB)
	PSK 1/2	-5	-25
(2.200)	DOIZ 1/2	- 10	

HT20			IEEE Spec (ITx dB)	Typical (TTx dB)
(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



The simplest, t	ne best				
	(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
	, ,	64-QAM		-27	-31
	(MCS13)	04-QAM	3/0	-27	-31
	HT40				
	(MCS0)	BPSK	1/2	-5	-26
	(MCS1)		1/2	-10	-27
		•			
	(MCS2)	-	3/4	-13	-27
	(MCS3)	16-QAM		-16	-27
	(MCS4)	16-QAM		-19	-29
	(MCS5)	64-QAM		-22	-30
	(MCS6)	64-QAM		-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
		16-QAM		-19	-29
	` '	64-QAM		-22	-30
	,	64-QAM		-25	-30
	l `	_			
	(MCS15)	64-QAM	5/6	-27	-31
	O 802.11na	•			
EVM			Data 1	Polativa constallation arror (dR)	Relative constellation error (dB)
E V IVI	Modulatio	on Coue N	tate 1		` '
	НТ20			IEEE Spec (1Tx dB)	Typical (1Tx dB)
	(MCS0)	BPSK	1/2	5	25
				-5	-25 26
	(MCS1)	QPSK	1/2	-10	-26
	(MCS1) (MCS2)	QPSK QPSK	1/2 3/4	-10 -13	-26 -26
	(MCS1) (MCS2) (MCS3)	QPSK QPSK 16-QAM	1/2 3/4 1/2	-10 -13 -16	-26 -26 -26
	(MCS1) (MCS2) (MCS3) (MCS4)	QPSK QPSK 16-QAM 16-QAM	1/2 3/4 1/2 3/4	-10 -13 -16 -19	-26 -26 -26 -29
	(MCS1) (MCS2) (MCS3) (MCS4) (MCS5)	QPSK QPSK 16-QAM 16-QAM 64-QAM	1/2 3/4 1/2 3/4 2/3	-10 -13 -16 -19 -22	-26 -26 -26 -29 -30
	(MCS1) (MCS2) (MCS3) (MCS4) (MCS5) (MCS6)	QPSK QPSK 16-QAM 16-QAM 64-QAM	1/2 3/4 1/2 3/4 2/3 3/4	-10 -13 -16 -19 -22 -25	-26 -26 -26 -29 -30
	(MCS1) (MCS2) (MCS3) (MCS4) (MCS5) (MCS6) (MCS7)	QPSK QPSK 16-QAM 16-QAM 64-QAM 64-QAM	1/2 3/4 1/2 3/4 2/3 3/4 5/6	-10 -13 -16 -19 -22 -25 -27	-26 -26 -26 -29 -30 -30
	(MCS1) (MCS2) (MCS3) (MCS4) (MCS5) (MCS6) (MCS7) (MCS8)	QPSK QPSK 16-QAM 16-QAM 64-QAM 64-QAM BPSK	1/2 3/4 1/2 3/4 2/3 3/4 5/6 1/2	-10 -13 -16 -19 -22 -25 -27 -5	-26 -26 -26 -29 -30 -31 -25
	(MCS1) (MCS2) (MCS3) (MCS4) (MCS5) (MCS6) (MCS7)	QPSK QPSK 16-QAM 16-QAM 64-QAM 64-QAM BPSK	1/2 3/4 1/2 3/4 2/3 3/4 5/6	-10 -13 -16 -19 -22 -25 -27	-26 -26 -26 -29 -30 -30
	(MCS1) (MCS2) (MCS3) (MCS4) (MCS5) (MCS6) (MCS7) (MCS8) (MCS9)	QPSK QPSK 16-QAM 16-QAM 64-QAM 64-QAM BPSK QPSK	1/2 3/4 1/2 3/4 2/3 3/4 5/6 1/2 1/2	-10 -13 -16 -19 -22 -25 -27 -5 -10	-26 -26 -26 -29 -30 -30 -31 -25 -26
	(MCS1) (MCS2) (MCS3) (MCS4) (MCS5) (MCS6) (MCS7) (MCS8) (MCS9) (MCS10)	QPSK QPSK 16-QAM 16-QAM 64-QAM 64-QAM BPSK QPSK QPSK	1/2 3/4 1/2 3/4 2/3 3/4 5/6 1/2 1/2 3/4	-10 -13 -16 -19 -22 -25 -27 -5 -10 -13	-26 -26 -29 -30 -31 -25 -26
