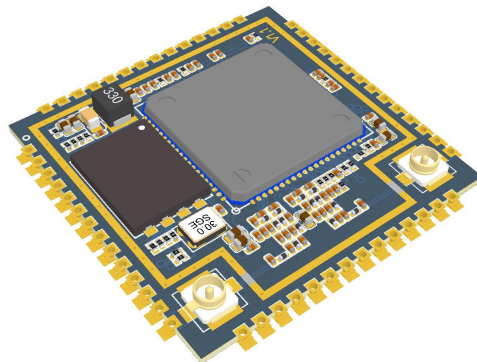




Shenzhen Hi-Link Electronic Co., Ltd.

HLK-7628D User Manual



Contents

| | |
|--|----|
| 1. PRODUCT DESCRIPTION..... | 1 |
| 1.1. BASIC PARAMETERS..... | 1 |
| 1.2. MODULE PHYSICAL MAP..... | 2 |
| 2. BLOCK DIAGRAM..... | 2 |
| 2.1. TYPICAL APPLICATION..... | 3 |
| 2.2. SPECIFICATION..... | 4 |
| 2.3. INTERFACE..... | 4 |
| 3. ELECTRICAL CHARACTERISTICS..... | 5 |
| 3.1. POWER SUPPLY REQUIREMENTS..... | 5 |
| 3.2. RADIO FREQUENCY CHARACTERISTICS..... | 5 |
| 4. MODULE PIN DEFINITION..... | 7 |
| 4.1. PIN DEFINITION DIAGRAM..... | 7 |
| 4.2. DEFAULT PIN FUNCTION (SERIAL PASSTHROUGH FIRMWARE)..... | 8 |
| 5. MODULE DIMENSION..... | 11 |
| 6. REFLOW SOLDERING TEMPERATURE CURVE..... | 12 |

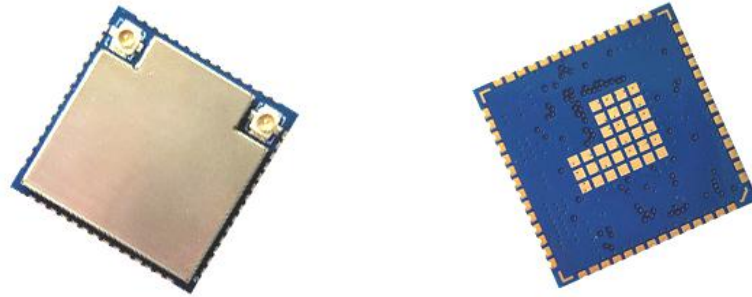
1. Product description

HLK-7628D module from Hi-Link is a low-cost, low-power IoT module based on MediaTek's MT7628DN. This module introduces all interfaces of MT7628DN, supports Linux and OpenWrt operating system and custom development, has rich interface and powerful processor, can be widely used in smart devices or cloud service applications as well as freely second-developed.

