

SHENZHEN HI-LINK ELECTRONIC CO., LTD

HLK-RMO8S USER MANUAL

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1. Brief Introduction

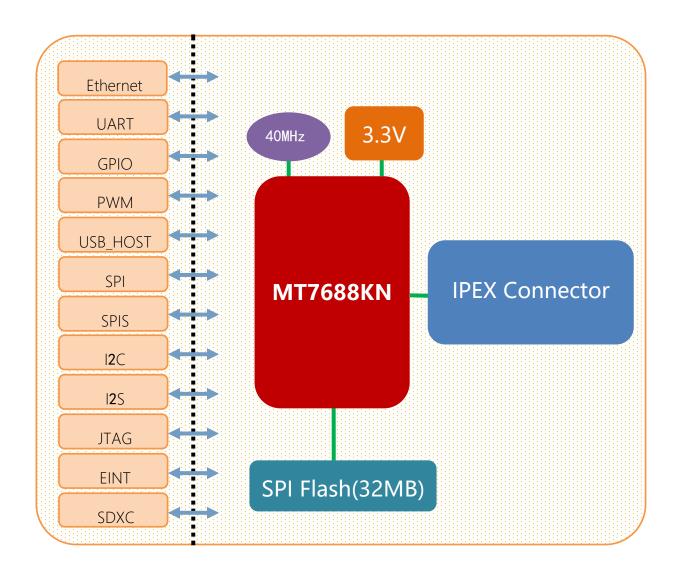
HLK-RM08S based on MT7688KN is a low cost and low power consumption IOT module developed by Hi-Link. The module has rich interfaces and powerful processor and could be widely used in smart devices and cloud service applications.

1.1. Basic parameters

- High data processing ability, MCU frequency 580MHz
- 150M Mbps
- Support 802.11b/g/n mode
- 20/40 channel bandwidth
- Support 802.11v
- Support AP,STA and AP,STA mixed
- Fifth 10/100M adaptive com port
- One USB2.0 host interface
- Multiple interfaces SPI/SD-XC/eMMC
- Rich peripheral interfaces, SPI,I2C,I2S,PCM,UART,JTAG,GPIO
- Widely used in IOT
- Inbuilt powerful PMU
- Support 16 Multiple BSSID
- Support multiple encryption WEP64/128, TKIP, AES, WPA, WPA2, WAPI
- Support QoS, WMM, WMM-PS



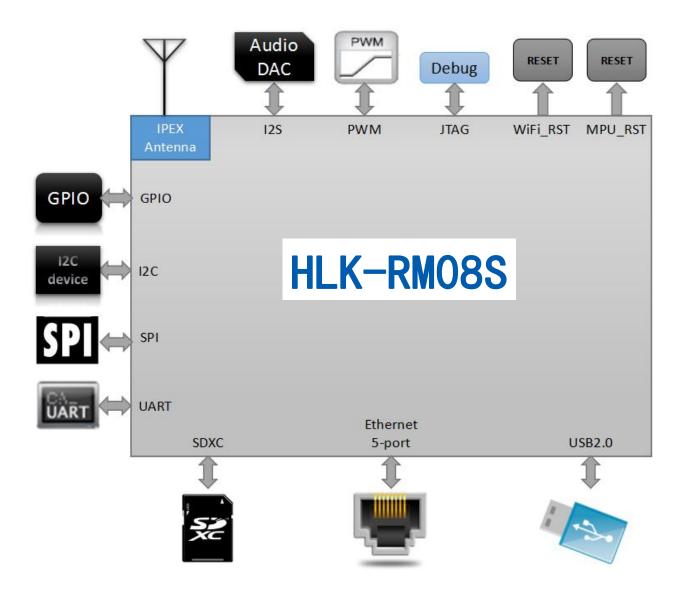
2. Block diagram



HLK-RM08S Block Diagram



2.1. Typical application



HLK-RM08S typical peripheral interfaces diagram



2.2. Specification

Item	Parameter
Model	HLK-RM08S
Main Chip	MT7688KN
I-Cache, D-Cache	64KB,32KB
Kernel	MIPS24KEc
Main frequency	580MHz
RAM	64Mb
Flash	32Mb
RF	1T1R 802.11n 2.4GHz
USB2.0	1
UART	2
Temperature	Environmental temperature: -40°C~85°C
Humidity	working: 10~95% (noncondensing) Storage: 5~95% (noncondensing)
Size	17.4mm×25.8mm×2.8mm