	(MCS1) (MCS2) (MCS3) (MCS4) (MCS5) (MCS6) (MCS7) (MCS8) (MCS9) (MCS10) (MCS11)	QPSK QPSK 16-QAM 16-QAM 64-QAM 64-QAM BPSK QPSK QPSK 16-QAM	1/2 3/4 1/2 3/4 2/3 3/4 5/6 1/2 1/2 3/4 1/2	-10 -13 -16 -19 -22 -25 -27 -5 -10 -13 -16	-26 -26 -29 -30 -31 -25 -26 -26
	(MCS1) (MCS2) (MCS3) (MCS4) (MCS5) (MCS6) (MCS7) (MCS8) (MCS9) (MCS10) (MCS11) (MCS12)	QPSK QPSK 16-QAM 64-QAM 64-QAM 64-QAM BPSK QPSK QPSK 16-QAM 16-QAM	1/2 3/4 1/2 3/4 2/3 3/4 5/6 1/2 1/2 3/4 1/2 3/4	-10 -13 -16 -19 -22 -25 -27 -5 -10 -13 -16 -19	-26 -26 -29 -30 -31 -25 -26 -26 -26 -29
	(MCS1) (MCS2) (MCS3) (MCS4) (MCS5) (MCS6) (MCS7) (MCS8) (MCS9) (MCS10) (MCS11) (MCS12) (MCS13)	QPSK QPSK 16-QAM 64-QAM 64-QAM 64-QAM BPSK QPSK QPSK 16-QAM 16-QAM 64-QAM	1/2 3/4 1/2 3/4 2/3 3/4 5/6 1/2 1/2 3/4 1/2 3/4 2/3	-10 -13 -16 -19 -22 -25 -27 -5 -10 -13 -16 -19 -22	-26 -26 -29 -30 -30 -31 -25 -26 -26 -26 -29 -30
	(MCS1) (MCS2) (MCS3) (MCS4) (MCS5) (MCS6) (MCS7) (MCS8) (MCS9) (MCS10) (MCS11) (MCS12) (MCS13) (MCS14)	QPSK QPSK 16-QAM 64-QAM 64-QAM 64-QAM BPSK QPSK QPSK 16-QAM 16-QAM 64-QAM	1/2 3/4 1/2 3/4 2/3 3/4 5/6 1/2 1/2 3/4 1/2 3/4 2/3 3/4	-10 -13 -16 -19 -22 -25 -27 -5 -10 -13 -16 -19 -22 -25	-26 -26 -29 -30 -30 -31 -25 -26 -26 -26 -29 -30 -30
	(MCS1) (MCS2) (MCS3) (MCS4) (MCS5) (MCS6) (MCS7) (MCS8) (MCS9) (MCS10) (MCS11) (MCS12) (MCS13) (MCS14)	QPSK QPSK 16-QAM 64-QAM 64-QAM 64-QAM BPSK QPSK QPSK 16-QAM 16-QAM 64-QAM	1/2 3/4 1/2 3/4 2/3 3/4 5/6 1/2 1/2 3/4 1/2 3/4 2/3 3/4	-10 -13 -16 -19 -22 -25 -27 -5 -10 -13 -16 -19 -22	-26 -26 -29 -30 -30 -31 -25 -26 -26 -26 -29 -30
	(MCS1) (MCS2) (MCS3) (MCS4) (MCS5) (MCS6) (MCS7) (MCS8) (MCS9) (MCS10) (MCS11) (MCS12) (MCS13) (MCS14)	QPSK QPSK 16-QAM 64-QAM 64-QAM 64-QAM BPSK QPSK QPSK 16-QAM 16-QAM 64-QAM	1/2 3/4 1/2 3/4 2/3 3/4 5/6 1/2 1/2 3/4 1/2 3/4 2/3 3/4	-10 -13 -16 -19 -22 -25 -27 -5 -10 -13 -16 -19 -22 -25	-26 -26 -29 -30 -30 -31 -25 -26 -26 -26 -29 -30 -30
	(MCS1) (MCS2) (MCS3) (MCS4) (MCS5) (MCS6) (MCS7) (MCS8) (MCS9) (MCS10) (MCS11) (MCS12) (MCS13) (MCS14)	QPSK QPSK 16-QAM 64-QAM 64-QAM 64-QAM BPSK QPSK QPSK 16-QAM 16-QAM 64-QAM	1/2 3/4 1/2 3/4 2/3 3/4 5/6 1/2 1/2 3/4 1/2 3/4 2/3 3/4	-10 -13 -16 -19 -22 -25 -27 -5 -10 -13 -16 -19 -22 -25	-26 -26 -29 -30 -30 -31 -25 -26 -26 -26 -29 -30 -30
	(MCS1) (MCS2) (MCS3) (MCS4) (MCS5) (MCS6) (MCS7) (MCS8) (MCS9) (MCS10) (MCS11) (MCS12) (MCS13) (MCS14) (MCS15)	QPSK QPSK 16-QAM 16-QAM 64-QAM 64-QAM BPSK QPSK QPSK 16-QAM 16-QAM 64-QAM 64-QAM	1/2 3/4 1/2 3/4 2/3 3/4 5/6 1/2 1/2 3/4 1/2 3/4 2/3 3/4 5/6	-10 -13 -16 -19 -22 -25 -27 -5 -10 -13 -16 -19 -22 -25 -27	-26 -26 -29 -30 -30 -31 -25 -26 -26 -26 -26 -30 -31 -31 -30 -31
