

ZTK7628P-core-board manual

v1.0 (2020.08.28)

Hangzhou Jotale Technology Co., Ltd

web: www.jotale.com

Catalogue

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1. Product overview

ZTK7628P-core-board module is a WIFI module based on MTK (Mediatek) MT7628DAN SOC chip scheme launched by Hangzhou Jotale Technology Co., LTD. CPU frequency up to 580MHz, onboard optional 64MB DDR2 RAM/16MB Flash, 64MB DDR2 RAM/32MB Flash configuration, 300M WIFI, external leads USB 2.0 Host, GPIO, UART, I2S, I2C, SD card interface, SPI, PWM, Ethernet interface, WIFI antenna interface, etc..

This module is small in size, low in power consumption, low in heat, and stable in WIFI and network port transmission performance. Running OpenWRT (Linux) system can run stably for a long time. The peripheral circuit of the module is very simple. It only needs to add 3.3V DC power supply to start the system and can be controlled through WIFI. The use of gold-plated needle connection or stamp hole connection, can be very stable fixed on the bottom plate.

It can be used in many applications such as smart home, IP camera, VOIP, remote shooting aircraft, remote monitoring system , simple WEB network server, simple FTP server, remote download, remote vision car, etc.

We specially develops the motherboard for this core board, the composition JS7628P development board, and provides the detailed development information, facilitates the user to study, the development, the details please enter www.jotale.com website to view.

2. Product parameter

Product name	ZTK7628P-core-board	
Product model	ZTK7628P_CORE_BOARD	
Operating system	OpenWrt (Linux)	
CPU	MT7628DAN MIPS 24KEc	
System frequency	580MHz	
RAM	64MB DDR2 RAM	
Flash	16MB/32MB Nor flash	
Ethernet interface	5 x WAN/LAN 10/100M adaptive	
USB interface	1 x USB 2.0 host	
PCIE interface	1 x PCIE	
UART interface	UART0 (debug by default) , UART1, UART2	
GPIO	Total 41 (reused with other functions)	
I2S	x 1, support VOIP	
I2C	1xI2C master	
SPI master	2 x SPI master(One of them is occupied by Flash and the other is free)	
SPI slave	1 x SPI slave	
PWM	4 x PWM	
Module size	Stamp hole version	32.5mm x 19.5mm x 2.8mm

	Pin header version	45mm x 31mm x 10mm
Pin interface		Stamp hole、Pin header
Operating voltage		3.3V ±10%
Average power consumption		0.78W
Supply current capacity		≥500mA
Antenna interface		2 x IPEX
Operating temperature		-20~60℃
Wireless protocol		Support IEEE802.11 b/g/n
Wireless rate		2T2R, 300Mbps
RF power consumption		≤18dbm
Wireless distance		≤100 meters (open area)
Wireless working mode		routing, AP, relay, bridge

3. Appearance and pin introduction

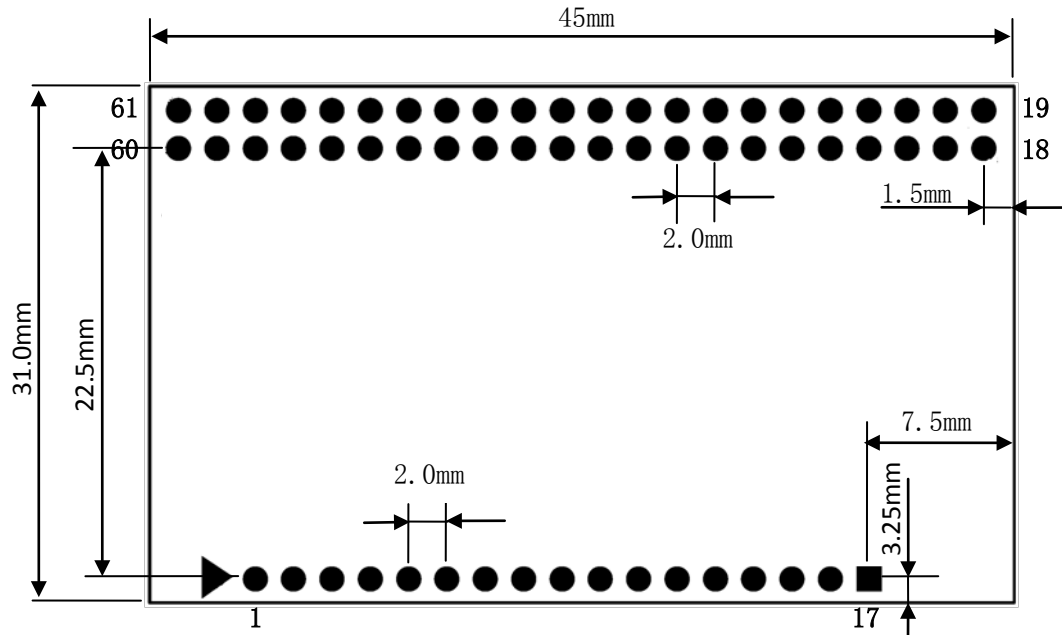
The ZTK7628P-core-board has two packaging forms available for customers to choose namely "Stamp hole version" and "Pin header version". Below are the photos of the real product and the packaging introduction.