1.1. Basic parameters

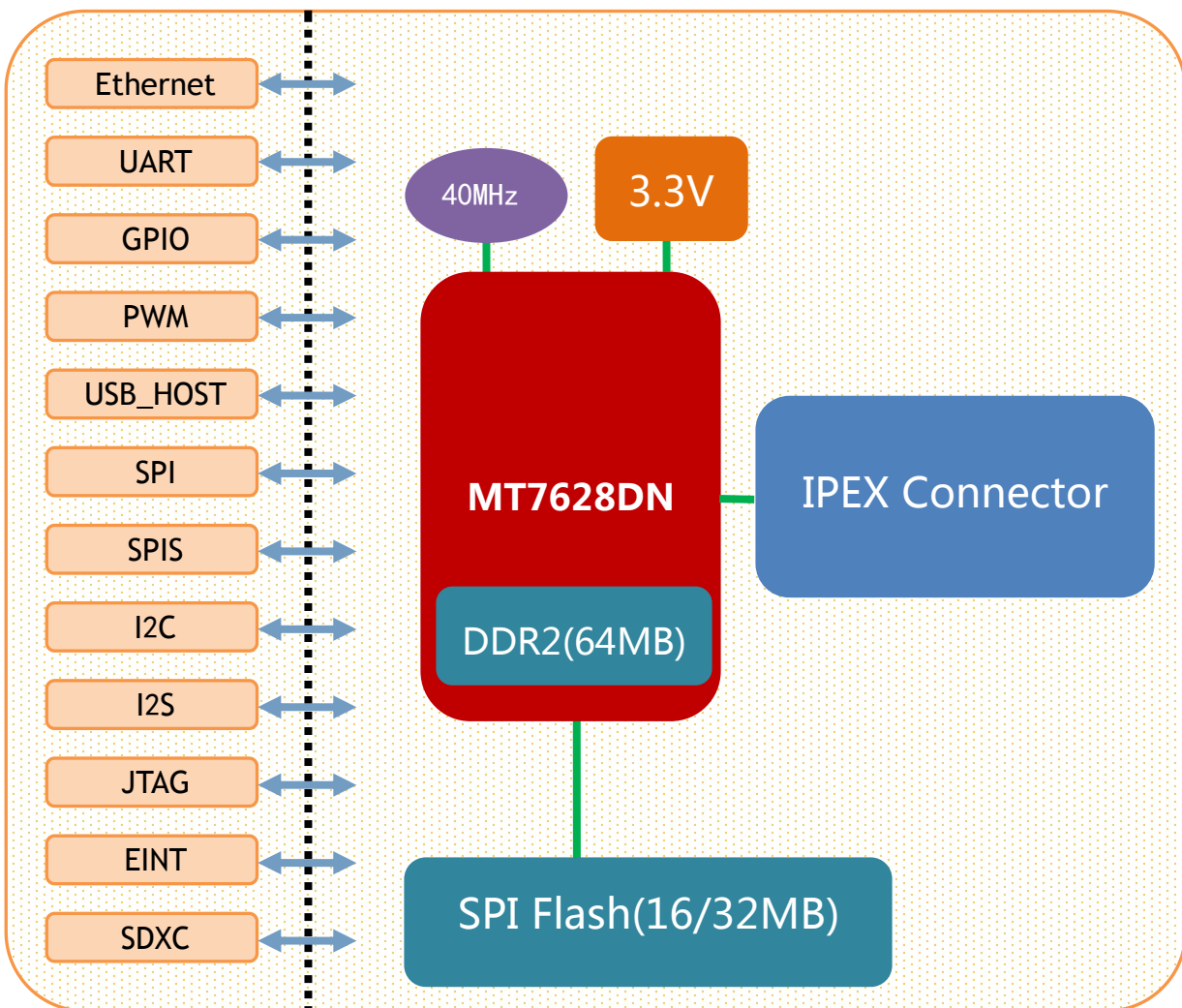
- Super data processing capability, MCU frequency up to 580MHz
- 150M wireless rate
- Support 802.11b/g/nmode
- 20/40 channel bandwidth
- Support 802.11v
- Support AP, STA and AP, STA mixed mode
- 5 10/100M adaptive network ports
- 1 USB2.0 host interface
- Multiple interfaces SPI/SD-XC/eMMC
- Rich peripheral interface, SPI, I2C, I2S, PCM, UART, JTAG, GPIO
- Widely used in the Internet of Things
- Built-in powerful PMU
- Support 16 Multiple BSSIDs
- Support multiple encryption methods WEP64/128, TKIP, AES, WPA, WPA2, WAPI
- Support QoS, WMM, WMM-PS
- Support multiple systems, Linux 2.6.36 SDK, OpenWrt 3.10