3. Electrical characteristics

3.1. Input voltage

Name	Function	Min voltage (V)	Typical voltage (V)	Max Voltage (V)
VBAT	VBAT Supply voltage		3. 3	3. 4
I/O I/O Voltage		3. 2	3. 3	3. 4



3.2. RF Characteristics

3. 2. 1. 802. 11b 11M

802.11b Transmit (Conductive)								
Item	Min.	Тур.	Max.	Unit				
Frequency Range		Channel 1		Channel 13				
Tx Power Level	DQPSK	18	20	22	dBm			
Frequency Tolerance		-15	0	15	ppm			
Constant Month	11MHz→22MHz		40		dBr			
Spectral Mask	>22MHz		53		dBr			
Modulation Accuracy	All Data Rate		15		%			
	802.11b F	Receiver (Co	onductive)					
Item	Condition	Min.	Тур.	Max.	Unit			
Frequency Range		Channel 1		Channel 13				
Min. Input 11Mbps PER<8%		-91.5	-89.5	-87.5	dBm			

3. 2. 2. 802. 11g 54M

802.11g Transmit (Conductive)								
Item	Condition	Min.	Тур.	Max.	Unit			
Frequency Range		Channel 1		Channel 13				
Tx Power Level	OFDM	15	17	19	dBm			
Frequency Tolerance		-15	0	15	ppm			
Modulation Accuracy All Data H			-31	-28	%			
	802.11g H	Receiver (Co	onductive)					
Item	Condition	Min.	Тур.	Max.	Unit			
Frequency Range		Channel 1		Channel 13				
Min. Input	54Mbps PER<10%	-78. 0	-76. 0	-74. 0	dBm			



3. 2. 3. 802. 11n MCS7 (HT20)

802.11n_HT20 Transmit (Conductive)							
Item	Condition	Min.	Тур.	Max.	Unit		
Frequency Range		Channel 1		Channel 13			
Tx Power Level	OFDM	15	17	19	dBm		
Frequency Tolerance		-15	0	15	ppm		
Modulation Accuracy All Data Rate			-31	-28	dB		
	802.11n_HT20 Receiver (Conductive)						
Item	Condition	Min.	Тур.	Max.	Unit		
Frequency Range		Channel 1		Channel 13			
Min. Input	MCS7 PER<10%	-76. 5	-74. 5	-72.5	dBm		

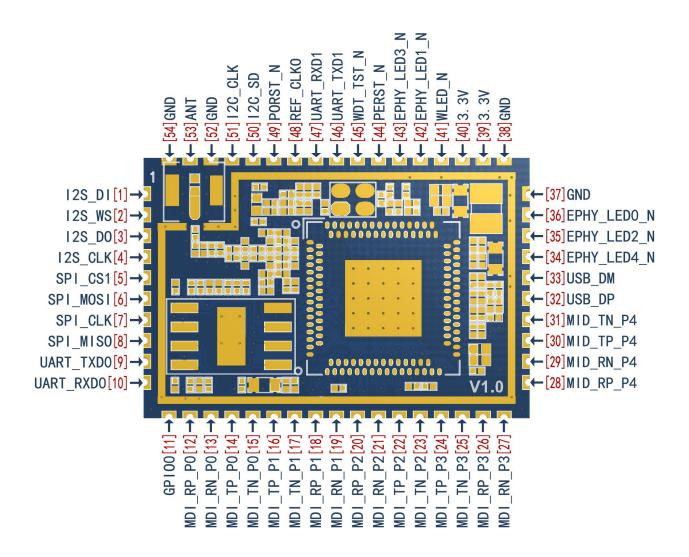
3. 2. 4. 802. 11n_MCS7 (HT40)

802.11n_HT40 Transmit (Conductive)								
Item	Min.	Тур.	Max.	Unit				
Frequency Range		Channel 1		Channel 13				
Tx Power Level	OFDM	15.0	17.0	19.0	dBm			
Frequency Tolerance		-15	0	15	ppm			
Modulation Accuracy All Data Rate			-31	-28	dB			
	802.11n_HT40 Receiver (Conductive)							
Item	Condition	Min.	Тур.	Max.	Unit			
Frequency Range		Channel 1		Channel 13				
Min. Input MCS7 PER<10%		-76 . 5	-74.5	-72 . 5	DBM			