3.1. Pin header version

3.1.1. Real photos



3.1.2. Pins introduction and product size



ZTK7628P-core-board pin header version front view

Pin introduction of ZTK7628P-core-board pin header version

Pin	Function 0	Function 1	Function 2	Function 3	comment
1	GND	N/A	N/A	N/A	Main power GND
2	GND	N/A	N/A	N/A	Main power GND
3	GND	N/A	N/A	N/A	Main power GND
4	VDD3V3	N/A	N/A	N/A	Main power supply 3.3V DC
5	VDD3V3	N/A	N/A	N/A	Main power supply 3.3V DC
6	VDD3V3	N/A	N/A	N/A	Main power supply 3.3V DC
7	REF_CLK_O	GPIO37	N/A	N/A	Default as GPIO, SYSTEM_LED
8	WDT_RST_N	GPIO38	N/A	N/A	Default as GPIO, USER_KEY1
9	EPHY_LED4_N_JTRST_N	GPIO39	w_utif_n[6]	jtrstn_n	Default as GPIO, WLAN_LED
10	EPHY_LED3_N_JTCLK	GPIO40	w_utif_n[7]	jtclk_n	Default as GPIO, LAN2_LED

11	EPHY_LED2_N_JTMS	GPIO41	w_utif_n[8]	jtms_n	Default as GPIO, USER_KEY2
12	EPHY_LED1_N_JTDI	GPIO42	w_utif_n[9]	jtdi_n	Default as GPIO, LAN1_LED
13	EPHY_LED0_N_JTDO	GPIO43	N/A	jtdo_n	Default as GPIO, WAN_LED
14	WLED_N	GPIO44	N/A	N/A	Default as GPIO, RESET_FN_KEY
15	GND	N/A	N/A	N/A	GND
16	UART_TXD1	GPIO45	PWM_CH0	antsel[1]	Internally connect 10K pull-up resistance to 3.3V, default as UART_TXD1
17	UART_RXD1	GPIO46	PWM_CH1	antsel[0]	Default as UART_RXD1
18	I2S_SDI	GPIO0	PCMDRX	antsel[5]	Default as I2S_SDI
19	I2S_SDO	GPIO1	PCMDTX	antsel[4]	Internally connect 10K pull-down resistance to GND, default as I2S_SDO
20	I2S_WS	GPIO2	PCMCLK	antsel[3]	Default as I2S_WS
21	I2S_CLK	GPIO3	PCMFS	antsel[2]	Default as I2S_CLK
22	I2C_SCLK	GPIO4	sutif_txd	ext_bgclk	Default as I2C_SCLK
23	I2C_SD	GPIO5	sutif_rxd	N/A	Default as I2C_SD
24	SPI_CS1	GPIO6	REF_CLK_O	N/A	Internally connect 10K pull-down resistance to GND, default as SPI_CS1
25	VDD3V3_PROG	N/A	N/A	N/A	External Flash burner power