1.2. Module physical map



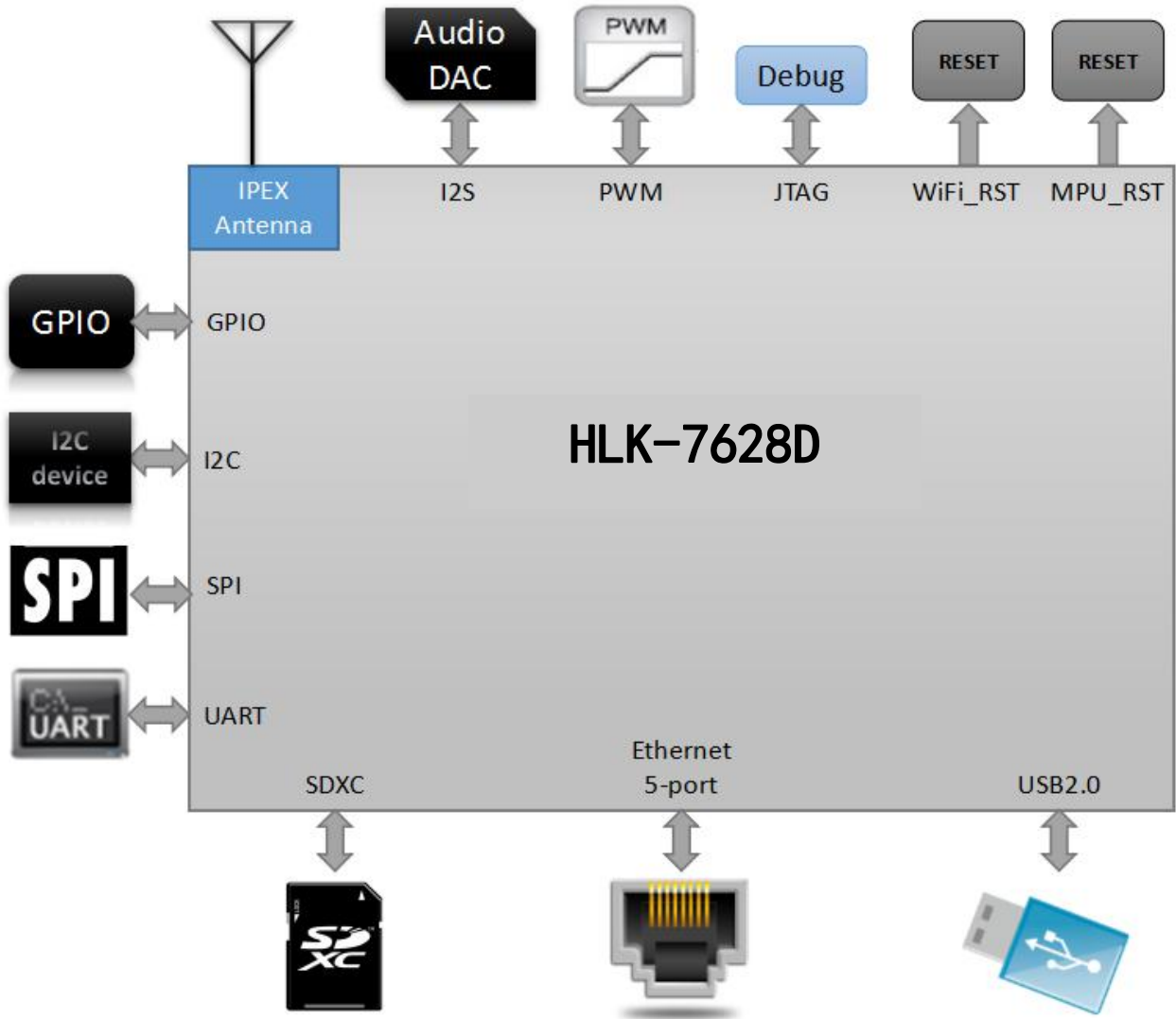
HLK-7628D Front and Back surface

2. Block diagram



HLK-7628D Module architecture diagram

2.1. Typical application



HLK-7628D Typical peripheral interface diagram

2.2. Specification

| Items | Parameter | Remarks |
|-------------|---|---------------------|
| Module type | HLK-7628D | Version V1.2 |
| Chip | MT7628DN | |
| Kernel | MIPS24KEc | |
| Frequency | 580MHz | |
| Storage | DDR2 64MB | |
| Flash | 16MB | Customized 32MB/8MB |
| Temperature | Ambient temperature:-40°C~85°C | |
| Humidity | Use: 10~95% (non-condensing) Storage: 5~95% (non-condensing) | |
| Dimension | 18mm×32.8mm×2.8mm | |