	(MCS1) (MCS2) (MCS3) (MCS4) (MCS5) (MCS6) (MCS7) (MCS8) (MCS9) (MCS10) (MCS11) (MCS12) (MCS13) (MCS14) (MCS15)	QPSK QPSK 16-QAM 16-QAM 64-QAM 64-QAM BPSK QPSK QPSK 16-QAM 16-QAM 64-QAM 64-QAM	1/2 3/4 1/2 3/4 2/3 3/4 5/6 1/2 1/2 3/4 1/2 3/4 5/6	-10 -13 -16 -19 -22 -25 -27 -5 -10 -13 -16 -19 -22 -25 -27	-26 -26 -29 -30 -30 -31 -25 -26 -26 -26 -27 -30 -30 -31 -27 -26 -26 -29 -30 -30 -31
	(MCS1) (MCS2) (MCS3) (MCS4) (MCS5) (MCS6) (MCS7) (MCS8) (MCS9) (MCS10) (MCS11) (MCS12) (MCS13) (MCS14) (MCS15)	QPSK QPSK 16-QAM 16-QAM 64-QAM BPSK QPSK 16-QAM 16-QAM 64-QAM 64-QAM	1/2 3/4 1/2 3/4 2/3 3/4 5/6 1/2 1/2 3/4 1/2 3/4 5/6	-10 -13 -16 -19 -22 -25 -27 -5 -10 -13 -16 -19 -22 -25 -27	-26 -26 -29 -30 -31 -25 -26 -26 -29 -30 -31 -26 -27
	(MCS1) (MCS2) (MCS3) (MCS4) (MCS5) (MCS6) (MCS7) (MCS8) (MCS9) (MCS10) (MCS11) (MCS12) (MCS13) (MCS14) (MCS15) HT40 (MCS0) (MCS0) (MCS1)	QPSK QPSK 16-QAM 16-QAM 64-QAM 64-QAM BPSK QPSK 16-QAM 64-QAM 64-QAM 64-QAM	1/2 3/4 1/2 3/4 2/3 3/4 5/6 1/2 1/2 3/4 2/3 3/4 5/6	-10 -13 -16 -19 -22 -25 -27 -5 -10 -13 -16 -19 -22 -25 -27	-26 -26 -29 -30 -30 -31 -25 -26 -26 -29 -30 -31 -26 -27 -27
	(MCS1) (MCS2) (MCS3) (MCS4) (MCS5) (MCS6) (MCS7) (MCS8) (MCS9) (MCS10) (MCS11) (MCS12) (MCS13) (MCS14) (MCS15) HT40 (MCS0) (MCS0) (MCS1) (MCS0)	QPSK QPSK 16-QAM 64-QAM 64-QAM 64-QAM 64-QAM 64-QAM 64-QAM 64-QAM 64-QAM 64-QAM	1/2 3/4 1/2 3/4 2/3 3/4 5/6 1/2 1/2 3/4 2/3 3/4 5/6	-10 -13 -16 -19 -22 -25 -27 -5 -10 -13 -16 -19 -22 -25 -27	-26 -26 -29 -30 -30 -31 -25 -26 -26 -26 -29 -30 -31 -27 -27
	(MCS1) (MCS2) (MCS3) (MCS4) (MCS5) (MCS6) (MCS7) (MCS8) (MCS9) (MCS10) (MCS11) (MCS12) (MCS13) (MCS14) (MCS15) HT40 (MCS0) (MCS0) (MCS1) (MCS3) (MCS3) (MCS3)	QPSK QPSK 16-QAM 64-QAM 64-QAM 64-QAM 16-QAM 64-QAM 64-QAM 64-QAM 64-QAM 64-QAM 64-QAM	1/2 3/4 1/2 3/4 2/3 3/4 5/6 1/2 1/2 3/4 5/6 1/2 3/4 5/6	-10 -13 -16 -19 -22 -25 -27 -5 -10 -13 -16 -19 -22 -25 -27	-26 -26 -29 -30 -30 -31 -25 -26 -26 -26 -29 -30 -31 -31 -27 -27 -27
	(MCS1) (MCS2) (MCS3) (MCS4) (MCS5) (MCS6) (MCS7) (MCS8) (MCS9) (MCS10) (MCS11) (MCS12) (MCS13) (MCS14) (MCS15) HT40 (MCS0) (MCS0) (MCS1) (MCS2) (MCS3) (MCS2)	QPSK QPSK 16-QAM 64-QAM 64-QAM BPSK QPSK QPSK 16-QAM 64-QAM 64-QAM 64-QAM 64-QAM 64-QAM 64-QAM	1/2 3/4 1/2 3/4 2/3 3/4 5/6 1/2 1/2 3/4 5/6 1/2 1/2 3/4 5/6	-10 -13 -16 -19 -22 -25 -27 -5 -10 -13 -16 -19 -22 -25 -27	-26 -26 -29 -30 -30 -31 -25 -26 -26 -26 -29 -30 -31 -27 -27 -27 -29 -30