					supply DC 3.3V input pin. Note: it is only necessary to connect when use the external flash burner. It is usually not connect
26	SPI_CLK	GPIO7	N/A	N/A	Internally connect 10K pull-up resistance to 3.3V, default as SPI_CLK
27	GND	N/A	N/A	N/A	GND
28	SPI_MOSI	GPIO8	N/A	N/A	Internally connect 10K pull-down resistance to GND, default as SPI_MOSI
29	SPI_MISO	GPIO9	N/A	N/A	Default as SPI_MISO
30	GPIO11	GPIO11	REF_CLK_O	PERST_N	Default as REF_CLK_O
31	SPI_CS0	GPIO10	N/A	N/A	Default as SPI_CS0, used by system for flash control, can be used for flash burning
32	UART_RXD0	GPIO13	N/A	N/A	Default as UART_RXD0, system debug uart port
33	UART_TXD0	GPIO12	N/A	N/A	Internally connect 10K pull-down resistance to GND, default as UART_TXD0, system debug uart port

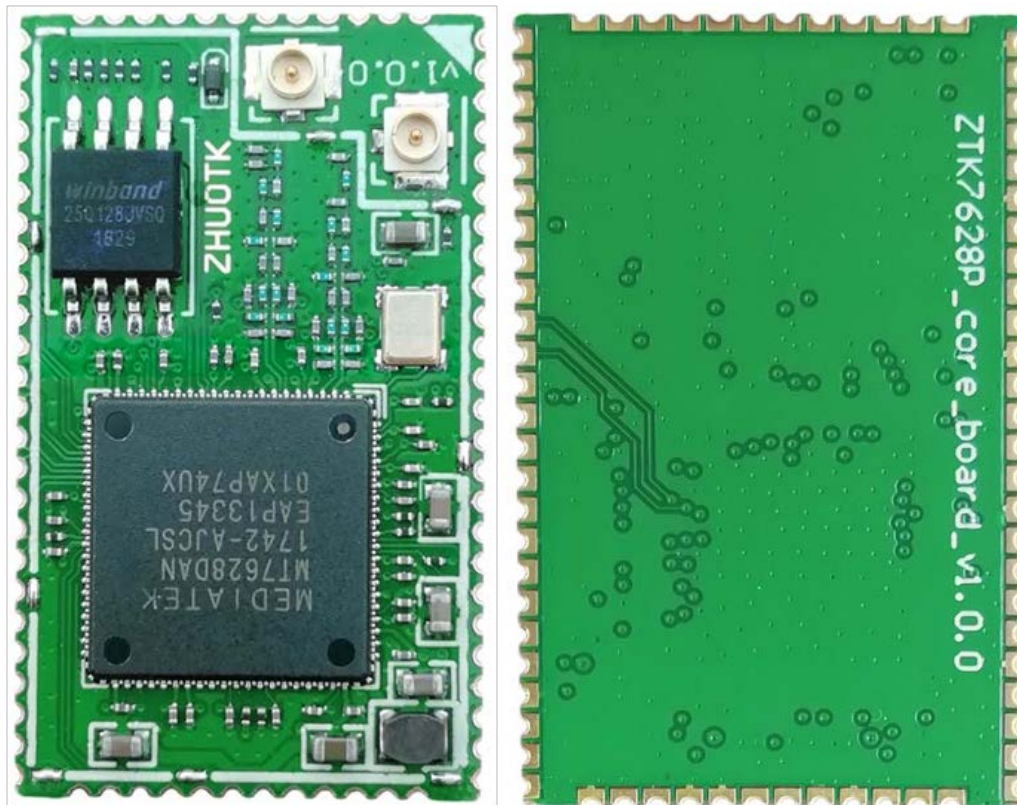
34	MDI_R_P0_P		N/A	N/A	N/A	Ethernet 0 receive positive port
35	GND		N/A	N/A	N/A	GND
36	GND		N/A	N/A	N/A	GND
37	MDI_R_P0_N		N/A	N/A	N/A	Ethernet 0 receive negative port
38	MDI_T_P0_N		N/A	N/A	N/A	Ethernet 0 transmit negative port
39	MDI_T_P0_P		N/A	N/A	N/A	Ethernet 0 transmit positive port
	gateway mode	IOT device mode				
40	MDI_T_P1_N	SPIS_CLK	GPIO15	w_utif[1]	PWM_CH1	Default as PWM_CH1
41	MDI_T_P1_P	SPIS_CS	GPIO14	w_utif[0]	PWM_CH0	Default as PWM_CH0
42	MDI_R_P1_N	SPIS_MOSI	GPIO17	w_utif[3]	UART_RXD2	Default as UART_RXD2
43	MDI_R_P1_P	SPIS_MISO	GPIO16	w_utif[2]	UART_TXD2	Default as UART_TXD2
44	MDI_R_P2_N	PWM_CH1	GPIO19	w_utif[5]	SD_D6	Default as GPIO
45	MDI_R_P2_P	PWM_CH0	GPIO18	w_utif[4]	SD_D7	Default as GPIO
46	GND		N/A	N/A	N/A	GND
47	MDI_T_P2_P	UART_TXD2	GPIO20	PWM_CH2	SD_D5	Default as PWM_CH2
48	MDI_T_P2_N	UART_RXD2	GPIO21	PWM_CH3	SD_D4	Default as PWM_CH3
49	MDI_T_P3_P	SD_WP	GPIO22	w_utif[10]	w_dbgin	Default as SD_WP
50	MDI_T_P3_N	SD_CD	GPIO23	w_utif[11]	w_dbgack	Default as SD_CD
51	GND		N/A	N/A	N/A	GND
52	MDI_R_P3_N	SD_D0	GPIO25	w_utif[13]	w_jtdi	Default as SD_D0
53	MDI_R_P3_P	SD_D1	GPIO24	w_utif[12]	w_jtclk	Default as SD_D1
54	GND		N/A	N/A	N/A	GND
55	MDI_R_P4_P	SD_CLK	GPIO26	w_utif[14]	w_jtdo	Default as