2.3. Interface

| Interface | Module interface | Factory default firmware supported interface |
|--------------------|---------------------|--|
| WiFi standard | IEEE 802.11b/g/n | Support |
| Ethernet interface | 5 10M/100M adaptive | 1 WAN and 4 LAN |
| UART | 3 way | 2-way UART with transparent transmission |
| SDIO | 1 way | Unavailable |
| SPI | 1 way | Unavailable |
| I2C | 1 way | Unavailable |
| I2S | 1 way | Unavailable |
| PWM | 1 way | Unavailable |
| GPIO | Above 8 way | Defined function |

Remarks:

- The module factory default development firmware is written by our company based on Linux; the Ethernet, WiFi, UART0 and UART1 of the firmware have transparent transmission function.
- You can rewrite the OPENWRT program or the MTK original Linux program according to the actual use.

3. Electrical characteristics

3.1. Power supply requirements

| Power supply requirements | |
|----------------------------|-------------|
| Power input voltage | DC:3.3±0.2V |
| No-load operating current | 170±50mA |
| Supply current requirement | ≥800mA |

3.2. Radio frequency characteristics

3.2.1. 802.11b 11M

| 802.11b Transmit (Conductive) | | | | | |
|-------------------------------|---------------|-----------|-------|------------|------|
| Item | Condition | Min. | Typ. | Max. | Unit |
| Frequency Range | | Channel 1 | | Channel 13 | |
| Tx Power Level | DQPSK | 18 | 20 | 22 | dBm |
| Frequency Tolerance | | -15 | 0 | 15 | ppm |
| Spectral Mask | 11MHz→22MHz | | 40 | | dBr |
| | >22MHz | | 53 | | dBr |
| Modulation Accuracy | All Data Rate | | 15 | | % |
| 802.11b Receiver (Conductive) | | | | | |
| Item | Condition | Min. | Typ. | 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. | Typ. | 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 | % |
| 802.11g Receiver (Conductive) | | | | | |
| Item | Condition | Min. | Typ. | 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)

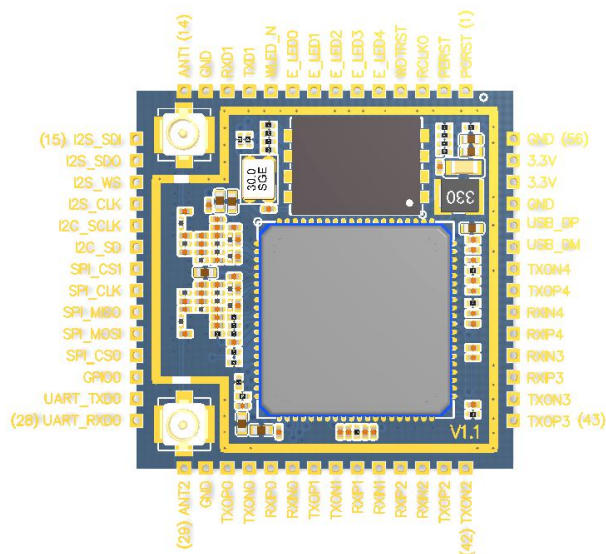
| 802.11n_HT20 Transmit (Conductive) | | | | | |
|------------------------------------|---------------|-----------|-------|------------|------|
| Item | Condition | Min. | Typ. | Max. | Unit |
| Frequency Range | | Channel 1 | | Channel 13 | |
| Tx Power Level | OFDM | 15 | 17 | 19 | dBm |
| Frequency Tolerance | | -15 | 0 | 15 | ppm |
| Modulation Accuracy | All Data Rate | | -31 | -28 | dB |
| 802.11n_HT20 Receiver (Conductive) | | | | | |
| Item | Condition | Min. | Typ. | 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 | Condition | Min. | Typ. | 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. | Typ. | Max. | Unit |
| Frequency Range | | Channel 1 | | Channel 13 | |
| Min. Input | MCS7 PER<10% | -76.5 | -74.5 | -72.5 | dBm |