	(MCS1) (MCS2) (MCS3) (MCS4) (MCS5) (MCS6) (MCS7) (MCS8) (MCS9) (MCS10) (MCS11) (MCS12) (MCS13) (MCS14) (MCS15) HT40 (MCS0) (MCS0) (MCS1) (MCS0) (MCS3) (MCS3) (MCS3) (MCS3) (MCS3)	QPSK QPSK 16-QAM 16-QAM 64-QAM 64-QAM 16-QAM 64-QAM 64-QAM 64-QAM 64-QAM 64-QAM 64-QAM 64-QAM	1/2 3/4 1/2 3/4 2/3 3/4 5/6 1/2 1/2 3/4 2/3 3/4 5/6	-10 -13 -16 -19 -22 -25 -27 -5 -10 -13 -16 -19 -22 -25 -27	-26 -26 -29 -30 -30 -31 -25 -26 -26 -26 -26 -27 -30 -31 -31 -27 -27 -27 -27 -29 -30 -30 -30
	(MCS1) (MCS2) (MCS3) (MCS4) (MCS5) (MCS6) (MCS7) (MCS8) (MCS9) (MCS10) (MCS11) (MCS12) (MCS13) (MCS14) (MCS15) HT40 (MCS0) (MCS1) (MCS2) (MCS3) (MCS4) (MCS5) (MCS6) (MCS7)	QPSK QPSK 16-QAM 16-QAM 64-QAM 64-QAM BPSK QPSK 16-QAM 64-QAM 64-QAM 64-QAM 64-QAM 64-QAM 64-QAM 64-QAM	1/2 3/4 1/2 3/4 2/3 3/4 5/6 1/2 1/2 3/4 2/3 3/4 5/6 1/2 1/2 3/4 1/2 3/4 2/3 3/4 5/6	-10 -13 -16 -19 -22 -25 -27 -5 -10 -13 -16 -19 -22 -25 -27 -5 -10 -13 -16 -19 -13 -16 -19 -22 -25 -27	-26 -26 -29 -30 -30 -31 -25 -26 -26 -26 -29 -30 -31 -27 -27 -27 -27 -29 -30 -30 -31
	(MCS1) (MCS2) (MCS3) (MCS4) (MCS5) (MCS6) (MCS7) (MCS8) (MCS9) (MCS10) (MCS11) (MCS12) (MCS13) (MCS14) (MCS15) HT40 (MCS0) (MCS1) (MCS0) (MCS1) (MCS2) (MCS3) (MCS4) (MCS5) (MCS5)	QPSK QPSK 16-QAM 16-QAM 64-QAM 64-QAM 16-QAM 64-QAM 64-QAM 64-QAM 64-QAM 64-QAM 64-QAM 64-QAM 64-QAM 64-QAM 64-QAM	1/2 3/4 1/2 3/4 2/3 3/4 5/6 1/2 1/2 3/4 2/3 3/4 5/6 1/2 3/4 1/2 3/4 1/2 3/4 1/2 3/4 1/2 3/4 1/2 3/4 1/2	-10 -13 -16 -19 -22 -25 -27 -5 -10 -13 -16 -19 -22 -25 -27 -5 -10 -13 -16 -19 -22 -25 -27 -5 -10 -13 -16 -19 -22 -25 -27 -5	-26 -26 -29 -30 -30 -31 -25 -26 -26 -26 -29 -30 -31 -31 -26 -27 -27 -27 -27 -29 -30 -30 -31 -26
	(MCS1) (MCS2) (MCS3) (MCS4) (MCS5) (MCS6) (MCS7) (MCS8) (MCS9) (MCS10) (MCS11) (MCS12) (MCS13) (MCS14) (MCS15) HT40 (MCS0) (MCS1) (MCS2) (MCS3) (MCS4) (MCS5) (MCS6) (MCS7)	QPSK QPSK 16-QAM 16-QAM 64-QAM 64-QAM 64-QAM 64-QAM 64-QAM 64-QAM 64-QAM 64-QAM 64-QAM 64-QAM 64-QAM 64-QAM 64-QAM	1/2 3/4 1/2 3/4 2/3 3/4 5/6 1/2 1/2 3/4 2/3 3/4 5/6 1/2 1/2 3/4 1/2 3/4 2/3 3/4 5/6	-10 -13 -16 -19 -22 -25 -27 -5 -10 -13 -16 -19 -22 -25 -27 -5 -10 -13 -16 -19 -13 -16 -19 -22 -25 -27	-26 -26 -29 -30 -30 -31 -25 -26 -26 -26 -29 -30 -31 -27 -27 -27 -27 -29 -30 -30 -31