4. PINS DEFINTION

4.1. Pins definition diagram



HLK-RM08S Default pins definition diagram



4.2. Default pins definition

	Name					
D:	(Function			D	ar to	N .
	1)		Function 3	Function 4	GPI0	Note
1	I2S_DI	PCMDRX			GPI00	
2	I2S_WS	PCMCLK			GPI02	
3	I2S_D0	PCMDTX			GPI01	
4	I2S_CLK	PCMFS			GPI03	
5	SPI_CS1			REF_CLKO	GPI06	
6	SPI_MOSI				GPI08	
7	SPI_CLK				GPI07	
8	SPI_MISO				GPI09	
	HADT TVDO					Default is serial port
9	UART_TXD0				GPI012	TR
	HADT DVDO					Default is serial port
10	UART_RXD0				GPI013	TR
11	GPI00		REF_CLKO	PERST_N	GPI011	
12	MDI_RP_P0				GPI024	
13	MDI_RN_P0				GPI023	
14	MDI_TP_P0				GPI022	
15	MDI_TN_PO				GPI021	
16	MDI_TP_P1	SPIS_CS		PWM_CHO	GPI014	
17	MDI_TN_P1	SPIS_CLK		PWM_CH1	GPI015	
18	MDI_RP_P1	SPIS_MISO		UART_TXD2	GPI016	
19	MDI_RN_P1	SPI_MOSI		UART_RXD2	GPI017	
20	MDI_RP_P2	_	eMMC D7	PWM_CHO	GPI018	
21	MDI RN P2		eMMC D6	PWM CH1	GPI019	
22	MDI_TP_P2	UART_TXD2	eMMC_D5	PWM_CH2	GPI020	
23	MDI_TN_P2	UART_RXD2	eMMC_D4	PWM CH3	GPI021	
24	MDI_TP_P3	SD_WP	eMMC_WP		GPI022	
25	MDI_TN_P3	SD_CD	eMMC CD		GPI023	
26	MDI_RP_P3	SD_D1	eMMC_D1		GPI024	