						SD_CLK
56	MDI_R_P4_N	SD_CMD	GPIO27	w_utif[15]	dbg_uart_t	Default as SD_CMD
57	MDI_T_P4_P	SD_D3	GPIO28	w_utif[16]	w_jtms	Default as SD_D3
58	MDI_T_P4_N	SD_D2	GPIO29	w_utif[17]	w_jtrst_n	Default as SD_D2
59	GND		N/A	N/A	N/A	GND
60	USB_N		N/A	N/A	N/A	USB negative port
61	USB_P		N/A	N/A	N/A	USB positive port

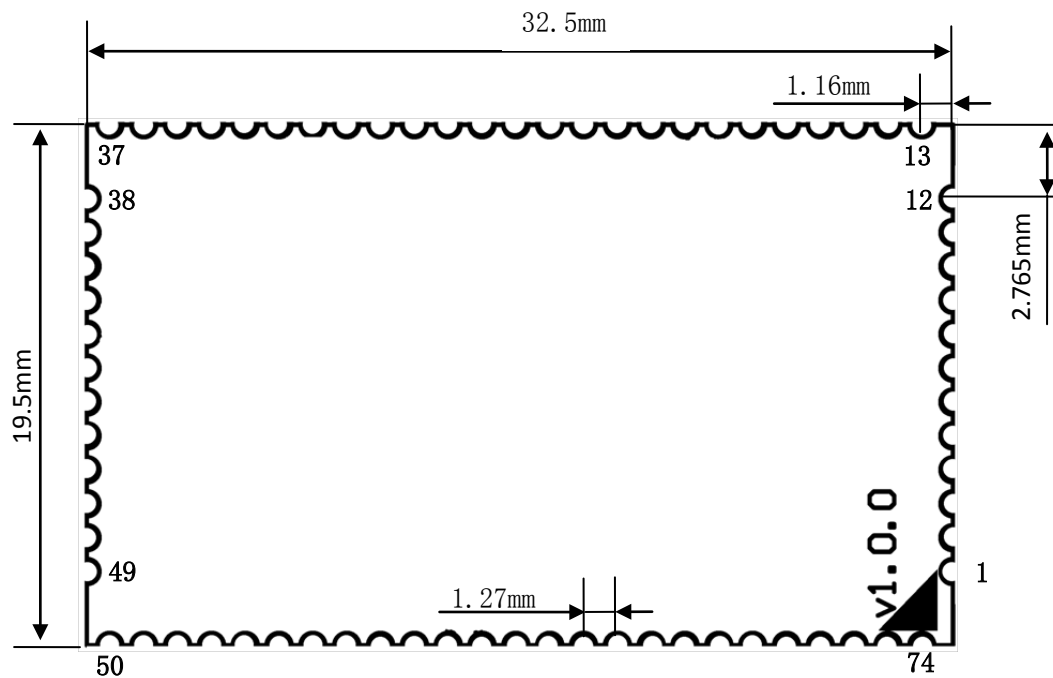
Note: When the chip is in "gateway mode", the pin function of the associated network port multiplexing is unavailable. In this case, the pin function of these multiplexed pins is ethernet port. While in "Internet of Things device mode", the Ethernet function of these multiplexed pins is not available and other multiplexing functions are available. ZTK7628P pin header version, JS7628 pin header version pin, ZTK7628P-core-board pin header version are fully compatible in the common base board.