	pest			
	(MCS11) 16-QAM	1/2	-16	-27
	(MCS12) 16-QAM		-19	-29
	(MCS13) 64-QAM		-22	-30
	(MCS14) 64-QAM		-25	-30
	, , -			
	(MCS15) <u>64-QAM</u>	5/6	-27	-31
	O 802.11a			
	Modulation	Codo Doto	IEEE Spec (1Rx dBm)	Typical (1Rx dBm)
	BPSK	1/2	-82	-88
	BPSK	3/4	-81	-86
	QPSK	1/2	-79 -7	-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
	-			
	O 802.11b			
	Modulation	IEH	EE Spec (1Rx dBm)	Typical (1Rx dBm)
	DBPSK		not specified	-93
	DQPSK		not specified	-91
	_		4	
	CCK		not specified	-87
	O 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
Sensitivity	16-QAM	1/2	-74	-83
(1RX with	16-QAM	3/4	-70	-80
+4/-2dB	64-QAM	2/3	-66	-75
tolerance,	-			
dBm)	64-QAM	3/4	-65	-70
ubiii)	O 802.11ng			
	Modulation Modulation	Code Ra	te IEEE Spec (1Rx dBm)	Typical (1Rx dBm)
	Modulation	Cout Na	te TEEE Spee (TKX ubiii)	Typicai (TKX ubiii)
	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	-77 -72
	, , , -			
	(MCS7) 64-QAM	5/6	-64	-67
	XXIII 40			
	HT40			
	(MCS0) BPSK	1/2	-79	-88
1	(MCS1) QPSK	1/2	-76	-86
	(MCS2) QPSK	3/4	-74	-84
		1 /0	-71	-80
	(MCS3) 16-QAM	1/2		
	(MCS3) 16-QAM (MCS4) 16-QAM	1/2 3/4	-67	-78
	(MCS3) 16-QAM			
	(MCS3) 16-QAM (MCS4) 16-QAM	3/4	-67	-78
	(MCS3) 16-QAM (MCS4) 16-QAM (MCS5) 64-QAM	3/4 2/3	-67 -63	-78 -73