4. Module pin definition

4.1. Pin Definition Diagram



HLK-7628D Default pin definition diagram

4.2. Default pin function (serial passthrough firmware)

| No. | Network name | Type | Function Description | Default features |
|-----|--------------|------|--|--|
| 1 | PORST_N | I/O | Module reset (restart), active low | Can't be used to restore the default settings, hang up without using |
| 2 | PERST_N | I/O | PCIe device reset output | Undefined, please hang up, cannot be pulled up and down |
| 3 | REF_CLK0 | I/O | Reference clock output | Undefined, please hang up |
| 4 | WDT_RST_N | I/O | Watchdog timeout reset | Pull down for 1s and enter the WeChat AirKiss function; Pull down for 3s, the serial port exits transparent transmission and enters AT mode; Pull down for 6s, the module restores the default settings; |
| 5 | EPHY_LED4 | I/O | PORT4 LED, Active low | LAN4 network port light |
| 6 | EPHY_LED3 | I/O | PORT3 LED, Active low | LAN3 network port light |
| 7 | EPHY_LED2 | I/O | PORT2 LED, Active low | LAN2 network port light |
| 8 | EPHY_LED1 | I/O | PORT1 LED, Active low | LAN1 network port light |
| 9 | EPHY_LED0 | I/O | PORT0 LED, Active low | WAN network port light |
| 10 | WLED_N | I/O | WiFi LED, Active low | WiFi LED flashes when there is a WiFi signal, can be left floating |
| 11 | UART_TXD1 | O | Serial port 1 data transmission | Serial port 1 output, hang up without using |
| 12 | UART_RXD1 | I | Serial port 1 data reception | Serial port 1 input, hang up without using |
| 13 | GND | P | Ground | Ground |
| 14 | ANT | RF | On-board antenna RF interface, default external antenna, this pin is not connected | If you need to connect the foot, you need to remove the antenna base and replace it with a 0 ohm resistor. |
| 15 | I2S_SDI | I/O | I2S Data input | Undefined, please hang up |
| 16 | I2S_SDO | I/O | I2S Data output | Undefined, please hang up, cannot be pulled up and down |
| 17 | I2S_WS | I/O | I2S channel selection, 0: left; 1: right | Undefined, please hang up |

| | | | | |
|----|------------------|-----|--|--|
| 18 | I2S_CLK | I/O | I2S data bit clock | Undefined, please hang up |
| 19 | I2C_SCLK | I/O | I2C bus clock | Undefined, please hang up |
| 20 | I2C_SD | I/O | I2C bus data | Undefined, please hang up |
| 21 | SPI_CS1 | I/O | SPI bus chip select signal 1 | Undefined, please hang up, cannot be pulled up and down |
| 22 | SPI_CLK | I/O | SPI bus clock signal | Undefined, please hang up, cannot be pulled up and down |
| 23 | SPI_MISO | I/O | SPI bus data master in and slave out | Undefined, please hang up |
| 24 | SPI_MOSI | I/O | SPI bus data master out and slave in | Undefined, please hang up, cannot be pulled up and down |
| 25 | SPI_CS0 | I/O | SPI bus chip select signal 0 | Undefined, please hang up |
| 26 | GPIO0 | I/O | Universal input and output interface | Undefined, please hang up |
| 27 | UART_TXD0 | O | Serial port 0 data output | Serial port 0 output, hang up without using, cannot be pulled up and down |
| 28 | UART_RXD0 | I | Serial port 0 data input | Serial port 0 input, hang up without using |
| 29 | ANT1 | RF | On-board antenna RF interface, default external antenna, this pin is not connected | If you need to connect the foot, you need to remove the antenna base and replace it with a 0 ohm resistor. |
| 30 | GND | P | Ground | Ground |
| 31 | MDI_RP_P0 | I/O | PORT0 Network signal reception positive | WAN port, hang up without using |
| 32 | MDI_RN_P0 | I/O | PORT0 Network signal reception negative | |
| 33 | MDI_TP_P0 | I/O | PORT0 Network signal transmission positive | |
| 34 | MDI_TN_P0 | I/O | PORT0 Network signal transmission negative | |
| 35 | MDI_TP_P1 | I/O | PORT1 Network signal transmission positive | LAN1port, hang up without using |
| 36 | MDI_TN_P1 | I/O | PORT1 Network signal transmission negative | |
| 37 | MDI_RP_P1 | I/O | PORT1 Network signal reception positive | |