3.2. Stamp hole packaging

3.2.1. Real photos



3.2.2. Pins introduction and product size



ZTK7628P-core-board stamp hole version front view

ZTK7628P-core-board stamp hole version pins introduction

Pin	Function0	Function1	Function2	Function3	备注
1	I2C_SCLK	GPIO4	sutif_txd	ext_bgclk	Default as I2C_SCLK
2	I2C_SD	GPIO5	sutif_rxd	N/A	Default as I2C_SD
3	VDD3V3_PROG	N/A	N/A	N/A	External Flash burner power supply DC 3.3V input pin. Note: it is only necessary to connect when use the external flash burner. It is usually not connect
4	GND	N/A	N/A	N/A	GND
5	SPI_CS1	GPIO6	REF_CLK_O	N/A	Internally connect 10K

					pull-down resistance to GND, default as SPI_CS1
6	SPI_CS0	GPIO10	N/A	N/A	Default as SPI_CS0, used by system for flash control, can be used for flash burning
7	SPI_CLK	GPIO7	N/A	N/A	Internally connect 10K pull-up resistance to 3.3V, default as SPI_CLK
8	SPI_MISO	GPIO9	N/A	N/A	Default as SPI_MISO
9	SPI_MOSI	GPIO8	N/A	N/A	Internally connect 10K pull-down resistance to GND, default as SPI_MOSI
10	GPIO11	GPIO11	REF_CLK_O	PERST_N	Default as REF_CLK_O
11	UART_TXD0	GPIO12	N/A	N/A	Internally connect 10K pull-down resistance to GND, default as UART_TXD0, system debug uart port
12	UART_RXD0	GPIO13	N/A	N/A	Default as UART_RXD0, system debug uart port
13	GND	N/A	N/A	N/A	GND
14	MDI_R_P0_P	N/A	N/A	N/A	Ethernet 0 RXP
15	MDI_R_P0_N	N/A	N/A	N/A	Ethernet 0 RXN
16	MDI_T_P0_P	N/A	N/A	N/A	Ethernet 0 TXP
17	MDI_T_P0_N	N/A	N/A	N/A	Ethernet 0 TXN
18	GND	N/A	N/A	N/A	GND