	O 802.11na										
	HT20	Modulation		Cod	o Doto		IFF	F Sno	o (1Dv	dRm)	
	(MCS0) BPSK	1/2	Code Rate -82			IEEE Spec (1Rx dBm) -89					
	(MCS1) QPSK	1/2			-79				87		
	(MCS2) QPSK	3/4			-77				84		
	(MCS3) 16-QAM	1/2			-7 4				80		
	(MCS4) 16-QAM	3/4			-70				77		
	(MCS5) 64-QAM	2/3			-66				72		
	(MCS6) 64-QAM	3/4			-65				7 1		
	(MCS7) 64-QAM	5/6			-64				67		
Sensitivity	HT40										
(1RX with	(MCS0) BPSK	1/2			-79				84		
+4/-2dB	(MCSI) QPSK	1/2			-19 -76				81		
	(MCS1) QFSK (MCS2) QPSK	3/4			-70 -74				01 79		
tolerance, dBm)	(MCS2) QFSK (MCS3) 16-QAM	3/4 1/2			-74 -71				19 76		
ubili)		3/4			-/1 -67				70 72		
	(MCS4) 16-QAM (MCS5) 64-QAM	2/3			-67 -63				72 70		
	(MCS6) 64-QAM	3/4			-62				67		
	(MCS7) 64-QAM	5/4 5/6			-62 -61				64		
	© For transmitted		mask	for	11a	shall	be	less	than	-40dBr	fo
Transmit	fc-30MHz <f<fc+30mh< td=""><td></td><td>шазк</td><td>101</td><td>114</td><td>Silaii</td><td>be</td><td>1035</td><td>ulali</td><td>-10uDi</td><td>10</td></f<fc+30mh<>		шазк	101	114	Silaii	be	1035	ulali	- 1 0uDi	10
spectrum	© For transmitted	-	mask	for	11b	shall	be	less	than	-50dBr	fo
mask	fc-22MHz <f<fc+22mi for="" td="" transmitted<="" ②=""><td></td><td>mask</td><td>for</td><td>11g</td><td>shall</td><td>be</td><td>less</td><td>than</td><td>-40dBr</td><td>fo</td></f<fc+22mi>		mask	for	11g	shall	be	less	than	-40dBr	fo
	fc-30MHz <f<fc+30mh< td=""><td></td><td>0 11</td><td>207.51</td><td></td><td></td><td>4.</td><td>4 =</td><td>1D 6</td><td></td><td></td></f<fc+30mh<>		0 11	207.51			4.	4 =	1D 6		
	② For transmitted sp		tor IIn	20MI	Hz sha	II be less	s than	–45	dBr for	•	
	fc-30MHz <f<fc+30mhz. -45dbr="" 11n="" 40mhz="" be="" for="" for<="" less="" mask="" shall="" spectral="" td="" than="" transmitted=""></f<fc+30mhz.>										
	fc-60MHz <f<fc+60mh< td=""><td></td><td>10F 11H</td><td>40WH</td><td>nz sna</td><td>n de iess</td><td>s unan</td><td>-45</td><td>abr 101</td><td></td><td></td></f<fc+60mh<>		10F 11H	40WH	nz sna	n de iess	s unan	-4 5	abr 101		
TD 1	② For 802.11a/g the	average energ	gy of the	e cons	stellatio	ons in ea	ach of	spect	ral line	s –161	and
Transmit	+1+16 will deviate no	more than +	/- 2dB f	rom t	heir av	verage e	nergy	7.			
spectrum	For 802.11n 40MHz m								ı of spe	ctral	
flatness	lines -422 and +2+										
114011055	② The transmitted sp	ectral flatness	s should	be w	ith in +	-2/- 4dB			C	.	
Transmit											
center	The transmitted c	antan fua an an	4 . 1		ah all h	20 m		~~ : ~~			
frequency	② The transmitted c	enter frequen	icy tolei	rance	snan d	pe ±zu p	bm m	aximu	IIII.		
tolerance											
Receiver											
maximum	Modulation (Code Rate	IE	EE Sp	ec (1R	x dBm)					
input level				>-3	30						
	② 802.11b										
	Modulation		IEI	EE Sp	ec (1R	x dBm)					
	DBPSK			>-		,					
	DQPSK			>-	10						
	CCK				10						
	② 802.11g										
	Modulation Code Rate IEEE Spec (1Rx dBm)										
				_	-20						



