D2112-KJX01

# User Manual

Date: July 27, 2020

# catalogue

目录

# 1. Moudle Parameters

| category | parameter | expl ain |
|---|---|---|
| wireless | Bluetooth version | BT5.0 |
| | Operating frequency band | 2402MHz ～ 2480MHz |
| | Receiving sensitivity | -The95dBm@1M |
| | authenticatio n | FCC/CE |
| | Appearance dimension | (24.8±0.2)mm x (16±0.2)mm x (3.5±0.2)mm |
| Hardware | Bluetooth chip | FR8016H |
| | SRAM | 48KB |
| | Flash | 512KB |
| | data interface | UART/SPI/I2C/PWM/ADC/I2S/PDM |
| | working voltage | 1.8V ～ 4.3V |
| | Working current | <10mA |
| | working temperature | -40℃ ～ +65℃ |
| | Storage temperature | -55℃ ～ +125℃ |
| | ESD | CDM: 2000V, HBM: 2000V |
| | Update Firmware | UART/SWD/OTA |
| Software | software development | Provide SDK required for secondary development |
| | Support agreement | SIG Mesh/HomeKit |

# 2. Pins and definitions

Pin definition

| Foot position | name | type | describe |
|---|---|---|---|
| 1 | GND | GND | Ground |
| 2 | Pa5 | Dio | Data_UART_TX |
| 3 | PA4 | Dio | Data_UART_RX |
| 4 | PA6 | Dio | At_Mode |
| 5 | PA7 | Dio | Wakeup |
| 6 | PA0 | Dio | GPIO |
| 7 | NC | / | |
| 8 | PA3 | Dio | HCI_UART_TX (burning port) |
| 9 | Pa2 | Dio | HCI_UART_RX (burning port) |
| 10 | VBAT | AI | Positive supply input (1.8~4.3V) |
| 11 | PC7 | Dio | GPIO |
| 12 | PD4 | Dio | GPIO |
| 13 | PD5 | Dio | GPIO |
| 14 | PD6 | Dio | GPIO |
| 15 | Pd7 | Dio | GPIO |
| 16 | NC | / | |
| 17 | NC | / | |
| 18 | NC | / | |
| 19 | RESET | AI | Global reset (Low active) |
| 20 | GND | GND | Ground |

# 3. Block Diagram

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## Bluetooth Radio

- ★ On-chip balun (50Ω impedance in TX and RX modes)
- ★ No external trimming is required in production
- ★ Qualified to Bluetooth v5.0 LE specification
- ★ -95dBm (1M) receiver sensitivity in LDO mode
- ★ Integrated channel filters
- ★ Digital demodulator for improved sensitivity and co-channel rejection
- ★ Real time digitized RSSI
- ★ Fast AGC for enhanced dynamic range

## Bluetooth Controller

- ★ All device classes support (Broadcaster, Central, Observer, Peripheral)
- ★ All packet types (Advertising / Data / Control)
- ★ Encryption (AES / CCM)
- ★ Bit stream processing (CRC, Whitening)
- ★ Frequency hopping calculation
- ★ Supports power down of the baseband during the protocol's idle periods

## Peripheral Interfaces

- ★ UART port for Debugging and AT Commands
- ★ IIC interface to support external EEPROM or other devices (like G-SENSOR)
- ★ One more SPI interface to support other device (like OLED controller)
- ★ Up to 17 general purpose IOs (17 IOs can be set in interrupt mode)
- ★ General purpose 10-bits ADC used for ADKey and other analog input
- ★ PWM controller
- ★ Hardware LED controller
- ★ General purpose programmable timer for various task

★ Watchdog used for tracking unexpected exception

## Integrated Power Control and Regulation

★ Embedded Power-On-Reset
★ Low power 0.9v core voltage
★ On-chip high efficiency switch-mode power supply, 1.8v to 4.3v input direct from battery and programmable output voltage
★ On-chip Low Dropout (LDO) Linear Regulator for internal Digital, RF and Analog circuit
★ Power management features include software shutdown and hardware wake-up
★ Power-on-reset cell detects low supply voltage
★ Internal voltage level detector