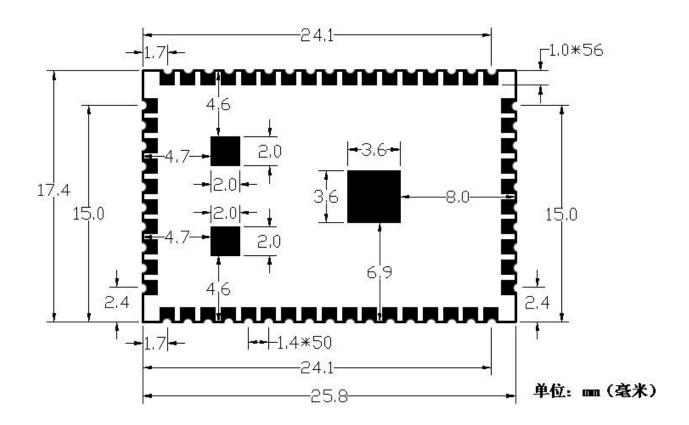
27 MDI_RN_P3 SD_OL eMMC_D0 GP1025 CHACCLK GP1026 CHACCLK GP1026 CHACCLK GP1026 CHACCLK GP1028 CHACCLK GP1028 CHACCLK GP1029 CHACCLK GP1029 CHACCLK GP1029 CHACCLK GP1029 CHACCLK GP1029 CHACCLK GP1029 CHACCLK GP1027 CHACCLK GP1027 CHACCLK GP1027 CHACCLK GP1027 CHACCLK GP1028 CHACCLK GP1028 CHACCLK GP1028 CHACCLK GP1030 CHACCLK GP1031 CHACCLK GP1031 CHACCLK GP1031 CHACCLK GP1032 CACCLK STATUS	_						
MDI_RN_P4	27	MDI_RN_P3	SD_D0	eMMC_DO		GPI025	
MDI_TP_P4	28	MDI_RP_P4	SD_CLK	eMMC_CLK		GPI026	
31 MDI_TN_P4 SD_D2 eMMC_D2 GPI027	29	MDI_RN_P4	SD_CMD	eMMC_CMD		GPI028	
USB_DP	30	MDI_TP_P4	SD_D3	eMMC_D3		GPI029	
USB_DM	31	MDI_TN_P4	SD_D2	eMMC_D2		GPI027	
34 EPHY_LED4_N JTAG_RST_N GPI030 Com 4 status led 35 EPHY_LED2 JTAG_TMS GPI032 Com 2 status led 36 EPHY_LED0 JTAG_TD0 GPI034 Com 0 status led 37 GND GPI034 Com 0 status led 39 3.3V Suggested external power supply current ≥ 500mA 41 WLED_N GPI035 WiFi status LED 42 EPHY_LED1 JTAG_TDI GPI033 Com 1 status LED 43 EPHY_LED3 JTAG_CLK GPI031 Com 3 status LED 44 PORST_N GPI037 Watchdog timeout reset 45 WDT_RST_N GPI037 Watchdog timeout reset 46 UART_TXD1 PWM_CH1 GPI045 TR 48 REF_CLK0 GPI038 Reference clock output 49 PERST_N GPI036 PCIe device reset 50 I2C_SD GPI04 GPI04 51 I2C_CLK GPI04 GPI04	32	USB_DP					Default not available
Sephy_Ledo	33	USB_DM					Default not available
Sephy_Ledo	34	EPHY_LED4_N	JTAG_RST_N			GPI030	Com 4 status led
37	35	EPHY_LED2	JTAG_TMS			GPI032	Com 2 status led
38 3.3V Suggested external	36	EPHY_LEDO	JTAG_TDO			GPI034	Com O status led
39 3.3V Suggested external power supply current ≥ 500mA 41 WLED_N GPIO35 WiFi status LED 42 EPHY_LED1 JTAG_TDI GPIO33 Com 1status LED 43 EPHY_LED3 JTAG_CLK GPIO31 Com 3status LED 44 PORST_N WIFI reset 45 WDT_RST_N GPIO37 Watchdog timeout reset 46 UART_TXD1 PWM_CHO GPIO45 TR 47 UART_RXD1 PWM_CH1 GPIO46 TR 48 REF_CLKO GPIO38 Reference clock output 49 PERST_N GPIO36 PCIe device reset 50 I2C_SD GPIO4 51 I2C_CLK GPIO4 52 GND 53 ANT Default not connected	37			GND			
3.3V	38			GND			
3.3V 500mA	39			3.3V			Suggested external
40				3 3V			power supply current≥
42 EPHY_LED1 JTAG_TDI GPI033 Com 1status LED 43 EPHY_LED3 JTAG_CLK GPI031 Com 3status LED 44 PORST_N GPI037 Watchdog timeout reset 45 WDT_RST_N GPI037 Watchdog timeout reset 46 UART_TXD1 PWM_CHO GPI045 TR 47 UART_RXD1 PWM_CHI GPI046 TR 48 REF_CLKO GPI038 Reference clock output 49 PERST_N GPI036 PCIe device reset 50 I2C_SD GPI05 51 I2C_CLK GPI04 52 GND 53 ANT Default not connected 54 Default not connected 55 Default not connected 56 Default not connected 57 CR CR CR CR 58 CR CR 59 CR CR 50 CR CR 51 CR CR 52 CR 53 CR Istatus LED 60 CR Istatus LED 61 CR Istatus L	40					T	500mA
43 EPHY_LED3 JTAG_CLK GPI031 Com 3status LED 44 PORST_N WIFI reset 45 WDT_RST_N GPI037 Watchdog timeout reset UART_TXD1 PWM_CHO GPI045 TR UART_RXD1 PWM_CHI GPI046 TR 48 REF_CLKO GPI038 Reference clock output 49 PERST_N GPI036 PCIe device reset 50 I2C_SD GPI05 51 I2C_CLK GPI04 52 GND 53 ANT Default not connected	41	WLED_N				GPI035	WiFi status LED
44 PORST_N 45 WDT_RST_N 46 UART_TXD1 47 UART_RXD1 48 REF_CLKO 49 PERST_N 49 PERST_N 50 I2C_SD 51 I2C_CLK 6ND ANT WIFI reset WIFI reset GPI037 Watchdog timeout reset Default is serial port TR Default is serial port TR PWM_CH1 GPI046 TR GPI038 Reference clock output GPI036 PCIe device reset GPI05 GPI05 GPI04 Default not connected	42	EPHY_LED1	JTAG_TDI			GPI033	Com 1status LED
45 WDT_RST_N UART_TXD1 46 UART_RXD1 47 UART_RXD1 48 REF_CLKO 49 PERST_N 10 CP1046 11 CP1046 CP1037 Watchdog timeout reset Default is serial port REF_CLKO GP1046 GP1038 Reference clock output GP1036 PCIe device reset GP103 GP104 GP104 GP104 GP104 GP104 GP104	43	EPHY_LED3	JTAG_CLK			GPI031	Com 3status LED
UART_RXD1 VART_RXD1 PWM_CH0 PWM_CH0 PWM_CH0 PWM_CH1 PWM_CH1 PWM_CH1 PWM_CH1 PWM_CH1 PPM_CH1 SPI046 PCIe device reset PPM_CH1 PPM_CH1 TR TR PPM_CH1 TR TR PPM_CH1 TR TR PPM_CH1 TR TR TR TR TR TR TR TR TR T	44	PORST_N					WIFI reset
46UART_TXD1PWM_CHOGPI045TR47UART_RXD1PWM_CH1GPI046TR48REF_CLK0GPI038Reference clock output49PERST_NGPI036PCIe device reset50I2C_SDGPI0551I2C_CLKGPI0452GND53ANTDefault not connected	45	WDT_RST_N				GPI037	Watchdog timeout reset
47 UART_RXD1 PWM_CH1 GPI046 TR 48 REF_CLK0 GPI038 Reference clock output 49 PERST_N GPI036 PCIe device reset 50 I2C_SD GPI05 51 I2C_CLK GPI04 52 GND 53 ANT Default not connected	46	UART_TXD1			PWM_CHO	GPI045	_
49 PERST_N GPI036 PCIe device reset 50 I2C_SD GPI05 51 I2C_CLK GPI04 52 GND 53 ANT Default not connected	47	UART_RXD1			PWM_CH1	GPI046	
50 I2C_SD GPI05 51 I2C_CLK GPI04 52 GND 53 ANT Default not connected	48	REF_CLKO				GPI038	Reference clock output
51 I2C_CLK GPI04 52 GND 53 ANT Default not connected	49	PERST_N				GPI036	PCIe device reset
52 GND 53 ANT Default not connected	50	I2C_SD				GPI05	
53 ANT Default not connected	51	I2C_CLK				GPI04	
	52			GND			
54 GND	53			ANT			Default not connected
	54			GND			