| | | | | |
|----|-----------|-----|--|----------------------------------|
| 38 | MDI_RN_P1 | I/O | PORT1 Network signal reception negative | |
| 39 | MDI_RP_P2 | I/O | PORT2 Network signal reception positive | LAN2 port, hang up without using |
| 40 | MDI_RN_P2 | I/O | PORT2 Network signal reception negative | |
| 41 | MDI_TP_P2 | I/O | PORT2 Network signal transmission positive | |
| 42 | MDI_TN_P2 | I/O | PORT2 Network signal transmission negative | |
| 43 | MDI_TP_P3 | I/O | PORT3 Network signal transmission positive | LAN3 port, hang up without using |
| 44 | MDI_TN_P3 | I/O | PORT3 Network signal transmission negative | |
| 45 | MDI_RP_P3 | I/O | PORT3 Network signal reception positive | |
| 46 | MDI_RN_P3 | I/O | PORT3 Network signal reception negative | |
| 47 | MDI_RP_P4 | I/O | PORT4 Network signal reception positive | LAN4 port, hang up without using |
| 48 | MDI_RN_P4 | I/O | PORT4 Network signal reception negative | |
| 49 | MDI_TP_P4 | I/O | PORT4 Network signal transmission positive | |
| 50 | MDI_TN_P4 | I/O | PORT4 Network signal transmission negative | |
| 51 | USB_DP | I/O | USB Data positive | Undefined, please hang up |
| 52 | USB_DM | I/O | USB Data negative | Undefined, please hang up |
| 53 | GND | P | Ground | System power |
| 54 | 3.3VD | P | 3.3V input, supply current $\geq 800\text{mA}$ | |
| 55 | 3.3VD | P | | |
| 56 | GND | P | Ground | |