# 4. Application circuit

# 5. Electrical parameters

- ●Maximum rating

| category | condition | value | Company |
|---|---|---|---|
| Supply voltage | - | 1.8 ～ 4.3 | V |
| working temperature | - | -40 ～ +65 | ℃ |
| Storage temperature | - | -55 ～ +125 | ℃ |
| welding temperature | - | 250 | ℃ |

- ●Recommended working environment

| category | name | minimum | Typical | Maximum | Company |
|---|---|---|---|---|---|

| | | value | value | value | |
|---|---|---|---|---|---|
| working temperature | - | -40 | 25 | 65 | ℃ |
| Supply voltage | VCC | 1.8 | 3.3 | 4.3 | V |

- ●Digital port

| category | name | minimum value | Typical value | Maximum value | Company |
|---|---|---|---|---|---|
| Input logic low level | Vil | -0.3 | - | 0.3*VDDIO | V |
| Input logic high level | VIH | 0.7*VDDIO | - | VDDIO+0.3 | V |
| Output logic low level | Vol | - | - | 0.1*VDDIO | V |
| Output logic high level | Voh | 0.8*VDDIO | - | - | V |

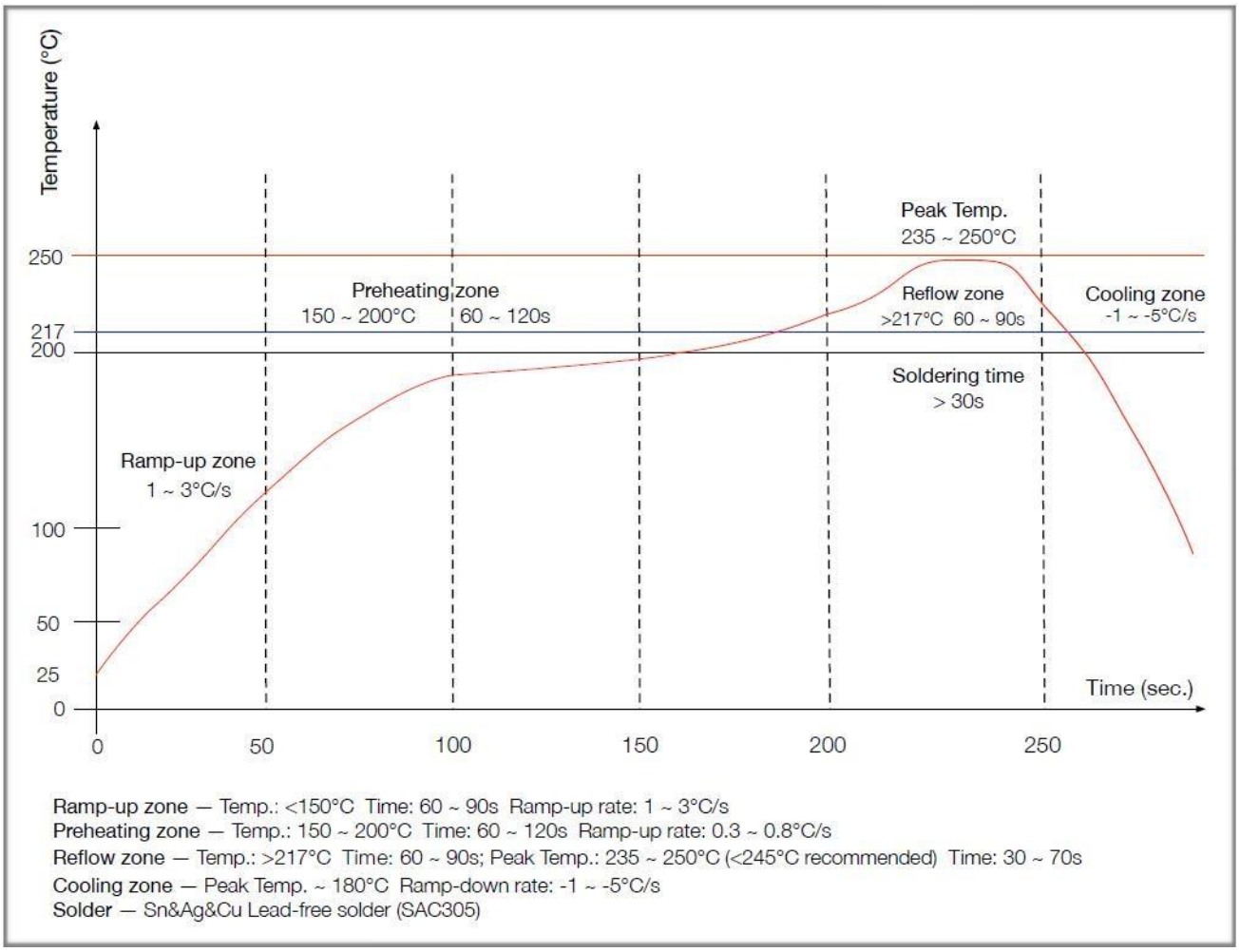
*VDDIO is generated by the internal LDO output of the chip, and the voltage can be adjusted by software, with a range of 2.1V - 3.5V.