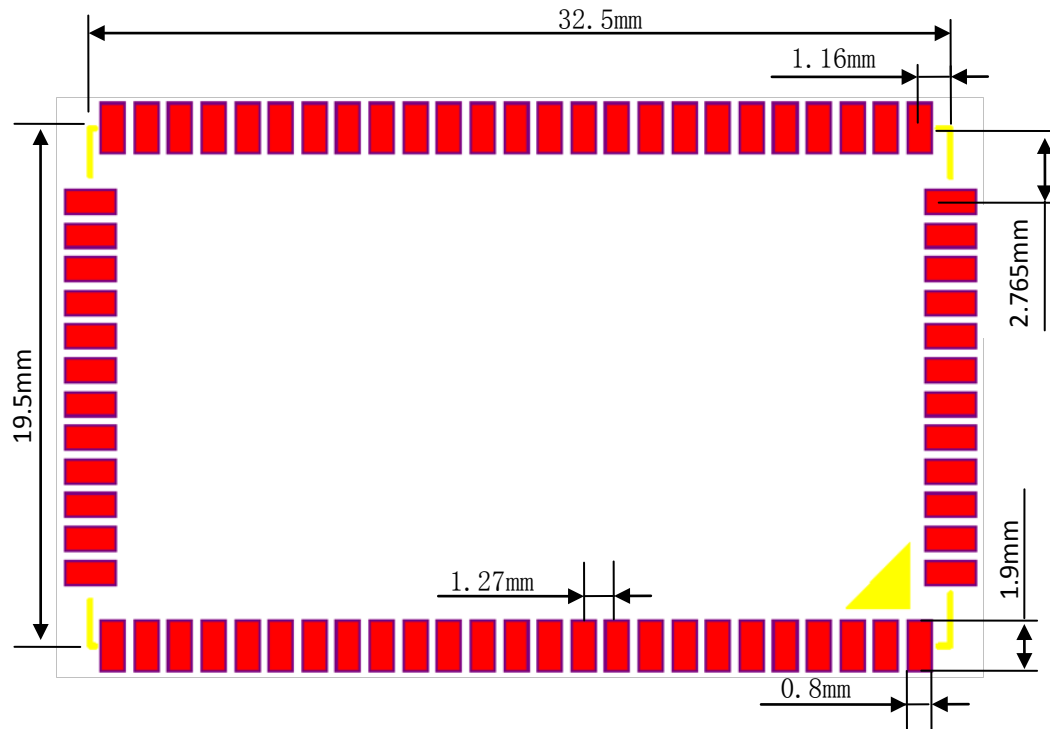
	Gateway mode		IOT device mode			
19	MDI_T_P1_P	SPIS_CS	GPIO14	w_utif[0]	PWM_CH0	Default as PWM_CH0
20	MDI_T_P1_N	SPIS_CLK	GPIO15	w_utif[1]	PWM_CH1	Default as PWM_CH1
21	MDI_R_P1_P	SPIS_MISO	GPIO16	w_utif[2]	UART_TXD2	Default as UART_TXD2
22	MDI_R_P1_N	SPIS_MOSI	GPIO17	w_utif[3]	UART_RXD2	Default as UART_RXD2
23	GND		N/A	N/A	N/A	GND
24	MDI_R_P2_P	PWM_CH0	GPIO18	w_utif[4]	SD_D7	Default as GPIO
25	MDI_R_P2_N	PWM_CH1	GPIO19	w_utif[5]	SD_D6	Default as GPIO
26	MDI_T_P2_P	UART_TXD2	GPIO20	PWM_CH2	SD_D5	Default as PWM_CH2
27	MDI_T_P2_N	UART_RXD2	GPIO21	PWM_CH3	SD_D4	Default as PWM_CH3
28	GND		N/A	N/A	N/A	GND
29	MDI_T_P3_P	SD_WP	GPIO22	w_utif[10]	w_dbgin	Default as SD_WP
30	MDI_T_P3_N	SD_CD	GPIO23	w_utif[11]	w_dbgack	Default as SD_CD
31	MDI_R_P3_P	SD_D1	GPIO24	w_utif[12]	w_jtclk	Default as SD_D1
32	MDI_R_P3_N	SD_D0	GPIO25	w_utif[13]	w_jtdi	Default as SD_D0
33	GND		N/A	N/A	N/A	GND
34	MDI_R_P4_P	SD_CLK	GPIO26	w_utif[14]	w_jtdo	Default as SD_CLK
35	MDI_R_P4_N	SD_CMD	GPIO27	w_utif[15]	dbg_uart_t	Default as SD_CMD
36	MDI_T_P4_P	SD_D3	GPIO28	w_utif[16]	w_jtms	Default as SD_D3
37	MDI_T_P4_N	SD_D2	GPIO29	w_utif[17]	w_jtrst_n	Default as SD_D2
38	GND		N/A	N/A	N/A	GND
39	USB_P		N/A	N/A	N/A	USB+
40	USB_N		N/A	N/A	N/A	USB-
41	GND		N/A	N/A	N/A	GND
42	GND		N/A	N/A	N/A	GND
43	VDD3V3		N/A	N/A	N/A	Main input power supply 3.3V DC
44	VDD3V3		N/A	N/A	N/A	Main input