Notes:

- 1, All pins default 1
- 2, IO drive current is 4mA
- **3, All TTL is 3.3V**

5. Dimensions



HLK-RM08S Drawing

Introductions:

- 1, The size of the module is length 1mm, width 1mm, space 1.4mm, depth 1.8mm.
- 2, The thickness of the module is 1.8mm.
- 3, The noted numbers in the picture is the actual size of module, do recommended pad extension around 1mm, internal heat shrink 0.2mm pad, internal thermal pad grounding once do encapsulation.

Do when the package recommended pad extension around the 1mm, 3 internal heat shrink 0.2mm pad, internal thermal pad grounding.

FCC Warning

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.

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

FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. End users must follow the specific operating instructions for satisfying RF exposure compliance.

Note 1: This module certified that complies with RF exposure requirement under mobile or fixed condition, this module is to be installed only in mobile or fixed applications.

A mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons. Transmitting devices designed to be used by consumers or workers that can be easily re-located, such as wireless devices associated with a personal computer, are considered to be mobile devices if they meet the 20 centimeter separation requirement.

A fixed device is defined as a device is physically secured at one location and is not able to be easily moved to another location.

- **Note 2:** Any modifications made to the module will void the Grant of Certification, this module is limited to OEM installation only and must not be sold to end-users, end-user has no manual instructions to remove or install the device, only software or operating procedure shall be placed in the end-user operating manual of final products.
- Note 3: Additional testing and certification may be necessary when multiple modules are used.
- **Note 4:** The module may be operated only with the antenna with which it is authorized. Any antenna that is of the same type and of equal or less directional gain as an antenna that is authorized with the intentional radiator may be marketed with, and used with, that intentional radiator.
- **Note 5:** To ensure compliance with all non-transmitter functions the host manufacturer is responsible for ensuring compliance with the module(s) installed and fully operational. For example, if a host was previously authorized as an unintentional radiator under the Declaration of Conformity procedure without a transmitter certified module and a module is added, the host manufacturer is responsible for ensuring that the after the module is installed and operational the host continues to be compliant with the Part 15B unintentional radiator requirements. Since this may depend on the details of how the module is integrated with the host, ShenZhen HaiLingKe Electronic co., Ltd. shall provide guidance to the host manufacturer for compliance with the Part 15B requirements.

Note 6: FCC ID label on the final system must be labeled with "Contains FCC ID: 2AD56HLK-RM08S" or "Contains transmitter module FCC ID: 2AD56HLK-RM08S".