- ●power waste

| category | average value | Maximum value | Company |
|---|---|---|---|
| TX peek current (0dB) | - | 8 | Ma |
| RX peek current | - | 9.7 | Ma |
| Deep sleep current (include 48K retention RAM) | 6.1 | - | UA |
| Power off | 2.7 | - | UA |

# 6. Reflow soldering conditions

1. 1.Heating method: conventional convection or IR convection;
2. 2.Allowable reflow times: 2 times, based on the following inclined heating conditions;
3. 3.Maximum temperature: 250 ° C.




ramp up

# 7. Electrostatic discharge warning

Modules will be damaged due to electrostatic discharge. It is recommended that all modules should be handled under the following three preventive measures:

1Anti static measures must be followed, and the module cannot be held with bare hands.

2The module must be placed in a placement area that can prevent static electricity.

3The antistatic circuit at the high-voltage input or high-frequency input should be considered in the product design.

Static electricity may result in subtle performance degradation to the failure of the entire equipment. Due to very small parameter changes, the equipment may not meet the value limit of its certification requirements, so the module will be more vulnerable to damage.

# 8. Version update record

| Version number | Document date | Update content |
|---|---|---|
| V10 | 2020/7/27 | ✓ ✓First release |

## FCC Caution:

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

**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.**

## FCC RF Radiation Exposure Statement:

**1. This Transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.**

**2. This equipment complies with RF radiation exposure limits set forth for an uncontrolled environment.**

**3.This equipment should be installed and operated with minimum distance 20cm between the radiator& your body.**

**Host product manufacturers that they need to provide a physical or e-label stating, "Contains FCC ID: 2ALPHD2112KJX01" with their finished product.**

**Only those antennas with same type and lesser gain filed under this FCC ID can be used with this device.**

**The host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. The final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.**

**The final host integrator must ensure there is no instruction provided in the user manual or customer documentation indicating how to install or remove the transmitter module except such device has implemented two-ways authentication between module and the host system.**

**The final host manual shall include the following regulatory statement: This equipment has been tested and found to comply with the limits. 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.**

**This module has been tested and found to comply with part 15.247 requirements for Modular Approval. This module is intended for OEM integrator. The OEM integrator is responsible for the compliance to all the rules that apply to the product into which this certified RF module is integrated. Additional testing and certification may be necessary when multiple modules are used.**

**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.**