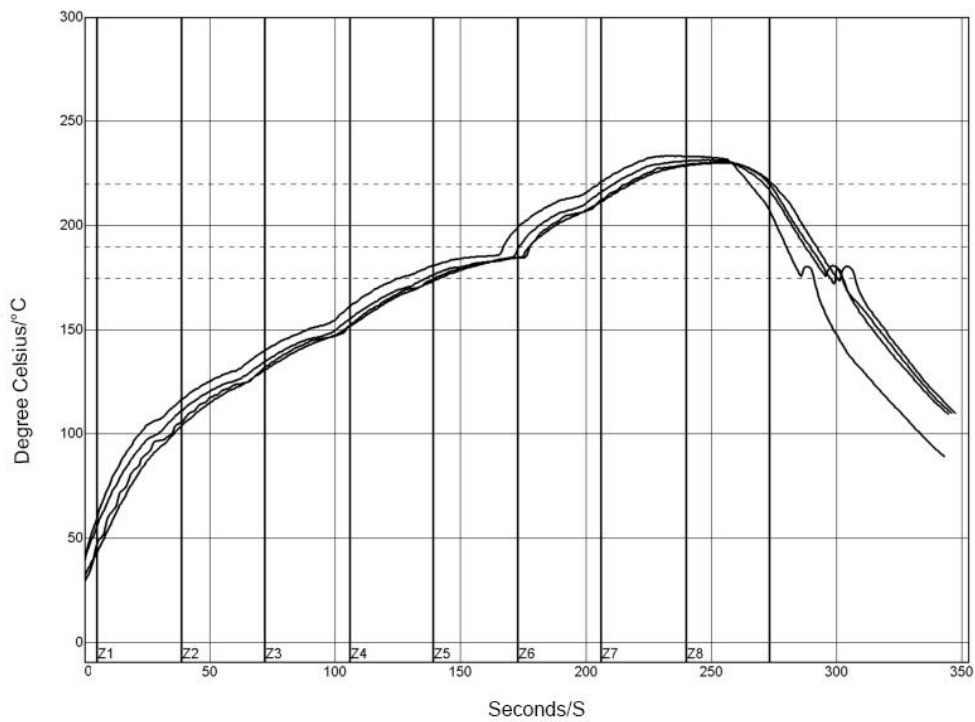
6. Reflow soldering temperature curve

When the module is over-fired, please strictly follow this temperature curve.

If the temperature deviation of the reflow soldering is too large, the module will be damaged!

| Temperature setting (degrees Celsius) | | | | | | | | | |
|---------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|--|
| Warm zone | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
| Upper temperature zone | 125 | 135 | 155 | 185 | 195 | 225 | 240 | 230 | |
| Lower temperature zone | 125 | 135 | 155 | 185 | 195 | 225 | 240 | 230 | |

Conveyor speed: 70.0 cm/min



| PW= 94% | Constant temperature time 175~190°C | | Reflux time/220° C | | Max temp. |
|------------------|-------------------------------------|------|--------------------|------|-----------|
| <TC2> | 35.53 | -82% | 55.58 | -72% | 230.28 |
| <TC3> | 37.66 | -74% | 58.66 | -57% | 230.56 |
| <TC4> | 41.52 | -62% | 60.63 | -47% | 233.62 |
| <TC5> | 37.07 | -76% | 60.44 | -48% | 231.67 |
| Temp. difference | 5.99 | | 5.05 | | 3.34 |

Process boundary

| Solder paste: System Default for Reflow | | | | |
|---|---------------|---------------|------|--|
| Statistic name | Minimum limit | Maximum limit | Unit | |
| Constant temperature time 175~190 °C | 30 | 90 | S | |
| Reflux time -220°C | 50 | 90 | S | |
| Maximum temp. | 230 | 240 | °C | |

Appendix 1:

Module chip expandable function comparison table (OpenWrt)

| Name (Function 1) | Function 2 | Function 3 | Function 4 | GPIO# | Remarks |
|----------------------|------------|------------|------------|---------|---|
| SPI_CS0 | | | | GPIO#10 | SPI bus chip select signal 0 |
| REF_CLK0 | | | | GPIO#38 | Reference clock output |
| PERST_N | | | | GPIO#36 | PCIe device reset output |
| WDT_RST_N | | | | GPIO#37 | Watchdog timeout reset |
| EPHY_LED4 | JTAG_RST_N | | | GPIO#39 | PORT4 LED, Active low |
| EPHY_LED3 | JTAG_CLK | | | GPIO#40 | PORT3 LED, Active low |
| EPHY_LED2 | JTAG_TMS | | | GPIO#41 | PORT2 LED, Active low |
| EPHY_LED1 | JTAG_TDI | | | GPIO#42 | PORT1 LED, Active low |
| EPHY_LED0 | JTAG_TDO | | | GPIO#43 | PORT0 LED, Active low |
| PORST_N | | | | | CPU reset, Active low |
| UART_TXD1 | | | PWM_CH0 | GPIO#45 | Serial port 1 data transmission |
| UART_RXD1 | | | PWM_CH1 | GPIO#46 | Serial port 1 data reception |
| I2S_SDI | PCMDRX | | | GPIO#0 | I2S data input |
| I2S_SDO | PCMDTX | | | GPIO#1 | I2S data output |
| I2S_WS | PCMCLK | | | GPIO#2 | I2S channel selection, 0: left; 1: right |
| I2S_CLK | PCMFS | | | GPIO#3 | I2S data bit clock |
| I2C_SCLK | | | | GPIO#4 | I2C bus clock |
| I2C_SD | | | | GPIO#5 | I2C bus data |
| SPI_CS1 | | | | GPIO#6 | SPI bus chip select signal 1 |
| SPI_CLK | | | | GPIO#7 | SPI bus clock signal |
| SPI_MISO | | | | GPIO#9 | SPI bus data master in and slave out |
| SPI_MOSI | | | | GPIO#8 | SPI bus data master out and slave in |
| GPIO0 | | | | GPIO#11 | Universal input and output interface |