	② 802.11na Modulation Code Rate IEEE Spec (1Rx dBm)
	>-30
	② 802.11ng Modulation Code Rate IEEE Spec (1Rx dBm)
	>-20
	 ② 802.11a: 6, 9, 12, 18, 24, 36, 48, 54Mbps ② 802.11b: 1, 2, 5.5, 11Mbps ② 802.11g: 6, 9, 12, 18, 24, 36, 48, 54Mbps ② 802.11n: @800GI(400GI)
Transfer data	z 20MHz BW
rate	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



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	VDDIN	7~~24	V
IO maximum input voltage	3V3V _{in} IOMax	3.6	V
IO minimum input voltage	3V3V _{in} IOMin	-0.3	V
Storage temperature	$T_{ m store}$	-40 [~] +125	$^{\circ}$
Operation temperature	Toper	-20 [~] +65	$^{\circ}$

4.2 Recommended operating parameters

Figure 4-2 Power supply range

parameters	Symbol	minimum	Typical values	maximum	unit
Power supply	VDD	7.0	12.0	24.0	V



5 Order Information

Table 5-1: Product Models

PART NO.	Description	Volume/tray	MPQ
RAK553	Image transmission,plug and play.	12PCS/tray	60PCS





6 Sales and Technical Support

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7 Revision&History

Revision	Update	Date
V0.1	Update picture and format.	2014-07-08
V0.2	Update the contact way, Update the document format.	2014-08-22
V0.3	Updated pictures and transmit distance, modify product feature, add order info and sales services.	2014-10-22
V0.4	Update the new module picture, size and pin definitions.	2015-04-07
V0.5	Adding UART transparent transmission-related information.	2015-04-17
V0.6	Update the power supply.	2015-05-17
V0.7	Update the new module and hardware physical map marked. Update the power supply parameters.	2015-07-13
V2.0	Add the LED light instruction. And release the document.	2015-08-31
V2.1	Add the Dial-up definition. 1, Add the channel selection. 2, Add the WPS function.	2015-10-11
V2.2	Modify the PIN definition of 8PIN eGH from PWM to NC.	2015-11-11
V2.3	Add the location hole position	2016-02-29
V2.4	Delete some error description for audio and video resolution.	2016-08-25
V2.5	 Update sales and Technical Support. update module picture. 	2016-11-10
V2.6	Fixed the channel list for the switcher.	2017-03-03