					power supply 3.3V DC
45	GND	N/A	N/A	N/A	Main power GND
46	GND	N/A	N/A	N/A	Main power GND
47	PCIE_TX0_P	N/A	N/A	N/A	PCIE 0 TX+
48	PCIE_TX0_N	N/A	N/A	N/A	PCIE 0 TX-
49	GND	N/A	N/A	N/A	GND
50	GND	N/A	N/A	N/A	GND
51	PCIE_RX0_P	N/A	N/A	N/A	PCIE RX+
52	PCIE_RX0_N	N/A	N/A	N/A	PCIE RX-
53	GND	N/A	N/A	N/A	GND
54	PCIE_CK0_N	N/A	N/A	N/A	External reference clock output, negative
55	PCIE_CK0_P	N/A	N/A	N/A	External reference clock output, positive
56	PERST_N	GPIO36	N/A	N/A	Internally connect 10K pull-down resistance to GND, default as GPIO
57	REF_CLK_O	GPIO37	N/A	N/A	Default as GPIO, SYSTEM_LED
58	GND	N/A	N/A	N/A	GND
59	WDT_RST_N	GPIO38	N/A	N/A	Default as GPIO, USER_KEY1, high level effective
60	EPHY_LED4_N_JTRST_N	GPIO39	w_utif_n[6]	jtrstn_n	Default as GPIO, WLAN_LED
61	EPHY_LED3_N_JTCLK	GPIO40	w_utif_n[7]	jtclk_n	Default as GPIO, LAN2_LED
62	EPHY_LED2_N_JTMS	GPIO41	w_utif_n[8]	jtms_n	Default as GPIO, USER_KEY2, high level effective
63	EPHY_LED1_N_JTDI	GPIO42	w_utif_n[9]	jtdi_n	Default as GPIO, LAN1_LED
64	EPHY_LED0_N_JTDO	GPIO43	N/A	jtdo_n	Default as GPIO, WAN_LED
65	WLED_N	GPIO44	N/A	N/A	Default as GPIO, RESET_FN_KEY,

					high level effective
66	GND	N/A	N/A	N/A	GND
67	UART_TXD1	GPIO45	PWM_CH0	antsel[1]	Internally connect 10K pull-up resistance to 3.3V, default as UART_TXD1
68	UART_RXD1	GPIO46	PWM_CH1	antsel[0]	Default as UART_RXD1
69	GND	N/A	N/A	N/A	GND
70	I2S_SDI	GPIO0	PCMDRX	antsel[5]	Default as I2S_SDI
71	I2S_SDO	GPIO1	PCMDTX	antsel[4]	Internally connect 10K pull-down resistance to GND, default as I2S_SDO
72	GND	N/A	N/A	N/A	GND
73	I2S_WS	GPIO2	PCMCLK	antsel[3]	Default as I2S_WS
74	I2S_CLK	GPIO3	PCMFS	antsel[2]	Default as I2S_CLK

Note: When the chip is in "gateway mode", the pin function of the associated network port multiplexing is unavailable. In this case, the pin function of these multiplexed pins is ethernet port. While in "Internet of Things device mode", the Ethernet function of these multiplexed pins is not available and other multiplexing functions are available. ZTK7628P pin header version, JS7628 pin header version pin, ZTK7628P-core-board pin header version are fully compatible in the common base board.

3.2.3. Recommend package

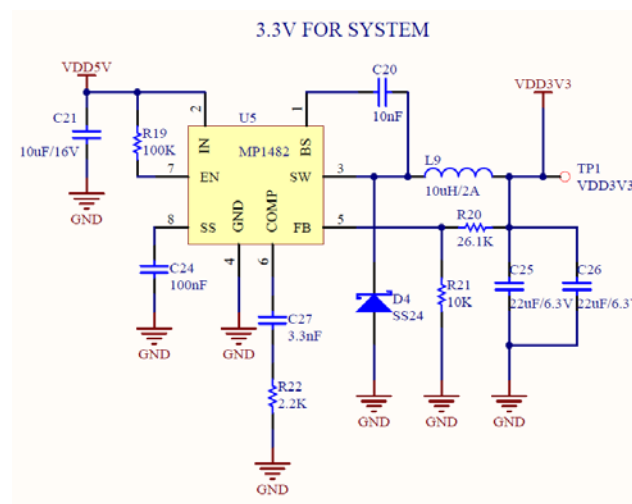


Note: "ZTK7628P_convert_board_xxxx.PcbLib" (xxxx is version number) ZTK7628P module PCB package library is provided inside.