| | | | | | |
|---------------|---------------|---------|---------------|---------|---|
| UART_TXD 0 | | | | GPIO#12 | Serial port 0 data output |
| UART_RXD0 | | | | GPIO#13 | Serial port 0 data input |
| WLED_N | | | | GPIO#44 | WiFi LED, active low |
| MDI_RP_P0 | | | | | PORT0 Network signal reception positive |
| MDI_RN_P0 | | | | | PORT0 Network signal reception negative |
| MDI_TP_P0 | | | | | PORT0 Network signal transmission positive |
| MDI_TN_P0 | | | | | PORT0 Network signal transmission negative |
| MDI_TP_P1 | SPIS_CS | | PWM_CH0 | GPIO#14 | PORT1 Network signal transmission positive |
| MDI_TN_P1 | SPIS_CLK | | PWM_CH1 | GPIO#15 | PORT1 Network signal transmission negative |
| MDI_RP_P1 | SPIS_MISO | | UART_TXD 2 | GPIO#16 | PORT1 Network signal reception positive |
| MDI_RN_P1 | SPI_MOSI | | UART_RXD 2 | GPIO#17 | PORT1 Network signal reception negative |
| MDI_RP_P2 | | eMMC_D7 | PWM_CH0 | GPIO#18 | PORT2 Network signal reception positive |
| MDI_RN_P2 | | eMMC_D6 | PWM_CH1 | GPIO#19 | PORT2 Network signal reception negative |
| MDI_TP_P2 | UART_TX D2 | eMMC_D5 | PWM_CH2 | GPIO#20 | PORT2 Network signal transmission positive |
| MDI_TN_P2 | UART_RX D2 | eMMC_D4 | PWM_CH3 | GPIO#21 | PORT2 Network signal transmission negative |
| MDI_TP_P3 | SD_WP | eMMC_WP | | GPIO#22 | PORT3 Network signal transmission positive |
| MDI_TN_P3 | SD_CD | eMMC_CD | | GPIO#23 | PORT3 Network signal transmission negative |
| MDI_RP_P3 | SD_D1 | eMMC_D1 | | GPIO#24 | PORT3 Network signal reception positive |

| | | | | | |
|-----------|--------|----------|--|---------|---|
| MDI_RN_P3 | SD_D0 | eMMC_D0 | | GPIO#25 | PORT3 Network signal reception negative |
| MDI_RP_P4 | SD_CLK | eMMC_CLK | | GPIO#26 | PORT4 Network signal reception positive |
| MDI_RN_P4 | SD_CMD | eMMC_CMD | | GPIO#28 | PORT4 Network signal reception negative |
| MDI_TP_P4 | SD_D3 | eMMC_D3 | | GPIO#29 | PORT4 Network signal transmission positive |
| MDI_TN_P4 | SD_D2 | eMMC_D2 | | GPIO#27 | PORT4 Network signal transmission negative |
| USB_DP | | | | | USB Data positive |
| USB_DM | | | | | USB Data negative |