4. Base board reference design Recommend package

4.1. Power circuit

The power supply voltage of the core board is 3.3V and the average current is about 185mA. In order to ensure the stable operation of the core board, a current of at least 500mA should be reserved for the module (depending on the actual application). The figure below is the design of 3.3V power supply of JS7628 base board



MP1482 stabilized power supply chip is used in the figure above, which can reach 2A output current. Users can choose whether to use this model or not according to the actual situation. It is not recommended to use "LDO chip" power supply, such as AMS1117, although the circuit design of this kind of chip is simple, but the high current working efficiency is too low, high heat, it is easy to cause the system power supply shortage, thus leading to the instability of the system.

4.2. About GPIO ports

The INPUT and output voltage of GPIO pin of MT7628/MT7688 is 3.3V. Some GPIO pins are pull-up or pull-down inside the module to configure the system for MT7628/MT7688 startup. Note that when the board is started, the GPIO pin labeled "pull up" in the "pin introduction" should not be externally forced to pull down to a low level, and the GPIO pin labeled "pull down" should not be externally forced to pull up to a high level, otherwise the system may be unable to work normally. Other GPIO can be used according to the ordinary GPIO port.

4.3. Core board minimum system

The user only needs to connect the pins "GND" and "VDD3V3" of the core board to supply power to the core board, and connect the three key pins "WDT_RST_N", "EPHY_LED2_N_JTMS" and "WLED_N" with 10K pull-down resistance to the ground, and the system can work normally. This module generally does not need to add heat sinks, but in order to improve the heat dissipation efficiency of the system, please try to connect all "GND" pins of the module to the bottom plate "GND" pins designed by the reader, so as to achieve better heat dissipation effect. Other pins, such as debug serial port, network port, etc., can be added according to the user's own needs. If you don't need them, just not connect them. Readers can refer to "JS7628_base_board_XXXXX.pdf" (XXXXX is version number) base board schematic for designing.

4.4. The temperature when reflow

If the customer needs to design the base board with ZTK7628P stamp hole version module through the reflow welding machine, pay attention to the reflow welding peak temperature do not exceed 240°C, otherwise it may cause damage to ZTK7628P stamp hole module.

5. Revision history

version	time	Modify description
v1.0	2020.08.28	Initial version of ZTK7628P-core-board manual in English. Based on Chinese manual v1.6

FCC 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.

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

Note: 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.

The WIFI Module is designed to comply with the FCC statement. FCC ID is 2AXEE-ZTK7628P. The host system using WIFI Module should have label indicated it contain modular's FCC ID :2AXEE-ZTK7628P . This radio module must not installed to colocate and operating simultaneously with other radios in host system additional testing and equipment authorization may be required to operating simultaneously with other radio.

The WIFI Module is deaigned for a compact PCB design .It should be installed and operated with host or other minimum distance of 20 centimeters between the radiator and your body." To comply with FCC regulations limiting both maximum RF output power and human exposure to RF radiation, the maximum antenna gain including cable loss in a mobile-only exposure condition must not exceed 5dBi in the 2.4G band. The WIFI Module and its antenna must not be co-located or operating in conjunction with any other transmitter or antenna within a host device.

This module integrates two IPEX antenna interface, the user needs to purchase and install the antenna according to the instructions.

Notice to OEM integrator

The WIFI Module is deaigned for a compact PCB design .It should be installed and operated with laptop. OEM can install the module into the host through the module's USB port, but it should be noted that the module's swipe port needs to be correctly installed on the surface to ensure the normal operation of the NFC function.

The end user manual shall include all required regulatory information/warning as show in this manual. The OEM integrator is responsible for testing their end-product for any additional compliance requirements required with this module installed.

The device must be professionally installed

The intended use is generally not for the general public.It is generally for industry/commercial use. The connector is within the transmitter enclosure and can only be accessed by disassembly of the transmitter that is not nomally required, the user has no access to the connector.Installation must be controlled. Installation requires special training

This device complies with Part 15, Subpart C, Section 15.247 of the FCC Rules.